THE PROBLEM WITH NUCLEAR IS THE DANGER OF ACCIDENTS AND NEAR ACCIDENTS

Canada

Chalk River—on Dec. 12, 1952 the world's first nuclear accident took place at the NRX experimental reactor at Chalk River, Ontario

- a massive power surge destroyed the core, causing a partial melt down
- a series of hydrogen gas explosions threw a 4-ton gasholder into the air
- thousands of curies of fission products were released into the atmosphere
- a million US gallons of radioactive water pumped out of basement, into trenches and then into the Ottawa River.
- 191 Canadian and American servicemen sent in to clean up, with inadequate radiation protection

- in 1958 a second accident with the NRU reactor
- an irradiated uranium fuel rod caught fire, was broken in half by a robotic crane, fell into a maintenance pit, spreading radioactivity throughout the building, and a jammed ventilation system allowed it to spread downwind
- 600 servicemen from Camp Petawawa sent in to clean up, with inadequate protection, and no compensation.
- in 1991 a broken weld spilled 18,000 litres of contaminated heavy water into the building
- the large danger is the loss of coolant, allowing the core fuel pellets to over heat, catch fire, and explode. (1)

Bruce 1 & 2 Reactors

- it was discovered that the pressure tubes in the reactors were subject to brittleness, to corrosion, to perforations, and to cracks because of the radiation, heat, steam and pressure—a danger for loss of coolant
  and melt down
- in 1977, a shut down for repairs and refurbishment till 2003 at a cost of $2.75 billion dollars and now a further repair escalating the cost to $3.4 billion.

Pickering Reactors

- At one time Ontario Hydro had 12 reactors shut down—4 at Pickering B station, 4 at Bruce B station, 4 at Darlington station.
- Pickering needed new pressure tubes in 1980's at a cost of $720 million dollars.

Darlington Reactor

- in 1983, a discovery of pressure tube embrittlement—refurbishment needed
- Nov. 2002, holes in the walls of "steamproof rooms" threatened sensitive shut-down equipment
- Fortunately, there have been no melt downs yet, but the conditions and deteriorations keep progressing. (1)

Britain or the United Kingdom

Sellafield

- on Oct.10, 1957—a large scale nuclear accident at Windscale 1 reactor (now called Sellafield) in northern England
- a plant producing plutonium for Britain's first nuclear weapons
- the graphite core in the reactor exploded with a release of Wigner energy
- started a fire that raged for 2 days, releasing 700 trillion becquerels of radiation
- a plume of iodine, polonium and cesium swept across Britain and northern Europe.
- cesium gets into the grass and vegetation, cows milk banned for 6 weeks, sheep still tested today for radioactivity before marketing..
- radiation has caused an increase of cancers, and increased leukemia in children
- 15 tons of radioactive fuel still remaining—if uranium hybrids mix with oxygen they could ignite spontaneously—decommissioning still proceeding 51 years later
- will take 100 years to decommission, at a cost of 73.6 billion pounds, or $139 .49 billion US dollars

Oldbury—an old reactor shut down by fire in July, 2007 (2)

United States of America

- has a total of 103 reactors
- in 1971 a fire at Indian Point reactor caused $5-10 million dollars of damage
- in 1979 the Nuclear Regulatory Commission of the USA—(NRC) published a list of 33 precursor accidents from 1971 till 1986

- in July of 2006, a factory making reactor fuel in Washington had a spill so bad that it was closed for 7 months, and was reported to Congress—it could have created a "critical mass."

Brown's Ferry Reactor in Alabama

- On March 22, 1975 a fire started in some insulation and destroyed vital wires to the control panels. Control wires and instruments went awry, and staff were barely able to forestall a melt-down. Fire raged for some hours.

Three Mile Island Reactor

- on March 28,1979—29 years ago, a partial meltdown and radiation disaster.
- a loss of coolant, melting of fuel, multiple explosions, venting of contaminated water, a build up of explosive hydrogen inside the reactor vessel
- 10 million curies of radioactive noble gases like krypton-85 and iodine-131 were vented (a curie is 37 billion disintegrations per second)
- 400,000 gallons of radioactive cooling water leaked into the Susquehanna River.
- on the third day 144,000 people fled the area
- six workers entered the contaminated reactor building, five later died from cancer
- infant deaths soared 53.7 % in the first month, 27% in the first year
- leukemia deaths in children jumped 50% from previous 5 years
- increased effects on animals—still-born pigs, deformed colts and dogs
- authorities denied radiation effects, refused to do follow-up health studies.
- orders for 51 new reactors were cancelled between 1980 and 1984

Point Beach –Unit 1&2 ----in Wisconsin

- complete loss of power for 15 minutes—steam leak and contamination
- back-up cooling pumps failed—explosion of hydrogen gas in a high level waste storage cask.

