

STATUS OF FINESSE (JULY 1985)

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FINESSE PROJECT (ADVISORY COMMITTEE) MEETING
UCLA
31 JULY 1985

- OUTLINE

- REVIEW OF FINESSE SCOPE, PROCESS
- MAJOR ASSUMPTIONS
- PROGRESS SINCE MARCH 1985
- PLANS FOR NEXT YEAR
- FNT IN USA AND INTERNATIONAL COOPERATION

- PURPOSE OF PRESENTATION

- BROAD REVIEW OF WHERE WE ARE AND WHERE WE ARE GOING

- DOES NOT COVER TECHNICAL DETAILS, CONCLUSIONS

- REST OF THE DAY: (TIME IS LIMITED)

- NO REPETITION (EACH TALK IS IMPORTANT)
- PRESENTATIONS FOCUSED ON HIGHLIGHTS

REFERENCE ASSUMPTIONS ABOUT
TYPICAL COMMERCIAL REACTOR CONDITIONS

- STEADY-STATE PLASMA OPERATION
- NEUTRON WALL LOAD:
5 MW/m²
- SURFACE HEAT LOAD:
MIRRORS: 0.1 MW/m²
TOKAMAKS: 0.5 TO 1.0 MW/m²
- HIGHEST MAGNETIC FIELD IN BLANKET REGION:
MIRRORS: 4 TO 5 T
TOKAMAKS: 5 TO 8 T
- BLANKET LIFETIME:
AUSTENITIC AND FERRITIC STEELS: 10 TO 20 MW·Y/M²
ADVANCED ALLOYS: 20 MW·Y/M²
SOLID BREEDERS: ? (10 MW·Y/M²)
- GENERAL REACTOR FRAMEWORK:
MIRRORS: MARS
TOKAMAKS: STARFIRE
(BUT BE CAREFUL; COMMERCIAL REACTORS CAN NEVER BE FIXED)
- AVAILABILITY REQUIREMENTS:
ETR/DEMO: 50%
COMMERCIAL: 75%

REFERENCE EXAMPLES OF
GENERIC BLANKET DESIGNS

1. SELF-COOLED LIQUID METAL

Li/Li/V
LiPb/LiPb/FS

2. SOLID BREEDER, NO MULTIPLIER

Li₂O/He/FS

3. SOLID BREEDER, WITH MULTIPLIER

LiAlO₂/H₂O/SS/Be

NOTES

- GENERAL FRAMEWORK FOR DESIGN CONCEPTS WERE TAKEN FROM BCSS
- SOME VARIATIONS WERE CONSIDERED
- MOLTEN SALTS WERE NOT INCLUDED

OTHER KEY ASSUMPTIONS
IN FINESSE EFFORT
DURING FY84, 85

- ELECTRIC APPLICATIONS AS REFERENCE

NON-ELECTRIC APPLICATIONS WERE NOT
EXPLICITLY EVALUATED

- TIME FRAME CONSIDERED: NOW TO YEAR 2000

ACCOMPLISHMENTS IN FY84

TASKS

1. IDENTIFIED, CHARACTERIZED AND CLASSIFIED ISSUES
2. SURVEYED EXPERIMENT NEEDS
3. INVESTIGATED ENGINEERING SCALING
4. EVALUATED EXPERIENCE FROM OTHER TECHNOLOGIES
5. EVALUATED CAPABILITIES AND LIMITATIONS OF EXISTING NON-FUSION FACILITIES
6. EXPLORED ROLE AND DESIRED CHARACTERISTICS OF FUSION TECHNOLOGY DEVELOPMENT DEVICES

REPORTS, MEETINGS

- INTERIM REPORT ISSUED (OCT. 84)
- U.S. COMMUNITY WORKSHOP (NOV. 84)

HIGHLIGHTS OF EFFORT DURING FY85

- ANALYSIS OF MAJOR EXPERIMENTS REQUIRED TO RESOLVE KEY ISSUES
- DEVELOP TECHNICAL FEATURES OF EXPERIMENTS TO BE PERFORMED IN EXISTING FACILITIES
- DEFINE TECHNICAL CHARACTERISTICS OF MAJOR NEW NON-FUSION FACILITIES
- EVALUATE TIME AND COST REQUIREMENTS
- SCOPE AND COMPARE CONCEPTS FOR FERF

HIGHLIGHTS OF EFFORT DURING FY85 (CONT'D)

- BEGIN EFFORT ON:
 - DEVELOPING ALTERNATIVE PATHWAYS AND LOGIC FOR EACH SUBSYSTEM
 - SCOPING ALTERNATIVE PATHWAYS FOR FUSION TECHNOLOGY R&D
 - DEVELOPING A METHODOLOGY FOR COMPARING PATHWAYS
 - ASSISTING INTERNATIONAL COMMUNITY IN DEFINING AREAS OF COMMON INTEREST

