

# PUBLIC SUBMISSION

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State-of-the-Art Reactor Consequence Analyses Reports

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77 FR 5281

## General Comment

NUREG-1935 draft should be sent back for complete rework to add the zirconium firestorm in steam key, leading severe accident phenomenon and its consequences.

There is only one reference to zirconium in NRC-2012-0022-0004: "These pellets are stacked and sealed inside long, slender, zirconium metal-based alloy (Zircaloy) tubes to form fuel rods". Zircaloy Mass in Fuel Cladding [kg / lb] 16,465 / 36,300 in the PWR and 40,580 / 89,500 in BWR from NRC-2012-0022-0002 and NRC-2012-0022-0003.

Zr (91) + 2 H<sub>2</sub>O (36) = ZrO<sub>2</sub> (123) + 2 H<sub>2</sub> (4) + 5 MJ/kgZr  
Water required for complete reaction for the PWR 16,465 \* 36/91 = 6513,6 kg or about 6.5 m<sup>3</sup> (available), it produces 16,465 \* 123/91 ZrO<sub>2</sub> = 22,255 kg zirconium dioxide and 16,465 \* 4/91 = 723.7 kg Hydrogen and 82,325 MJ heat. For a 10 second firestorm duration it gives 8GW power... or twice the full power of the reactor...

Water required for complete reaction for the BWR 40,580 \* 36/91 = 16053,6 kg or about 16 m<sup>3</sup> (available), it produces 40,580 \* 123/91 ZrO<sub>2</sub> = 54,850 kg zirconium dioxide and 40,580 \* 4/91 = 1784 kg Hydrogen and 204,250 MJ heat. For a 10 second firestorm duration it gives 20GW power... or five-six times the full power of the reactor...

Considering that NRC does not require a top of the reactor depressurization vent to prevent the zirconium firestorm in the reactor, the above back of the envelope calculated worst case scenario should be considered.

SOVSI Review Complete  
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