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THE EUROPEAN UTILITY REQUIREMENT DOCUMENT (EUR)

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SUMMARY

The major European electricity producers work on a common requirement document for future LWR plants since 1992. They aim at requirements acceptable together by the owners, the public and the authorities. Thus the designers can develop standard LWR designs acceptable everywhere in Europe and the utilities can open their consultations to vendors on common bases. Such a standardisation promotes an improvement of generation costs and of safety: public and authorities acceptance should be improved as well; significant savings are expected in development and construction costs.

Since the early stages of the project, the EUR group has grown significantly. It now includes utilities from nine European countries. Utilities from two other European countries are joining the group. Specific cooperation agreements are also in progress with a few extra-European partners.

1. A SHORT STORY

Even if today's prospects look rather dull, the major European electricity producers want to keep the nuclear option open, that is to be able to build new nuclear power plants when the economic interest or the necessity re-appear. As the conditions for construction (market organisation, licensing requirements, design objectives, etc.) will not be the ones existing up to the beginning of the 90s, the utilities and the vendors have set up various action plans to support the development of future nuclear plant designs. These new designs must meet several targets: to be acceptable by the regulatory bodies, attractive to the public and profitable for the electricity producer. Producing a common European Utility Requirement (EUR) document that sets out the requested targets is one of the basic tasks for this renewal.

In late '91, five of the major European electricity producers set up an organisation to develop the EUR document which includes 4 volumes. Up to that time, development, design and licensing had been performed on a national basis with little interaction between countries. Their primary objective was to produce a common set of requirements that could be endorsed by the major European electricity producers and that would provide clear guidance to the designers.

The first issue of the volumes 1 and 2 dedicated to generic LWR nuclear islands' requirements was released in 1994. The EUR utilities first revised the volumes 1 and 2 considering both the comments received during the review of the first issue and internal requests to address new topics. In 1995, revision B of the volumes 1 and 2 was released, which is still being reviewed by the licensing and regulatory authorities.

A volume 4 dedicated to the power generation plant was worked out in parallel. The first state (revision A) has been dispatched for review to the main utilities and vendors in November 1996. Many comments have been received which are still being discussed in prospect to a revision B.

Since the first release of volumes 1 & 2, the EUR organisation has kept growing. In parallel, the main LWR vendors have developed advanced designs for the European market, with reference to the EUR document. The EUR organisation has come to agreements with some of these vendors to produce a volume 3 of the EUR document that specifically addresses these new designs.

Volume 2 has been kept stabilised as long as the review by the safety authorities has not produced clear conclusions and the assessments of compliance of the first parts of volume 3 have not been produced. Meanwhile, other works are in progress by the EUR organisation to broaden the scope, to improve the requirements, to clarify the existing texts and to stabilise the background policies, paving the way to a revision C.

2. THE PROMOTERS

The EUR promoters are a group of organisations that represent the major western Europe electricity producers committed to keeping the nuclear option open in Europe. Started with five partners in 1992, the group now includes 10 utilities :

- British Energy/Nuclear Electric from UK,
- Tractebel from Belgium,
- Electricité de France from France,
- KEMA Nederland BV from the Netherlands,
- Agrupación eléctrica para el desarrollo tecnológico nuclear (DTN aie) from Spain,
- Vereinigung Deutscher Elektrizitätswerke (VDEW) from Germany,
- ENEL SpA from Italy,
- Vattenfal/FKA from Sweden,
- FORTUM-IVO from Finland,
- Unterausschuss Kernenergie der Verberlandwerke (UAK) from Switzerland.

In 1998, Rosenergoatom from Russia has been welcomed as associated member and will become full member in a near future.

3. MAJOR OBJECTIVES OF EUR

The EUR document develops requirements addressed to the LWR plant designers and vendors. It is basically a tool for promoting the harmonisation of the most important plant features which were often too country-specific.

The main items considered in this convergence process are the safety approaches, targets, criteria and assessment methods, the standardised environmental design conditions and design methods, the performance targets, the design features of the main systems and equipment, and -at a lower level- the equipment specifications and standards.

Significant benefits are expected in two fields :

- Better competitiveness vs. alternate electricity generation means. The standardisation offers the possibilities of larger series and thus low prices for components.
- Improved public and authorities' acceptance, thus allowing an easier licensability of a design developed following EUR. In that direction, a long effort has been undertaken to improve safety features and to deal with severe accidents.

