

Nuclear Regulation

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# **Learning from Nuclear Regulatory Self-assessment**

**International Peer Review of  
the CSN Report on Lessons Learnt  
from the Essential Service Water System  
Degradation Event at the Vandellós  
Nuclear Power Plant**

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NUCLEAR ENERGY AGENCY  
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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## FOREWORD

The OECD Nuclear Energy Agency (NEA) has an acknowledged role in maintaining and further developing the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy. One of the objectives of the NEA is to help member countries to pool and maintain their technical expertise and human infrastructure by constituting a scientific, technical and legal centre of nuclear competence, providing advice and organising peer reviews. In this context, the NEA Committee on Nuclear Regulatory Activities (CNRA) provides a forum for senior representatives from nuclear regulatory bodies to exchange information and experience on nuclear regulation policies and practices in NEA member countries and to review developments which could affect regulatory requirements. The Committee seeks to promote co-operation among member countries, using feedback from experience to develop measures to improve safety, to enhance efficiency and effectiveness in the regulatory process and to maintain adequate infrastructure and competence in the nuclear field.

On 14 October 2005, the *Consejo de Seguridad Nuclear* (CSN), the Spanish nuclear regulatory body, formally asked the NEA to establish an international peer review team to assess the CSN report on the lessons learnt as a result of the Vandellós II event, which had occurred on 25 August 2004. Although it was the first time that the NEA was asked to conduct a peer review in the field of regulatory supervision of reactor safety, the NEA has long-standing experience both in conducting peer reviews (more than 15 reviews have been conducted in the area of radioactive waste management) and in incident assessment (the international Incident Reporting System for nuclear events was initiated by the NEA in 1978).

Accordingly, the NEA brought together the Review Team, consisting of four former senior nuclear regulators, with a collective nuclear safety experience of more than 120 years, and solid national and international experience (including participation in peer reviews) related to nuclear safety and regulation. Two of the members were familiar with NRC regulations, which have been used as a basis for Spanish nuclear regulations.

The Review Team held its first meeting on 21 November 2005 and decided that, in view of the agreed mandate and schedule, it would rely solely on information provided by the CSN, as listed in the Reference section, complemented by interviews with CSN management and staff in order to check and fully understand the information provided, especially in the CSN lessons learnt report. The Review Team appreciated the quality of this exchange of information, which was very open, professional and productive. The CSN demonstrated throughout its willingness to use this event as a unique opportunity for learning and improvement, so as to bring its regulatory supervision into line with best international practice.

Mr. Lars Högberg (Sweden), chairperson of the Review Team, has also been the Editor-in-Chief of this report based on draft texts and comments provided by the team members: Dr. Samuel A. Harbison (United Kingdom), Mr. Ellis W. Merschoff (USA) and Mr. Jean-Pierre Clausner (France), assisted by Mr. Jean Gauvain (NEA) providing Secretariat support.

The report herein represents the consensus opinion of the Review Team as agreed at its final meeting.

## **ACKNOWLEDGEMENTS**

The Review Team (RT) members would like to thank the CSN staff for their kind hospitality during the visits to Spain and for their organisational support which greatly facilitated the work of the RT. The RT would also like to thank all the CSN staff who took part in the review for the helpful and open manner in which they responded to the review and to the requests from the RT.

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## KEY CONCLUSIONS AND RECOMMENDATIONS

The Review Team **considers** the lessons learnt report developed by the *Consejo de Seguridad Nuclear* (CSN) as a consequence of the Vandellós event to be a commendable effort of regulatory self-assessment. The performance of such self-assessments is consistent with best international practices. The lessons learnt report, complemented by the outcome of this international peer review, should enable the CSN to take the proper actions to ensure that its regulatory supervision is in line with best international practices.

The Review Team largely **endorses** the actions proposed in the CSN lessons learnt report. To these proposed actions, the Review Team adds its own suggestions, amplifying, developing and widening the scope of many of the actions proposed in the lessons learnt report. Most of the actions suggested, both in the lessons learnt report and by the Review Team, are of a fairly detailed technical nature. In order to provide an overview and to facilitate turning the proposed actions into an appropriate action plan, the Review Team has arrived at the following key overarching conclusions and recommendations; the aim being to distil and summarise key actions proposed by the CSN lessons learnt report as complemented by the Review Team report.

The Review Team **concludes** that the most important safety concerns raised by the event are first and foremost related to the significant weaknesses revealed in licensee performance with regard to safety management. The degradation of the essential service water (ESW) system was known within the licensee organisation for several years prior to the event, but appropriate corrective actions were not taken, nor was the CSN informed. However, while the primary responsibility for safety rests with the licensee, the event also raises concerns about the weaknesses revealed in the CSN regulatory oversight which contributed to the CSN failure to detect both the degradation of the ESW system and the weaknesses in licensee safety management prior to the event.

The Review Team offers the following overarching recommendations:

- The CSN should benchmark the differences between its regulatory programme and associated oversight processes and tools with those of its reference programme (USNRC) also taking into account good regulatory practices applied elsewhere, notably by other nuclear regulators within the European Union. This benchmarking review

should use a holistic and systematic approach, looking beyond the specific weaknesses revealed by the Vandellós event. In particular, the review should include a thorough assessment of the CSN approach to regulatory supervision of licensee safety management in relation to good practices both in the US and in Europe.

- The CSN should assess the various ways in which it interacts with licensees, to ensure that there are clear and appropriate internal policies and guidelines for different types of interactions and information exchange between the CSN and the licensees. This should include a review of the way that the CSN obtains, analyses, documents and reacts to safety-related information from nuclear power plant licensees, both as a part of the CSN normal supervision process and in the case of unexpected events.
- The CSN Plenary should initiate an internal review of the actual working processes of the Plenary and the Secretariat General, identifying and implementing appropriate actions in order to ensure and facilitate the effective functioning of the Plenary, the Secretariat General and the Technical Directors, with regard to both regulatory decision making and the internal management of the CSN. In this context, the CSN should develop clear internal guidelines for the initiation and performance of self-assessments.
- The CSN should consider the added value of having a technical expert advisory group, such as is found in many foreign nuclear regulatory organisations to provide independent technical advice to the Plenary on safety issues, thereby also playing an important role in the internal quality assurance processes of the CSN.
- The CSN should develop and implement a proactive information policy and strategy, drawing on the experience available through the NEA/CNRA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC). A clear distinction between the respective roles of the licensee and the CSN in providing information to the public should be included in this information policy and strategy.

Last but not least, the CSN should turn the proposed actions in the lessons learnt report, together with the recommendations and suggestions by the Review Team into a specific action plan, with identification of priorities, responsibilities and associated resources for the various tasks, as well as with milestones for the completion of the tasks and for the evaluation of the effectiveness of the actions taken. This action plan should start with activities aimed at creating a shared understanding within the CSN of current weaknesses in the CSN regulatory oversight and how these are rooted in the prevailing attitudes and internal decision-making processes.

## **1. BACKGROUND AND MISSION**

### **1.1 CSN request for a peer review of a lessons learnt report**

On 25 August 2004, an event occurred at the Vandellós II nuclear power plant, which affected the operation of its essential service water (ESW) system. The subsequent follow-up of this safety related event and of the associated licensee's activities by the *Consejo de Seguridad Nuclear* (CSN), the Spanish nuclear regulatory body, eventually resulted in a report from the CSN, entitled *Lessons Learnt from the Essential Service Water System Piping Degradation Event at the Vandellós II Nuclear Power Plant*, in the following referred to as the CSN lessons learnt report.

On 14 October 2005, during the final stage of editing the CSN lessons learnt report, the CSN requested the NEA to set up an international Review Team to provide an independent peer review of this CSN lessons learnt report. The NEA accepted the responsibility to organise this review, since it was clear that its result would not only benefit the CSN but would also be useful to other nuclear regulators of the member countries.

The purpose of this review was to prepare a report of the Review Team's findings regarding the adequacy and completeness of the lessons learnt, as identified by the CSN. The findings were to be based on practices by regulatory authorities from other countries and were expected to either highlight a good practice or include a suggestion or a recommendation.

