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NGC1977 Courtesy of C. Lopresti
Summary

With the sustained development in computer technology, the possibilities of code capabilities have been enlarged substantially. Consequently, advanced safety evaluations and design optimizations that were not possible a few years ago can now be performed. The challenge today is to revise the safety features of the existing nuclear plants and particularly research reactors in order to verify that the safety requirements are still met.

The present thesis provide an overview of the accident analysis technology applied to the research reactor, with emphasis given to the capabilities of computational tools. For this purpose, the IAEA 10MW benchmark MTR Research Reactor and other variety of plate type research reactors are studied, with emphasis given to FRJ2 RR in Germany. The purpose of the thesis is to give a contribution to extend the application of Best Estimate analysis – use of realistic physical models combined with realistic input data - to Research Reactors.

The thesis has been conducted, in the framework of international activities, in collaboration with researchers working at research reactors from: Algeria, Bangladesh, Italy Iran, Egypt, Germany, Libya, Syria, Thailand and United States. This work is also connected to recent IAEA activities which are still in progress.

Through this work it was confirmed the necessity of the application of BE computational tools for future applications and qualifying level of the codes. The analysis performed are adequate even though they were applied to still unexplored areas.
Index

Chapter 1  Introduction ____________________________________________1-1

Chapter 2  General overview of Research Reactors ________________________2-5

1  Historical Overview ________________________________________________ 2-5
   1.1  The Full-Scale Reactor Experiments ____________________________________ 2-5
   1.2  The Borax Experiments _____________________________________________ 2-6
   1.3  The Spert Experiments _____________________________________________ 2-8
   1.4  Other Experiments relevant for MTR-type Research Reactors ________________ 2-11
   1.5  Other Systems of Interest ____________________________________________ 2-12
   1.6  Non-Proliferation and the RERTR Program ________________________________ 2-13
   1.7  Current situation _____________________________________________________ 2-14

2  General Overview of Research Reactors ________________________________ 2-14
   2.1  Background ________________________________________________________ 2-14
   2.2  Type and use of Research Reactor __________________________________________ 2-15
       2.2.1  Siemens Unterrichtsreaktor (SUR) ___________________________________ 2-15
       2.2.2  Argonaut Research Reactor __________________________________________ 2-16
       2.2.3  Slowpoke Reactor ___________________________________________________ 2-16
       2.2.4  The Miniature Neutron Source Reactor (MNSR) __________________________ 2-17
       2.2.5  TRIGA Reactors _____________________________________________________ 2-18
       2.2.6  Material Testing Reactors (MTR) ______________________________________ 2-19
       2.2.7  High Flux Reactors (HFR) ___________________________________________ 2-20
       2.2.8  Overview of possible research reactor utilization ________________________ 2-20
       2.3  Classification ____________________________________________________________________________________________________ 2-21

Chapter 3  State of the Art of Accident Analysis_________________________3-23

1  Background ________________________________________________________ 3-23

2  Application of a graded approach to Safety Analysis______________________ 3-23

3  Initiating Events _____________________________________________________ 3-26
   3.1  Fundamental safety functions ___________________________________________ 3-26
   3.2  Identification and selection of Initiating Events ____________________________ 3-28
   3.3  Regulatory guides for accident analysis ________________________________ __3-29
   3.4  Event sequence analysis ___________________________________________________________________________________________ 3-30
       3.4.1  Event Sequence Development Methodology ________________________________ 3-32

4  Human Factors ________________________________________________________ 3-34

5  Acceptance Criteria __________________________________________________ 3-34

6  Computational Tools for Safety Analysis ________________________________ 3-37
   6.1  Methods for Analytical Accident Analysis ________________________________ 3-38
       6.1.1  Background ________________________________________________________ 3-39
       6.1.2  Deterministic Analysis ______________________________________________ 3-41
       6.1.3  Conservative Approach _____________________________________________ 3-41
       6.1.4  Best Estimate Approach _____________________________________________ 3-42
       6.1.5  Sensitivity and Uncertainty ___________________________________________ 3-43
       6.1.6  Probabilistic Analysis _________________________________________________________________________________________ 3-44
Chapter 4   Safety Analysis of Research Reactors         4-52

