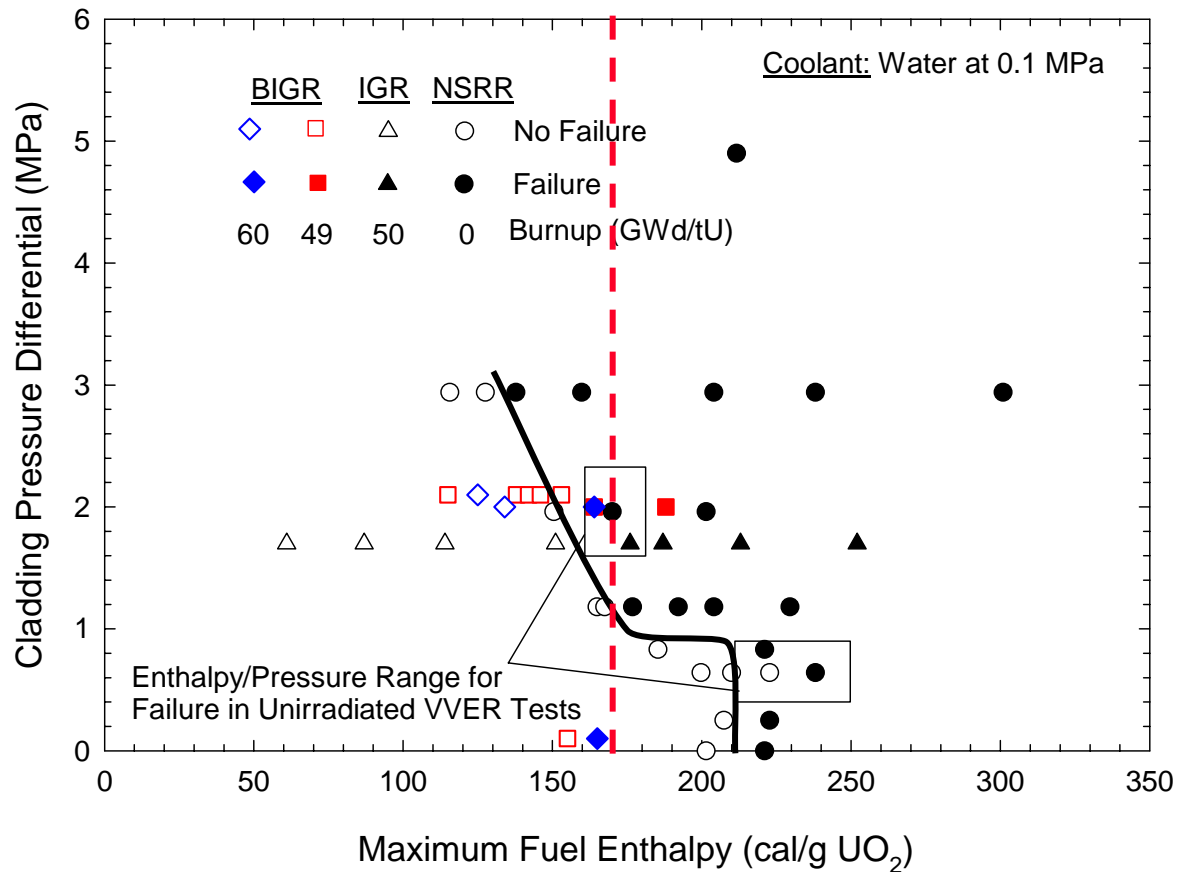


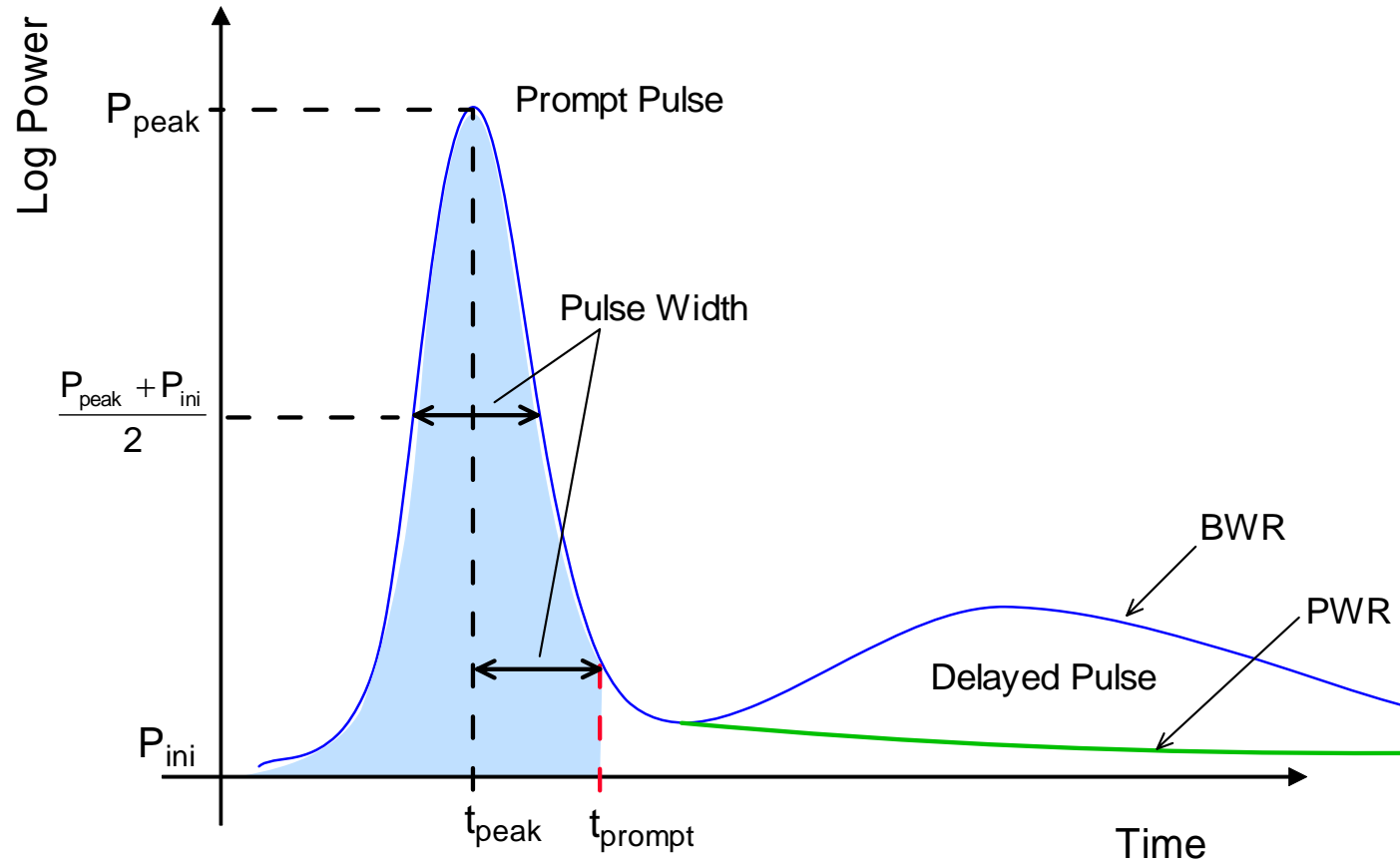
Industry Recommended Modifications to Interim RIA Acceptance Criteria Document (Support Slides)

2nd Public Workshop on the RIA Interim
Acceptance Criteria
December 19, 2006
NRC Offices

