ATWS-I Rod Bundle Tests UNR

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Overview

- Steady State Testing:
  Considers variation in flow, pressure, subcooling, and power – Used to determine empirical quantities (critical power and spacer losses)
- Transient Testing:
  Considers variation in power, level, subcooling, fuel thermal time constant, hysteresis, and feedback coefficient – Used to determine conditions leading to failure to rewet

Testing Schedule

- Pre-insertion assembly witnessing test:
  August 1-3, 2016.
- Steady-state testing:
  August 8-15, 2016.
- Transient testing:
  August 29-September 12, 2016.
- Final testing data transfer:
  September 26, 2016.
- Documentation of the final testing:
  4th quarter CY 2016.

Test Matrix without Feedback

Test No.	Pressure bar	Inlet Subcooling K	Initial Power MW	Water Level
1	70	20.0	3.0	Nominal
2	70	20.0	3.0	Reduced
3	70	45.0	3.0	Nominal
4	80	20.0	3.0	Nominal

Test Matrix with Feedback

Feedback		Pressure (bar)	Fuel thermal Time Constant	Expected DR		Oscillation Magnitude		Record	Comments
	gain			Hyd.	System	Flow%	Power%	Time [min]	
0	0	70	2.5	0.5	-	Noise	Noise	10	
	Small			0.5	<1.0	Coherent	Coherent	3	
	Increase			0.5	~1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
						Large		Short	Dryout/rewetting, ΔT< 100 K
						Decay		2	
0	0	80	2.5	0.5	-	Noise	Noise	10	
	Small			0.5	<1.0	Coherent	Coherent	3	
	Increase			0.5	~1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
						Large		Short	Dryout/rewetting, ΔT< 100 K
						Decay		2	
1.0	Same	70	2.5	0.5	<1.0	Noise	Noise	10	
	Increase			0.5	~1.0	Coherent	Coherent	3	
	Increase			0.5	>1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
	Increase			0.5	>1.0	Large		Short	Dryout/rewetting, ΔT< 100 K
	0			0.5	-	Decay		2	
0.8	Same	70	2.5	0.5	<1.0	Noise	Noise	10	
	Increase			0.5	~1.0	Coherent	Coherent	3	
	Increase			0.5	>1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
	Increase			0.5	>1.0	Large		Short	Dryout/rewetting, ΔT< 100 K
	0			0.5	-	Decay		2	

Test Matrix with Feedback (continued)

Feedback		Pressure (bar)	Fuel thermal Time Constant	Expected DR		Oscillation Magnitude		Record	Comments
	gain			Hyd.	System	Flow%	Power%	Time [min]	
1.2	Same	70	2.5	0.5	<1.0	Noise	Noise	10	
	Increase			0.5	~1.0	Coherent	Coherent	3	
	Increase			0.5	>1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
	Increase			0.5	>1.0	Large		Short	Dryout/rewetting, ΔT< 100 K
	0			0.5	-	Decay		2	
0.0	Same	70	2.0	0.5	<1.0	Noise	Noise	10	
	Increase			0.5	~1.0	Coherent	Coherent	3	
	Increase			0.5	>1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
	Increase			0.5	>1.0	Large		Short	Dryout/rewetting, ΔT< 100 K
	0			0.5	-	Decay		2	
0.0	Same	70	4.0	0.5	<1.0	Noise	Noise	10	
	Increase			0.5	~1.0	Coherent	Coherent	3	
	Increase			0.5	>1.0	20%		3	
	Increase			0.5	>1.0	Large		1	Dryout inception
	Increase			0.5	>1.0	Large		Short	Dryout/rewetting, ΔT< 100 K
	0			0.5	-	Decay		2	

Questions?