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

January 29, 1997

MEMORANDUM TO: Charles J. Haughney, Acting Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

FROM: Mark S. Delligatti, Senior Project Manager
Spent Fuel Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SUMMARY OF THE JANUARY 16, 1997, MEETING BETWEEN THE NUCLEAR REGULATORY COMMISSION STAFF AND HOLTEC INTERNATIONAL CORPORATION

Staff from the U.S. Nuclear Regulatory Commission met with representatives of Holtec International Corporation (Holtec) on January 16, 1997, at NRC Headquarters in Rockville, MD. The subjects discussed were thermal code benchmarking, 1/8- and 1/4-scale testing, and the status of Holtec's revisions to the Hi-Storm Storage Cask application, the review of which is currently suspended. Also attending the meeting were representatives of Commonwealth Edison, Northern States Power, The Ibex Group, Westinghouse, and Lawrence Livermore National Laboratories. An attendance list is included as Attachment 1. This meeting was noticed on January 2, 1997. Proprietary information associated with the thermal code benchmarking was discussed in an initial closed session of the meeting. Attachment 2 is a copy of the slides used by Holtec in its non-proprietary presentation.

Holtec described its proposed program to benchmark the thermal models used in the analyses of the Hi-Star 100 system. Published temperature data from the test program conducted on Transnuclear's TN-24P metal storage cask at the Idaho National Laboratories are planned to be used.

The completed 1/8-scale impact limiter testing results were discussed by Holtec. As a result of the 1/8-scale testing, a number of modifications were made to the final design of the impact limiter. The staff stated that, to perform the impact analysis, force deflection relationships of the impact limiter for the various drop orientations considered in the package design are required. Unless Holtec can demonstrate that it can predict reasonably accurate force deflection relationships of the impact limiter for the various drop orientations, further testing of the 1/8-scale model may be necessary. Holtec then described the 1/4-scale testing program plans. The staff verified that the plans included appropriate drops at appropriate angles and attitudes.

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Finally, Holtec discussed plans for submittal of a revised topical safety analysis report (TSAR) for the Hi-Storm Storage Cask. Holtec plans to submit the TSAR to the staff in February 1997.

Please let me know if you wish to discuss the contents of the meeting summary.

Attachment: 1. Attendance List
2. Holtec Slides

Dockets 72-1008
71-9261
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OFC	SFPO	E	SFPO	C	SFPO	C				
NAME	VTharpe		MDelligatti		EJLeeds					
DATE	01/27/97		01/27/97		01/27/97					

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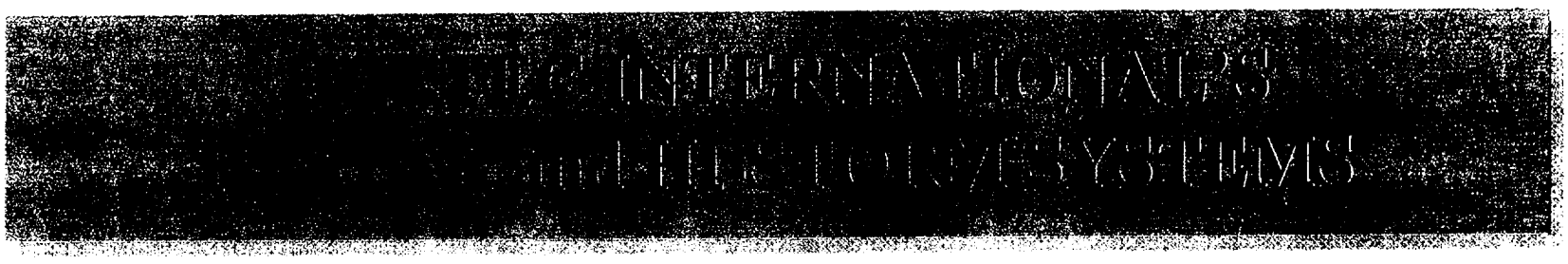
ATTENDANCE LIST
Meeting Between Holtec International and NRC Staff
January 16, 1997

