APEX and ALPS Advanced Technology Meetings

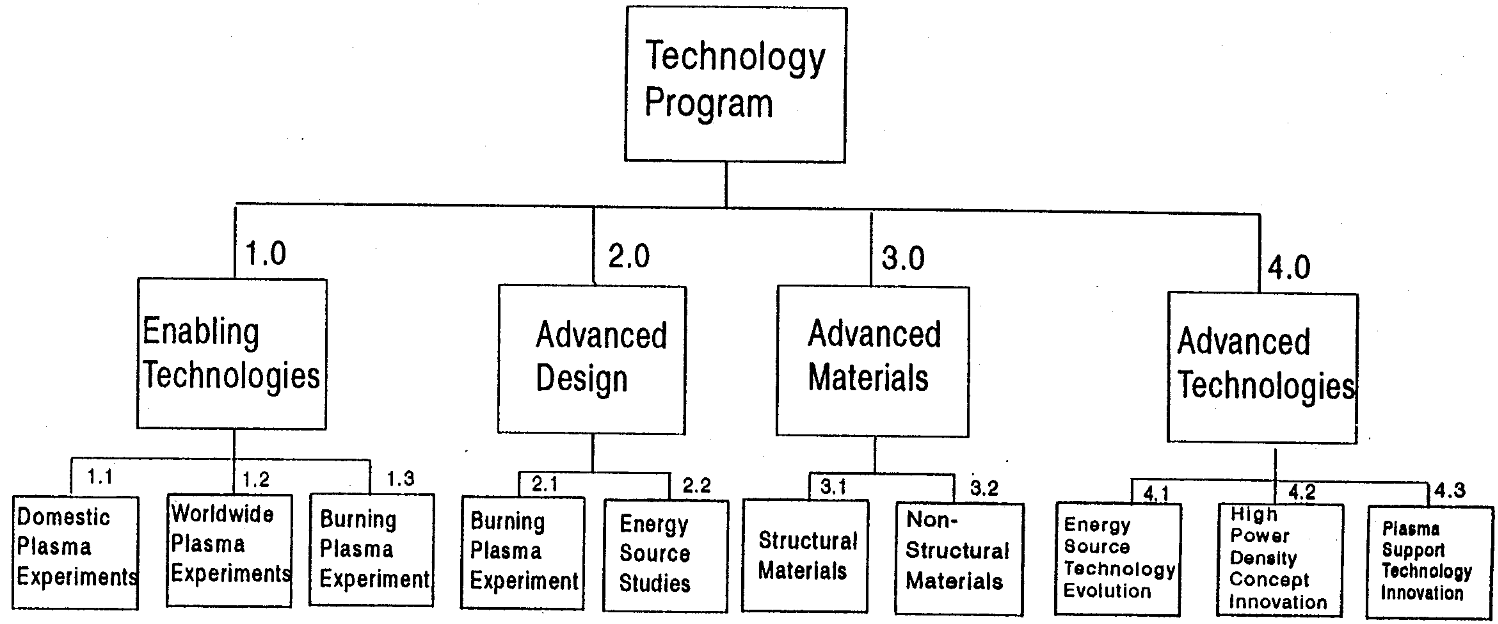
July 27-31, 1998

Topics:

- FY 1999 Resource Allocations
- Action Items for June 24-25 Virtual Laboratory for Technology (VLT) Meeting
- Guidance to APEX/ALPS Teams

OFES Technology Program

Matrix of WBS and Budgeting Elements



Plasma Technologies

- Magnets
- Plasma Facing Components
- ICH
- ECH
- Fueling
- Diagnostics

Fusion Technologies

- Energy Extraction
- Safety and Environment
- Tritium Systems
- Vacuum Vessel
- Remote Handling

