Progress Energy

NOV 1 1 2004

SERIAL: HNP-04-162

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
DOCKET NO. 50-400/LICENSE NO. NPF-63
NOTIFICATION OF NPDES PERMIT PROPOSED CHANGE

Ladies and Gentlemen:

In accordance with Section 3.2 of the Environmental Protection Plan (Nonradiological) issued as Appendix B to the Operating License (NPF-63) for the Harris Nuclear Plant, Carolina Power & Light Company doing business as Progress Energy Carolinas, Inc is providing notification of a proposed change to the facility's National Pollutant Discharge Elimination System (NPDES) Permit # NC0039586 by providing the enclosed copy of the proposed change. The proposed change has been forwarded to the State of North Carolina permitting agency.

If you have any questions regarding this submittal please contact me at (919) 362-3137.

Sincerely,

Brian C. McCabe for

David H. Corlett
Supervisor, Licensing/Regulatory Programs
Harris Nuclear Plant

MGW

Enclosure

c: Mr. R. A. Musser (NRC Senior Resident Inspector, HNP)
Mr. C. P. Patel (NRC Project Manager, HNP)
Dr. W. D. Travers (NRC Regional Administrator, Region II)

Progress Energy Carolinas, Inc.
Harris Nuclear Plant
P.O. Box 165
New Hill, NC 27562

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Progress Energy

NOV 0 8 2004

SERIAL: HNP-04-157

Mr. Mark McIntire
NCDENR – Division of Water Quality, NPDES Unit
1617 Mail Service Center
Raleigh, North Carolina 27699-1617

Subject: Harris Nuclear Plant
NPDES Permit Number NC0039586
Water Treatment Facility Upgrade
Notification of Minor Changes in Waste Discharge to Outfall 004

Dear Mr. McIntire:

Thank you for meeting with Bob Wilson and Steve Cahoon of our staff and Kevin Eberle of McKim & Creed, P.A. on July 15, 2004, to review Progress Energy's on-going efforts to upgrade the Harris Nuclear Plant's (HNP) potable water and demineralized make-up water treatment systems. As was discussed during the meeting, Progress Energy has signed a contract with GE Osmonics to provide a new membrane water treatment process at the HNP in New Hill, NC. The new water treatment system will replace the existing potable water and demineralized make-up water treatment processes at the site. The changes are required in order to comply with regulatory requirements as defined in the USEPA Long-Term Enhanced Surface Water Treatment Rule and the Stage 2 Disinfectants and Disinfection Byproducts Rule.

Enclosed is a simplified description of the new system, an updated NPDES Permit NC0039586 Outfall 004 as discussed and the Material Safety Data Sheets (MSDSs) for all of the monitoring equipment chemical (Hach) tests and process chemicals used with the new drinking water system.

I trust that this letter is sufficient to allow you to modify our existing NPDES permit and give us permission to use these chemicals during the testing of the new drinking water system.

If you have any questions or comments concerning this information, please contact Mr. R. T. Wilson at (919) 362-2444 or Mr. S. G. Cahoon at (919) 362-3568.

Progress Energy Carolinas, Inc.
Harris Nuclear Plant
P.O Box 165
New Hill, NC 27562

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

Sincerely,

B.C. Waldrep
Plant General Manager
Harris Nuclear Plant

MGW

Enclosures

c: Mr. S. G. Cahoon
Mr. M. Hardy
Mr. K. C. Eberle, P.E., McKim & Creed
Mr. B. White, McKim & Creed
Mr. R. T. Wilson
USNRC
Nuclear Records
HNP Licensing File: H-X-230

Attachment 1

DESCRIPTION OF PROPOSED WATER TREATMENT SYSTEM IMPROVEMENTS

The proposed new water treatment system consists of a dual-train, dual-barrier membrane treatment process with pretreatment consisting of screening and chemical pre-oxidation of iron and manganese. The new system will also include a new 30,000 gallon fiberglass reinforced plastic (FRP) potable water clearwell, hydropneumatic pressure distribution system and disinfection using sodium hypochlorite to maintain free chlorine residual in the distribution system.