1 Types of Accident Analysis  4-52
   1.1 Design Basis Accidents  4-52
   1.2 Beyond Design Basis Accidents  4-55

2 Types of Computational Tools  4-55
   2.1 Adoption of Codes  4-57
   2.2 Quality of the Code  4-58
      2.2.1 Background and necessary features of a code  4-58
      2.2.2 Documentation  4-59
   2.3 Code Assessment and Qualification  4-60
      2.3.1.1 Code Verification  4-62
      2.3.1.2 Code Validation  4-63
   2.4 Accuracy and Uncertainty of the code  4-65
      2.4.1 Accuracy  4-65
      2.4.2 Uncertainty  4-66

3 Procedure for Consistent Application of the Codes  4-67
   3.1 Preparation of Input Data  4-69
   3.2 Engineering Handbook and Input Deck  4-70
   3.3 Verification and Validation of Input Data  4-71

Chapter 5   Best Estimate calculations and qualification         5-74

1 IAEA Benchmark Static Calculation with MCNP  5-74
   1.1 Code description and modelling  5-74
   1.2 Power distributions  5-77
   1.3 Conclusions  5-77

2 IAEA Benchmark Dynamic Calculation  5-78
   2.1 Benchmark problem  5-78
   2.2 Nodalization  5-81
   2.3 Results and discussion  5-83
      2.3.1 RIA transients  5-83
      2.3.2 LOFA transients  5-86
   2.3.3 Conclusion  5-88
   2.4 Analysis of Partial and Total Flow Blockage of a Single Fuel Assembly  5-89
      2.4.1 Brief description of the reactor  5-89
      2.4.2 Problem modelling  5-89
         2.4.2.1 Plant nodalization  5-89
         2.4.2.2 Core modelling  5-91
         2.4.2.3 Problem description  5-91
      2.4.3 Results of the analysis  5-92
         2.4.3.1 Partial blockage of FA channel  5-92
         2.4.3.2 Total blockage of a FA channel  5-93
      2.4.4 Conclusion  5-95

3 Application to FRJ 2 Research Reactor  5-96
   3.1 Reactor description  5-97
   3.2 Core configuration  5-99
   3.3 Nodalization and problem modeling  5-103
   3.4 Transients description  5-106
      3.4.1 Kinetic transients  5-106
      3.4.2 Thermal-hydraulic transient  5-107
List of Figures

