NEA/CSNI/R(94)19

OECD
NEA

CSNI

INTERNATIONAL STANDARD PROBLEMS

(ISP)

BRIEF DESCRIPTIONS

(1975-1994)

July 1994

COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS
OECD NUCLEAR ENERGY AGENCY
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ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

NUCLEAR ENERGY AGENCY

STEERING COMMITTEE
FOR NUCLEAR ENERGY

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COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

PRINCIPAL WORKING GROUP ON COOLANT SYSTEM BEHAVIOUR (PWG2)
PRINCIPAL WORKING GROUP ON
CONFINEMENT OF ACCIDENTAL RADIOACTIVE RELEASES (PWG4)

CSNI
INTERNATIONAL STANDARD PROBLEMS (ISP)

BRIEF DESCRIPTIONS
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015684

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OECD

The Convention establishing the Organisation for Economic Co-operation and Development (OECD) was signed on 14th December 1960.

Pursuant to Article 1 of the Convention, the OECD shall promote policies designed:

-- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;

-- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and

-- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The current Signatories of the Convention are Australia, Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

NEA

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. NEA membership today consists of all European Member countries of OECD as well as Australia, Canada, Japan, Republic of Korea, Mexico and the United States. The Commission of the European Communities takes part in the work of the Agency.

The primary objective of NEA is to promote co-operation among the governments of its participating countries in furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source.

NEA works in close collaboration with the International Atomic Energy Agency (IAEA), with which it has concluded a Co-operation Agreement, as well as with other international organisations in the nuclear field.

CSNI

The NEA Committee on the Safety of Nuclear Installations (CSNI) is an international committee made up of scientists and engineers. It was set up in 1973 to develop and coordinate the activities of the OECD Nuclear Energy Agency concerning the technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. The Committee's purpose is to foster international co-operation in nuclear safety amongst the OECD Member countries.

FOREWORD

Over the last twenty years the NEA Committee on the Safety of Nuclear Installations (CSNI) has sponsored some forty International Standard Problems (ISPs) in the fields of in-vessel thermal-hydraulic behaviour, fuel behaviour under accident conditions, fission product release and transport, core/concrete interactions, hydrogen distribution and mixing, containment thermal-hydraulics. ISPs are comparative exercises in which predictions of different computer codes for a given physical problem are compared with each other or with the results of a carefully controlled experimental study. The main goal of ISP exercises is to increase confidence in the validity and accuracy of tools which are used in assessing the safety of nuclear installations. Moreover, they enable code users to gain experience and demonstrate their competence. ISPs are performed as "open" or "blind" problems. In an open Standard Problem the results of the experiment are available to the participants before performing the calculations, while in a blind Standard Problem the results are locked until the calculational results are made available for comparison.

While code verification is primarily a task for institutions developing codes, requiring considerable financial resources for performing a large number of calculations and comparing relevant experimental results with calculated data, ISP exercises can be considered as a supplementary activity, validating appropriate code applications through the analyses of experts different from the code developers.

Experiments selected to support ISP exercises are exceptionally well documented; they provide the framework for several code validation matrices.

