

ENCLOSURE 2

M240066

Presentation Slides for BWRX-300 Stability Pre-Application Meeting

Non-Proprietary Information

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BWRX-300 STABILITY

Outline

Context for discussion

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- **BWRX-300 Key Stability Claims**
- **NEDC-33912P-A Limitation and Condition**
- **Example BWRX-300 Stability Decay**
- **Example Core Wide Dominance Demonstration**
- **Cycle Specific Conditions**
- **Methodology**
- **Qualification**
- **Conclusion / Discussion**

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BWRX-300 Key Stability Claims

Power oscillations which can result in conditions exceeding specified acceptable fuel design limits are not possible (key GDC 12 compliance).

- Maximize Natural Circulation Flow
- Higher core inlet loss (decreasing ratio of 2 phase / single phase loss)
- Decreasing core inlet subcooling
- No AOO leads to an instability

Regional Instability is not possible for this core size.

- Highly coupled, Small core size (240 bundles << 560 bundles)
- Analyses confirm core wide dominant

The BWRX-300 has features that prevent the loss of stability margin for upset events.

- BWRX-300 natural circulation design eliminates the possibility of a pump trip
- designed to have higher natural circulation flow than the natural circulation for forced flow plants
- BWRX-300 normal AOO defense line 2 function for a loss of feedwater heating initiates a SCRR1 to reduce the power from a loss of feedwater heating, increasing stability margin



BWRX-300 Design Features that Improve Stability

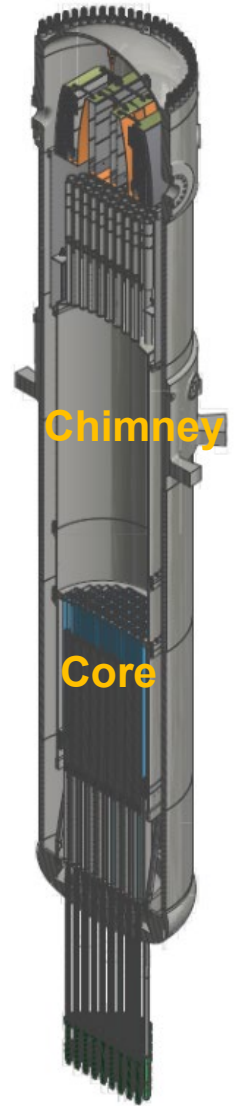
		Forced Circulation		Natural Circulation			
DESCRIPTION	Units	KKM	KKM	KKM	BWRX	DAEC	ESBWR
		rated	min pump	Nat. Circ.	Nat. Circ.	Nat. Circ.	Nat. Circ.
avg. bundle power	MWth	4.57	3.20	2.88	3.63	2.47	3.98
avg. bundle flow	kg/s	15.59	6.67	5.41	7.88	4.86	8.73
Most Important for Stability							
power/flow ratio	MWth/(kg/s)	0.29	0.48	0.53	0.46	0.51	0.46
core inlet subcooling	°C	11.9	23.2	26.6	11.7	24.1	18.3
core inlet orifice diameters	cm	6.0, 3.7			5.0, 3.7	5.31, 3.64	6.2, 3.5

- No forced circulation pumps that can trip
- Smaller core not susceptible to regional instability
- Compared to KKM in natural circulation
 - Power to flow ratio is lower
 - Inlet subcooling is much less
- Core inlet orifices are smaller in interior part of core (higher single-phase pressure drop in the interior part of the core)
- BWRX-300 reduces power when FW temperature decreases