Fig. 1 Map of the Idaho National Engineering and Environmental Laboratory .......................................................... 2-5
Fig. 2 Reactor destroyed by melting of fuel plates after being made supercritical by 3.3% keff ................................. 2-7
Fig. 3 Cutaway view of the Spert I reactor [Miller, 1964] ..................................................................................... 2-9
Fig. 4 Flash bulb incindates transient rod release (t=-143 msec) [Miller, 1964] ......................................................... 2-10
Fig. 5 t= 360msec [Miller, 1964] ....................................................................................................................... 2-10
Fig. 6 t= 2160 msec [Miller, 1964] ..................................................................................................................... 2-10
Fig. 7 t= 3280msec [Miller, 1964] ..................................................................................................................... 2-10
Fig. 8 Schematic of SL-1 reactor ....................................................................................................................... 2-11
Fig. 9 Selected examples on the relation between neutron flux density and reactor power for various reactor types ................................................................................................................... 2-22
Fig. 10 The concept of defence-in-depth [NEA, 1992] ............................................................................................ 3-25
Fig. 11 Relation between Specific Acceptance Criterion and Safety Limit .......................................................... 3-35
Fig. 12 General Scheme of Computer Code Validation for Safety Assessment of Research Reactors.................. 4-61
Fig. 13 MTR benchmark core cross section ....................................................................................................... 5-75
Fig. 14 Standard Fuel Element ........................................................................................................................... 5-75
Fig. 15 Control Fuel Element ............................................................................................................................. 5-75
Fig. 16 Radial Thermal Flux Distribution of 93% - Fresh core ............................................................................ 5-76
Fig. 17 Neutron fluxes along the X-axis in fresh and BOL cores of 93% w/o ........................................................ 5-76
Fig. 18 Neutron fluxes along the X-axis in fresh and EOL cores of 93% w/o ......................................................... 5-77
Fig. 19 Reactor Nodalization ............................................................................................................................. 5-82
Fig. 20 Fuel-clad and coolant dimensions .......................................................................................................... 5-83
Fig. 21 HEU and LEU cores: Power Evolution during RIA accidents ................................................................. 5-85
Fig. 22 HEU and LEU cores: Power Evolution during SRIA accidents ............................................................... 5-85
Fig. 23 HEU and LEU cores: Clad Temperature during RIA ................................................................................ 5-85
Fig. 24 HEU and LEU cores: Coolant Temperature during RIA ......................................................................... 5-85
Fig. 25 Inlet and Outlet Flow during RIA transients ............................................................................................ 5-86
Fig. 26 HEU and LEU cores: Clad Temperature during SRIA accidents .......................................................... 5-86
Fig. 27 HEU and LEU cores: Power Evolution during LOFA accidents .............................................................. 5-88
Fig. 28 HEU and LEU cores: Clad and coolant Temperatures during Flow loss of flow ..................................... 5-88
Fig. 29 HEU and LEU cores: clad and coolant temperatures during slow loss of flow ........................................ 5-88
Fig. 30 Inlet core flow trends during LOFA Accidents .......................................................................................... 5-88
Fig. 31 Benchmark core configuration .............................................................................................................. 5-90
Fig. 32 Sketch of the adopted nodalization for RELAP5 code ........................................................................... 5-90
Fig. 33 Core nodalization .................................................................................................................................... 5-91
Fig. 34 Mass flow in different channel ................................................................................................................ 5-93
Fig. 35 Fuel temperature in the obstructed channel ............................................................................................. 5-93
Fig. 36 Coolant temperature in the obstructed channel at different axial level .................................................. 5-94
Fig. 37 Void fraction in the obstructed channel ................................................................................................... 5-94
Fig. 38 Reactor Power .......................................................................................................................................... 5-94
Fig. 39 Mass flow in different channel ................................................................................................................ 5-94
Fig. 40 Fuel temperature in the obstructed channel ............................................................................................. 5-94
Fig. 41 Coolant temperature in the obstructed channel ....................................................................................... 5-94
Fig. 42 Void fraction in the obstructed channel ................................................................................................... 5-95
