

Contents

Contributors ix

Preface xv

OVERVIEW

Current Trends and Options in Liquid-Metal Cooled Fast Reactor Safety
C. N. Kelber 3

OUT-OF-PILE EXPERIMENTS AND ANALYSES

Comparison of Numerical Results with Experimental Data Single-Phase Natural Convection in an Experimental Sodium Loop

R. J. Ribando 9

Out-of-Pile Experiments for Natural Circulation Decay Heat Removal in LMFBR Fuel Assembly—Power Skew Effects upon Intra-Assembly Hydraulic Characteristics

F. Namekawa, K. Mawatari, T. Tamaoki, and R. Makiura 27

Analytical and Experimental Simulation of LMFBR Decay Heat Removal by Natural Circulation Heat Transfer

K. S. Chung, W. A. Bezella, D. H. Thompson, and J. H. Tessier 39

Numerical Simulation of the 6MW P2 Transient Free Convection Test Using the COMMIX-1A Computer Code

H. M. Domanus, M. J. Chen, T. M. Kuzay, and W. T. Sha 53

Impact of Thermal Buoyancy in LMFBR Piping Systems

M. Khatib-Rahbar, I. K. Madni, and A. K. Agrawal 69

Theoretical Study and Experimental Investigation of Mixed and Natural Circulation in LMFBR Core Subassemblies

D. Leteinturier, D. Blanc, B. Menant, and G. Basque 81

Subchannel Friction Factors for Bare Rod Arrays under Mixed Convection Conditions

S.-F. Wang, N. E. Todreas, and W. M. Rohsenow 95

ANALYTICAL METHODS AND MODELING

Facility Requirements for Natural Convection Shutdown Heat Removal System Testing

M. P. Heisler and R. M. Singer 113

Development of Computer Codes for Decay Heat Removal Analysis in Reactor Vessel and Primary Loop System

H. Kinjo, H. Wada, Y. Okubo, and T. Sawada 129

Effects of Buoyancy on LMFBR Plant Design

G. S. Drucker 145

A Computer Simulation of a Pool-Type LMFBR Passive Decay Heat Removal System

K. Kesavan, J. D. Bradley, and D. E. Noe 161

Buoyancy Induced Flow and Heat Redistribution during LMFBR Core Decay Heat Removal

R. D. Coffield, Jr., Y. S. Tang, J. S. Killimayer, and R. A. Markley 177

EXPERIMENTS AND ANALYSES

Response of EBR-II to a Complete Loss of Primary Forced Flow during Power Operation

R. M. Singer, J. L. Gillette, D. Mohr, J. E. Sullivan, J. V. Tokar, and E. M. Dean 193

A Dynamic Simulation of the EBR-II Plant during Natural Convection with the NATDEMO Code

D. Mohr and E. E. Feldman 207

Post Test Evaluation of Natural Circulation in FFTF Secondary Loops

T. R. Beaver, D. M. Turner, and S. L. Additon 225

FFTF Primary System Transition to Natural Circulation from Low Reactor Power

W. T. Nutt, S. L. Additon, and G. D. Bouchey 239

Decay Heat Removal of the SNR-300 with Special Consideration of the Natural Convection Effects

F. Roesgen, M. Dueweke, F. Timmermann, and H. Vossebrecker 253

Decay Heat Removal in SUPER PHENIX and Related Design Basis Plant Conditions

M. Debru, P. Lauret, J. Deckert, and J.-C. Schneider 263

Theoretical and Experimental Analysis of Super Phenix-1 Thermohydraulique Problems in Natural Convection

J. C. Astegiano, R. Martin, and E. Gesi 275

Observations on Coolant Flow Patterns in the PFR Primary Circuit during Natural Circulation Experiments

R. Anderson, C. W. Dawson, C. V. Gregory, D. J. Lord, and R. Webster 289

A Theoretical Analysis of the Establishment of Natural Circulation in the Dounreay Prototype Fast Reactor*C. W. Dawson* 303**The Effects of System Configuration and Initiating Conditions on Natural Convection in an LMFBR***J. H. Germer and F. W. Sciacca* 317**Hypothetical Loss-of-Heat-Sink and In-Vessel Natural Convection: Homogeneous and Heterogeneous Core Designs***M. Khatib-Rahbar, J. G. Guppy, and A. K. Agrawal* 329**A Test Loop Concept for Verification of Natural Convection Decay Heat Removal in LMFBR's***J. C. Mills, R. T. Lancet, M. J. Gabler, and H. R. Zweig* 343**DECAY HEAT REMOVAL IN GCFR****Design, Analysis, and Verification of Natural Circulation in the GCFR***W. A. Medwid, L. L. Parme, and A. Shenoy* 357**Comparison of Carbon Dioxide and Helium for Natural Circulation Cooling of GCFRs***G. Melese d'Hospital and C. B. Baxi* 371**GCFR Residual Heat Removal Following Depressurization Accidents***H. S. Chung, H. Chi, and A. Shenoy* 383**PANEL DISCUSSION: FUTURE RESEARCH AND DEVELOPMENT—WHAT NEEDS TO BE DONE?****Introduction***J. G. Guppy* 399**Statements by the Panelists** 401**Questions and Answers and Comments** 405**Index** 409