## Nuclear fuel safety research projects

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| HALDEN Fuel and Material | Fuel and clad behaviour in accidents, fuel safety | Norway | Ongoing  2021-2023 |
| CABRI Water Loop | Fuel and clad behaviour in RIA transients | France | Ongoing  2000-2026 |
| SCIP  SCIP-2  SCIP-3 | Pellet-clad mechanical interaction in transients  Fuel and clad behaviour in LOCA, fuel fragmentation and dispersion | Sweden | Completed  2004-2008  2009-2014  2014-2019 |
| SCIP-4 | Fuel and clad behaviour in back-end and LOCA conditions | Sweden | Ongoing  2019-2024 |
| Paks Fuel Project | Fuel assembly damage | Hungary | Completed  2004-2007 |
| Sandia Fuel Project | Fuel assembly damage in spent fuel pool | USA | Completed 2009-2012 |
| FIDES INCA | Cladding creep, Zr alloys and Cr-coated | Czech Republic | Ongoing  2021-2024 |
| FIDES P2M | Power to melt and manoeuvrability | Belgium | Ongoing  2021-2024 |
| FIDES LOCA MIR | Gd-doped fuel rod behaviour under LOCA | Russia | Ongoing  2021-2024 |
| FIDES HERA | Modern high Burn-up fuel in RIA transients | USA, Japan | Ongoing  2021-2024 |
| QUENCH-ATF | ATF claddings in accident conditions  DBA and BDBA conditions | Germany | Ongoing  2021-2025 |

## Primary and secondary circuit thermal-hydraulics projects

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| LOFT | LOCA integral tests | USA | completed  1983-1989 |
| SETH | LOCA, boron dilution, shut-down state tests | Germany | completed  2001-2006 |
| PSB-VVER | LOCA in VVER, natural circulation, scaling tests | Russia | completed  2003-2008 |
| ROSA  ROSA-2 | LOCA, SGTR, natural circulation, 1-ɸ and 2-ɸ flows, mixing, stratification, complex flows, scaling (ROSA/PKL) | Japan | completed  2005-2009  2009-2012 |
| PKL  PKL-2  PKL-3  PKL-4 | LOCA including DEC, cool down and late SAM procedures, boron dilution and precipitation, shut-down states, MSLB, MSGTR, scaling (ATLAS/PKL/ROSA) | Germany  Hungary | completed  2004-2007  2008-2011  2012-2016  2016-2020 |
| ETHARINUS | LOCA including DEC, passive systems, cool down and late SAM procedures, cooling with core blockage, MSGTR, scaling (PPKL/ATLAS) | Germany  Finland  Russia | ongoing  2021-2024 |
| ATLAS  ATLAS-2 | LOCA including DEC, SGTR, natural circulation, 1-ɸ and 2-ɸ flows, mixing, stratification, complex flows, scaling (ATLAS/PKL) | Korea | completed  2014-2017  2017-2020 |
| ATLAS-3 | LOCA including DEC, integral tests with RCS/containment interactions, natural circulation, passive systems, scaling (ATLAS/PKL) | Korea | ongoing  2021-2024 |
| RBHT | High quality data for core reflooding models, uncertainty analysis | USA | completed  2019-2022 |

**Containment thermal-hydraulics, systems and hydrogen risk management**

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| BUBCON | VVER bubbler condenser, containment pressure suppression system | Russia | completed  2001-2002 |
| SETH | Gas stratification and mixing in containment (in relation to H2 combustion) | Switzerland | completed  2001-2006 |
| SETH-2  HYMERES | Gas stratification and mixing in containment, effects of safety systems (sprays, coolers, H2 recombiners, rupture disks), scaling (PANDA/MISTRA), high quality data for CFD modelling | Switzerland  France | completed  2007-2010  2013-2016 |
| HYMERES-2 | Effect of internal structures on flows, effects of combination of safety systems, BWR pressure suppression pools | Switzerland | completed  2017-2020 |
| PANDA | Effect of internal structures on flows, BWR pressure suppression pools, SMRs systems | Switzerland | ongoing  2021-2025 |
| THAI  THAI-2  THAI-3 | H2 mixing including effects of spray systems, H2 recombiners performance, H2 combustion | Germany | completed  2007-2009  2011-2014  2016-2019 |
| THEMIS | Recombiners performance and combustion in late phases of a severe accident (H2/CO mixes) | Germany | ongoing  2020-2024 |

## Severe accident projects

Accident progression and melt coolability in-vessel and ex-vessel

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| RASPLAV | In-vessel melt coolability with and without external cooling, melt chemical composition effects on stratification and thermal loads on RPV | Russia | completed  1994-2000 |
| OLHF | RPV deformation and failure, mechanical analysis | USA | completed  1998-2002 |
| MASCA  MASCA-2 | In-vessel melt coolability, melt chemical composition effects on stratification and thermal loads on RPV, fission products partitioning, scaling to reactor applications | Russia | completed  2000-2003  2003-2007 |
| SERENA | Molten fuel coolant interaction, steam explosion, scaling to reactor applications | France  Korea | completed  2007-2012 |
| MCCI  MCCI-2 | Ex-vessel melt coolability and long term containment basemat concrete erosion by melt, scaling to reactor applications | USA | completed  2002-2005  2006-2010 |
| ROSAU | Ex-vessel melt coolability by top flooding and underwater spreading, scaling to reactor applications | USA | ongoing  2019-2024 |

