



serco

Serco Assurance

Presentation by

Christopher Dean

**Prompt Photon Production from
Fission Products**

!7 November 2003

Reactor Heating

- Overall reactor heating
10-12% of the energy is deposited by gamma rays.
- Major Photon Production Sources (equal proportions)
 - neutron induced fission(Prompt)
 - neutron capture (Prompt)
 - decay of fission and daughter products.
- The photons penetrate some distance from their birth
- Can cause some 80-90% of heating in non-fissile regions

Trend and Impact

- Fuel life extension
More higher actinides and
More FISSION PRODUCTS
- Heating
 - distortion of control rods
 - chemical damage structure e.g. graphite erosion rate.

Status of Evaluations

- Fission product range ($Z=35-70$)
- JEFF3.0 - 340 nuclides, 83 contain gamma source
4 in fission product range
- JENDL3.3 -337 nuclides, 114 contain gamma
source data. 31 in fission product range
natural isotopes of Zr, Mo, Ag, Cd, Eu and Er
the long-lived daughter products Zr-93 +Cd-13
- ENDF/B-VI-R8 - 329 nuclides, 98 contain gamma
source data.
15 in the fission product range.

Sources of Data

- ENSDF
- IAEA CRP Prompt Gamma-ray Neutron Activation Analysis
- Models for short lived fission products e.g Xe-135

Proposal

- WPEC Sub-group to assemble sources of prompt photons
- limit to fission product range
- IAEA CRP covers light + structural ELEMENTS
- Actinides need to be considered - being reviewed at Cadarache (Courcelle/Serot)