CP&L

Carolina Power & Light Company

June 29, 1979

FILE: NG-3514(B) SERIAL NO.: GD-79-1668

Office of Nuclear Reactor Regulation
ATTENTION: Mr. T. A. Ippolito, Chief
Operating Reactors Branch No. 3
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
AUGMENTED OFF-GAS SYSTEM

Dear Mr. Ippolito:

Your letter dated September 12, 1978 required that Carolina Power & Light Company (CP&L) submit by July 1, 1979 a technical description of our proposed modifications for the Brunswick Augmented Off-Gas System.

Attached to this letter is CP&L's "Preliminary Technical Description of the Brunswick S.E.P. Off-Gas Hydrogen Recombiner System" dated June 27, 1979 which includes a conceptual flow diagram. Our design concept for the modification work is fixed although, at this time, certain system parameters (some pressures, flows, and temperatures) remain dependent on vendor selection.

Please call us if you have any questions concerning the attached information.

Yours very truly,

E. E. Utley
Executive Vice President
Power Supply & Customer Services

JAM/ELP/jcb
Attachment

349 215

A001
1/1

(6)

7907110406

PRELIMINARY TECHNICAL DESCRIPTION

OF THE

BRUNSWICK STEAM ELECTRIC PLANT

OFF-GAS HYDROGEN RECOMBINER SYSTEM

June 27, 1979

Objective: The objective of this project is to reduce the hydrogen concentration in the condenser off-gas to less than 4% at all points downstream of the condenser steam jet air ejector discharge. The reduction in hydrogen volume concentration will be accomplished by a combination of steam dilution and recombination of the free hydrogen and oxygen in the gas mixture utilizing a catalytic recombiner.

Technical Description:

NOTE: The reader is advised to refer to the attached conceptual flow diagram while reviewing the following discussion.

Present plans call for installing the hydrogen recombiner and its associated preheater, condenser, and moisture separater/cooler within the existing steam jet air ejecter rooms. Since each nuclear unit at BSEP has two 100% capacity air ejectors, a recombiner subsystem will be provided for each ejector to maintain the redundancy feature of the condenser off-gas removal system.

The second stage jet of each air ejector will be modified to provide the necessary pressure to drive the mixture through the system. It is anticipated that the jet will be modified to discharge against a 6 to 9 psig backpressure. Additionally, the steam flow to the second stage jet will be increased to provide dilution of the off-gas necessary to yield a mixture with a hydrogen concentration just under 4% under worst case conditions (i.e., low air inleakage and full power operation). The required steam flow will be approximately 7000 lbs/hr.

The steam-gas mixture from the ejector will pass through a preheater where the mixture will be superheated to 300°F - 350°F. The mixture will then

pass to the recombiner where the hydrogen will be recombined with the oxygen. The mixture exiting from the recombiner will be essentially hydrogen free and at a temperature of approximately 850°F.

