

Blue Ridge Environmental Defense League

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William S. Lee III Nuclear Station

FACT SHEET

Clean Water Act NPDES Permit

On August 15, 2011 the South Carolina Department of Health and Environmental Control (DHEC) received a permit application for a National Pollution Discharge Elimination System (NPDES) permit for the Duke Energy Carolinas proposed Lee nuclear power station in Gaffney. An NPDES permit is wholly separate from the Nuclear Regulatory Commission license process; it is granted by the state under federal law. If approved, it may be challenged in state courts.

In March the staff of the Blue Ridge Environmental Defense League contacted DHEC's Bureau of Water Quality Director, Jeff DeBessonet, and inquired about the permit status and requested that a public hearing be held. In April SAFE Carolina's contacted DHEC's Randy Thompson who said that a draft permit could be ready in about a month. A public hearing would give residents of North and South Carolina an opportunity to organize to halt or delay the proposed plant.

A Permit for Pollution

An NPDES permit for the Lee plant would be like those of many other facilities such as sewage treatment plants. The difference is that the pollutant of principal concern is heat. Steam electric generating plants, including coal-fired and nuclear, are thermo-electric; that is, they generate heat to boil water to make steam to run a turbine attached to a generator. The problem for the plant operator and the permitting agency is that roughly two-thirds of the heat energy generated in this process is wasted, produces no power and must be discarded. This inefficiency is a fundamental flaw of all thermo-electric plants and is determined by the laws of physics. In fact, the permit application states that each of the two AP1000 reactors would have a thermal output of 3415 megawatts (MWt) but the electric power output of each reactor would be just 1199.5 megawatts (MWe), for an efficiency of 35%.

The wasted heat may be discharged into the air via a cooling tower or to the water by a pipe. Cooling towers may either use the evaporation of water to remove process heat and cool the working fluid to near the wet-bulb air temperature or, in the case of closed circuit dry cooling towers, rely solely on air to cool the working fluid to near the dry-bulb air temperature. Wet bulb temperature is the lowest temperature that can be reached by the evaporation of water only. Dry bulb temperature is the temperature that is usually thought of as air temperature, and it is the true thermodynamic temperature. It is the temperature measured by a regular thermometer exposed to the air.¹

Duke Power plans to use mechanical draft wet cooling towers at the Lee Station. According to a company spokesman, problems include limited space and available flow

¹ www.en.wikipedia.org

in the Broad River, and limited effectiveness during hot weather. To counter these problems, Duke plans to supplement river water withdrawals with water from on-site impoundments to limit downstream impacts during low water conditions.²

For cooling purposes, the Lee station would require the withdrawal of 35,030 gallons/minute from the Broad River. Of this, 71% would be consumptive use, water lost by evaporation and drift loss from the cooling towers. The remaining 29% would be returned to the river either via screen wash or cooling tower blowdown and other process waste streams.³ The discharge to the river would be at the Ninety-Nine Islands Dam.

Lee Station Sources of Water Pollution⁴

Outfall number	Operation	Average flow (gpm)
001a	Cooling tower blowdown	8087
001b	Wastewater treatment	1500*
001c	Liquid radwaste	30*
001	Combined discharge	8216

* Intermittent

The Lee plant would release heat and other pollutants into waters of the United States. The permitted water discharge temperature could be as high as 91 degrees-F in the summer. Other pollutants listed in the application include radionuclides (3.4 picocuries/liter), fluoride (43 pounds/day), phosphorus (56 lb/d), nitrates (167 lb/d), sulfates (3677 lb/d), aluminum (99 lb/d), lead (½ lb/d), arsenic (½ lb/d), and smaller amounts of chromium, cadmium and mercury.⁵

The Clean Water Act

Section 316(a) of the federal Clean Water Act regulates heated discharges into waters of the United States. Under Section 316(a), heated water is considered a pollutant, and facilities wishing to discharge into a water source must apply for a NPDES permit. Section 316(a) also allows a power plant operator to obtain a thermal effluent variance.

Section 316(b) of the Clean Water Act requires that the cooling water intake structures minimize adverse environmental impacts: 1) the impingement and mortality of organisms, primarily fish, on screens that protect the intake system, and 2) the entrainment and mortality of small organisms, primarily fish eggs and larvae, that pass through those screens and through the plant's entire cooling system.

Water Problems Plague Thermoelectric Power Plants

U.S. Geological Society data show that thermoelectric power plants account for 41% of freshwater withdrawals nationwide. Annual temperatures in the Southeast region are increasing and are projected to continue to do so. DHEC must fully analyze the following potential impacts of elevated water temperatures in the Broad River and its

² Summary of Presentations, EPRI Advanced Cooling Technology Workshop, July 8-9, 2008, Charlotte, North Carolina

³ WS Lee NPDES application, 8/15/11, Geosyntec Consultants, Attachment B.1 Details of CFD Model, p.1

⁴ WS Lee NPDES application, 8/15/11, EPA Form 2D, Page 1 of 30

⁵ WS Lee NPDES application, 8/15/11, EPA Form 2D, Page 3-5 of 30

water shed:

- The impact of the reactor's thermal discharge on water that is already elevated in temperature ó both additive and synergistic impacts on the local and downstream ecosystem
- The evaluation of increasingly warmed water on technical specifications for reactor cooling
- The evaluation of the impact of warmer ambient water temperatures on total withdrawal, consumption and evaporation
- The impact of warmed water on condenser cooling ó nuclear power reactors around the world have gone to low power or offline due to elevated cooling water temperatures and the loss of efficiency in power production due to loss of effective condensation of steam used to generate power
- The impact on other facilities ó the need to provide cool water to the two William States Lee reactors could impact operations at upstream facilities. And heat generated at the Lee site would impact operations at downstream facilities.
- The impact of pollution in water at warmer temperatures on the ecology of the site and downstream ó most chemical reactions are facilitated by elevated temperatures; a full analysis of the impact of reactor heat in hotter water on the other pollutants in the water from any source must be considered, including implications for the food chain
- The impact of reactors going off-line during a heat wave; specifically, the loss of power during a heat wave on electric power customers
- The impact of reactors going off-line on regional grid stability
- The potential for extended drought locally and in the region to exacerbate all of the issues identified above.

Duke Energy's own environmental report includes a longitudinal analysis of flow-rates in the Broad River, which shows that there are potential problems with water supply:

During the 1998-2002 drought, operations would have been curtailed for 42 days during June-September 2002, which was the worst year of the drought. Part of this outage would have coincided with the summer peak power demand.⁶

This reveals that based on historical data there are water supply uncertainties. DHEC must fully address a host of issues associated with the problem of rising temperatures, including the potential for current and future climatological conditions to depart from the past.

It would be good science, to be looking at the new projections for changes in coastline, increased storms, changes in water levels, changes in flood patterns.⁷

People all across the Carolinas will be adversely impacted if a facility is built that is vulnerable to reduced capacity and or at risk from a major reactor accident caused by heat problems. Further, residents would be affected if the Broad River and other water resources in the area are substantially reduced or compromised by the operation of Duke's WS Lee station.

L. Zeller 5/31/12

⁶ William States Lee III Nuclear Station, Nuclear Regulatory Commission Environmental Report, Revision 0, Section 5.2.2.2 Potential Impacts on Water Use, page 5.2-9

⁷ Comments/Suggestions from December 6, 2007 Meeting on Enhancing the Efficiency and Effectiveness of the NRC Environmental Review Process, Jon Block, Union of Concerned Scientists, Transcript at 90