Advanced Design Activities in US

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Electronic copy: http://aries.ucsd.edu/najmabadi/TALKS
ARIES Web Site: http:/aries.ucsd.edu/ARIES

Virtual Laboratory for Technology (VLT) Coordinates Technology Research in the US

- The Virtual Laboratory for Technology has been charged to organize and integrate the US Technology Program's diverse and interrelated activities.
- The VLT began its official operation on October 1, 1998.
- Beginning in FY 1999, the Technology program has shifted its emphasis t:
  - * Enabling technologies for domestic plasma experiments and international collaborations;
  - * Fusion system design and system studies;
  - * Materials and technologies needed in the long-term for fusion to achieve its potential as an attractive energy source.

VLT Team

- Director: Charles Baker
- Area Coordinators:
  - Plasma Experiments Technologies — Stan Milora
  - Fusion Energy Technologies — Mohamed Abdou
  - Fusion Material — Everett Bloom
  - Advanced Design — Farrokh Najmabadi
  - IFE Chamber/Target Technologies — Grant Logan
  - NSO Study — John Schmidt
- VLT web site (http://vlt.ucsd.edu) contains information on VLT acitivies

Advanced Design Activities Encompass Three Program Elements

- Fusion application and Test Facilities design studies:
  - Design of commercial facilities for all confinement concepts are carried out to guide the fusion R&D and to assist major program evaluations.
  - Fusion application studies continue assessment of supply, demand, and cost of electricity from fusion as well as exploration of other non-electric application.
  - Design of fusion test facilities, such as neutron sources, define cost and risk associated with different fusion development pathways.
- Strategic planning and forecasting:
  - These studies assess the role of fusion energy in a long-term, sustainable global energy strategy, taking into account the portfolio of energy options available.
- Development pathway analysis:
  - This research develops and applies methodologies for assessing the cost, risk, and schedule impact of different approaches to fusion development.

Role of Fusion in a Sustainable Global Energy Strategy

FY 99 Research Activities:

- Role of large power fusion stations in future energy markets.
- Role of fusion in a global energy strategy.
- Macro-economics modeling of global energy market and role of fusion.
- Comparison of various sources of energy based on equivalent CO_2 emission.
- Outreach to other communities.

Fusion Application & Test-Facilities Design

FY 99 Research Activities:

- ARIES Team activities (~$1.7M):
  - Fusion neutron source;
  - Advanced ARIES-RS;
  - Support for proof-of-principle concepts;
  - Support for hydrogen production by fusion, impact of ferromagnetic material on plasma performance, etc.
- Pre-conceptual designs (analysis of critical issues) of advanced fusion concepts, such as FRC (U.W. and U.W.), Dipole (MIT), etc. (~$200k)

Advanced ARIES-RS Study

- ARIES-RS is the vision for the advanced tokamak program and is used to plan R&D directions.
- Focus of the program on advanced tokamaks has resulted in major progress which will be continued in the next few years.
- A re-visit of ARIES-RS is warranted to assess “how good” advanced tokamaks can be using higher performance physics (more optimized profiles, reduced current drive power, etc.) and higher performance technologies (high-temperature superconductors, SiC blankets with liquid metal breeder/coolant, etc.)

Fusion Neutron Source Study

- Scoping studies have indicated that fusion neutron sources may lead to attractive, near term products for the fusion program (burning of fission waste, fissile fuel and tritium production, etc) leading to new clients and to additional resources for fusion.

- Study will be performed in two phases. First phase will define what fusion should deliver to be competitive in these markets:
  - Technical requirements of fusion neutron sources (e.g, flux, fluence, availability, cost, competition potential);
  - Extrapolation from present data base;
  - Cost, safety & environmental issues, and licensing;
  - Political issues associated with certain applications.

- Depending on the outcome of the first phase, a detailed design studies may be launched.