



# NUCLEAR INFORMATION AND RESOURCE SERVICE

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## NIRS FACT SHEET—NUCLEAR 911

### EMERGENCY PLANNING FOR NUCLEAR DISASTERS

#### **Current Emergency Planning Rules:**

Under current emergency planning rules (10 C.F.R. 50.47(c)(2)), reactor operators must work with state and local governments to produce reasonable assurances that adequate protective measures will be taken in the event of a radiological emergency. An emergency evacuation plan includes an emergency planning zone (EPZ) that encompasses both the exposure plume pathway and the ingestion pathway. The exposure plume pathway EPZ requires that a 10 mile radius around the reactor have an evacuation plan for nuclear plant accidents to protect the health and safety of resident's in the 10 mile zone. The ingestion pathway consists of an area about 50 miles in radius and focuses on actions appropriate to protect from ingestion of contaminated food and liquids.

In determining the size of the EPZs, an NRC/EPA task force looked at factors like risk, probability, cost effectiveness and accident consequence spectrum. The 10 mile EPZ is an arbitrary number that was initially generated by examining simulations of how much nuclear fuel would fail and leak in the event of an accident.

#### **Why the 10 mile EPZ is not adequate:**

Both the Chernobyl and Fukushima Daiichi nuclear accidents provide examples of how a limited evacuation zone of 10 miles around a nuclear reactor disaster is insufficient.

Chernobyl evacuations began on April

27, 1986 with Pripyat and the nearby village Yanov. On May 2, 1986 evacuations were ordered for villages beyond an initial 10 kilometer (6 mile) zone surrounding Chernobyl to include villages within 30 kilometers of Chernobyl. Eventually, evacuations spread over the years as far as 200 miles away from the reactor. Between 1986 and 2000 approximately 350,400 people were evacuated from the areas surrounding Chernobyl.

Fukushima evacuations began similarly. On March 11, 2011, the day that the reactors were struck by the earthquake and tsunami, a 3-kilometer region around the reactor was evacuated. The following day, evacuations rose from 3 kilometers to 10 kilometers and finally 20 kilometers, when the pressure within the reactor coolant system caused a hydrogen explosion in reactor unit 1. In May, after efforts to mitigate the overheating at the reactors continued for several weeks after the initial meltdown, a new evacuation order was issued to those living beyond the 30 kilometer exclusion zone. In August, reports of continued concerns regarding the radiation released from Fukushima culminated in the Japanese government announcing that the 20 kilometer region around the reactor would be uninhabitable for decades. On August 31, 2011 the Japanese government revealed that 34 locales surrounding Fukushima have higher levels of radiation than the Chernobyl threshold. The threshold for

radioactive contamination in Chernobyl was 1.48 million Becquerels per square meter. The Japanese government found levels of deadly cesium-137 in excess of this threshold which renders these locations completely uninhabitable.

### **Natural Disasters:**

The earthquake and subsequent tsunami that destroyed the Fukushima plant demonstrate that natural disasters can cause serious nuclear emergencies. The U.S. is not immune to such disasters. In August 2011, both an earthquake and a hurricane caused damage to nuclear reactors, further demonstrating the need to reconsider and expand emergency planning zones.

On August 24, 2011 the east coast experienced an earthquake of 5.8 magnitude, the largest magnitude earthquake in the region since 1944. The ground motion acceleration caused by that earthquake was twice what the North Anna nuclear reactors were designed to withstand. North Anna subsequently lost offsite power. Without offsite power to cool the reactors, back-up diesel generators had to be turned on. One of the four diesel generators failed to activate.

Hurricanes are dangerous to nuclear reactors for several reasons, especially storm surge which can adversely affect cooling water intake systems. The central portion of a hurricane is a low pressure system surrounded by high pressure zones. The combination of the two can form columns of water that can be several feet in height. This can inundate vital water pumps.

Wind can also be a factor: during August 2011's Hurricane Irene, a piece of metal siding on one of the buildings at the Calvert Cliffs, MD nuclear complex became dislodged and hit a transformer which caused an explosion that shut the plant down.

Tornadoes, wildfires, and floods also can—and during 2011 in fact did—threaten operations of nuclear reactors. Yet current NRC regulations do not require testing of emergency evacuation plans with a concurrent or initiating natural disaster.

### **Our Proposed Changes:**

**25-mile Plume Exposure Pathway EPZ** would be established within a 25-mile radius of a reactor site. Within this zone, detailed plans must be developed to provide prompt and effective evacuation and other appropriate protective measures, including conducting of biannual full scale emergency drills. Sirens will be installed within this zone to alert the population of the need for evacuation. Transportation for elderly, prison and school populations shall be provided within this zone. Emergency shelters shall be located outside of the 25 mile zone. Every other biannual test of an emergency evacuation plan would have to use a scenario that includes a regionally-appropriate concurrent or initiating natural disaster.

### **50 Mile Emergency Response Zone**

Within this 50 mile zone, the licensee must identify evacuation routes for all residents within this zone and annually provide information to all residents within this zone about these routes and which they are supposed to take in the event of an emergency. The licensee must make basic pre-arrangements for the potential transport of disabled/hospital/prison populations. Emergency centers for the public currently located less than 25 miles out shall be located to 25 miles or further out. Information shall be made available to the public within this zone through television, internet, radio alerts and text message notices and other appropriate means of public communication.

### **100 mile Ingestion Exposure Pathway Zone**

In the event of a radioactive release, the deposition of radionuclides on crops, other vegetation, bodies of surface water and ground surfaces can occur. Measures should be in place to protect the public from eating contaminated food. Information shall be made available to the public within this zone through television, internet, radio alerts and text message notices and other appropriate means of public communication.

*--Dominique French, January 2012*