NRC FORM 658
(9-1999)

U.S. NUCLEAR REGULATORY COMMISSION

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DATE OF MEETING
03/21/2002

The attached document(s), which was/were handed out in this meeting, is/are to be placed in the public domain as soon as possible. The minutes of the meeting will be issued in the near future. Following are administrative details regarding this meeting:

Docket Number(s)	50-269, 50-270, 50-287
Plant/Facility Name	OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3
TAC Number(s) (if available)	MB3537, MB3538, MB3539
Reference Meeting Notice	3/6/02
Purpose of Meeting (copy from meeting notice)	TO DISCUSS 10/16/01 AMENDMENT REQUEST CONCERNING ALTERNATE SOURCE TERM AND CONTROL ROOM HABITABILITY

NAME OF PERSON WHO ISSUED MEETING NOTICE	TITLE
L. N. OLSHAN	PROJECT MANAGER

OFFICE
NRR

DIVISION
DLPM

BRANCH
PD II-1

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DF01

Duke Energy

Oconee Nuclear Station
Alternative Source Term
License Amendment Request

March 21, 2002

1

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Agenda

- Regulatory Position – Larry Nicholson
- Overview of Dose Analysis Work – Steve Schultz
- Discussion of RAI Responses – Christie Taylor

2

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Meeting Agenda

9:00	Introductions	L. Nicholson L. Olshan
9:05	Purpose & Background to Meeting	L. Nicholson
9:15	Overview of Submittal and Status	S. P. Schultz
9:30	ONS Control Room Testing	S. P. Schultz
9:45	Submittal Review & Amplification	C. B. Taylor, et al.
10:15	Break	
10:30	Submittal Review & Amplification	C. B. Taylor, et al.
11:15	Discussion	All
11:45	Action Items and Schedule Plan	S. P. Schultz
12:00	Adjourn	L. Olshan

3

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Radiological Engineering Program

- Duke Power Radiological Engineering Program
- Staff profile and capabilities
- Program Objectives
- Oconee NS is the Lead AST Application
- General Analysis Features
  - Alternative Source Term LOCADOSE analyses
  - ARCON96 χ/Q evaluation and analyses
  - Full scope in-house analysis
  - Consultant support in specialty areas

4

Duke Energy — Consultant Support Profile

- **Resources to support full scope applications of AST technology**

Bechtel Corporation	LOCADOSE
Polestar	Source term chemistry; spray washout
Duke Engr & Services	Directed calculation support
NISYS	SCALE/ORIGEN source term
Duke Power EHS	ARCON96 reviews

- **Decision-making and final analyses by Duke Power**

5

Duke Energy — LOCADOSE Application

- Extensive code Verification / Validation calculation
- Code and applications training
- Multi-plant applications
- Multi-purpose applications
- Duke Power training process integration
- Bechtel code applications support & interaction

6

Duke Energy — ARCON96 Application

- Oconee Nuclear Station Application
  - DE&S → Duke Power → C. B. Taylor
  - Duke Power Environmental Health & Safety
- Catawba & McGuire Nuclear Station Application
  - Duke Power Environmental Health & Safety
  - Duke Power Radiological Engineering
  - DE&S review (Brad Harvey)
- **NRC Draft Guidance / NEI 99-03 / DG-1111**

7

Duke Energy — Site Support Schedule

- Duke Power Radiological Engineering Site Support Schedule

Oconee	LOCA -------→ FHA --------------→ Other				
Catawba		FHA -----→ LOCA --------------→SGTR			
McGuire			FHA ----→ LOCA -----→ Other		

- Radiological Engineering committed as full force applications program
  - Staff expertise and applications breadth
  - Plant and analysis experience

8

Duke Energy — Control Room Testing Program

- Tracer Gas Testing performed in 1998 and 2001
- Both test programs performed by NCS Corporation and Lagus Applied Technologies, Inc
- System improvements and sealing work was performed between tests
- Additional test performance and data analysis lessons-learned applied in the 2001 testing program
  - Tracer gas mixing
  - Injection and sampling locations for flow measurements
  - Calculation of measured values and uncertainties
- Results demonstrate that these changes caused a significant improvement in performance

9

Duke Energy — Control Room Testing Results

- Tracer Gas Testing performed in 1998 and 2001

Control Room	Test Configuration	1998 Results	2001 Results
1 & 2	Normal	1065 +/- 61	869 +/- 31
1 & 2	Emergency – 1 Fan	80 +/- 55	0 +/- 18
1 & 2	Emergency – 2 Fan	[0 - 128]	0 +/- 30
3	Normal	534 +/- 30	467 +/- 16
3	Emergency – 1 Fan	73 +/- 25	0 +/- 13
3	Emergency – 2 Fan	[0 - 236]	0 +/- 39

- Control room pressurization system performance improvement

10

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LOCADOSE Code

(R1)

