UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Docket File
50-237

July 3, 1997

LICENSEE: COMMONWEALTH EDISON COMPANY

FACILITIES: Dresden Nuclear Power Station, Units 2 and 3
Quad Cities Nuclear Power Station, Units 1 and 2
LaSalle County Station, Units 1 and 2

SUBJECT: SUMMARY OF MEETING CONCERNING THE QUAD CITIES, DRESDEN AND LASALLE ECCS SUCTION STRAINERS (NRC BULLETIN 96-03)

On June 16, 1997, the NRC staff met with Commonwealth Edison Company (ComEd) to discuss the status of the Emergency Core Cooling System (ECCS) suction strainer replacement project for Dresden, Quad Cities, and LaSalle County Stations. This ComEd project is in response to NRC Bulletin (Bulletin) 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors." All Boiling Water Reactors (BWR) licensees were requested to implement appropriate measures to ensure the capability of the ECCS to perform its safety function following a loss of coolant accident (LOCA). A list of attendees is provided as Attachment 1.

The objective of the meeting was for ComEd to provide the status of the project at the Dresden, Quad Cities, and LaSalle facilities. Quad Cities, Unit 2, and Dresden, Unit 3, have had new ECCS strainers installed; however, they had requested, and received, a deferral in showing compliance to Bulletin 96-03 until December 1998 so that the staff and the industry can finalize the BWR Owners Group Utility Resolution Guidance (URG) report; upon which the design of the strainers is based. A copy of the licensee's presentation is included as Attachment 2.

The licensee discussed their program for resolution of Bulletin 96-03 with a discussion on the methodology to establish the required strainer design and the present status and future schedule at the three stations. This project provides a common approach at each station by replacing the existing ECCS suction strainers with large passive strainers. The licensee stated that these new strainers accommodate the postulated post-LOCA debris and maintain the required ECCS net positive suction head and they also maintain the containment structural and mechanical design within the current licensing design basis.

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Based on the meeting, the licensee is scheduling to have the project completed at each facility by the end of the first refueling outage starting after January 1, 1997, in accordance with Bulletin 96-03, except for deferrals for Quad Cities, Unit 2, and Dresden, Unit 3, as mentioned above. The licensee also stated that the method of drywell post-LOCA debris determination is based

on the URG Method 3. ComEd will provide further information regarding strainer testing, strainer exclusion zone penetration, and upward forces on the installed strainer.

Original signed by
Robert M. Pulsifer, Project Manager
Project Directorate III-2
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-237, 50-249, 50-254,
50-265, 50-373, 50-374

Attachments: 1. List of Attendees
2. Licensee's Presentation

cc w/encls: see next page

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Docket File,T5C3	PUBLIC	PDIII-2 r/f
R. Pulsifer	D. Skay	J. Stang
ACRS, T2E26	OGC, 015B18	M. Dapas, RIII
WKropp, RIII		

E-Mail (w/encl 1):

R. Zimmerman, RPZ	S. Collins, SJC1/F. Miraglia, FJM	
R. Capra	J. Roe, JWR	E. Adensam, EGA1
D. Ross, SLM3	C. Moore, ACM	G. Tracy
T. K. Kim, TJK3	R. Lobel, RML	J. Kudrick, JAK1
R. Elliott, RBE	M. Marshall, MXM2	
	A. Serkiz, AWS	

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cc:

Ms. I. Johnson
Acting Manager, Nuclear Regulatory Services
Commonwealth Edison Company
Executive Towers West III
1400 Opus Place, Suite 500
Downers Grove, Illinois 60515

Phillip P. Steptoe, Esquire
Sidley and Austin
One First National Plaza
Chicago, Illinois 60603

Assistant Attorney General
100 West Randolph Street
Suite 12
Chicago, Illinois 60601

U.S. Nuclear Regulatory Commission
Resident Inspectors Office LaSalle Station
2605 N. 21st Road
Marseilles, Illinois 61341-9756

Chairman
LaSalle County Board of Supervisors
LaSalle County Courthouse
Ottawa, Illinois 61350

Attorney General
500 South Second Street
Springfield, Illinois 62701

Chairman
Illinois Commerce Commission
Leland Building
527 East Capitol Avenue
Springfield, Illinois 62706

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, Illinois 62704

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

LaSalle Station Manager
LaSalle County Station
Rural Route 1
P.O. Box 220
Marseilles, Illinois 61341

Robert Cushing
Chief, Public Utilities Division
Illinois Attorney General's Office
100 West Randolph Street
Chicago, Illinois 60601

Michael I. Miller, Esquire
Sidley and Austin
One First National Plaza
Chicago, Illinois 60603

Document Control Desk-Licensing
Commonwealth Edison Company
1400 Opus Place, Suite 400
Downers Grove, Illinois 60515

cc:

Ms. I. Johnson
Acting Manager, Nuclear Regulatory Services
Commonwealth Edison Company
Executive Towers West III
1400 Opus Place, Suite 500
Downers Grove, Illinois 60515

Michael I. Miller, Esquire
Sidley and Austin
One First National Plaza
Chicago, Illinois 60603

Site Vice President
Dresden Nuclear Power Station
6500 North Dresden Road
Morris, Illinois 60450-9765

Station Manager
Dresden Nuclear Power Station
6500 North Dresden Road
Morris, Illinois 60450-9765

U.S. Nuclear Regulatory Commission
Resident Inspectors Office
Dresden Station
6500 North Dresden Road
Morris, Illinois 60450-9766

Richard J. Singer
Manager - Nuclear
MidAmerican Energy Company
907 Walnut Street
P.O. Box 657
Des Moines, Iowa 50303

Brent E. Gale, Esq.
Vice President - Law and
Regulatory Affairs
Mid American Energy Company
One RiverCenter Place
106 East Second Street
P.O. Box 4350
Davenport, Iowa 52808

Chairman
Rock Island County Board
of Supervisors
1504 3rd Avenue
Rock Island County Office Bldg.
Rock Island, Illinois 61201

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, Illinois 62704

Chairman
Grundy County Board
Administration Building
1320 Union Street
Morris, Illinois 60450