Advanced Design and Analysis

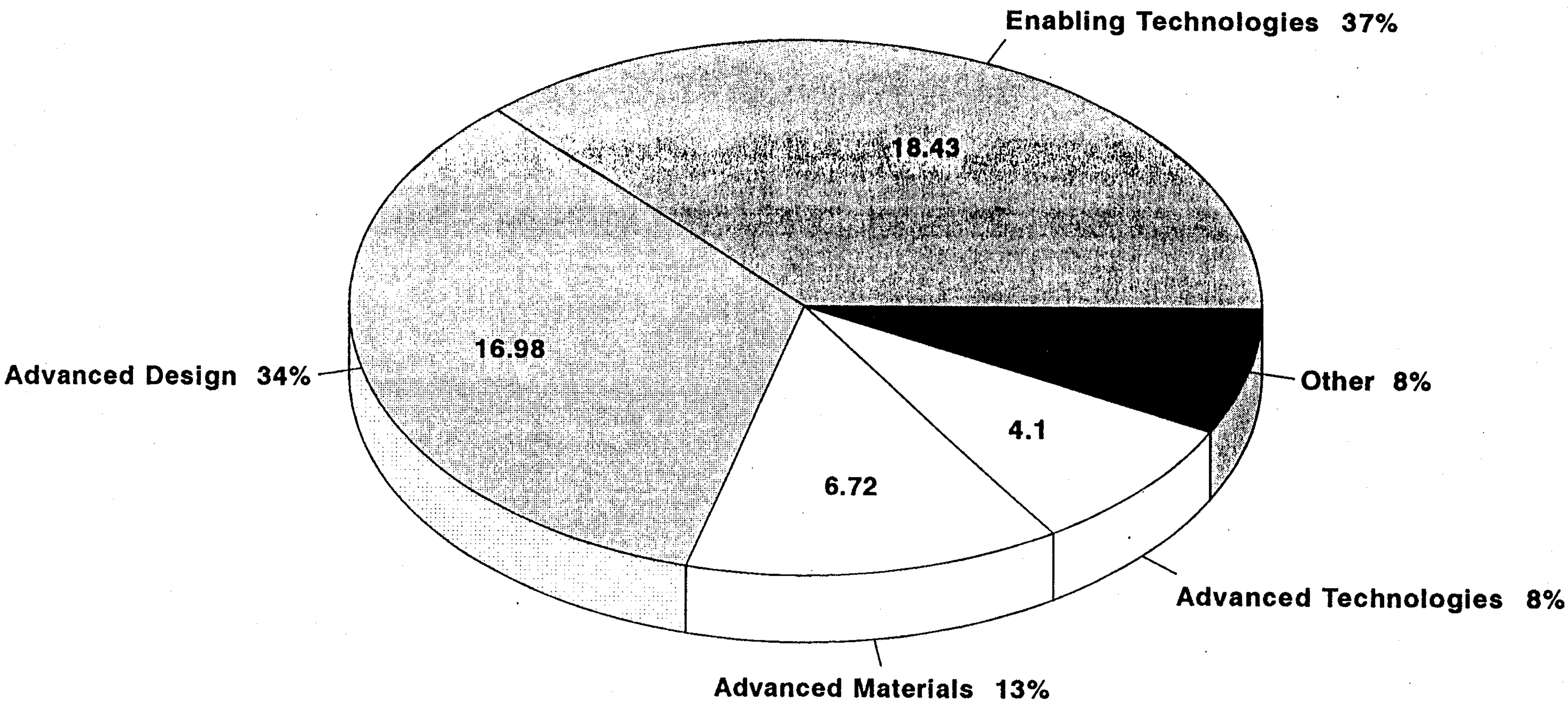
- ITER Design
- ITER JCT
- ITER JWS
- Systems Studies