### **1.2 Peer Review Team working method**

Immediately after receiving the CSN lessons learnt report, the Review Team met on 21 November 2005 at NEA headquarters for a preliminary exchange of views on the report, and to agree on the review approach and the structure of the Team's report.

Having prepared a first set of questions, the Review Team then travelled to Madrid on 22-23 November 2005 for a series of interviews with the CSN (President, Vice-President, two other Commissioners and selected members of CSN staff, notably from the Technical Directorate of Nuclear Safety, as well as

the Resident Inspector at Vandellós) about the content and background of the CSN lessons learnt report. On 9 January 2006, in Paris, two members of the team assisted by the secretary interviewed the Commissioner who was not available in Madrid in November.

In addition to the lessons learnt report, the Review Team was provided with the CSN mission and with Spain's national report for the third review meeting under the Convention on Nuclear Safety.

The review process then continued through e-mail exchange of draft texts and comments, leading to this final report, in which the Review Team referenced its findings and suggested actions according to the chapter numbers of the CSN report and the order of occurrence of each lesson learnt in each chapter.

A final draft of the report, with its findings, suggestions and recommendations was submitted to the CSN for factual comments before its adoption by the Review Team. After formal adoption of the final text, the report was presented by the Review Team to the CSN in Madrid on 3 March 2006.

The Review Team recognises that, given the agreed mandate and schedule for this peer review, its report is the result of a scrutiny of the CSN lessons learnt report, supplemented by brief interviews, without in-depth checks of CSN regulations, requirements or practices. The Review Team believes that this does not affect the main conclusions of the report, although there may be some inaccuracies in the technical details.

### **1.3 Short summary of the Vandellós II event and related CSN actions**

The following short summary of the Vandellós II event and related CSN actions is based on the information provided either in the CSN lessons learnt report or during the Review Team's interviews with the CSN staff.

On 25 August 2004, a manhole ruptured in the 800 mm Bonna-type piping of the ESW system at the Vandellós II nuclear power plant. The function of that system is to provide the ultimate heat sink for most safety systems of the plant. During the 25 August 2004 event, train B of that system was completely lost and cooling of the plant systems was ensured by the remaining train A. Over the days August 25-29, the licensee informed the CSN that the plant had been shutdown to repair the ruptured manhole in train B and the symmetrical one in train A and to make some additional checks of the system. No information was provided on the previous history of system problems. The CSN checked that the plant followed its established internal review procedures for repairs, and on

29 August, the plant safety committee approved the start-up of the plant, and it was subsequently restarted. No CSN approval was deemed necessary according to the Spanish legal framework and licensing process.

The CSN Resident Inspector promptly informed the CSN main office of the event and subsequently followed and reported back on the actions taken by the licensee. On 31 August, the Resident Inspector sent a note to the CSN, mentioning a number of circumstances meriting further attention.<sup>1</sup> The safety significance of the event was recognised at the CSN, and there were internal discussions about whether to send a reactive inspection team to the plant. In the end, no such decision was taken as the Technical Director of Nuclear Safety proposed to include the ESW event as a special issue on the agenda of the CSN multidisciplinary inspection already scheduled to begin on 20 September.

The multidisciplinary inspection and subsequent investigations performed by the CSN revealed that the licensee apparently knew of the degradation of the ESW system for some considerable time before the actual event occurred. A root-cause analysis by the CSN revealed that the licensee's routine inspections of the system had identified pervasive corrosion in the outer part of the manhole necks in both trains in 1998. Despite these findings, the licensee did not take any appropriate corrective actions or inform the CSN about the degraded state of the ESW system. The regulatory inspection programme carried out independently by the CSN over the years had also failed to uncover the degradation situation.

The widespread corrosion of the ESW system presented a significant risk of a common cause failure in both trains of the system and consequently represented a significant degradation of the defence in depth and hence of the safety of the plant. Given the safety significance of the event and the weaknesses revealed in the licensee's safety culture, the incident was finally classified by the CSN as INES Level 2.

When the full safety significance of the event was appreciated, the CSN took a number of regulatory actions to require the licensee to make safety improvements. Recently, the CSN also proposed legal actions against the licensee.

Furthermore, the Technical Director of Nuclear Safety asked the head of the CSN Office of Inspection to perform an internal CSN review to identify lessons learnt from the event. This internal review process was subsequently developed in several steps, resulting finally in the report approved by the CSN

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1. CSN Lessons Learnt Report, p. 14.

Plenary on 18 November 2005. The report analyses aspects of the event related to the licensing and inspection process, the internal communication within the regulatory body, the interaction between the licensee and the CSN, and the CSN communication with national and international institutions, the media and the public. In each of these four areas, the report contains conclusions on lessons learnt and proposals for actions by the CSN, aiming at preventing the occurrence of similar situations in the future. It is the final version of the report, as approved by the CSN Plenary that has been used as the basis for the International Peer Review.

## 2. GENERAL FINDINGS AND SUGGESTIONS

Before addressing the specific lessons learnt and the proposals for actions in each of the four areas covered in the CSN report, the Review Team considers it appropriate to present some general findings and to suggest some actions of a general character. These draw together, in an overarching manner, a number of the detailed lessons identified and discussed later in Chapter 3.

### 2.1 The main safety significance of the event

While the direct technical safety significance of the event must not be underrated, the Review Team **concludes** that the two most important safety concerns raised by the event were the following:

- Firstly, there were significant weaknesses in the licensee's performance with regard to safety management. Specifically, at least part of the licensee organisation was aware of the widespread degradation of both trains of the ESW system for a number of years prior to the event, without either taking appropriate corrective actions or informing the CSN of the extent of the degradation and its history until the regulator started to ask specific questions after the event.
- Secondly, while the primary responsibility for safety always rests with the licensee,<sup>2</sup> there were weaknesses in the CSN regulatory oversight which contributed to the CSN failing to detect both the degradation of the ESW system and the weaknesses in licensee safety management prior to the event. These weaknesses also contributed to the CSN delayed regulatory response to the event.

As a detailed scrutiny of the licensee's performance is outside the mandate of the Review Team, the Team will, in the following, mainly restrict itself to factual information, e.g. with regard to information given by the licensee to the CSN. The statements made in this report about licensee actions should not in any way prejudice any legal proceedings initiated in Spain.

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2. Cf. the International Convention on Nuclear Safety, Art. 9.

## 2.2 The CSN regulatory oversight

The Review Team offers the following general observations and suggestions with regard to improvements in CSN regulatory oversight:

From a number of the lessons identified and the actions proposed in the CSN lessons learnt report, the Review Team **has drawn the general conclusion** that the CSN regulatory oversight appears to rely too much on the direct applicability to Spanish nuclear activities of the USNRC regulatory framework, without a thorough check to ensure that all the tools and oversight redundancies that help assure the effectiveness of the USNRC regulatory programme are also effectively in place in Spain or, if not, that these gaps are properly compensated for by other means. In this context, it should be noted that during the time period covered by the lessons learnt report, the CSN was developing and testing a new regulatory oversight system that at that time had not been fully implemented.<sup>3</sup>

With the above in mind, the Review Team **suggests** that the CSN, by means of a benchmarking exercise, should identify the differences between its regulatory programme and associated oversight processes and tools and those of its reference programme (USNRC). This benchmarking should assure the CSN that its regulatory oversight programme has equivalent completeness, adequacy and effectiveness to that of the USNRC. The benchmarking should also take account of good regulatory practices applied elsewhere, notably within the European Union. Thus, this internal benchmarking exercise of the CSN should be properly co-ordinated with the European benchmarking project presently being performed by WENRA,<sup>4</sup> making appropriate use of the reference levels developed in that project. Where gaps are noted, corrective or compensatory measures should be established to close those gaps and ensure the effectiveness of the CSN regulatory oversight programme. Particular attention should be paid to the CSN regulatory oversight of licensee safety management (see Section 3.2).

In this context, the Review Team notes the importance of achieving co-ordination and mutual consistency between, on the one hand, the regulatory requirements and standards used as a formal licensing basis, and, on the other hand, the regulatory inspection and review processes so as to ensure that all risk-significant systems and components, processes and events are receiving appropriate regulatory attention. This becomes especially challenging when a mixture of regulations, codes and standards from different countries is used as

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3. Cf. Spain's 3<sup>rd</sup> National Report under the Convention on Nuclear Safety, September 2004; Section 7.3.