Mr. L. William Pearce
Station Manager
Quad Cities Nuclear Power Station
22710 206th Avenue North
Cordova, Illinois 61242

U.S. Nuclear Regulatory Commission
Quad Cities Resident Inspectors Office
22712 206th Avenue North
Cordova, Illinois 61242

Document Control Desk-Licensing
Commonwealth Edison Company
1400 Opus Place, Suite 400
Downers Grove, Illinois 60515

ATTACHMENT 1

MEETING BETWEEN COMED AND NRC

ECCS SUCTION STRAINER PROJECT - NRC BULLETIN 96-03

JUNE 16, 1997

	NAME	AFFILIATION	TELEPHONE NUMBER
1	Robert A. Capra	NRC/DRPW/PDIII-2	(301) 415-1395
2	Richard Lobel	NRC/DSSA/SCSB	(301) 415-2865
3	J. Kudrick	NRC/DSSA/SCSB	(301) 415-2871
4	Daniel L. Shamblin	ComEd-NES	(630) 663-6580
5	Jeffrey W. Drowley	ComEd-NES/M&S	(630) 663-7371
6	Hemmat Safwat	ComEd-NES	(630) 663-7369
7	Steven P. Brown	ComEd-LaSalle	(815) 357-6761 ex 2506
8	T.J. Kim	NRR/DRPW/PDIII-1	(301) 415-1392
9	Donna Skay	NRR/DRPW/PDIII-2	(301) 415-1322
10	Gilbert Zigler	ITS Corp.	(505) 254-1005
11	Greg Ashley	Duke Engineering	(630) 778-4218
12	John Eglaston	ComEd-NES	(630) 663-3753
13	Michael Marshall	NRC/RES/GSIB	(301) 415-5895
14	Rob Elliott	NRC/NRR/SCSB	(301) 415-1397
15	Al Serkiz	NRC/RES/GSIB	(301) 415-6563
16	Mike Neal	NUS Information Svcs.	
17	Bob Rybak	ComEd-Nuc. Lic.	(630) 663-7286
18	Roger Heyn	ComEd-Quad Cities	(309) 654-2241 ex 3075
19	Harry Palas	ComEd-NES	(630) 663-7382
20	Vijay Datta	ComEd-Dresden	(815) 942-2920 ex 3368
21	Robert Pulsifer	NRR/DRPW/PDIII-2	(301) 415-3016

ATTACHMENT 2

Quad Cities, Dresden and LaSalle County Stations

ECCS Suction Strainer Replacement Project

Presentation

to the

Nuclear Regulatory Commission

June 16, 1997

ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
  - ***Bob Rybak, Senior BWR NLA***
- Overview
- ECCS Suction Strainer Design Methodology
- Station Status
  - Quad Cities
  - Dresden
  - LaSalle County
- Conclusion

- Agenda/Meeting Objective/Background - *Bob Rybak*
- Overview - *Dan Shamblin*
- ECCS Suction Strainer Design Methodology - *Jeff Drowley*
- Station Status
  - Quad Cities - *Roger Heyn*
  - Dresden - *Vijay Datta*
  - LaSalle County - *Steve Brown*
- Conclusion - *Bob Rybak*

Objective of the Meeting

- Review Program for Resolution of IEB 96-03
- Present the Common Three Station Approach
- Discuss Methodology to Establish the Required Strainer Design
- Present Preliminary Strainer Head Loss Results
- Obtain Staff Feedback

Facilitate the Staff's Understanding of Our Program

Background

- ComEd Response to IEB 96-03
  - Install new strainers at the earliest opportunity
- Quad Cities and Dresden
  - Strainers installed at Quad Cities U2 and Dresden U3
    - Meet original licensing basis
  - Reduce fibrous insulation
  - Requested Deferral to Show Compliance with IEB 96-03 for Quad Cities 2 and Dresden 3
  - Will meet IEB 96-03 requirements
- LaSalle
  - Install new strainers prior to Return-to-Service
  - Will meet IEB 96-03 requirements
- At This Time ComEd is Ready to Finalize the Methodology with the Staff

ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- ***Overview***
  - ***Dan Shamblin, Nuclear Engineering Services, Projects Manager***
- ECCS Suction Strainer Design Methodology
- Station Status
  - Quad Cities
  - Dresden
  - LaSalle County
- Conclusion

Implement a comprehensive program which addresses the technical issues identified by NRC Bulletin 96-03 and allows the ComEd Stations to fully comply with the Bulletin

Key Program Elements

- Common Approach
- Enhanced FME Program
- Inspections/Continued Surveillance of the Drywell and Suppression Pool
- Suppression Pool Cleaning
- Reduction of Fibrous Insulation - *Essentially RMI Plants*
- Review of NPSH Design Basis
- ***Replacement of ECCS Suction Strainers With Large Passive Strainers***

Replacement of ECCS Suction Strainers

- Install the Largest Passive ECCS Strainers Possible which Satisfy the Following Criteria:
  - Accommodate the postulated Post-LOCA debris and maintain the required ECCS NPSH
  - Maintain the containment structural/mechanical design within the licensed Design Basis
  - Fit through existing suppression pool hatches
- Utilize PCI *Sure Flow*™ Stacked Disk Suction Strainer