- LOCADOSE computer code used in dose analyses
- LOCADOSE input used for LOCA and FHA will be provided.
  - NRC Preference: Input decks or description of input parameters
  - Alternatives may be preferable (RADTRAD)
- LOCADOSE output obtained for LOCA and FHA will be provided.
- Level of detail desired

11

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Site Layout

(R2)

- Site Layout Sketch can be provided showing:
  - Site Building Layout
  - Control Room Intake Locations
    - Current single CR intake locations
    - Proposed dual CR intake locations
  - Source Term Release Point Locations
- Level of detail desired

12

Duke Energy — PRVS and SFPVS

(R3)

- Probabilistic Risk Analysis
  - ONS PRA is a full scope Level 3 PRA
  - Neither PRVS nor SFPVS is credited in the PRA
  - Removal of PRVS and SFPVS from T.S. will not invalidate any assumptions made in PRA
- Severe Accident Management Program
  - The Oconee Severe Accident Guideline does not credit PRVS nor SFPVS
  - Removal of PRVS and SFPVS from T.S. will not adversely impact the severe accident management program

13

Duke Energy — Dual CR Intakes

(R4)

- Piping and Instrumentation Diagrams
  - Design of new CR intake system is in early stages
  - Sketches of system can be provided
- Dilution Effects
  - The system will be designed to achieve equal flowrates
  - Post-modification testing will be performed
  - Any flow imbalance will be included in dose analyses
- Schedule
  - Implementation schedule will be established Fall 2002

14

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HPI/LPI Discharge

(R5)

- Piping and Instrumentation Diagram
  - Design of new CR intake system is in early stages
  - Sketches of system can be provided
- Schedule
  - Implementation schedule will be established Fall 2002

15

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Passive Caustic

(R6)

- Reactor Building Sump Water pH Transient Calculation
  - The pH profile is based on 300 cubic feet of trisodium phosphate dodecahydrate (TSP-C).
  - The initial water pH value is calculated to be 5.21 at actual sump temperatures.
  - Total sump water inventory ranges from 6.8E+05 lbm at accident initiation to 3.1E+06 lbm when the entire BWST inventory has been emptied into the sump.
  - The inventory of chloride-bearing cable is 45,700 lbm.

16

Passive Caustic

(R6)

- Reactor Building Sump Water pH Transient Calculation
  - Nitric acid generation is based on NUREG/CR-5950 methodology, and is calculated to be 7.3 x 10-9 mol HNO3 per g H2O per Mrad.
  - The hydrochloric acid generation rate for PVC cable insulation is 33.12x10-4 mol of HCL per lb of PVC insulation per Mrad.
  - Containment dose in the Reactor Building following an accident is based on data in the ONS post-accident shielding calculation.
- Schedule
  - Implementation schedule will be established Fall 2002

17

Fission Products

(R7)

- Specifics of fission product release model:
  - The particulate iodine removal constant for removal by aerosol deposition (natural processes) are calculated using methodology from NUREG/CR-6189.
  - Particulate washout values are obtained using NUREG/CR-0009 and SRP 6.5.2 methodology. At 25 minutes post-accident, the recirculation phase begins, and a new lambda is calculated based on the recirculation spray flowrate.
  - The time for reaching a particulate decontamination factor of 50 by containment spray is approximately 3 hours post-accident.

18

Fission Products
(R7)

- Specifics of fission product release model:
  - Elemental iodine decontamination factor does not reach 200 by containment spray in calculation based on NUREG/CR-5950 methodology.
  - Elemental iodine DF is approximately 82 when equilibrium elemental iodine concentration is reached.
  - The maximum 2 hour dose for the EAB occurs during the time period from 0 to 2 hours following accident initiation.

19

Iodine Spray Removal
(R8)

- Containment Atmosphere Iodine Spray Removal Analysis
  - Reactor Building spray flowrates and timing determined
  - SRP 6.5.2 guidance for containment spray coverage
  - Spray flowrate correction for spray interaction with containment wall
  - Elemental and particulate iodine spray lambdas calculated based on SRP 6.5.2 and NUREG/CR-0009
  - Iodine washout model developed based on ANSI/ANS-56.5
  - Results are spray removal rate constants (lambdas) for elemental and particulate iodine for use in LOCADOSE modeling

20

Iodine Spray Removal
(R8)

- Iodine Re-volatilization Analysis
  - Iodine Re-volatilization Methodology is based on NUREG/CR-5950
  - Iodine tranforms to volatile form in low pH conditions
  - Elemental iodine can re-volatilize into containment atmosphere as sump solution is recirculated as containment spray
- Level of detail desired

21

Spray Lambdas
(R9)

- Elemental Iodine Spray Lambdas calculations are documented in the same calculations described in previous slides.