ISPs

Number	Date	Title
1	1975	Standard Problem 1 - Edwards' Pipe
2	1975	Analysis of Semiscale Blowdown Test 11
3	6/77	CSNI Standard Problem 3; Comparison of LOCA Analysis Codes
4	3/78	United States Standard Problem 6 and International Standard Problem 4: Semiscale MOD1 Test S-02-6
5	1/79	Final Comparison Report on LOFT Test L1-4
6	1978	ISP-6: Calculations Comparison Report
7	6/79	Comparison Report on OECD-CSNI LOCA Standard Problem No. 7: Analysis of a Reflooding Experiment
8	1979	Semiscale MOD1 Test S-06-03 (LOFT Counterpart Test)
9	4/81	LOFT Test L3-1
10	9/81	OECD-CSNI LOCA Standard Problem No. 10: "Refill and Reflood Experiment in a Simulated PWR Primary System (PKL)"
11	1984	LOFT L3-5 and L3-6 Tests
12	9/82	ROSA-III 5% Small Break Test, Run 912
13	4/83	International Standard Problem 13 (LOFT Experiment L2-5)
14	2/85	Behavior of a Fuel Bundle Simulator during a Specified Heatup and Flooding Period (REBEKA Experiment)
15	11/83	LOCA Experiment at FIX-II Facility
16	6/85	Rupture of a Steam Line within the HDR Containment Leading to an Early Two-Phase-Flow
17	1984	Marviken BWR Standard Problem
18	4/87	LOBI-MOD2 Small Break LOCA Experiment
19	1987	Behavior of a Bundle during a large break LOCA transient with a Two-Peaks Temperature History
20	12/88	Doel 2 Steam Generator Tube Rupture Event
21	11/89	Piper-One, Simulation of Small and Intermediate Break LOCA for BWRs
22	10/90	SPES - Loss of Feedwater Transient in Italian PWR
23	12/89	Rupture of a Large Diameter Pipe in the HDR Containment
24	12/89	SURC-4 - Core-Concrete Interaction Test
25	2/91	ACHILLES - N2 injection from accumulators and faster (best estimate) reflood rates
26	2/92	ROSA-IV LSTF Cold-Leg Small-Break LOCA Experiment
27	1992	BETHSY - Small break LOCA with Loss of HP Injection
28	12/92	PHEBUS SFD B9+ - Experiment on the Degradation of a PWR Type Core
29	2/93	HDR Experiment - Hydrogen distribution inside the HDR containment under severe accident conditions
30	4/92	BETA II Core-Concrete Interaction Experiment (Test V5.1)
31	7/93	CORA-13 Experiment on Severe Fuel Damage
32	---	FLHT-6 Experiment (cancelled)
33	TBD	PACTEL - VVER-440 Natural Circulation Test Behaviour
34	TBD	Falcon Experiments FAL-ISP-1 and FAL-ISP-2
35	TBD	NUPEC Hydrogen Distribution Test M-7-1
36	TBD	CORA - VVER Severe Fuel Damage Experiment (Test W2)

Containment Analysis Standard Problems (CASPs)

CASP-1	5/80	Steamline Rupture within a Chain of Compartments
CASP-2	5/82	Water Line Rupture in a Branched Compartment Chain
CASP-3	4/83	Final Comparison Report for Containment Standard Problem Exercise 3

Number	Date	CSNI Report No.	Author
1	1975	None	

Title
Standard Problem 1 - Edwards' Pipe

Subject
Discharge, pressure waves

Description
Analysis of the blowdown of a straight pipe filled with pressurized water. Test modeled is reported by A.R. Edwards and T.P. O'Brien in "Studies of Phenomena Connected with the Depressurization of Water Reactors", Journal of the British Nuclear Energy Society, pp. 125-135, April 1970.

Type
Open exercise

Facility
Edwards' Pipe

Country
UK

Number	Date	CSNI Report No.	Author
2	1975	None	

Title
Analysis of Semiscale Blowdown Test 11

Subject
Large break LOCA blowdown

Description

Type
Blind exercise

Facility
Semiscale

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
3	1976	15	6/77	W.T. Hancox, B.H. McDonald

Title
CSNI Standard Problem 3; Comparison of LOCA Analysis Codes

Subject
Pipe discharge

Description
Blowdown experiment of initially subcooled fluid with heat addition, conducted by CISE for AECL.

Type
Open exercise

Facility
CISE

Country
Canada

Number	Starting Date	CSNI Report No.	Date	Author
4	1976	16, 50	3/78	H.M. Delaney

Title
United States Standard Problem 6 and International Standard Problem 4 : Semiscale Mod 1 Test S-02-6

Subject
6% small break LOCA

Description
Comparison Report of Test S-02-6 of the Semiscale Mod-1 Facility. This test was a 6% small break area blowdown heat transfer test from initial conditions of 2265 psia, 542 F, and 148 lbm/sec in the cold leg using 5.5 ft. PWR type electric core heater rods.