Status of Actions to Address IEB 96-03

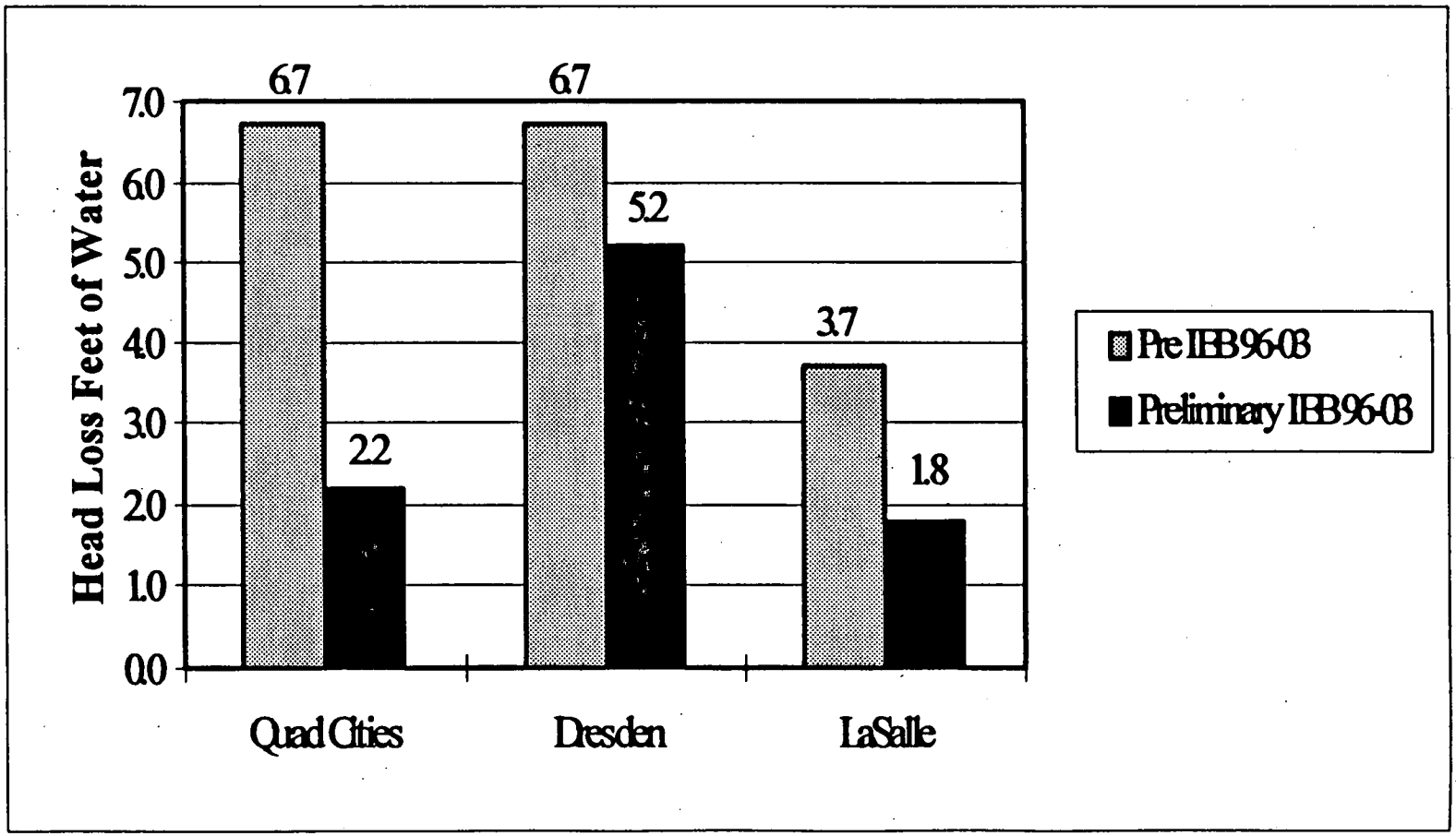
- FME Program
  - All Stations — Spring 1995
  - Enhanced Common Program — Spring 1997
- Inspections/Surveillance of Drywell and Suppression Pool
- Suppression Pool Cleaning
  - Quad Cities — U1 (Spr '96) — U2 (Spr '97)
  - Dresden — U2 (Sum '96) — U3 (Spr '97)
  - LaSalle — U1 (Spr '96) — U2 (Fall '96)
- Reduction of Fibrous Insulation
  - Quad Cities — U1 (Spr '98) — ***U2 Complete (April '97)***
  - Dresden — U2 (Spr '98) — ***U3 Complete (May '97)***

Status of Actions to Address IEB 96-03 (cont'd)

- Review of NPSH Design Basis
  - All Stations comply with current Design Basis
  - All Stations update Design Basis - Target Fall 1997
- Replacement of ECCS Strainers

- Quad Cities	U1 (Spr '98)	***U2 Complete (March '97)***
- Dresden	U2 (Spr '98)	***U3 Complete (April '97)***
- LaSalle	U1 (Wntr '97)	U2 (Spr '98)

