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PWROG Conclusions on AREVA and Westinghouse Test Facility Evaluations

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BACKGROUND

- Initial fuel assembly (FA) testing indicated that Westinghouse and AREVA assemblies behaved similarly and that further testing could be done at a single facility (Westinghouse STC)
- Confirmatory testing of AREVA FA (at CDI) at low particulate-to-fiber ratios (p:f) showed significant difference in the test results.
- While, there no reason to doubt the results of the test results questions arose regarding reason for the difference:
 - Difference in test facilities?
 - Difference in each vendor's FA design

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RECENT ACTIVITY

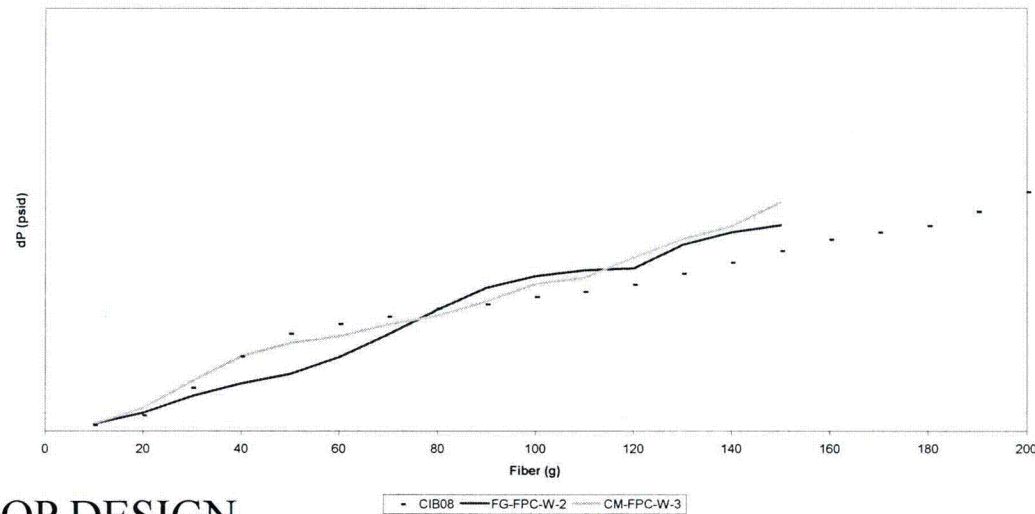
- Westinghouse and AREVA independently generated reports regarding differences in test facilities
- PWROG considered these reports and issued its own report with conclusions
 - Draft sent to NRC on 5/7/2010
 - Submit the week of June 1, 2010

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PWROG CONSIDERATION OF VENDOR REPORTS

- Higher p:f ratio fuel assembly (FA) testing indicated that Westinghouse and AREVA assemblies behaved similarly.

Pressure Drop Across Entire Fuel Assembly with Fiber Load
[dP (psid) vs Fiber Addition (g) - Hot Leg Break Tests w/ Similar Particulate Load]



- TEST LOOP DESIGN
 - o Components in each test loop are functionally identical.
 - o Flow rate and flow path in both facilities are the same.
 - o City water used in both loops; 100 gallon initial water fill, both circulated for approximately 30 minutes prior to debris introduction.
- FLOW RATE REQUIREMENTS
 - o Both facilities perform the same regarding ability to meet and maintain defined flow rate requirements.
 - o Both facilities met +/- 10% control of target flow rate for each test, as established in the testing protocol.

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- HARDWARE

- o Mix tanks:

- Both tanks open to atmosphere and continuously agitated per test protocol.
 - Mixing hardware is different (mechanical agitator versus flow recirculation), but this is not considered the source of test result differences since no settling was observed in either tank.

- o Simulated lower core support plate hole pattern: Same for both facilities.

- o Lower plenum length is different but not considered to cause difference in test results as stated in as stated in both vendor reports.

- o Gap between test section walls and fuel assembly is different

- AREVA performed “full-gap” test and concluded that gap size did not change pressure drop as stated in vendor report.

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- MEASUREMENT AND CONTROL

- o Instrument calibration programs at both facilities ensure integrity of measurements.
- o Pressure differentials measured at same locations in each facility.

- DEBRIS CHARACTERISTICS

- o NUKON fiber used at both facilities
 - Expected that batch-to-batch variation in fiber length and other characteristics is minimal, as controlled by the insulation vendor's manufacturing process.
 - For one difference that was identified (AREVA's use of unbaked NUKON versus Westinghouse's use of baked NUKON), AREVA repeated a test using fiber supplied by Westinghouse and noted no appreciable difference in test results. The results of this test also definitively put to rest any questions about the affect of fiber batch characteristics on the tests. Independent of batch characteristics, the same results were recorded.
 - It was postulated that differences in main circulation pumps and method of agitating the mixture in the main tank may have changed fiber size distribution downstream of the pump. Observations and photos do not show such differences. No clumping of debris was observed in either facility.

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- CHEMICAL SURROGATE PREPARATION

- o Both facilities adhered to established guidance in WCAP-16530-NP-A for chemical surrogate preparation and settling criteria.

- DEBRIS INTRODUCTION

- o Both facilities followed established protocol for introduction of particulate, fiber, and chemicals. Protocol followed at both facilities.

- TEST ARTICLE COMPARISON

- o Each facility tested a simulated 4-foot, 17x17 assembly
- o Westinghouse assembly used 6 spacer grids; most AREVA testing was done with 4 spacer grids
 - A test was run with AREVA assembly with 7 spacer grids, with no appreciable difference in test results.
- o There are differences in the Westinghouse and AREVA fuel assembly designs (proprietary). These were discussed at proprietary meetings last week.

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- CONCLUSIONS

- o No reason to cause one to doubt the validity of the results
- o Both facilities followed established testing protocol. The debris type, debris prep, hardware, and data collection requirements were met.
- o Small facility differences exist but are not considered to impact collection of debris throughout the fuel assemblies:
 - o Lower plenum length
 - o Turbulator
 - o Agitation of hold tank
- o Tests at high p:f values gave similar results at each facility. If significant differences in test facilities exist, it is expected that those test results would have been significantly different (i.e., not just at low p:f values as observed).
- o It is the opinion of the PWROG, the largest differences are in the designs of the Westinghouse and AREVA fuel assemblies. Based on the differences of the two designs, it is concluded this is the factor that caused the differences in test results at the low p:f ratios.

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- CONCLUSIONS (cont.)
 - o Reasonable assurance has been provided to provide for the results
 - o No reason to doubt the test results
 - o It is PWROG opinion that is not a facility issue
 - o No additional penalty needs to added to any fuel acceptance criteria