SG39: Perspectives (G.Palmiotti and M.Salvatores)

1) Finalise deliverables

- **Deliverable on covariance data to be finalized in 1-2 months. Feedback on covariance analysis expected.**
- **More on methodology (how to avoid compensations, key issue). New developments in continuous energy cross sections adjustment (AREVA).**
  Next version of deliverable by November 2015
- **Sensitivity coefficients (MC vs deterministic, other issues)**
- **Produce report on the status of uncertainties of Am-241 (for critical sphere, criticality-safety issues)**

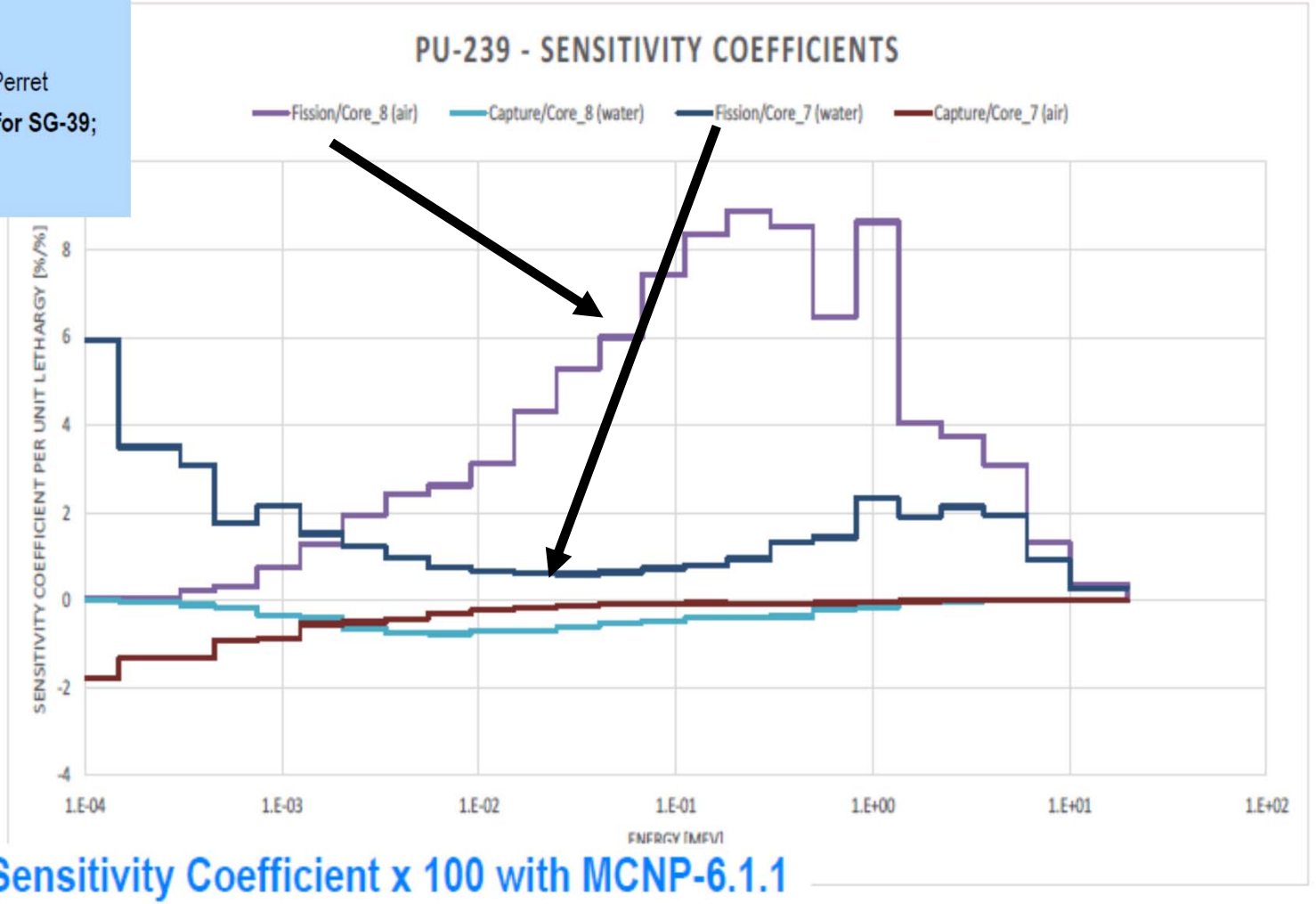
2) New experiments (separate effects) and their analysis:

- **PROTEUS (link between epithermal and fast energy range: k-infinity, void coefficient, reaction rate ratios): U-238, Pu isotopes**
- **Beff experiments (new inelastic information, but need delayed nubar uncertainty). U-238, Pu-239, U-235**
- **Variable adjoint experiments (e.g. SEG) to separate inelastic from absorption effects. Check experiment availability**
- **Neutron leakage experiments (RPI, CALIBAN?) mostly for U-238 and Fe-56 inelastic**
- **Possibly, selected neutron propagation experiments (inelastic, elastic). Mostly Fe, also Na-23**
- **STEK experiments? For now, in standby**

Fission and capture SC of water- and air-moderated core configurations (7 & 8)

Paul Scherrer Institut
Efstathios Vlassopoulos[a], Mathieu Hursin, Gregory Perret

PROTEUS FDWR-II (HCLWR) program summary for SG-39; Status of Re-analysis for Core 7, 8 & 9



Sensitivity Coefficient x 100 with MCNP-6.1.1

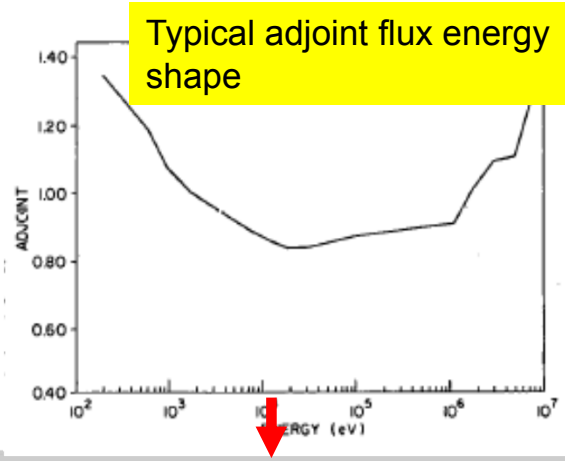
The energy-dependence of the adjoint flux (or neutron importance) is characterized by a depression at about 10 keV and a more or less rapid increase at lower and higher energies, which is due to the greater number of fission neutrons produced per neutron absorbed.

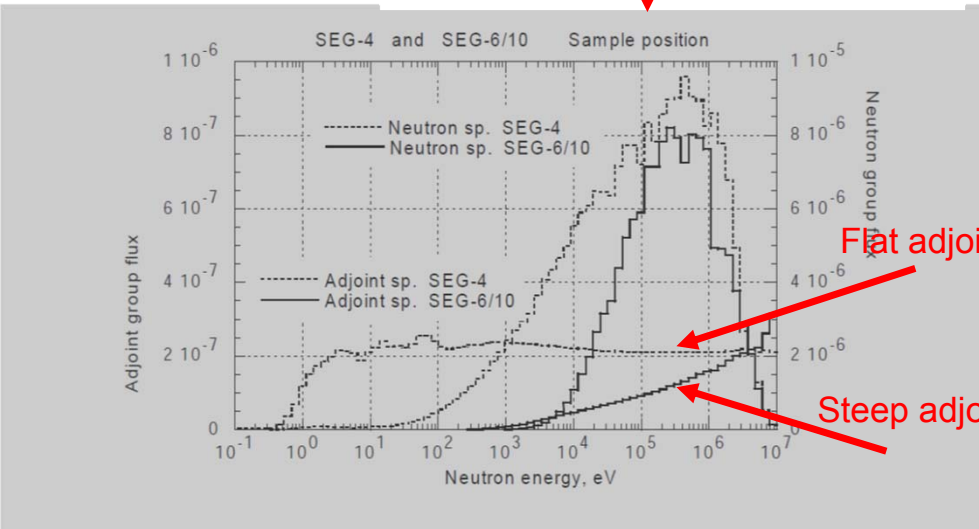
To "lower" the adjoint in the fast energy range, the content of 238U in the system should be as low as possible.

Moreover, the neutron spectrum, Can be shifted to lower energies by a *scattering material introduced into the system* (in SEG: essentially graphite).

