

FirstEnergy Nuclear Operating Company
(Davis-Besse Nuclear Power Station, Unit 1)
License Renewal Proceeding

**NRC Staff Answer to Motion for
Summary Disposition of Contention 4**

ATTACHMENT A

NEA/CSNI/R (91) 12

O E C D

NEA

**IN-VESSEL CORE DEGRADATION IN LWR
SEVERE ACCIDENTS:**

**A STATE OF THE ART REPORT TO CSNI
JANUARY 1991**

NOVEMBER 1991

IN-VESSEL CORE DEGRADATION IN LWR

SEVERE ACCIDENTS:

A STATE OF THE ART REPORT TO CSNI

JANUARY 1991

AUTHORS

S R Kinnersly - AEA Technology, Winfrith, UK
(Chairman, Writing Group)
J N Lillington - AEA Technology, Winfrith, UK
A Porracchia - CEA Cadarache, France
K Soda - JAERI, Tokaimura, Japan
K Trambauer - GRS, Garching, Federal Republic of Germany
P Hofmann - KfK, Karlsruhe, Federal Republic of Germany
Y Waaranpera - ABB, Atom, Vasteras, Sweden
R A Bari - Brookhaven National Laboratory, USA
C E L Hunt - AECL, Chalk River, Canada
J A Martinez - CSN, Madrid, Spain

generation and cladding deformation. Since these tests had been terminated before severe fuel damage took place, the comparison is not discussed further here.

6.2.8 TMI-2 Accident

In order to focus TMI-2 studies within the OECD, the OECD in collaboration with the US DOE established a Joint Task Group /6.35/, /6.36/, /6.37/. The objectives of the group were to assess the capability of the severe accident analysis methods (e.g. benchmark the relevant codes) and by way of calculations of the accident sequence, to improve understanding of the accident. The participants in this analysis exercise are listed below with the accompanying computer codes and simulated accident phases:

<u>Organisation</u>	<u>Code(s)</u>	<u>Version</u>	<u>Phase</u>
GRS, FRG	ATHLET	1.0C	1
VTT, Finland	MAAP	3.0	1 - 2
CEA, France	CATHARE/ICARE	M1	1 - 2
ENEA, Italy	SCDAP/RELAP	M0.47	2
JAERI, Japan	THALES		1 - 3
JINS, Japan	SHAPE, MACRES		2 - 4
ECN, Netherlands	MARCH	M3	1 - 3
UPM, Spain	MARCH	M3	1 - 3
AEA, UK	MELPROG	M1	2
BCD, US	MARCH	3.195	1 - 3
EPRI, US	MAAP	3.B12	1 - 2
FAI, US	MAAP	DOE	1 - 3
INEL, US	SCDAP/RELAP5	M1.5	1 - 3
SNL, US	MELCOR		1 - 2

The main phenomena analysed in this accident were the thermal-hydraulic system response, the core heatup and core degradation processes.

6.2.8.1 Thermal-Hydraulics

One group of codes (ATHLET, CATHARE, RELAP, MAAP, MARCH, MELCOR) simulates the entire primary reactor coolant system (RCS) including the pressuriser and steam generator secondary side. The other group (MELPROG, SCDAP, SHAPE) use the conditions at the reactor vessel (RPV) boundaries as boundary conditions.

During phase 1 the thermal-hydraulic system response is determined by the flow rates into and out of the RCS and the heat transfer to the steam generator. The quality of the simulation of the system pressure and coolant inventory depends on the correct description of these boundary conditions. Missing measurements were replaced in some cases by trend data and by recommended simplified boundary conditions such that the correct overall system response was calculated. This yielded reasonable results for the system pressure and coolant

Mrs Marie-Clare Dupuis
Mission surete nucleaire
Centre d'Etudes Nucleaires de
Fontenay-aux-Roses
Commissariat a l'Energie
Atomique, BP No 6
F-92265 Fontenay-aux-Roses
France

Mr Michel Laverie
Ministere de l'Industrie et
du Commerce Exterieur
99 rue de Grenelle
F-75700 Paris
Cedex, France

M Michel Livolant
Institut de Protection et
de Surete Nucleaire
Commissariat a l'Energie
Atomique
Centre d'Etudes Nucleaires
de Fontenay-aux-Roses
BP No 6. F-92265, France

M Daniel Queniart
Commissariat a l'Energie
Atomique
Centre d'Etudes Nucleaires
de Fontenay-aux-Roses
BP No 6, F-92265
Fontenay-aux-Roses, France

Dr Karl-Heinz Berg
Ministerialrat, Referat RS I 3
Bundesministerium for Umwelt,
Naturschutz und
Reaktorsicherheit (BMU)
Postfach 170290
D-5300 Bonn 1, Germany

Prof Dr A Birkhofer
Universitat Munchen
Gesellschaft fur
Reaktorsicherheit mbH
Forschungsgelände
D-8046 Garching, Germany

Mr Karl Heinz Kreuer
Ministerialrat, Referat 314
Bundesministerium f Forschung
und Technologie (BMFT)
Heinemannstrasse 2
Postfach 20 02 40
D-5300 Bonn 2, Germany

Dr Ioannis Bartzis
Greek Atomic Energy Comm.
N.R.C.P.S Demokritos
P.O.B 60228
GR-153 10 Aghia Paraskevi
Greece

Mr G Papadatos
Greek Atomic Energy Comm.
N.R.C.P.S Demokritos
P.O.B 60228
GR-153 Aghia Paraskevi
Greece

Mr Giovanni Naschi
ENEA/DISP
Via Vitaliano Brancati 48
I-00144 Roma-Eur
Italy

Mr Gianni Petrangeli
ENEA/DISP
Via Vitaliano Brancati 48
I-00144 Roma-Eur,
Italy

Mr Giovanni Saponaro
ENEA/DISP
Via Vitaliano Brancati 48
I-00144 Roma-Eur
Italy

Mr Claudio Sennis
ENEA
Via Vitaliano Brancati 48
I-00144 Roma-Eur
Italy

Mr Yukio Arai
Agency of Natural Resources
& Energy
MITI, 1-3-1, Kasumigaseki
Chiyoda-ku
Tokyo, 100, Japan

Mr Ryuko Fujii
Agency of Natural Resources
& Energy
MITI, 1-3-1, Kasumigaseki
Chiyoda-ku
Tokyo, 100, Japan

Mr Tomihiko Furuta
Japan Institute of Nuclear
Safety (JINS)
Nuclear Power Eng. Test Centre
Fujita Kankou-Toranomon 7F
3-17-1, Toranomon
Minato-ku, Tokyo, 105, Japan

Mr Mikio Hada
Nuclear Power Safety Info.
Research Centre (NUSIRC)
(NUPEC)
Fujita Kankou-Toranomon 7F
3-17-1, Toranomon
Minato-ku, Tokyo, 105, Japan

Mr Ryo Kimura
Nuclear Safety Bureau
Science and Tech. Agency
2-2-1 Kasumigaseki
Chiyoda-ku
Tokyo, 100, Japan