Type
Blind exercise

Facility
Semiscale

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
5	1977	29 (+ Addendum)	1/79	B.L. Hansen

Title
Final Comparison Report on LOFT Test L1-4

Subject
Isothermal large break LOCA

Description
Non-nuclear isothermal blowdown test with a primary volume of 7.71 cu. m. and starting from initial conditions of 552.2 K, 15.73 MPa, and 268.4 kg/s mass flow on the intact loop. Simulation of a 200% double-ended offset shear in the cold leg of a four loop large PWR.

Type
Blind exercise

Facility
LOFT

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
6	----	30	1978	

Title
ISP-6: Calculations Comparison Report

Subject
Discharge from top of vertical vessel

Description
Simulation of a steamline rupture with a pressure vessel not equipped with internals, to determine the water level and phase separation effects during the initial blowdown phase.

Type
Open exercise

Facility
Battelle

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
7	----	55	6/79	R. Deruaz, N. Tellier

Title
Comparison Report on OECD-CSNI LOCA Standard Problem No. 7: Analysis of a Reflooding Experiment

Subject
Reflood of heated tube

Description
Separate effects experiment performed on the ERSEC loop at the Grenoble Nuclear Centre. Investigated the thermal-hydraulics of the reflood phase of a loss of coolant accident.

Type
Blind exercise

Facility
ERSEC

Country
France

Number	Starting Date	CSNI Report No.	Date	Author
8	----	38	1979	

Title
Semiscale MOD1 Test S-06-03 (LOFT Counterpart Test)

Subject
Large break LOCA

Description
Intended to determine the maximum cladding temperature associated with a high-powered rod peak density of 39.4 kW/m, or 75% of the maximum peak power density of 52.5 kW/m. Designed to obtain thermal-hydraulic response data from blowdown, refill, and reflood transients to assist the LOFT Program in the planning of the first LOFT nuclear test series.

Type
Open exercise

Facility
Semiscale

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
9	1980	66	4/81	A.C. Peterson, C. Polk, J.A. Sellars

Title
LOFT Test L3-1 Preliminary Comparison Report

Subject
2.5% small break LOCA

Description
Comparison report for L3-1 LOFT test. This test was a single ended small cold leg break experiment initiated from typical PWR operating conditions. Comparisons between measurements from Test L3-1 are made with calculations by 11 international participants using 7 different computer codes.

Type
Blind exercise

Facility
LOFT

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
10	1980	64	9/81	D.L. Nguyen, W. Winkler

Title
Comparison Report on OECD-CSNI LOCA Standard Problem No. 10: "Refill and Reflood Experiment in a Simulated PWR Primary System (PKL)"

Subject
Large break LOCA reflood

Description
Investigation of gravity-feed refill and reflood process within a pressure vessel after a LB-LOCA considering the influence of the simulated primary loops. Comparison report of PKL test K 9.

Type
Open exercise

Facility
PKL-I

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
11	1981	99	1984	

Title
LOFT L3-5 and L3-6 Comparison Reports

Subject
2.5% small break LOCA

Description
Comparison using a pair of tests to assist in evaluating the effects of tripping the primary coolant pumps.

Type
Open exercise

Facility
LOFT

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
12	----	100	09/82	K. Tasaka et al.

Title
ROSA-III 5% Small Break Test, Run 912

Subject
5% small break in BWR

Description
Test simulated a 5% split break at the recirculation pump inlet line with the assumption of HPCS D/G single failure. Peak cladding temperature was 839 K. All heater rods quenched after LPCS and LPCI actuation, and the effectiveness of ECCS for Cooling was confirmed.