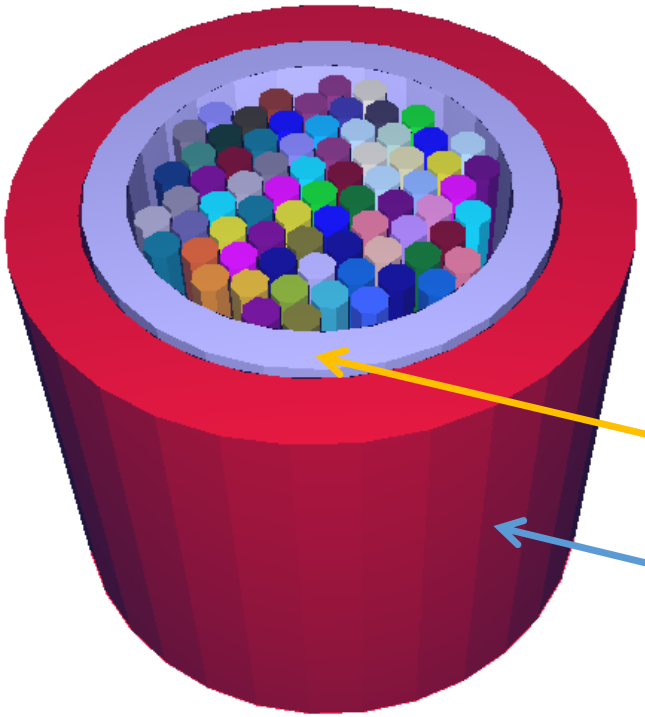
The growing increase of the neutron importance at lower energies is best compensated by poisoning the system with *1/v-absorber material* (in SEG: Cd or B4C).