22

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ECCS Leakage

(R10)

- ECCS leakage begins at earliest time of recirculation: 25 minutes post-accident
- Maximum 2 hour dose at EAB occurs between 0 to 2 hours post-accident
- Doses from ECCS portion of LOCA model:
  - EAB 0.1 rem TEDE
  - LPZ 0.1 rem TEDE
  - Control Room 0.7 rem TEDE

23

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BWST Release

(R11)

- BWST back-leakage begins at earliest time of recirculation: 25 minutes post-accident
- BWST leakage is tested and monitored against the assumption of 5 gpm each outage by Duke procedures
- Iodine partition coefficient varies from a value of 34 at back-leakage initiation to 9 at the end of leakage
- BWST volume is time-dependent. Initial volume at the end of the spray injection period is approximately 4,000 gallons. Increases to 219,000 gallons at the end of ECCS back-leakage.

24

BWST Release
(R11)

- The iodine release rate from the BWST to the environment is calculated on a time dependent basis. The maximum release rate is 4.2E-08 gram/second of iodine at the end of back-leakage.
- The maximum 2 hour dose for the EAB occurs during the time period from 0 to 2 hours following accident initiation.
- The calculated EAB, LPZ and control room doses for the BWST are a subset of the small total dose due to ECCS leakage shown on the ECCS leakage slide, and are not calculated separately.

25

Unfiltered CR Inleakage
(R12)

- The measured inleakage values, with uncertainty, obtained from 1998 tracer gas testing performed by NCS Corporation are as follows:

Control Room	Ventilation Mode	Inleakage	Current Analysis Value
U1/U2	Normal	1065 +/- 61 (ACFM)	1150 cfm
U1/U2	Emergency Fan	80+/- 55 (SCFM)	150 cfm
U3	Normal	534 +/- 30 (ACFM)	600 cfm
U3	Emergency Fan	73 +/- 25 (SCFM)	100 cfm

- The total uncertainty of each CRE air inleakage measurement is calculated using the prescription provided in ANSI/ASME Standard PTC 19.1-1985 "Measurement Uncertainty" and represent 95% confidence limits.

26

Single Assembly FHA

(R13)

- The Maximum Linear Heat Generation Rate is 6.0 kW per foot, based on Oconee specific fuel parameters, burnup of 62,000 MWD/MTU and a peaking factor of 1.65.
- Fractions of fission products in the fuel gap follow Regulatory Guide 1.183 Position 3.2.
- Assemblies are decayed 72 hours in accordance with ONS T.S. prohibition of fuel movement until 72 hours post-shutdown.
- 5.6E+04 curies released to environment for single assembly accident

27

Multiple Assembly FHA

(R14)

- The Maximum Linear Heat Generation Rate is 3.8 kW per foot, based on Oconee specific fuel parameters, core average inventory and a peaking factor of 1.2.
- Fractions of fission products in the fuel gap follow Regulatory Guide 1.183 Position 3.2
- Various decay times are assumed for each postulated event. Freshly discharged fuel is decayed from 55 to 70 days. All other fuel is conservatively assumed decayed for one year.
- 5.6E+05 curies released to environment for bounding cask drop case

28

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ISFSI Cask Drop (R15)

- It is postulated that an ISFSI transfer cask is dropped onto the spent fuel pool racks.
- The dropped cask is postulated to impact and damage numerous assemblies stored in the SFP racks.
- The entire gap activity of the impacted assemblies is released. Fractions of fission products in the fuel gap follow Regulatory Guide 1.183 Position 3.2.
- Various decay times are assumed for each postulated event, as in previous slide.

29

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Equipment Hatch Closure (R16)

- NRC expectation – Equipment Hatch closure within 30 minutes
- Equipment Hatch closure is achievable in 30 minutes
- Worker exposure can be a concern in some maximum DBA analyses
- Programmatic controls on closure process being examined at Catawba NS (2002/2003)
- Results will be applicable to Oconee NS (2003/2004)

30

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χ/Q Values

(R17)

- χ/Q values were calculated for each release point by analyzing the corresponding release from each unit (1, 2 and 3) to each control room intake location.
- Maximum bounding χ/Q values are applied, so that the calculation is bounding for all 3 Oconee units.
- A description of which specific χ/Q values were used for the specified release points will be provided.

