Spikes in Radioactive Emissions from Nuclear Power Stations

By Dr. Ian Fairlie

Up until very recently, it was impossible to obtain information on the time release patterns of radioactive emissions from nuclear power reactors (NPRs). Despite requests, British nuclear utilities and UK government regulators repeatedly refuse to publish any time-related data. Averaged annual emissions were released. But not monthly, weekly, daily, or hourly real-time emission data.

I [believe] most radioactive emissions from nuclear reactors are not spread evenly across the whole year, but happen during short refueling periods which occur about once every year or two and which last a few days or so.

These short spikes could explain a matter which has puzzled radiation protection agencies for decades: the reason for apparent increases in childhood leukemias near NPRs all over the world. Governments have insisted that these increased leukemias could not be caused by radioactive emissions from NPRs, because their estimated radiation doses were 100-1,000 times too low. But these estimates are riddled with uncertainties, and they don't take the time patterns of radioactive emissions into account.

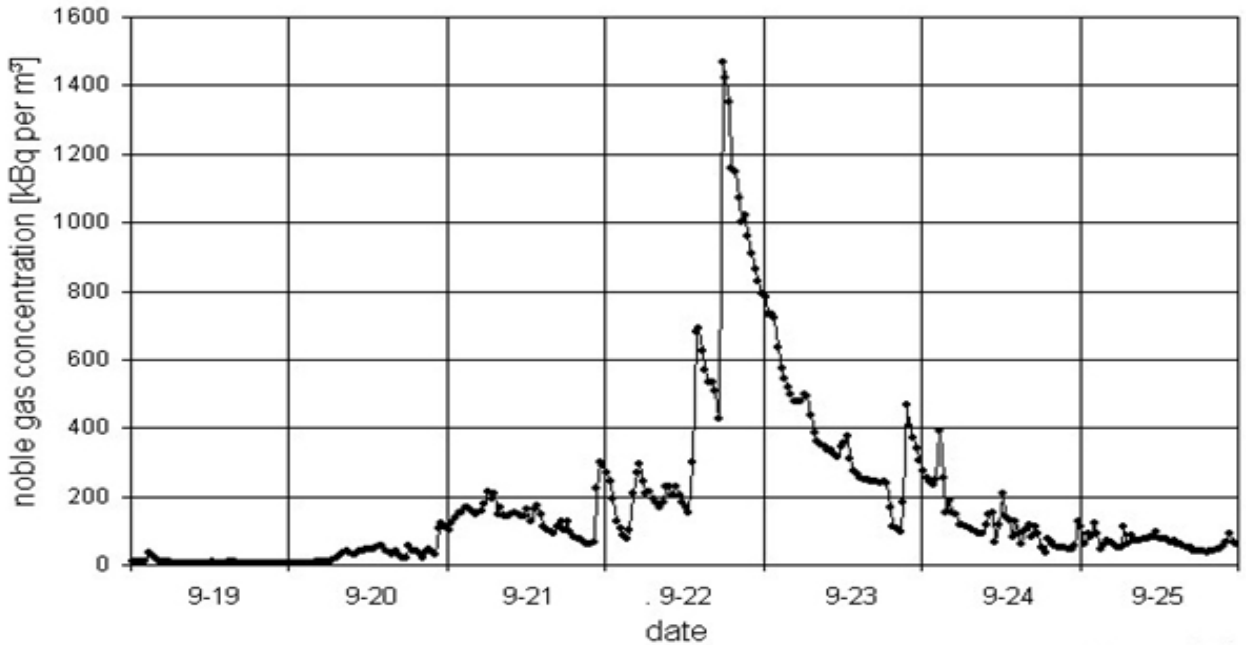
In September 2011, International Physicians for the Prevention of Nuclear War (IPPNW) in Germany released a press notice which contained data on half-hourly releases of radioactive noble gases from an NPR for the very first time anywhere in the world. This information is shown in the chart below for seven days in September 2011.

How was this data released?

