Docket Nos.: 50-269, 50-270 and 50-287

Mr. H. B. Tucker, Vice President Nuclear Production Department Duke Power Company 422 South Church Street Charlotte, North Carolina 28242

Dear Mr. Tucker:

Reference: Oconee Nuclear Station Units 1, 2, and 3

As a result of the Surry pipe erosion/corrosion incident in December of 1986, the NRC is preparing a report that will reference existing research information available and describe the actions being taken by utilities regarding erosion/ corrosion in feedwater pipes in nuclear power plants. Central to an understanding of erosion/corrosion in pipes is an accurate assessment of erosion/corrosion experience, piping design, feedwater and condensate chemistry and piping materials.

To ensure that both the NRC and the nuclear industry have available a comprehensive collection of data regarding erosion/corrosion in feedwater pipes, the NRC will assemble a summary of utility information related to ongoing water chemistry actions in pressurized water reactors. To accomplish this task we ask that you complete the enclosed questionnaire.

The information being requested is quite extensive and will require a diligent effort on your part and ours to assure accurate and timely completion. Also, we realize that parts of the information may already be available to the NRC, but not in a convenient format which is readily accessible. Therefore, we request that you assist us by returning for each unit a single completed copy of the enclosed questionnaire to the Project Manager, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, within 60 days of receipt of this letter. We believe the questionnaire is self explanatory; however, if questions arise or clarification is required, please contact me.

This request is covered by Office of Management and Budget Clearance Number 3150-0011 which expires December 31, 1989. Comments on burden and duplication may be directed to the Office of Management and Budget, Room 3208, New Executive Office Building, Washington, D.C. 20503.

Sincerely, 151

Helen N. Pastis, Project Manager Project Directorate II-3 Division of Reactor Projects I/II

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Enclosure: Erosion/Corrosion Questionnaire

cc: See next page

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PDIL-3/DRPI/II MDuncan 07/16/87 Local PDR JPartlow SVarga/GLainas EJordan OGC-Betnesda ACRS(10) PDM/3/0RPI/II BJYpurgbTood 07/0/87 PWR EROSION-CORROSION QUESTIONNAIRE (Check or Circle All Applicable) J = I

ENCLOSURE

Jnit Name:	MWe							
Date:	Phone No							
AVT with ammonia.	morpholine, hydrazine.							
<pre>c, mixed bed; H4-OH form. ing tower. opper alloy FW heat ation, layup, low</pre>	.% of feedwater flow; ter tubes: LP, HP, none. load soaks, other							
	•,							
 Erosion-Corrosion identified in wet steam piping: yes, no. Erosion-Corrosion of MSR Chevrons or mesh: yes, no. Chevron material: stainless steel, carbon steel, other								
•								
<pre>is operating is operating is orifices.</pre>	d. d pump On at7 load. 							
ing ing actual (preferred)	Feet/second.) or design): P: Steam Generators P: P: Steam Generators Steam Generators 							
	Date: Date: AVT with ammonia. AVT aver. Av							

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C. FEEDWATER AND CONDENSATE CHEMISTRY

Please complete the attached Table.

2. Feedwater chemistry history (average or typical values, final feedwater):											
Year of op	er.:	<u>lst</u>	<u>1974</u>	<u>1976</u>	<u>1978</u>	<u>1980</u>	<u>1982</u>	<u>1983</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
pH of FW ma	mumixe	•	•	•	•	•	•	•	•	•	• •
. mi	inimumi	•	•	•	•	•	•	•	•		·
av all of coord	verage	•	•	•	•	•	•	•	•	•	••
	avinum										
ភា	inimum	•	•	•	•	•	•	•	•	·	··
av	/erage	•	•	•		•	•	•	•	· ·	••
DO, ppb ma	mumixe	•	•	•	•	•		•	' <u></u> '	·	'`
mi	nimum	•	•	•	•	•	•	·	·	·	
8	verage .	•	•	•	•	•	•	·	·	·	
Cat. Cond.	u5/cm	•	•	•	•	•	•	·	·	·	
Spec. Cond.	uS/cm	•	•	•,	•	•	•	·•	·	·	
NH3 PPD	•	•	•	·	•	•	•	·•	·		
N ₂ H ₄ , ppb	•	•	•	·	•	•	•	·•			· · · ·
Boron, ppb	•	•	•	•	•	•	•		·	· · · · · · · · ·	
AIF Inleaka SCFM	ige,	•	•		•	· ·		•			

Please send any water chemistry summary reports and data.