Name	Organization
Mark S. Delligatti	NRC/NMSS/SFPO
Michael Franovich	NRC/NMSS/SFPO
Henry W. Lee	NRC/NMSS/SFPO
David Tang	NRC/NMSS/SFPO
Marissa Bailey	NRC/NMSS/SFPO
Tom Matula	NRC/NMSS/SFPO
Steve Hogsett	NRC/NMSS/SFPO
Michael Waters	NRC/NMSS/SFPO
Stephen McDuffie	NRC/NMSS/SFPO
Fritz Sturz	NRC/NMSS/SFPO
Eric Leeds	NRC/NMSS/SFPO
Gary Tjersland	Holtec
Kris Singh	Holtec
Indresh Rampall	Holtec
Mark Soler	Holtec
Garry R. Thomas	LLNL
Max DeLong	Northern States Power
Alex Panagos	ComEd
Kenneth Ainger	ComEd
Thomas L. Nauman	ComEd
David Elias	ComEd
Rita Bowser	Westinghouse
Robert E. Sweeney	IBEX

ATTACHMENT 1



USNRC MEETING

JANUARY 16, 1997

ATTACHMENT 2

AGENDA

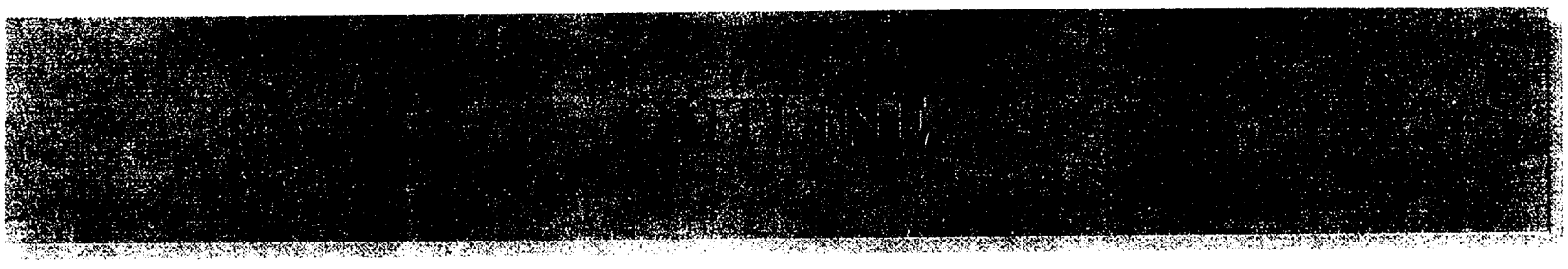
- **INTRODUCTIONS**
- **THERMAL BENCHMARKING - PROPRIETARY**
- **HI-STAR IMPACT LIMITER TEST PROGRAMS**
- **HI-STORM TSAR STATUS AND SCHEDULE**
- **SUMMARY AND DISCUSSION**

[redacted]

- THE THERMAL MODELS UTILIZED IN THE ANALYSES OF THE HI-STAR 100 MPCs WILL BE BENCHMARKED AGAINST PUBLISHED TEMPERATURE DATA FROM A FULL-SCALE CASK.
- THE BENCHMARKING WILL BE PERFORMED UTILIZING TEMPERATURE DATA OBTAINED FROM THE TN-24P METAL STORAGE CASK TEST PROGRAM AT INEL. THE TEST RESULTS ARE PUBLISHED IN EPRI REPORT NO. NP-5128.
- THE INTERNAL BASKET DESIGN OF THE TN-24P HAS FEATURES WHICH ALLOW A DIRECT COMPARISON TO THE HI-STAR 100 MPC BASKETS.
- THE BENCHMARKING RESULTS SHOW THAT THE HOLTEC THERMAL ANALYSIS METHOD CAN CONSERVATIVELY PREDICT BOTH THE PEAK FUEL CLADDING TEMPERATURE AND THE PROFILE OF THE INTERNAL FUEL AND BASKET TEMPERATURE.
- THE DEGREE OF CONSERVATISM OVERPREDICTS THE PEAK FUEL CLADDING TEMPERATURE BY OVER 100 DEGREES C.
- THE BENCHMARKING RESULTS WILL BE FULLY REPORTED IN THE NEXT TSAR/SAR REVISIONS.

