

Summary and Closing Remarks

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Presentation to:

ARIES Program Peer Review

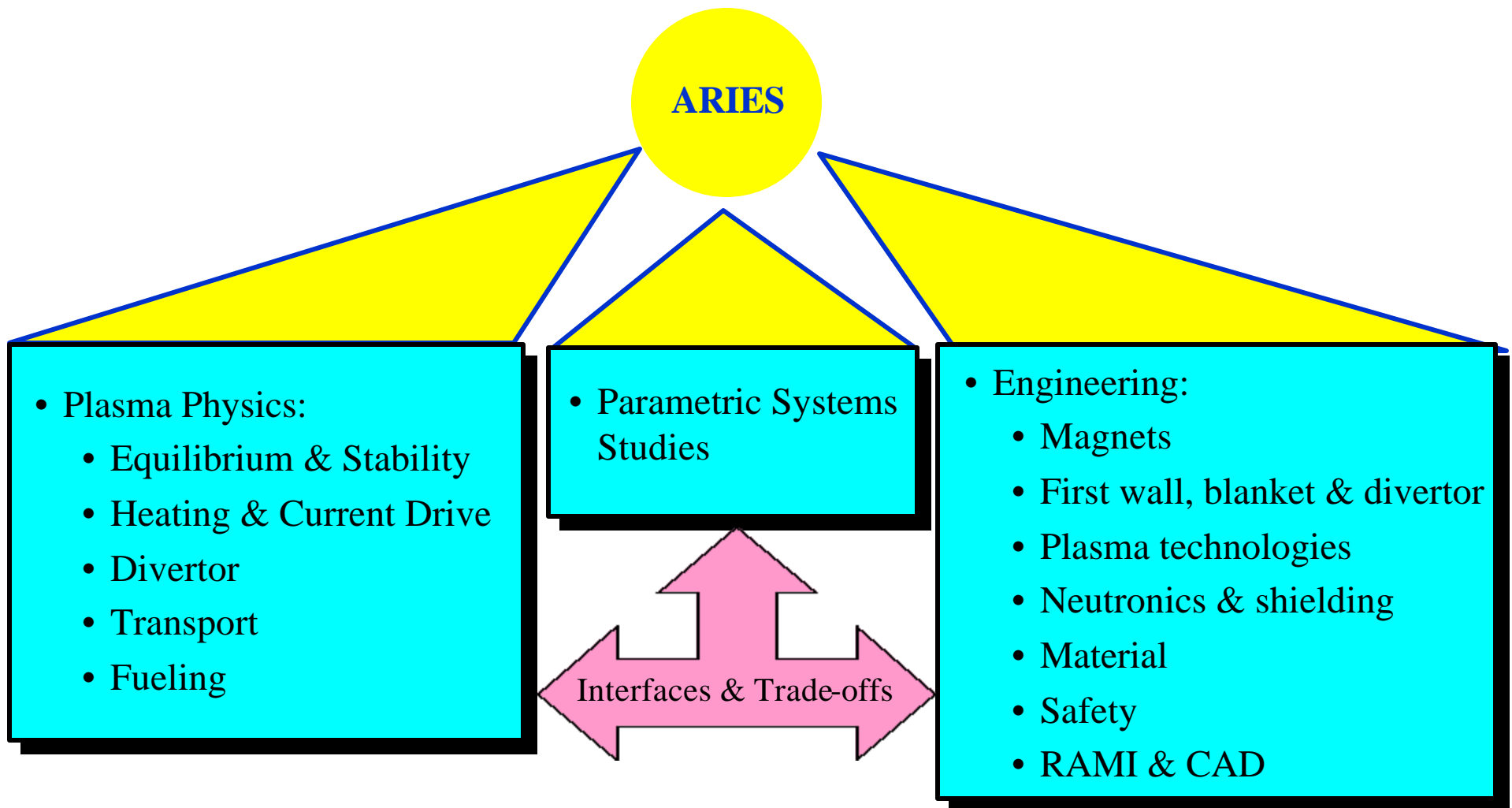
August 18, 2000

UC San Diego

Electronic copy: <http://aries.ucsd.edu/najmabadi/TALKS/>

ARIES Web Site: <http://aries.ucsd.edu/ARIES>

Detailed and in-depth analysis is necessary to make scientific progress and impact the R&D program



- Many areas of research were not covered today.

