

CONTAINMENT DESIGN IN SPAIN

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1. EXISTING PLANTS

There are ten operating nuclear reactors in Spain. Currently, there are further plants with operating permits, although this situation may change as predictions for electricity demand are revised. The construction of four other reactors was initiated but is currently interrupted.

The ten operating reactors are:

- one graphite-gas reactor of French design
- one BWR Mark I reactor
- one BWR Mark III reactor
- one PWR single-loop Westinghouse reactor
- five PWR three-loop Westinghouse reactors
- one PWR KWU reactor.

2. DESIGN METHODOLOGY

All existing plants were designed following the relevant regulatory criteria of the country supplying the main equipment. This means that all plants were designed and built to withstand Design Basis Accidents (DBA) but, in principle, no loads which exceed the DBA (severe accidents) were considered.

The Spanish regulatory authority (CSN) has recently started to request information from nuclear utilities, and is considering further action, in order to assess and improve plant performance in relation with postulated accidents which exceed the Design Basis.

3. CSN OBJETIVES IN RESPECT OF SEVERE ACCIDENTS

The objectives currently pursued by the CSN in respect of severe accidents can be tentatively summarised as follows:

- Improve general knowledge in the area of plant safety.
- Identify plant-specific vulnerabilities, in respect of both procedures and design.
- Provide understanding about possible contributors to risk in relation with severe accidents.
- Identify and evaluate means (hardware, procedures, training, etc) for improving containment behaviour during severe accidents.
- Decide on necessary improvements and programme their fulfilment.

4. PROGRESS TO DATE

From a regulatory point of view, the only information formally requested up to now from nuclear owners has been a study of the ultimate capacity of the containment building and a risk analysis and cost/benefit study in relation with non-filtered venting of the containment. These studies are now in varying stages of development. Their goal is to improve knowledge about the safety margins of the containment structure and to assess potential effects of design changes.

Other subjects under current consideration, but on which a formal decision has not been taken as yet, include:

- Plant-specific studies in respect of the behaviour of containment structures and associated systems during severe accidents.
- Generic studies to be carried out by the Owners' Group on the following subjects:

- A) Filtered venting of the containment (design characteristics, sequences in which it is useful, effects on other sequences, utilization criteria, impact of releases, consequences of misuse or malfunction, impact on emergency planning, etc).
- B) Hydrogen burning (sequences in which it is useful, effects on other sequences, design characteristics, qualification, effects on other systems and equipment, utilization criteria, consequences of misuse or malfunction, impact on emergency planning, etc).

From the point of view of industry, the PWR Owners' Group has proposed carrying out individual plant examinations, but suggest delaying further action until some of the current research programmes are concluded and the NRC has a more definitive stance on the severe accident issue. They have taken less into account the European approach which seems to be more in favour of immediate filtered venting.

At the same time, Spanish industry is collaborating in a number of international research efforts in this area, such as:

- LOFT (OECD)
- LACE (EPRI)
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- ICAP (NRC)
- PHEBUS (CEA/IPSN)
- Shared Cost Actions (CEC)

Most of these programmes have also some degree of participation by CSN.

5. THE FUTURE

Given the limitations of size and technology of our economy, both the regulatory authorities and industry agree that future progress can only be achieved by enhanced participation and collaboration in international research efforts. Our industry and regulators monitor carefully the results from those research programmes, as well as the

regulatory decisions arising from Europe and America, with the idea of acquiring information and enlightening eventual decisions to be taken in Spain.