March 11, 2011

Karl Grossman

Investigative reporter

Posted: March 11, 2011 12:46 PM

Nuclear Emergency in Japan

What Japan is now trying to avoid is a complete loss of power to the cooling systems at its Fukushima nuclear power plant. This would lead to a loss-of-coolant or meltdown accident -- a disaster which could have catastrophic impacts on Japan and much of the world.

Radioactive material is used in a nuclear plant as a heat source -- to boil water and produce steam that turns a turbine that generates electricity. Huge amounts of radioactive material are made to go through a chain reaction, a process in which atomic particles bombard the nuclei of atoms, causing them to break up and generate heat.

But to keep the nuclear reaction in check -- to prevent the material from overheating -- vast amounts of coolant are required -- up to a million gallons of water a minute in the most common nuclear plants that have been built ("light water" reactors). That is why nuclear plants are sited along rivers and bays, to use the water as coolant.

If the water which cools the reactor "core" -- its 200,000 to 300,000 pounds of radioactive fuel load -- stops flowing, the "emergency core cooling system" must send water in. If it fails, a loss-of-coolant or meltdown accident can occur.

In such an accident, the core of nuclear fuel, which in less than a minute can reach 5,000 degrees Fahrenheit, burns through the cement bottom of the nuclear plant and bores into the earth. This is what U.S. nuclear scientists have dubbed the "China syndrome" -- based on a nuclear plant on their side of the planet undergoing an accident seemingly sending its white-hot core in the direction of China.

In fact, the radioactive core doesn't -- in any location -- go to China but it descends to the water table underlying a plant. Then, in a violent reaction, molten core and cold water combine, creating steam explosions and releasing a plume of radioactive poisons.

The problem at Fukushima Diachi nuclear facility is that one of its six reactors lost all its power as a result of the earthquake. Back-up diesel generators didn't work, so battery power became necessary to keep coolant water flowing. If the battery power is depleted and electric power is not otherwise restored, a loss-of-coolant accident or meltdown would ensue.

"The emergency shutdown has been conducted but the process of cooling down the reaction is currently not going as planned," explained Japan's Chief Cabinet Secretary Yukio Edano, according to CNN.

Thus, Japan declared a state of "atomic power emergency" and people living within three kilometers of the Fukushima facility were advised to evacuate.

In fact, if the coolant flow is not maintained and a loss-of-coolant accident with a "breach of containment" occurs, people way beyond three kilometers around Fukushima would be impacted. The radioactive releases in the Chernobyl nuclear plant accident affected the entire northern hemisphere, as a book published last year by the New York Academy of Sciences documents. And *Chernobyl: Consequences of the Catastrophe for People and the Environment*, authored by Dr. Alexey Yablokov, Dr. Vassily Nesterenko and Dr. Alexey Nesterenko, finds that medical records between 1986, the year of the accident, and 2004 reflect 985,000 deaths as a result of the radioactivity released. Most of the deaths were in Russia, Belarus and Ukraine, but others were spread through the many other countries the radiation from Chernobyl struck.

Where the radioactivity spreads after a nuclear plant meltdown is largely a function of where winds take the radioactivity and of the rain that causes it to fall out.

There are numerous lessons to be learned from the situation now underway in Japan including why a nation situated on a string of volcanic islands would build nuclear power plants, vulnerable as they are to earthquakes. Of course, Japan is not alone on this score: in the U.S., the Diablo Canyon nuclear facility in California was built less than three miles from the Hosgri earthquake fault.

Nuclear power plants are, in fact, life-threatening wherever they are -- they represent the most dangerous way to boil water ever devised.

Wind, solar and geothermal energy and other forms of safe, clean power would not cause massive deadly damage because of an earthquake.