4. Harmonisation of Reactor Safety in WENRA Countries; Report by the WENRA Reactor Harmonization Working Group; January 2006 ([www.wenra.org](http://www.wenra.org)).

the licensing basis. The Review Team therefore **suggests** that the review of the CSN regulatory oversight should use a holistic and systematic approach, going beyond the specific weaknesses revealed by the Vandellós event.

Furthermore, the Review Team **suggests** that this review of the CSN regulatory oversight programme should include an in-depth analysis of the root causes to any weaknesses and gaps in the CSN oversight programme identified in the benchmarking process. This analysis should then be used as a basis for a continuous process of the CSN self-improvement (see also Section 2.4 below).

### **2.3 The CSN self-assessment process**

The CSN Report on lessons learnt from the Essential Services Water System Piping Degradation Event at Vandellós II nuclear power plant is, in the opinion of the Review Team, a thoughtful and reasonably well developed analysis of a significant event. The Review Team **considers** that the report demonstrates a commendable effort of regulatory self-assessment, in which a significant event has been used to identify weaknesses in regulatory oversight and to initiate appropriate corrective actions. The performance of such self-assessments is consistent with best international practices.<sup>5</sup>

The report contains a significant number of useful proposals for actions which, if carefully implemented, will improve the effectiveness of the CSN regulatory oversight. The Review Team **agrees** with these proposals while emphasising and providing additional specificity to several of them, as well as adding a number of new conclusions and suggested actions, based on the Review Team's own assessment.

Although the initiative within CSN to start such a self-assessment process was commendable, the Review Team has found that the actual implementation suffered from a lack of established procedures and adequate managerial guidance from the top management of CSN. This resulted in some confusion about the handling and internal review of the draft reports on the event which were produced in successive stages. There was additional confusion in the way that information was communicated to the Spanish parliament and the general public.

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5. Examples of similar regulatory self assessments familiar to Review Team members, and thus providing part of the reference framework for the Review Team include the SKI assessment of its performance with regard to the Barsebäck event in 1992 ("Evaluation Report concerning SKI's handling of the matter of the clogged strainers from July 28 to September 17, 1992", March 1993) and the USNRC assessment of its performance with regard to the Davis Besse event in 2002 (Degradation of the Davis Besse Nuclear Power Station Pressure Vessel Head Lessons-Learnt Report, September 2002).

Therefore, the Review Team **suggests** that the CSN should develop clear internal guidelines for the initiation and performance of self-assessments, including guidelines for related communications with the Spanish parliament, local and regional authorities and the general public. Such guidelines should also identify circumstances where it would be appropriate to use external assessment teams.

#### **2.4 Further definition and implementation of a CSN action plan**

As an overall conclusion, the Review Team finds that the CSN lessons learnt report, complemented with this report from the Review Team, should provide a good basis for a CSN action plan aimed at further development and improvement of CSN regulatory activities.

The Review Team therefore **suggests** that the CSN should promptly turn the recommended actions into a specific action plan, with priorities, identification of responsibilities and associated resources for the various tasks, as well as with milestones for the completion of tasks and for the evaluation of the effectiveness of the actions taken. The overall leadership for development and implementation of the action plan should be firmly exercised by the CSN Plenary and the Secretary General and should be aimed at motivating the staff towards self-assessment and self-improvement.

The Review Team is well aware that the development, implementation and evaluation of such an action plan may need several years. A process of continuous improvement and self-assessment should be set in motion and allowed to proceed in a systematic manner. This process of continuous improvement must start with a common understanding, shared by the CSN Plenary, its managers and staff, of the current weaknesses in the CSN regulatory oversight and how these are rooted in the prevailing attitudes and internal decision-making processes.

The Review Team therefore **suggests** that the action plan should start with activities, such as internal seminars and training courses, aimed at creating such a shared understanding and paying particular attention to remedying the regulatory weaknesses revealed by the Vandellós event and further discussed in the following chapter of the Review Team Report, such as:

- Developing a more questioning attitude to formal compliance with foreign regulations without enough critical assessment of their effective functioning in the Spanish context.
- Developing a more critical attitude to information provided by the licensees, also evaluating the adequacy of the CSN regulatory

requirements regarding information and assessments to be provided by the licensee in the case of unexpected events and degradation processes.

- Improving the response to events within the CSN to ensure prompt involvement of all relevant expertise within the CSN.
- Developing more precise and coordinated communication channels between the technical staff and the Plenary.
- Further clarification of the ways in which the CSN President, the Commissioners and the Secretary General exercise their roles in the internal management of the CSN.
- Implementing an information policy and strategy in line with good professional practices for public information activities, to provide for proactive and coherent external communications activities.



### 3. TOPICAL REVIEW OF THE LESSONS LEARNT REPORT

Short summary tables of lessons learnt and proposed actions listed in the CSN report have been prepared by the Review Team as “quick references” to facilitate understanding of the Review Team’s conclusions and suggestions and the of the context in which they are made. They do not, in any way, replace the full text to be found in the CSN report.

#### 3.1 Lessons learnt regarding the licensing process

Summary Table 1. **Lessons learnt and proposed actions by the CSN**

1.1	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> need for greater attention to non-conventional designs.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Recommendation to the licensees to use designs based on well proven technologies.</li> <li>b. Special attention to non-conventional designs, with specific regulatory resources.</li> <li>c. Adequate analysis and selection of standards applicable to non-conventional designs.</li> </ol> </li> </ul>
1.2	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> need to reinforce CSN integrated safety assessment, especially for complex systems, where existing standards are only partially applicable.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Integrated safety assessment when different standards are applied partially.</li> <li>b. Adequate documentation of the requirements and standards applied in the assessment.</li> </ol> </li> </ul>
1.3	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> surveillance requirements related to degradation phenomena were not well established.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Require nuclear power plants to analyse the operating experience relating to degradation phenomena.</li> </ol> </li> </ul>
1.4	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> the manholes in the ESW system were always outside the scope of the system maintenance.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Guarantee that nuclear power plant maintenance plans include surveillance of entire safety systems</li> <li>b. Reinforce the CSN control, tracking and inspection of licensee maintenance activities.</li> </ol> </li> </ul>

### ***Findings, conclusions and suggestions by the Review Team***

The Review Team finds that the event and the CSN lessons learnt report has identified and highlighted a number of weaknesses related to the licensing process in areas such as:

- the processes involved in approving safety-related design modifications to standard plants imported into Spain from another country;
- the awareness on the parts of both the licensee and the CSN of the safety significance of such design modifications to the overall system, both initially and on a continuing basis;
- the inspection and maintenance regimes that the licensee applied to the ESW system, the technical arguments underpinning these regimes and the role of the CSN in monitoring the licensee's performance and granting derogations from certain aspects of the test programme for the system;
- the CSN activities prior to the event, its acceptance of an inadequate licensee inspection programme and its lack of challenge and independent checking/verification of the licensee's claims; circumstances that point to weaknesses in the regulatory requirements regarding information and assessments to be provided by the licensee in the case of unexpected events and degradation processes.

The Review Team **concludes** that the actions proposed in the CSN lessons learnt report are highly relevant for addressing these weaknesses, and should be included in the CSN action plan. In addition, however, the Review Team **concludes** that they should be strengthened and widened to a more comprehensive review of the CSN approach to its regulatory oversight, in line with the general suggestions already made by the Review Team in Section 2.2 above. In this respect, the Review Team makes the following observations and suggestions aiming at ensuring completeness and adequacy of the action plan of improvements in the Spanish regulatory framework and licensing process.

Firstly, the Review Team finds that the actions proposed in the lessons learnt report, and summarised in the table above, are not sufficiently specific about which reviews should be carried out by the licensees and which reviews should be done by the CSN. Therefore, the Review Team **suggests** that the CSN should require all Spanish nuclear power plants (to the extent that CSN has not already done so) to:

- perform systematic internal reviews to identify any modifications of conventional designs and the standards applied to such modifications;

- perform appropriate safety assessments of systems in which there is the partial application of different standards in order to determine the adequacy of the standards actually applied;
- analyse and assess operating experience with regard to relevant degradation phenomena, taking into account international experience;
- ensure that their in-service inspection and maintenance plans include adequate coverage of all safety systems in their entirety, taking into account both the safety significance of each system and its sensitivity to various types of degradation; and
- report back to the CSN on their findings, conclusions and action plans with regard to the above.

