EUROPEAN UTILITY REQUIREMENTS: ACTIONS IN PROGRESS AND NEXT STEPS

Pierre BERBEY

Electricité de France/SEPTEN 12 avenue Dutriévoz 69628 Villeurbanne, France Phone: 33 47282 7135, Fax: 33 47282 7701, e-mail: pierre.berbey@edf.fr

Abstract –Since late 1991, the major European electricity producers have been writing a common set of requirements that provides clear guidance to the designers. Meanwhile the main vendors have developed advanced LWR standard designs for the European market, with reference to the EUR document. An action plan has been adopted by the EUR utilities to continue the development of the EUR document up to 2005. It is based upon 3 main ideas: (1) publish revised versions of the volumes 1, 2 and 4, stressing on the necessary responses of the electricity producers to Europe's integration: competitive and unified electricity market in view, electricity producers' stakes different from the other electricity business actors', common rules ahead (safety, HV grid, ...), newcomers, (2) keep volume 3 updated (existing subsets and new subsets), (3) improve coordination with the non-EUR actors to seek for harmonisation of the key requirements at a global level.

INTRODUCTION

The major European electricity producers want to keep the nuclear option open, that is to be able to build new nuclear power plants when their economic interest or necessity requests it. Producing a common European Utility Requirement (EUR) document that sets out harmonised design targets is one of the basic tasks for this renewal. On this base the main vendors develop advanced LWR standard designs adapted to the European market, that can be built in the different countries without any major design change.

I. STRUCTURE OF THE EUR DOCUMENT

The EUR document is structured into four volumes:

• Volume 1 (Main policies and objectives) defines the major design objectives and presents the main policies that are implemented throughout the EUR document.

• Volume 2 (Generic nuclear island requirements) contains all the generic requirements and preferences of the EUR utilities for the nuclear island.



Figure 1
The EUR document as of May 2003

- Volume 3 (Application of EUR to specific designs) is divided into a number of subsets. Each subset is dedicated to a specific design 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) contains the generic requirements related to the power generation plant.

The whole EUR document includes about forty chapters and 4000 individual requirements that deal with all the topics a utility has to address to have a nuclear power plant developed and built.

II. STATUS OF THE EUR DOCUMENT AS OF MAY 2003

Since the early steps in 1992, the scope of the document has been progressively broadened -more topics and more designs addressed- while its bases have been strengthened.

As of the beginning of 2002, all the parts of the EUR document that were foreseen in the initial action plan have been produced and a large part of the document has been updated one or two times. Volume by volume the situation is as follows:

Volumes 1 and 2:

The most recent state (revision C) has been released in April 2001. The bases for this revised version were:

- the results of the review of the main chapters of revision B by a group of European safety regulators,
- comments produced from in-depth reviews of the previous revision by the EUR organisation.
- the will to rewrite completely two chapters that were felt a bit outdated

(chapter 2.10: "I&C and man-machine interface" and chapter 2.3: "HV transmission grid requirements") or not specific enough to allow the development of standard designs (chapter 2.11: "layout rules")

- the outcome of the analyses of compliance of the different projects addressed in EUR volume 3. During the production of the different subsets of volume 3, the generic EUR requirements have actually been tested at detail level

vs. real designs. Thus many requests for further investigation, clarification and proposals for changes have been listed about important 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, have been reconciled in 2000. Then a complex discussion and review process has been necessary to come to a consensus on all issues and to check the overall consistency of the document.

The corresponding texts have been dispatched worldwide, on paper in April 2001, and on CDROM in July 2001.

Volume 3:

Beside the sets of generic requirements of volumes 1 and 2, the EUR promoters are producing evaluations of selected LWR designs that may be offered on the European market. Brought together, they make up volume 3 of the EUR document. Five subsets have been published between 1997 and 2002.

A subset includes a description of the standard design and an analysis of compliance vs. the generic requirements of Volume 1 and 2. It may also include design dependent requirements. A subset of volume 3 is produced with contribution of the corresponding vendor. As of today 5

subsets dedicated to the ABWR, BWR90, EPR, EPP, and SWR1000 projects have been published and a sixth one dedicated to the Russian VVER AES92 is still being drafted.

