50-498

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

May 14, 1997

LICENSEE: HOUSTON LIGHTING AND POWER COMPANY (HL&P)

FACILITY: South Texas Project, Units 1 and 2 (STP)

SUBJECT: SUMMARY OF APRIL 24, 1997, MEETING ON INCOMPLETE CONTROL ROD INSERTION (IRI) AT STP

On April 24, 1997, HL&P met with the Nuclear Regulatory Commission (NRC) to discuss HL&P's plans regarding IRI at STP. Meeting attendees are listed in Attachment 1. Attachment 2 is a handout provided by HL&P.

During a January 25, 1997, rod drop test on Unit 1, which took place during the middle of Cycle 7, 2 control rods stuck at 6 steps. During a subsequent test on April 5, 1997, 4 control rods stuck at 6 steps (the same 2 from the January test plus 2 others). HL&P attributes the root cause to fuel assembly thimble tube distortion caused by excessive axial compressive loads, with irradiation metallurgical effects as a contributing factor.

HL&P has been addressing this problem by limiting fuel assembly burnups in rodded fuel assemblies. In addition, HL&P is planning to augment their approach with Phase I and Phase II fuel design changes. Phase I plans include using Zirlo fuel cladding, thimble tubes and mid-grids to reduce fuel assembly growth and corrosion, and adding a debris grid at the fuel assembly bottom to reduce assembly skeleton axial loading. Phase I is scheduled for Unit 1 Cycle 8 (September 1997). Phase II plans include increasing the thimble tube outside diameter and increasing the tube wall thickness for improved buckling resistance, and using a single (versus a double) dashpot to lower the top of the dashpot and remove a transition. Phase I is scheduled for Unit 2 Cycle 7 (October 1998). HL&P noted that they have not approved Phase II at this time. Other design changes under consideration include decreasing the top nozzle spring force and reducing the control rod rodlet outside diameter.

Regarding the current operating cycle for Unit 1, HL&P presented a graph that compares the shutdown margin limit of 56 IRIs at 6 steps with a predicted equivalent number of IRIs at 6 steps during Cycle 7, based on Cycle 6 data and Cycle 7 data observed to date. Based on this graph, which HL&P believes shows substantial safety limit margin, HL&P plans to perform only one additional rod drop test (on June 28, 1997) between now and the end of Cycle 7 (September 13, 1997). From this graph, HL&P is predicting the equivalent of 8 IRIs at 6 steps during the June test and 14 IRIs at 6 steps during the end of Cycle 7 test. HL&P indicated that if the June test results are substantially different from what they are expecting, they will reevaluate their plan.

Regarding the current operating cycle for Unit 2, HL&P indicated that Unit 2 has not experienced IRI when standard fuel is limited to burnups of 30 GWD/MTU and Vantage 5H fuel is limited to burnups of 25 GWD/MTU. The current Unit 2 cycle burnups are projected to slightly exceed these values, and therefore, HL&P may decide to do a rod drop test just prior to Unit 2 end of cycle.

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NRC FILE CENTER COPY

The NRC expressed concerns that under HL&P's proposed plan for Unit 1, the proposed burnup deltas since the last rod drop test (i.e., 3009 MWD/MTU for the June test and 2769 MWD/MTU for the end of Cycle 7 test) will exceed the 2500 MWD/MTU minimum burnup increment between successive tests that was proposed by the Westinghouse Owners Group in response to Bulletin 96-01, "Control Rod Insertion Problems." The NRC also expressed concern with the possibility of control rods sticking in the upper part of the core, since rod drop traces are showing evidence of slowing down in this area. The NRC indicated that they will consider HL&P's plan and provide feedback.

ORIGINAL SIGNED BY:
Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Attachments: 1. List of Meeting Attendees
2. Licensee Handout

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OFC	PM/PD4-1	LA/PD4-1	(A)BC/SPSB
NAME	TAlexion/TWA	CHawes CMH	JLyons
DATE	5/5/97	5/5/97	5/12/97
COPY	YES/NO	YES/NO	YES/NO

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MEETING WITH HL&P ON INCOMPLETE CONTROL ROD INSERTION

April 24, 1997

Name	Organization
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S. Head	HL&P
D. Leazar	HL&P
R. Dunn	HL&P
G. Holahan	NRC
J. Lyons	NRC
M. Chatterton	NRC
H. Conrad	NRC
F. Grubelich	NRC
T. Alexion	NRC