BWRX-300 Reactivity Control LTR, NEDC-33912P-A

Limitation and Condition 5.3

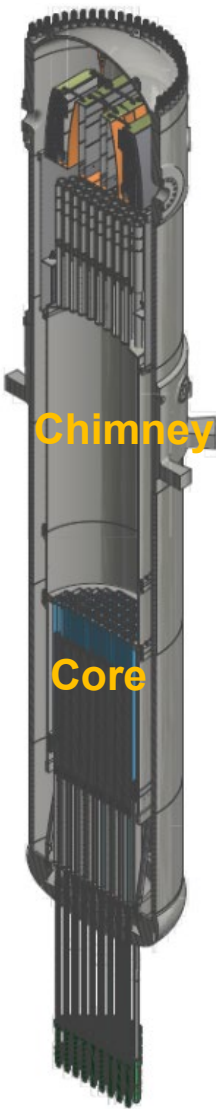
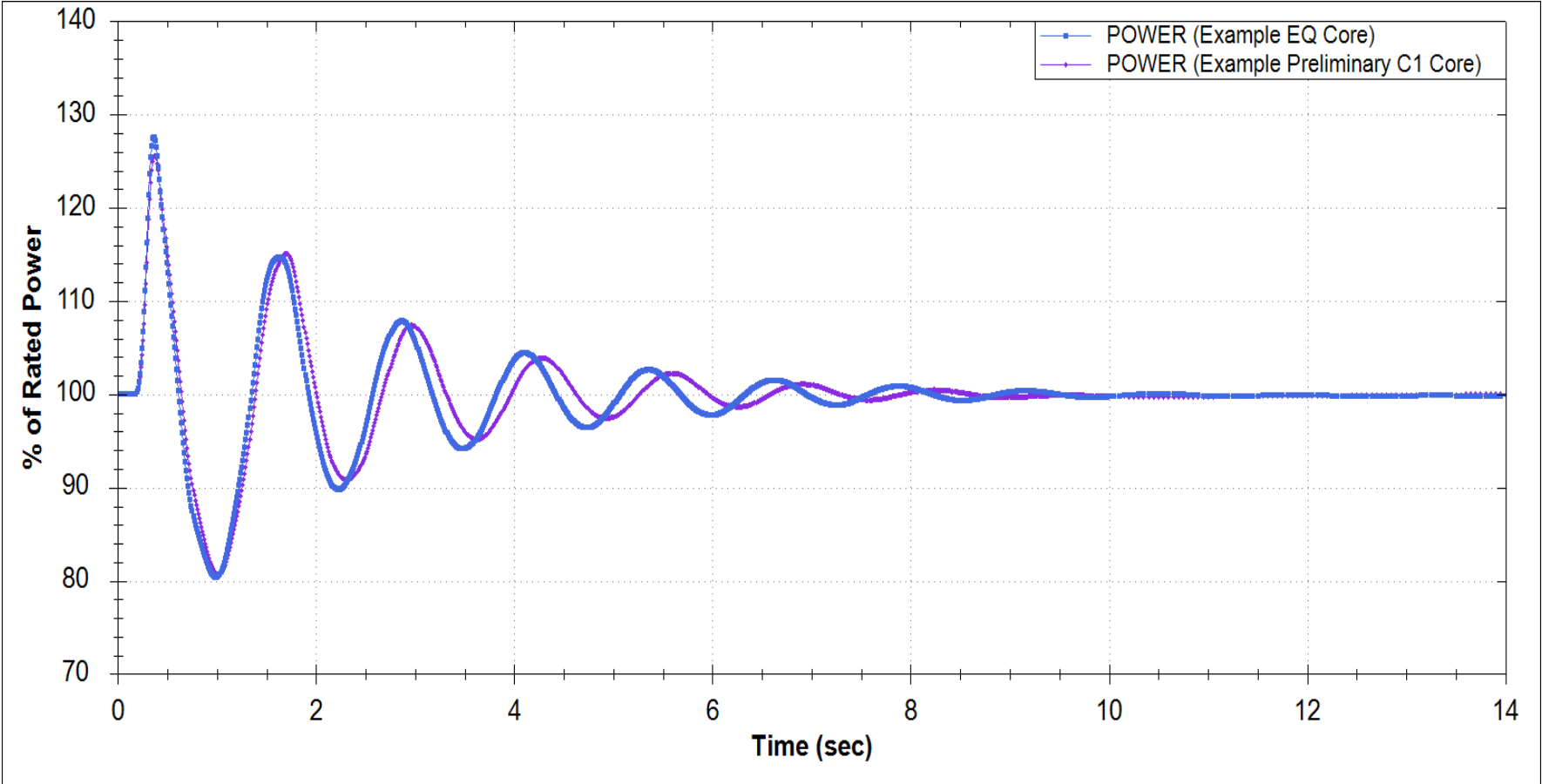
A stability analysis in accordance with an approved methodology to demonstrate that the BWRX-300 maintains a coupled power-flow response such that any operational perturbation, maneuver, or AOO that does not cause an immediate scram is naturally damped and decays quickly to steady state for all modes of operation; prevents SAFDLs from being exceeded; is not susceptible to regional or radial modes of oscillation; and includes necessary provisions to address cycle-specific conditions.