The works on volume 3 have actually been more indepth and longer than initially planned. Since the analyses of compliance have been carried on to the elementary requirement level, they have requested much resource and time, both by the EUR utilities

status of the EUR document volume 1 volume 2 volume 3 volume 4 generic nventional island requirements revision A : 03/1994 BWR 90 subset : 06/1999 revision A: 11/1996 revision B: 11/1995 FPR subset : 12/1999 revision B: 03/2000 revision C : 04/2001 EPP subset : 12/1999 12/2001 ABWR subset : SWR 1000 subset: 02/2002

Figure 2 Structure and status of the EUR document

and by the interested vendors. On the other hand these detailed assessments of compliance vs. EUR have resulted in a kind of "qualification" of the volumes 1 and 2 vs. a panel of rather diverse real projects.

Another very positive fallout is the involvement of the main vendors, that have got an in-depth knowledge of the EUR document, including the background rationales that do not appear explicitly in the text, and that were given opportunities to discuss the most critical issues.

As the sixth subset of volume 3 is being drafted, there obviously is a much better understanding between the European utilities that develop EUR and the NPP vendors that plan to be present on the European market in the ten coming years.

Volume 4

Several non-EUR utilities and the vendors have reviewed the revision A of the EUR volume 4 between 1997 and 1999. Their comments have been taken into consideration by the EUR organisation to write a revision B of the EUR volume 4 that was published in March 2000.

Is the EUR document already usable?

After ten years of thorough development and checking works the EUR document is now complete. It will, of course, be further improved to follow up the progress of technology and the constraints coming from Europe's integration as this is explained below. In its current stage it actually is fully operational. It has already been used as the base for the call for bids of the fifth Finnish unit in October 2002. It has also been used by the NPP vendors willing to be present in Europe as a guide for designing their new products.

III. STRONG LINKS WITH ALL THE OTHER ACTORS OF THE NUCLEAR BUSINESS WORLDWIDE

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

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 requested to review the document at the successive stages of its development: the vendors and the utilities first, then the safety authorities and the administrations.

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, indepth analyses of the differences between EUR and EPRI/URD have been worked out. Nevertheless, the EUR

promoters keep the content of their document under their own control.

The EUR promoters keep active links with all the other utilities that consider nuclear power an acceptable option world-wide. This is to make sure that the ideas being discussed for future versions of EUR are actually in the global mainstream. Actually this also brings fresh ideas to the EUR organisation. In the same spirit, the EUR organisation has concluded specific agreements with other non-European utilities to support them to produce their own set of requirements. On the vendor side, there is a

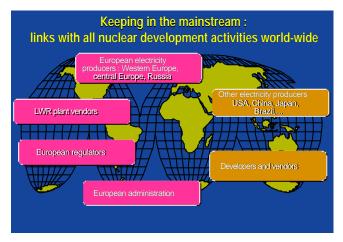


Figure 3 Keeping in the mainstream

living dialogue with the vendors involved in volume 3.

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

IV. AN ACTION PLAN FOR THE NEXT THREE YEARS

After taking stock of this situation, the EUR promoters may have been satisfied. The first question the EUR utilities had to ask themselves before considering a possible continuation was:

Was a continuation of the EUR works necessary?

On the con side, the EUR utilities had actually met important objectives they had set in the early stages of the project:

- they have published specifications that express common views of the investors / operators on the design of the future LWR plants to be built in Europe
- the last versions of the EUR document encompass feedback from reviews by many external partners : utilities, vendors, regulators
- the exchanges with the vendors in the frame of the assessments of compliance of volume 3 have allowed a very good understanding between the vendors that are present on the European market and the potential customers
- the EUR document is now well recognised and is the best reference for the LWR plants that may be ordered in Europe...or elsewhere

On the other hand, it was impossible to say that all the objectives had been met. Important issues were still pending that could not allow us to consider the EUR document as fully stabilised:

- the exchanges with the nuclear safety regulators could not be pushed as in-depth as initially foreseen and so far no clear view of a European regulators' common position is possible.
- Europe's integration still requests joint responses by the nuclear electricity producers. A competitive and unified electricity market is in view; electricity producers' stakes are more and more different from the other electricity business actors', common rules appear (safety, HV grid, ...), may be some day common regulators; newcomers step in.
- the suitable designs are still in evolution (new designs, new vendors, design evolution)
- the current version of the EUR document is felt pushing the pendulum too far in some areas as compared to what is actually allowed in regions other than Europe (regrets)

Even if the growth of the EUR group makes consensus more difficult, it was felt that the benefits the utilities foresee were substantial enough to keep developing the EUR document at a steady pace.