ATTACHMENT 1

SOUTH TEXAS PROJECT

MEETING WITH THE

NUCLEAR REGULATORY COMMISSION

TO DISCUSS

INCOMPLETE ROD INSERTION STATUS

APRIL 24, 1997

VISION: SOUTH TEXAS PROJECT - - A WORLD CLASS POWER PRODUCER

ATTACHMENT 2

Purpose

- Communicate STP-specific information regarding:

  - Incomplete rod insertion (IRI)

  - Planned STP fuel assembly design changes to prevent IRI

  - Proposed Unit 1 rod drop testing schedule to monitor IRI

- STP Team

  Ted H. Cloninger - Vice President, Nuclear Engineering
  David A. Leazar - Manager, Nuclear Fuel & Analysis
  Roland F. Dunn - Supervisor, Reactor Engineering
  Scott M. Head - Supervisor, Nuclear Licensing

STP Unit 1 Cycle 7 Incomplete Rod Insertion (IRI) Background

Assembly ID	Core Location	06/08/96 (0 gwd/mtu)	01/25/97 (8.3 gwd/mtu)	04/05/97 (10.7 gwd/mtu)
(All V5H)		Steps above rod bottom / Fuel burnup(gwd/mtu)		
H05	C-9	0 / 17	6 / 26	6 / 28
H47	K-8	0 / 18	6 / 27	6 / 30
H10	C-7	0 / 17	0 / 26	6 / 29
H46	F-8	0 / 18	0 / 27	6 / 30

STP Fuel Assembly Design Changes to Prevent IRI

- The root cause of incomplete rod insertion has been identified as fuel assembly thimble tube distortion caused by excessive axial compressive loads, and a contributing factor includes irradiation metallurgical effects
- Therefore, in addition to fuel assembly burnup management under control rods, the following Phase I and II fuel design changes are planned to address the above cause, and provide our long term correction to the IRI condition

STP Fuel Assembly Design Changes to Prevent IRI

Phase I *- Implementation planned for Unit 1 Cycle 8 (September 1997)*

- ZIRLO fuel cladding, thimble tubes, and mid-grids
  - reduced creep rate
  - reduced axial assembly growth
  - reduced corrosion
  - requires Tech Spec change
- Debris grid added at bottom (Performance +)
  - reduced assembly skeleton axial loading from fuel rods

STP Fuel Assembly Design Changes to Prevent IRI

Phase II - *Implementation planned for Unit 2 Cycle 7 (October 1998)*

The following proposed changes are being evaluated by the STP-W design team:

- Thimble tube OD from top to bottom is same diameter
  - OD above dashpot is .008" larger than V5H XL fuel, same as standard XL
  - OD in dashpot is .052" larger than V5H or standard XL fuel
  - improved buckling resistance in dashpot area compared to V5H and standard XL fuel
  - improved buckling resistance above dashpot compared to V5H XL fuel
- Thicker thimble tube wall
  - thimble tube wall thickness above dashpot increases by .004"
  - thimble tube wall thickness in dashpot increases by .026"
  - improved buckling resistance compared to V5H and standard XL fuel
- Dashpot is single vs. double
  - removes a transition and lowers the top of the dashpot by about 4" (equivalent to six steps)

STP Fuel Assembly Design Changes to Prevent IRI

Additional Long Term Actions

STP has requested the following to be evaluated by the W design team:

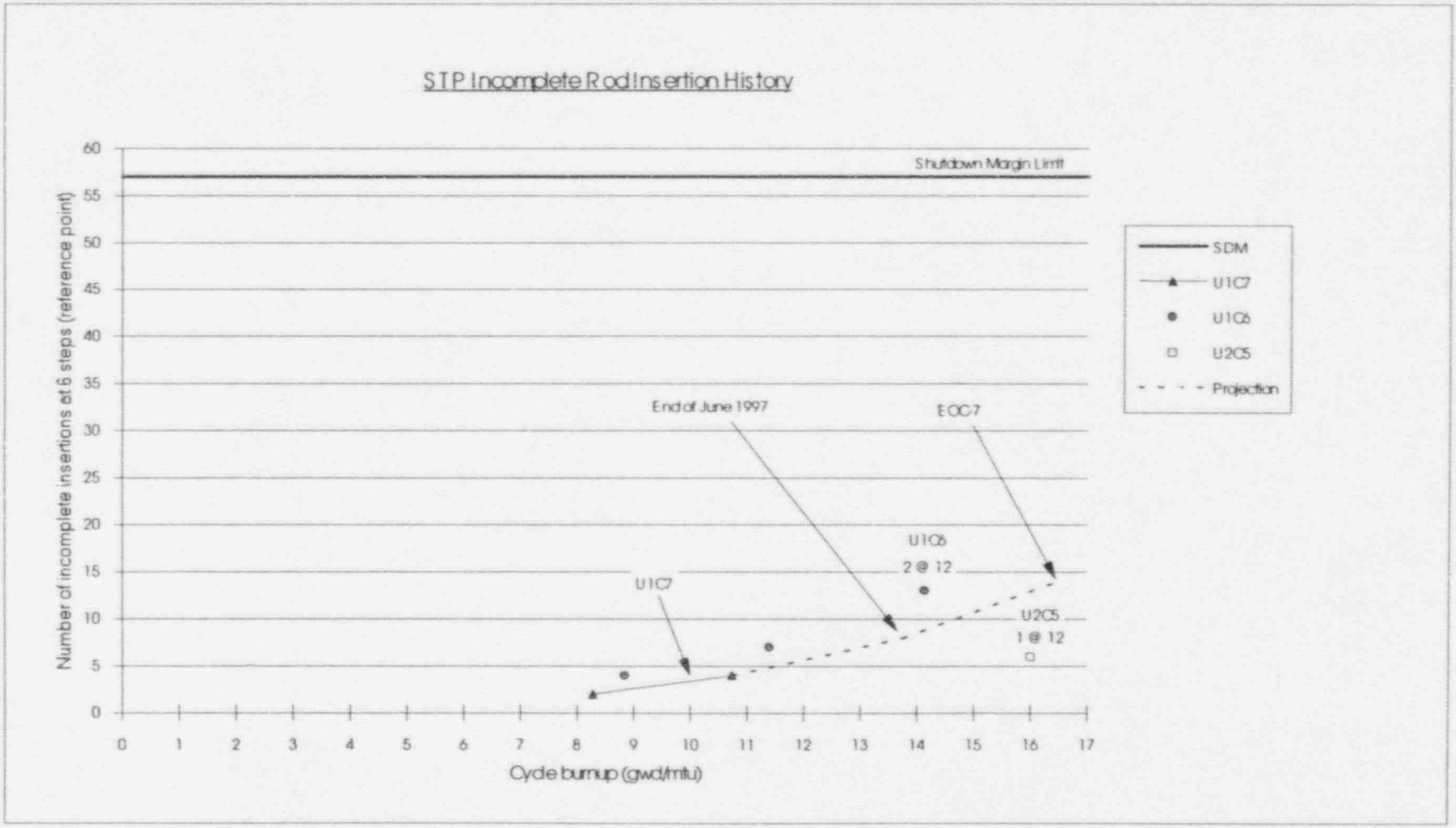
- Decrease top nozzle spring force
  - Condition II, loss of load/RCP overspeed event with fuel assembly liftoff may be limiting
- Reduce RCCA rodlet OD
  - STP is planning to replace RCCAs with chrome-plated cladding at 10 year ISI outage

STP Unit 1 Cycle 7 Shutdown Margin Capability

All cases assume the highest worth stuck rod is fully withdrawn
BOC and EOC shutdown margin and trip reactivity met for the following cases:

	# Stuck rods*	Position**
Case 1	12	18
Case 2	20	12
Case 3	56	6

*no core location or fuel burnup restrictions, e.g., any 12 or any 20 rods
**based on digital rod position indication (DRPI) - includes 4 step uncertainty


STP Incomplete Rod Insertion History
Shutdown Margin Limit
Number of incomplete insertions at 6 steps (reference point)
Cycle burnup (gwd/mtu)
End of June 1997
EOC7
U1C6
2 @ 12
U1C7
U2C5
1 @ 12
SDM
U1C7
U1C6
U2C5
Projection

Planned Test Schedule

- Rod drop test on 6/28/97, burnup delta of 3009 mwd/mtu since last test
- Rod drop test at End-of-Cycle on 9/13/97, burnup delta of 2769 mwd/mtu since 6/28

These dates are acceptable for the following reasons:

- IRI condition progresses slowly with core burnup
- Significant safety limit margin exists
- Unit 1 operation remains bounded by previous fuel cycle IRI experience
- STP will continue to use Restart Evaluation Criteria for the next Unit 1 rod drop test
  - monitors rod drop time, changes in rod drop time, and shutdown margin
  - evaluates reduction of burnup interval prior to next rod drop test, if required

Meeting Summary

- Described STP's long term corrective actions to prevent incomplete rod insertions
- Presented STP safety limit margin for incomplete rod insertions
- Described planned Unit 1 Cycle 7 rod drop test schedule