- WORK ON BLANKET, TRITIUM AND SHIELD COVERED ALL STEPS (BLANKET RECEIVED LARGEST PART OF RESOURCES)

- WORK ON PIC COVERED ONLY ISSUES AND CLASSES OF FACILITIES

- PROVIDE ASSISTANCE TO TPA

HIGHLIGHTS OF EFFORT DURING FY85 (CONT'D)

REPORTS, MEETINGS

- PHASE 1 REPORT TO BE ISSUED IN NOVEMBER 1985

- INTERNATIONAL WORKSHOP HELD IN MARCH 1985

- ADVISORY COMMITTEE MEETING HELD ON 31 JULY 1985

- SPECIAL ISSUE OF NED/FUSION IN PREPARATION

PLANS FOR FY86

- (ASSIST TPA AS MUCH AS PRACTICALLY POSSIBLE)

- NON-FUSION EXPERIMENTS AND FACILITIES
 - BLANKET/FIRST WALL, TRITIUM AND SHIELD
 - DETAILS ON NEARER TERM EXPERIMENTS AND FACILITIES
 - EMPHASIZE PRACTICAL EXPERIMENTAL CONSIDERATIONS (E.G., CAN WE REALLY GET MEANINGFUL INFORMATION, I&C?)
 - DEVELOPMENT & COMPARISON OF PATHWAYS
 - RECOMMENDATIONS ON LOGIC, MAJOR EXPERIMENTS AND FACILITIES

 - PIC
 - APPLY FINESSE PROCESS STEPS
EXPERIMENT NEEDS
FACILITIES
PATHWAYS

PLANS FOR FY86 (CONT'D)

- ANALYTIC MODELLING
 - ENHANCE CAPABILITIES TO ANALYZE (ANTICIPATE) PHENOMENA
 - INVESTIGATE MODELLING NEEDS

- EXPLORE CONCEPTS, IDEAS FOR FUSION DEVELOPMENT FACILITIES

- IMPACT ON FNT EXPERIMENTS & FACILITIES OF:
 - NON-ELECTRIC APPLICATION
 - HIGH POWER DENSITY

- ASSIST IN DEVELOPING FRAMEWORK FOR FNT INTERNATIONAL COOPERATION

FNT AND INTERNATIONAL COOPERATION

- FNT PROVIDES UNIQUE OPPORTUNITIES FOR COOPERATION:
 - A. MANY AREAS OF COMMON INTEREST
 - BASIC AND PHENOMENA EXPLORATION REQUIRED EVEN IF FUSION DEVELOPMENT STRATEGY IS DIFFERENT
 - B. EXPERIMENTS & FACILITIES
 - SEVERAL
 - EACH IS OF MODEST COST

- JAPAN
 - UNIVERSITIES STARTED FINESSE-TYPE PROCESS (ACTUAL CONSTRUCTION OF FACILITIES IS RECEIVING HIGH PRIORITY)
 - JAERI IS VERY SUPPORTIVE OF INTERNATIONAL COOPERATION ON FNT

FNT AND INTERNATIONAL COOPERATION (CONT'D)

• CANADA

- SUPPORTIVE OF INTERNATIONAL COOPERATION
- PLAN FOR A FACILITY SOON

• EUROPE

- SUPPORTIVE OF INTERNATIONAL COOPERATION
- NEED MORE EFFORT TO COORDINATE WITHIN
EC

• USA

- VERY INTERESTED IN (ALSO POLICY)
INTERNATIONAL COOPERATION
- PREPARATION FOR INITIATIVES

FNT IN U.S. FUSION PROGRAM

- FNT HAS BEEN RECOGNIZED AS ONE OF THE FOUR MAJOR TECHNICAL ISSUES OF THE MAGNETIC FUSION PROGRAM PLAN (MFPP)

- MEMBERS OF THE FUSION TECHNOLOGY COMMUNITY MADE SERIOUS INFORMATION EFFORTS ON FNT ISSUES AND NEEDS (E.G., VARIOUS PRESENTATIONS IN MFAC AND OTHER TECHNICAL AND PROGRAMMATIC MEETINGS)

- FINESSE IS PROVIDING CLEAR AND SPECIFIC NEEDS ON CRITICAL EXPERIMENTS AND FACILITIES BASED ON TECHNICAL CONSIDERATIONS

- BUT, A LOT OF EFFORT IS NEEDED TO ACT ON IMPLEMENTATION
 - THIS REQUIRES DIRECT INTERACTION BETWEEN LEAD ORGANIZATIONS AND OFE

FUSION NUCLEAR TECHNOLOGY

- **Function**

- **Fuel Production and Processing**
- **Energy Extraction and Use**

- **Components**

- **Blanket**
- **PIC (First Wall, Limiter, etc.)**
- **Shield**
- **Tritium Processing**