Developing the action plan

The EUR action plan 2002-2005 was approved by the EUR Steering Committee during the 10-years celebration meeting held in Lyon in February 2002. The action plan has been built in one year and half following a step by step approach that is summarised on the figure 4.

The strategic objectives have been identified first. This was not the easiest task since it took a rather long time to the EUR parties to come to a consensus. In this phase 23 strategic objectives were identified that were grouped under the following four headlines:

1/ keeping the EUR document usable, updated and recognised as the reference

- 2/ maintaining stress to harmonise the technical specifications world-wide
 - 3/ dealing with European market liberalisation
 - 4/ enlarging the scope of use of EUR



Figure 4
Building the EUR action plan for 2002-2005

From these strategic objectives the action plan was worked out. Each task was identified and scheduled and the corresponding resource allocated. To make project management easier the tasks have been eventually reallocated under the seven main headlines below that correspond to the organisation of the EUR project.

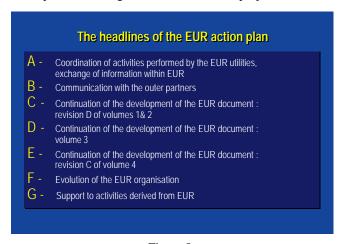


Figure 5
Headlines of the EUR action plan for 2002-2005

The main actions foreseen till 2005

Communication with the outer partners

- improve communication through institutional channels: be present in the main nuclear conferences, publish periodic status papers in the energy press.
- forward information about EUR to the main organisations that support nuclear business in Europe

- publish on the Internet to identified partners, may be some day to the public, develop interactive tools for comments, Q&A, ...
- make the internal revision processes more visible from outside (release of draft texts)
 - organise periodic meetings with privileged partners: utilities, vendors, regulators, and administrations

Pave the way to a revision D of volumes 1 & 2 within 4- 5 years

- still improve clarity and neutrality of vol. 2: eliminate duplicated parts, eliminate the solution-oriented requirements where they are unnecessary, improve rationales & comments,...
- more detailed requirements about plant decommissioning.
 - feedback from use of the EUR document

EUR actions related to safety harmonisation

- 1 keep exchanges with WENRA as active as possible while they develop harmonised regulatory positions for existing European NPPs.
- proceed with discussions with the EC administration to make the idea of common specifications for future NPPs in an open European market progress.
 - including the safety-related design requirements
 - prerequisite to use of standardised designs throughout Europe by the utilities.

Figure 6
Towards volume 2 rev. D: safety requirements

EUR actions related to safety harmonisation

- 3 carry out internal comparison works
 - between EUR and the IAEA safety requirements & guides
 - between EUR and the US regulatory positions
 US laws & regulations
 - positions expressed by the US regulators during the certification of the 3 ALWR plants + AP1000 & ESBWR
- 4 keep benchmarking with the other URD being produced world-wide (China, Korea, Brazil,...)
- 5 eventually propose new EUR positions for revision D, in line with well recognised safety practices.

Figure 7
Towards volume 2 rev. D: safety requirements

-promote harmonisation at European level of the regulatory requirements related to safety. The corresponding actions are detailed on the figures 6 & 7.

EUR actions related to HV grid requirement harmonisation

- The current text of chapter 2.3 has been changed in depth as compared to the previous versions
 - express the electricity producers views about the performance of future nuclear plants connected to the European HV transmission network
 - > just enough manoeuvrability to be connectable to the HV grid
 - no request to design for performances that cannot be sold to the grid operators
- request for review by the European grid operators and by the HV grid regulators
- revision D of the chapter 2.3 will take in consideration the main conclusions of this review

Figure 8 Towards volume 2 rev. D: HV grid **requirements**

- promote harmonisation at European level of the HV transmission grid requirements. The corresponding actions are detailed on the figure 8.
- -promote the emergence of more cost-efficient concepts; relax the requirements that do not show a good enough cost-benefit balance.