Similarly to the current Harris Water Treatment Systems, the new process will be designed to produce water for both potable use as well as to produce highly treated make-up water for the existing Demineralization Process. Potable water is utilized throughout the main facility and is also used for seasonal cooling at the Harris Energy & Environmental Center. Demineralized water is used extensively at the facility for process cooling and boiler make-up.

Raw water is currently withdrawn from Harris Lake using two low lift pumps located in a pump house on the lake shore. These pumps supply surface water to the cooling tower and also supply make-up water to the water treatment building. This water is high-quality surface water with relatively low levels of turbidity and other organics. It is anticipated that as the lake ages the turbidity levels and organic loading levels in the lake will increase as result of natural eutrophication.

Raw water enters the water treatment building through a 10" welded steel pipe at a residual pressure of 40-45 psi. New potassium permanganate and sodium hypochlorite chemical feed systems will inject oxidant immediately upstream of a new 100 micron automatically backwashing strainer (upstream of the microfiltration process) to oxidize and precipitate naturally occurring soluble iron and manganese in the raw water. The pretreated water will then pass through the 100 micron automatic backwashing strainer for removal of suspended solids prior to microfiltration via 0.1 micron PVDF (polyvinylidenefluoride) hollow filter membranes. A new 6" tapping saddle and valve will be installed directly following the strainers to convey raw water to the new microfiltration process via a new 6" welded steel pipe using residual pressure from the low lift pumps.

Two parallel-train, 100 gpm Pall Aria Microfiltration systems and ancillary equipment will receive pretreated raw water via the new 6" steel piping. The dual train microfiltration process will be designed to produce 200 gpm of filtered water (100 gpm per train) for potable use and demineralized supply makeup water. The Pall Microza Microfiltration modules are specially designed for water processing applications. These modules use proprietary; 0.1 micron rated PVDF hollow fiber membrane technology with high and stable flux rates and advanced bonding techniques for an exceptionally strong module design.

The Microza Microfilters operate in an outside-in mode with a small amount of recirculation. Unlike conventional filtration or single pass filtration, where the membrane filter is perpendicular to feed flow direction and solids are dead end filtered by the media, Microza microfiltration membranes are placed parallel to the feed direction and only clean liquid passes through the membrane. Two exit streams are produced during filtration:

- Filtrate (or permeate), which passes through the process and into a downstream holding tank (called "Filtrate Break Tank on the P&ID Drawing);
- Recirculated raw water consisting of approximately 10% of the forward flow. This raw water is returned to the feed stream from the top of the module and ensures complete utilization of the available filter area by increasing the velocities in the upper end of the module and removing any air that might get trapped at the top of the housing. Solids retained on the filter are removed via periodic backwashing, air scrubbing, chemically enhanced backwashing, and periodic chemical clean-in-place (monthly basis).

When the flux is reduced, as evidenced by a transmembrane pressure drop, then the microfiltration system programmable logic controller (PLC) will signal the individual Microza train to initiate a backwash procedure. Each train will intermittently backwash, (typically once every 20 minutes for approximately 1.5 minutes); however, time between backwashes varies depending upon the quality of the raw water being fed to the microfiltration trains.

In addition to the PLC-initiated backwash cycle, the microfiltration skids will also be equipped with an operator initiated clean-in-place (CIP) process which the operator will schedule regularly (typically once every 20 days or less frequently if transmembrane pressure returns to normal after backwash cycles) to extend membrane life. The CIP process removes embedded matter from the membrane, and will restore the membrane flux and transmembrane pressure back into the original design range. The CIP process is a two step sequence consisting of a citric acid cycle and a sodium hypochlorite/sodium hydroxide cycle. These two cycles will consist of 20 minutes of circulation, 20 minutes of soaking, and a 20 minute flush period. The CIP will restore the membranes to their design flux level and transmembrane pressure.

The filtrate from the microfiltration process will discharge, under pressure, into a 2,500 gallon high density polyethylene (HDPE) break tank that will serve as supply reservoir for the downstream nanofiltration system. This tank will be equipped with an ultrasonic level sensor that will communicate continuously with the system master PLC. This PLC will continuously monitor liquid level in the break tank and will automatically pace the microfiltration feed pump variable frequency drives (VFD) to maintain the pre-established set point-level in the tank. However, if levels increase to the Operator-selected "high water" set point elevation, then the master PLC will take both microfiltration trains off line. The master PLC will restore microfiltration operation once water level in the break tank falls below the Operator-selected "system restore" water level in the tank. Likewise if water levels fall below the "minimum level" setpoint water elevation, then the PLC will send a "system failure" to the Harris Supervisory Control and Data Acquisition (SCADA) system.