Kewannee—Wisconsin

- shut down due to loss of oil pressure, and failure of main feed water pump
- 3 auxiliary feed water pumps proved inoperable
- leakage of radioactive tritium into 4 shafts
- with the shut-down, a discovery of corroded steam pipes

Oak Harbor, Ohio

- in 2002 the Davis- Besse reactor was shut down for 2 years
- A discovery and replacement of its acid-eaten vessel head at the top of its core

Fermil in Monroe, Michigan

- In 1966 a melt-down destroyed a $100 million dollar reactor, and threatened a potential evacuation of Detroit and south eastern Michigan(3)

Ukraine

Chernobyl –outside of Kiev in northern Ukraine, near village of Prypiat

- 1986—the world's worst industrial accident and nuclear explosion in the reactor # 4.
- a combination of design failure and operator error.
- a routine test went wrong, setting up a chain reaction, creating an explosion that blew off the reactor's 1000 tonne steel and concrete lid.
- it spewed out at least 200 times more radiation than the bombing of Hiroshima.
- the 1,700 ton graphite moderator core caught fire , exploded and sent fragments of burning graphite all over the reactor building and area, and burned for 2 weeks
- one billion or more curies of radiation were released—a single curie is a large amount—one curie is the disintegration of 37 billion atoms per second.
- liquidators or clean-up workers were sent in to clear up the debris—in the months following the explosion, some 600,000 soldiers, firemen, and workers were sent in to work for short periods.
- out of the 600,000 liquidators, in the first decade 40,000 clean-up workers died.

- the first set of liquidators died within a few hours from radiation burns.
- a 30 kilometre “dead zone” was established around the reactor where human habitation was prohibited
- immediately after the explosion, 116,000 persons were evacuated, and later some 400,000 inhabitants were permanently evacuated.
- in the Ukraine, over 4.6 million hectares of agricultural land were contaminated.
- outside the 30 kilometre zone, 1.2 million people live on the land with low-level radiation, with some 1800 villages affected, and 70 villages buried underground
- northwesterly winds carried clouds of radiation over Scandinavia, Wales and Ireland, the next day over Germany, Poland and France, the next day over southern Europe and Greece.
- thousands of children and adults were stricken with radiation sickness, leukemia and cancer
- thyroid cancer among children in the region rose to levels 80 times higher than normal
- infant mortality in the Ukraine stands at twice the European average
- there has been an increase of sterility in parents, plus genetic damage, and congenital deformities among their off-spring. .
- a sarcophagus was built over the devastated reactor, plus the remaining 20 tonnes of nuclear fuel, in order to restrict the ongoing spread of radiation. Now, the sarcophagus is cracked, leaking radioactivity, and is to be replaced at a cost of $1 billion dollars.
- it was a disaster of unprecedented scale! (4)

Japan

52 nuclear reactors in Japan -Japan sits on top of 4 tectonic plates, subject to earthquakes, with a periodicity of 10 years.

Hamaoka Reactor—sits directly on the junction of 2 tectonic plates—the most dangerous plant in Japan

Tokai Reactor—Ibaraki Prefecture—

- Sept . 1999—the worst nuclear plant disaster in Japan’s history
- cracks in the cooling pipes from vibrations, led to the shut-down of Tokyo Electric Power.
- half of the reactors in Japan currently shut down for conversion to natural gas

Tsuruga Reactor

- 1997—fire and explosion in processing plant exposed 35 workers to radiation
- 1999 – internal leak of radiation at 11,500 times the safety level.

Tokaimura Reactor

- 1999—flash criticality at conversion plant, radiation levels increased
- dissolving uranium oxide in nitric acid, and transferring it to a precipitation tank by poorly trained workers
- 50 families evacuated within 350 metres of the plant—10,000 times the normal level of radiation
- later, an evacuation order to 200,000 residents within a 10 kilometre radius
- later, 12 factories shut down, 10,000 workers advised to stay home.
- later, 310,000 persons ordered not to leave home, schools and trains closed
- some 55 people exposed to serious levels of radiation, 3 persons died after **exposure.**

Kashiwazaki Reactors

- July 16, 2007—an earthquake of 6.1 magnitude almost caused a major catastrophe.
- 9 people killed and over 800 injured in the earthquake
- of 7 reactors, 4 were forced into SCRAM mode to avoid meltdown
- a fire started in a transformer, and the reactor shut down—billows of black smoke visible for a long distance
- 545 gallons of radioactive water leaked into the ocean, waste barrels tipped and lost their lids.
- authorities acknowledged reactor design not adequate for earthquakes
- re-opening date not yet known

Google Internet, from 1957 to 2008, lists 9 reactor accidents from fires, explosions, ruptured pipes, and leaking steel barrels. (5)

Germany

Possesses several aging reactors, some over 31 years old.