Materials Research

OFES Technology Program

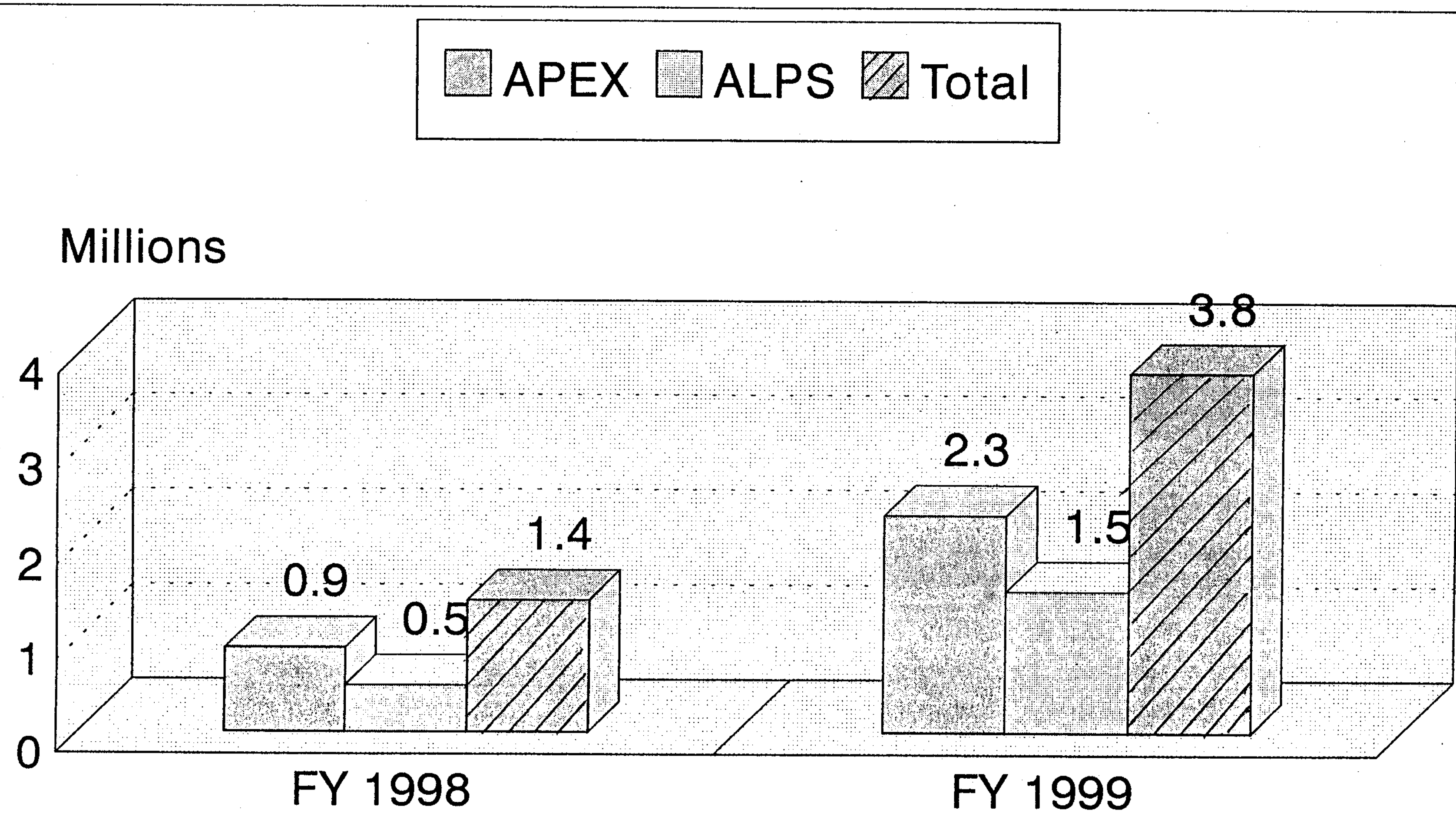
FY 1999 Funding Request in $ M

Total = 50



APEX and ALPS Funding

Total from All Sources in $Million



	FY 1998	FY 1999
APEX	0.9	2.3
ALPS	0.5	1.5
Total	1.4	3.8

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FY 1999 Resource Allocations for APEX/ALPS

- Project-oriented approach to planning, defining work products, and budgeting:
  - Work Breakdown Structure should define tasks down to work product level
  - Task priorities and budget constraints will determine FY 1999 work plans
  - Task-performer-effort matrices will establish organizational budgets
  - Selected tasks should have schedules and be measurable for progress to completion
- Preliminary budget allocations have been made
  - Straw man FY 1999 budget plan issued prior to June 24-25, 1998 VLT meeting
  - FY 1999 budget plans were revised following VLT meeting based on APEX/ALPS preliminary task-performer-effort matrices
- APEX/ALPS meetings will provide basis for further refining FY 1999 budget plan; Congressional actions on FY 1999 budget may lead to further adjustments

APEX/ALPS-Related Action Items from June 24-25, 1998 VLT Meeting

- Update and finalize white paper on Advanced Technology (Abdou)

- Propose work scope and resource requirements for plasma modeling needed under ALPS and APEX (Mattas/Abdou)

- Prepare APEX and ALPS plans for start of competitive, peer-reviewed activities by end of FY 1999 (Berk/Abdou/Mattas)

