NEER FY 2001 PROJECT ABSTRACT	
Grant Number:	01ID14119
Project Title:	A Liquid Metal Bond for Improved Heat Transfer in LWR Fuel Rods
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Abstract:	It is proposed to replace the helium gas in the gap between fuel and cladding -with a liquid metal (LM) with -100 times larger thermal conductivity. The eutectic alloy of bismuth, tin, and lead, which melts at 100°C, is the LM of choice. The LM reduces the thermal resistance of the gap and so reduces fuel temperature. The cooler fuel reduces fission gas release. With LM bonding, the thermal resistance of the gap is no longer a design constraint; the initial gap size can be made large enough to eliminate closure during operation. The very desirable effect is the complete elimination pellet-clad mechanical interaction and all of the cladding failure mechanisms associated with stressed cladding. The large gap reduces the constraints on dimensional tolerances for the pellet, which means simpler and less costly fabrication. The project tasks are: 1) by laboratory experiments, demonstrate a fabrication process that can be scaled up to full-size fuel elements; 2) by laboratory experiments, assess the effect of fission gas release on the integrity of the LM bond; 3) calculate the neutronic (reactivity) penalty associated with replacing He in the gap by the Bi-Sn-Pb eutectic metal.