

FACT SHEET

William S. Lee III Nuclear Station

A Permit to Pollute the Broad River

The South Carolina Department of Health and Environmental Control has prepared a draft water pollution discharge permit for the William States Lee III nuclear power plant proposed by Duke Energy Carolinas. The public now has an opportunity to comment and call for changes in or denial of the permit at a public hearing set for April 4 in Gaffney and in writing until April 19, 2013. This fact sheet is based on the state's draft permit and the company's permit application.

Why People Should Be Concerned

A state permit for the Lee plant centers on toxic and radioactive chemicals and heat; all are pollutants regulated under the federal Clean Water Act. The Lee plant would release large amounts of heated water and other pollutants into the Broad River. The permitted water discharge temperature could be as high as 91 degrees-F in the summer. Other pollutants listed in Duke Energy's permit application include radionuclides, fluoride, phosphorus, nitrates, sulfates, aluminum, lead, arsenic, zinc, chromium, oil and grease and trace amounts of cadmium and mercury.¹ Annually, the permitted water pollutant totals would be:



Pollutant	Average emission rate	Annual pounds emitted
Sulfate	3677 lb/d ^a	1,342,105
Oil and grease	15 mg/l ^b	539,025
Nitrates	167 lb/d ^a	60,955
Aluminum	99 lb/d ^a	36,135
Zinc	1 mg/l ^b	35,935
Phosphorus	56 lb/d ^a	20,440
Fluoride	43 lb/d ^a	15,695
Chromium	0.2 mg/l ^b	7,186
Lead	0.5 lb/d ^a	182
Arsenic	0.5 lb/d ^a	182
Radionuclides	3.4 picocuries/liter ^a	56 millicuries

a. emission limits from permit application
b. emission limits from draft permit

¹ WS Lee NPDES application, 8/15/11, EPA Form 2D, Page 3-5 of 30

Nuclear Power in Hot Water

Steam electric generating plants, both fossil-fuel 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. Duke Energy's permit application states that each of the two proposed nuclear reactors would have a thermal output of 3415 megawatts, but that the electric power output would be just 1199 megawatts, an efficiency of 35%. The waste heat is discharged into the air via a cooling tower or to surface water by a pipe. Duke Energy plans to use mechanical draft wet cooling towers at the Lee Station. 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 as heated water.² The discharge to the river would be at the Ninety-Nine Islands Dam.

Lee Station Water Discharge Rates³ (gallons per minute)

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

* Intermittent

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

- 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 the reactors' thermal discharge on water that is already elevated in temperature and impacts on local and downstream ecosystems
- The impact of warmed water on power plant 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 evaluation of the impact of warmer ambient water temperatures on total withdrawal, consumption and evaporation
- 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.

² WS Lee NPDES application, 8/15/11, Geosyntec Consultants, Attachment B.1 Details of CFD Model, p.1

³ WS Lee NPDES application, 8/15/11, EPA Form 2D, Page 1 of 30

- 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.

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 National Pollution Discharge Elimination System (NPDES) permit. Section 316(a) also allows a power plant operator to obtain a thermal effluent variance, an exemption from water quality standards.

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.

Global Warming Adds Uncertainties

Duke Energy's environmental report for the Lee plant includes an 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.⁴

The report 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. Regarding climate change factors, the Union of Concerned Scientists advised the Nuclear Regulatory Commission:

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.⁵

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

L. Zeller 3/27/13

⁴ 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

⁵ 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