31

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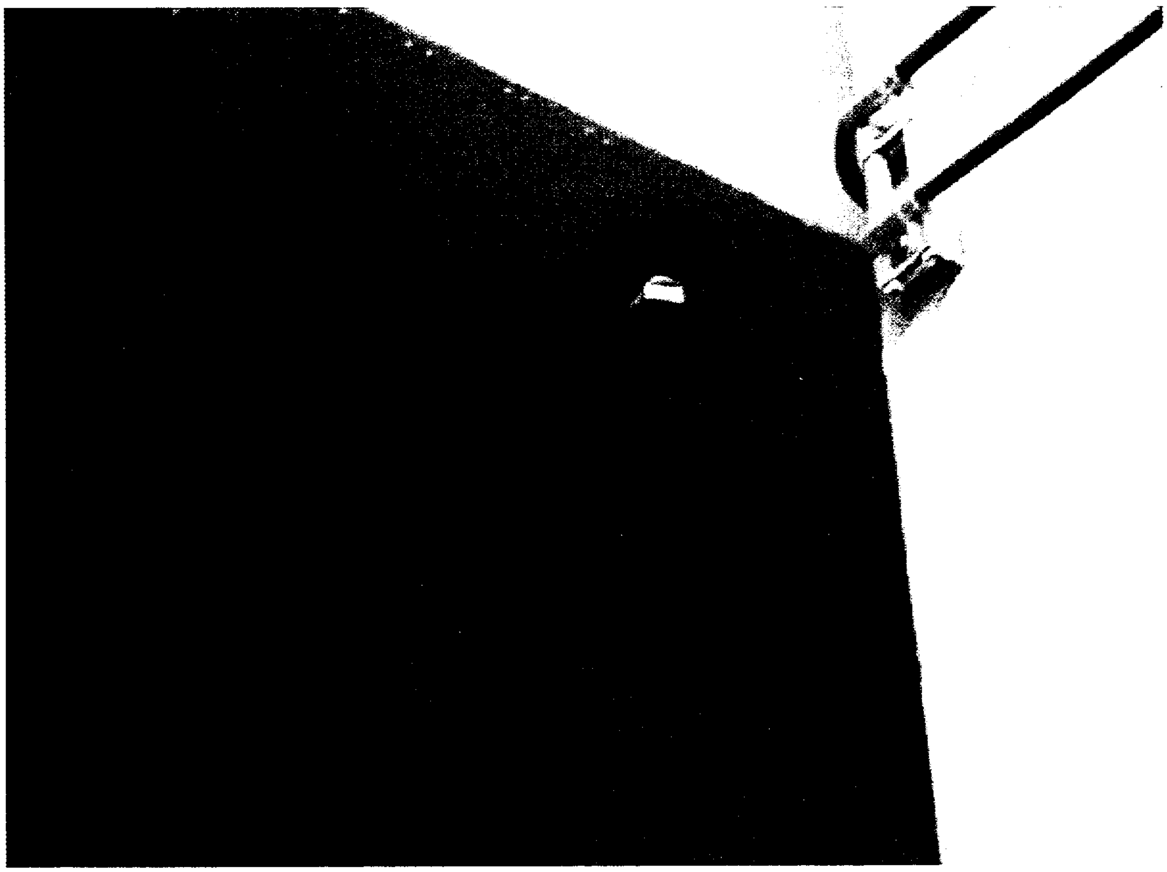
Iodine DF

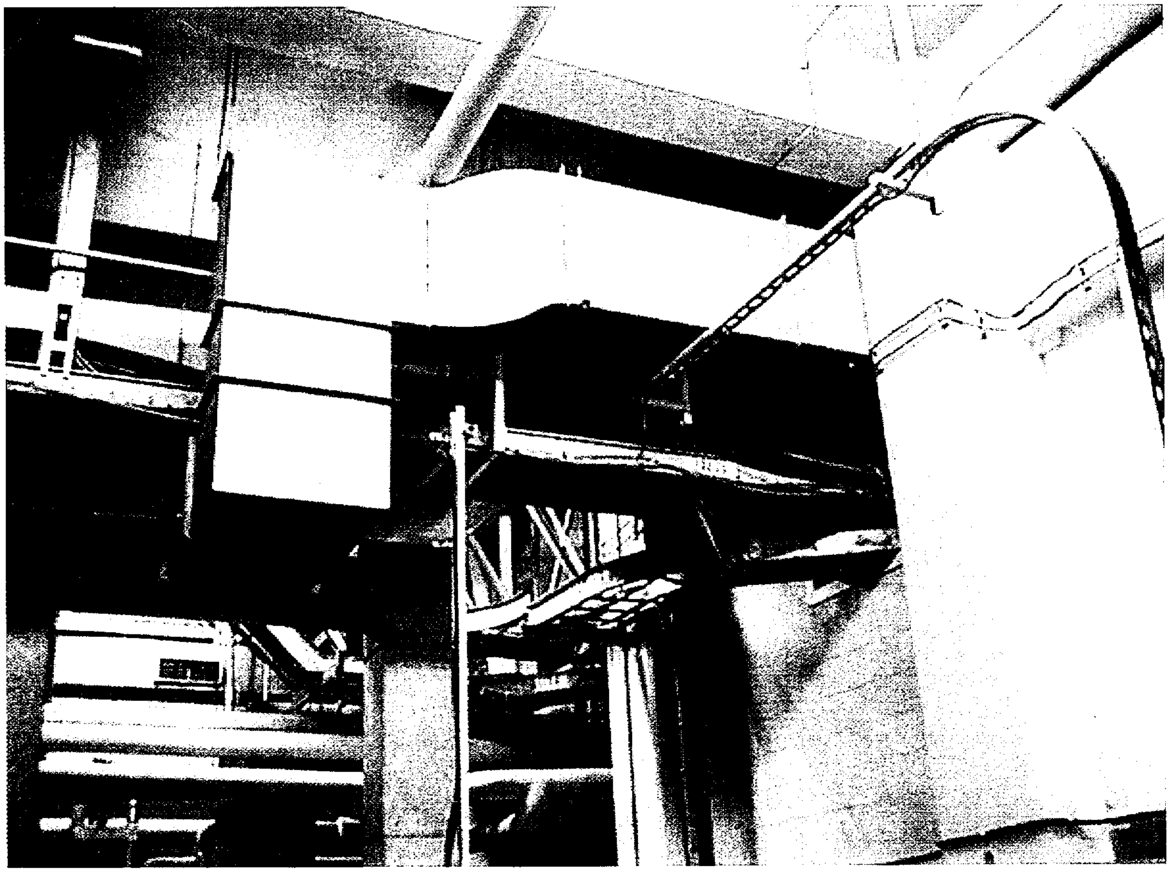
(R18)

