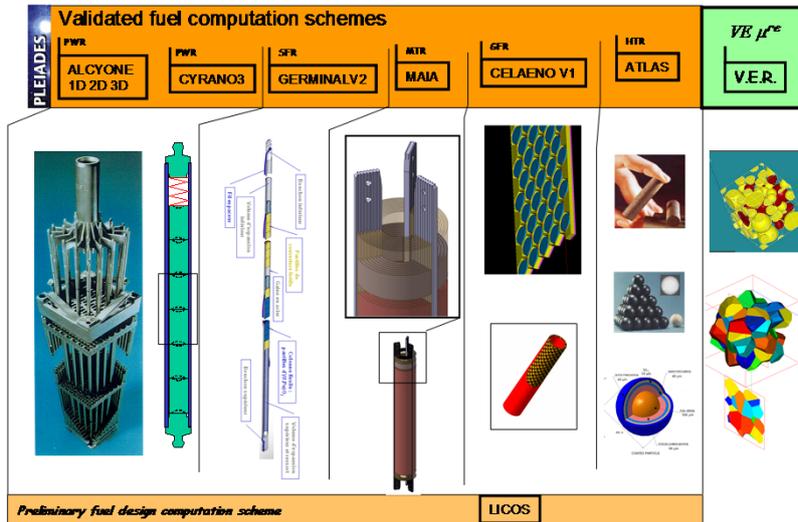


Objective

Research on fuels is used to elaborate physical behaviour models which are then integrated into numerical simulation softwares developed within the scope of the PLEIADES platform. Each fuel technology results in a dedicated application.



Characteristics

All these applications share some of the same components of the fuel and cladding behaviour laws and models, of the numerical resolution methods and of the pre- and post-processing tools, not to mention the same software architecture. Some applications can be coupled with databases (e.g. CRACO which pools all the experimental results from PWR fuel rods for the ALCYONE application) for both the pre-processing (database queries) and post-processing (comparison of measurements and predictions) phases of the calculation.

Focus is placed on validating applications that integrate the database reference system into the platform and on the non-regression of results collected from R&D fuel projects with each new version of applications.

The conditions investigated are those characterising the whole fuel life cycle: its behaviour in the reactor under normal conditions, incident and accident conditions, and the backend of the fuel cycle (transport and waste storage configurations). New multi-scale calculation algorithms are also being developed to refine the fuel description.

The EDF R&D branch has been co-developing the platform by providing the human resources for the platform at Cadarache since 2003. AREVA has been increasing its participation in the PLEIADES project since 2009.

To meet the intensive computing requirements and to build on personal work stations, the PLEIADES platform has been ported to the centralised computing resources of the research centre and those of the CCRT (CEA).

Programmes

Simulation tools (i.e. applications) have been or are being developed within the scope of this platform for the different reactor concepts studied by the CEA and its partners:

- ✓ **ALCYONE** et **CYRANO** for pressurised water reactors (PWR),
- ✓ **MAIA** for the Material Test Reactor (MTR),
- ✓ **ATLAS** for the High Temperature Reactor (HTR),
- ✓ **CELAENO** for the gas-cooled fast reactor (GFR),
- ✓ **GERMINAL V2** for the sodium-cooled fast reactor (SFR),
- ✓ **VER** for the representative elementary volume, which aims at calculating the behaviour of fuels under irradiation using properties on a microstructural scale,
- ✓ **LICOS** is used for preliminary fuel design studies on non standard geometry concept (new fuels/absorbers or in pile experiments).