

Reactor Experiments

Pierre D'hondt

SCK•CEN, Mol, Belgium

Quote by P.B.Lyons (NRC,USA)

Need for experimental validation will
continue.....

Experimental validation

- Nuclear databases
- Computational tools
- Experiments to compare with

Nuclear data

- Cross sections, decay data, fission yields, fission neutron multiplicities and spectra, isotopic half-lives, etc...
- Obtained at facilities such as NTOF, GELINA,
- These data are feeding evaluated databases such as ENDF, JEFF....
- Important work done by WPEC (Working Party on International Data Evaluation Co-operation)
 - Recently reviewed High Priority List

Reactor Experiments

- Material and fuel behaviour under irradiation;
- Integral experiments at zero-power facilities.

Material and fuel behaviour under irradiation (1)

- MTR's still available but getting old : Halden , BR2 , OSIRIS , HFR , LVR-15...
- The needs of experimental research programmes for present and evolutionnary LWRs are still large enough to justify the investment for the new MTR JHR ;
- Thermal spectrum RR can't answer the major needs of of the Gen.IV systems;

Material and fuel behaviour under irradiation (2)

- Need for a fast spectrum irradiation facility to replace the very few ones ,close to shut down, is identified ;
- Innovative instrumentation requested by the new needs or imposed by the new environmental condition of the future systems (different coolants, higher T° , harsher irradiation conditions) should be developed ;
- CEA and SCK•CEN joint forces in the LCI (Labo commun d'Irradiation) to cope with this demand.

Integral experiments at zero-power facilities (1)

- Validation of codes and nuclear data sets;
- Lot of papers use data from recent programmes in still existing facilities in Belgium, France, Switzerland, Check Republic...;
- Lot of papers use data older programmes:
 - HTR programme in PROTEUS;
 - First Pu-recycling programme in VENUS.
- Importance of preserving experimental data from the past : IRPhE initiative of the OECD/NEA.
- New programmes related to fast concepts:
 - GENESIS in MASURCA (France)
 - GUINEVERE in VENUS (Belgium)

Integral experiments at zero-power facilities (2)

Operating and maintaining Experimental Reactor Facilities, in particular research reactor and zero power reactors are very costly. Possible routes for responding to this funding issue are:

- International pooling of facilities
- Stimulate investment & operational cost sharing between public & private shareholders
- Open Reactor Facilities to education of young scientists and engineers
- Examples of such strategies exist in Europe and can serve as test-cases

Integral experiments at zero-power facilities (3)

Benchmark exercises done within the WPRS of OECD/NEA can yield contradictory conclusions from one experimental Benchmark towards another (VENUS-2, KRITZ).

- Need for also benchmarking of experimental techniques;
- PSI, CEA and SCK•CEN joint forces in the VEP-collaboration (VENUS-EOLE-PROTEUS):
 - Several papers were presented on obtained results

CONCLUSIONS

- Experimental validation is still needed;
- Preservation of experimental Benchmarks is essential;
- Initiatives for new experimental campaigns for new reactor concepts are popping up;
- Benchmarking of experimental techniques is necessary;
- International collaboration is essential for surviving.