DE LA RECHERCHE À L'INDUSTRIE

REQUIREMENTS FOR FISSION PRODUCT YIELDS IN DECAY HEAT STUDIES

REUNION NEA WPEC 37 | V. VALLET, J-C BENOIT

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CONTEXT

Industrial challenges resulting from the calculation of the decay heat and of its uncertainty

- Deep impact on the design of emergency cooling systems
- Impact on the cooling time that is needed before maintenance,
- Impact on the design of transport waste casks and storage facilities

Propagation of nuclear data uncertainties on decay heat calculations

- Decay heat bursts
- MOX fuel of fast reactors
- MOX and UOX fuels of LWR
- …

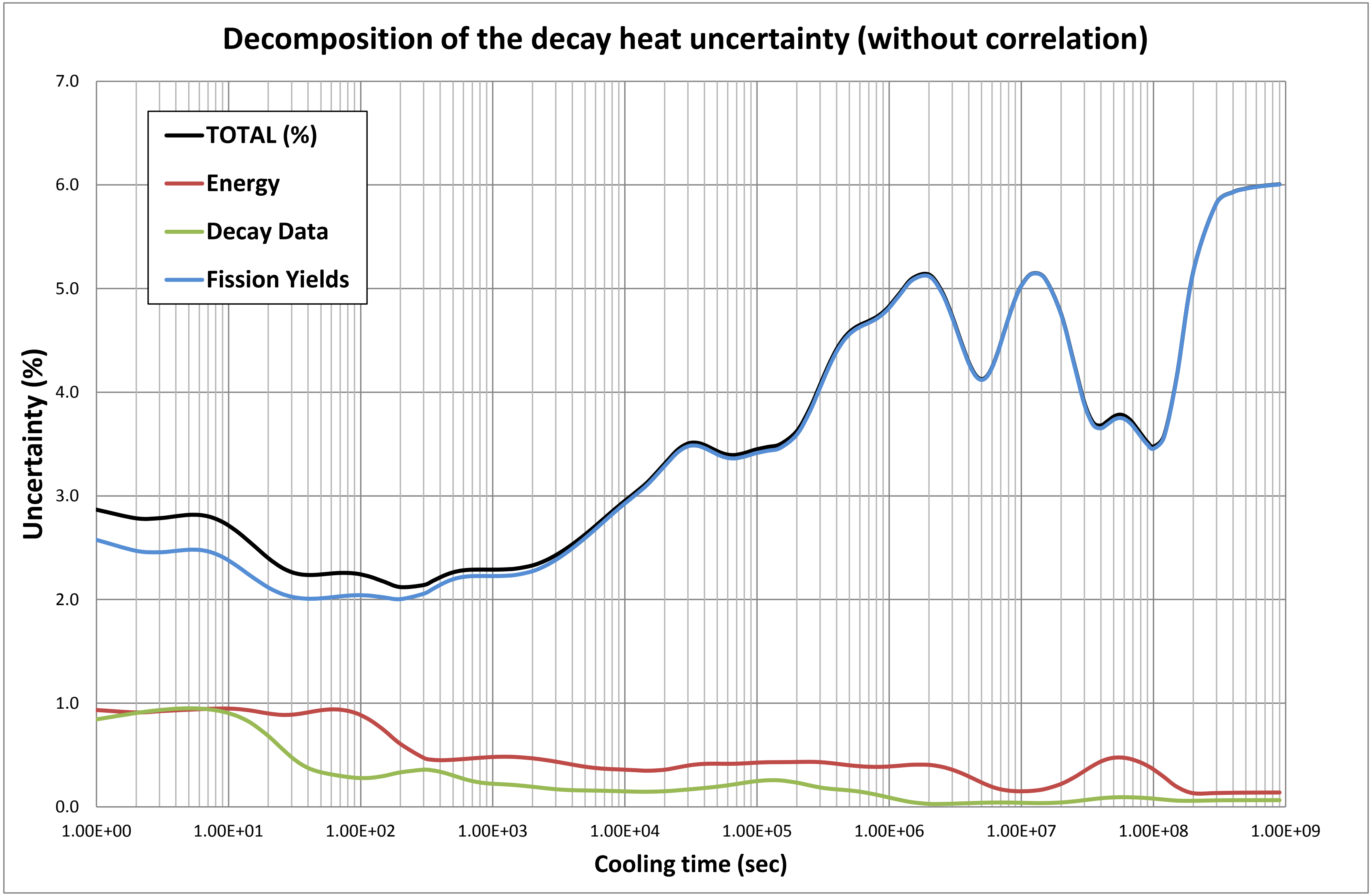
For example, in the case of the MOX fuel assembly of a LWR, the uncertainties of

- ❑ ~ 6500 fission yields
- ❑ ~ 800 periods and branching ratios
- ❑ ~ 120 cross-sections

are propagated.