Keep Volume 3 updated

The 5 subsets of EUR volume 3 already published cover the whole range of the LWR designs that could be offered in Europe in 2001. There is a strong will to keep the first 5 subsets updated to follow up the design evolution, the revision of the EUR document, the evolution of the vendor's support to these products

A few new subsets may be undertaken in the coming years

- dedicated to projects that are mature enough be offered and built in the coming decade
- dedicated to projects that have found support by the EUR utilities

Preliminary compliance assessments vs. the EUR document have being carried out on the VVER AES 92 during the last couple of years. A few other projects may be targeted: (ESBWR, ...)

More details on the corresponding actions are given on the figures 9 & 10.

Actions on EUR Volume 3

Works on the 5 published subsets

- Identify the published subsets of volume 3 that deserve updating with the interested vendors
- propose and work out a programme for each selected subset: review of the current texts, production of updated drafts, review & approval, publication
- target: 2 or 3 subsets updated by the end of 2004

Figure 9 Actions on the published subsets of EUR vol. 3

Actions on EUR Volume 3

Works on new subsets:

- ♦ VVER AES 92 :
 - the preliminary assessment works should be completed in the first quarter of 2003
 - the corresponding EUR organisation & programme should be set up by mid 2003.
- target : release in 2004-2005
- other designs :
 - discussion round with the interested vendors in 2002-2003: status of the project, need for a preliminary assessment of compliance, possible organisation & programme
 - > selection by EUR SC
 - the EUR organisation & programme for any new subset of volume 3 cannot not be set up before 2004

Figure 10 Actions on the new subsets of EUR vol. 3

Revision of Volume 4

The objective here is to produce a revision C of volume 4 the last revision of which was released in 1999. This revision will be more in depth than the previous one. The following objectives have been given:

- eliminate the parts duplicated from volume 2; the list of chapters may be upset.
- improve neutrality by rewriting the volume 4 in a less solution-oriented way
 - keep functional requirements only, as far as possible
- clarify the text: more rationales, elimination of the obscure requirements, self-standing texts

- check $\;$ consistency $\;$ with $\;$ revision $\;$ C/D $\;$ of volumes 1 & 2

There may be a consultation of the main suppliers / vendors in the last steps of the revision process. The current target is to get revision C of volume 4 finalised in the second half of 2004

Support to activities derived from EUR

Since revision B of volumes 1 & 2 has been published in 1995, the EUR organisation has brought support to several organisations that were willing to undertake similar works.

For the next years this will be continued and focused on the following objectives:

- support to the development of guidelines for the development of designs other than LWRs: up to 2002: the EUR organisation has allowed the developers to use the EUR for design specification of the European projects like HTRs, fusion reactors, ...
- support to the development of daughter requirement documents: up to 2002 the EUR organisation has supported the development & review of the Brazilian standard NPP requirements
- support to the development of other utility requirement documents, not directly derived from EUR: Up to 2002, support to the development of the Chinese requirement documents CUSR / CURD.

V. TO SUMMARISE

No dramatic strategy inflexion is foreseen with reference to the initial EUR objectives. The proposed action plan is a "natural" extension of the previous phases of the EUR works.

Common interest allows information pooling, common specification work and common development works despite the highly competitive environment in Europe. There is a rather good experience from the last ten years.

Limited resource is needed to go on. Even if the benefits can only be foreseen in the long term, they are substantial enough and for most of the participants, it keeps worth participating. No external funding is needed; the decision to go on is to the EUR utilities only. This is a medium term project with limited uncertainty, thus good chances of success. There is now a firm commitment by the EUR utilities to go on according to this action plan.

Collaboration with the other actors of the nuclear business is an important item of the EUR strategy for the coming years. The EUR document has been developed for Europe. The nuclear market is not actually regional but global for several reasons: (i) the development costs are too high to allow developing specific designs for a specific area, (ii) there is a small number of designers/vendors, (iii) the rules of the game are getting harmonised world-wide. The European utilities plan to interact will all the other actors that may be engaged in design and design requirements, especially:

- the utilities that produce URDs world-wide
- the utilities that intend to use existing URDs to produce NPP specifications
- the vendors that propose designs usable by the European electricity producers in the coming decade

The ultimate objective keeps the same as in the initial steps of the EUR works: to offer a stabilised and predictable environment to the vendors to allow them to develop standard designs that fit the needs of the utilities and do not need to be redesigned for each new construction. We simply think that, beyond what is being done in Europe in EUR, there is a supplementary benefit for all the utilities worldwide in harmonising their specifications for future NPPs.



European Utility Requirements for LWR nuclear power plants