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# MEASURES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN MATTERS RELATING TO NUCLEAR SAFETY AND RADIOLOGICAL PROTECTION

## (a) Implementation of resolution GC(XXXVI)/RES/582

## (ii) The safety overview process: The Agency's safety services

1. At its 1992 regular session, in resolution GC(XXXVI)/RES/582, the General Conference urged the Board of Governors and the Director General - inter alia - to consider "a more thorough and transparent nuclear safety overview process with the objective of achieving a high safety performance in all operating nuclear installations".

2. With a view to greater thoroughness and transparency in the nuclear safety overview area, the Secretariat has for some years been endeavouring to ensure the existence of an "international presence" in this area by promoting a number of services for the advancement of operational safety (including OSART and ASSET missions) and also the Incident Reporting System and - for communication to the public - the International Nuclear Event Scale, and in the same resolution the General Conference last year recommended to Member States that they avail themselves fully of these.

3. The other safety services provided by the Agency (also designed to complement - rather than replace - national safety efforts) are the Engineering Safety Review Service (ESRS), whereby missions assist Member States in trying to ensure nuclear power plant safety levels that are in accordance with modern standards, particularly for imported plants (the emphasis of ESRS missions has so far been mainly on seismic safety and siting); the INSARR (Integrated Nuclear Safety Assessment of Research Reactors) service, which involves missions with more comprehensive objectives than the research reactor safety missions carried out pursuant to Project and Supply Agreements with Member States; the International Peer Review Service (IPERS), whereby independent reviews are performed of - inter alia - the PSA (probabilistic safety analysis) methods applied by Member States in their PSA programmes for assessing the design and operation of nuclear facilities; the IRRT (International Regulatory Review Team) service, the purpose of which is to advise and assist Member States wishing to strengthen and enhance the effectiveness of their national nuclear regulatory bodies; and the RAPAT (Radiation Protection Advisory Team) service, whereby assessments are performed of national radiation protection services and their associated national infrastructures and Member States are assisted in establishing good safety practices.

In addition, the Secretariat is preparing to launch a service for the assessment of Safety Culture in organizations engaged in nuclear power activities - the ASCOT (Assessment of Safety Culture in Organizations Team) service.

4. Reports relating to OSART and ASSET missions, to the Incident Reporting System and to the International Nuclear Event Scale were submitted to the General Conference last year in document GC(XXXVI)/INF/309, and further reports relating to them were considered by the Board of Governors in June.

5. The Board requested the Director General to transmit the latter reports, updated as necessary, to the General Conference for consideration at its thirty-seventh regular session, and this document has been prepared in response to that request and to the request, in the final operative paragraph of resolution GC(XXXVI)/RES/582, that the Board and the Director General report to the General Conference in 1993 on the progress achieved in implementing that resolution.

# THE OSART (OPERATIONAL SAFETY REVIEW TEAM) SERVICE

Background

1. The OSART service, which has been available for more than ten years, aims to help Member States enhance the safety of operation of their nuclear power plants by reviewing operational safety practices and performance at individual plants, identifying strengths and weaknesses, providing objective advice on improvements and making the results of operational safety reviews available to other Member States.

2. The service is appropriate to all Member States with nuclear power programmes, whether the programme is in an early stage of development or well established.

3. The Secretariat staff responsible for the service endeavour to ensure that the guidance material employed in the conduct of OSART missions is based on the latest operational safety principles and practices; for example, each mission now includes a safety culture review using material in the 1991 Agency publication Safety Series No. 75-INSAG-4 entitled *Safety Culture*. They also endeavour to ensure that all OSART members - from within and outside the Secretariat - have the most relevant experience, and prior to each mission appropriate team member training is provided.

4. Follow-up visits to operating nuclear power plants, now an integral part of the OSART service, provide an insight into the thoroughness of the OSART process. In the period 1989-92, eleven follow-up visits took place, each lasting about one week. During the visits, the team members met with plant managers and other senior personnel and assessed their responses to the proposals made regarding the safety issues identified in the course of the original OSART missions.