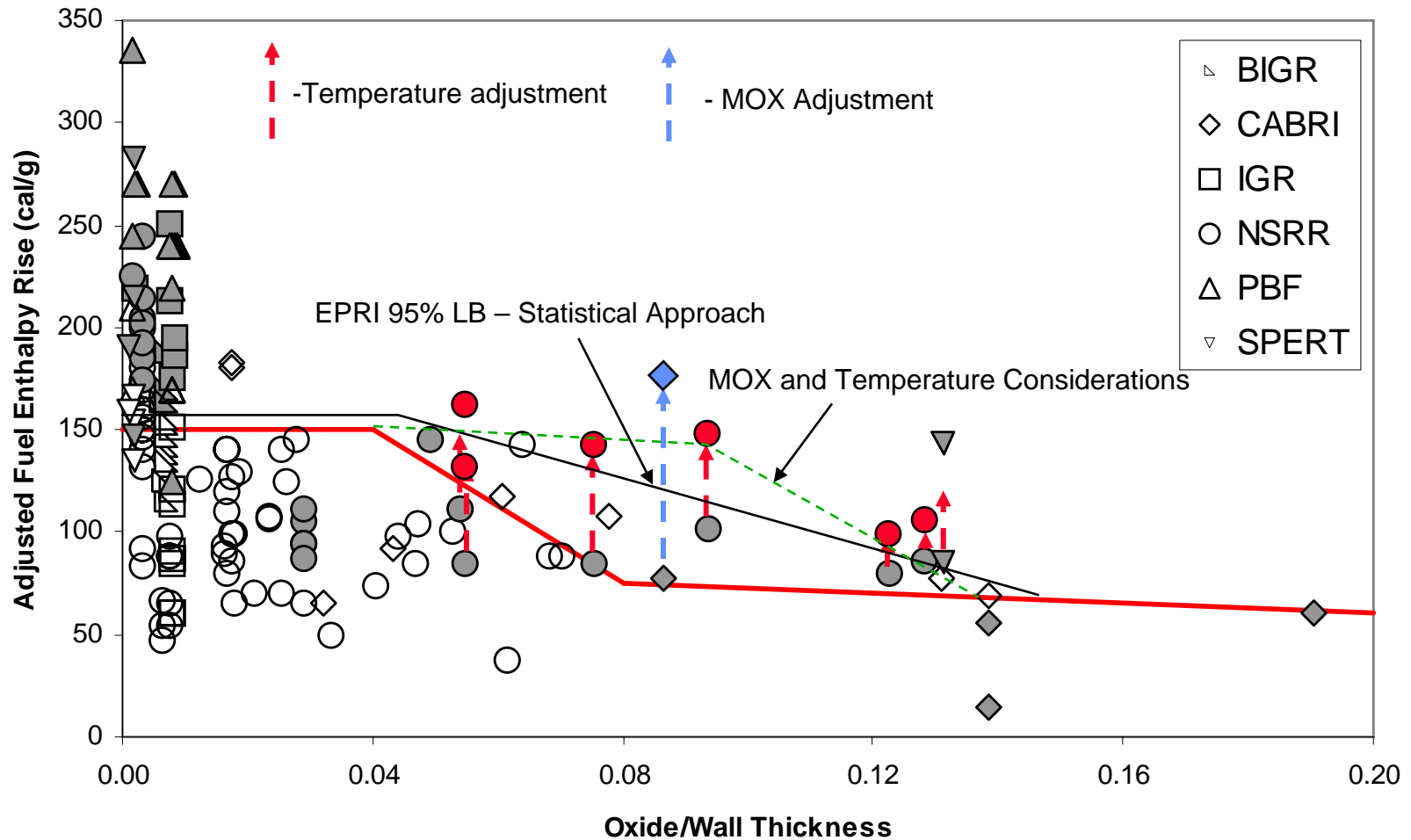
High Temperature Ballooning Failures



Prompt Enthalpy Rise vs Total



Alternative PWR Curves – Improved Consideration MOX and NSRR Tests

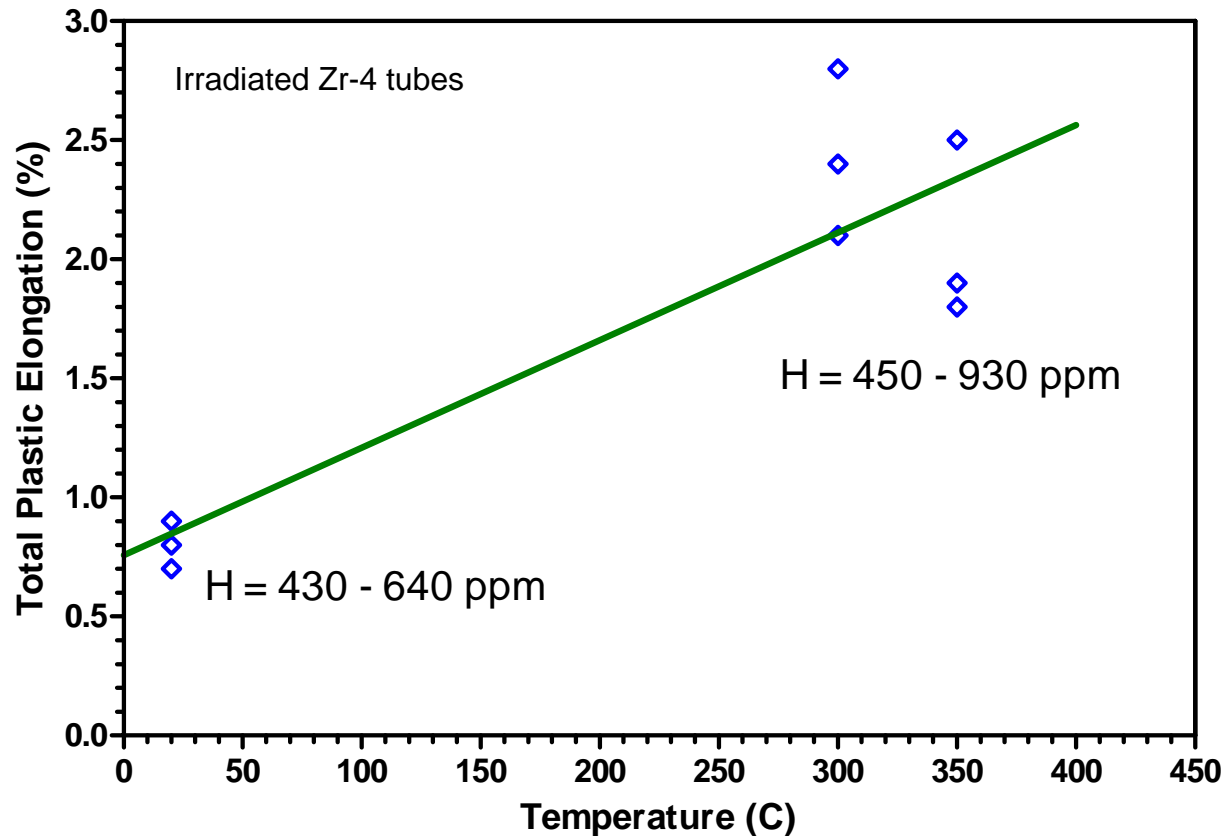


NSRR and CABRI Comparison

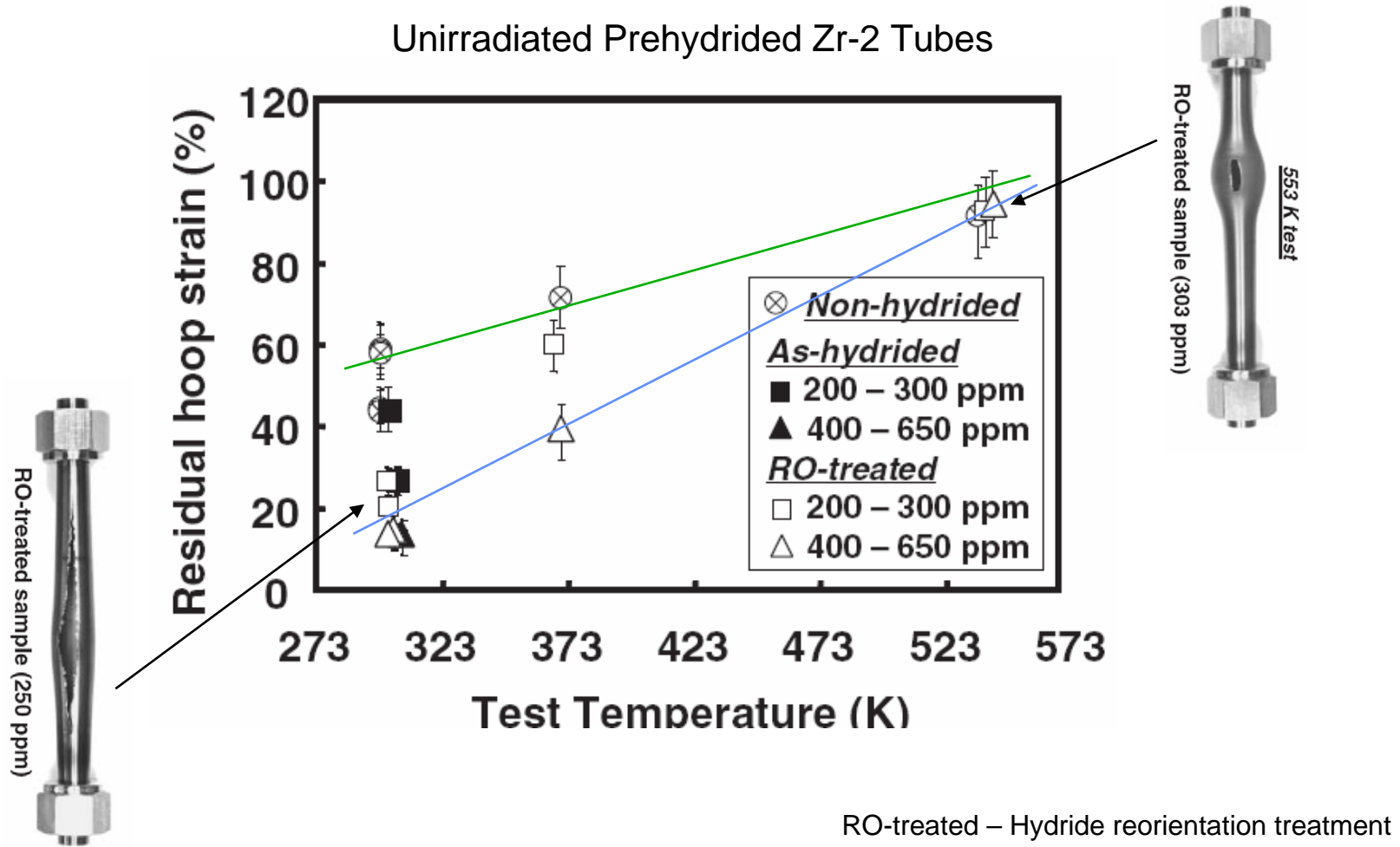
| Test | Material | Burnup (GWd/MT) | Test Temperature (°C) | Pulse Width(ms) | Oxide/wall Thickness | Failure Enthalpy Rise (cal/g) |
|---------|----------|-----------------|-----------------------|-----------------|----------------------|-------------------------------|
| VA-2 | Zirlo | 79 | 20 | 4.4 | 0.12 | 55 |
| CIP-01 | Zirlo | 75 | 280 | 32 | 0.14 | >75 |
| | | | | | | |
| HBO-1 | Zr-4 | 50.4 | 20 | 4.4 | 0.075 | 60 |
| REP-Na3 | Zr-4 | 54 | 280 | 9.5 | 0.08 | >109 |
| | | | | | | |
| TK-2 | Zr-4 | 48 | 20 | 4.4 | 0.055 | 60 |
| REP-Na6 | Zr-4 | 47 | 280 | 32 | 0.06 | >118 |
| | | | | | | |
| TK-7 | Zr-4 | 50 | 20 | 4.4 | 0.047 | 86 |
| REP-Na5 | Zr-4 | 64 | 280 | 8.8 | 0.044 | >93 |