- Prepare guidelines for competitive, peer-reviewed activities for all areas of Technology Program and start some activity in all areas in FY 1999 (Berk)

Competition in the APEX and ALPS Advanced Technology Programs

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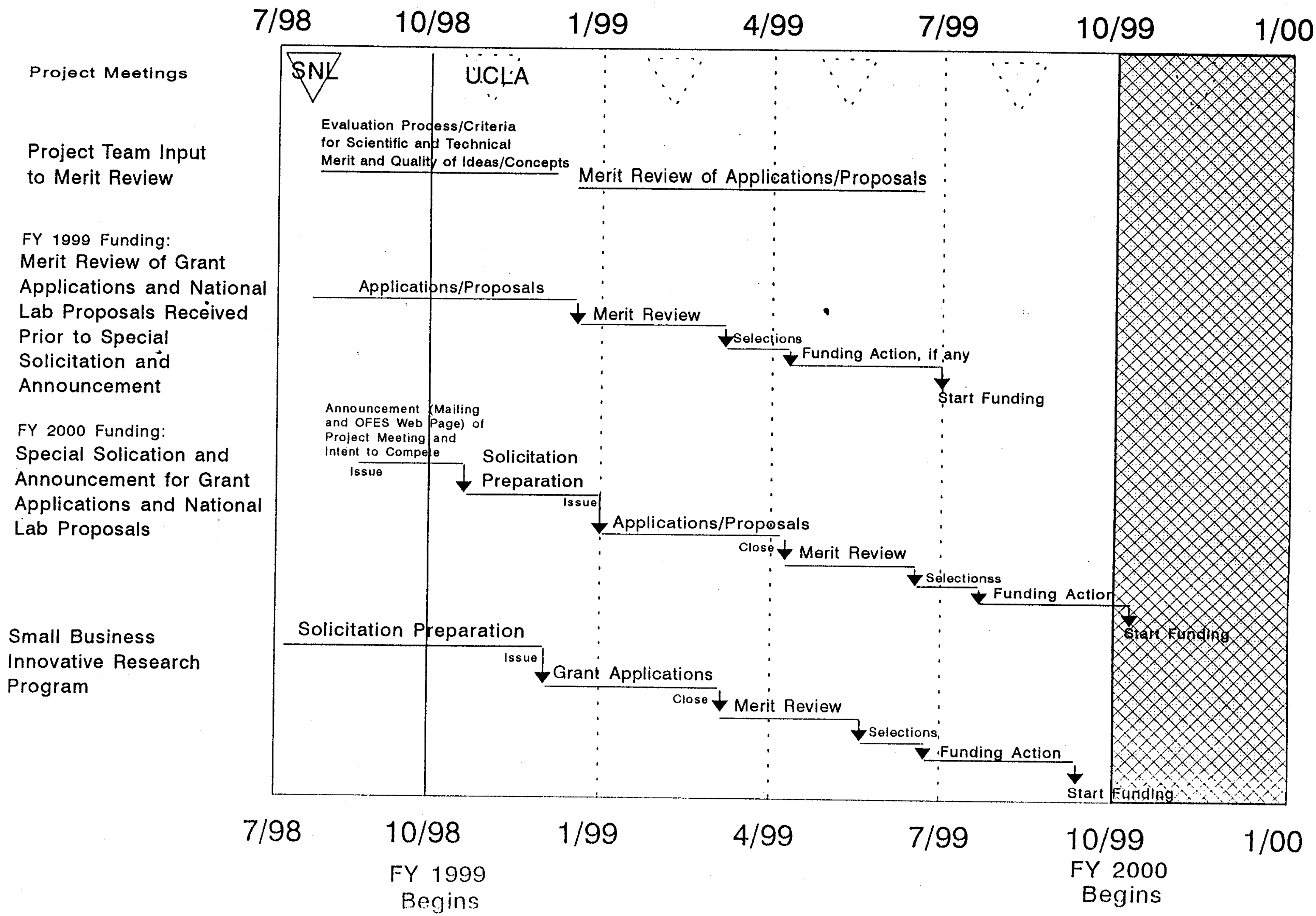