Type
Open exercise

Facility
ROSA-III

Country
Japan

Number	Starting Date	CSNI Report No.	Date	Author
13	----	101	4/83	J.D. Burtt, S.A. Crowton

Title
International Standard Problem 13 (LOFT Experiment L2-5) Preliminary Comparison Report

Subject
Large Break LOCA

Description
Simulation of a double ended offset shear guillotine cold leg rupture in a large PWR. A loss of offsite power was also simulated with a reactor coolant pump trip and an ECCS injection delay. The participants calculated the hydraulic response adequately, except where there were obvious modeling problems. Densities were calculated adequately in the sections where condensation did not occur. Break flows were generally over predicted. Clad temperature heatups were calculated adequately but quench times for cladding was predicted less well.

Type
Blind exercise

Facility
LOFT

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
14	1984	98	2/85	H. Karwat

Title
Behavior of a Fuel Bundle Simulator during a Specified Heatup and Flooding Period (REBEKA EXPERIMENT) (Results of Post-Test Analyses)

Subject
Behaviour of fuel rod simulator bundle

Description
Intended to predict in a integrated manner the transient behavior of an electrically heated fuel simulator bundle with respect to its local cladding temperatures, strains and time to rupture together with the thermohydraulic boundary conditions. Original aim not fully achievable. The applied codes for mechanical fuel behavior largely demonstrated their capabilities for pretest predictions when certain local fluiddynamic parameters are well knows to the code users. Confirmed the difficulties expected with the proper analysis of thermohydraulics of the test, caused by the coupling between pin cooling conditions, rod upper plenum calculations and the feedback to clad deformation and burst simulation.

Type
Blind exercise

Facility
REBEKA

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
15	----	102	11/83	

Title
LOCA Experiment at FIX-II Facility

Subject
31% break in BWR

Description
Simulated the conditions corresponding to an intermediate size break on one of the main recirculation lines of a BWR with external pumps. Comparison Report.

Type
Blind exercise

Facility
FIX-II

Country
Sweden

Number	Starting Date	CSNI Report No.	Date	Author
16	1984	112	6/85	M. Firnhaber

Title
Rupture of a Steam Line within the HDR Containment Leading to an Early Two-Phase-Flow

Subject
Containment behaviour during large break LOCA

Description
Containment Thermal/Hydraulic Experiment. Steam Line Rupture in the HDR Containment leading to early two-phase flow.

Type
Blind exercise

Facility
HDR

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
17	----	103	1984	

Title
Marviken BWR Standard Problem

Subject
BWR containment behaviour

Description
Thermal-Hydraulic experiment of Reactor blowdown in the Marviken Full Scale Pressure Suppression Containment.

Type
Open exercise

Facility
Marviken

Country
Sweden

Number	Starting Date	CSNI Report No.	Date	Author
18	1985	133	4/87	H. Städke

Title
LOBI-MOD2 Small Break LOCA Experiment Final Comparison Report

Subject
1% small break LOCA

Description
Simulates the transient thermo-hydraulic behavior of a PWR in case of a small break in the cold leg pipe between pump and pressure vessel. 26 participants from 12 OECD Member countries performed blind predictions for this experiment using 9 different LWR safety codes. The results of the comparison between calculated and measured data are presented and analysed. Specific emphasis is given to the prediction capabilities of the various codes involved in the exercise, to the influence of the code users on the predicted results and to the code running times. Code strength and deficiencies are identified and recommendations are given for further effort needed to improve the reliability of small break LOCA calculations.

Type
Blind exercise

Facility
LOBI-Mod 2

Organisation
CEC (JRC Ispra)

Number	Starting Date	CSNI Report No.	Date	Author
19	1986	131	1987	E. Scott de Martinville, M. Pignard

Title
Behavior of a bundle during a large break LOCA transient with a two-peaks temperature History

Subject
Behaviour of fuel rod bundle

Description
PHEBUS test number 218. Involves the transient behaviour of a reduced length nuclear fuel bundle submitted to a high temperature transient obtained under large break LOCA conditions.

Type
Open exercise

Facility
PHEBUS-CSD

Country
France

Number	Starting Date	CSNI Report No.	Date	Author
20	1987	154	12/88	E. Stubbe

Title
Doel 2 Steam Generator Tube Rupture Event

Subject
Steam generator tube rupture

Description
Comparison report of actual event at operating nuclear power plant. Information provided in common RELAP-5 input deck format.