Typical adjoint flux energy shape



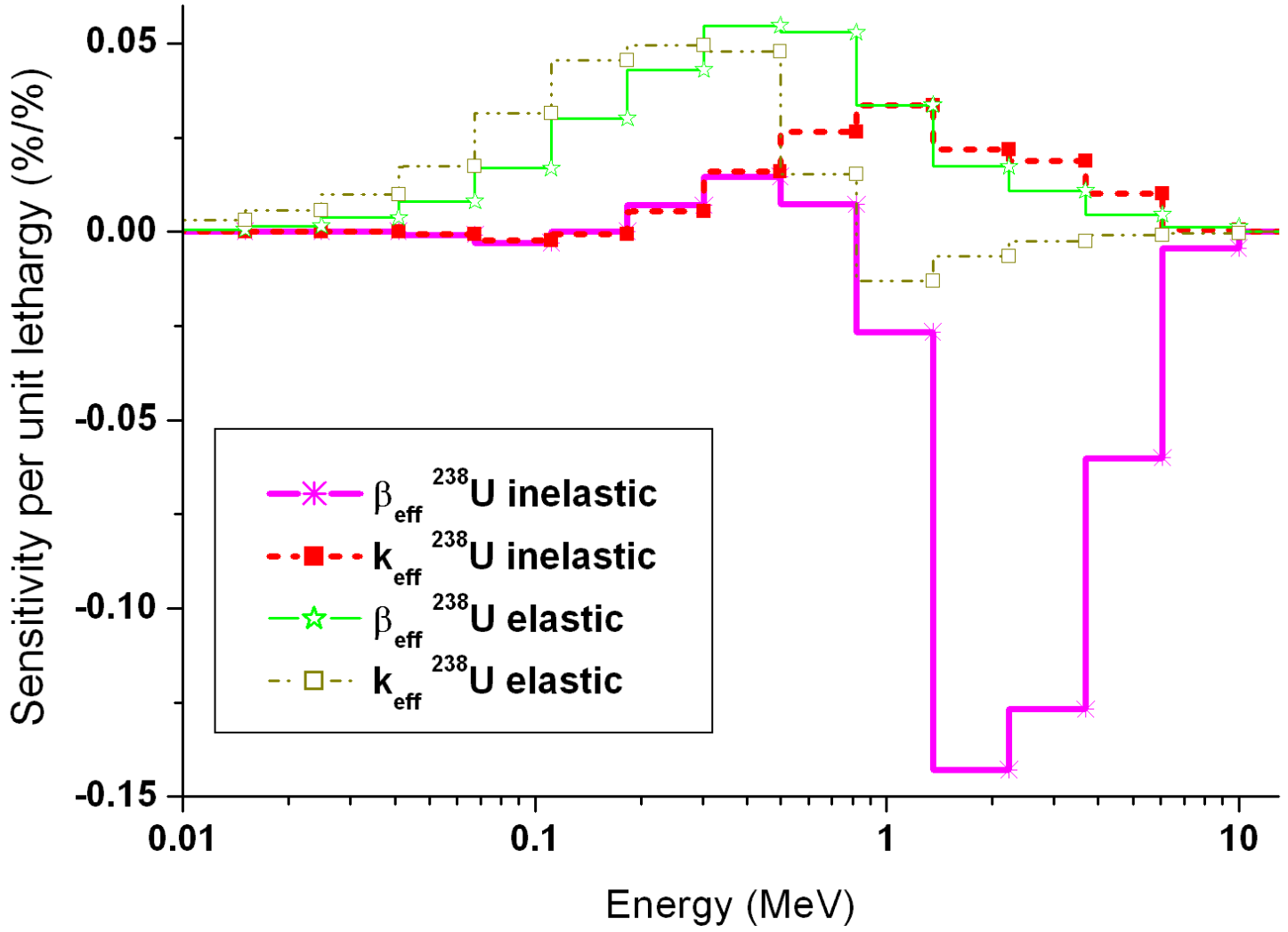


RRR/SEG Fast-Thermal Coupled Facility



- SEG 4, 5, & 7 lattice
  - 72 holes in a six-angular arrangement
  - Central channel filled with graphite and sample material
  - Pellets grouped in unit cells fill holes
  - Graphite converter surrounded by annular driver fuel

Comparison of β_{eff} and k_{eff} sensitivities with respect to inelastic and elastic cross-sections of ^{238}U (**Popsy - FLATTOP-Pu**)



3) Account for new emerging needs:

- **Industry driven (see TerraPower). Others? How to help specific initiatives for data uncertainty reduction**
- **New target uncertainties? If yes, how to cope with them?**
- **Provide feedback to be used in the frame of ND activities towards MA improvement requirements (NSC Expert group, Am-241 issue)**

Relative Uncertainty Results in TWR

Preliminary UQ Efforts for TWR Design

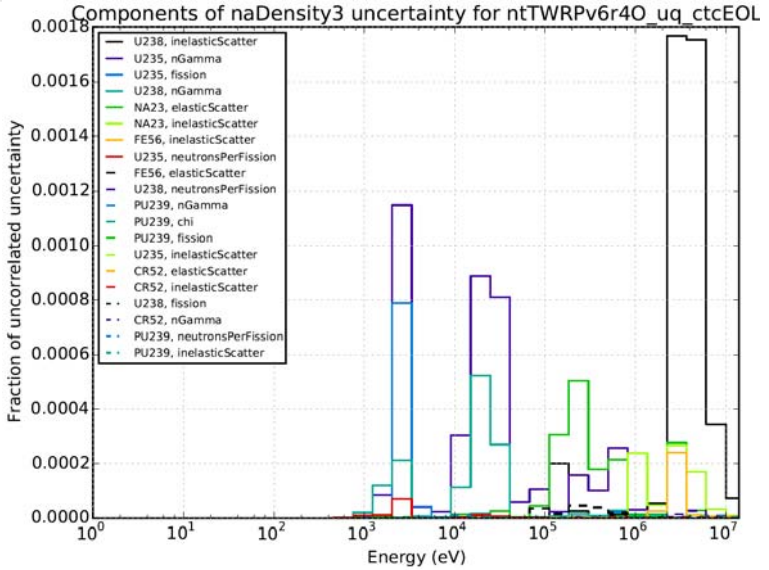
- **N. Touran**
- **WPEC/SG39 Meeting**
- **2015-05-19**

Integral Parameter	TWR-P BOL	TWR-P EOL	TWR-C EOL
k_{eff}	1.54E-02	1.19E-02	1.76E-02
CTC	1.24E+00*	1.07E-01	5.67E-02
Doppler coefficient	8.61E-02	4.80E-02	6.78E-02
Void worth	1.74E+00*	1.08E-01	5.45E-02

*CTC/void worth is very close to 0 at BOL, hence large relative uncertainty

These results do not include contributions from:

- **U235 MF5/MT18** ← important TWR-P k_{eff}
- U238 MF5/MT18
- U235 MF3/MT16
- U238 MF3/MT16
- PU239 MF3/MT16
- PU240 MF3/MT16
- PU241 MF3/MT16
- PU241 MF5/MT18



TerraPower

4) Starting from CIELO new files (with uncertainties) attempt new adjustment:

- **Selection of specific integral experiments (old and new ones)**
- **Improved criteria for reliability (from methodology studies)**
- **A-posteriori covariance data: how to use them in evaluation**
- **Need more complete covariance information (e.g. U-235 data), possibly cross correlations, angular distributions etc.**

- **Schedule? Interest from CIELO?**
- **At present, most benchmarking or integral experiment (if any) selection seems (from what we understans) to be done with little « detailed » sensitivity analysis (?).**
- **We should avoid as much as possible the risk of using integral experiment information « twice » !**