Results of OSART follow-up visits during the period 1989-92

| PERIOD | ISSUES RESOLVED | SATISFACTORY PROGRESS | LITTLE OR NO PROGRESS | PROPOSAL(S) WITHDRAWN | TOTAL |
|---|---|---|---|---|---|
| [No. of visits] | No. of issues (%) | No. of issues (%) | No. of issues (%) | No. of issues (%) | No. of issues (%) |
| 1989/90 [6] | 219 (40) | 236 (43) | 74 (14) | 18 (3) | 547 (100) |
| 1991/92 [5] | 312 (55) | 200 (35) | 51 (9) | 4 (1) | 567 (100) |

5. From the foregoing table, which is an update of Table 2 in document GOV/INF/611, it can be seen that the percentage of resolved safety issues has risen and the percentage of withdrawn proposals has fallen. This suggests that the effectiveness of the OSART service has been increasing, with plant operators taking OSART missions seriously and making worthwhile improvements in operational safety.

6. The effectiveness of the OSART process depends very much on the co-operation of Member States, particularly in providing cost-free experts to work with the Secretariat in organizing OSART missions and to serve as mission leaders and assistant mission leaders.

Missions since the 1992 session of the General Conference

7. Since the 1992 session of the General Conference, at which the Conference had before it the status report contained in Annex 1 to document GC(XXXVI)/INF/309, there have been full-scope OSART missions to the Sizewell B nuclear power plant in the United Kingdom (26 October to 13 November 1992), the Mochovce nuclear power plant in Slovakia (11 to 29 January 1993), the Gravelines nuclear power plant in France (15 March to 2 April 1993), the Cernavoda nuclear power plant in Romania (26 April to 14 May 1993), the Guangdong nuclear power plant in China (17 May to 4 June 1993 and the Krsko nuclear power plant in Slovenia (5 to 23 July 1993) and follow-up visits to the Ringhals nuclear power plant in Sweden (2 to 6 November 1992), the Koeberg nuclear power plant in South Africa (29 March to 2 April 1993), the Kozloduy nuclear power plant in Bulgaria (26 to 30 April 1993) and the Novovoronezh nuclear power plant in Russia (26 June to 2 July 1993).

8. The number of requests for OSART missions has declined somewhat, and in this connection it is pointed out that a few Member States with operating nuclear power plants have never requested a mission and some have not requested one for a long time.

Transparency

9. In the interests of greater transparency, the Secretariat, in its official OSART mission reports, is now referring more explicitly to the strengths and weaknesses found during missions; also, it is encouraging host Member States to remove the initial restriction on the distribution of reports so that these can be made available to other Member States.

10. Despite the change to a more open reporting style, late in 1991, no Member State has since that time considered it necessary to inform the Agency that it wishes a mission report to remain restricted.

