

● 國家高技術計劃能源領域專家委員會編

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● 先進能源技術論文摘要

● DEGEST ON ADVANCED ENERGY TECHNOLOGY



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# 前 言

面对世界新技术革命的挑战，在党中央、国务院的关怀下，一个包括生物、航天、信息、激光、自动化、能源和新材料等 7 个领域的《高技术研究发展计划（即八六三计划）纲要》在我国脱颖而出，举世瞩目。

我国是世界上的人口大国，要实现国民经济现代化目标，能源是社会和经济发展的基础。为了缓解下世纪我国能源面临总的供需缺口较大，石油后备资源不足，以及以煤为主的能源结构带来严重的环境污染等三大矛盾，国家已将能源工业确定为国民经济发展的战略重点，并制订了相应的能源工业发展规划和战略布署。在国家八六三高技术计划中，按照“目标有限，突出重点”的原则，把燃煤磁流体发电和先进核反应堆列为两个主题项目，以期在这两个方面跟踪国外的高技术前沿，缩短与先进工业国家的差距，为我国 21 世纪的能源工业长期稳定的发展作出贡献。

我国的核电已经起步，并确定以压水堆作为第一代堆型发展。我国未来对核能需要的规模将十分巨大，快中子增殖堆、高温气冷堆、聚变—裂变混合反应堆将在核能发展体系中起着不同的作用。快中子增殖堆是可以较早实用的增殖堆，能有效利用我国核燃料资源；高温气冷堆在核能工艺热应用方面有独特作用，利用“核能—煤转化”技术可补充我国未来液态燃料的不足；聚变—裂变混合反应堆有可能为核能更大规模的发展提供核燃料，同时可推动我国核聚变能利用的研究和发展。因此，到本世纪末作为一个跟踪研究计划，按照“有主有从，协调发展”的原则，以快堆为重点，兼顾到高温气冷堆和混合反应堆的跟踪研究，既可积极跟踪国外技术发展，又可加强技术储备，减少风险。

“七五”期间，在国家科委和各有关部委的领导与支持下，能源技术领域全体科技人员发扬“公正、献身、求实、协作、创新”的八六三精神，无论是在燃煤磁流体发电还是在快中子增殖堆、高温气冷堆、聚变—裂变混合反应堆的发展战略研究及关键技术攻关方面均取得了长足的进展。全领域共完成研究报告、学术论文 1100 余篇，取得阶段成果 160 多项。同时，在积极开展多渠道、多层次的国际合作与交流方面，也取得了实质性进展。正是由于八六三计划的实施，加速了高技术研究基地的建设，培养和锻炼了一大批老、中、青相结合的、富有朝气的国家攻关队伍，这将为实现 2000 年的研究发展目标奠定物质基础，做好人才准备。回顾过去，八六三计划显示了巨大活力；展望未来，我们作为奋斗在能源技术领域的科技工作者，为我国有一个八六三计划而感到自豪。

为了便于较全面，较广泛的学术交流，特将本领域“七五”期间的部分论文摘要汇编成册，以期推动本领域各项研究工作，激励广大科技工作者承前启后，勇于拼搏、积极进取，为实现 2000 年发展目标做出更大贡献。

编者

1992 年 4 月

## FORWARD

With the care of the Party Central Committee and the State Council, the " Guidelines of High Technology Research and Development Program (863 Program)" is published to meet the challenge of the world new technology revolution. The Guidelines, attracting world wide attention, includes such seven areas as biology, space, information, laser, automation, energy and new materials.

To fulfill the objectives of modernization of national economy, energy is the basis for its social and economic development in such a populous country like China. We have three major problems in the field of energy, namely; 1) the total supply of energy in the next century can not meet the needs, 2) backup oil resource is insufficient, and 3) coal dominated energy structure brings serious environment pollution. To alleviate these problems, the government has identified energy industry as the strategic priority in national economic development, and made the associate program and strategic plan. According to the principle of " Limiting objectives and concentrating on key points", coal magnetic fluid power generation and advanced nuclear reactor are identified as major projects in national 863 Program so as to follow after the world high-tech development and narrow the gap between China and the advanced industrial countries in both fields and make contributions to the long-term stable development of our energy industry in the 21st century.

The work on nuclear power generation was started in China and the pressure water reactor has been selected as the first generation reactor to be developed. However, the future needs for nuclear energy in China is very great, so that fast breeder reactor, high-temperature gas reactor and fission/fusion hybrid reactor will play different roles in the development system of nuclear energy. Fast neutron breeder reactor can be practically used soon, which can effectively utilize our nuclear fuel resources. High-temperature gas-cooled reactor is of special function in the application of nuclear heat process, which will fill up the gap between supply and need of our liquid fuel through nuclear energy coal transformation technology. Fission/fusion hybrid reactor will probably provide nuclear fuel for large scale development of nuclear energy and will promote our R&D work on the application of nuclear fission energy. Therefore, according to the principle of coordinative development of major and subsidiary fields, the program will mainly concentrate on fast reactor and in the meantime will pay attention to the research in high-temperature gas reactor and hybrid reactor. In this way we will not only follow after foreign technology development, but also enhance our technology back-up and reduce risk.

During the Seventh Five-Year-Plan, with the leadership and support from the State Science and Technology Commission and other related commissions and ministries, and with the 863 spirit of " Justice, contribution, reality, coordination, creation", all the S & T staff in the field of energy technology made great progress in both strategic development research and key technical problem tackling for coal magnetic hydro dynamics, fast breeder reactor, high-temperature gas-cooled reactor as well as fission/fusion hybrid reactor. In the field, all together 1100 research reports or academic papers were completed and more than 160 phase results were gained. In the meantime, substantial progress was obtained for multi-channel and

multi-level international cooperation and exchange. It is because of the implementation of " 863" Program that has speeded up the establishment of hi-tech research base and trained a batch of problem-tackling staff composing the old, the middle-aged and the young. This will lay a material and human resource foundation for achieving our R & D objectives in the year 2000. As technology, we are very proud of our 863 Program because it showed its great active power in the past.

In order to facilitate the extensive academic exchange, the abstracts for some of the papers and research results in the field for the period of the Seventh Five-Year-Plan were compiled as this book. We hope this book will promote the various kinds of research work in the field and encourage all the S & T workers to make further effort and greater contribution for achieving our development objectives for the year 2000.

Editor

1992. 4.

## 编写说明

- 一、本书是国家科委高技术计划能源技术领域专家委员会办公室负责组织编写的，汇集了该领域有关专家学者在 1987~1991 年期间发表的重要论文的中英文摘要，以供国内外有关读者参考。
- 二、本书共分为五个部分，分别反映能源领域四个主题和软科学研究方面这几年来所取得的进展和成就，每篇摘要按其课题所属的主题归类。
- 三、同一分类中文摘要的刊登顺序按收稿时间先后排列。
- 四、所有论文的中英文摘要均由作者提供，文责由作者本人负责。
- 五、为了收取最新发表的论文摘要，所以本书编印时间比较仓促，不足之处在所难免，敬请批评指正。

## Word from Editor

- I. This book is edited by the Office of Energy Technology Area of National High-tech R & D Program, consisting of abstracts, in both Chinese and English, of representative papers published between 1987-1991.
- II. The classification of the abstracts is based on the program administration system so that it might seem to be unperfect from technical point of view.
- III. The abstracts in the same catalog are arranged in the sequence of receipt.
- IV. All abstracts and their English versions are in such unedited forms as provided by authors themselves.
- V. We would like to acknowledge everybody who gave his support to our work.

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