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## **Status of Innovative Small and Medium Sized Reactor Designs**

**2005** - International Atomic Energy Agency 2006

The objective of this report is to provide Member States, including those just considering the initiation of nuclear power programmes and those already having practical experience in nuclear power, with balanced and objective information on important development trends and objectives of innovative small and medium sized reactors (SMRs) for a variety of uses, on the achieved state-of-the-art in design and technology development for such reactors and on their design and regulatory status. The publication is intended for many categories of stakeholders, including regulators, electricity producers, designers, non-electricity producers and policy makers. The main sections of this publication, addressed to all the above mentioned groups of stakeholders, provide a summary of major specifications, applications and user-related special features of innovative SMRs. The annexes, intended mainly for designers and technical managers, provide detailed design descriptions of innovative SMRs, focusing on their potential to provide solutions in the areas of concern associated with future nuclear energy systems

*Minor Actinide Burning in Thermal Reactors* - 2014

## **Proceedings of the International Conference Industrial and Civil**

**Construction 2021** - Sergey Vasil'yevich Klyuev 2021-02-11

This book gathers the latest advances, innovations, and applications in the field of construction design and management, as presented by researchers and engineers at the International Conference Industrial and Civil Construction 2021, held in Belgorod, Russia, on January 18-19, 2021. It covers highly diverse topics, including building materials, building constructions, structural mechanics and theory of structures, industrial and civil construction, environmental engineering and sustainability. The contributions, which were selected by means of a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaborations.

**Inpro Methodology for Sustainability Assessment of Nuclear Energy Systems** - International Atomic Energy Agency 2015-12-07

**The First Reactor** - United States. Energy Research and Development Administration 1967

Thermal Engineering - 2002

Handbook of Generation IV Nuclear Reactors - Igor Pioro 2016-06-09

Handbook of Generation IV Nuclear Reactors presents information on the current fleet of Nuclear Power Plants (NPPs) with water-cooled

reactors (Generation III and III+) (96% of 430 power reactors in the world) that have relatively low thermal efficiencies (within the range of 32-36%) compared to those of modern advanced thermal power plants (combined cycle gas-fired power plants - up to 62% and supercritical pressure coal-fired power plants - up to 55%). Moreover, thermal efficiency of the current fleet of NPPs with water-cooled reactors cannot be increased significantly without completely different innovative designs, which are Generation IV reactors. Nuclear power is vital for generating electrical energy without carbon emissions. Complete with the latest research, development, and design, and written by an international team of experts, this handbook is completely dedicated to Generation IV reactors. Presents the first comprehensive handbook dedicated entirely to generation IV nuclear reactors Reviews the latest trends and developments Complete with the latest research, development, and design information in generation IV nuclear reactors Written by an international team of experts in the field

**Thermal Hydraulics Aspects of Liquid Metal Cooled Nuclear Reactors** - Ferry Roelofs 2018-11-30

Thermal Hydraulics Aspects of Liquid Metal cooled Nuclear Reactors is a comprehensive collection of liquid metal thermal hydraulics research and development for nuclear liquid metal reactor applications. A deliverable of the SESAME H2020 project, this book is written by top European experts who discuss topics of note that are supplemented by an international contribution from U.S. partners within the framework of the NEAMS program under the U.S. DOE. This book is a convenient source for students, professionals and academics interested in liquid metal thermal hydraulics in nuclear applications. In addition, it will also help newcomers become familiar with current techniques and knowledge. Presents the latest information on one of the deliverables of the SESAME H2020 project Provides an overview on the design and history of liquid metal cooled fast reactors worldwide Describes the challenges in thermal hydraulics related to the design and safety analysis of liquid metal cooled fast reactors Includes the codes, methods, correlations, guidelines and limitations for liquid metal fast reactor

thermal hydraulic simulations clearly Discusses state-of-the-art, multi-scale techniques for liquid metal fast reactor thermal hydraulics applications