Two new GE Osmonics nanofiltration trains will be installed in parallel, directly downstream of the microfiltration process and will take suction from the new HDPE break tank. The nanofiltration trains will be designed to produce finish water with total organic carbon (TOC) concentrations of less than 1.5 ppm based on a maximum raw water TOC concentration of 10 ppm or less. This TOC reduction will minimize disinfection byproduct formation in the distribution system and allow Harris to maintain their use of free-chlorine disinfection. The two parallel nanofiltration trains have each been designed for an average flow of 100 gpm (125 gpm peak flow) in order to meet Harris Nuclear Plant's maximum daily demand for potable water and demineralizer makeup.

The nanofiltration system will be fed by VFD-controlled pumps that will draw pretreated water from the microfiltration break tank. Water will flow, under 100 psi pressure through the nanofiltration membranes and colloidal particles, soluble organic molecules, and soluble cationic metals (calcium, magnesium, iron, manganese and aluminum) will be concentrated on the upstream side of the membranes and the finish water will pass through the membranes into either the potable water clearwell or the demineralizer make-up "finish water storage tank".

Nanofiltration technology utilizes semi-permeable membranes to perform the function of removing dissolved organic molecules and large ions in solution. The technology functions on the basis of diffusion. In the diffusion process water moves from an area with high concentration of organic molecules (or inorganic ions) through a semi-permeable membrane to an area of lower concentration in an attempt to maintain chemical equilibrium on both sides of the membrane. Nanofiltration utilizes diffusion-under-pressure to cause water to diffuse through a semi-permeable membrane in a "reverse flow" direction in order to concentrate contaminants (i.e. organic molecules and inorganic cations) on one side of the membrane while allowing water molecules to pass through the membrane to produce a high-quality product water. The concentrated contaminants are said to be "rejected" by the membrane and are continuously wasted from the process to optimize membrane performance.

Nanofiltration uses a forward flow "flushing" process as opposed to the "backwash procedure" typical of microfiltration. In addition to continuous flushing, nanofiltration (NF) treatment technologies require regular cleaning via chemically enhanced flushing and periodic CIP's to maintain their capacity to produce finish water at the desired flux rate. During normal operation, the NF system will gradually see reduced throughput of water and increased transmembrane pressure as the membrane becomes fouled with contaminants. Since the system PLC continuously monitors transmembrane pressure (TMP), it automatically triggers a chemically-enhanced cleaning cycle whenever the TMP exceeds the pre-established "maximum" pressure. During the chemically-enhanced cleaning process one entire nanofiltration train will be temporarily taken off-line until the cycle has completed. However, the PLC will ensure that the cleaning cycles are staggered between the two trains to ensure a minimum production of 100 gpm at all times.

Finish water from the nanofiltration system will flow into either the 0.5 million gallon demineralized makeup "Filtered Water Storage Tank" (FWST) or the new FRP "Potable Water Clearwell" (PWC) depending on automatic valve sequences. Finish water will normally flow to the 0.5 MG FWST (to serve as makeup for the demineralized water process) but will automatically be diverted, (via motorized butterfly valves) to the potable water clearwell whenever liquid level falls below the established "minimum" liquid level setpoint. When the potable water clearwell level reaches the "maximum" set point elevation, flow will automatically be restored to the FWST. If both the FWST and the potable water clearwell reach their respective "maximum" levels, the system master PLC will automatically shut down both the nanofiltration and microfiltration processes. Flow will be automatically restarted whenever liquid levels in either tank fall to the pre-selected "system restore" elevations.

Each of the tanks will be equipped with new ultrasonic level sensors that measure the level of water in each tank and transmit a 4-20 mA analog signal that is proportional to the level (in feet) to the system master PLC. The master PLC will automatically open or close the two motorized butterfly valves located on the supply lines feeding the FWST and the new 30,000 gallon potable water clearwell in response to the actual water elevations in each tank. The potable water clearwell will have precedence over the FWST and will be filled preferentially.