Source term projects

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| LOFT | Gap fission product (FP) release in LOCA FP release in severe accident | USA | completed  1983-1989 |
| BIP  BIP-2  BIP-3 | Iodine (I) source term in containment  I chemistry in sumps and in gas phase incl. effects of contaminants Interactions with surfaces  Organic iodides (RI) formation) | Canada | completed  2007-2011  2011-2014  2016-2018 |
| THAI  THAI-2  THAI-3 | PARs poisoning and iodine formation by aerosols interacting with PARs  Wash-down of soluble aerosols  I reaction with aerosols  FP re-entrainment from boiling pools  FP resuspension by H2 deflagration | Germany | completed  2007-2009  2011-2014  2016-2019 |
| THEMIS | Interaction of IOx with aerosols  FP retention by pool scrubbing  Aerosol interactions with PARs | Germany | ongoing  2020-2024 |
| STEM  STEM-2 | I and ruthenium (Ru) source terms (Ru transport in RCS, irradiation of iodine-bearing aerosols, IOx formation, I interaction with aged paints and RI formation) | France | completed  2011-2015  2016-2019 |
| ESTER | FP (Cs, I, Mo, Te) remobilisation from deposits (differed releases)  RI formation | France | ongoing  2020-2024 |

Major accidents projects (TMI-2, Fukushima-Daiichi)

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| TMI-VIP | TMI-2 accident analysis with a focus on RPV integrity, analysis of material from RPV lower head | USA | completed  1988-1993 |
| BSAF | Fukushima-Daiichi accident analyses with a focus on thermal-hydraulic response of RPV and PCV over six days | Japan | completed  2012-2015 |
| BSAF-2 | Fukushima-Daiichi accident analyses extended to three weeks and including radioactive release | Japan | completed  2016-2018 |
| PreADES | Preparatory studies for fuel debris retrieval in damaged units at Fukushima-Daiichi | Japan | completed  2017-2021 |
| ARC-F | Compilation and analysis of data and information from damaged units at Fukushima-Daiichi  Accident analyses with a focus on in-vessel and ex-vessel accident development, hydrogen explosion events and radioactive release | Japan | completed  2019-2022 |
| FACE | Continue supporting preparation of fuel debris retrieval from damaged units at Fukushima-Daiichi  Refine accident analyses with a focus on effects of accident measures | Japan | ongoing  2022-2025 |
| TCOFF | Enhancement of thermodynamic databases for Fukushima-Daiichi accident analysis | Japan | completed  2017-2020 |
| TCOFF-2 | Enhancement of thermodynamic databases for severe accident analysis including for ATF material | Japan | ongoing  2022-2025 |

## Material ageing experimental projects and events database projects

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| HALDEN fuel and material | Crack initiation and growth rate in BWR and PWR reactor core components | Norway | ongoing  2021-2023 |
| SMILE | Harvesting of aged components in Swedish BWR and PWR under decommissioning  Investigations of aged low alloy RPV steels, of core support structures and internals alloys and of pressure boundary austenitic alloys | Sweden | ongoing  2021-2025 |
| SCAP | Stress corrosion cracking events database (integrated in CODAP)  Cable ageing database (integrated in CADAK) | NEA | completed  2006-2010 |
| OPDE | Piping failure data exchange database (integrated in CODAP) | NEA | completed  2002-2011 |
| CADAK | Cable ageing database | NEA | completed  2011-2014 |
| CODAP | Component Operational Experience, Degradation and Ageing database | NEA | ongoing  2021-2023 |
| COMPSIS | Computer-based Systems Important to Safety database Project (integrated in ICDE) |  | Completed  2006-2011 |
| ICDE | International Common-cause Failure Data Exchange |  | Ongoing  2023-2026 |

## Fire research projects (experimental and fire events database)

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| PRISME  PRISME-2  PRISME-3 | Fire and smoke propagation (fuel pools, electrical cabinets and cables fires) in various multi-rooms configurations, consequences on equipment, effects of fire extinction systems | France | completed  2006-2011  2011-2016  2017-2022 |
| FAIR | Cable fire propagation, poorly ventilated combustion, multi-source and multi-rooms scenarios | France | Ongoing  2023-2026 |
| HEAF | HEAF experiments with commercial NPP electrical cabinets, modelling of HEAF scenarios | USA | completed  2012-2017 |
| HEAF-2 | HEAF experiments with commercial NPP electrical cabinets and bus ducts, modelling of HEAF scenarios  Effect of bus bar and bus duct material on HEAF consequences | USA | ongoing  2018-2024 |
| FIRE | Fire incident records database | NEA | ongoing  2023-2025 |

## Projects on other topics (Human and organisational aspects of safety, projects on HTGR)

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| **Project name** | **Subject** | **Host country** | **Status**  **Mandate** |
| Human and organisational aspects of safety | | | |
| PLASMA | Development of a plant safety monitoring and assessment system for VVERs | Norway | completed  1998-2000 |
| HALDEN HTO | Human performance, digital I&C – safety assurance, control room design and evaluation, human-automation collaboration, digital systems for operation and maintenance,  digital transformation of decommissioning, cybersecurity for main control rooms | Norway | Ongoing  2021-2023 |
| High temperature gas phase reactors | | | |
| DRAGON | First high temperature gas-cooled reactor which operated between 1966 and 1975 | UK | completed  1958-1975 |
| LOFC | Loss of forced cooling transients without SCRAM, reactor kinetics, coupled core physics and thermal-hydraulics in JAEA HTTR reactor | Japan | ongoing  2011-2024 |