At the same time, the CSN should make its own internal reviews and assessment, in preparation for a critical review of the reports submitted by the licensees.

In this context, the Review Team **suggests** that the CSN should review and clarify, as appropriate, its regulatory requirements with regard to licensee in-service inspection programmes to ensure satisfactory coverage of potential degradation mechanisms and other unexpected deviations from expected performance in safety-significant systems, using a comprehensive approach.<sup>6</sup>

Secondly, the Review Team notes that most nuclear countries have programmes for systematic reassessments of the safety of existing nuclear

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6. Such a comprehensive approach would typically include the following elements:
- The safety significance of system failure should be well understood, using PSA and other methods.
  - Possible degradation mechanisms of system components should be identified based on state of the art engineering knowledge, including national and international operating experience.
  - The extent of any faults or degradation discovered, which are considered relevant to safety, must be determined with acceptable precision.
  - The mechanism causing the faults or degradation should be understood, to the extent that a prognosis of fault or degradation growth rates can be made, and the inspection and testing intervals chosen accordingly.
  - The necessary remedial and control measures – at least of a provisional nature – should be implemented on the basis of the estimated extent and growth rates. Some uncertainties in these estimates can be accepted if it can be shown that the probability of serious consequences with regard to safety (such as system function failure) is low in the intervals between inspections and tests.

power plants<sup>7</sup> to make sure that the plants remain in compliance with their original design basis and that corrective measures are identified and implemented when necessary. Such programmes typically also review national and international operating experience and R&D results in order to decide whether further safety improvements are justified with regard to design, operation and maintenance, including plant-specific in-service inspection programmes (see box on next page). The Review Team is aware that there is a corresponding Spanish periodic safety review programme initiated by the CSN, and that the results are assessed mainly in connection with the reviews performed as a basis for licence renewal every ten years.<sup>8</sup> However, the Review Team notes that the CSN lessons learnt report does not address whether this programme could have picked up the accelerating degradation of the BONNA piping manholes observed at least from 1993 onwards.

The Review Team therefore **suggests** that the CSN should perform a critical review of its periodic safety review programme to ensure that it includes exhaustive re-examinations of the design basis of risk-significant systems, complemented by appropriate safety system functional inspections of these risk-significant systems to assure that they meet their original design intent.

Furthermore, the Review Team **suggests** that the CSN should benchmark its legal regulatory framework and associated oversight processes, amended as suggested above, to assure they would have identified the design weaknesses and the degradation mechanisms revealed by the Vandellós event, and initiated appropriate corrective actions by both the licensee and the CSN before any serious degradation of plant safety had occurred.

The observations and suggestions by the Review Team with regard to the CSN regulatory supervision of licensee safety management are given in the following section.

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7. This is in fact an obligation under the Convention of Nuclear Safety (Art. 14).

8. See for example Spain's 3<sup>rd</sup> National Report under the Convention on Nuclear Safety, Sect. 6.3.2.

**Programmes for systematic reassessments of the safety  
of existing nuclear power plants: two examples**

***In the United States of America***

One of the lessons learnt from the Millstone Nuclear Plant's regulatory issues in the 1990s was that over time, some U.S. plants had been modified or degraded to an extent that they no longer met the original design basis. In some instances the original design basis was not readily available and needed to be reconstituted. The result of this was a letter sent by the regulator to all licensees (pursuant to 10 CFR 50.54(f)) requiring licensees to show how they assure they remain in compliance with the original design basis of the plant. Additionally, the regulator conducted a series of multidisciplinary safety system functional inspections (SSFIs) to identify problems and assure compliance of risk-significant systems with the design and licensing basis. These SSFIs, when performed on the Essential Service Water and Electrical Distribution Systems of every U.S. nuclear plant identified instances where the original design intent had been compromised by modifications, degradation, or original design and construction errors.

***In France***

In recent years, a number of "conformity" anomalies have been detected in French nuclear power plants, to a large extent as a result of the systematic conformity checks. The Nuclear Safety Authority (ASN) requires that conformity examinations be conducted as part of the periodic safety reviews. These examinations consist in comparing the state of the facility with the design safety requirements, taking account of changes made since construction, and listing any anomalies. These anomalies can be of various origins: design errors, construction defects, discrepancies introduced during maintenance, deterioration due to ageing and so on. This examination includes a check on the conformity of the steps taken to protect against external hazards, including extreme weather conditions and earthquakes, and against internal hazards such as high-energy pipe breaks, as well as a check on the ability of the equipment to operate in the degraded ambient conditions likely to exist in the event of an accident (known as "qualification for accident conditions"). In addition to the process of systematic anomaly searches, a questioning attitude on the part of the operator's staff is another means of detecting conformity discrepancies: routine field inspections or even a critical review of older design studies in the engineering centres can contribute to this. A specific procedure was set up to inform the ASN about the conformity anomalies discovered by the French utility EDF. When there is any doubt as to the conformity of an item, EDF notifies the ASN and undertakes a process of "characterisation" which aims to determine whether there is a real deviation from the design safety requirements and if so, to specify the equipment affected and assess the consequences of the anomaly for safety.

### 3.2 Lessons learnt regarding the supervision process by the regulator

#### 3.2.1 Effectiveness of the response of CSN technical staff to the Vandellós II event

Summary Table 2. **Related lessons learnt and proposed actions by the CSN**

2.1	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> the information provided by the licensee may be incomplete.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Reinforce Resident Inspector’s means of checking information supplied by licensee.</li> <li>b. Establish mechanisms to reinforce and widen the licensee’s safety culture.</li> <li>c. Revise the sanctions chart to include cases of hiding of information.</li> </ol> </li> </ul>
2.2	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> need for specific procedure covering immediate analysis of safety-related SSC events</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Develop a procedure for the immediate assessment of incidents, which includes:               <ul style="list-style-type: none"> <li>– Definition of those incidents that should be assessed.</li> <li>– Composition of the Assessment Group.</li> <li>– Identification of other people who should receive information from the Group.</li> <li>– Circumstances in which additional information should be acquired.</li> <li>– Circumstances in which reactive inspections should be performed.</li> </ul> </li> </ol> </li> </ul>
2.3	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> the information on the condition of the plants provided by the Resident Inspector may be of vital importance for the correct assessment of incidents.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Introduce obligatory attendance of Resident Inspector at Plant and Operator’s Safety Committee meetings.</li> <li>b. Intensify the direct observation by the Resident Inspector of the activities of the licensee, especially with regard to the lifetime management of safety-related SSC and to the appliance of the maintenance rule.</li> <li>c. Formalise daily meetings with those responsible for the plants.</li> <li>d. Reinforce coordination with and support for the Resident Inspector from CSN central services.</li> </ol> </li> </ul>

#### *Findings, conclusions and suggestions by the Review Team*

The Review Team finds that the event and the CSN lessons learnt report have identified and highlighted a number of weaknesses in the response of the CSN technical staff to the Vandellós II event and in the CSN supervision process in general.

The Review Team **concludes** that the actions proposed in the CSN lessons learnt report are relevant for addressing these weaknesses, and should be included in the CSN action plan.<sup>9</sup> In addition, however, the Review Team **concludes** that the actions identified by the CSN report should be strengthened and widened to a more comprehensive review of the CSN regulatory supervision processes, in line with the general suggestions already made by the Review Team in Section 2.2 above. With this in mind, the Review Team makes the following observations and suggestions aimed at ensuring completeness and adequacy of the action plan with regard to improvements in the response of the CSN technical staff to events at the Spanish nuclear power plants, and to the CSN supervision process in general.

First and foremost, the Review Team **emphasizes** the importance of adequate auditing of licensee performance with regard to safety management, both by the licensees themselves and by the CSN. It appears to the Review Team that the Vandellós event revealed weaknesses in the licensee's safety management of such an extent that the licensee had neither appreciated fully the safety significance of the modifications to the ESW system, nor responded properly to the findings and recommendations of its own internal inspection programme, that had identified ongoing degradation in the ESW system since at least 1993. The licensee had apparently failed to provide the CSN with frank, accurate and complete information on the status of the ESW system for some considerable time. Moreover, the licensee's actions when the event occurred indicated a lack of appreciation of the overall safety significance of the event, and an emphasis on a "quick fix" to get the plant back on line as quickly as possible, meanwhile providing a minimum amount of information to the CSN.