In May 2011, German Green Members of Parliament entered the Bavarian State Parliament for the first time where they formed the Government in coalition with the Socialist Party. After several requests, the new Bavarian Government insisted that the state nuclear regulator release non-averaged data on emissions. The highly reluctant nuclear regulator was compelled to respond. In other words, the Green MPs obtained the data because they had the political power to force its release: there is a lesson here for environmentalists.

Why is this data important?

In order to refuel, reactor pressure vessels must be opened up. This releases large volumes of radioactive gases and vapors to the local environment.



These data were from Gundremmingen, a boiling water reactor in Southern Germany. The chart shows that normal emission concentration (of noble gases) during the rest of the year was about 3,000 Becquerels-per-cubic-meter (3kBq/m³), but during refueling on Sept. 22, 2011 this sharply increased to ~700 kBq/m³, with a peak of 1,470 kBq/m³, in other words a "spike." This data shows that NPRs emit much larger amounts of radioactive noble gases during refueling than during normal power operation. From the new data, Nuremberg physicist and statistician, Dr. Alfred Körblein, estimated ... that about two thirds of the NPR's annual emissions occur during refueling.

These include noble gases, H-3 (tritium), carbon-14, and iodine-131. Until now, nuclide amounts had only been published as annual averages throughout the world. Now, non-averaged values have been made available for scientific evaluation for the first time.

Could these spikes explain leukemia increases near reactors?

Yes. People living near nuclear power stations and downwind from them will be exposed to high doses of radiation during these emissions spikes—much higher than from releases during the rest of the year. Estimates range from 20 to 100 times higher. Recently the British National Dose Assessment Working Group published guidance on "Short Term Releases to the Atmosphere."

This states that "…doses from the assessment of a single realistic short-term release are a factor of about 20 greater than doses from the continuous release assessment." An older German study indicated that these doses could be a factor of 100 greater. …

Therefore higher doses from emission spikes could go a long way to explaining the increased incidences of child leukemias near NPRs shown by KiKK (2007 German government report) findings. IPPNW Germany warns of the probable health impacts of such large emission spikes. "Especially at risk are unborn children," the physicians said..

"When reactors are open and releasing gases, pregnant women can incorporate much higher concentrations of radionuclides than at other times, mainly via respiration," said Reinhold Thiel, member of the German IPPNW Board. "Radioactive isotopes inhaled by the mother can reach the unborn child via the blood and placenta with the result that the embryo/fetus is contaminated ('labelled') by radioactive isotopes. This contamination could affect blood-forming cells in the bone marrow later resulting in leukemia. This provides a plausible explanation for the findings of the KiKK study published in 2007 and 2008—that [children under five] living near nuclear power plants are considerably more at risk of cancer, particularly leukemia, than children living further away," Thiel said.

—Ian Fairlie, an independent consultant on radioactivity in the environment, was head of the Secretariat of the British government's Committee Examining Radiation Risks from Internal Emitters. He posted a longer version of this article Jan. 19, 2012.

Unaccounted Radioactive Iodine Plume Reported Across Europe

A plume of radioactive iodine-131 was detected "in the ground-level atmosphere" over large areas of Europe during the month of January 2017, France's Institute for Radiation Protection and Nuclear Safety (Institute de Radioprotection et de Süreté Nucléaire, or IRSN) reported February 13. The source of the reactor-borne contamination remains unknown.

The agency noted that because iodine-131 has a relatively short hazard life (half of it decays away in eight days), its detection "is proof of a rather recent release."