- Calculated overall effective DF values are based on an elemental DF of 500 and organic DF of 1 for a water level greater than or equal to 23 feet.
- Corresponding DFs for Oconee's 21.34 feet water depth are 430 and 1, with a resultant overall effective DF = 262

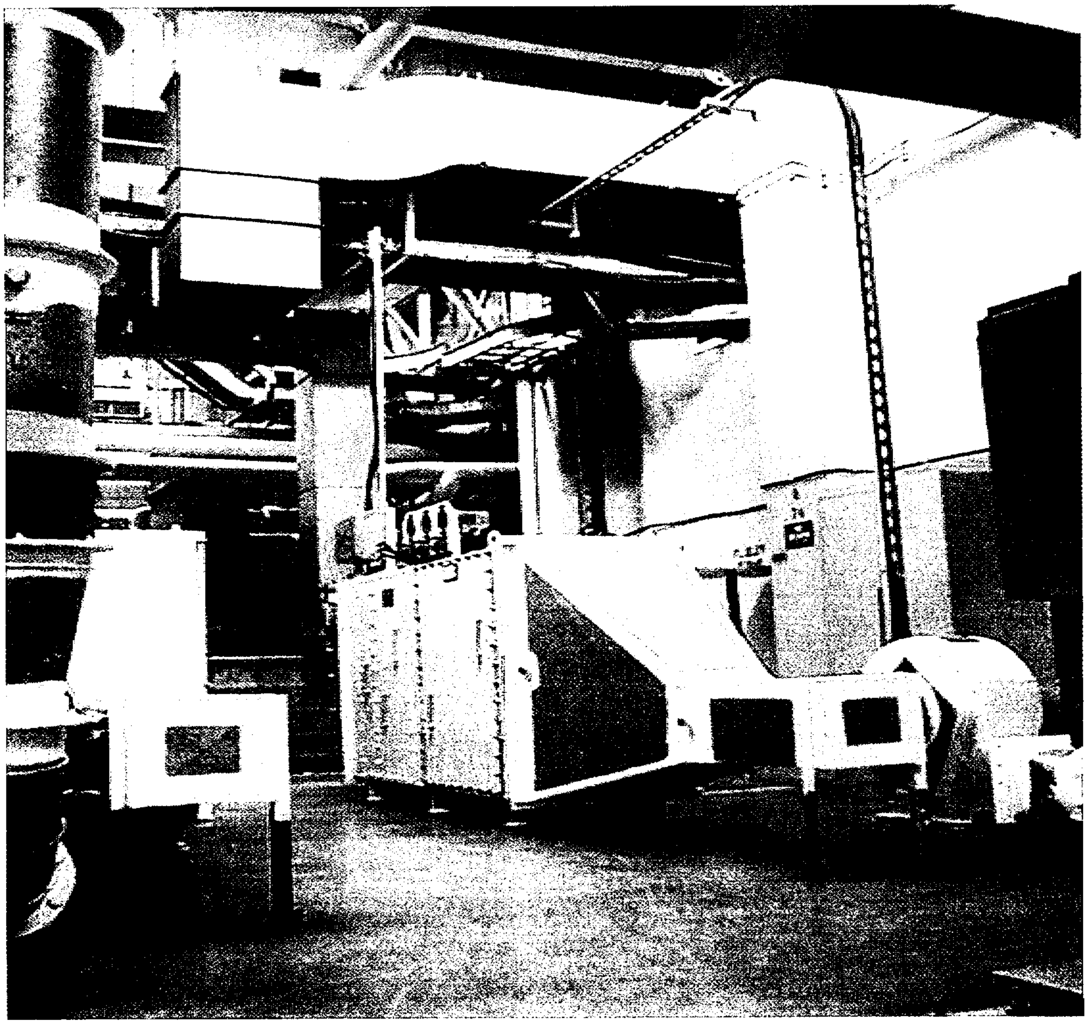
32



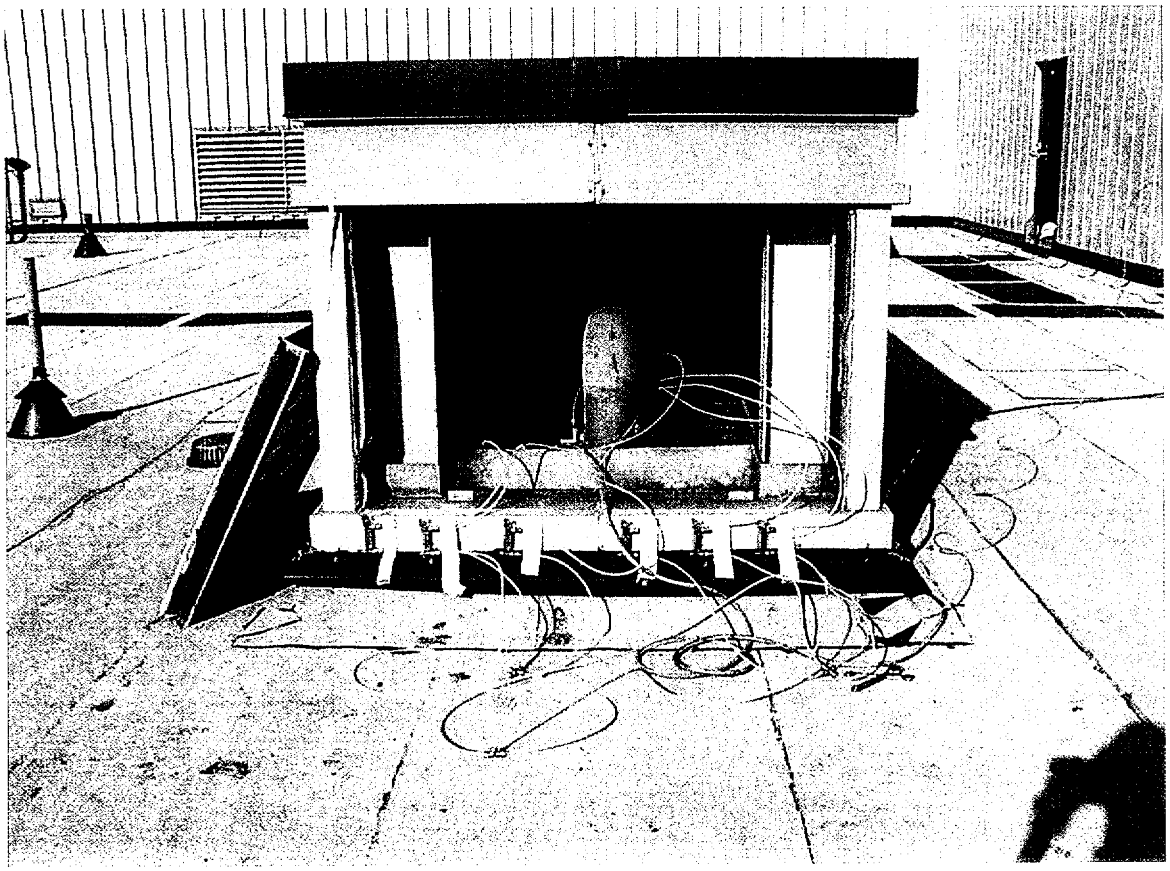
Gas Injection ports used in 1998 test - Units 1 & 2



