



EPRI-DOE Partnership Opportunities

DOE Workshop Meeting
Pittsburgh, Pennsylvania
November 8-10, 1999

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EPRI

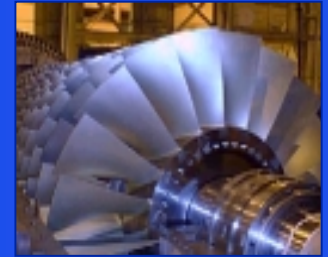
CARLA Workshop



October 19-21, 1999
Key Organizations Attending

- EPRI
- DOE
- Oak Ridge National Labs
- General Electric Company
- Siemens-Westinghouse
- WPAFB
- University of Connecticut
- Structural Integrity
- Lasson Technologies
- ABB
- BWD
- HOWMET
- Carolina Power & Light
- ENEL
- Southwest Research Institute
- JENTEK Sensors
- Solar Turbines

Key Recommendations



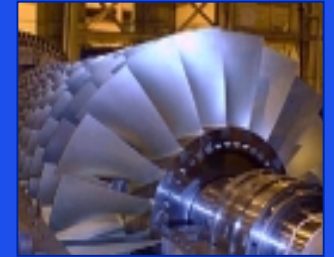
Advanced Combustion Turbine O&M

- Coating Life Prediction Models
- Coating NDE Methods Development
- Repair/Refurbish Technologies
- Sensors and On-line Monitoring Systems
- Material Properties Data

New Combustion Turbine Design

- Flexible Combustion Turbine Cycles
 - CHAT: Cascaded Humidified Advanced Turbine
- Durability and Surveillance

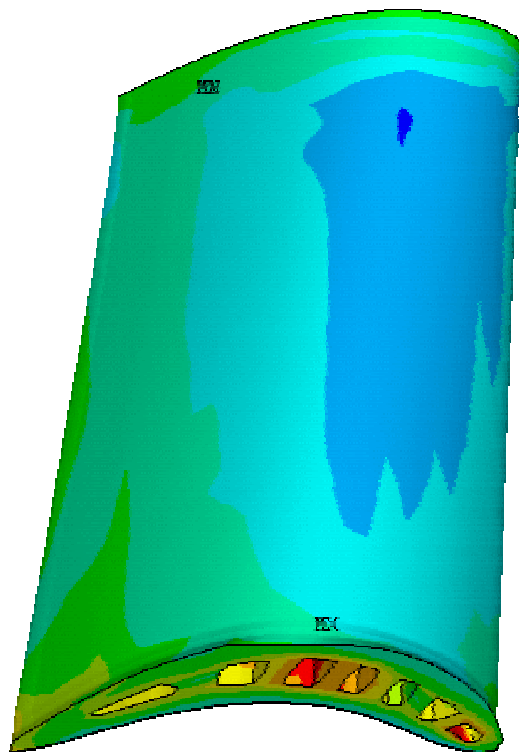
Coating Life Prediction Models



Develop mechanistic-based life assessment algorithms

- Metallic (MCrAlY) Coatings
 - Models for oxidation, spallation, depletion of aluminide barrier, diffusion and TMF
 - Calibrate models with actual field measurements
- Thermal Barrier Coating (TBC)
 - Models for calculation of initial TGO stress state and change in stability of TGO/bond coat interface
 - Calibrate models for varying cyclic duties (fired hours, starts)

Comparison of Predicted Stress with Surface Cracking on Suction Side



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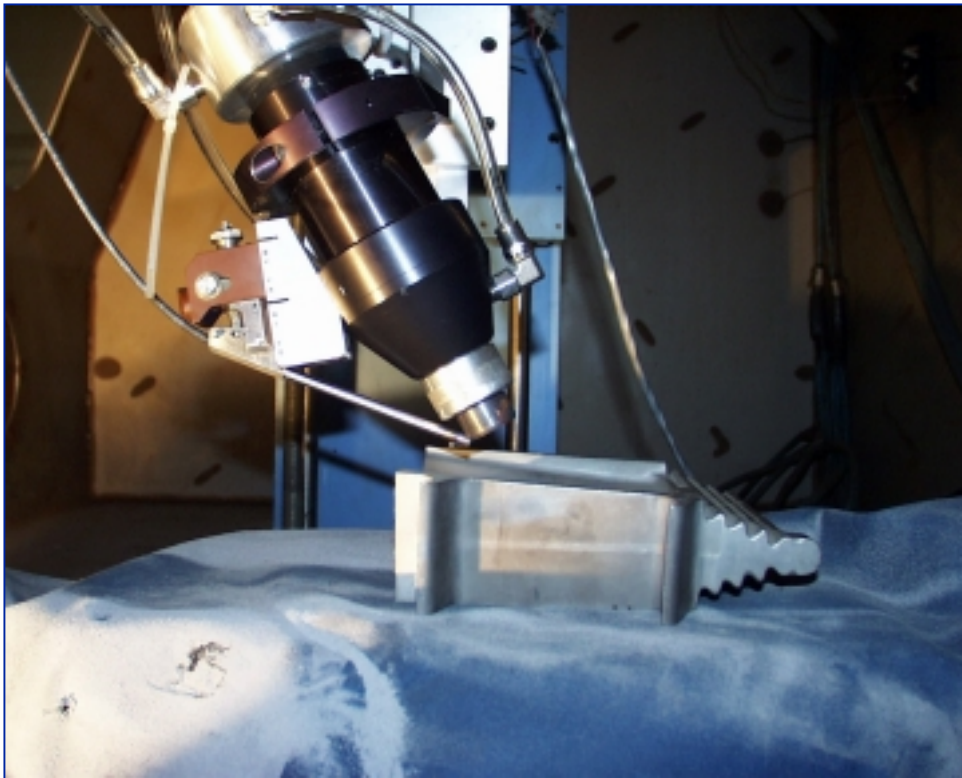
Coating NDE Methods Development