Neckarwestheim 1 Reactor—has experienced numerous problems

Biblis A—has experienced several problems

- October 2005, a fire broke out and the reactor had to be shut down manually
- it took 20 days to discover a leak of radioactive water into the Neckar River
- shut down for 8 months to repair back-up cooling system
- 1500 heavy dowels found to be installed incorrectly, maintenance deficiencies

Philippsburg II Reactor

- came on-line in 1984, has experienced various shut-downs
- concrete containment shell proved to be not thick enough
- after maintenance, a start-up without an emergency cooling system, because it had been incorrectly filled.

Krmmel Reactor—operated by Vatenfall

- a fire in a transformer on July 4, 2007 led to thick clouds of smoke recorded on television, and took the fire department several hours to extinguish
- technical failures, human error, and corporate incompetence.blamed

Brunnsbttel Reactor—operated by Vatenfall

- June 29, 2007—a phenomenon of "arcing" which caused a fire
- ignited several tons of transformer oil

Asse II—former salt mine, used to store nuclear waste since 1967

- has been found to be leaking radioactive brine, some 80,000 litres which is 8 times the radioactivity limit—could cause uncontrollable chemical reactions.

Gorleben and Moreslaben---former salt mines used for storage of nuclear waste, and potential for leakage of radioactive brine

130 incidents reported annually in Germany (6)

Sweden

Sweden has 3 sets of nuclear reactors

Ringhals—60 km south of Gothenburg

- Nov. 14, 2006—a fire of explosive nature broke out, shutting down reactor #3

Oskarshams—150 miles south of Stockholm

- safety could not be guaranteed, so shut down for a period
- 2 out of 4 back-up generators not working

Forsmark--- 46 miles north of Stockholm

- 1992—5 reactors shut down due to serious flaws in the cooling systems
- another shut down for safety reasons after a power surge and a blackout

July 25, 2006—2 out of 4 back-up power systems failed leading to shut-down—following this incident, 4 out of 10 reactors were shut down for 3 months (7)

Spain

Spain has 8 aging reactors within its borders

Asco I Reactor on the Ebro River

- Nov. 29, 2007—radioactive cooling water spilled, with cobalt-60 spread over 45 miles.
- Endesa Corp kept accident secret for 5 months, was fined $48 million for release and cover-up
- The leak turned out 100 times more serious than first reported. (8)
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Bulgaria

Kozlodicy Reactors

- Oldest 1st and 2nd reactors closed at end of 2002, due to fires and leaks
- Soviet designed reactors –in danger of another Chernobyl accident.
- 2of 4 reactors shut down as requirement for entry into European Union

2 1000 megawatt reactors remaining to provide energy for the Balkans. (9)

France

has 59 reactor sites

Tricaster –home to 4 reactors, a nuclear waste site, a uranium enrichment site

- July 7, 2008 leak caused 7925 gallons of uranium contaminated water to poison the Lauzon, Gaffire, Drom and Rhone rivers.
- 100 workmen exposed to radiation, 70 showed traces of contamination
- residents alarmed when contamination found in water from wells
- July 29, 2008—more than 120 workers evacuated when a reactor alarm sounded

St. Albun—in the southeast of France

- July 29, 2008—a leak exposed 15 workers to radioactivity

Bollene---southern France

- Well water showed micrograms of uranium per litre to be over 4 times the allowable limit.

Authorities now checking the groundwater at all 59 reactor sites.

La Hague—Normandy

- Five workers at a nuclear processing plant were exposed to radiation after an accident at the plant

A list of "incidences" in France: 115 in 2008. 86 in 2007, 114 in 2006 (10)

China

–Little information available

- Has a research reactor, 2 nuclear fuel production sites, 2 atomic weapons sites, and a plutonium production reactor
- all of these reactors are within Sichuan Province, which recently experienced an 8.0 earthquake on the Richter scale.
- potential damage not yet known. (11)

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