3. Chemical additions

3.1 Ammonia: typical concentration in feedwater ppb; added at 3.2 Hydrazine: typical concentration in feedwater ppb; added at 3.3 Boric acid: typical concentration in feedwater ppb as B; added at

D. MATERIALS

1.

1. Feedwater piping - list ASTM or other specification numbers

2. Wet steam piping:

3. Attach results of chemical analysis by you or pipe vendors.

PWR EROSION-CORROSION QUESTIONNAIRE (Check or Circle All Applicable) A = V

ENCLOSURE

Utili	ity Company:	Unit Name:	MWe
Fille	ed by:	Date:	Phone No
in se	ervice: 19 Water Treatmen	t: AVT with ammon	ia, morpholine, hydrazine.
Conde	ensate polishers: none, cation, po installed 19; operated in: H-O	wdex, mixed bed; . H, NH4-OH form.	1 of feedwater flow;
Cooli	ing water: fresh, salt, brackish,	cooling tower.	
Coppe	er alloy condenser tubing: yes, no	. Copper alloy FW	heater tubes: LP, HP, none.
Boric	c acid used since: 19; during:	operation, layup,	low load soaks, other
	•		
Α.	EROSION-CORROSION EXPERIENCE		
,	Fraction-Corrocton identified in we	t steem nining	
2	Erosion-Corrosion of MSR Chevrons	or mesh: ves. no	23, 10.
	Chevron material: stainless st	eel, carbon steel.	other
з.	Erosion-Corrosion of feedwater pip	ing: yes, no. Da	ste found
	Feedwater piping materials:	* * * * * * * * * * * * * * * * * *	
4.	Erosion-Corrosion of:, elbows	, Ts,	diffusers,: reducers,
• .	valves, orifices,	. other components	(specify)
5.	Erosion-Corrosion of J-Tubes: yes	, no.	
6.	Erosion-Corrosion of feedwater dis	tribution ring: ye	15, NO.
1.	Erosion-Lorrosion of turbine: HP,	LP; Identify comp	
9. 9	Erosion-corrosion of other cycle c	erosion-corrosion	Found: From to OF
10.	Inspection frequency for feedwater	pipipo vear	s Steam lines vears.
11.	Inspection methods used: ultrason	ic thickness. radi	ography. visual. other
Β.	PIPING DESIGN	•	
1.	Maximum feedwater flow velocity	feet/se	cond.
2.	No. of feed pumps operating at 100	% load se	cond pump On at load.
3.	Maximum flow velocity when only 1	pump is operating	feet/second.
4.	No. of feedwater piping components	: elbows,	Ts, diffusers,
	reducers, valves,	orifices,	
E	Other components (specif	y)	,
5.	Feedwater pressures and temperatur	s (actual (profe	reet/second.
	Full load (pressure, psia/temperat	ure. F):	
	P: P:	· [P:]	»: P: }
	↓ ⊺ : ∩ ↓ ⊺ :	. T : T	
	Condensate Pump Cond. Polisher	s S BF Pur	np Steam Generators
	low load (typica)	id):	\frown
	T: (T:	. T:	r: T:
	Condensate Pump Cond. Polisher	's 🗸 🗸 BF Pur	np Steam Generators
Dian	no ottoob opping of the back below		
tvni	se allach copies of the heat balance callow load.	e diagrams for you	Jr actual full load and

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C. FEEDWATER AND CONDENSATE CHEMISTRY

1. Please complete the attached Table.

2. Feedwater chemistry history (average or typical values, final feedwater):

Year of oper.:	<u>1st</u>	<u>1974</u>	<u>1976</u>	<u>1978</u>	<u>1980</u>	1982	1983	1985	1986	1987
5	•	•	•	•	•					<u></u>
pH of FW maximu	ſŗ·∓	•	•	•	•	•	•	•		•••
. minimu	ան	•	•	•	•	•	•	•	•	·:
averag	e	•	•	•	•	•	•	•		··
pH of condensate	e									
maximur	m	•	•	•	•	•	•	•	·	••
minimu	m	•	•	•	•	•	•	•		·
average	e	•	•	•	•	•	•	•	·	••
DU, ppp maximum	™• <u></u>	•	•	•	• • • • • • • • • • • • • • • • • • • •	•	•	•	·	••
	n•	•	•	•	•	•	•	·	·	••
Cat. Cond. uS/cr	۳ • <u> </u>	•	•	•	•	•	•	··	·	••
Spec. Cond. uS/c	"• Cm .	•	•	•	•	•	•	· ·	··	·•
NH., Ppb	····· ·	·	•	•	•	•	•	· •	·'	·•
N.H. ppb	•	•	•	•	•	•	•	· •		••
Boron, ppb	•	•	•	·	· •	•	•	·•		••
Air Inleakage. SCFM	•		· ·	•	· •	••	•	°•	·•	••

Please send any water chemistry summary reports and data.