**Nuclear Reactor Theory** - George I. Bell 1970

In a part of North Africa where, within miles, the backdrop can change dramatically from snow-blasted mountains to wind-scoured dunes live the Berber people of the Atlas Mountains. In the third book of her trilogy on African women, world-renowned photojournalist Margaret Courtney-Clarke examines the difficult lives and remarkable arts of Berber women. As modern times and modern warfare in Algeria, Morocco, and Tunisia have encroached on their centuries-old traditions, Berber women have begun to give up the old ways. Imazighen: The Vanishing Traditions of Berber Women is a record of a quickly disappearing way of life. As in her earlier books, Ndebele: The Art of an African Tribe and African Canvas: The Art of West African Women, Courtney-Clarke succeeds in capturing the spirit of the women by experiencing their world from season to season and by respecting their values and traditions. Through photographs, interviews, and observations, Courtney-Clarke documents the Berber women as they stoically carry water and firewood on their backs for miles of rocky terrain. And she records the beauty they have magically produced in their lives - through their spinning and weaving and their carefully coiled pottery - a metaphor for survival and creativity. Geraldine Brooks, award-winning journalist and an expert on life in the Middle East, accompanied Courtney-Clarke on her last trip to North Africa, and has written moving, thoughtful essays on the struggle of existence among the Berbers. With a glossary of Berber terms and a detailed map of the region, this book is not only a handsomely illustrated volume of the triumph of the arts of the Berber women, but a dramatic record of a people yielding to the pressures of the twentieth century. [Desalination in Nuclear Power Plants](#) - Gustavo Alonso 2020-04-21 Desalination in Nuclear Power Plants presents the latest research on a variety of nuclear desalination techniques for different nuclear reactor systems; it includes also several aspects regarding competitiveness, sustainability, safety, and licensing process. Authors Alonso, del Valle,

and Ramirez explore the possibilities of the cogeneration of water and electricity using a nuclear reactor. This book consolidates the latest research to provide readers with a clear understanding of the advantages and disadvantages of the thermal, membrane, and hybrid desalination processes, along with a comprehensive methodology to guide the reader on how to perform levelized cost analyses for water and electricity. The conditions for the coupling of nuclear reactors and desalination plants are presented, and techniques to maximize water and energy production and to reduce their corresponding costs are provided. Mathematical modeling techniques for different components of the power plant are also included based on mass and energy state equations, as well as different steam currents alternatives for coupling along with a proposed method for their evaluation. Explains nuclear cogeneration in the context of multiobjective optimized methods and their application in the design of a cogeneration system of water and electricity Explores principles to optimize the cogeneration process from an economic and thermal perspective (exergoeconomic analysis) Includes competitiveness, sustainability, safety, and licensing of the nuclear desalination system

**Thermal Energy** - Yatish T. Shah 2018-01-12

The book details sources of thermal energy, methods of capture, and applications. It describes the basics of thermal energy, including measuring thermal energy, laws of thermodynamics that govern its use and transformation, modes of thermal energy, conventional processes, devices and materials, and the methods by which it is transferred. It covers 8 sources of thermal energy: combustion, fusion (solar) fission (nuclear), geothermal, microwave, plasma, waste heat, and thermal energy storage. In each case, the methods of production and capture and its uses are described in detail. It also discusses novel processes and devices used to improve transfer and transformation processes.

*New Ways and Needs for Exploiting Nuclear Energy* - Didier Sornette 2018-09-29

The history of mankind is a story of ascent to unprecedented levels of comfort, productivity and consumption, enabled by the increased mastery of the basic reserves and flows of energy. This miraculous

trajectory is confronted by the consensus that anthropogenic emissions are harmful and must decrease, requiring de-carbonization of the energy system. The mature field of indicator-based sustainability assessment provides a rigorous systematic framework to balance the pros and cons of the various existing energy technologies using lifecycle assessments and weighting criteria covering the environment, economy, and society, as the three pillars of sustainability. In such a framework, nuclear power is ranked favorably, but since emphasis is often placed on radioactive wastes and risk aversion, renewables are usually ranked top. However, quantifying the severity of the consequences of nuclear accidents on a rough integral cost basis and balancing severity with low core-damage accident probabilities indicates that the average external cost of such accidents is similar to that of modern renewables, and far less than carbon-based energy. This book formulates the overall goal and associated unprecedented demanding criteria of taming nuclear risks by excluding mechanisms that lead to serious accidents and avoiding extremely long stewardship times as far as possible, by design. It reviews the key design features of nuclear power generation, paving the way for the exploration of radically new combinations of technologies to come up with “revolutionary” or even “exotic” system designs. The book also provides scores for the selected designs and discusses the high potential for far-reaching improvements, with small modular lines of the best versions as being most attractive. Given the ambition and challenges, the authors call for an urgent increase in funding of at least two orders of magnitude for a broad international civilian “super-Apollo” program on nuclear energy systems. Experience indicates that such investments in fundamental technologies enable otherwise unattainable revolutionary innovations with massive beneficial spillovers to the private sector and the public for the next generations.