*INTERNATIONAL ATOMIC ENERGY AGENCY*
*OSART (OPERATIONAL SAFETY REVIEW TEAM) SERVICES*
*as of 1 July 1993*

| *SCHEDULE OF OSART MISSIONS REQUESTED BY MEMBER STATES* | | | | | |
|---|---|---|---|---|---|
| *NO.* | *TYPE* | *COUNTRY* | *NPP/ LOCATION* | *DATE* | *PLANT TYPE* |
| *1.* | *O* | *Korea, Rep.* | *Ko-Ri 1* | *8-26 August 1983* | *PWR 600 MW* |
| *2.* | *O* | *Yugoslavia* | *Krsko* | *6-17 February 1984* | *PWR 670 MW* |
| *3.* | *P* | *Philippines* | *PNPP-1* | *25 June-12 July 1984* | *PWR 650 MW* |
| *4.* | *O* | *Pakistan* | *Kanupp* | *7-20 January 1985* | *PHWR 140 MW* |
| *5.* | *P* | *Philippines* | *PNPP-1* | *4-15 February 1985* | *PWR 650 MW* |
| *6.* | *O* | *Brazil* | *Angra I* | *12-30 August 1985* | *PWR 660 MW* |
| *7.* | *O* | *France* | *Tricastin* | *4-29 October 1985* | *PWR 950 MW* |
| *8.* | *P* | *Mexico* | *Laguna Verde* | *12-31 January 1986* | *BWR 680 MW* |
| *9.* | *O* | *Finland* | *Olkiluoto* | *3-21 March 1986* | *BWR 740 MW* |
| *10.* | *O* | *Sweden* | *Barsebäck* | *1-19 September 1986* | *BWR 620 MW* |
| *11.* | *O* | *Netherlands* | *Borssele* | *6-24 October 1986* | *PWR 480 MW* |
| *12.* | *O* | *Germany* | *Biblis A* | *17 October-14 November 1986* | *PWR 1200 MW* |
| *13.* | *O* | *Korea, Rep.* | *Ko-Ri 3/4* | *1-19 December 1986* | *PWR 950 MW* |
| *14.* | *P* | *Mexico* | *Laguna Verde* | *12-30 January 1987* | *BWR 680 MW* |
| *15.* | *O* | *Germany* | *Krümmel* | *16 February-6 March 1987* | *BWR 1320 MW* |
| *16.* | *O* | *Italy* | *Caorso* | *16 March-3 April 1987* | *BWR 890 MW* |
| *17.* | *O* | *Netherlands* | *Dodewaard* | *27 April-15 May 1987* | *BWR 60 MW* |
| *18.* | *O* | *Canada* | *Pickering* | *1-19 June 1987* | *PHWR 540 MW* |
| *19.* | *O* | *USA* | *Calvert Cliffs* | *10-28 August 1987* | *PWR 860 MW* |
| *20.* | *P* | *Mexico* | *Laguna Verde* | *4-15 September 1987* | *BWR 680 MW* |
| *21.* | *O* | *Germany* | *Philippsburg* | *2-20 November 1987* | *PWR 1350 MW* |
| *22.* | *O* | *Spain* | *Almaraz 2* | *30 November-18 December 1987* | *PWR 930 MW* |

***The OSART Services***
***Options***

***O*** = *Operational Safety Review Team (OSART)*
***P*** = *Pre-operational Safety Review Team (Pre-OSART)*
***T*** = *Technical Exchange Review - Review of specific OSART topics and/or assistance mission*
***S*** = *Safety Review Mission - Design review combined with an OSART mission*

| SCHEDULE OF OSART MISSIONS REQUESTED BY MEMBER STATES | | | | | |
|---|---|---|---|---|---|
| NO. | TYPE | COUNTRY | NPP/ LOCATION | DATE | PLANT TYPE |
| 23. | P | Italy | Alto Lazio | 18 January-5 February 1988 | BWR 1000 MW |
| 24. | O | Sweden | Forsmark 3 | 22 February-11 March 1988 | BWR 1150 MW |
| 25. | O | Japan | Takahama 3/4 | 3-21 October 1988 | PWR 870 MW |
| 26. | O | France | St. Alban 1/2 | 24 October-11 November 1988 | PWR 1380 MW |
| 27. | O | Hungary | Paks 1/4 | 14 November-1 December 1988 | WWER 440/213 |
| 28. | O | USSR | Rovenskaya 3 | 5-23 December 1988 | WWER 1000 MW |
| 29. | O | Pakistan | Kanupp | 8-19 January 1989 | PHWR 140 MW |
| 30. | O | Brazil | Angra I | 20 February-10 March 1989 | PWR 660 MW |
| 31. | P | China | Qinshan | 3-21 April 1989 | PWR 300 MW |
| 32. | O | USA | Byron 1/2 | 15 May-2 June 1989 | PWR 1180 MW |
| 33. | T | South Africa | Koeberg | 5-16 June 1989 | PWR 970 MW |
| 34. | O | UK | Oldbury | 3-21 July 1989 | GCR 230 MW |
| 35. | O | Korea, Rep. | Wolsong | 24 July-11 August 1989 | PHWR 680 MW |
| 36. | P | USSR | Gorky DHNP | 14 August-1 September 1989 | WWER 500 MW |
| 37. | O | CSFR | Dukovany | 4-22 September 1989 | WWER 440/213 |
| 38. | P | Poland | Zarnowiec | 15 September-2 October 1989 | WWER 440/213 |
| 39. | O | Sweden | Oskarshamn 1 | 6-24 November 1989 | BWR 460 MW |
| 40. | T | South Africa | Koeberg | 20 November-8 December 1989 | PWR 970 MW |
| 41. | O | Spain | Cofrentes | 22 January-9 February 1990 | BWR 990 MW |
| 42. | P | CSFR | Temelin | 23 April-11 May 1990 | WWER 1000 MW |
| 43. | T | Canada | Point Lepreau | 2-13 July 1990 | PHWR 680 MW |
| 44. | P | Bulgaria | Belene | 2-20 July 1990 | WWER 1000 MW |

