

VLT Budget Information: FY2001/2002

<ul style="list-style-type: none"> • Program Element: 	CHAMBER TECHNOLOGY (MFE)
<ul style="list-style-type: none"> • Program Element Mission: (25 words or less) 	Identify an attractive concept, advance the underlying engineering sciences, and resolve critical feasibility and attractiveness issues for the Chamber Technology.
<ul style="list-style-type: none"> • Element Five-Year Goals: (list up to five) 	<u>Liquid Walls (LW's)</u> 1. Understanding of free surface fluid flow and plasma-liquid interactions 2. Operate flowing LW's in an experimental physics device (e.g. NSTX) 3. Construction of integrated thermofluid research facility for MFE/IFE 4. Understand advantages & implications of LW's in fusion systems. <u>Solid Walls</u> 5. Advance novel concepts that can extend the capabilities and attractiveness of solid walls 6. Contribute to international effort on key feasibility issues where US has unique expertise
<ul style="list-style-type: none"> • Relationship to FESAC Major MFE and IFE Goals: (25 words or less) (Goals List: Attachment III) 	Contribute to MFE Goals 2-4 and IFE Goal 2 - Innovation to reduce cost and time of R&D path - Enable plasma experiments in the near term (e.g. higher heat flux) - Contribute to substantial improvements in attractiveness of fusion energy systems
<ul style="list-style-type: none"> • Principal FY1999/2000 Achievements: (list up to five) 	<ul style="list-style-type: none"> • Identified promising concepts with high potential for attractive energy system and more affordable R&D path • Identified and prioritized key issues • Initiated modelling for free surface flows with MHD and plasma-wall interactions • Initiated experiments on free surface flows • Advanced 3-D modelling capabilities and conducted experiments on thermomechanics, deformation, and fundamental properties for pebble bed ceramics and Be
<ul style="list-style-type: none"> • Identify Key Connections to Other Program Elements 	Key linkages to plasma, heating/fueling, PFC, materials, safety, and system studies

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FY2001	
• President's Budget:	\$2737 K
• Expected Deliverables and Key Milestones: (list up to five)	<ul style="list-style-type: none"> • Operation and initial results of LW's thermofluid flibe simulant and MHD (APEX and US-Monbusho) • n-D MHD modelling for multi-component magnetic field $\kappa - \epsilon$ modelling for developing flow, plasma-liquid interaction modelling • Begin pre-conceptual design and initiate R&D for flowing LW in NSTX • Key scientific and engineering issues for LW's including thermofluid, materials, safety, and tritium • 2-phase Li flow with MHD and high-temp refractory alloy issues • Complete experiments on effective κ and interface h for ceramic breeders and Be. Initiate thermomechanics interaction experiments
• Participating Institutions and Proposed Funding:	APEX + ceramic breeders + neutronics UCLA (1185), ANL (310), ORNL (280), UW (150), LLNL (130), PPPL (190), GA (125), TSI (40), PNNL (5), SNLA (240), U. Texas (82)
• Issues:	<ul style="list-style-type: none"> • Work needed exceeds resources • US-Monbusho collaboration needs resources
• Incremental Request:	\$2300 K
• Additional Expected Deliverables:	<ul style="list-style-type: none"> • US-Monbusho thermofluid, flibe chemistry, tritium safety (\$500 K) (Japan will provide matching funds) • Enhanced national liquid wall initiative for NSTX and fusion energy (\$1000 K) • Define goals and preliminary features for MFE/IFE integrated thermofluid facility (\$200 K) • Maintain flibe loop and simple tests at ORNL (\$75 K) • Initiate integrated in-vessel testing of refractory alloys (GA - \$100 K) • Initiate construction of UNICEX (\$200 K)

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	• Others

FY2002	
<ul style="list-style-type: none"> • Flat Budget: (same as FY01 President's Budget) 	\$2737 K
<ul style="list-style-type: none"> • Expected Deliverables and Key Milestones: (list up to five) 	<ul style="list-style-type: none"> • Obtain experimental results from thermofluid facilities. Additional experiments to control fluids and enhance heat transfer • Modelling and experiments comparison for LW • Continue R&D for LW's in NSTX • Scientific engineering issues and design assessments for LW's • R&D for EVOLVE • Initiate construction of UNICEX for pebble bed thermomechanics interactions
<ul style="list-style-type: none"> • Incremental Request: 	\$2700 K - \$3200 K
<ul style="list-style-type: none"> • Additional Expected Deliverables: 	<ul style="list-style-type: none"> • US-Monbusho thermofluid, flibe chemistry, tritium safety (\$500 K - \$1000 K) • National LW's initiative for NSTX and fusion energy (\$1200 K) • Exploration of design and issues for MFE/IFE integrated thermofluid facility (\$300 K) • SiC bag test articles (ORNL – 250 K) • Perform integrated in-vessel testing of refractory alloy components (\$150 K – GA) • Participate in unit cell irradiation experiment (\$200 K) • Others