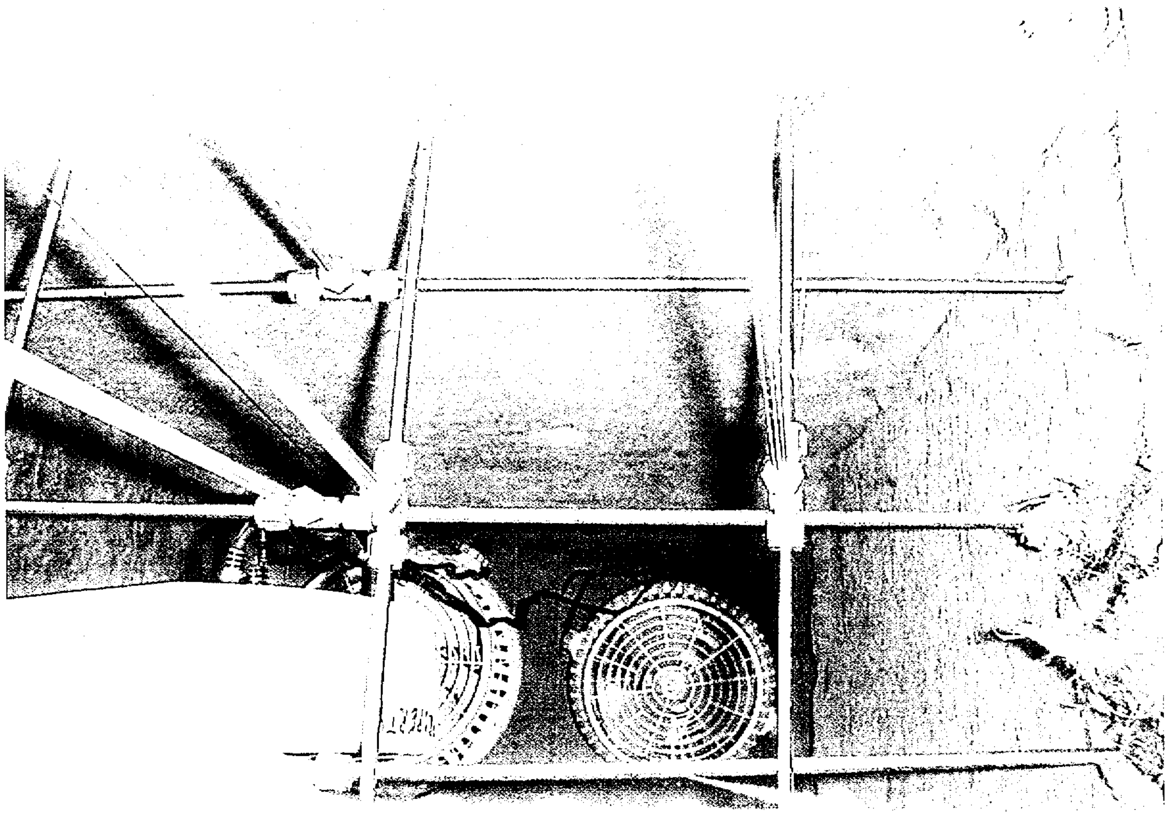
Ductwork at inlet of Unit 1 & 2 CR filters. Injection Ports are at upper right at column. Note there is not much distance between the injection point and the sample point. The sample points are on the bottom of the duct in the lower left portion of the picture. The same sample ports were used in the 2001 test with the gas injection on the roof at the outside air intake.