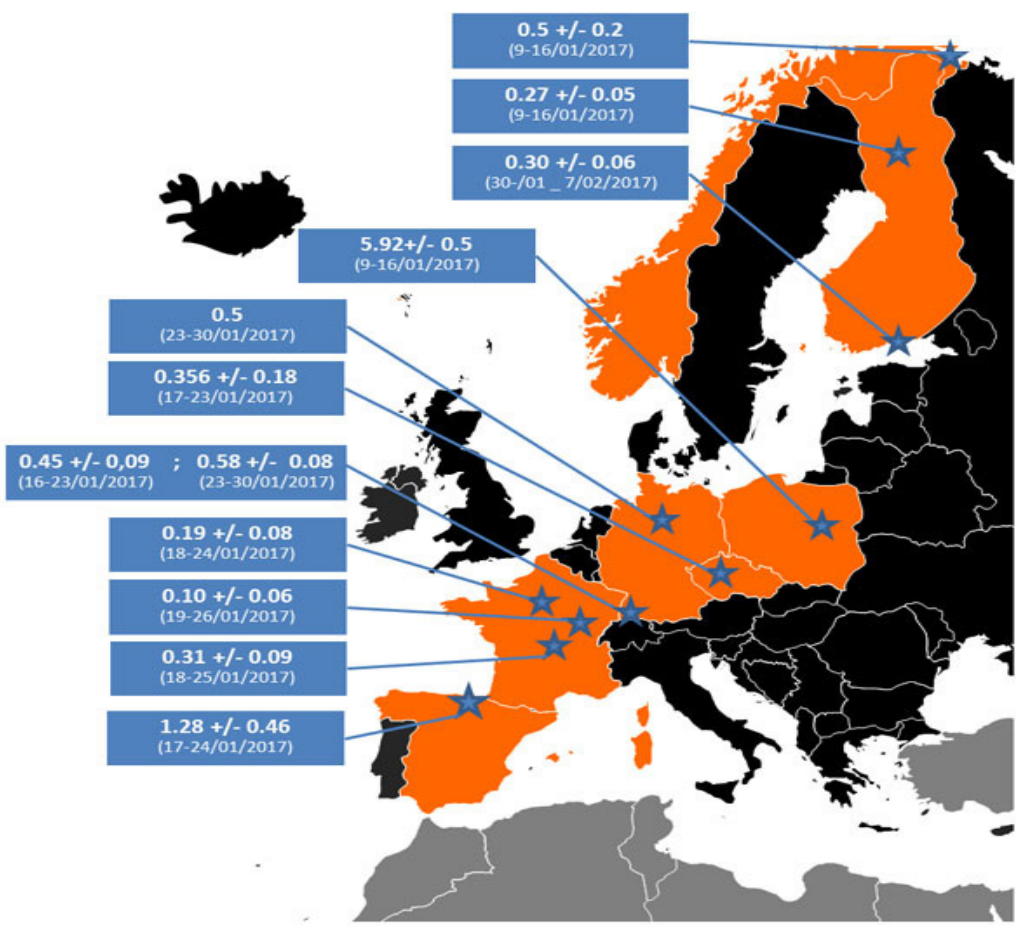
The IRSN was unable to identify the source of the radio-iodine, but its press release noted that it was certainly "of anthropogenic origin," the result of a release from a nuclear reactor or a reactor fuel facility accident. The agency acknowledged that "iodine-131 in the air could come from an incident with a nuclear reactor."

The *Independent Barents Observer* reported that a monitoring station in Svanhovd, Norway was the first to measure the airborne iodine-131 during the second week of January. IRSN noted that, "The preliminary report states it was first found during week 2 of January 2017 in northern Norway. Iodine-131 was also detected in Finland, Poland, Czech Republic, Germany, France and Spain, until the end of January."

The highest documented amounts of the radio-iodine were reported in Poland and Spain (see chart). Both the IRSN and the *Barents Observer* accounts called the observed amounts of radio-iodine "tiny," and IRSN also used the phrase "trace amounts"—the scientific term-of-art that refers to very small volumes of radioactive isotopes.

Airborne radioactive materials are ordinarily measured in terms of the number of atomic disintegrations (Becquerels) in a given cubic meter of air. France's IRSN said, "At Svanhovd, [Norway] measurements in the period January 9-16 show levels of 0.5 micro Becquerel per cubic meter air." A micro Becquerel is one-millionth of a Becquerel.

Neither of the accounts noted that airborne iodine-131 can be ingested by breathing or by swallowing contaminated food or water, nor that internal radioactive contamination is more dangerous than external exposures. Iodine-131 accumulates in the thyroid gland where it is associated with the development of thyroid cancer. ***—JL***



—Chart by French Institute for Radiation Protection and Nuclear Safety, press release, Feb. 13, 2017; & *Independent Barents Observer*, Kirkenes, Norway, Feb. 19, 2017