| SCHEDULE OF OSART MISSIONS REQUESTED BY MEMBER STATES | | | | | |
|---|---|---|---|---|---|
| NO. | TYPE | COUNTRY | NPP/ LOCATION | DATE | PLANT TYPE |
| 45. | T | CSFR | Bohunice 1/2 | 3-7 September 1990 | WWER 440/230 |
| 46. | P | Romania | Cernavoda | 24 September-12 October 1990 | PHWR 700 MW |
| 47. | O | Bulgaria | Kozloduy 5 | 15-26 October 1990 | WWER 1000 MW |
| 48. | O | Finland | Loviisa | 5-23 November 1990 | WWER 440/213 |
| 49. | P | China | Guangdong | 26 November-14 December 1990 | PWR 980 MW |
| 50. | T | China | Guangdong | 21 January-1 February 1991 | PWR 980 MW |
| 51. | O | Sweden | Ringhals 3/4 | 14 January-1 February 1991 | PWR 960 MW |
| 52. | S | CSFR | Bohunice 1/2 | 8-26 April 1991 | WWER 440/230 |
| 53. | S | Bulgaria | Kozloduy 1/4 | 3-21 June 1991 | WWER 440/230 |
| 54. | O | Bulgaria | Kozloduy 5 | 15 July-2 August 1991 | WWER 1000 MW |
| 55. | S | USSR | Novovoronezh 3/4 | 12-30 August 1991 | WWER 440/230 |
| 56. | S | USSR | Kola 1/2 | 9-27 September 1991 | WWER 440/230 |
| 57. | T | CSFR | Dukovany | 14-25 October 1991 | WWER 440/213 |
| 58. | O | South Africa | Koeberg | 4-22 November 1991 | PWR 970 MW |
| 59. | O | Germany | Grafenrheinfeld | 25 November-13 December 1991 | PWR 1300 MW |
| 60. | O | France | Blayais | 13-31 January 1992 | PWR 950 MW |
| 61. | O | France | Fessenheim | 9-27 March 1992 | PWR 920 MW |
| 62. | O | Japan | Fukushima Daini 3/4 | 23 March-10 April 1992 | BWR 1100 MW |
| 63. | T | Brazil | Angra I | 11-15 May 1992 | PWR 660 MW |
| 64. | O | USA | Grand Gulf | 3-21 August 1992 | BWR 1370 MW |
| 65. | P | UK | Sizewell B | 26 October-13 November 1992 | PWR 1260 MW |

| SCHEDULE OF OSART MISSIONS REQUESTED BY MEMBER STATES | | | | | |
|---|---|---|---|---|---|
| NO. | TYPE | COUNTRY | NPP/ LOCATION | DATE | PLANT TYPE |
| 66. | P | Slovakia | Mochovce 1/4 | 11-29 January 1993 | WWER 440/213 |
| 67. | O | France | Gravelines | 15 March-2 April 1993 | PWR 950 MW |
| 68. | P | Romania | Cernavoda | 26 April-14 May 1993 | PHWR 700 MW |
| 69. | P | China | Guangdong | 17 May-4 June 1993 | PWR 980 MW |
| 70. | S | Russia | Smolensk | 7-18 June 1993 | RBMK 1000 MW |
| 71. | O | Slovenia | Krsko | 5-23 July 1993 | PWR 670 MW |
| 72. | S | Ukraine | Zaporozhe | 7-25 February 1994 | WWER 1000 MW |
| 73. | O | France | Cattenom | 14 March-1 April 1994 | PWR 1360 MW |
| 74. | O | UK | Hunterston B | 11-29 April 1994 | AGR 620 MW |
| 75. | O | Korea, Rep | Ulchin | May/June 1994 | PWR 950 MW |
| 76. | O | Lithuania | Ignalina | May/June 1994 | RBMK 1500 MW |
| 77. | O | Canada | Gentilly 2 | 2nd half 1994 | PWR 690 MW |
| 78. | O | Argentina | Embalse | 2nd half 1994 | PHWR 650 MW |
| 79. | O | Bulgaria | Kozloduy | 2nd half 1994 | WWER 440/230 |
| 80. | O | Switzerland | Leibstadt | 21 November-10 December 1994 | BWR 1050 MW |
| 81. | O | Mexico | Laguna Verde | 1st half 1995 | BWR 690 MW |
| 82. | O | Ukraine | Khmelnitsky | 1st half 1995 | WWER 1000 MW |
| 83. | O | China | Qinshan | March/April 1995 | PWR 300 MW |