Impact of Temperature on Total Elongation

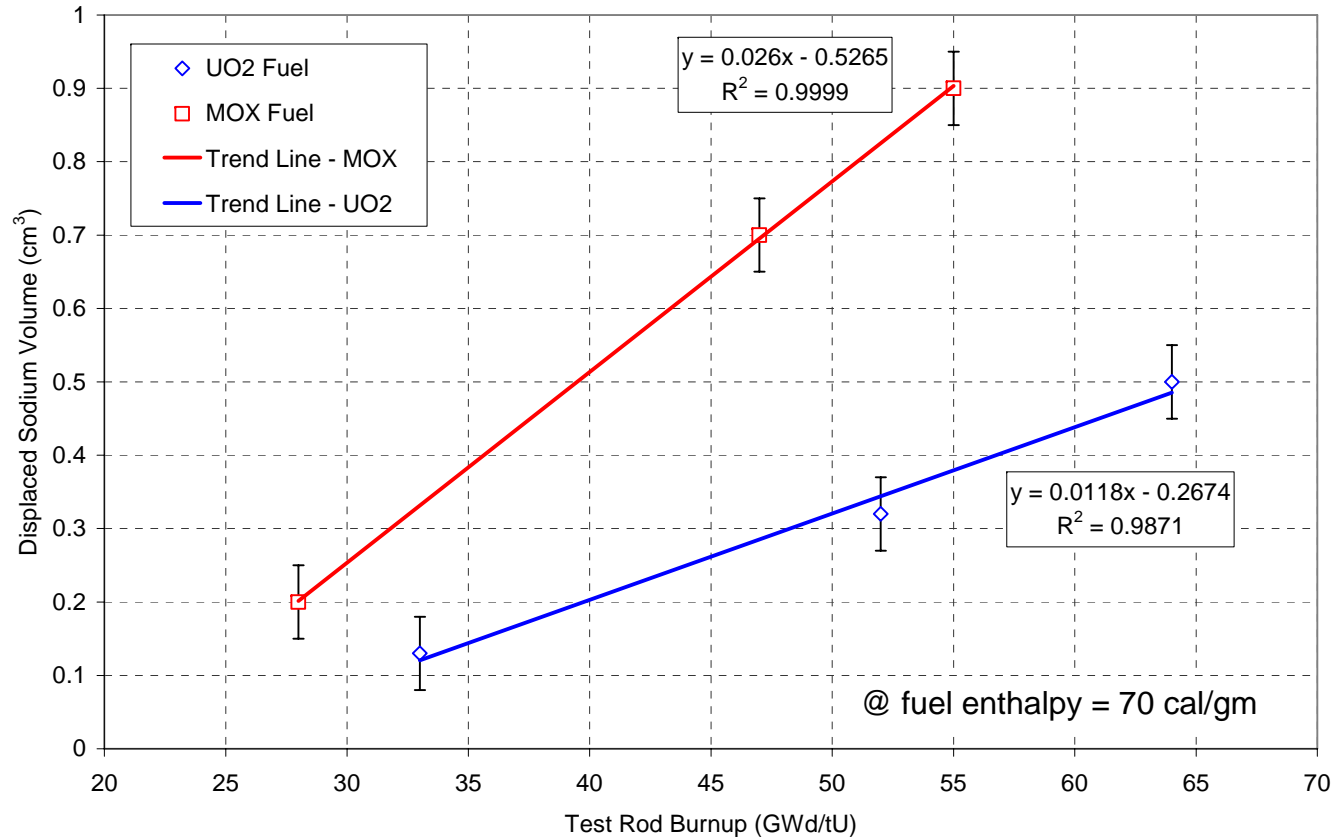
NFIR Burst Tests



Impact of Temperature on Hoop Strain

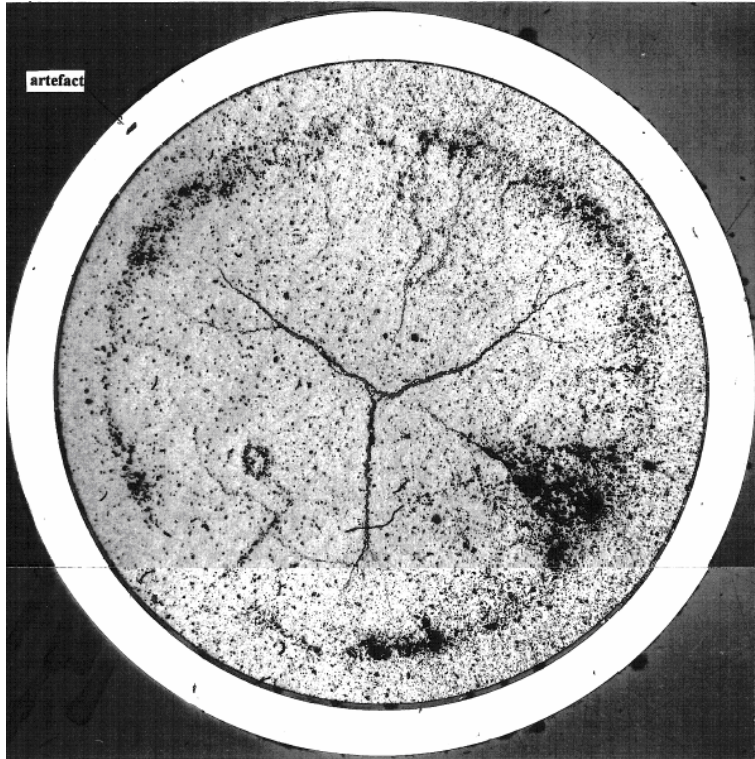


MOX Effect on Fuel Rod Expansion



Fuel rod volume expansion in MOX fuel 2-3 times larger than UO₂ fuel