Type
Open exercise

Facility
Doel-2 PWR

Country
Belgium

Number	Starting Date	CSNI Report No.	Date	Author
21	1988	162	11/89	F. D'Auria

Title
Piper-One, Simulation of Small and intermediate Break LOCA for BWRs (Experiment PO-SB-7)

Subject
1.6%/2.8% small break in BWR

Description
Intended to be a "double blind" small break LOCA experiment for BWRs. Is a counterpart of tests carried out in ROSA-III and FIST facilities. Simulates a SB-LOCA in the recirculation line of a GE BWR-6 plant.

Type
Blind exercise

Facility
PIPER-ONE

Country
Italy

Number	Starting Date	CSNI Report No.	Date	Author
22	1988	174 and NEA/CSNI/R(92)7	10/90 and 07/92	E. Negrenti et al.

Title
SPES - Loss of Feedwater Transient in Italian PWR. Final Comparison Report and Evaluation of Post-Test Analyses.

Subject
Loss of feed water

Description
Double-blind of FW without mitigation by aux FW or hi pressure injection. Eventually, HP injection into one loop of 3-loop W-PWR simulator and natural circulation cooldown. Included non-OECD participation.

Type
Blind exercise

Facility
SPES

Country
Italy

Number	Starting Date	CSNI Report No.	Date	Author
23	1988	160	12/89	H. Karwat

Title
Rupture of a large diameter pipe in the HDR containment

Subject
Containment behaviour during LBLOCA, including hydrogen injection and long-term T/H behaviour in containment

Description
Comparison of pre-test predictions to a large number of measured parameters. The exercise focused on the long-lasting post-blowdown phenomena expected inside a PWG containment. Local pressurization effects and the evolution of the maximum pressure were also addressed.

Type
Blind exercise

Facility
HDR

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
24	----	155	12/89	R. Bari, et.al.

Title
SURC-4 - Core-Concrete Interaction Test

Subject
Core-concrete interaction

Description
First severe accident ISP, involving the interaction of 200 kg of stainless steel melt in a basaltic concrete crucible. Heat was supplied by an induction unit. During the experiment, a large chunk of Zircaloy and FP simulants were added, and the calculations attempted to predict the concrete ablation rate, the gas generation rates, the temperatures in the crucible and the melt, and the FP simulant release rates.

Type
Blind exercise

Facility
SURC

Country
USA

Number	Starting Date	CSNI Report No.	Date	Author
25	1988	NEA/CSNI/R(91)11	02/91	B.J. Holmes

Title
ACHILLES - N2 injection from accumulators and faster (best estimate) reflood rates - Almost a separate effects test

Subject
Effect of accumulator gas during LOCA reflood

Description
The selected transient simulates the end of the accumulating discharge period in a postulated large break loss of coolant accident when the nitrogen, which is used to pre-pressurize the accumulators, enters the primary circuit. The resultant decrease in pressure drop between the accumulators and the pressure vessel causes an increase in the pressure at the top of the downcomer which in turn produces a surge a water into the core with subsequent oscillatory flow occurring between the core and downcomer. The test was performed in the ACHILLES test facility using a Best Estimate configuration at AEA Technology Winfrith.

Type
Blind exercise

Facility
Achilles

Country
United Kingdom

Number	Starting Date	CSNI Report No.	Date	Author
26	1989	NEA/CSNI/R(91)13	02/92	Y. Kukita et al.

Title
ROSA-IV LSTF-Cold-Leg Small-Break LOCA Experiment

Subject
5% small break LOCA

Description
Small Break LOCA in the ROSA-IV LSTF facility. Includes non-NEA participation.

