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Idaho National Engineering Laboratory

Space Nuclear Thermal Propulsion

Evaluation of PIPET at the INEL's CTF

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PRESENTATION OUTLINE

- Study Scope
- Existing CTF Status & Infrastructure
- Assumptions
- Results
- Other Studies

SCOPE FOR FEASIBILITY REPORT

- Evaluate the Feasibility and Provide an ROM Estimate of Cost and Schedule for Testing the PIPET Reactors in the Contained Test Facility (CTF)

STUDY EVOLUTION

- Task was Identified at Meeting on June 11-12, 1992
- Task was Authorized to Start August 12, 1992
- Supported Three Meetings With Sandia
- Supported LANL Study for ETS-1

PIPET FACILITY REQUIREMENTS

Building	Size
• Receiving & Support Building	10,000 ft sq
• I & C Building	2,900 ft sq
• Reactor Systems Support (Test Building &Area)	Undefined
• Fuel Storage Support (Handling, Storage, & Shipping of Irradiated Material	Undefined
• Disassembly Building	7,500 ft sq
• Test Evaluation Center	6,400 ft sq

EXISTING CTF FACILITIES

- TAN 650 - Containment Building - 70 ft Dia by 129 ft High
- TAN 630 - Control & Data Acquisition Building - 18,000 ft sq
- TAN 624 - Containment Vessel Entry Building - 3,600 ft sq
- TAN 607 - Warm Shop - 4,080 ft sq
- TAN 604 - Maintenance Shop - 11,000 ft sq
- TAN 601/602 - Administration Building - 58,000 ft sq
- TAN THS - Hot Shop - 8,160 ft sq
- TAN THC - Hot Cell - 350 ft sq
- TAN 668 - Heavy Equipment Cleaning Facility - 2,800 ft sq

CTF BACKGROUND

- Contained Test Facility (CTF) was Loss-of-Fluid Test Facility (LOFT)
- LOFT was designed to study safety issues in a PWR
- CTF & associated facilities consist of a containment vessel, control and data rooms, maintenance shops, administrative buildings, hot shop, hot cells, warm shop, utilities, ES&H infrastructure
- CTF containment vessel is 70 ft. in dia. by 129 ft high, is an ASME Sect. III, Class B vessel rated at 40 psi, 360,000 cu ft volume with a 24 by 33 ft high door. 60 ft under 50 T Polar Crane

CTF REPORT ASSUMPTIONS

- PIPET/CTF test series will consist of testing five reactor cores and one technology demonstration engine.
- PIPET cores up to 550 Mw and run times up to 1,000 sec. Demonstration engine 1,000 Mw, Max. run time of 500 sec.
- Use of mechanical and electrical components and systems developed for SNTP.
- Determine feasible SNTP components and systems lay out for CTF.
- No design optimization of equipment and components.
- Existing INEL facilities and infrastructure will be used.
- No other programs or projects are assumed to restrict CTF use.
- Facilities will be upgraded to meet current codes and standards.
- Costs are based on SNTP Program.

ETS SIZE INFORMATION

PIPET COMPONENT SIZES

Component	Qty	Diameter (ft)	Length (ft)	Nozzle sizes (IPS)
Debris tank	1	15'-6" ID	30'-0" Tan.-Tan. ~38' Overall	24" ID inlet 60" OD outlet
Hot Gas Cooler	1	11' - 0" OD	60'	60" OD inlet 42" OD outlet
Process gas filter	4	9'-0" OD	30'-0" Tan.-Tan.	24" OD
Cryogenic mixer	1	4'-0" OD	5'-0"	
Noble gas adsorber	8	8'-0" OD	8'-0" Tan.-Tan.	20" OD

ETS COMPONENT ARRANGEMENT EVALUATION

Arrangement Option	Ramification
No Confinement	(1) Maximum radiological release
Reactor Only	(1) Maximum radiological release (2) Difficult materials problems
Reactor and Debris Trap	(1) Confinement of majority of particulate (2) Adequate access for maintenance (3) Single Large Containment Vessel Penetration Reqd.
Rx, Debris Trap, Heat Exchanger	(1) Confinement of majority of particulate (2) Adequate access for maintenance (3) Redesign of hx required (4) Several Large Containment Vessel Penetrations Reqd
RX, DT, Hx, Process Filters	(1) Confinement of all particulate (2) Reduced access for maintenance (3) Redesign of hx required (4) Several Large Containment Vessel Penetrations Reqd
RX, DT, Hx, Process Filters, Gas Adsorbers	(1) Confinement of all particulate (2) Very limited access for maintenance (3) Redesign of hx required (4) Several Large Containment Vessel Penetrations Reqd

PROPOSED ETS CONFIGURATION

- Size and Number of ETS Components Favored Locating Part of System Outside of Containment Vessel
- ETS Inside Containment Vessel Negated Flexibility for Other Test Reactor Programs
- Higher Temperature Components Located in Containment Vessel

The Cost Evaluation Results

- **A potential savings is possible from the use of existing facilities.**

CTF SCHEDULE

- Current Preliminary Project Schedule for PIPET starts In-pile Testing in 1st Quarter of 1997.
- INEL experience indicates that the design and procurement of large high-pressure storage tanks will be critical path.
- The use of existing CTF facilities will allow an earlier start of facility equipment installation.
- Significant reactor testing infrastructure exists to support the PIPET activities.

The PIPET schedule is not impacted at INEL.

The Bottom Line

The existing facilities are robust and provide ample space for the planned operations with the potential for both cost and schedule improvement.