While underlining that safety, including safety management, is the licensee's responsibility, the Review Team **concludes** that the Vandellós event also points to significant weaknesses in the CSN's oversight of licensee safety management. In particular, the Review Team has found that, although the CSN uses the USNRC Regulatory Oversight Process as a reference, there is no direct correspondence in Spain to the active role that the U.S. Institute of Nuclear Power Operations (INPO) plays in the oversight of nuclear plant safety in the USA, conducting extensive reviews of plant performance with regard to operations, maintenance and safety at every nuclear power plant at intervals of approximately 18 months. The performance of each plant is benchmarked

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9. The wording of the Action 2.1 b) in the above table is misleading (at least in the English translation) in that it implies that the regulatory body can reinforce and widen a licensee's safety culture. This can only be achieved by the licensee, although the regulator should monitor and audit it, as suggested by the Review Team later in this Section.

against best industry practices. The outcomes of these reviews are fully available to USNRC and used as appropriate in their regulatory oversight. In Spain, World Association of Nuclear Operators (WANO) peer reviews have been considerably less frequent, and, in accordance with WANO's policy, the results have not been shared as openly with the CSN. Despite these differences to the US approach, the CSN has not developed any system of its own for regulatory supervision of licensee safety management, such as, for instance, that applied by the Swedish Nuclear Power Inspectorate.

As a consequence, the Review Team **suggests** that the CSN should develop and implement a comprehensive approach to the regulatory supervision of licensee safety management, drawing on international experience to adopt methods which would work effectively in Spain. In this context, the CSN should consider further development of specific and auditable regulatory requirements regarding licensee internal safety review and decision-making procedures related to modification of plant design and in-service inspection programmes, and licensee handling of unexpected events and observed degradation phenomena.<sup>10</sup> The CSN should of course also, to the extent that it has not already done so, require the Vandellós licensee to tackle immediately the safety management deficiencies revealed by the ESW event by means of an auditable continuous improvement programme.

Secondly, the Review Team finds that the CSN handling of the Vandellós event, in particular the initial responses of the resident inspector (RI) and other CSN technical staff, were conditioned and impaired by the incomplete and misleading information provided by the licensee.

However, the Review Team finds that the CSN staff share some of the responsibility for the slow response to the issue. The evidence the Review Team has examined suggests that the CSN was too content to rely on safety information and analyses provided by the licensee, without carrying out sufficient independent checks itself. The Review Team was surprised that the long history of corrosion problems in the ESW system could have escaped the notice of the CSN inspectors, even allowing for the fact that the licensee did not voluntarily divulge it. The Review Team finds that the CSN management missed an opportunity to encourage the inspectors to uncover this problem, by not requiring any spot checking to ensure that the relaxations it had agreed to with respect to testing of the ESW system were not leading to deterioration in safety.

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10. Such regulatory requirements can for example be found in The Swedish Nuclear Power Inspectorate's Regulations concerning Safety in Nuclear Facilities (SKIFS 2004:1) (available in English on [www.ski.se](http://www.ski.se)).

A further concern for the Review Team relates to the response of the CSN technical units to the Resident Inspector's early reports on the event. It appears that the technical staff accepted the licensee's version of the event without making any independent checks on it. This was in spite of the Resident Inspector's Note of 31 August 2004, which should have alerted the technical staff but which was not properly distributed within the CSN. In particular, the Operating Experience Unit, responsible for categorising reportable events, was apparently not involved in any of the meetings held between 25-30 August 2004 to consider and analyse the event. Thus, it seems clear to the Review Team that the importance of the event, and the potential widespread corrosion problems that it should have highlighted, were not fully appreciated and so no reactive inspection team was dispatched promptly to the site. The full implications of the event became widely recognised within the CSN only after the first part of the multidisciplinary inspection from 20 to 23 September 2004.

The Review Team consequently **concludes** that it is important for the CSN to carry out a general review of the way that it obtains, analyses and documents safety-related information from nuclear power plant licensees as a part of their regular supervision activities. The Review Team also **concludes** that it is important for the CSN to review its internal processes for handling and analysing events affecting safety-related SSC.

The Review Team therefore **suggests** that the CSN should undertake a thorough review of the way that it obtains, analyses, documents and reacts to safety-related information from nuclear power plant licensees, both as a part of the CSN normal supervision process and in the case of unexpected events. This would constitute a broader, more generic action, complementing the actions proposed in the lessons learnt report. In particular, this generic action should include the following elements:

- The rights of the CSN staff and, in particular, the Resident Inspector to unfettered access to safety-related information from the licensee should be clarified and strengthened, and the outcome communicated to all Spanish licensees in an unambiguous way. This may, for example, involve attendance of the Resident Inspectors at the meetings of the Plant Nuclear Safety Committee and the Operator's Safety Committee, and some formalisation of the Resident Inspector's daily meetings with the operating staff.
- The working methods of the Resident Inspectors, and their interaction with the technical sections in the CSN, should be reviewed, clarified and strengthened as appropriate.

- The CSN processes for handling and assessing unexpected events and inspection findings, for example regarding degradation phenomena, should be reviewed, resulting in an improvement programme which may involve one or more of the following actions:
  - a. improved definition of the types of events and other deviations from expected performance that should be assessed;
  - b. clarification of the expected composition of the Assessment Group and any additional training of potential members, including Resident Inspectors;
  - c. clarification of all CSN staff who should receive information from the Assessment Group;
  - d. clarification of circumstances in which additional information should be acquired;
  - e. clarification of circumstances in which reactive inspections should be performed.

Although the Review Team **recognises** that the CSN already has taken some action, for example with regard to improving the Resident Inspector's access to licensee information, it emphasizes the importance of a comprehensive, thorough review, as suggested above.

The Review Team notes that rigorous and consistent implementation of an improved inspection programme requires the full involvement of the CSN management. Managers from the CSN central office should periodically accompany inspectors in the field not only to assure the consistent application of regulatory requirements and inspection programmes at each regulated facility but also to stimulate mutual exchange of professional knowledge and experience. The Review Team notes with satisfaction that the CSN Plenary in 2003 initiated regular meetings between Commissioners and Resident Inspectors. The Review Team **suggests** that the CSN continues to pay attention to the involvement of its management in the field inspection activities, introducing improvements where appropriate.

### 3.2.2 Effectiveness of current processes for reporting and analysing abnormal events

Summary Table 3. **Related lessons learnt and proposed actions by the CSN**

2.4	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> information provided by licensees in Reportable Event Reports (RERs) is of vital importance to adequate assessment of events.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Improve the Instruction and Guideline on the Reportability of Events at nuclear power plants.</li> <li>b. Establish the contents and quality of information with respect to the RER's.</li> </ol> </li> </ul>
2.5	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> Analyse licensee's authority to correct certain defects unilaterally.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Revise situations where the licensee may implement unilaterally corrective initiatives without previous approval by the CSN.</li> </ol> </li> </ul>
2.6	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> CSN technical experts and Resident Inspectors should receive adequate training in events management.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Develop a training programme in relation to incidents and use of information on risk.</li> </ol> </li> </ul>

#### *Findings, conclusions and suggestions by the Review Team*

The Review Team has already identified and discussed in the previous section the significant shortcomings in the quantity and quality of information provided by the licensee on the Vandellós ESW event, also noting that the licensee's actions when the event occurred indicates a lack of appreciation of the overall safety significance of the event, and an emphasis on a "quick fix" to get the plant back on line as quickly as possible. As also described in the previous section, the Review Team has moreover **concluded** that the initial response to the event by the technical staff within the CSN was not sufficiently searching and independent, and the Team has **suggested** appropriate remedial actions, which also cover Lesson 2.6 in the table above.