Type
Open exercise

Facility
ROSA-IV LSTF

Country
Japan

Number	Starting Date	CSNI Report No.	Date	Author
27	1991	NEA/CSNI/R(92)20	1992	CEA

Title
BETHSY - Small break LOCA with loss of HP Injection

Subject
0.5% small break LOCA

Description
Depressurization and use of low pressure injection, and S/G cooldown. Open to non-OECD participation. BETHSY experiment 9.1B, 2 in. cold leg break without HPIS and with delayed ultimate procedure.

Type
Blind exercise

Facility
BETHSY

Country
France

Number	Starting Date	CSNI Report No.	Date	Author
28	1991	NEA/CSNI/R(92)17	12/92	CEA

Title
PHEBUS SFD B9+ - Experiment on the Degradation of a PWR Type Core

Subject
Core degradation with fresh fuel

Description
Predictions of the phenomena associated with a severe fuel damage accident, including the thermal behaviour of the bundle, the cladding oxidation level, fuel dissolution by molten zircaloy, decladding, and relocation of the molten material.

Type
Semi-blind exercise

Facility
PHEBUS-SFD/In-pile test

Country
France

Number	Starting Date	CSNI Report No.	Date	Author
29	1990	NEA/CSNI/R(93)4	02/93	H. Karwat

Title
HDR Experiment E11.2 - Hydrogen distribution inside the HDR containment under severe accident conditions

Subject
Hydrogen distribution in a PWR containment

Description
The objectives of the experiment E11.2 were the following:

- calculate the temperature distribution during the entire transient (small break LOCA blowdown with up to a 24 hour period of analysis of natural convection phenomena);

- study the distribution of energy during and after the SBLOCA phase;

- analyse the steam/air/hydrogen distribution within the containment atmosphere under severe accident conditions initiated by a SBLOCA.

Type
Open exercise

Facility
HDR

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
30	1991	NEA/CSNI/R(92)9	04/92	M. Firnhaber and H. Alsmeyer

Title
BETA II Core-Concrete Interaction Experiment (Test V5.1)

Subject
Core-concrete interactions

Description
The aim of BETA Test V5.1 was to investigate the influence of a high content of metallic Zry-4 in the melt on the MCCI and to get quantitative information on the long-term aerosol generation during the interaction period.

Type
Open exercise

Facility
BETA

Country
Germany

Number	Starting Date	CSNI Report No.	Date	Author
31	1992	NEA/CSNI/R(93)17	07/93	M. Firnhaber et al.

Title
CORA-13 Experiment on Severe Fuel Damage

Subject
Core degradation and quench

Description
Severe core damage experiment with quenching, of a full length simulated fuel bundle, heated with internal tungsten heaters. Investigations of the material relocation dynamics, quench phenomena and hydrogen generation.

Type
Blind exercise

Facility
CORA

Country
Germany

Number	Date	CSNI Report No.	Author
32	----	----	USNRC

Title
FLHT-6 Experiment

Subject
BWR core degradation

Description
Experimental destruction of a full length BWR fuel element, including absorber material, to investigate absorber interactions and blockage behaviour.

Type
Blind exercise

Facility
FLHT (NRU)

Country
Canada

EXPERIMENT AND EXERCISE CANCELLED

Number	Starting Date	CSNI Report No.	Date	Author
33	03/92	TBD	1994	H. Purhonen et al.

Title
PACTEL-VVER-440 Natural Circulation Behaviour Test

Subject
VVER-440 natural circulation

Description
Investigation of the natural circulation behaviour of a VVER-440 type PWR with horizontal steam generators and loop seals in both hot and cold legs, and of the effect of opening a relief valve on the secondary side.

Type
Blind exercise

Facility
PACTEL

Country
Finland

Number	Starting Date	CSNI Report No.	Date	Author
34	03/92	TBD	1944	D.A. Williams

Title
Falcon Experiments FAL-ISP-1 and FAL-ISP-2

Subject
Fission product transport

Description
The objective of ISP-34 is to test computer codes designed to follow the transport and deposition, in both the primary circuit and containment building, of fission product and bulk reactor materials aerosols released from degrading fuel in a severe accident. Test FAL-ISP-1 had a high particle concentration and low relative humidity in the containment, with the aim of testing the impact of multicomponent aerosols involving different chemical species. Test FAL-ISP-2 studied lower particles concentrations with a high containment humidity in orcer to follow condensation of steam onto hygroscopic particles.