**Status and Trends in Pyroprocessing of Spent Nuclear Fuels** - International Atomic Energy Agency 2021-10-19

The importance of recycling the spent nuclear fuel through partitioning processes has been recognized worldwide for increasing and sustaining nuclear energy.

Nuclear Data Needs for Generation IV Nuclear Energy Systems - P. Rullhusen 2006

This volume presents recent progress in the improvement of the nuclear database needed for the development of Generation IV nuclear energy systems. The Generation IV International Forum (GIF) identified six advanced concepts for sustainable nuclear energy production at competitive prices and with advanced safety, with special attention to nuclear non-proliferation and physical protection issues, minimization of long-lived radiotoxic waste, and optimum natural resource utilization. System groups have been established for studying these concepts in detail, and nuclear data are an inherent part of these studies. This book reviews the work recently performed for the development of these systems. The contributions include an up-to-date overview of recent achievements in sensitivity analysis, model calculations, estimates of uncertainties, and the present status of nuclear databases with regard to their applications to Generation IV systems. In the workshop, special attention was given to the identification of nuclear data needs from sensitivity analysis of benchmark experiments and the treatment of uncertainties. The proceedings contain overviews of several experimental programs and recent results of interest for the development of Generation IV systems.

*The Environmental Challenges of Nuclear Disarmament* - Thomas E. Baca 2000-08-31

This book draws together recognized experts from numerous institutions in Western Europe, Eastern Europe, the former Soviet Union, and North America. Nuclear facility decontamination and decommissioning, waste treatment, management and disposal, long-term monitoring and surveillance, and prevention of proliferation are the primary topics discussed, including critical assessments of the existing knowledge and identification of the needs for future collaboration. Proposals are presented for a variety of national and international agencies, and preliminary business plans developed for collaboration with private companies. A network of international projects needs to be financed since it is such projects that will ultimately ease tensions, help solve

nuclear waste contamination and security problems, and help pave the road toward nuclear weapons disarmament.

*Small Modular Reactors for Electricity Generation* - Jorge Morales Pedraza 2017-03-11

As a flexible, cost-effective energy alternative to large scale nuclear power reactors, this book examines the potential future use of small modular reactors for the generation of electricity in different regions. Exploring advanced nuclear technologies, chapters describe the current situation and perspective of the small modular reactors market (SMRs) in different regions around the world, including North and South America, Europe, Asia, Middle East and Africa. Particular attention is paid to the benefits of using these types of reactors for the generation of electricity, discussing their efficiency and reduced construction time, as well as exploring the main difficulties encountered in the development stage. Looking at the potential dangers that SMRs pose to the environment and population, the text presents the new safety measures that have been adopted in SMRs design to reduce future risk.

*Fast Reactor Fuel Cycles* - 1982

Proceedings of an International Conference organized by the British Nuclear Energy Society and co-sponsored by the Royal Society of Chemistry and the Institution of Metallurgists LONDON, 9-12 NOVEMBER 1981

**Handbook of Small Modular Nuclear Reactors** - Daniel T. Ingersoll 2020-10-22

Handbook of Small Modular Nuclear Reactors, Second Edition is a fully updated comprehensive reference on Small Modular Reactors (SMRs), which reflects the latest research and technological advances in the field from the last five years. Editors Daniel T. Ingersoll and Mario D. Carelli, along with their team of expert contributors, combine their wealth of collective experience to update this comprehensive handbook that provides the reader with all required knowledge on SMRs, expanding on the rapidly growing interest and development of SMRs around the globe. This book begins with an introduction to SMRs for power generation, an overview of international developments, and an analysis of Integral