As a possible contributing factor to the above shortcomings, the CSN lessons learnt report indicates that there may be weaknesses or ambiguities in the CSN Instructions and Guidelines on the Reportability of Events at nuclear power plants, as well as in the CSN definitions of situations where the licensee may implement unilaterally corrective initiatives without previous approval by the CSN. The Review Team considers that clearer and more specific regulatory instructions and guidelines concerning the CSN expectations about the classification of events and the quality and characteristics of the safety

assessments to be supplied by the licensee as a part of the event reporting would probably have improved the information supply following the Vandellós event.

The Review Team therefore **concludes** that the actions referred to in Lessons 2.4-2.5 in the table above are relevant and appropriate. In addition, the Review Team **suggests** that the review of the relevant CSN regulatory instructions and guidelines and the way in which they have been implemented at Spanish nuclear power plants, should be performed with a scope broad enough to include the following items:

- guidance on the licensee classification of unexpected events and findings, for example regarding degradation processes, with due regard to their safety significance;
- guidance on the type and quality of safety assessments that the licensee is expected to perform for various classes of events and findings;
- guidance on the information to be provided to the CSN for various classes of events and findings;
- criteria for situations in which CSN regulatory review and approval shall be needed before the licensee takes certain types of actions such as repairs and restarting operation of the facility.

Again, regulatory practices in other countries and the experience gained from their practical application should be taken into account in the CSN review.

While the Review Team underlines the importance of such a CSN review, it recognises that it may not necessarily – and preferably will not – result in an increased number of situations in which CSN regulatory review and approval are needed before the licensee takes appropriate action, as this could be seen as taking away some of the licensee’s responsibility for safety and possibly compromising the regulator’s independence. Instead, the review should clarify and amplify the licensee’s responsibilities with regard to performing adequate safety assessments before taking action in different types of safety-significant situations, thereby also making licensee performance with regard to safety management more clearly auditable. This has in fact already been addressed by the Review Team in the previous section when dealing with regulatory supervision of safety management.

### 3.2.3 Role and effectiveness of the CSN Plenary

Summary Table 4. **Related lessons learnt and proposed actions by the CSN**

2.7	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> the coordination of information flow by the Secretariat General is essential.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Information supplied to Plenary to be formalised in writing and reflected in the minutes.</li> <li>b. Need for formal documentation of information given orally to the Board, allowing for further dissemination within the CSN.</li> <li>c. Proposals for decisions should include all relevant information provided directly by the licensees.</li> <li>d. Consider a procedure on information flows between Technical Services and Plenary.</li> <li>e. The Secretariat General shall systematize documentation of events like this one and insure that the minutes reflect all relevant information.</li> </ol> </li> </ul>
2.8	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> the CSN should have a procedure to assess its own actions in dealing with important events.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Develop a procedure for internal assessment, under the Secretariat General coordination.</li> </ol> </li> </ul>
2.9	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> need for the Plenary to act as a collegiate body.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Act in a collegiate manner in accordance with the Law creating the CSN and its Statutes.</li> <li>b. Draw up a Plenary actuation procedure.</li> </ol> </li> </ul>
2.10	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> on the basis of the information received, the Plenary underestimated the event.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Analyse adequateness of information received by Plenary in view of event's importance.</li> </ol> </li> </ul>

#### *Findings, conclusions and suggestions by the Review Team*

The Review Team finds that several circumstances contributed to the CSN Plenary's difficulties in dealing with the Vandellós event. Chief amongst these was the incomplete information supplied by the licensee. This was compounded by the technical staff's initial acceptance of the licensee's version of the event without a sufficiently questioning attitude or independent checking. The Review Team has addressed these circumstances in previous sections of this report.

Moreover, the Review Team **considers** that the existence of several communication channels between the technical staff and the five commissioners, with poor co-ordination of the internal information flow, helped to exacerbate the Plenary's difficulties in dealing with the Vandellós event. This meant that individual members of the Plenary were apparently party to different types and amounts of technical information at different times.

The Review Team **concludes** that the formal Plenary procedures were either inadequate or inadequately applied in order to ensure that the Plenary was put in a position where proper consensus could be reached, based on appropriate and common information. The Review Team notes that the Plenary, as the highest decision-making body of the CSN, has the ultimate responsibility for the way in which the Plenary itself and the CSN organisation as a whole conducts its business according to the Statutes of the CSN, including the promotion by the Plenary of a questioning attitude and independent checking with regard to information provided by the licensees. In this context, the Review Team particularly notes the role assigned to the Secretariat General, both with regard to ensuring that the Plenary is provided with timely, adequate and appropriately complete information as a basis for the Plenary decision making, and with regard to acting as an executive director of operations for most of the CSN organisation, including the Reactor Safety and Inspection units.

Taking the above into account, the Review Team **concludes** that the actions in this topical area proposed in the lessons learnt report, and summarised in the table, are relevant and appropriate as such (allowing for some apparent ambiguities in the translation into English), but that the scope of the proposed actions should be expanded.

Thus, the Review Team **suggests** that the Plenary initiates an internal review of how the CSN Statutes are implemented in the actual working processes of the Plenary and the Secretariat General. The main purpose of this review should be to identify and implement appropriate actions in order to ensure and facilitate the effective functioning of the Plenary and the Secretariat General, with regard to regulatory decision making as well as to the internal management of the CSN. This review should address issues such as:

- Ways to ensure that all the relevant information covering all aspects of a safety or policy issue on the Plenary's agenda is properly collected, compiled and shared between all Commissioners<sup>11</sup> in a timely manner

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11. This does not exclude that individual Commissioners seek technical clarifications from the CSN staff in direct and informal ways, but when relevant, information thus received should be shared.

before any policy or regulatory decisions are taken or public statements issued on behalf of the Plenary.

- Formal clarity in the way the CSN President, the Commissioners, the Secretary General and the Technical Directors exercise their roles in the internal management of the CSN.
- Processes and programmes for self-assessment and continuous improvement of CSN performance and the role of the Plenary and the Secretary General with regard to such processes and programmes.
- The workload of the Secretary General and any possibilities for delegation of certain tasks in order to enable the Secretary General to focus on the key functions of the position. The Review Team sees these as serving the Plenary in its decision-making function and handling issues of strategic and policy importance in the management of the CSN operations.

Moreover, the Review Team notes that nuclear regulatory organisations in several NEA member countries, including the United States of America, France, Finland, Germany, Japan, Sweden and the United Kingdom use an independent group of outside experts in nuclear safety to provide their regulators with additional technical advice and recommendations on important safety issues, generally related to safety assessments initiated and presented by the regulator's expert staff, thereby playing an important role in the internal quality assurance processes of the regulator.<sup>12</sup> The Review Team **suggests** that the CSN should consider the added value of having such a technical expert advisory group to provide independent technical advice to the Plenary on general and specific nuclear safety issues.

The Review Team is aware that a review of the working processes of the Plenary and the Secretary General as suggested above may identify needs for amendments to the Statutes of the CSN. However, the Review Team has noted that the Statutes of the CSN gives the Plenary quite wide-ranging authority to shape the internal working processes of the CSN, so strong efforts should be made in the review to accommodate proposed improvements in the working processes within the framework of the present CSN Statute.

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12. IAEA Safety Requirements GS-R-1: see paragraph on Advisory Bodies to the Regulatory Body.

### 3.3 Lessons learnt regarding the interaction between the regulator and the licensee

Summary Table 5. **Lessons learnt and proposed actions by the CSN**

3.1	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> establish a transparent system of interaction between the CSN and the licensee, including CSN strategies in cases of inadequate licensee response to problems.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Create a generally accessible network on events.</li> <li>b. Establish single go-betweens and full documentation &amp; communications traceability.</li> <li>c. Develop systems for transmission of relevant information for action by technical staff.</li> <li>d. The licensees should always be given the opportunity to comment on the CSN reports.</li> </ol> </li> </ul>
3.2	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> usefulness of setting up assessment Working Groups.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Draw up a procedure applicable to Assessment Working Groups, establishing:               <ul style="list-style-type: none"> <li>– Composition of the teams.</li> <li>– Methodology to be used.</li> <li>– Participant training processes.</li> </ul> </li> </ol> </li> </ul>

#### *Findings, conclusions and suggestions by the Review Team*

The Review Team notes that the CSN lessons learnt report, as also discussed in previous sections, highlights that the information received from the Vandellós licensee had been repeatedly inadequate and that CSN perceived reluctance on the part of the licensee to transmit complete and accurate information. This resulted in the loss of the CSN trust in the licensee which may have contributed to its decision not to share with the licensee some of the results of its assessment of the appropriateness of the repair/control measures. This may have contributed to increase the mistrust and frustrations between both organisations.