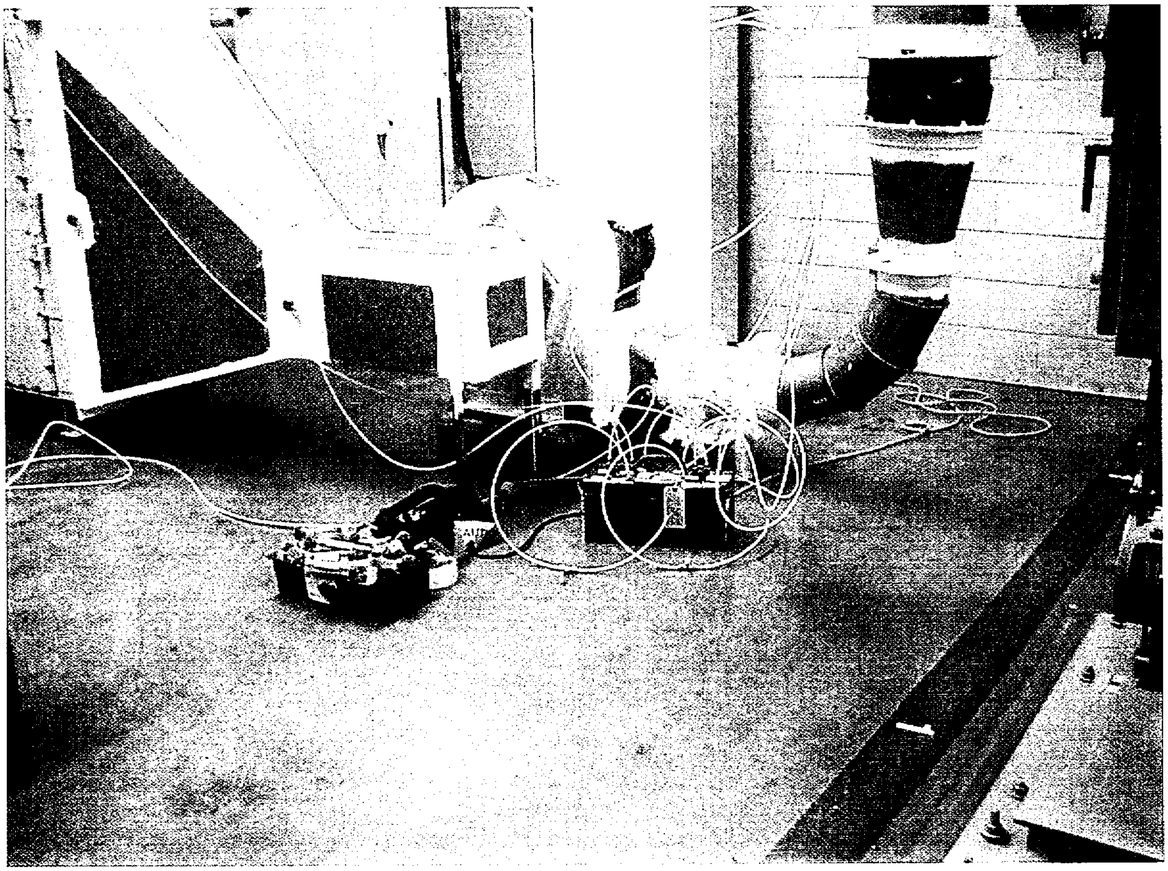
View from farther back showing filter train, 1998 injection ports and sample ports. Uncertainty was reduced by injecting gas on roof.