Pressurized Water Reactors as a popular class of SMRs. The second part of the book is dedicated to SMR technologies, including physics, components, I&C, human-system interfaces and safety aspects. Part three discusses the implementation of SMRs, covering economic factors, construction methods, hybrid energy systems and licensing considerations. The fourth part of the book provides an in-depth analysis of SMR R&D and deployment of SMRs within eight countries, including the United States, Republic of Korea, Russia, China, Argentina, and Japan. This edition includes brand new content on the United Kingdom and Canada, where interests in SMRs have increased considerably since the first edition was published. The final part of the book adds a new analysis of the global SMR market and concludes with a perspective on SMR benefits to developing economies. This authoritative and practical handbook benefits engineers, designers, operators, and regulators working in nuclear energy, as well as academics and graduate students researching nuclear reactor technologies. Presents the latest research on SMR technologies and global developments Includes new case study chapters on the United Kingdom and Canada and a chapter on global SMR markets Discusses new technologies such as floating SMRs and molten salt SMRs

*Thorium Energy for the World* - Jean-Pierre Revol 2016-04-05

The Thorium Energy Conference (ThEC13) gathered some of the world's leading experts on thorium technologies to review the possibility of destroying nuclear waste in the short term, and replacing the uranium fuel cycle in nuclear systems with the thorium fuel cycle in the long term. The latter would provide abundant, reliable and safe energy with no CO<sub>2</sub> production, no air pollution, and minimal waste production. The participants, representatives of 30 countries, included Carlo Rubbia, Nobel Prize Laureate in physics and inventor of the Energy Amplifier; Jack Steinberger, Nobel Prize Laureate in physics; Hans Blix, former Director General of the International Atomic Energy Agency (IAEA); Rolf Heuer, Director General of CERN; Pascal Couchepin, former President of the Swiss Confederation; and Claude Haegi, President of the FEDRE, to name just a few. The ThEC13 proceedings are a source of reference on

the use of thorium for energy generation. They offer detailed technical reviews of the status of thorium energy technologies, from basic R&D to industrial developments. They also describe how thorium can be used in critical reactors and in subcritical accelerator-driven systems (ADS), answering the important questions: - Why is thorium so attractive and what is the role of innovation, in particular in the nuclear energy domain? - What are the national and international R&D programs on thorium technologies and how are they progressing? ThEC13 was organized jointly by the international Thorium Energy Committee (iThEC), an association based in Geneva, and the International Thorium Energy Organisation (IThEO). It was held in the Globe of Science and Innovation at the European Organization for Nuclear Research (CERN), Geneva, Switzerland, in October 2013.

*Handbook of Nuclear Engineering* - Dan Gabriel Cacuci 2010-09-14

This is an authoritative compilation of information regarding methods and data used in all phases of nuclear engineering. Addressing nuclear engineers and scientists at all levels, this book provides a condensed reference on nuclear engineering since 1958.

[Nuclear Materials](#) - Pavel V. Tsvetkov 2021-04

This book examines nuclear materials through select chapters focusing on the impact of reactor technology, use of materials data in modeling applications, and reasoning in design choices. It provides an opportunity to explore contemporary and emerging frontiers. Chapters cover such topics as manufacturing approaches, forms, fundamental considerations, and applications as well as highlight contemporary pathways in nuclear material development.

[Closed Nuclear Fuel Cycle with Fast Reactors](#) - Evgenei O. Adamov 2022-07-28

Closed Nuclear Fuel Cycle with Fast Reactors: Handbook of Russian Nuclear Power provides unique insights into research and practical activities from leading Russian experts. It presents readers with unprecedented insight and essential knowledge surrounding nuclear fast reactor technologies, as well as novel methods to close the nuclear fuel cycle to achieve cleaner, more environmentally friendly, and more

efficient nuclear power. Using the Proryv Project as a framework, the book's contributors provide detailed descriptions of technologies in development in Russia, allowing readers from around the globe to gain a thorough understanding which they can then apply to their own research and practice. Nuclear engineers and technologists of fast reactors, advanced reactors and fuel cycles will use this book as a guide to inform new technology development. They will be able to use the experiences from the Proryv Project to drive fast reactor development with closed fuel cycles for the future. Provides a presentation of new nuclear reactor and fuel cycle technologies within the unique framework of Russia's Proryv Project Presents novel technologies to close the nuclear fuel cycle to promote cleaner and more environmentally protective nuclear power Includes thorough coverage on the topic, including core design, coolants, fuels, accident protection and waste management technologies  
Experimental Facilities in Support of Liquid Metal Cooled Fast Neutron Systems - International Atomic Energy Agency 2019-02-25