Strainer Head Loss Results



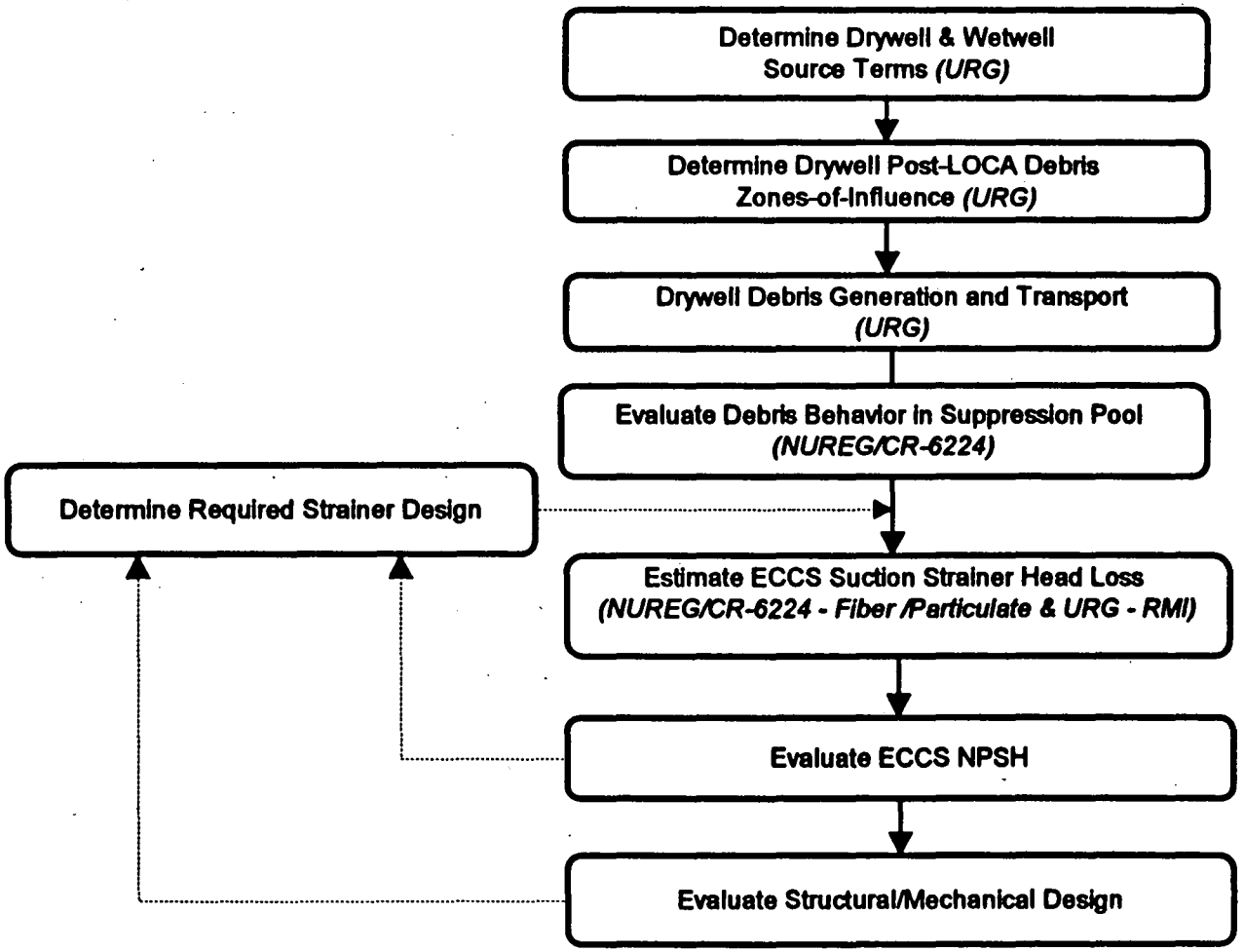
ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- Overview
- ***ECCS Suction Strainer Design Methodology***
  - ***Jeff Drowley, Nuclear Engineering Services, System Design Technical Specialist***
- Station Status
  - Quad Cities
  - Dresden
  - LaSalle County
- Conclusion

ECCS Suction Strainer Design Approach

- ComEd has Implemented a Common Approach to ECCS Suction Strainer Design for Quad Cities, Dresden and LaSalle
  - Post-LOCA debris determination
  - Behavior of debris in suppression pool
  - Strainer performance
  - NPSH evaluation
- Individual Station and Staff members active on BWROG
- ComEd Stations First to Install Large ECCS Suction Strainers

ECCS Suction Strainer Design Process



Drywell and Wetwell Debris Source Terms

- Review of Design Documentation
- Review Supplemented by Walkdown as Necessary
- Review Basis of URG Recommended Quantities to Assure Applicability to the Stations
- Quad Cities and Dresden Measured Wetwell Sludge Quantities

Method of Drywell Post-LOCA Debris Determination

- URG Method 3
  - Drywell models containing all significant debris sources (piping and equipment)
  - Breaks unrestrained/double jet
  - Spherical Zones-of-Influence (ZOI) and destruction pressures per URG
  - Spheres systematically moved to Identify ZOIs which control design
  - Potential breaks inside bio shield wall evaluated
    - Assume debris generated from 100% of insulation
  - Breaks which could destroy drywell penetration insulation being evaluated

Drywell Debris Generation and Transport Factors[1]

	Quad Cities (Mark I)	Dresden (Mark I)	LaSalle (Mark II)
Fibers Below Grating	78	78	(N/A)
Fibers Above Grating	28	28	28
Cal Sil	32.5[2]	32.5[2]	(N/A)
RMI	50	50	25[2]

Notes: 1) Factors applied as percentage of volume of insulation within a ZOI to determine debris destroyed and transported to the suppression pool.

2) Conservative with respect to URG

Debris Behavior in Suppression Pool

- Fibers
  - Time dependent accumulation
  - Fully suspended throughout the event
  - Uniform accumulation on strainers and in proportion to flow rate (RG 1.82)
- Particulate
  - Sludge/Dirt/Dust/Cal Sil
    - Assumed fully suspended throughout the event
    - Utilized conservative 50% filtration efficiency for thin fiber beds

Debris Behavior in Suppression Pool (cont'd)

- Particulate (cont'd)
  - Paint/Rust Flakes
    - Conservative settling post turbulent phase
    - Utilized conservative 100% filtration efficiency
- RMI
  - Assumed fully suspended throughout the event
  - Uniform accumulation on strainers and in proportion to flow rate (RG 1.82)

Strainer Head Loss Analysis

- Plant Specific Design Basis to Conservatively Consider ECCS Flow and Pool Temperature Time Histories
- Clean Strainer
  - Tested prototype strainer to measure component resistance
  - Evaluated difference in the tested and designed strainers
- Debris Bed
  - NUREG/CR-6224 correlation for fiber and particulate
  - BLOCKAGE Program to evaluate time dependence, particulate sedimentation, and filtration efficiency
  - URG correlation to estimate losses through RMI bed
  - Combined fiber/particulate and RMI losses

Strainer Head Loss Analysis (cont'd)

- Miscellaneous Debris (tags, rubber boots, etc.)
  - Addressed as reduction in effective strainer surface area
- Total Strainer Head Loss is the Sum of the Clean Strainer Loss, the Maximum Time Dependent Fiber/Particulate Loss, and the RMI Loss

NPSH Evaluation

	Quad Cities	Dresden	LaSalle
NPSH - Limiting Single Failure	X	X	X
NPSH - Limiting Pool Temperature/Pressure Response	X	X	X
Suppression Pool Tech Spec Minimum Level (w/ drawdown)	X	X	X
Tech Spec Suppression Pool Temperature to Maximize ΔP	X	X	X
Increased Friction Losses to Account for Aging	X	X	X
Unthrottled Flows for t<600 s	X	X	X
Throttled Flows for t> 600 s	X	X	X

Structural/Mechanical Qualification

- Consistent With Current Licensing Commitments
- Design Basis Calculations Updated (Piping, Supports, Penetrations)
- Strainers Qualified for Design Basis Loads Including Submerged Structure Hydrodynamic Loads

