



# Office of Nuclear Energy FY 2010 University Program Workshop

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***High Temperature Materials***

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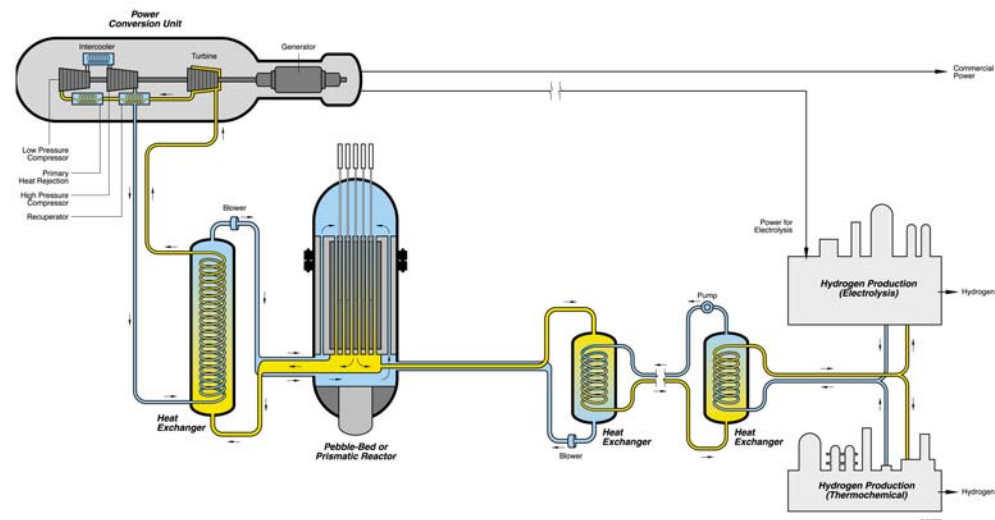
***Salt Lake City Hilton Center  
Salt Lake City, UT  
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# High Temperature Materials Overall Work Scope

- ◆ Alloys for heat exchangers and steam generators
- ◆ Pressure vessel steels
- ◆ Control rod sleeves and other core internals





## NEEDS FOR FY10-11

### ◆ VHTR Research Needs IHX Alloy Mechanical Properties

- Mechanisms of dynamic strain aging
- Mechanisms of strain localization and creep cavitation
- New strategies for creep resistant alloys at 1000°C and above
- Constitutive models for creep-fatigue of Ni based alloys



## NEEDS FOR FY10-11

### ◆ VHTR Research Needs Joining and Pressure Vessel Steels

- Microstructure/properties/processing relationships in diffusion bonding and brazing Ni based alloys
- Experimental/simulation methods to characterize negligible creep in pressure vessel steels
- NDE methods to characterize microstructure in heavy section ferritic-martensitic steels



## NEEDS FOR FY10-11

- ◆ **VHTR Research Needs Aging and Environmental Effects**
  - Mechanisms of environmental embrittlement
  - Alternatives to chromia forming alloys for high temperature environments
  - Resistance of protective oxides to thermal cycling/high velocity gas/particulate erosion
  - Methods for accelerated testing/simulation of very long term aging behavior



## NEEDS FOR FY10-11

### ◆ Generation IV Systems Materials R&D

- Environmental effects and long term thermal stability of interfaces in SiC/SiC composites
- Diffusion bonding and brazing thin section austenitic stainless steels
- New concepts for high temperature strength and irradiation resistance in austenitic alloys
- High creep strength – low thermal expansion alloys for application above 500°C