[redacted]

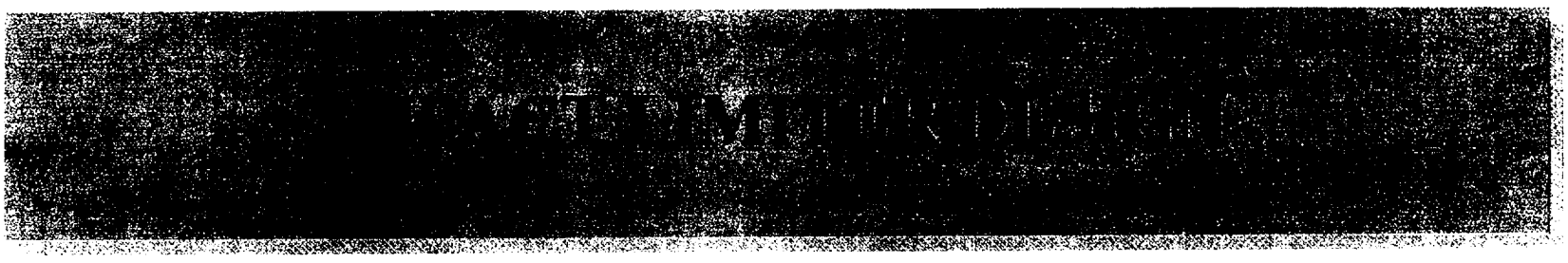
by Mark Soler
Holtec International
555 Lincoln Dr. West
Marlton, NJ-08053



- **IMPACT LIMITER DESIGN FEATURES**

- **1/8 SCALE IMPACT LIMITER STATIC TESTING**
  - **METHODOLOGY**
  - **TESTING**
  - **RESULTS**

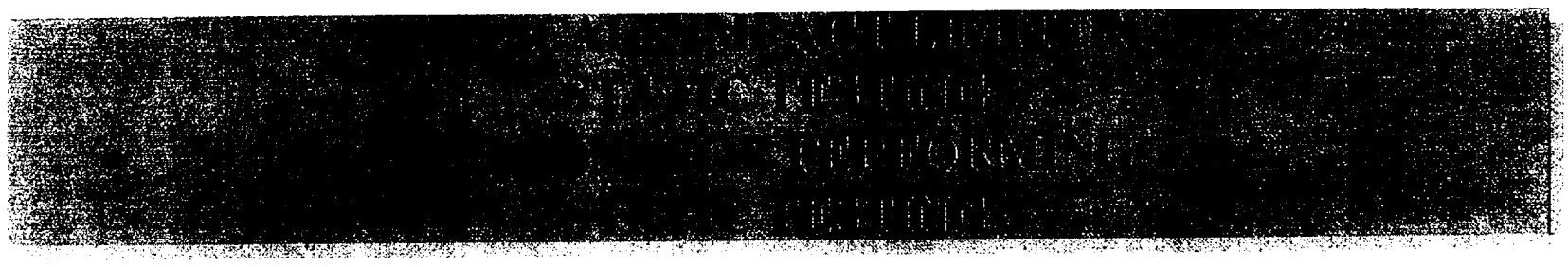
- **1/4 SCALE IMPACT LIMITER DYNAMIC TESTING**
  - **TEST PLAN**
  - **METHODOLOGY AND TEST EVALUATION**



