In-Vessel Melt Retention Severe Accident Management Strategy for Existing and Future NPPs

From 2015-06-01 to 2019-11-30, ongoing project | IVMR Website

Objective

The stabilization of molten corium is recognised as essential if a safe and stable state is to be reached following a severe accident. Among the possible options, In-Vessel Melt Retention (IVMR) appears as an attractive solution that would minimize the risks of containment failure (less Hydrogen produced, no corium-concrete interaction), if it can be proved to be feasible. The strategy is already adopted for the VVER 440 type 213 based on thorough research work for the Finnish Loviisa NPP and Hungarian Paks NPP. It is also included in the design of some new Gen.III reactors like AP-1000, APR 1400 and Chinese CPR-1000. It has also been studied in the past for other reactor concepts like KERENA (BWR) or VVER-640. Current approaches for reactors with relatively small power, such as VVER 440 or AP600, use conservative assumptions. However, for higher power reactors (around 1000 MWe), it is necessary to evaluate the IVMR strategy with best-estimate methods in order to address the uncertainties associated with the involved phenomena. Additional R&D is needed to ensure and demonstrate adequate safety margins, including identification of efficient technical solutions for the external cooling of the vessel and performing best-estimate evaluation of relevant scenarios. Among other provisions, the possibility of cooling the corium inside the vessel by direct injection of water into the degraded core, may be considered because it is likely to remove a significant part of the residual power.

The goal of the project is an analysis of the applicability and technical feasibility of the IVMR strategy to high power reactors, both for existing ones (e.g. VVER 1000 type 320 units) as well as for future reactors of different types (PWR or BWR). The main outcomes of the project will be relevant assumptions and scenarios to estimate the maximum heat load on the vessel wall, improved numerical tools for the analysis of IVMR issues and a harmonized methodology on the IVMR.

Related information

Report Summaries

Periodic Reporting for period 2 - IVMR (In-Vessel Melt Retention Severe Accident Management Strategy for Existing and Future NPPs)
**Coordinator**

INSTITUT DE RADIOPROTECTION ET DE SURETÉ NUCLEAIRE
AV DE LA DIVISION LECLERC 31
92260 FONTENAY AUX ROSES
France

**EU contribution:** EUR 840 130

**Activity type:** Research Organisations

**Contact the organisation**

---

**Participants**

UJV REZ, a. s.
HLAVNI 130, REZ
250 68 HUSINEC
Czechia

**EU contribution:** EUR 663 397

**Activity type:** Private for-profit entities (excluding Higher or Secondary Education Establishments)

**Contact the organisation**

---

JRC - JOINT RESEARCH CENTRE - EUROPEAN COMMISSION
Rue de la Loi 200
1049 BRUSSELS
Belgium

**EU contribution:** EUR 293 215

**Activity type:** Research Organisations

**Contact the organisation**

---

COMMISSARIAT A L’ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
RUE LEBLANC 25
75015 PARIS 15
France

**EU contribution:** EUR 550 682

**Activity type:** Research Organisations

**Contact the organisation**

---

KUNGLIGA TEKNISKA HOEGSKOLAN
BRINELLVAGEN 8
100 44 STOCKHOLM
Sweden

**EU contribution:** EUR 1 078 701

**Activity type:** Higher or Secondary Education Establishments

**Contact the organisation**
KARLSRUHER INSTITUT FUER TECHNOLOGIE  
KAINERSTRASSE 12  
76131 KARLSRUHE  
Germany  
See on map  
**Activity type:** Higher or Secondary Education Establishments  
Contact the organisation

AREVA NP SAS  
1 PLACE JEAN MILLIER TOUR AREVA  
92400 COURBEVOIE  
France  
See on map  
**Activity type:** Private for-profit entities (excluding Higher or Secondary Education Establishments)  
Contact the organisation

ELECTRICITE DE FRANCE  
AVENUE DE WAGRAM 22  
75008 PARIS 08  
France  
See on map  
**Activity type:** Private for-profit entities (excluding Higher or Secondary Education Establishments)  
Contact the organisation

GESELLSCHAFT FUR ANLAGEN UND REAKTORSICHERHEIT (GRS) gGmbH  
SCHWERTNERGASSE 1  
50667 KOLN  
Germany  
See on map  
**Activity type:** Research Organisations  
Contact the organisation

HELMHOLTZ-ZENTRUM DRESDEN-ROSENDORF EV  
BAUTZNER LANDSTRASSE 400  
01328 DRESDEN  
Germany  
See on map  
**Activity type:** Research Organisations  
Contact the organisation
EU contribution: EUR 47 812
Keilanimentie 1
00048 Espoo
Finland
See on map

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)
Contact the organisation

Teknologian tutkimuskeskus VTT Oy
VUORIMIEHENTIE 3
02150 Espoo
Finland
See on map

Activity type: Research Organisations
Contact the organisation

MAGYAR TUDOMANYOS AKADEMIA ENERGIATUDOMANYI KUTATOKOZPONT
KONKOLY THEGE MIKLOS UT 29-33
1121 Budapest
Hungary
See on map

Activity type: Research Organisations
Contact the organisation

NUBIKI Nuclear Safety Research Institute Ltd.
KONKOLY THEGE MIKLOS UTCA 29 33 6 EP
1121 BUDAPEST
Hungary
See on map

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)
Contact the organisation

INZINIERSKA VYPOCTOVA SPOLOCNOST TRNAVA S.R.O.
JANA HOLLEHO 5
917 01 TRNAVA
Slovakia
See on map

Activity type: Private for-profit entities (excluding Higher or Secondary Education Establishments)
Contact the organisation
AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L’ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE

LUNGOTEVERE GRANDE AMMIRAGLIO THAON DI REVEL 76
00196 ROMA
Italy

See on map

**Activity type:** Research Organisations

Contact the organisation

---

LIETUVOS ENERGETIKOS INSTITUTAS
Breslaujos g. 3
LT-44403 KAUNAS
Lithuania

See on map

**Activity type:** Research Organisations

Contact the organisation

---

TRACTEBEL ENGINEERING
BOULEVARD SIMON BOLIVAR 34 - 36
1000 BRUXELLES
Belgium

See on map

**Activity type:** Private for-profit entities (excluding Higher or Secondary Education Establishments)

Contact the organisation

---

IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE
SOUTH KENSINGTON CAMPUS EXHIBITION ROAD
SW7 2AZ LONDON
United Kingdom

See on map

**Activity type:** Higher or Secondary Education Establishments

Contact the organisation

---

NUCLEAR RESEARCH AND CONSULTANCY GROUP
WESTERDUINWEG 3
1755 LE PETTEN
Netherlands

See on map

**Activity type:** Other

Contact the organisation
INSTITUTE OF NUCLEAR RESEARCH AND NUCLEAR ENERGY - BULGARIAN ACADEMY OF SCIENCES
Tzarigradsko Shose 72
1784 SOFIA
Bulgaria

**Activity type:** Research Organisations

See on map

**EU contribution:** EUR 41 400

CENTRUM VYZKUMU REZ SRO
HLAVNI 130
250 68 HUSINEC-REZ
Czechia

**Activity type:** Research Organisations

See on map

**EU contribution:** EUR 80 000

NARODOWE CENTRUM BADAN JADROWYCH
ULICA ANDRZEJA SOLTANA 7
05 400 OTWOCK
Poland

**Activity type:** Research Organisations

See on map

**EU contribution:** EUR 57 600

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