Fig. 43 Reactor power .......................................................................................................................................... 5-95
Fig. 44 Global view of the cooling system of the FRJ-2 ....................................................................................... 5-98
Fig. 45 FRJ-2 core and CCA arrangement inside the reactor tank ......................................................................... 5-98
Fig. 46 Simplified FRJ-2 coolant loop schema ..................................................................................................... 5-99
Fig. 47 Transversal view of the FRJ core .......................................................................................................... 5-100
Fig. 48 Fuel element arrangement..................................................................................................................5-101
Fig. 49 Radial power peaking factor distribution...............................................................................................5-101
Fig. 50 Sketch of the adopted Plant nodalization for Relap5 code.................................................................5-101
Fig. 51 Core Nodalization....................................................................................................................................5-105
Fig. 52 Core induced external Reactivity as consequence of CCA rupture.......................................................5-107
Fig. 53 Core power as consequence of CCA rupture under nominal conditions...............................................5-109
Fig. 54 Core reactivity under CCA rupture at nominal conditions.......................................................................5-110
Fig. 55 Maximal Fuel temperature (CATHENA) and Clad temperature (RELAP5) under CCA rupture at nominal conditions............................................................................................................................................5-110
Fig. 56 Maximal coolant temperature under CCA rupture at nominal conditions.............................................5-111
Fig. 57 Relative Central fuel assembly mass flow rate under CCA rupture at nominal conditions......................5-111
Fig. 58 Hot channel Void fraction under CCA rupture at nominal conditions....................................................5-112
Fig. 59 RELAP5 Heat transfer and flow regimes under CCA rupture at nominal conditions...............................5-112
Fig. 60 Upper plenum pressure under CCA rupture at nominal conditions.......................................................5-113
Fig. 61 Core power as consequence of CCA rupture under startup conditions..................................................5-113
Fig. 62 Core reactivity under CCA rupture at startup conditions.......................................................................5-114
Fig. 63 Maximal Fuel temperature (CATHENA) and Clad temperature (RELAP5) under CCA rupture at startup conditions............................................................................................................................................5-114
Fig. 64 Maximal Coolant temperature under CCA rupture at startup conditions..............................................5-115
Fig. 65 Relative Central fuel assembly mass flow rate under CCA rupture at startup conditions......................5-115
Fig. 66 RELAP5 Heat transfer and flow regimes under CCA rupture at startup conditions...............................5-116
Fig. 67 Core power course under pump trip without Scram transient...............................................................5-117
Fig. 68 Core reactivity course evolution under pump trip without Scram transient ...........................................5-118
Fig. 69 Maximal fuel temperature (CATHENA) and Clad temperature (RELAP5) pump trip without Scram transient..........................................................5-118
Fig. 70 Core mass flow rate under pump trip without Scram transient...............................................................5-119
Fig. 71 Maximal core temperature course under pump trip without Scram transient..........................................5-119
Fig. 72 Heat transfer and flow regimes under pump trip without Scram transient...............................................5-120
Fig. 73 The UMLRR layout..................................................................................................................................5-121
Fig. 74 Three-dimensional detail of reactor core ..............................................................................................5-122
Fig. 75 LEU core configuration........................................................................................................................5-122
Fig. 76 Fuel plate geometry (unit in meter).........................................................................................................5-123
Fig. 77 Schematic diagram of the cooling system of UMLRR...........................................................................5-124
Fig. 78 UMLRR Nodalization............................................................................................................................5-125
Fig. 79 Fuel assembly mass flow rate..................................................................................................................5-129
Fig. 80 Clad temperatures for natural convection mode.....................................................................................5-132
Fig. 81 Pool heat up during the heat up experiment............................................................................................5-132
Fig. 82 Core (plenums) inlet and outlet temperatures.........................................................................................5-132
Fig. 83 Power distribution of a small negative reactivity insertion.................................................................5-134
Fig. 84 Power distribution of a small positive reactivity insertion.......................................................................5-135
List of Tables