After the dual barrier microfiltration-nanofiltration process, the finished water will contain only soluble anions and low-molecular weight organics. Therefore, since precursors to disinfection-by-products will be removed, the potable water can be safely disinfected via injection of sodium hypochlorite prior to the Potable Water Clearwell. A continuous on-line total chlorine residual monitor will measure free chlorine concentrations in the finish potable water prior to distribution and will report the results via a proportional 4-20 mA signal to the system PLC. The PLC will automatically adjust the sodium hypochlorite feed in order to maintain chlorine residual levels in the distribution system at 1.5 to 2.5 ppm. Sodium hydroxide (for alkalinity and pH adjustment) and zinc polyphosphate (for metallic pipe protection) will be added to the finish water in order to reduce the corrosivity of the potable water prior to distribution. A new inline mixer will be installed downstream of the two chemical injection points in order to ensure that the chemicals are fully blended in the treated water.

A new hydropneumatic system consisting of (3) pumps, (2) bladder-type hydropneumatic tanks and associated pressure switches and controls will be installed as part of the potable water system upgrade. The pumps will draw suction from the potable water clearwell in response to system pressure and will fill the two new hydropneumatic tanks by compressing the air bladder to maintain system pressures between 50 and 70 psi. At start-up, potable water will be pumped into the two new hydropneumatic tanks filling them to capacity. The air bladders in each tank will then be pressurized to 70 psi to create pressure for distribution into the Harris plant system. Two of the hydropneumatic pumps will operate in a lead-lag mode of operation, with the lead pump automatically activating (via pressure switches) whenever the system pressure falls below 50 psi and automatically deactivating upon reaching 70 psi. The third pump will serve as a pressure maintenance (or jockey) pump for low flow periods and will be automatically activated (via a

separate pressure switch) whenever system pressure drops below 65 psi. and deactivating upon reaching the setpoint pressure of 70 psi.

A new totalizing flow meter will be installed downstream of the bladder tank that will measure and totalize the potable water flow into the distribution system.

ESTIMATES OF WASTE PRODUCTION:

Following is a listing of all the wastewater producing processes in the new Harris Water Treatment Plant membrane facility. The volume of wastewater produced, along with the contaminants in that water is each detailed below by processes.

Automatic Backwash Strainer

- Waste Volume: 20 gallons per backflush, typically once per hour = 480 gal/d
- Auto Backwash unit is a 400 micron screen that will remove a portion of precipitated Fe and Mn and the majority of large, insoluble inorganics and organics prior to microfiltration.
- The unit will be PLC controlled and programmed to backwash at operator selected time intervals.
- Waste stream will consist of raw lake water containing screen reject (organic debris such as leaves, sticks, sand & gravel). The stream may also contain residual oxidants (up to 1 ppm of potassium permanganate and up to 2 ppm of total residual chlorine), although any residual oxidant will rapidly react with soluble Fe, Mn, and organics and will not be reactive by the time it enters the waste neutralization basin.

Microfiltration Units

- Waste Volume: 160 gallons every 20 minutes (each train will function in this manner) for 90 seconds @ 107 gpm. Maximum discharge in a 24 hour period assuming dual train operation and continuous production is 1440 min/20 min per cycle = 72 waste cycles per day x 1.5 minutes/cycle = 108 minutes per day x 107 gpm = 11,556 gallons per day x 2 units = **23,112 gpd (maximum)**
- Waste stream will contain suspended and colloidal particles larger than 0.1 micron, specifically inorganics, organic particles, precipitated iron and manganese and color causing agents. May also contain residual oxidants (up to 1 ppm of potassium permanganate and up to 2 ppm of total residual chlorine) although any residual oxidant will rapidly react with soluble Fe, Mn, and organics.
- Clean in Place Procedure
    - Waste volume: each skid will generate approximately 800 gallons of waste during the clean in place procedure (1600 gallons total).
    - Waste stream will contain: a 2% citric acid solution, followed by flushing water (potable), a 0.4% NaOH solution with 300 ppm chlorine solution, followed by 5-10 minute potable water flush.