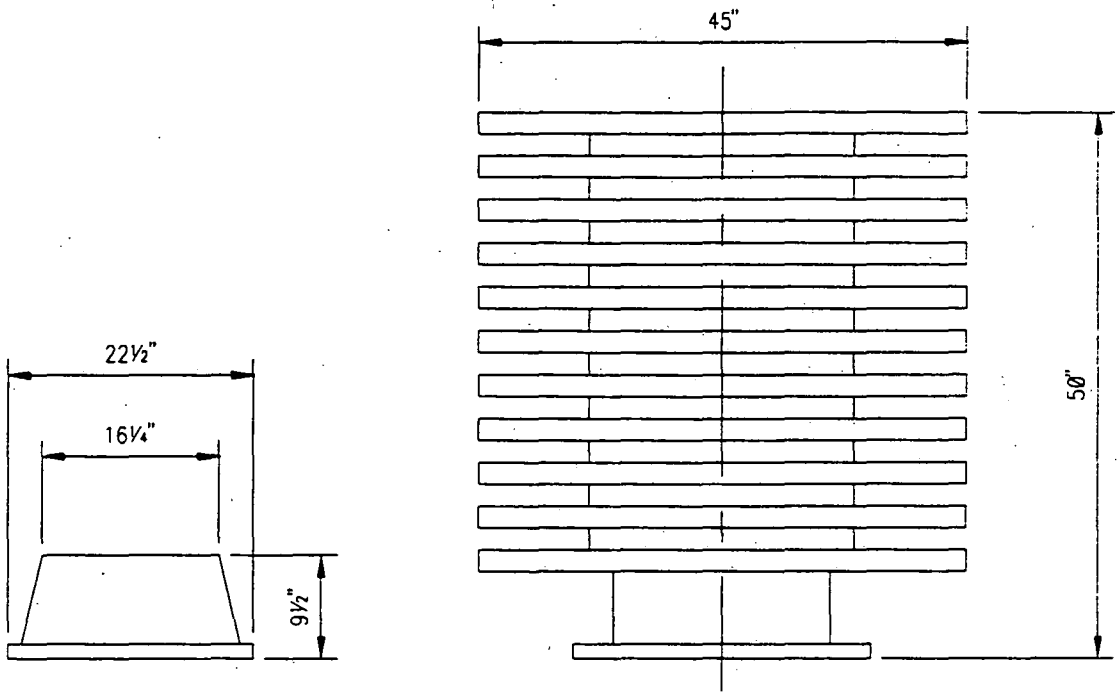
ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- Overview
- ECCS Suction Strainer Design Methodology
- ***Station Status***
  - ***Quad Cities***
    - ***Roger Heyn, Cognizant Design Engineer***
  - Dresden
  - LaSalle County
- Conclusion

Quad Cities Station Strainer Implementation Schedule

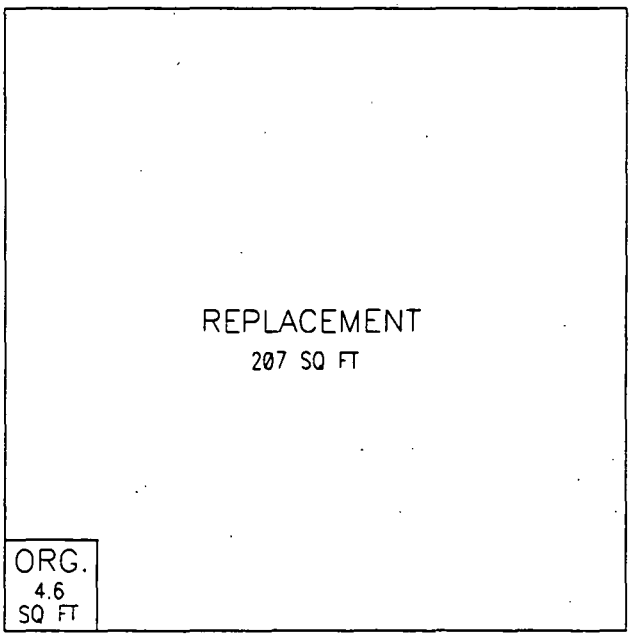
	Unit 2 (Actual)	Unit 1 (Planned)
Strainer Design	*10/96*	7/97
Modification Issued for Construction	*12/96*	9/97
Strainers Delivered	*2/97*	2/98
Strainers Installed	*3/97*	Spring/98

QUAD CITIES REPLACEMENT STRAINER DESIGN



ORIGINAL REPLACEMENT

STRAINER PROFILE



STRAINER SURFACE AREA

Postulated Post-LOCA Debris Quad Cities Station

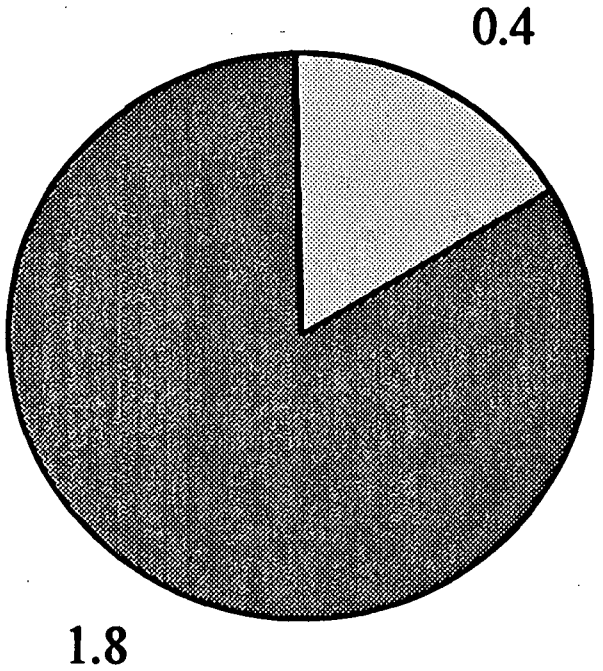
Total Drywell Insulation Estimated in the Pool from Controlling ZOI

Controlling Break	Location	Cal Sil (ft^3)	Fiber (ft^3)	RMI (ft^2)
Max Fiber	Recirc Header El. 610 ft	0.8	5	11,773
Max RMI	Inside Bio Shield	0	0	19,405