The major objectives of the EUR organisation are derived from these targets. These objectives are the foundation of the requirements developed in the EUR document :

- giving the producers means for controlling construction costs through standardisation, simplification, series ordering and consideration of maintenance at the design stage ;
- establishing a common specification valid in an area large enough so as to allow the vendors to develop standard designs ;
- establishing stable market conditions for a broader competition between suppliers ;
- making sure that acceptable operation and fuel cycle costs can be achieved, even in an upset economic environment ;
- prescribing ambitious -but achievable- availability and lifetime targets ;
- harmonising safety related requirements : common safety targets, common safety approaches and common technical solutions to safety problems ;
- setting "good neighbour" requirements like low impact for environment , reduction of emergency planning, consideration of decommissioning at the design stage ...

On these bases, the main vendors are developing a number of standard designs :

- which could be built in many countries with minimum adaptations ;
- which show acceptable economic prospects ;

- which actually meet the needs of the customers.

4. STRUCTURE OF THE DOCUMENT

The EUR document is structured into four volumes :

- Volume 1 Main policies and top tier requirements : it defines the major design objectives and it presents the main policies that are implemented in the EUR document.
- Volume 2 Generic nuclear island requirements : it contains all the generic requirements and preferences of the EUR utilities for the nuclear island.
- Volume 3 Specific nuclear island requirements : it is divided into a number of subsets. Each subset is dedicated to a specific design that could be offered on European market and that is of interest to the participating utilities. A subset includes a description of the design and an analysis of compliance vs. the generic requirements of Volume 2. It may also include design dependent requirements.
- Volume 4 Power generation plant requirements : it contains the generic requirements related to the power generation plant.

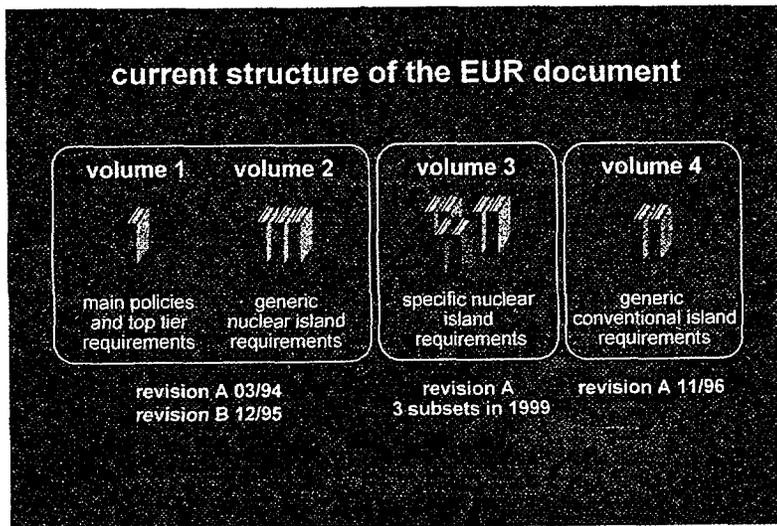


Figure 1 : Structure of the EUR document

The whole document includes about forty chapters that deal with specific topics.

5. ORGANISATION AND CONTROL OF THE PRODUCTION PROCESS

As the EUR document is customer oriented, the whole process has to be driven by the utilities that will be the final users. The texts of the EUR document are written by electricity producers involved in EUR. A joint organisation has been set up for the development and the review of the document, which has been kept very decentralised thanks to e-mail.

All the other nuclear business actors that may have an influence in Europe (other electricity producers, vendors to the European market, safety authorities and administrations, international nuclear organisations) have been asked to review the document at the successive stages of its development : the vendors and the utilities first, then the safety authorities.

Beyond Europe, dialogue has been also established with the major vendors and utilities to aim at world-wide consistency of the design approaches. For instance, in depth analysis of the differences between EUR and the American EPRI/URD (Utility Requirement Document) have been worked out. Nevertheless, the final content of the document is kept under control by the EUR promoters only.