- **CROSS CORE ALUMINUM HONEYCOMB-LAYERED CORRUGATED SHEETS**
  - **VARIOUS CRUSH STRENGTHS**
  - **DOES NOT POSE THE FIRE THREAT THAT OTHER ENERGY ABSORBERS DO**

- **STAINLESS STEEL EXTERNAL SKIN**
  - **LONG-TERM PERFORMANCE WITH MINIMAL MAINTENANCE**
  - **SUFFICIENT STRENGTH TO RETAIN INTEGRITY THROUGH IMPACT**

- **THICK CARBON STEEL INNER SHELL BUTTRESSED WITH GUSSETS TO PROVIDE ADDITIONAL BACKING AREA FOR HONEYCOMB**



- **VERIFY ACCEPTABILITY OF ANALYTICAL MODEL AND METHODOLOGY**

- **VERIFY ACCEPTABILITY OF IMPACT LIMITER DESIGN AND IDENTIFY AREAS OF DESIGN IMPROVEMENT**

[redacted]

- LOAD-DEFLECTION CURVES DEVELOPED CONSERVATIVELY USING THE CLASSICAL INTERPENETRATION APPROACH

- FINITE ELEMENT CODE USED TO CALCULATE THE INTERSECTION AREA FOR DEPTH OF PENETRATION

- AREA VERSUS PENETRATION CURVE MULTIPLIED BY THE CRUSH STRENGTH GIVES THE FORCE DEFLECTION CURVE

- DEVELOP CURVES FOR END, SIDE, 30 DEGREE, AND 60 DEGREE IMPACT LIMITER ORIENTATIONS

- TEST RESULTS REPORTED IN HI-STAR 100 SAR, REVISION 4

[redacted]

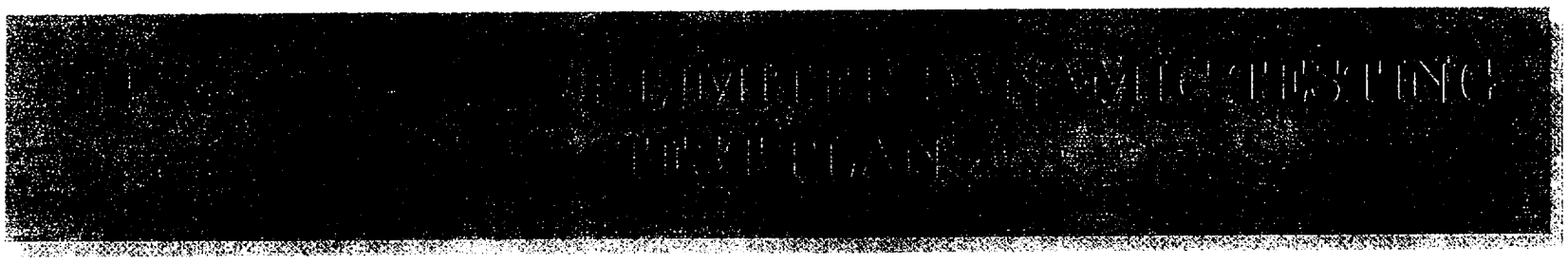
- **INCREASE THICKNESS OF INNER CARBON STEEL CYLINDER**
- **MOVE REINFORCING GUSSETS TO OUTSIDE OF INNER CYLINDER**
- **REDUCED CRUSH AREA AT INITIATION OF END IMPACT**
- **REPLACE HONEYCOMB MATERIAL AROUND PERIMETER OF THE IMPACT LIMITER WITH LOWER CRUSH STRENGTH MATERIAL**

- **1/4 SCALE IMPACT LIMITER DROP TESTS ARE PERFORMED TO CONFIRM THE VALIDITY OF THE COMPUTER MODELS WHICH WERE USED TO VERIFY THAT THE HI-STAR 100 IMPACT LIMITER ABSORBS THE REQUIRED AMOUNT OF IMPACT ENERGY DURING A 10CFR71.73 FREE DROP**