Nanofiltration Units

- Waste Volume: 25 gpm continuous flow per train as long as the system is in operation. Maximum discharge in a 24 hour period assuming dual train operation and continuous production is 25 gpm x 1440 min/day x 2 trains = 72,000 gpd (maximum).
- Waste stream will contain naturally occurring soluble organic molecules (i.e. large molecular weigh soluble molecules such as tanins) and removes tri- and di-valent cations (hardness). Additionally the wastestream could contain 0-1 ppm of sodium bisulfite (to remove chlorine) and low levels (>0.5 ppm) of antiscalant. NOTE: The character of this wastestream is no different than the wastestream currently being produced by the existing demineralization process at the Harris Plant.
- Clean in Place Procedure
    - Waste Volume: Each skid will produce 720 gallons of wastewater during the CIP procedure (1440 gallons total)
    - Waste Stream will contain: a 2% citric acid solution, followed by flushing water (potable), a 0.4% NaOH solution followed by 5-10 minute potable water flush.

Potable Water Clearwell Overflow and Drain

- The water from this source will be potable water. As such the only contaminants will be residual chlorine at a maximum concentration of 2.0 ppm.
- Waste volume: tank will be infrequently drained resulting in 30,000 gallons of water to the waste neutralization basin. Additionally, the tank is equipped with an overflow pipe that will only send flow to the waste neutralization basin in the event of a failure in the level sensors.

NPDES PERMIT MODIFICATIONS

Outfall 004 - HNP Low-Volume Wastes discharge to Outfall 006

Progress Energy is permitted to discharge intermittent, low volume waste streams generated during the production of potable water and demineralized make-up water needed for operation of the HNP. Low-volume waste is treated by neutralization (for pH adjustment), sedimentation, and separation. These wastes are pre-treated in the neutralization basins (as needed) prior to routing to the sedimentation basin (for particulate removal), prior to ultimate discharge to the common outfall line. Low-volume waste flow from the settling basin averages approximately 0.2 MGD. The various low-volume waste sources are permitted for discharge to Harris Lake in accordance with NPDES Permit #NC0039586 via Outfall 004 and Combined Outfall 006.

Attachment 2

Outfall 004 - HNP Low-Volume Wastes discharge to Outfall 006

In the operation of the HNP, there are many processes which result in intermittent low volumes of various waste streams. Low-volume waste is treated by neutralization (for pH adjustment), sedimentation, and separation. These wastes may be treated in the oily waste separator and/or neutralization basin as needed prior to routing to the sedimentation basin, which ultimately discharges to the common outfall line. Chemicals present in these systems may include corrosion products (such as copper and iron) corrosion inhibitors (such as nitrites, molybdates, ammonia, hydrazine, carbohydrazide, and ethanolamine), acids and bases from water treatment processes, and wastewater from ion exchange processes and ammonium bisulfite from dechlorination. Low-volume waste flow from the settling basin averages approximately 0.2 MGD. The various low-volume waste sources are described below:

a) Water treatment system wastes from processing of potable water and demineralized water.

The water treatment systems include the following unit processes:

1. Iron and manganese oxidation with sodium hypochlorite and potassium permanganate to create a precipitate that can be removed via filtration;
2. Microfiltration to remove suspended solids and colloidal particles down to 0.1 micron in size;
3. Nanofiltration to remove naturally occurring organic molecules (to prevent THM formation after chlorine disinfection in public water supplies);
4. Disinfection of potable water supplies with sodium hypochlorite;
5. Ion exchange for production of demineralized water for process requirements on site.

(Wastes from the treatment processes include microfiltration and nanofiltration backwash and demineralizer regeneration wastes.)

b) Non-radioactive oily waste, floor drains, and chemical tank containment drains.

(Turbine building wastes which could contain oil are routed to the oily waste separator for treatment prior to routing to the neutralization basin. Used oil is collected by a contractor for reclamation.)

c) Steam generator and auxiliary boiler draining following wet layup

d) Non-radioactive secondary waste from condensate polishers

e) Miscellaneous drains/leaks from condenser, steam generator, and secondary components

f) Auxiliary boiler system blowdown

g) Miscellaneous waste streams not otherwise identified elsewhere in this application.