Gas injection tubing at outside air intake for Units 1 & 2
2001 Test

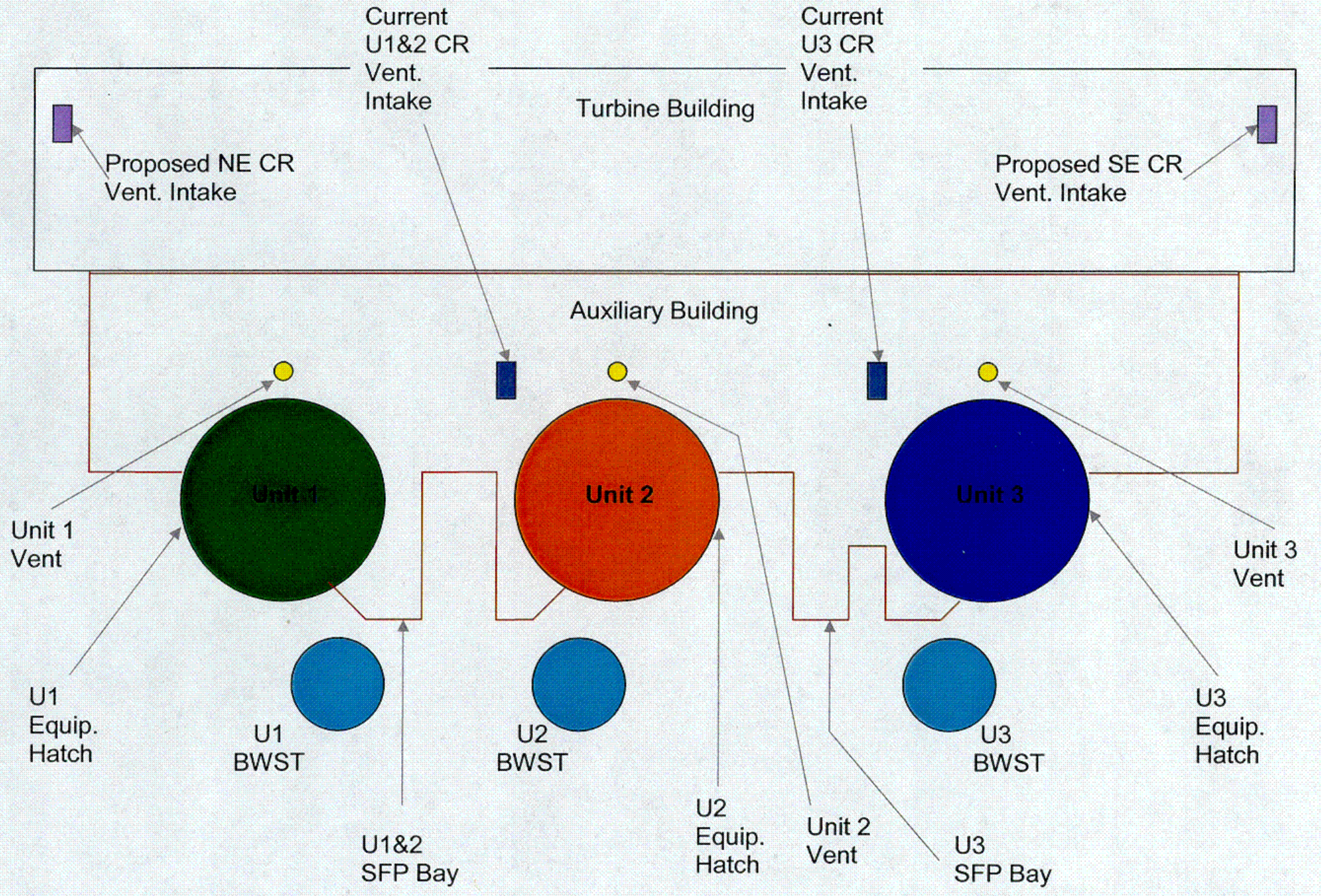


Gas injection manifold inside duct and fans to promote mixing
2001 Test



Sample pump and tubing in ventilation equipment room.
Also note sealant on filter unit and ductwork
2001 Test

Air Handling Unit Access Door and Sealant


Current
U1&2 CR
Vent.
Intake
Turbine Building
Current
U3 CR
Vent.
Intake
Proposed NE CR
Vent. Intake
Proposed SE CR
Vent. Intake
Auxiliary Building
Unit 1
Unit 2
Unit 3
Unit 1
Vent
Unit 3
Vent
U1
Equip.
Hatch
U1
BWST
U2
BWST
U3
BWST
U3
Equip.
Hatch
U1&2
SFP Bay
U2
Equip.
Hatch
Unit 2
Vent
U3
SFP Bay

C01