The Review Team finds that there were weaknesses in the interaction process between the CSN and the licensee during the handling of the event which were detrimental to the adequate and timely resolution of the issue. In consequence the plant continued operation at full power for a considerable time without a fully satisfactory solution to the safety problems having been identified.

The Review Team **concludes** that the actions proposed in this topical area in the CSN lessons learnt report and summarised in the table above, are relevant. They are also essentially covered by the suggestion by the Review Team in Section 3.2.1 above, namely that the CSN should perform a general and in-depth review of the way that it obtains, analyses, documents and reacts to safety-related information from nuclear power plant licensees, both as a part of the CSN normal supervision process and in the case of unexpected events and findings.

In addition to these suggestions, the Review Team finds that there are also other aspects of the interaction between the CSN and the licensees that merit attention and assessment.

Firstly, the Review Team notes the importance of ensuring a correct balance in the interactions between the regulator and the licensee. This is especially true when the licensee has to take actions to correct an identified safety deficiency. While being as open and constructive as possible in providing questions and comments on licensee proposals, the regulator must avoid becoming a quasi technical consultant to the licensee. Even worse, the regulator must not get into the position of suggesting the solution and so taking over the licensee's safety responsibilities. In such a situation the regulator's scope for regulatory action would be severely undermined or hampered.

Secondly, the Review Team notes the value of informal discussions between a regulator and licensee in order to avoid misunderstandings about regulatory requirements, etc. However, these should take place within a formal regulator/licensee protocol in order not to jeopardise the independence of the regulator and the public perception of this independence.

The Review Team **suggests** that the issues discussed above should be addressed in an overall assessment of the various ways the CSN interacts with the licensees, with the objective to ensure that there are clear and appropriate internal policies and guidelines for different types of interactions and information exchange between the CSN and the licensees, and that these policies and guidelines are communicated and understood both within CSN and among the licensees. This overall assessment of the CSN interaction with licensees should of course be properly co-ordinated with the general and in-depth review suggested in Section 3.2.1 of the way that the CSN obtains, analyses, documents and reacts to safety-related information from nuclear power plant licensees.

### 3.4 Lessons learnt regarding the external communication of the regulator

Summary Table 6. **Lessons learnt and proposed actions by the CSN**

4.1	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> Public communication limited to event notification and technical reports – sometimes after information appearing in media.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Develop an integral and proactive communications policy with professional support.</li> </ol> </li> </ul>
4.2	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> Advisability of greater opening up in the publication of public documents.</li> <li>• <b>Actions</b> <ol style="list-style-type: none"> <li>a. Documentation supporting Plenary’s agreements will be published with the Minutes.</li> <li>b. Inspection Reports shall be published; Continue work on the Communications Plan.</li> </ol> </li> </ul>
4.3	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> Need to improve communications with all authorities, especially the regional and local..</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Update the procedure for communications with the regional and local authorities.</li> <li>b. Develop a joint information model for events likely to have repercussions in the local media.</li> </ol> </li> </ul>
4.4	<ul style="list-style-type: none"> <li>• <b>Lesson learnt:</b> The protection of confidential or proprietary information should be reinforced.</li> <li>• <b>Action</b> <ol style="list-style-type: none"> <li>a. Establish an internal system for the control of access to documentation that might contain confidential or proprietary information.</li> </ol> </li> </ul>

#### *Findings, conclusions and suggestions by the Review Team*

In summary, the Review Team notes that the CSN lessons learnt report states that the institutional communications of the CSN showed weaknesses throughout the entire event. The Review Team **concludes** that the CSN report makes a generally adequate assessment of the lessons learnt with regard to external communications and **supports** implementation of the actions identified in it.

The Review Team **suggests** that in developing a proactive policy and strategy, as proposed in the lessons learnt report, the CSN should draw on the experience available through the NEA/CNRA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC).

In addition to the assessment in the CSN Report, the Review Team finds that the first press releases from CSN related to the event were characterised by lack of clarity as to the respective roles of the licensee and the regulatory authority in providing information to the public. According to best international practices, the licensee should typically provide the media with short factual information about the event, a first assessment of its safety significance, and licensee actions taken as a result. The regulatory authority should complement this information with its own assessment of the safety significance of the event and the regulatory actions under consideration or already taken.

The Review Team **suggests** that a clear distinction between the respective information roles of the licensee and the CSN is included in the new CSN information policy and strategy, and that the licensees are made aware of their expected role.<sup>13</sup>

The Review Team notes that the CSN has started to make more of its documents publicly available on its website. The Review Team regards this as a good step, but a first step only, in the development and implementation of an integrated and proactive external communication policy and strategy, in line with best international practices among regulatory authorities.

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13. The licensees may choose not to exercise such an expected role, but would then have to justify to the media the rationale for their alternative approach, as the regulator should anyhow inform the public according to its role as described above.



#### **4. SUMMARY OF THE ACTIONS SUGGESTED BY THE REVIEW TEAM**

For the convenience of easy reference, the detailed actions suggested by the Review Team are presented in summarised form in the following list. The full texts of these suggestions, as found in Chapters 2 and 3 of this report, should be regarded as the authentic versions, to be considered together with the associated observations and conclusions of the Review Team, as well as with the actions proposed in the CSN lessons learnt report.

##### **Suggested actions of a general character**

1. The CSN should by benchmarking identify the differences between its regulatory programme and associated oversight processes and tools, and those of its reference programme (USNRC), also taking into account good regulatory practices applied elsewhere, notably by other nuclear regulators within the European Union.
2. The review of the CSN regulatory oversight according to suggestion No. 1 should use a holistic and systematic approach, looking beyond the specific weaknesses revealed by the Vandellós event.
3. The benchmarking and review suggested in 1 above should include an in-depth analysis of the root causes of any identified weaknesses and gaps in the CSN oversight programme.
4. The CSN should develop clear internal guidelines for the initiation and performance of self-assessments, also providing guidelines for related public communication activities.
5. The CSN should turn the recommended actions into a specific action plan with identified priorities, responsibilities and associated resources for the various tasks, as well as with milestones for the completion of tasks and for the evaluation of the effectiveness of the actions taken.

6. The CSN action programme referred to in suggestion No. 5 should start with activities, such as internal seminars and training courses, aimed at creating a shared understanding within the CSN of current weaknesses in the CSN regulatory oversight and how these are rooted in the prevailing attitudes and internal decision-making processes.

#### **Suggestions regarding the licensing process**

7. The CSN should require all Spanish nuclear power plants (to the extent that the CSN has not already done so) to perform systematic internal reviews and safety assessments of non-conventional designs so as to ensure the adequacy of the standards and in-service inspection programmes applied to them, taking into account relevant international experience.
8. The CSN should review, as appropriate, their regulatory requirements with regard to licensee in-service inspection programmes to ensure satisfactory coverage of potential degradation mechanisms and other unexpected deviations from expected performance in safety-significant systems, using a comprehensive approach.
9. The CSN should perform a critical review of its periodic safety review programme to ensure that it includes exhaustive re-examinations and inspections of risk-significant systems, to provide assurance that they continue to meet their original design intent.
10. The CSN should benchmark its legal regulatory framework and associated oversight processes, amended as suggested, to ensure that they would have identified at an early stage the weaknesses revealed by the Vandellós event, and that they would have initiated appropriate corrective actions before any serious degradation of plant safety had occurred.

#### **Suggestions regarding the supervision process by the regulator**

11. The CSN should reassess and develop its regulatory supervision of licensee safety management to make it more comprehensive, drawing on international experience to adopt methods which would work effectively in Spain.
12. The CSN should review the way that it obtains, analyses, documents and reacts to safety-related information from nuclear power plant licensees, both as a part of the CSN normal supervision process and in the case of unexpected events.