I: Quality and Innovation

- **Validity and effectiveness of scientific methods and approaches**
 - Research includes detailed analysis of high-leverage systems.
 - An environment is created for fusion scientists to investigate fusion systems together. Team members bring in the latest information from R&D program. State-of-art analysis, innovation, and high-leverage issues are readily transferred back to the R&D program.
 - ARIES work is referenced and used by other scientists in the program.
- **Effectiveness in use of state-of-the-art analytical and experimental tools**
 - We use the latest code/models developed by the physics & technology community and extend these models to power plant relevant regimes.
 - Experimental results are continuously incorporated.
 - Good connection with R&D communities exists.

I: Quality and Innovation

- **Degree of creativity, originality, and uniqueness in addressing scientific issues and technical problems**
 - Many concepts have been introduced which were taken up by the R&D program.
 - Impact of latest development in other scientific fields on fusion systems are evaluated.
 - Because we draw from expertise of the national program, we are unique in the world in the ability to provide a fully integrated analysis of power plant options including plasma physics, fusion technology, economics, safety, etc.
- **Quality and completeness of documenting/reporting technical approaches and obtained results**
 - 230 Publications, presentations in every major conference, town meeting & workshops, extensive Web site.

II: Resourcefulness in resource management

- **Resourcefulness in seeking out and adapting available research resources (personnel, access, etc.) both domestically and internationally**
 - ARIES research is viewed as a resource by the R&D communities.
 - ARIES Program receives voluntary contribution from R&D programs.
 - Team utilizes the best expertise in US in each technical area.
- **Progress toward addressing scientific issues & resolving technical problems**
 - Each ARIES design provide new insights and help focus R&D.
 - Progression of ARIES research underlines continuing innovation and resolution of technical issues.
- **Effectiveness of teaming domestically and internationally for information transfer and synergistic problem-solving**
 - A US national team
 - Collaboration with programs in EU and Japan
 - We have had many long-term visitors from EU and Japan (all paid by their home institutions).
 - Current proposal of collaboration between US and EU in power plant studies.

III: Relevance and Impact

- **Relevance of the research and development (R&D) to the scientific goals of the program element**
 - ARIES Research focuses the R&D directions toward high-leverage area (see support letters of J. Sheffield and VLT PAC).
- **Influence of results obtained to progress in fusion energy sciences research**
 - TPX and KSTAR experimental regimes names after ARIES-I and –II.
 - Focused stellarator research on compact stellarators.
 - Introduction of SiC composites as a high-performance material
 - Many others (see F. Najmabadi overview presentation).
- **Contributions to strengthening the scientific foundations of the U.S. fusion program**
 - Innovative solutions to many systems.
 - Extending models and tools to power plant conditions and environment.

III: Relevance and Impact

- **Influence on other program elements of both the domestic and international fusion programs**
 - Large impact on the R&D program (this is a major part of ARIES mission).
- **Contributions to and impact on other scientific and technical fields**
 - **Need help here**
- **Educational benefits of R&D work, such as effectiveness of attracting and training students to become future fusion scientists and engineers**
 - About 2/3 of resources is allocated to universities this year.
 - Seven students were supported last year.

III: The scientific and technical excellence

- **Recognition of R&D results and performers by peers, scientific communities, and professional societies**
 - ARIES designs are goals of R&D programs (DIII-D, FIRE, ...)
 - ARIES research is referenced extensively in the literature
 - Invited papers and presentations in many conferences and symposia
- **Publication of R&D results in peer-reviewed journals**
 - See list of 230 publications
- **Use of R&D results in fusion programs, domestically and internationally**
 - ARIES designs are goals of R&D programs (DIII-D, FIRE, ...)
 - TPX and KSTAR experimental regimes names after ARIES-I and –II.
 - European and Japanese visions of fusion power has become progressively closer to ARIES visions.

National Advanced Design Program Is a High-Leverage Research Effort

- **High Quality of Science:** Detailed and in-depth analysis is necessary to make scientific progress.
- **High-Leverage Research:** Integrated design & analysis beyond current experiments identifies key R&D Issues.
- **Community input and consensus:** An environment is created for fusion scientists to investigate fusion systems together. Team members bring in the latest information from R&D program. State-of-art analysis, innovation, and high-leverage issues are readily transferred back to the R&D program.
- **Interaction with other disciplines:** Impact of latest development in other scientific fields on fusion systems are evaluated.
- **Impact on Education:** Approximately 2/3 of the research is performed by universities (UCSD, U. Wisc., RPI, MIT). Seven students were supported by this activity last year.
- **A high-leverage niche on the international fusion program.** It is recognized internationally as a credible driving force towards an attractive end product and influences world-wide fusion research.