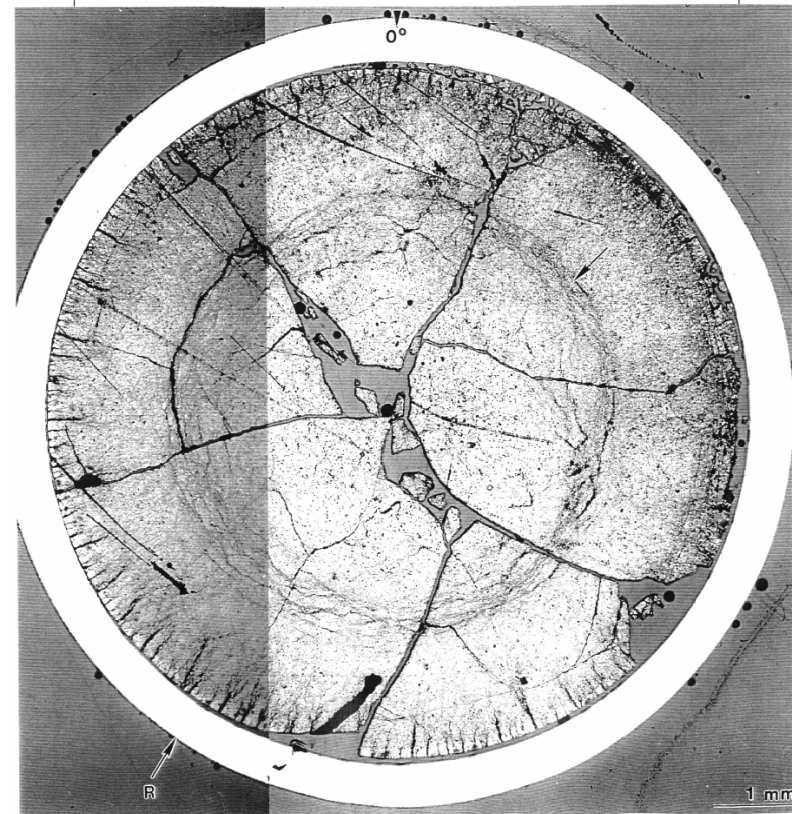
Comparison of UO₂ and MOX Pellet Behavior



REP Na-2

Bu = 33 GWd/MTU

H_{max} = 199 cal/gm

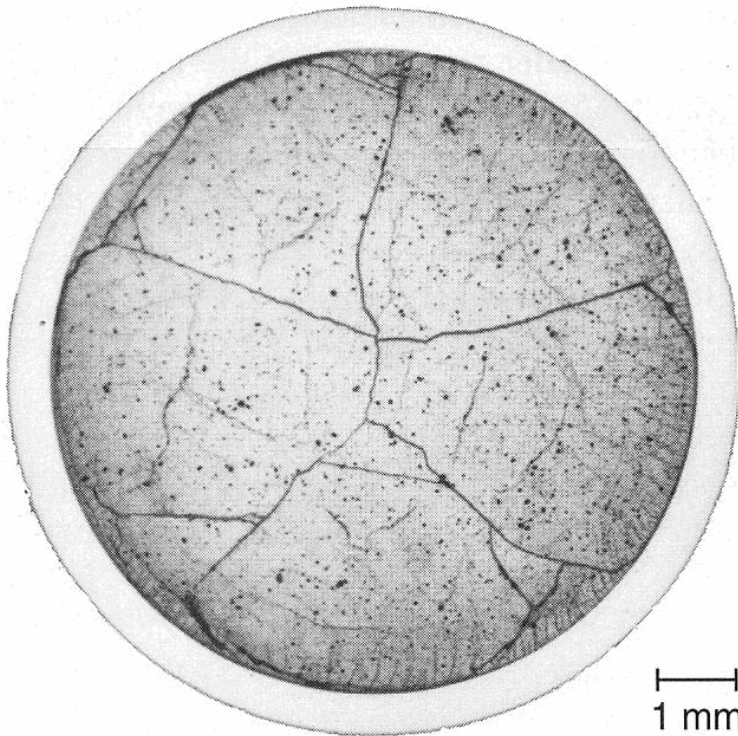


REP Na-9

Bu = 27 GWd/MTU

H_{max} = 197 cal/gm

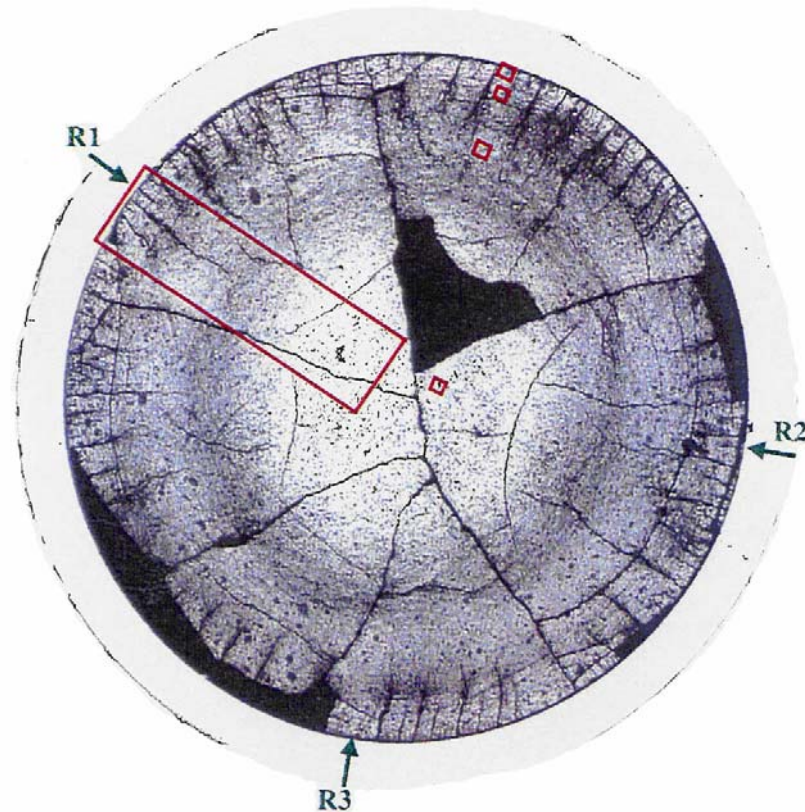
Comparison of UO₂ and MOX Pellet Behavior