Type
FAL-ISP-1: open exercise
FAL-ISP-2: blind exercise

Facility
Falcon

Country
United Kingdom

Number	Starting Date	CSNI Report No.	Date	Author
35	03/93	TBD	1944	TBD (NUPEC)

Title
NUPEC Hydrogen Distribution Test M-7-1

Subject
Hydrogen Distribution and Mixing in a PWR-type containment

Description
The model containment vessel of the NUPEC Hydrogen Mixing and Distribution Test Facility is about 1/4 scale of an actual containment vessel and has inner structures composed of about 20 compartments. There were two periods in test M-7-1. During the pre-heating phase, steam was injected into the steam generator foundation compartment at a constant mass flow for about 3.5 hours. During the experiment itself, a steam/helium mixture was injected into the same compartment and spray water into the dome. These injections were terminated after 30 minutes. Pressure, temperatures and helium concentrations were measured during the experiment.

Type
Blind exercise

Facility
NUPEC Hydrogen Mixing and Distribution Test Facility

Country
Japan

Number	Starting Date	CSNI Report No.	Date	Author
36	02/94	TBD	TBD(1995)	TBD

Title
CORA-VVER Severe Fuel Damage Experiment (Test W2)

Subject
VVER core degradation

Description
ISP-36 is the first VVER-related ISP in the field of severe accidents, and also the first ISP co-sponsored by a non-OECD country. The main objectives of CORA Test-W2 included studies of temperature and material behaviour and hydrogen generation of a VVER fuel bundle, especially the influence of the hexagonal grid and the different material combinations (cladding, grid spacers and absorber rods) compared to western-type PWRs.

Type
Blind exercise.

Facility
CORA

Countries
Germany, Russian Federation

CONTAINMENT ANALYSIS STANDARD PROBLEMS
(CASPs)

Number	Date	CSNI Report No.	Author
CASP-1	5/80	41	W. Winkler

Title
Comparison Report on OECD-CSNI Containment Standard Problem No. 1: "Steamline Rupture within a Chain of Compartments"

Subject
Steam discharge (1:4 scale)

Description
Comparison of experimental results of history of pressure, temperature, pressure difference, and water mass after a steamline rupture within a chain of six subsequent compartments (simplified integral test) with the corresponding results of best-estimate post-test calculations from computer codes for three different time intervals.

Type
Open exercise

Facility
Battelle Model Containment

Country
Germany

Number	Date	CSNI Report No.	Author
CASP-2	5/82	65	D.L. Nguyen, W. Winkler

Title
Comparison Report on OECD-CSNI Containment Standard Problem No. 2: "Water Line Rupture in a Branched Compartment Chain"

Subject
Water discharge (1:4 scale)

Description
Comparison report of temperature, pressure, pressure difference, and water mass in a reactor containment following a pipe rupture. Intended to come close to the accident conditions expected during the design of a full-pressure containment. Also, rupture was located in a relatively small compartment and the compartments were arranged in a branched chain with asymetrical flow paths to ensure that water transport will heavily influence the results.

Type
Open exercise

Facility
Battelle Model Containment

Country
Germany

Number	Date	CSNI Report No.	Author
CASP-3	4/83	77	J. Marshall, W. Woodman

Title
Final Comparison Report for Containment Standard Problem Exercise 3

Subject
Large break LOCA (small scale)

Description
An insulated pressure vessel contains an electric heater to boil the water and raise pressure. The outlet pipe is heated by an electric heater type wound around the pipe and is thermally insulated. This pipe is blocked by a copper disc which is ruptured to start blowdown into a containment vessel which is not insulated and is freestanding within a large building.

Type
Open exercise

Facility
AAEC Lucas Heights blowdown/containment rig

Country
Australia