This publication presents both an overview and detailed information on more than 150 experimental facilities being used for developing and deploying innovative liquid metal-cooled (sodium, lead and lead-bismuth) fast neutron systems, both critical and subcritical. Facilities, both under construction and those in operation are considered. It is expected that by providing the end users with detailed information on existing and future experimental facilities able to support innovative liquid metal cooled fast neutron systems, the publication will facilitate cooperation between organizations and knowledge transfer. An overview of the existing and future experimental facilities is presented in the body text of this publication. The profiles of all facilities in the form of individual papers are available on the attached CD-ROM and in the related on-line database maintained by the IAEA Catalogue of Facilities in Support of Liquid Metal-cooled Fast Neutron Systems (LMFNS Catalogue).  
*Reactivity Coefficients in Large Fast Power Reactors* - Harry H. Hummel 1970

*Reactor Development* - Lyle B. Borst 1948

*The World Set Free* - H. G. Wells 2021-03-14T21:37:23Z

After learning of atomic physics, H. G. Wells began to think of its potential impact on human society. In *The World Set Free*, atomic energy causes massive unemployment, shaking the already fragile social order. The ambitious powers of the world decide to seize the opportunity to compete for dominance, and a world war breaks out, echoing the looming Great War about to ignite in 1914. Waking to the catastrophe, humanity begins the hard search for a way into a better future. The novel traces a soldier, an ex-king, a despot, and a sage through a profound transformation of human society, and we gain a window into Wells' own thoughts and hopes along the way. With one prophetic stroke, Wells gives the first detailed depiction of atomic energy and its potential destructive power, and predicts the use of the air power in modern warfare. He may have even directly influenced the development of nuclear weapons, as the physicist Leó Szilárd, shortly after reading the novel in 1932, then conceived of harnessing the neutron chain reaction critical to the development of the atom bomb. This book is part of the Standard Ebooks project, which produces free public domain ebooks.

**Nuclear Renaissance** - William J. Nuttall 2022-06-16

Nuclear power is low carbon and reliable, but in recent years it has struggled to play a strong role in global plans for electricity generation in the 21st century. Many of those involved with nuclear power and environmental agencies see controlled expansion of nuclear plants as the most environmentally friendly way of meeting growing energy demands. In the UK policy makers must recognise concerns around severe accidents and radioactive wastes and balance these against the risks arising from other energy technologies. In addition, energy policy-makers must ensure that energy supplies remain affordable for all in society. How might new nuclear power stations help meet emerging policy needs? This second edition of *Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power* continues to examine the future of nuclear power in the contexts of economics, environmental sustainability, and security of electricity supplies. Fully updated with the latest technologies and concerns, this comprehensive guide illustrates

the technical challenges and opportunities facing nuclear power. This semi-technical overview of modern technologies meets the growing interest from scientists, environmentalists, and governments in the potential expansion of nuclear power. Various countries are starting to announce plans for new nuclear plants, either to replace those being decommissioned, to provide additional power or to contribute to the decarbonisation of especially challenging industrial activities. In the 2020s many commentators, once again, point to a renaissance just beginning. *Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power* is essential reading for physicists, engineers, policy-makers, researchers, energy analysts and graduate students in energy sciences, engineering and public policy. Key features Fully updated throughout, with new content on topics including the latest developments in fission and fusion energy, the global financial crisis of 2008/2009, and the Fukushima-Daiichi nuclear accident. Accessible to readers without a formal education in the area Authored by an authority in the field

**High Performance Light Water Reactor** - Thomas Schulenberg  
2014-07-28

Results of the project "High Performance Light Water Reactor--Phase 2," carried out September 2006-February 2010 as part of the 6th European Framework Program.

**Thermophysical Properties of Materials for Nuclear Engineering** - International Atomic Energy Agency 2009-02-01

A resource for reactor physicists and engineers and students of nuclear power engineering, this publication provides a comprehensive summary of the thermophysical properties data needed in nuclear power engineering. It includes data for nuclear fuels (metallic and ceramic), coolants (gases, light water, heavy water and liquid metals), moderators, absorbers and structural materials. The correlations and equations provided allow for the estimation of all important thermodynamic and transport properties. The detailed material properties of both solid and liquid states are shown in tabular form. The data on thermophysical properties of saturated vapours of some metals are also given.