IMPORTANCE OF FISSION YIELDS IN THE DECAY HEAT UNCERTAINTY

Example of the thermal fission burst of ^{235}U

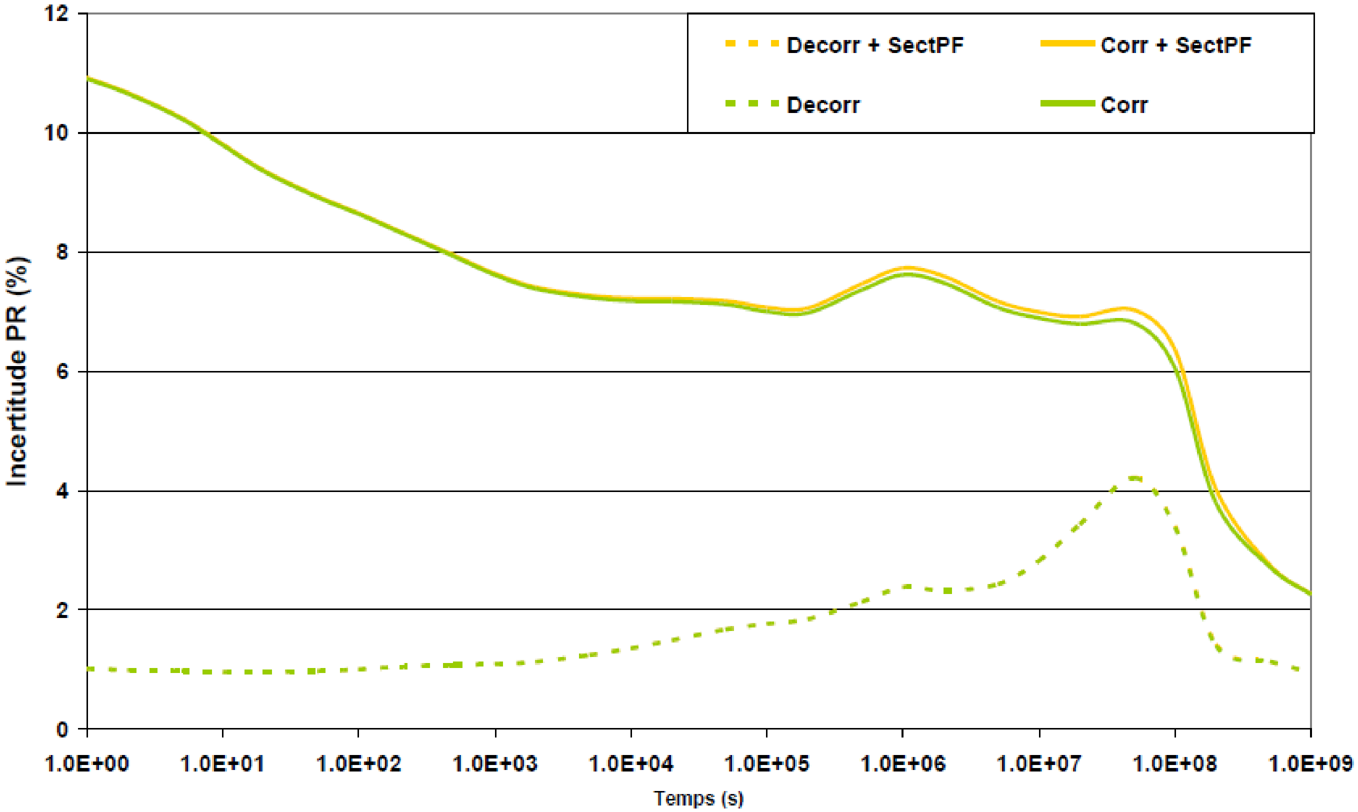


IMPORTANCE OF COVARIANCE DATA ON THE GLOBAL UNCERTAINTY

Example of the decay heat uncertainty of the MOX fuel of the PHENIX fast reactor (J-C BENOIT)

The following graph compares two calculations of uncertainty propagation :

- all correlations data = 0 (totally anti-correlated)
- all correlations data = 1 (totally correlated)



CONCLUSION

The uncertainty on decay heat results from the propagation of variance and covariances values of the nuclear data involved to describe the fuel during both depletion calculation and cooling time.

Individual **fission yield uncertainties** (no correlation taken) are the **main contributors** to the decay heat uncertainty.

The use of **covariance data** may have a **huge impact** on the final result.

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