3. Chemical additions

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2. Wet steam piping:

3. Attach results of chemical analysis by you or pipe vendors.

PWR EROSION-CORROSION QUESTIONNAIRE (Check or Circle All Applicable) 1

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Utility Company	/:	· _ · · · · · · · · · · · · · · · · · ·	Unit Name:	MWe
Filled by:			Date:	Phone No
In service: 19	• • • •	Water Treatment	AVT with ammon	ia, morpholine, hydrazine.
Condensate poli installed 1 Cooling water: Copper alloy co Boric acid used	shers: no 9; op fresh, sa ndenser tu J since: 19	one, cation, powe berated in: H-OH, alt, brackish, co ubing: yes, no.); during: op	dex, mixed bed; . NH4-OH form. poling tower. Copper alloy FW H peration, layup,	f feedwater flow; neater tubes: LP, HP, none. low load soaks, other
A. EROSION-CO	RROSION EX	PERIENCE		
 Erosion-Co Chevron Erosion-Co Feedwat Erosion-Co Frosion-Co Erosion-Co Erosion-Co Erosion-Co Erosion-Co Erosion-Co Feedwater Inspection 	rrosion id rrosion of material: rrosion of er piping rrosion of lves, rrosion of rrosion of rrosion of temperatur frequency methods u	dentified in wet MSR Chevrons or stainless stee feedwater pipir materials: elbows, orifices, J-Tubes: yes, feedwater distr turbine: HP, L other cycle com e range where er for feedwater p sed: ultrasonic	steam piping: ye mesh: yes, no. 1. carbon steel, 19: yes, no. Dat Ts, c other components no. ibution ring: yes P; identify compo ponents (identify osion-corrosion f iping years thickness, radio	<pre>>>, no. other ie found iiffusers,: reducers, (specify)</pre>
B. PIPING DES	IGN		•	• •
 Maximum fe No. of fee Maximum fi No. of fee 	edwater fl d pumps op ow velocit dwater pip reducers, other comp	ow velocity erating at 100% y when only 1 pu ing components: valves, . onents (specify)	feet/sec load sec mp is operating . elbows, . orifices,	cond. cond pump On at1 load. feet/second. Ts, diffusers,
6. Feedwater <u>Full load</u> Condensate <u>Low load (</u> Condensate	pw velocit pressures (pressure, P: T: Pump typical T: Pump	y in wet steam p and temperatures <u>psia/temperatur</u> P: T: Cond. Polishers .1 of full load) P: T: Cond. Polishers	iping (actual (preferr <u>e, f):</u> P: P: T: T: BF Pump : P: P: BF Pump	. feet/second. ed) or design): P: T: Steam Generators P: Steam Generators Steam Generators
typical low loa	d.	ne near Darance	uragrams for your	actual full load and

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pH of FW maximum		•	•	•	•	•			•	• •
. minimumí	•	•	·	•	•	•	·	·		·•
average pH of condensate	•	•	·	•		•	· ·	·•	·	··
maximum	•	••		••	·	•				
៣រែករំពាម៣	•	••	·	••	·,	··	·			·
DO. DOD maximum	••	· ·	· <u> </u>	••	· ·	·•	•			<u> </u>
minimum	·	· · · · · · · · · · · · · · · · · · ·	·	· ·	· ·	·•	·•	•		••
average	•	••••••	·	' '	·•	•		•	•	•
Cat. Cond. uS/cm	••	·•		·•		'·	·•	•	•	•
Spec. Cond. uS/cm	••	••			·	••		:	·	•
	••	•		·•				•		
Boron, pob	••	•		•	•	·•	•	<u> </u>		•
Air Inleakage, SCFM	••	••	••••••••••••••••••••••••••••••••••••••	••	·•	••	• •	•	•	*

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Mr. H. B. Tucker Duke Power Company

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cc: Mr. A. V. Carr, Esq. Duke Power Company P. O. Box 33189 422 South Church Street Charlotte, North Carolina 28242

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Office of Intergovernmental Relations 116 West Jones Street Raleigh, North Carolina 27603

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Oconee Nuclear Station Units Nos. 1, 2 and 3

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