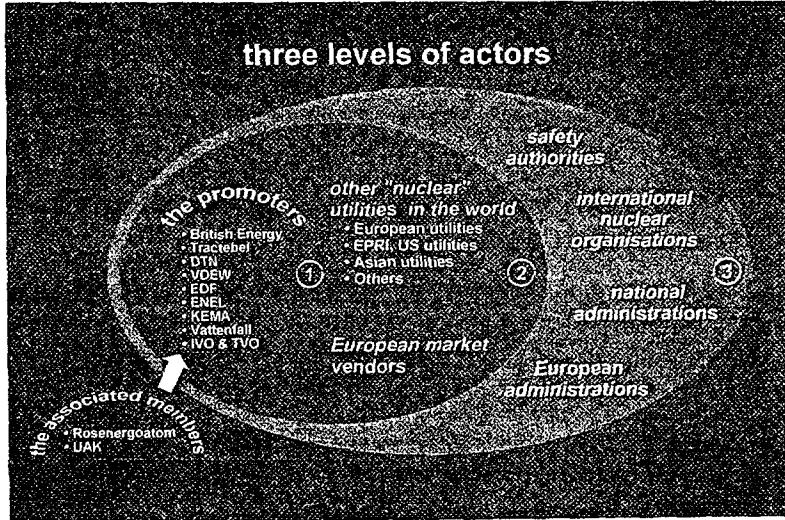


Figure 1 : Control of the production process

6. CURRENT PROGRAMME OF WORK CONSOLIDATING THE EUR DOCUMENT

The EUR utilities are continuing the development of the EUR document. The scope of the document is being broadened- more topics and more designs addressed- while its bases are strengthened. The key points are as follows :

6.1. Volumes 1 & 2 : generic requirements for nuclear islands

6.1.1. Discussing volumes 1 & 2 with the regulatory and licensing bodies

In Europe, the power to license a nuclear facility is a national prerogative. Dialogues with all safety authorities have been initiated in 1997 about the EUR document. Even if no generic licensing process can be targeted today at European Community level, the objective is to establish common ground between the EUR utilities and their safety authorities, so that the national safety requirements come closer to each other which prepares some harmonization of safety rules through Europe. A background objective is to make a standard plant developed

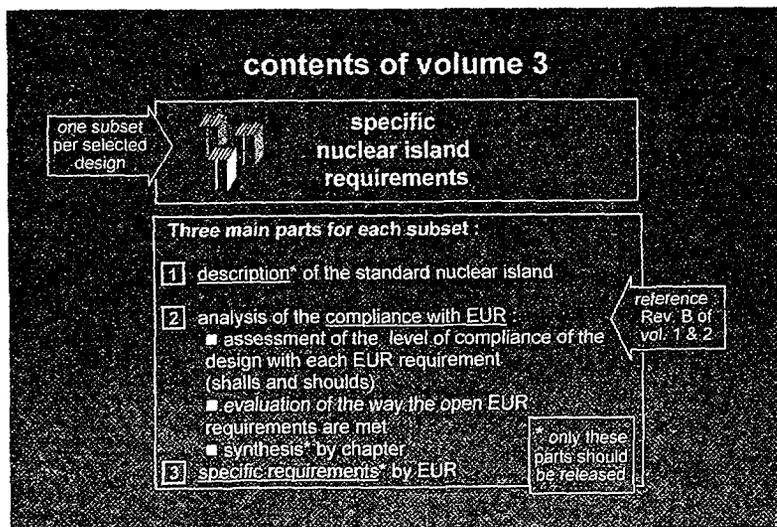
according to EUR in one of the EUR countries licensable in another one, without major design change. The national licensing and regulatory bodies of the EUR countries have agreed to review the main chapters of Rev B of volumes 1 and 2 in a co-ordinated way. So far common positions have not been achieved on all topics. The first results show that no fundamental safety objective proposed in the EUR document has been called into question by the safety authorities. Nevertheless there are a lot of comments that will need in depth discussions by the EUR topical working groups, so as to clarify the initial text or even to propose changes to some requirements. This discussion round is foreseen to last till the end of '99.

6.1.2. Establishing the bases for a revision C of the volumes 1 & 2

During the production of the different subsets of volume 3, the generic EUR requirements are tested at detail level vs. real designs. Thus a number of requests for further investigation, clarification and proposals for changes have appeared about important requirements. The discussion with the safety authorities is bringing a number of requests and proposals as well. Other external factors may lead the EUR parties to reconsider other important requirements, such as the grid requirements and the I&C requirements. The EUR organisation has been busy with the clarification and investigation works in 1998 and 1999. The proposals for evolution related to volumes 1 and 2 should be reconciled by the end of 2000 when the major contributions are available. The revision of the chapters of volumes 1 and 2 should begin by the end of 1999. The result may be available during year 2000, considering the complex discussion and review process necessary to come to a consensus on all items.