REP Na-3

Bu = 52 GWd/MTU

H_{max} = 124 cal/gm

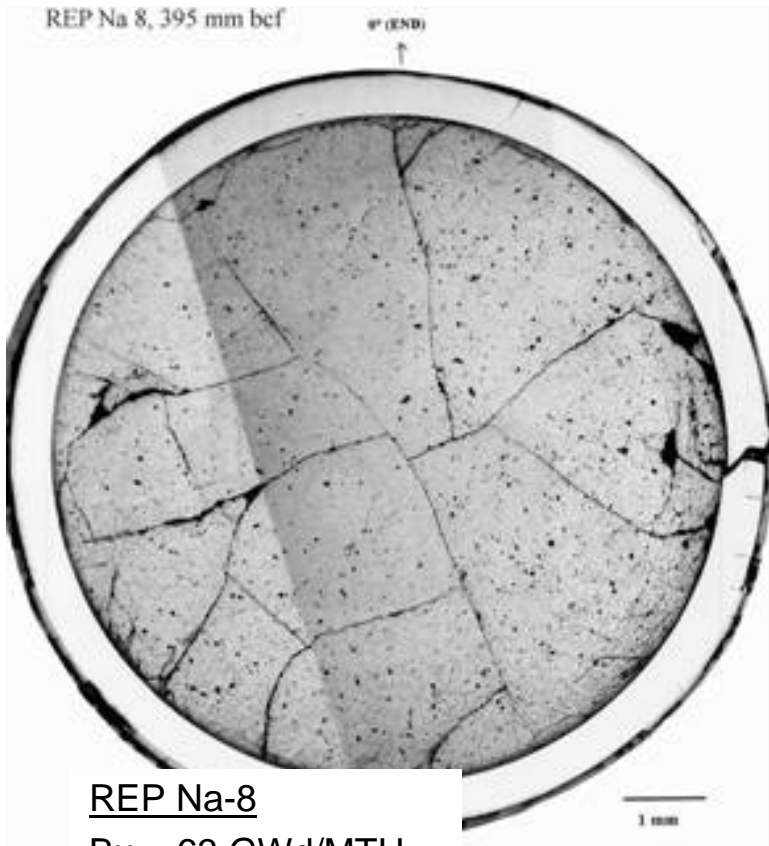


REP Na-6

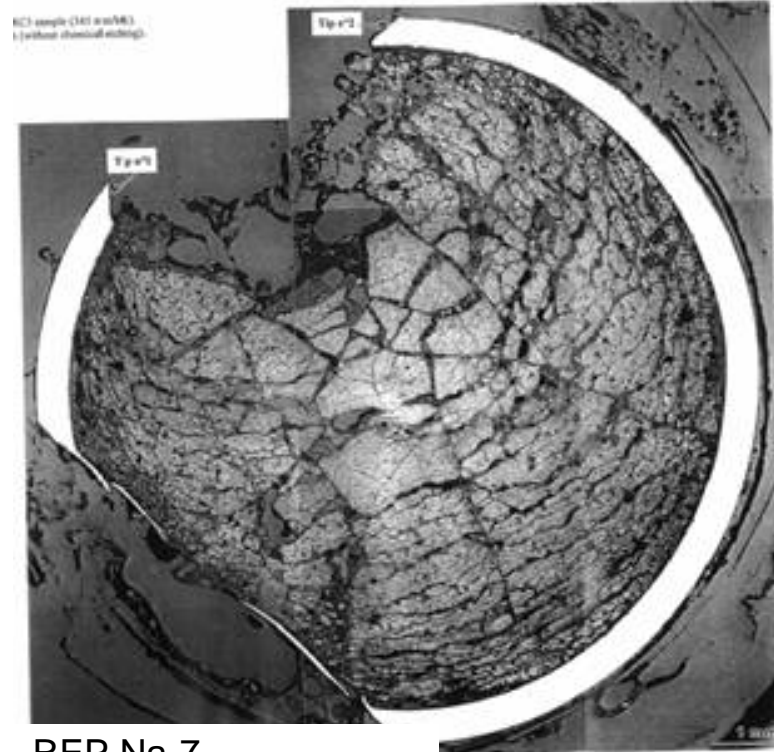
Bu = 47 GWd/MTU

H_{max} = 133 cal/gm

Comparison of UO₂ and MOX Pellet Behavior

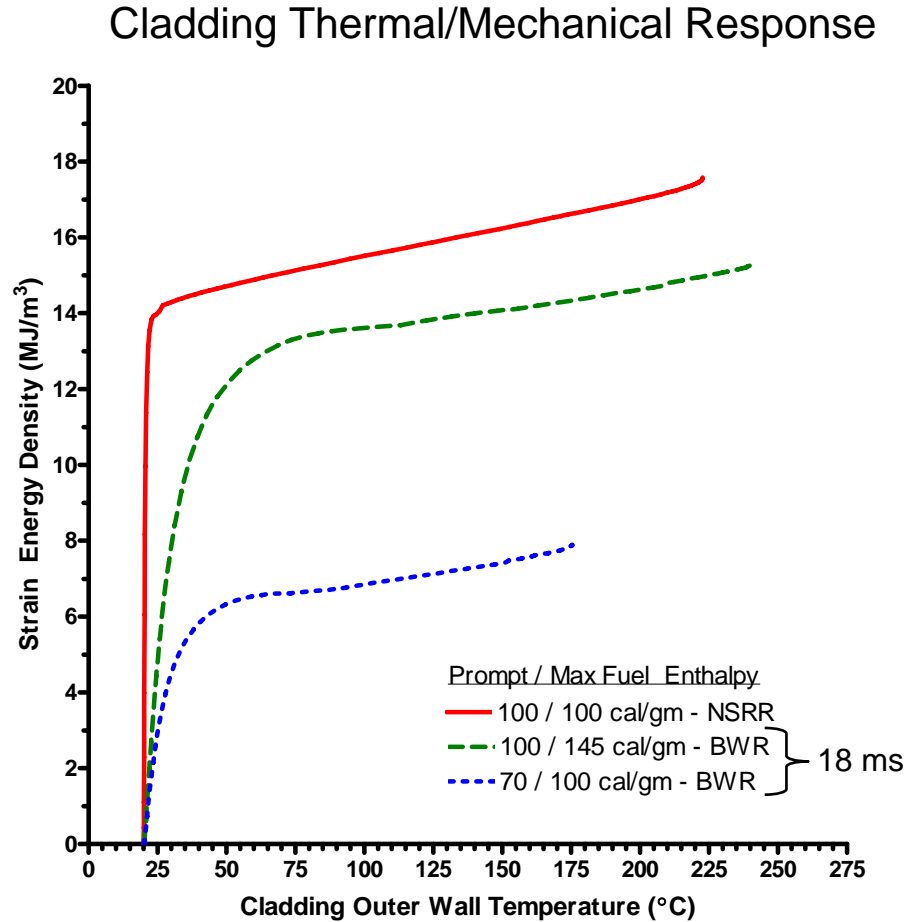
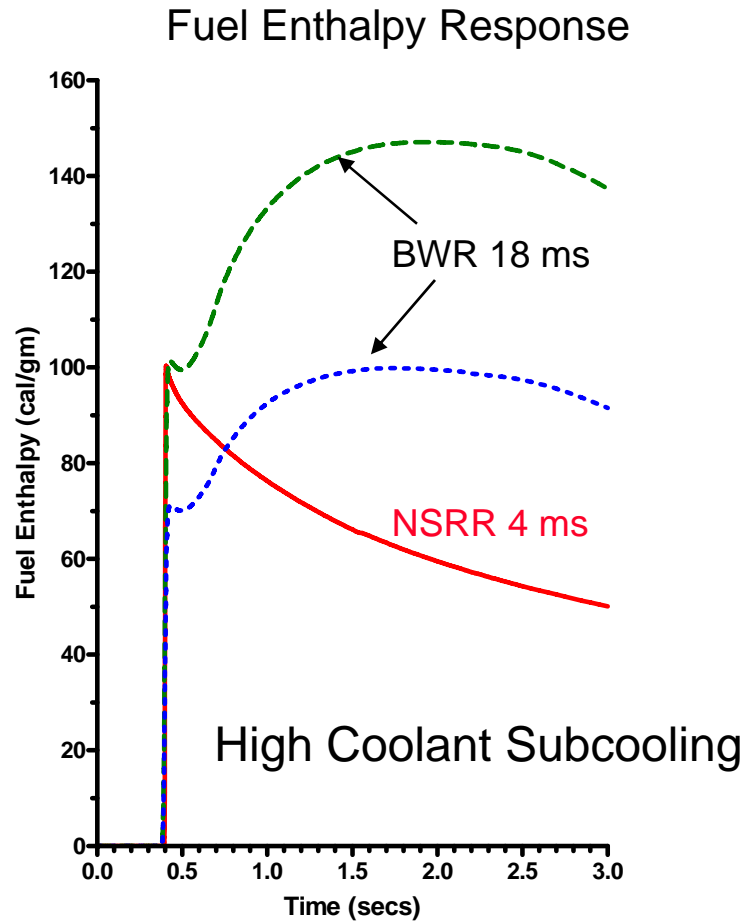


REP Na-8
 Bu = 63 GWd/MTU
 $H_{fail} = \sim 80$ cal/g
 $H_{max} = \sim 100$ cal/g



REP Na-7
 Bu = 55 GWd/MTHM
 $H_{fail} = \sim 113$ cal/g
 $H_{max} = 150$ cal/g

Fuel Rod Behavior NSRR vs. BWR CRDA



NSRR conditions are conservative and apply only to prompt energy deposition

PCMI Failures in High Burnup BWR Fuel