BWRX-300 Naturally Damped and Decays Quickly

Pressure Perturbation at most limiting conditions
No growing oscillations, therefore, SAFDLs met

Representative Results

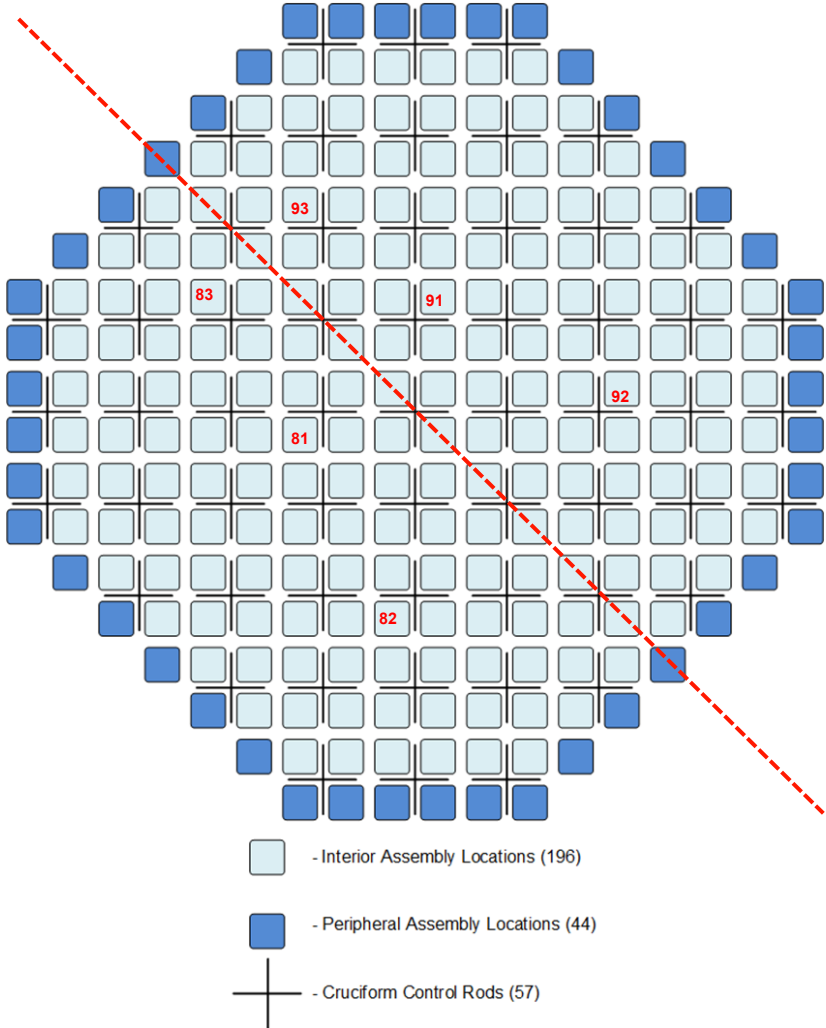
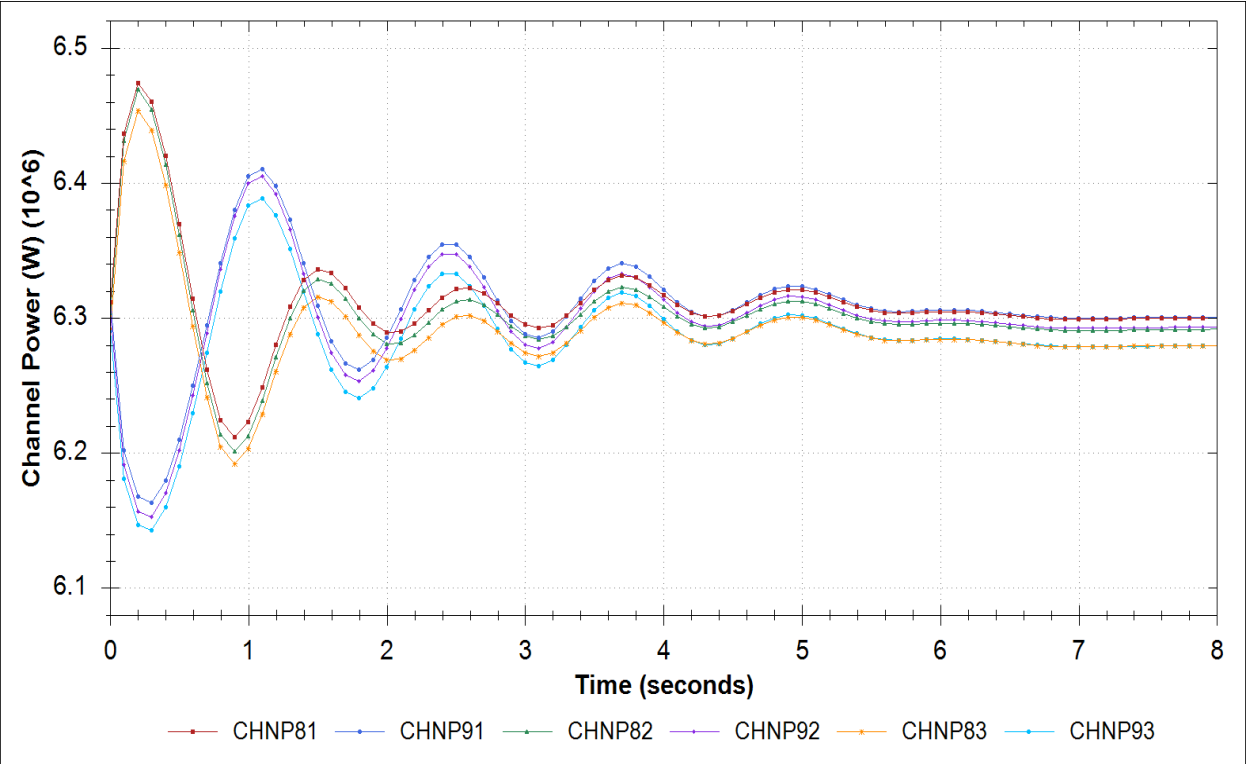


BWRX-300 Not Susceptible to Regional Modes

Analysis forcing regional mode quickly moves to core-wide, demonstrating core-wide dominance

Small Core – 240 Bundles, same as KKM Plant

Representative Results



BWRX-300 Cycle Specific Conditions

II

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FRIGG Qualification – Natural Circulation

II

Plant Data – NMP2 Instability Event

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Conclusion / Discussion

A stability analysis in accordance with (L&C from NEDC-33912P-A):

- “an approved methodology to demonstrate that the BWRX-300 maintains a coupled power-flow response”
 - Previously approved methods leveraged with each channel individually modeled which is supported by qualification data (qualification update can be confirmed via NRC audit of supporting PSAR information)
- “such that any operational perturbation, maneuver, or AOO that does not cause an immediate scram...for all modes of operation; prevents SAFDLs from being exceeded”
 - No AOO is an initiator for instability and SAFDL are not exceeded (described in PSAR)
- “is naturally damped and decays quickly to steady state”
 - BWRX-300 demonstrated to be naturally damped and decays quickly (described in PSAR)
- “is not susceptible to regional or radial modes of oscillation”
 - No regional mode of operation (described in PSAR)
- “includes necessary provisions to address cycle-specific conditions”
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Q+A