6.2. Volume 3 : specific designs

Beyond the sets of generic requirements of volumes 1 and 2, the EUR promoters are producing subsets of specific requirements for selected LWR designs that may be offered on the European market. Brought together, they will make up volume 3 of the EUR document. A subset includes a description of the design and an analysis of compliance vs. the generic requirements of Volume 2. It may also include design dependent requirements. A subset of volume 3 is produced with contribution of the corresponding vendors.



Beyond those three designs, a couple of other advanced LWR projects will be included into volume 3. Preliminary compliance assessments have been undertaken by some EUR utilities on other projects. The two next subsets of Volume 3 will be dedicated to SWR 100 (1000 MW BWR with passive safety features developed by SIEMENS) and to an European version of ABWR ((1300 MW BWR developed by GENERAL ELECTRIC). These two subsets may be released by the end of 2000.

6.3. Volume 4 : generic requirements for power generation plants

Revision A of the volume 4 has been reviewed by the utilities and the vendors in 1997. Numerous comments have been produced which have been processed and reviewed by the EUR organisation. Each comment has been dealt with individually and a position has been proposed. From these positions vs. the external comments and from other internal works, a revision B is being produced that should be released at the beginning of 2000.

6.4. Discussion with the organisations outside EUR

As long as Volumes 1 and 2 of the EUR document are discussed with the safety authorities, they are stabilised as Rev. B. The EUR promoters want to keep active links with all the other utilities that consider nuclear power an acceptable option world-wide. A specific structure has been set up for that : the EUR international utility advisory committee. This is to make sure that the ideas being discussed for future versions of EUR are actually in the global mainstream. This may also work the other way round : bringing fresh ideas to the EUR organisation. A step farther in the same way, the EUR organisation has concluded specific agreements with other utilities to support them to produce their own set of requirements.

On the vendor side, there is of course a living dialogue with the vendors involved in volume 3. In the frame of development of their own projects, other vendors discuss the level of compliance of their designs with EUR utilities.

Beyond these discussions, the EUR document is more and more used as a yardstick by various organisations to assess proposed designs. Even if the EUR document is not yet finalised, it is well fitted to this use since the requirements of the volumes 1, 2 and 4 are really generic. They are valid for any kind of LWR plants and are not specific of any design or of any vendor. The EUR utilities have provided support to most of the users.

7. CONCLUSION

When the first tasks were launched at the beginning of 1992, the EUR document was a rather distant target for five European utilities looking for keeping an access to nuclear power generation open. Since that time it has become a reality. The scope of the document has been extended. The base of the major policies are being strengthened. The momentum looks now sufficient to produce an extensive revision of the whole text by the end of year 2000, even if the growth of the EUR group makes consensus more difficult.

Thus the renovated EUR document can be used as a reference for the LWR plants that may be ordered beyond the turn of the century in Europe and it will represent a good basis for harmonisation in Europe. Then remains the most difficult task : to really start the construction of an advanced reactor in Europe !

Figure 2 : Contents of volume 3 of the EUR document

The works on the first subset, dedicated to EPR (large evolutionary PWR developed by NPI, Framatome and Siemens), started in 1996. The detailed analysis of compliance has followed the progress of the project. No fundamental deviation has been identified during the analysis. Of course there are a few differences, but the EPR design actually meets the major EUR objectives. The whole set (plant description, analysis of compliance and specific requirements) will be ready for release by the end of 1999, when it includes the results of the Basic Design Optimisation Phase.

Two other subsets were launched in 1997 :

- A set dedicated to ABB's BWR 90 (1300 MW evolutionary BWR developed by ABB Atom). An in-depth analysis of compliance was possible on this project because it was offered a few years ago and it has been developed at detail level. Since the project was developed before the EUR document, one can find differences in the analysis of compliance. Meanwhile ABB performed design evolution studies -known as BWR 90+- that deal with the most recent utility and safety authority requirements. BWR 90+ actually meets the EUR safety requirements where differences were identified for BWR 90. The whole BWR 90/90+ set (plant description, analysis of compliance and specific requirements) has been released during Summer 1999.
- Another set dedicated to EPP (1000 MW PWR with passive safety features developed by Westinghouse, Ansaldo and other European partners). Most of the analysis of compliance vs. Volume 2 has been worked out in 1998 and is now available. The depth and the scope of the analysis of compliance correspond to the stage of development of the project at the end of phase IIa. Since the reference specification for the EPP project is the EUR document, there is obviously a good level of compliance. The whole EPP set (plant description, analysis of compliance and specific requirements) should be released around the end of 1999, including the most recent developments of the project (phase IIa).