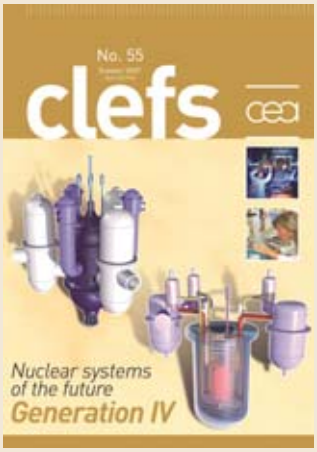

Clefs CEA No. 55 – Summer 2007

Main picture:
CEA is carrying out in-depth investigations on two distinct systems, for the industrial nuclear systems liable to be built from the 2040s: a sodium-cooled fast reactor (lower right), and another model, likewise a fast reactor, but gas-cooled (helium-cooled) (top left).
Dominique Hoarau–DHDesignProd/CEA

Inset
(top): **The CLAIRE loop, at CEA's Grenoble Center, allows the testing of components for high-temperature reactors, heat exchangers in particular, in compressed air.**
D. Michon–Artechnique/CEA

(bottom): **Microbending apparatus in the characterization area of the UO_2 Laboratory, at CEA's Cadarache Center.**
P. Dumas/CEA

Review published by
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Requests for subscriptions or renewals should be addressed preferably via Internet to:

http://www.cea.fr

or by fax to: + 33 (0)1 64 50 20 01

Translated into English by
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ISSN 1625-970X
Clefs CEA (CD-Rom)

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Editorial

At the time when researchers are beginning to lay the groundwork for what will be, not the generation of reactors to take over from current installations, rather the generation that will follow on, by the middle of the century, an overview was called for, taking stock of the matter, in Clefs CEA. The Director, Nuclear Energy at CEA, Philippe Pradel, makes this plain in the following pages. In his postscript, Bernard Bigot, High Commissioner for Atomic Energy, identifies, in turn, the challenge set by the research effort thus initiated, for the country, and, more widely, the world.

The present issue is organized around five chapters, the first one setting the context for this new generation, while the last one surveys possible deployment strategies, which remain very much open. These two chapters serve as endpieces for three more technical chapters, starting with the description of the innovative reactor lines involved, drawing both on what has been achieved with previous generations, and advances – achieved, or awaiting confirmation – in research and development. Such advances are covered in the following chapter.

The fourth chapter provides illustrations of what is CEA's strong point: the experimental resources, making it possible to compare theories with experiment, and allowing the validation of concepts, on their way to become concrete objects. For that purpose, such proven installations may be relied on as the Phénix fast reactor, and the MASURCA and MINERVE critical mockups, along with new facilities, such as the much-awaited Jules Horowitz Reactor, or the JANNUS irradiation platform. As for the experimental technology demonstration reactor (ETDR), this is intended to pave the way for the gas-cooled fast reactor line, which, while it has not so far resulted in any actual implementation, is highly promising.

> Bernard Bouquin

CEA is one of the foremost technological research organizations in Europe, with respect to energy, defense, security, and new information and medical technologies.
At the same time, it has the remit of ensuring the continuing viability of the French nuclear deterrent, one of its historic briefs, as Atomic Energy Commission.
The organization's assets are a meeting of cultures, bringing together engineers and research scientists, conducive to synergies between fundamental research and technological innovation; outstanding facilities; and actual involvement in the industrial and economic fabric, with 346 priority patents registered in 2006.
With sites in France accommodating nine research centers, distributed across the country, CEA, with a workforce of 14,910 and an annual budget of €3.21 billion, benefits from its strong involvement at regional level, and sound partnerships with other research organizations, local authorities, and universities.
Internationally recognized for its expertise in its areas of competence, CEA, operating as a public-sector establishment of industrial and commercial character under French law (EPIC), while itself forming a unique category of public-sector establishment, is fully involved in the European Research Area, being a participant in 180 projects, of which it steers 34.
A major player in the field of research, development and innovation, the organization, since 1985, when a dedicated structure was set up to nurture spinoffs, has presided over the setting up of about a hundred new companies in the high-technology sector.