Total Non-Insulation Debris in the Pool

Type	Quantity	Source
Drywell		
Dirt/Dust/Spalled Concrete	150 lbs	URG
Other Transient Debris		
Fiber	2 ft^3	Station Unique
Tags, Rubber Boots, Etc.	8 ft^2	Station Unique
Rust Flakes	50 lbs	URG
Paint and Other Surface Coatings	85 lbs	URG
Other Fixed Debris	0	Station Unique
Latent Debris (Unqualified Paint)	85 lbs	Bounding Estimate
Wetwell		
Suppression Pool Sludge(dry)	443 lbs (1 fuel cycle)	Station Unique

Preliminary Quad Cities Station Strainer Head Loss Results



Total Head Loss 2.2 ft of H_2O

- Clean Strainer @ 8350 gpm
- RMI @ 8350 gpm

Notes: 1) Negligible Fiber
2) Head Loss in ft of H_2O

Quad Cities Station Summary

- Quad Cities Replacement ECCS Suction Strainers have been Designed Using Conservative Methods
  - Source estimates (additional sources considered which are not in the as-built plant)
  - Break locations, types and ZOI
  - Generation and transport
  - Instantaneous arrival of debris in the pool
  - Uniform accumulation of debris on the strainers
  - ECCS flows and pool temperatures
- Reduction in Fibrous Insulation
- Essentially No Fiber/Particulate Head Loss

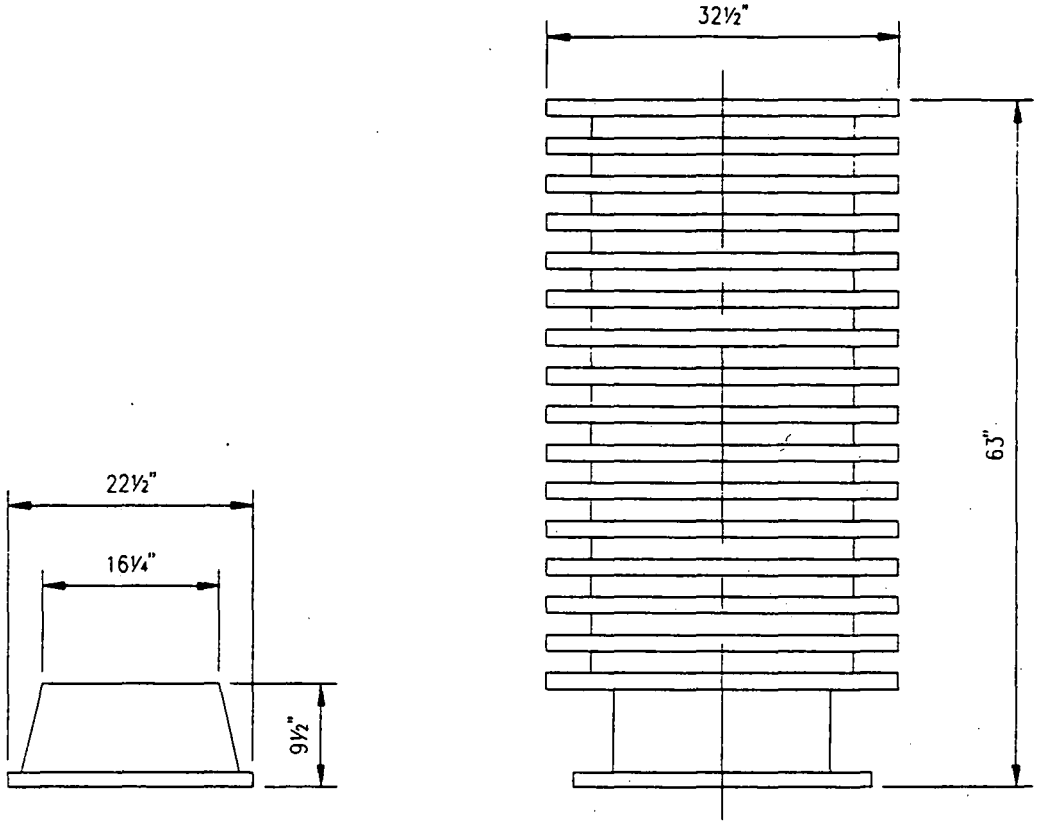
ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- Overview
- ECCS Suction Strainer Design Methodology
- ***Station Status***
  - Quad Cities
  - ***Dresden***
    - ***Vijay Datta, Cognizant Design Engineer***
  - LaSalle County
- Conclusion

Dresden Station Strainer Implementation Schedule

	Unit 3 (Actual)	Unit 2 (Planned)
Strainer Design	*12/96*	8/97
Modification Issued for Construction	*2/97*	9/97
Strainers Delivered	*3/97*	1/98
Strainers Installed	*4/97*	Spring/98