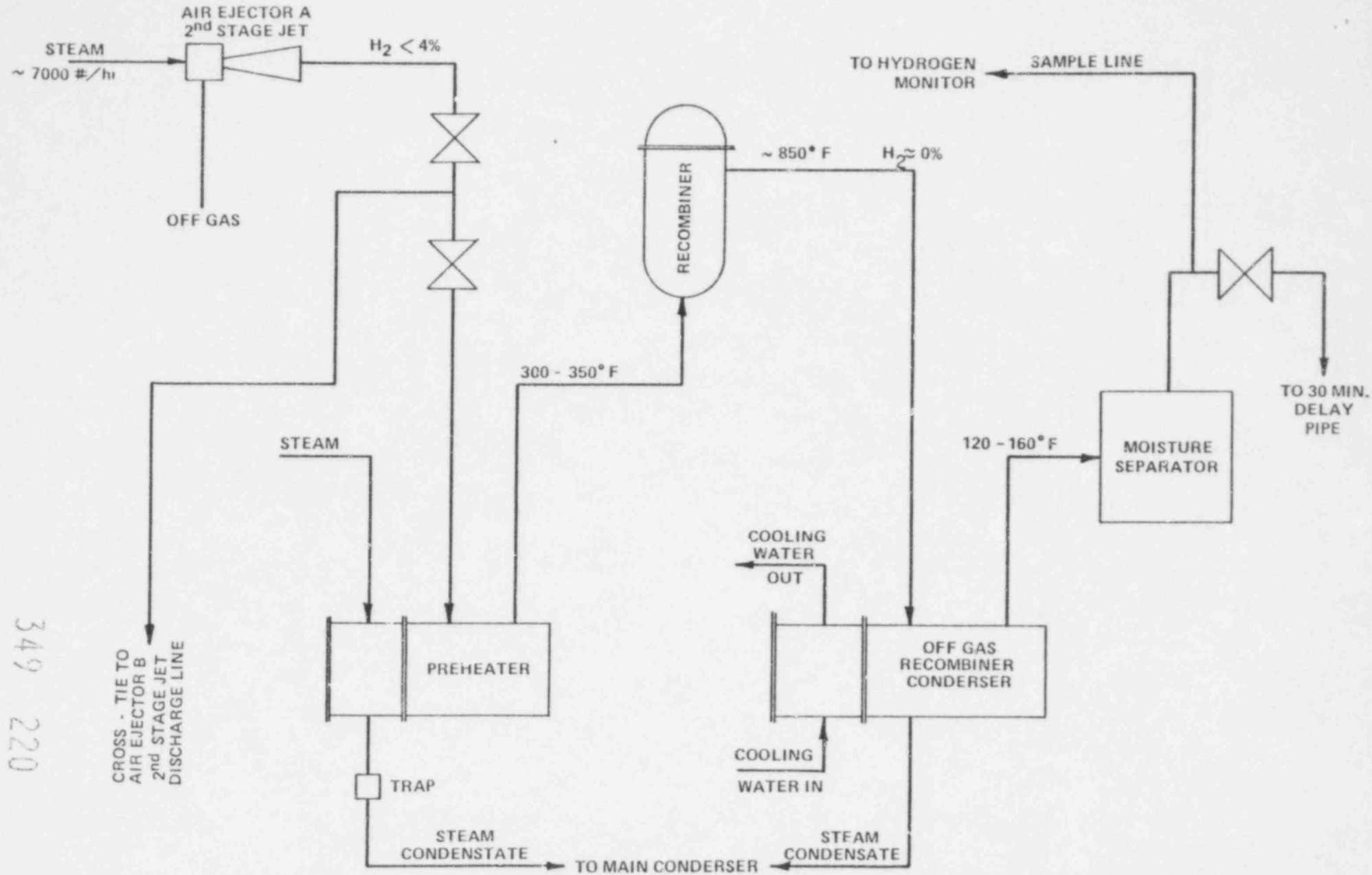
This superheated steam-gas mixture will flow to the recombiner condenser where the dilution steam and water vapor formed in the recombination will be removed. The non-condensible gases will be vented from the recombiner condenser at a pressure slightly above atmospheric pressure and at a temperature between 120°F and 160°F. A moisture separator or a moisture separator/cooler may be installed downstream of the recombiner condenser for the purpose of removing any excess moisture from the gas prior to the gas entering the underground off-gas delay pipe. The gas exiting from the delay pipe will pass through a HEPA filter and then be routed to the plant stack or the Augmented Off-Gas (AOG) Treatment System. Gas sent to the AOG System will be sent directly to the cryogenic distillation subsystem. The existing AOG hydrogen recombiners will be removed or permanently bypassed. The cryogenic distillation subsystem will remove the gaseous fission products from the off-gas prior to stack release.

The recombiner, preheater, recombiner condenser and moisture separator, as well as the associated piping and valves will be designed to be resistant to the peak pressures resulting from a hydrogen ignition at each component's design temperature. Materials of construction will be selected by the chosen vendor and will conform to the applicable ASTM code. Recombiner catalyst will be the metallic basis type utilizing a platinum and paladium catalyst.

Hydrogen monitoring of the recombiner condenser discharge will be provided to provide continuous readout of the hydrogen level in the discharged gas. A trip function will be integrated into the system logic to provide automatic

isolation of the air ejector discharge in the event of high hydrogen concentration. Dilution flow to the air ejectors' second stage jets will be monitored to insure that the gas passing to the recombiner contains less than 4% hydrogen by volume. A minimum flow setpoint will be determined below which the system will isolate. Provisions for blanketing the recombiner with an inert gas or purging at shutdown will be provided, the details of which will be vendor-dependent. Appropriate pressure, temperature, and flow monitoring will be integrated into the system to provide sufficient data to verify proper system operation.

No recombiner bypass provision will be provided due to the potential for catalyst carryover. To provide the highest degree of system flexibility, a cross tie line between the air ejectors' discharges will be provided to allow the use of air ejector A with air ejector B's recombiner and vice versa. This cross tie will be a remote manual operator and will not be integrated into any automatic actuation logic.



FLOW DIAGRAM
BRUNSWICK OFF GAS
RECOMBINER ADDITION