Develop advanced non-destructive evaluation methods to assess hot gas path (HGP) coatings during service life

- Assess Emerging Methods
 - Swept eddy current probe
 - Meandering-wandering eddy current technology
 - Laser-based ultrasonics
- Round Robin Evaluation
 - EPRI developing highly characterized materials specimens
 - Include instrument vendors, national labs, universities
- Field Validation

Advanced Repair/Refurbish Technology



Weldhead and powder feed nozzle

- Laser-weld repair technology
 - IN-738
 - GTD-111
 - Single-crystal
- In-situ thermal barrier coating repair
- Advanced materials repair guidelines

Sensors and On-line Monitoring



Develop sensors and systems for monitoring HGP components

- Temperature monitoring
 - Low-cost optical pyrometers with spectral analysis capability for TBC's
- Other sensors for damage measurement and detection
- Innovative in-situ sensor technologies
- Smart materials
 - Doped hot gas path materials that respond to NDE techniques like laser fluorescence

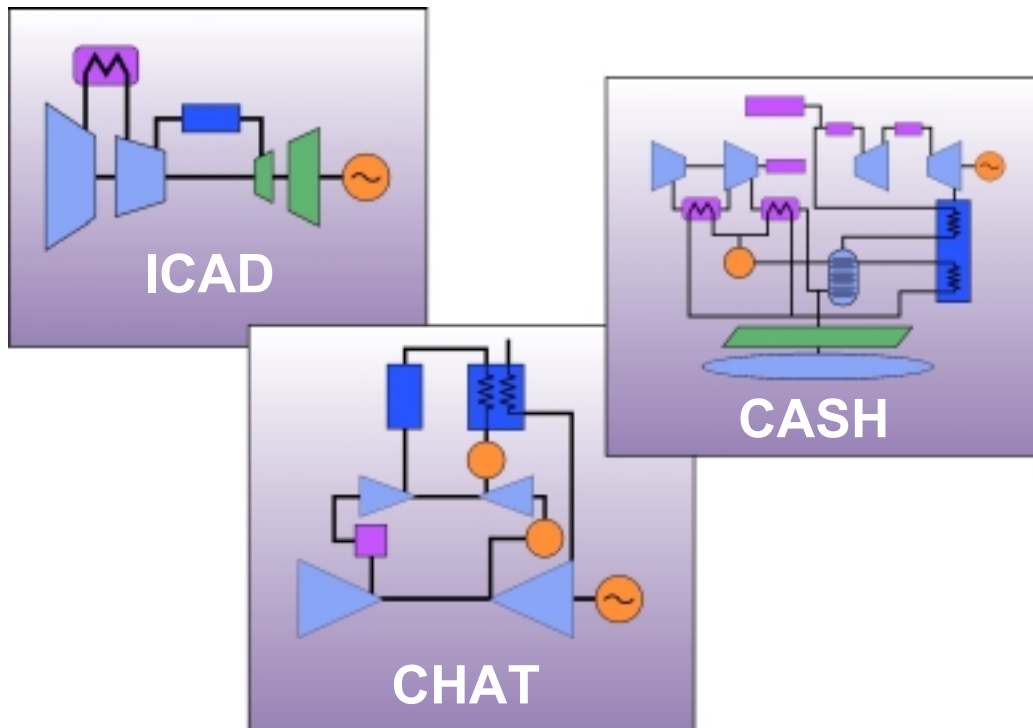
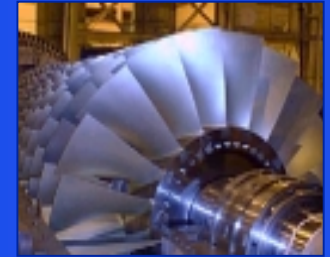
Properties of Advanced Materials and Coatings



Develop mechanical and physical properties database of advanced HGP materials

- Compilation of mechanical and physical properties of advanced blade materials most critical short-term need
- These properties required for development of key elements of comprehensive remaining life models
 - Aero-thermal analysis
 - Stress analysis
 - Mechanistic modeling
 - Oxidation and environmental (corrosive) effects
 - Fatigue/creep life consumption
 - Crack initiation and propagation

Advanced CT Cycles and Components



- Flexible machines for mid-range markets
- Humid air and storage cycles
- CHAT cycle demonstration

EPRI Durability Surveillance



On-Line Monitoring

- Performance
- Vibration
- Pyrometry

**Inspection &
Overhaul Data
for Life Cycle
Assessment**

**Design
Modifications Made
During
Commissioning**

CT Condition Monitoring and Inspection



- Eddy current coating life NDE
- Compressor performance monitoring software
- Exhaust gas debris monitoring