**Nuclear Reactor Technology Assessment for Near Term Deployment** - International Atomic Energy Agency 2013

Given the increasing interest in the near term deployment of new nuclear power plants, IAEA Member States have requested guidance on the process of evaluating and selecting available technology options. Reactor technology assessment enables the evaluation, selection, and deployment of the best technology to meet the objectives of a nuclear power programme. This publication demonstrates how reactor technology assessment is performed and how the process and results of this work enable decision making in nuclear power planning. The approach also provides decision makers with the documentation necessary to support their conclusions.

**The Breeder Reactor** - John Samuel Forrest 1977

*Safety Issues Associated with Plutonium Involvement in the Nuclear Fuel Cycle* - Theodore A. Parish 2012-12-06

The "VOLGA" conferences, hosted in odd-numbered years by the Department of Theoretical and Experimental Reactor Physics of the Moscow Engineering Physics Institute (MEPhI), are some of the most prestigious technical meetings held in Russia. Traditionally, these conferences present the opportunity for reactor physicists from around the world to gather at MEPhI's holiday camp on the banks of the Volga river (near Tver) to exchange ideas and explore innovative concepts related to nuclear power development. In 1997, NATO became involved in the "VOLGA" meetings for the first time by co-sponsoring "VOLGA97" as an advanced research workshop. This workshop broke with tradition a bit in that the venue was moved from MEPhI's holiday camp to a location nearer Moscow. The workshop program was effectively organized in order to cover a broad range of topics relating to the theme of the meeting. Generally, the papers concerned safety related questions associated with utilizing both weapons-grade and reactor-grade plutonium in the nuclear fuel cycle, including facility requirements, licensing issues, proliferation risks, and a variety of advanced concepts for alternative fuel cycles. The program contained a total of ninety-nine

papers presented in five days of sessions.

*Modular Systems for Energy and Fuel Recovery and Conversion* - Yatish T. Shah 2019-06-28

Modular Systems for Energy and Fuel Recovery and Conversion surveys the benefits of the modular approach in the front end of the energy industry. The book also outlines strategies for managing modular approaches for fossil, renewable, and nuclear energy resource recovery and conversion with the help of successful industrial examples. The book points out that while the modular approach is most applicable for distributed and small-scale energy systems, it is also often used for parts of large-scale centralized systems. With the help of successful industrial examples of modular approaches for energy and fuel recovery and conversion, the book points out the need for more balance between large-scale centralized systems and small-scale distributed systems to serve the energy needs of rural and isolated communities. Coal, oil, natural gas, hydrogen, biomass, waste, nuclear, geothermal solar, wind, and hydro energy are examined, showing that modular operations are very successfully used in all these components of the energy industry. Aimed at academic researchers and industry professionals, this book provides successful examples and analysis of the modular operation for energy and fuel recovery and conversion. It is also a reference for those who are engaged in the development of modular systems for energy and fuel recovery and conversion.

**Structural Materials for Heavy Liquid Metal Cooled Fast Reactors** - International Atomic Energy Agency 2021-11-30

The compatibility of structural materials, such as steels with lead and lead-bismuth eutectic, poses a critical challenge in the development of heavy liquid metal (HLM) cooled fast reactors. Factors such as the high temperatures, fast neutron flux and irradiation exposure and corrosiveness provide a severe environment for the materials in these advanced reactor systems. The compatibility of liquid coolant with structural materials is critical for the development of innovative nuclear energy systems. To understand the current status of the research and development in this area as well as to provide a forum to exchange

information on structural materials for HLM cooled reactors at the national and international levels, the IAEA organized a technical meeting. This resulted in the current publication which presents the summaries of the technical and the group sessions, conclusions and recommendations, and the papers presented at the event.