Table 1 Classification of research reactors .................................................................................................................. 2-21
Table 2 Possible subdivision of Event Occurrences ................................................................................................... 3-36
Table 3 Validation Matrix for the Safety Code of Research Reactors ........................................................................ 4-62
Table 4 Main Benchmark operating conditions ....................................................................................................... 5-79
Table 5 Main Benchmark leading characteristics .................................................................................................... 5-80
Table 6 Main component used in the nodalisation ...................................................................................................... 5-81
Table 7 HEU and LEU – FRIA results ......................................................................................................................... 5-84
Table 8 HEU and LEU – SRIA results ........................................................................................................................ 5-85
Table 9 HEU and LEU – FLOFA results ...................................................................................................................... 5-87
Table 10 HEU and LEU – LOFA results ...................................................................................................................... 5-87
Table 11 Main Initial and Boundary Conditions ..................................................................................................... 5-95
Table 12 Main FRJ-2 Characteristics ........................................................................................................................ 5-102
Table 13 Components Correspondence between CATHENA and RELAP5 definitions ........................................ 5-104
Table 14 Nodalization data ........................................................................................................................................ 5-105
Table 15 Main Transients Initial and Boundary Conditions ........................................................................................ 5-107
Table 16 Main steady state achievement compared with experimental data .............................................................. 5-108
Table 17 Main component for the nodalization .......................................................................................................... 5-127
Table 18 UMLRR Characteristics ........................................................................................................................... 5-127
Table 19 Comparison of steady state forced convection mode .................................................................................. 5-130
Table 20 Reactivity insertion key parameters .......................................................................................................... 5-134
Table 21 System conditions ....................................................................................................................................... 5-136
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEC</td>
<td>Atomic Energy Commission</td>
</tr>
<tr>
<td>ARGONAUT</td>
<td>Argonne Nuclear Assembly for University Training</td>
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<tr>
<td>BDBA</td>
<td>Beyond Design Basis Accidents</td>
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<tr>
<td>BE</td>
<td>Best Estimate</td>
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<tr>
<td>Borax</td>
<td>Boiling Water Reactor Experiments</td>
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<tr>
<td>BWR</td>
<td>Boiling Water Reactor</td>
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<tr>
<td>CFE</td>
<td>Control Fuel Element</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CHF</td>
<td>Critical Heat Flux</td>
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<tr>
<td>CR</td>
<td>Control Rod</td>
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<tr>
<td>DBA</td>
<td>Design Basis Accident</td>
</tr>
<tr>
<td>DNB</td>
<td>Departure from Nucleate Boiling</td>
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<tr>
<td>EBWR</td>
<td>Experimental Boiling Water Reactor</td>
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<tr>
<td>EE</td>
<td>External Event</td>
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<tr>
<td>F-</td>
<td>Fast</td>
</tr>
<tr>
<td>FA</td>
<td>Fuel Assembly</td>
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<tr>
<td>FE</td>
<td>Flow Excursion</td>
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<tr>
<td>FRJ-2</td>
<td>Research Reactor Juelich &quot;DIDO&quot;</td>
</tr>
<tr>
<td>HEU</td>
<td>Highly Enriched Uranium</td>
</tr>
<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td>IE</td>
<td>Initiating Events</td>
</tr>
<tr>
<td>INEEL</td>
<td>Idaho National Engineering and Environmental Laboratory</td>
</tr>
<tr>
<td>LANL</td>
<td>Los Alamos National Laboratory</td>
</tr>
<tr>
<td>LEU</td>
<td>Low Enriched Uranium</td>
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<tr>
<td>LOFA</td>
<td>LOss of Flow Accident</td>
</tr>
<tr>
<td>MNSR</td>
<td>Miniature Neutron Source Reactor</td>
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<tr>
<td>MTR</td>
<td>Material Testing Reactor</td>
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<tr>
<td>NB</td>
<td>Nucleate Boiling</td>
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<tr>
<td>NCV</td>
<td>Natural Convection Valve</td>
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<tr>
<td>NPP</td>
<td>Nuclear Power Plant</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>NRTS</td>
<td>National Reactor Nuclear Testing Station</td>
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<tr>
<td>OFI</td>
<td>Onset of Flow Instability</td>
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<td>PIE</td>
<td>Postulated initiating event</td>
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<tr>
<td>PSA</td>
<td>Probabilistic Safety Assessment</td>
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<tr>
<td>PWR</td>
<td>Pressurized Water Reactor</td>
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<td>RELAP</td>
<td>Reactor Excursion and Leak Analysis Program</td>
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<td>RERTR</td>
<td>Reduced Enrichment Research and Test Reactor</td>
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<td>RIA</td>
<td>Reactivity Insertion Accident</td>
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<td>S-</td>
<td>Slow</td>
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<tr>
<td>SAR</td>
<td>Safety Analysis Report</td>
</tr>
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<td>Stationary Low-Power Reactor Number One</td>
</tr>
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<td>Safe Low-Power Kritical Experiment</td>
</tr>
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<td>Special Power Excursion Reactor Tests</td>
</tr>
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<td>THI</td>
<td>Thermal Hydraulic Instability</td>
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<td>TREAT</td>
<td>Transient Reactor Test Facility</td>
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<td>Training Research and Isotope General Atomic</td>
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<td>University of Massachusetts Lowell Research Reactor</td>
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