13. The CSN should continue to pay attention to the involvement of its management in the field inspection activities, introducing improvements where appropriate.
14. The review proposed in the lessons learnt report of the CSN regulatory instructions and guidelines regarding handling of events at Spanish nuclear power plants should be performed with a scope broad enough to include a number of relevant items (see full text in Section 3.2.2).
15. The Plenary should initiate an internal review of the working processes of the Plenary and the Secretariat General, identifying and implementing appropriate actions in order to ensure and facilitate the effective functioning of the Plenary, the Secretariat General and the Technical Directors, with regard to both regulatory decision making and the internal management of the CSN.
16. The CSN should consider the added value of having a technical expert advisory group, such as is found in many foreign nuclear regulatory organisations, to provide independent technical advice to the Plenary on safety issues.

**Suggestions regarding the interaction between the regulator and the licensee**

17. The CSN should assess the various ways the CSN interacts with licensees, to ensure that there are clear and appropriate internal policies and guidelines for different types of interactions and information exchange between the CSN and the licensees (this assessment should be co-ordinated with the review referred to in suggestion No. 12 above).

**Suggestions regarding the external communications of the regulator**

18. In developing a proactive information policy and strategy, as proposed in the CSN lessons learnt report and supported by the Review Team, the CSN should draw on the experience available through the NEA/CNRA Working Group on Public Communication of Nuclear Regulatory Organisations (WGPC).
19. A clear distinction between the respective roles of the licensee and the CSN in providing information to the public should be included in the CSN information policy and strategy, and the licensees should be made aware of their expected role.



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## SOME WORDS OF WISDOM RELEVANT TO THE REVIEW

On our need for reviewers

**“The reviewer is the conscience and the memory of the organisation. The reviewer reminds us that reality has its shortcomings and that there is room for improvement. The reviewer freely shares lessons learnt from the warehouse of past mistakes and points out that it is more worthwhile to make new mistakes than old ones.”**

Olof Petersson, Professor of Political Sciences, Stockholm, Sweden

On implementation of recommendations

**“When it is easier said than done, it is usually the Boss (or an external review team) who has said it.”**

Unknown source

On safety culture

**“When in doubt, there is safety in sticking with the intelligent and prudent, for sooner or later they catch up with luck.”**

Baltasar Gracián, *The Art of Worldly Wisdom*



## *Appendix 1*

### **MEMBERS OF THE INTERNATIONAL PEER REVIEW TEAM**

#### **Lars HÖGBERG, Chairman**

Mr. Lars Högberg obtained a M. Sci. (fil.lic.) in plasma physics at Uppsala University in 1961. After serving with the National Defence Research Institute, he joined the Swedish Nuclear Power Inspectorate (SKI) in 1980, first as Director, Office of Regulation and Research, and from 1989 through 1999 as Director General. Before retiring from active government service in 2001, he served in the Ministry of the Environment with special assignments, including to chair the Euratom Atomic Questions Group during the Swedish Presidency of the EU in the first half of 2001, with the evaluation of nuclear safety in the then Candidate Countries as the main task. On the international scene, he has served as chairman of the NEA Steering Committee and of the NEA Committee of Nuclear Regulatory Activities (CNRA). He has also served as IAEA Governor for Sweden. He has been a member of the IAEA's International Nuclear Safety Group (INSAG) and was elected president of the 1<sup>st</sup> Review Meeting of the International Convention on Nuclear Safety. He was a founding member of the Western European Nuclear Regulators' Association (WENRA). In 1991 he was elected Fellow of the Royal Swedish Academy of Engineering Sciences (IVA). In recent years he has worked as a consultant in nuclear safety, both nationally and internationally.

#### **Samuel A. HARBISON**

Dr. Samuel A. Harbison CB obtained his first degree from Queen's University, Belfast, in 1962. He worked as a research physicist for the UK Atomic Energy Authority at Windscale in Cumberland, UK from 1962-1964, and then studied at the University of California, Los Angeles, from 1964-1966, obtaining MS degree in nuclear physics in 1966. From 1966-1969, he carried out research at the Rutherford High Energy Laboratory, Harwell, UK, and obtained PhD in nuclear physics from London University in 1969. He was a Senior Lecturer in the Department of Nuclear Science and Technology at the Royal Naval College, Greenwich, UK, from 1969-1975. From 1975-1998, he

was a staff member of HM Nuclear Installations Inspectorate, UK, eventually becoming Chief Inspector and Director of Nuclear Safety in 1991. He retired from full-time employment in 1998 and has since been working part-time for national and international bodies in a number of capacities, including: Member of the IAEA's International Nuclear Safety Group (INSAG) since 2003, Chairman of the UK Defence Nuclear Safety Committee, Member of UKAEA and BNFL Nuclear Safety Committees, Consultant to the British National Space Centre on nuclear power sources in outer space, Chairman of UN COPUOS Working Group on Nuclear Power Sources in Outer Space, Member of the Euratom Scientific and Technical Committee (1991-2004) and Member of the Euratom Article 31 Group on Radiation Protection (1991-2004).

### **Jean-Pierre CLAUSNER**

Mr. Jean-Pierre Clausner, graduated engineer from the French Navy where he was initially appointed in 1960, has more than 30 years of experience in the nuclear field. After his experience in the French Navy he has been working successively with FRAMATOME, the French nuclear manufacturer then at the French Institute for Radiation Protection and Nuclear Safety (IRSN), the technical support of the French Nuclear Safety Authority. He participated in several international nuclear safety assessment missions at nuclear facilities in Brazil, Republic of Korea and in the USA where in 1987, he was seconded to the US-NRC Region 4 to work as inspector in charge of following up the South Texas unit 1 start up test programme. From 1991 to 1997 he joined the NEA secretariat where he was in charge successively of the PSA working group, the human factors and operating experience working group and the Halden Reactor Project, before being elected chairman of the NEA operating experience working group in 1998. In 2000, he joined the French Nuclear Safety Authority, working as senior executive responsible for the bilateral relation programmes with a number of countries including Japan, United Kingdom, United States, Switzerland, South Africa, and Spain. Since his retirement in 2003, he has been acting as consultant, including in a number of NEA task forces on nuclear safety subjects.

### **Ellis W. MERSCHOFF**

Mr. Ellis W. Merschoff obtained his first degree from the US Naval Academy where he was awarded with a B.S. Degree in Aerospace Engineering in 1972. Subsequently, he obtained an advanced degree in Mechanical Engineering from the Massachusetts Institute of Technology. After 12 years in the US Navy, he joined the US Nuclear Regulatory Commission (USNRC) where he served in various positions of increasing responsibility including Regional Administrator of the USNRC's Region IV office with responsibility

for licensing and safety oversight of the use of nuclear materials and the operation of nuclear power plants in the western half of the United States; Chief Information Officer with overall responsibility for the development, operation, and security of the USNRC's information technology and information management systems; and Deputy Executive Director for Operations with overall responsibility for the safe construction, licensing, operation, and decommissioning of the Nation's nuclear reactors. He has constructed, operated, and regulated nuclear facilities for more than 30 years, and has participated in international safety missions at nuclear facilities in China, Russia, and India and has worked periodically with the International Atomic Energy Agency in Vienna, Austria. He retired from the USNRC in 2005 and is currently the President of a small firm that provides international consulting services for the safety and regulation of nuclear facilities.

### **Jean GAUVAIN**

Mr. Jean Gauvain, after obtaining an engineering degree from the *École Centrale de Paris* in 1973, has worked for 25 years in safety-related research at the French *Commissariat à l'énergie atomique* and at the IRSN. Initially in charge of development and experimental validation of computer codes in structural mechanics, he later moved onto thermal hydraulics modelling applied to severe accident studies for nuclear reactors. From the beginning he was involved in a number of international benchmarks and working groups, including within the NEA/CSNI, on these matters. From 1999 to 2005 he was seconded to the French Nuclear Safety Authority (DGSNR) where he was in charge of multilateral co-operation (NEA, IAEA and EC). As National Co-ordinator for the review processes of the international Convention on Nuclear Safety and of the Joint Convention he was in charge of the preparation of the national reports and co-ordination of the French participation in the reviews. In October 2005, he joined the NEA Nuclear Safety Division as project manager in the area of nuclear safety.

## ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

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## NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1<sup>st</sup> February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20<sup>th</sup> April 1972, when Japan became its first non-European full member. NEA membership today consists of 28 OECD member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, the Republic of Korea, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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