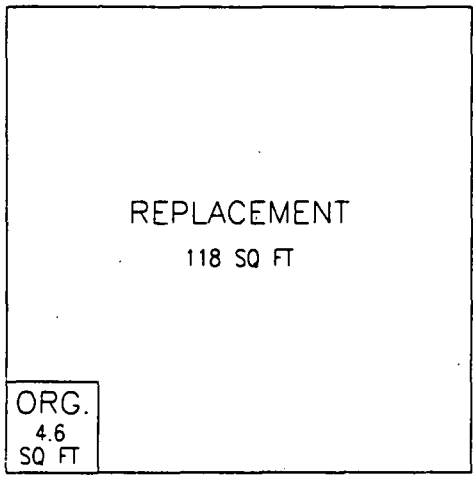
DRESDEN REPLACEMENT STRAINER DESIGN



ORIGINAL

REPLACEMENT

STRAINER PROFILE



STRAINER SURFACE AREA

Postulated Post-LOCA Debris Dresden Station

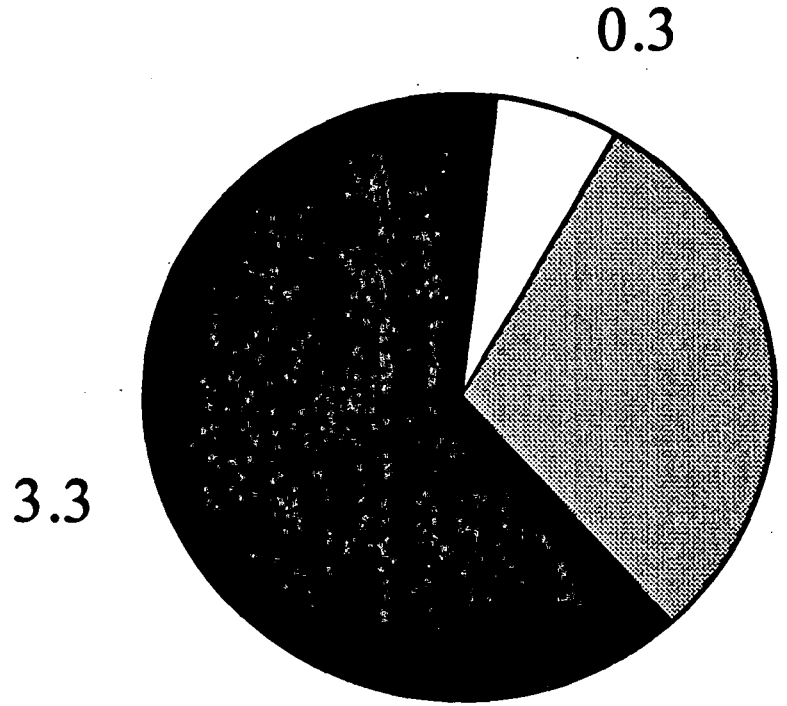
Total Drywell Insulation Estimated in the Pool from Controlling ZOI

Controlling Break	Location	Fiber (ft^3)	RMI (ft^2)
Max Fiber	Recirc Line El. 535 ft.	16	14,025
Max RMI	Inside Bio Shield Wall	9	19,405

Total Non-Insulation Debris in the Pool

Type	Quantity	Source
Drywell		
Dirt/Dust/Spalled Concrete	150 lbs	URG
Other Transient Debris		
Fiber	2 ft^3	Station Unique
Tags, Pads, Etc.	8 ft^2	Station Unique
Rust Flakes	50 lbs	URG
Paint and Other Surface Coatings	85 lbs	URG
Other Fixed Debris	0	Station Unique
Latent Debris (Unqualified Paint)	85 lbs	Bounding Estimate
Wetwell		
Suppression Pool Sludge(dry)	370 lbs (1 fuel cycle)	Station Unique

Preliminary Dresden Station Strainer Head Loss Results



Total Head Loss 2.2 ft of H_2O

- Clean Strainer @ 8050 gpm
- Fiber & Particulate @ 7250 gpm
- RMI @ 8050 gpm

Notes: 1) Values in ft of H_2O
2) Flow rate at worst case head loss

Dresden Station Summary

- Dresden Replacement ECCS Suction Strainers have been Designed Using Conservative Methods
  - Source estimates (additional sources considered which are not in the as-built plant)
  - Break locations, types and ZOI
  - Generation and transport
  - Instantaneous arrival of debris in the pool
  - Filtration and sedimentation
  - Uniform accumulation of debris on the strainers
  - Consideration of thin fiber bed head loss
  - ECCS flows and pool temperatures
  - Head loss calculation (sum of individual components)
- Reduction in Fibrous Insulation

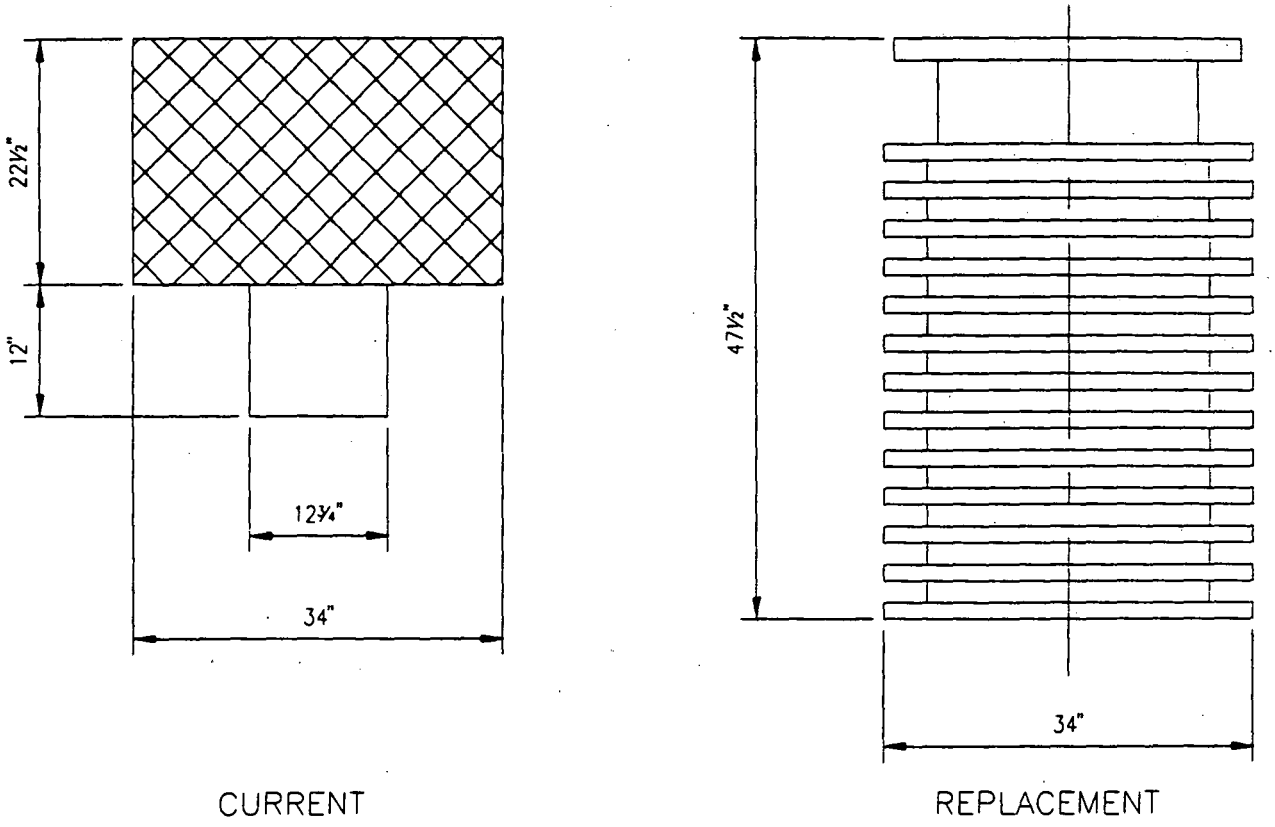
ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- Overview
- ECCS Suction Strainer Design Methodology
- ***Station Status***
  - Quad Cities
  - Dresden
  - ***LaSalle County***
    - ***Steve Brown, Cognizant Design Engineer***
- Conclusion