- **CONFIRM MAXIMUM DECELERATIONS ARE LESS THAN 60 g's (DESIGN BASIS)**

- **CONFIRM IMPACT LIMITER INTEGRITY THROUGH THE IMPACT EVENT**

- FOUR DROP TESTS
  - CENTER-OF-GRAVITY OVER CORNER
  - TOP END
  - SIDE
  - SLAP DOWN
- IMPACT LIMITER SCALED IN ALL DIMENSIONAL CHARACTERISTICS
- OVERPACK AND MPC TEST SPECIMEN SCALED FOR CENTER OF GRAVITY, MOMENT OF INERTIA, WEIGHT, LENGTH, AND OUTER DIAMETER
- DUMMY IMPACT LIMITER SCALED FOR WEIGHT, CENTER OF GRAVITY, AND MOMENT OF INERTIA



- **DROP HEIGHT TO BE 30 FEET**
- **IMPACT SURFACE TO BE UNYIELDING, SMOOTH, AND FLAT**
- **ACCELEROMETERS TO BE ATTACHED TO TEST SPECIMEN**
- **HIGH-SPEED CAMERAS AND VIDEO CAMERAS TO BE USED**
- **COLOR PHOTOGRAPHS OF TEST SPECIMENS TO BE TAKEN BEFORE AND AFTER EACH DROP TEST**

ACCELEROMETER DYNAMIC TESTING FEATURE EVALUATION

- **LOAD-DEFLECTION CURVES INPUT INTO DYNAMIC MODEL OF A CASK DROP TO PREDICT G-LEVELS FOR VARIOUS ANGLES OF IMPACTS**

- **ACCELEROMETER DATA (FILTERED FOR HIGH FREQUENCY EFFECTS) TO BE COMPARED TO COMPUTER-GENERATED MODEL RESULTS**

- **HIGH-SPEED CAMERAS TO BE USED TO ALLOW CALCULATION OF THE ACCELERATIONS BY PHYSICAL MEASUREMENT**

- **DIMENSIONAL INSPECTIONS OF PRE- AND POST DROP SPECIMENS TO BE TAKEN FOR EVALUATION OF INTEGRITY OF IMPACT LIMITER DURING IMPACT**

TEST DOCUMENTATION

- **TEST REPORT PREPARED BY INDEPENDENT TEST AGENCY**

- **TEST RESULTS REVIEWED AND COMPARED TO MODEL RESULTS**

- **TEST RESULTS TO BE INCORPORATED INTO REVISED HI-STAR 100 SAR**

[redacted]

- HI-STORM TSAR REVISED (REVISION 1) TO BE COMPATIBLE WITH HI-STAR TSAR AND SAR (REVISION 4 OF SEPTEMBER 1996)
  - HI-STORM INTEGRAL PART OF HI-STAR SYSTEM
  - DESIGN BASIS FUEL - IDENTICAL
  - MPC DESIGN - IDENTICAL
- COMPLETE DESCRIPTION AND DRAWINGS OF MPC INCLUDED
- COMPLETE DESCRIPTION AND DRAWINGS OF HI-TRAC TRANSFER CASK INCLUDED

[redacted]

- **ADDITIONS**

  - **SS CLAD FUEL ADDED TO DESIGN BASIS FUEL EVALUATIONS**

  - **GTCC WASTE ADDED TO ACCEPTABLE CONTENTS**

  - **MPC-GTCC DESIGN SPECIFICALLY FOR GTCC WASTE**

  - **MINOR MODIFICATIONS TO HI-STORM OVERPACK TO INCREASE SHIELDING EFFECTIVENESS**

[redacted]

- HOLTEC INTERNAL REVIEW COMPLETE: 31 JANUARY 1997

- **NRC RECEIVE HI-STORM TSAR: 1st WEEK OF FEBRUARY**