1999 SBIR Solicitation

Advanced Technologies and Materials for Fusion Research and Development

Successful development of the knowledge base needed for an attractive fusion energy source will require substantial progress toward the technologies and materials that will be needed to withstand the high levels of surface heat flux and neutron wall loads expected for the in-vessel components of fusion energy systems. These technologies and materials, which are substantially advanced relative to today's capabilities, are required to assure safe, reliable, economic, and environmentally benign operation of fusion energy systems. The long-range technical problems posed by these challenges create many research opportunities. Efforts are focused on basic and innovative research to gain the scientific understanding necessary to identify and evaluate low activation materials, technologies, and design options with the most attractive performance, safety, and environmental features. This research is aimed at improving the scientific understanding and extending the performance limits for innovative concepts with high power density and high temperature capabilities, long life times, and low parasitic neutron absorption, tritium permeability, decay heat, long-term activation, and cost. **Grant applications are sought only in the following subtopics:**

a. Structural Materials and Coatings--Grant applications are sought for research that will lead to the relaxation of operating limits for the following materials: (1) vanadium alloy structural materials, (2) silicon carbide/silicon carbide (SiC/SiC) structural composites, (3) oxide dispersion strengthened (ODS) ferritic steels, (4) copper alloys, and (5) electrically insulating coatings to reduce magnetohydrodynamic (MHD) effects in vanadium alloy/liquid lithium systems. For vanadium alloys, areas of interest include the development of improved alloys, increased resistance to degradation under neutron irradiation, relaxation of protection requirements set by their sensitivity to gaseous impurities, and the development of advanced welding/joining techniques to produce tough, ductile vanadium alloy-to-vanadium alloy or vanadium alloy-to-steel joints. For SiC/SiC composites, techniques to improve the thermal conductivity, improved and low cost production methods, and advanced joining processes are needed. For ODS ferritic steels, the interest is in developing these materials for higher temperature service that is permitted by the creep strength limits of conventional low activation ferritic steels - low cost production techniques, product isotropy, and joining methods are possible research topics of interest. For copper alloys, improved radiation resistance, fracture toughness and fatigue properties are desired, while retaining high conductivity properties. For electrically insulating coatings, coating technologies to reduce MHD effects must take into consideration the compatibility with both the coated vanadium alloy and liquid lithium coolant for long time operation at elevated temperatures. In addition, grant applications must address the use of candidate coatings on actual system components and account for the *in situ* repair of defects that could develop in the coating. Note that in this subtopic, the emphasis is on materials for structural applications and issues related to plasma-surface interactions should not be addressed.

High Power Density Concepts--Grant applications are sought for research on innovative fusion power technologies for in-vessel components that can significantly enhance the potential of fusion to become an attractive and competitive energy source. Research should be aimed at new, possibly "revolutionary", concepts that can provide the capability to efficiently extract heat from plasmas in fusion energy systems with very high neutron and surface heat loads, while also satisfying all fusion power technology functional requirements with high degrees of reliability, maintainability, safety, and environmental attractiveness. The performance capabilities being sought for these new in-vessel concepts are: (1) high power density handling, with average neutron load at the first wall > 5 MW/m2, peak surface heat flux at first wall of about 2 MW/m2, and peak surface heat flux at the divertor of about 50 MW/m2, (2) high power conversion efficiency, with net > 40%, (3) clear potential to achieve high availability through low failure rate, large design margin, and short downtime for maintenance, and (4) high public safety and minimization of radioactive waste. Grant applications are sought for research to (a) address feasibility issues of concepts use flowing liquids in contact with the plasma and (b) identify and evaluate innovative new ideas. Candidate liquids include lithium, gallium (for divertors), Flibe (florine-lithium-beryllium salt), and lead-lithium (Pb83Li17) and specific areas of interest for investigation (experimental and/or modeling) include erosion behavior of liquid surfaces, the interactions of sputtered and vaporized liquids with the plasma, hydrogen and helium recycling, fluid dynamic of free surface liquid flows in proposed fusion reactor configurations, and efficient removal of high levels of power. Grant applications concerning feasibility issues must clearly indicate the specific concept and describe the feasibility issue(s) to be addressed and present an outline of the proposed approach to solving the feasibility issue. Relative to innovative new ideas, grant applications must include identification of proposed materials and configurations for in-vessel components and preliminary analysis to indicate the potential for achieving the above performance capabilities being sought for new concepts, including maximum and minimum temperatures of key materials.