



# **ACR Water Critical-Heat-Flux & Post-Dryout Tests**



**Presentation for CNSC & US NRC  
Inspection Visit to Stern Labs  
D.E. Bullock  
Thermalhydraulics Branch  
March 17 2004**



**AECL**  
Atomic Energy  
of Canada Limited

**EACL**  
Énergie atomique  
du Canada limitée



# Outline

- **Objective**
- **Quality Assurance**
- **Scope**



# Objective

- **Update the experimental database for use in AECL's Fuel-Channel Thermalhydraulic toolset (NUCIRC, CATHENA, ASSERT and TEP)**
- **Confirmatory Data for**
  - **Inlet-Skewed Axial Flux Distribution**
  - **Applicable Radial Flux Distribution**
  - **Channel outlet pressures >12 MPa**
  - **Flow Rates of 25 to 28 kg/s.**



# Quality Assurance

- **Quality Assurance Plan to meet applicable requirements**  
**CAN/CSA-ISO 9001:1994,**  
**(AECL Report 108-125000-490-001,**  
**SL Report SLQP-068).**
- **AECL audits are planned;**
  - 1 during design & fabrication of the ACR simulator
  - 1 during testing of the simulator.



# **Scope (1) Phases of the Project**

- **Upgrade the Loop at Stern Labs to meet ACR flow conditions**
- **Design & Fabricate the Fuel Simulator**
- **Perform Critical-Heat-Flux and Post-Dryout Tests**



# Scope (2) Loop Upgrade

- **Upgrade the Loop to Operate at**
  - 13 MPa channel outlet pressure
  - Up to 29 kg/s flow rate
  - 14.5 MW of power
- **Upgrade & Commissioning to be completed 2005 August**



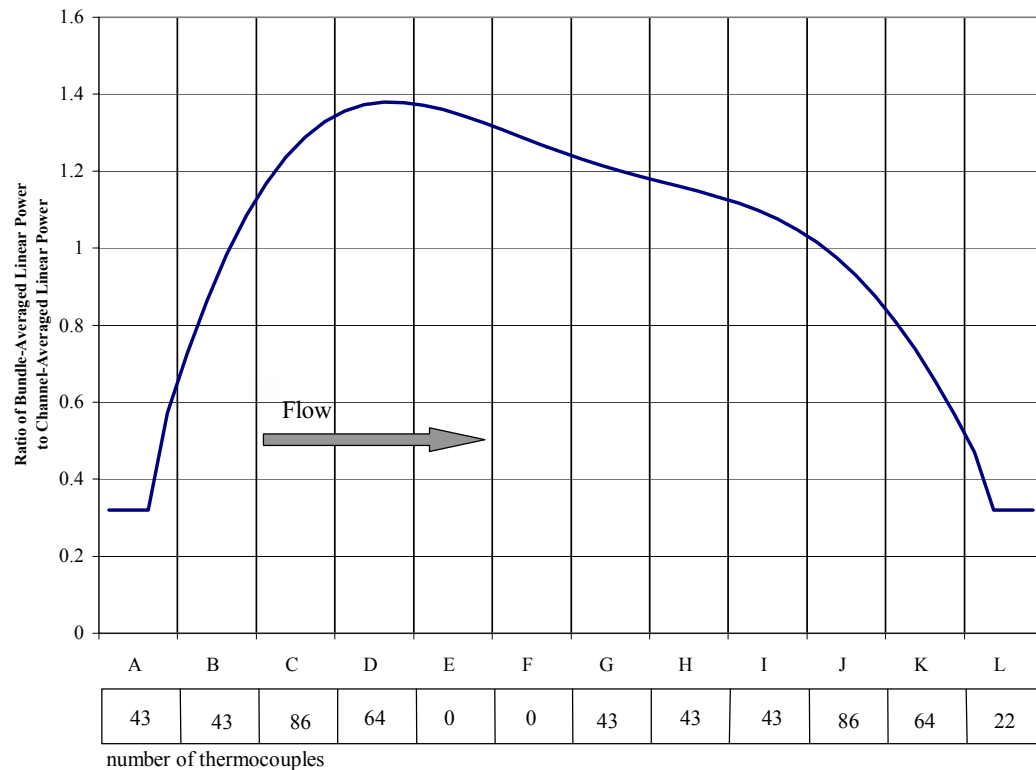
# Scope (3) Fuel Simulator

- **Design & Fabricate the 6-m Fuel Simulator**
  - **To Operate at 14.5 MW of DC Power, 14 MPa Pressure, 30 kg/s Flow Rate and 600°C Maximum Sheath Temperature**
  - **Inlet-Skewed Axial Flux Distribution**
  - **Appropriate Radial Flux Distribution**
  - **Approximately 600 Sliding & Rotating Thermocouples**
  - **Three Ceramic Flow Tubes to simulate 0%, ~2% and ~4.5% diametral creep**
- **Electrical simulator to be completed 2005 September**



# Scope (4) Fuel Simulator

- ACR 6-m Fuel Simulator Axial Flux Distribution







# Scope (5) Testing

- **Single-Element Tests**
  - Establish Measurement Uncertainties
  - Report on Uncertainties, 2006 March
- **Critical-Heat-Flux Tests**
  - CHF Data Report (uncrept), 2006 June
  - CHF Data Report (4.5% creep), 2006 September
  - CHF Data Report (2% creep), 2006 December
- **Post-Dryout Tests**
  - PDO Data Report (4.5% creep) July 2007
  - PDO Data Report (uncrept) October 2007



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The logo features a large, stylized blue letter 'A' on the left. The 'A' is composed of three thick, dark blue strokes. The top stroke is a diagonal line from the top-left to the top-right. The bottom stroke is a diagonal line from the bottom-left to the bottom-right. The third stroke is a vertical line that starts from the middle of the top stroke, goes down, loops around to the right, and then points upwards towards the top-right corner. To the right of the 'A' is the text 'AECL' stacked above 'EACL'. Both are in a bold, blue, serif font.