THE USE OF OPERATING EXPERIENCE TO REDUCE RISK

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ABSTRACT

The French nuclear program is based on a high level of standardization. However, operating experience of the first units, information on operating experience from foreign units, technical developments and new requirements from the safety authorities have led to some modifications from the initial design of the plants.

A major problem is to maintain standardization of all the units when at the same time modifications are implemented on units, some of which are under construction and others in operation. Another problem is to assure that an improvement on one point will not prove harmful on another. An organization and procedures have been set up by Electricite de France to collect operating experience data, analyze them, and decide where and when to apply eventual remedies to different units of a given series and to different series (900MW, 1300MW ...). These decisions take into account risk analysis, and the state of construction, start-up, or operation.

A system of determining priorities has been used, and examples of criteria and priority items are given.

KEY WORDS: Nuclear Plant Safety; Standardization; Risk Management; Operating Experience Feedback; Electricité de France

INTRODUCTION: THE REASONS FOR A NUCLEAR OPERATING EXPERIENCE FEEDBACK

In 1985, nearly 60% of the French electricity shall have been generated by PWR system nuclear plants, equipped with nuclear steam supply systems provided by FRAMATOME. This percentage will exceed 75% of 1990. Owing to a thorough standardization policy, only two types of nuclear steam power supply systems have been retained: in 1990, on the power grid, there will be 34 units provided with similar 3 loop power steam supply systems (900 MW units) which represent a total of 32000 MW and 18 units equipped with similar 4 loop power steam supply systems (1300 MW units) which represent a total of 23000 MW.

For EDF, the only owner and operator of a family of power plants that are not diversified, the specific structure of its generating system has a double effect, as far as concerns hazards:
- as a power supplier, not only must EDF consider the hazards represented by nuclear plants for people or for the environment; these hazards are analyzed by nuclear safety specialists as part of the design basis accidents studies, but it must also ensure the reliability and continuity of the power supply. This means getting
secured against the accidents that are the most likely to happen, constituting no radiological risk for the environment but which might entail unavailabilities of a generic kind. The identified risk is not only the risk for the environment, it is also the more subtle and more difficult situation stemming from repetitive technical incidents, affecting facilities directly or the acceptance of nuclear plants by the public opinion.

- on the other hand, even though it goes along with a certain vulnerability of the power generation system, the high degree of standardization can also be used to reduce hazards. In particular, it justifies a specific effort to ripe benefit from the operating experience by giving a special value to the precursor event analysis: an incident with a recurrence probability of 0.1 per year statistically occurs about 3 times a year out of a number of 30 similar units. Should it imply an unavailability - even a short one - or should it be a precursor of incidents having effects on safety, then efforts that are justified by the number of units must be made to reduce this frequency. The same incident could pass relatively unnoticed in non-standard plants.

With such a background, where the risks EDF is faced with are not only these of major accidents, no clear risk management system has been implemented yet: moreover, there is no certainty as to whether it is possible to present this problem in a totally rational manner that would permit solving it in a clear way.

However, in addition to the traditional methods of reducing risks (the good old safety analysis method; the design, construction and operation quality, the probabilistic studies, the personnel training and so on..) EDF undertakes a systematic analysis of the nuclear operating experience feedback, with the aim of taking the best advantage of the precursor incident analysis. In this respect, there is a double objective:

- to reduce the frequency of incidents likely to entail power generation unavailabilities, even though they have no effect on safety.
- to reduce the frequency of major incidents that are likely to have some effects on safety. Such are the design principles of the nuclear steam power supplies based on defense-in-depth and the presence of barriers that major accidents can only result from a simultaneous combination of independent and individually more frequent incidents.

As far as concerns nuclear safety which is the major concern of this presentation, the operating experience feedback aims at the following targets:

- Identifying the precursor events in order to define and implement the necessary corrective measures before the accidents occur.
- taking advantage of the standardization of PWR nuclear units.
- checking that changes -when changes are required- have no harmful side-effects before implementing them on all the units.
- taking full advantage of the data derived from the actual plant operation, in order, if necessary, to homogenize their safety level, especially on new standardized plant series.

1 - THE OPERATING EXPERIENCE FEEDBACK ORGANIZATION

In EDF, the operating experience feedback process is governed by the following guidelines:

- to gather systematically as much data as possible and to disseminate it widely both inside and outside EDF.
- to involve, as much as possible, designers, operators, manufacturers and safety authorities in their analysis.