**Liquid Metal Cooled Reactors** - International Atomic Energy Agency 2007

This publication presents a survey of worldwide experience gained with fast breeder reactor design, development and operation. It is focused on the following subjects: state of the art of liquid metal fast reactor (LMFR) development and relevant IAEA activities; design features and operating experience of demonstration and commercial sized nuclear power plants with sodium cooled fast reactors; lead-bismuth cooled (LBC) ship reactor operation experience and LBC fast power reactor development; activation characteristics of the primary coolant, reactor and components; treatment and disposal of spent sodium; removal of residual sodium deposits and decontamination after shutdown of the typical loop type LMFR; passive principles of fast reactor emergency shutdown and heat removal, demonstration of safety with test fast reactors during the final stages of operation, and an analysis and assessment of advantages and disadvantages of sodium as a coolant, giving due consideration to the advances in the technology and design of sodium components.

Fast Spectrum Reactors - Alan E. Waltar 2011-09-28

This book is a complete update of the classic 1981 FAST BREEDER REACTORS textbook authored by Alan E. Waltar and Albert B. Reynolds, which, along with the Russian translation, served as a major reference book for fast reactors systems. Major updates include transmutation physics (a key technology to substantially ameliorate issues associated with the storage of high-level nuclear waste), advances in fuels and materials technology (including metal fuels and cladding materials capable of high-temperature and high burnup), and new approaches to reactor safety (including passive safety technology). New chapters on gas-cooled and lead-cooled fast spectrum reactors are also included. Key international experts contributing to the text include Chaim Braun,

(Stanford University) Ronald Omberg, (Pacific Northwest National Laboratory, Massimo Salvatores (CEA, France), Baldev Raj, (Indira Gandhi Center for Atomic Research, India) , John Sackett (Argonne National Laboratory), Kevan Weaver, (TerraPower Corporation) ,James Seinicki(Argonne National Laboratory). Russell Stachowski (General Electric), Toshikazu Takeda (University of Fukui, Japan), and Yoshitaka Chikazawa (Japan Atomic Energy Agency).

Nuclear Data Needs for Generation IV Nuclear Energy Systems -

**Challenges for Coolants in Fast Neutron Spectrum Systems -**  
International Atomic Energy Agency 2020-07-30

This publication evaluates the different coolant options considered for nuclear applications with a fast neutron spectrum (i.e. fusion, fission and accelerators), compiles the latest information in the field and identifies research needs.

*Nuclear Power and Energy Security - Samuel Apikyan 2009-10-13*

The basic logic is very simple. Countries around the globe have a need for more electrical generating capacity because of increases in population and increases in energy use per capita. The needs are constrained by the requirement that the base load energy source be economical, secure, and not emit climate-changing gases. Nuclear power fits this description. Therefore, many countries that have not had a nuclear power program (or only had a small program) see a need to develop one in the future. However, the development of a national nuclear energy program is not so simple. The purpose of the NATO Advanced Research Workshop on Nuclear Power and Energy Security was to contribute to our understanding of how these programs might evolve. The workshop took place 26-29 May 2009 in Yerevan, Armenia.

Approximately 50 participants discussed the infrastructure that is needed and some of the reactor options that might be considered. The papers in this book helped define the discussion that took place. The infrastructure that is needed includes a legal framework, a functioning regulator, a plan for waste disposal, a plan for emergency response, etc. These needs were explained and just as importantly, it was explained what international, bilateral, and regional cooperation is available. Although there were many countries represented, the Armenian experience was of particular interest because of where the meeting was located. The papers on reactor options covered both innovative and evolutionary designs.

*Small Modular Reactors - NEA. 2016*

Recent interest in small modular reactors (SMRs) is being driven by a desire to reduce the total capital costs associated with nuclear power plants and to provide power to small grid systems. According to estimates available today, if all the competitive advantages of SMRs were realised, including serial production, optimised supply chains and smaller financing costs, SMRs could be expected to have lower absolute and specific (per-kWe) construction costs than large reactors. Although the economic parameters of SMRs are not yet fully determined, a potential market exists for this technology, particularly in energy mixes with large shares of renewables. This report assesses the size of the market for SMRs that are currently being developed and that have the potential to broaden the ways of deploying nuclear power in different parts of the world. The study focuses on light water SMRs that are expected to be constructed in the coming decades and that strongly rely on serial, factory-based production of reactor modules. In a high-case scenario, up to 21 GWe of SMRs could be added globally by 2035, representing approximately 3% of total installed nuclear capacity.