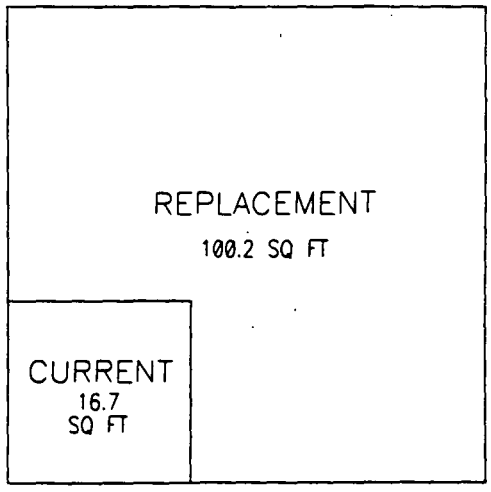
LaSalle County Station Strainer Implementation Schedule

	Unit 1 (Underway)	Unit 2 (Planned)
Strainer Design	6/97	7/97
Modification Issued for Construction	8/97	9/97
Strainers Delivered	10/97	1/98
Strainers Installed	Winter/97	Spring/98

LASALLE REPLACEMENT STRAINER DESIGN



STRAINER PROFILE



STRAINER SURFACE AREA

Postulated Post-LOCA Debris LaSalle Station

Total Drywell Insulation in the Pool Estimated from Controlling ZOI

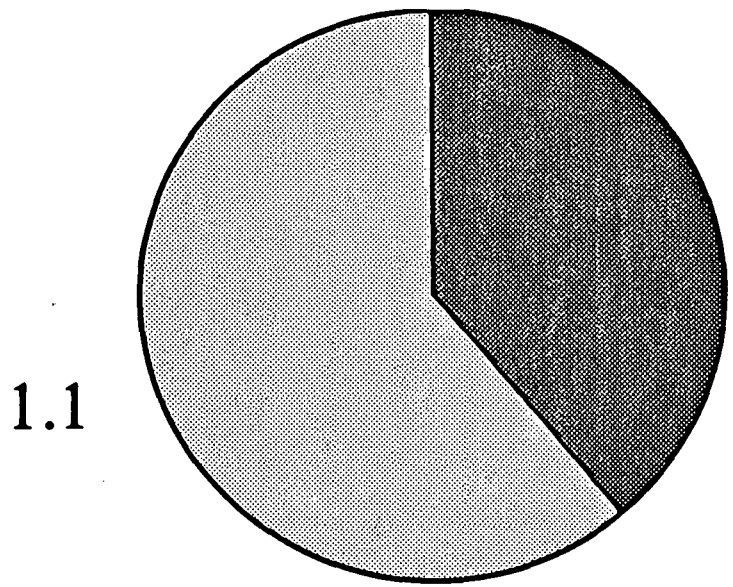
Controlling Break	Location	Fiber (ft^3)	RMI (ft^2)
Max RMI (piping)	D Main Steam Line El. 745 ft.	0.1	4,100
Max RMI (other)	Inside Bio Shield Wall	0	3,000

Total Non-Insulation Debris in the Pool

Type	Quantity	Source
Drywell		
Dirt/Dust/Spalled Concrete	150 lbs	URG
Other Transient Debris		
Fiber	1.7 ft^3	Station Unique
Tags, Rubber Boots, Etc.	8 ft^2	Station Unique
Rust Flakes	50 lbs	URG
Paint and Other Surface Coatings	85 lbs	URG
Other Fixed Debris	0	Bounding Estimate
Latent Debris (Unqualified Paint)	85 lbs	Station Unique
Wetwell		
Suppression Pool Sludge(dry)	600 lbs (2 fuel cycles)	URG

Preliminary LaSalle County Station Strainer Head Loss Results

Total Head Loss 1.8 ft of H_2O



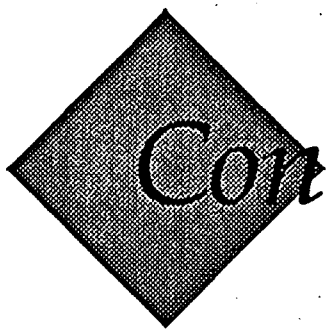
Notes: 1) Negligible Fiber
2) Head Loss in ft of H_2O

LaSalle County Station Summary

- LaSalle County Station is Using Conservative Methods for Design of Replacement ECCS Suction Strainers
  - Source estimates (additional sources considered which are not in the as-built plant)
  - Break locations, types and ZOI
  - Generation and transport
  - Instantaneous arrival of debris in the pool
  - Head loss calculation (conservative interpretation of URG RMI data)
  - ECCS flows and pool temperature
- Essentially No Fiber/Particulate Head Loss

ECCS Suction Strainer Replacement Project

- Agenda/Meeting Objective/Background
- Overview
- ECCS Suction Strainer Design Methodology
- Station Status
  - Quad Cities
  - Dresden
  - LaSalle County
- ***Conclusion***
  - ***Bob Rybak, Senior BWR NLA***



Conclusion

- ComEd is Implementing a Consistent Program to Address IEB 96-03 Concerns
- ComEd is Taking Reasonable Steps to Ultimately Assure Compliance with IEB 96-03