*FOLLOW-UP VISITS*

| *SCHEDULE OF OSART FOLLOW-UP VISITS REQUESTED BY MEMBER STATES* | | | | | |
|---|---|---|---|---|---|
| *NO.* | *TYPE* | *COUNTRY* | *NPP/ LOCATION* | *DATE* | *PLANT TYPE* |
| *1.* | *O* | *Netherlands* | *Borssele* | *6-10 April 1987* | *PWR 480 MW* |
| *2.* | *O* | *Italy* | *Caorso* | *16-24 April 1989* | *BWR 890 MW* |
| *3.* | *O* | *Sweden* | *Barsebäck* | *30 October-3 November 1989* | *BWR 620 MW* |
| *4.* | *O* | *Sweden* | *Forsmark 3* | *30 October-3 November 1989* | *BWR 1150 MW* |
| *5.* | *O* | *Yugoslavia* | *Krsko* | *30 May-1 June 1990* | *PWR 670 MW* |
| *6.* | *O* | *USSR* | *Rovenskaya 3* | *25-29 June 1990* | *WWER 1000 MW* |
| *7.* | *O* | *UK* | *Oldbury* | *15-19 October 1990* | *GCR 230 MW* |
| *8.* | *O* | *CSFR* | *Dukovany 1/4* | *12-16 November 1990* | *WWER 440/213* |
| *9.* | *P* | *China* | *Qinshan* | *14-18 January 1991* | *PWR 300 MW* |
| *10.* | *O* | *Hungary* | *Paks 1/4* | *25 February-1 March 1991* | *WWER 440/213* |
| *11.* | *O* | *Sweden* | *Oskarshamn 1* | *11-15 March 1991* | *BWR 460 MW* |
| *12.* | *O* | *Spain* | *Cofrentes* | *13-17 May 1991* | *BWR 900 MW* |
| *13.* | *P* | *Romania* | *Cernavoda* | *9-13 September 1991* | *PHWR 700 MW* |
| *14.* | *P* | *CSFR* | *Temelin* | *17-21 February 1992* | *WWER 1000 MW* |
| *15.* | *S* | *CSFR* | *Bohunice 1/2* | *27-30 April 1992* | *WWER 440230* |
| *16.* | *O* | *Brazil* | *Angra I* | *4-8 May 1992* | *PWR 660 MW* |
| *17.* | *T* | *China* | *Guangdong* | *18-22 May 1992* | *PWR 980 MW* |
| *18.* | *O* | *Sweden* | *Ringhals 3/4* | *2-6 November 1992* | *PWR 960 MW* |
| *19.* | *O* | *South Africa* | *Koeberg* | *29 March-2 April 1993* | *PWR 970 MW* |
| *20.* | *S* | *Bulgaria* | *Kozloduy 1/4* | *26-30 April 1993* | *WWER 440/230* |
| *21.* | *S* | *Russia* | *Novovoronezh 3/4* | *28 June-2 July 1993* | *WWER 440/230* |
| *22.* | *O* | *Japan* | *Fukushima Daini 3/4* | *25-29 October 1993* | *BWR 1100 MW* |
| *23.* | *O* | *UK* | *Sizewell B* | *1-5 November 1993* | *PWR 1260 MW* |
| *24.* | *O* | *Germany* | *Grafenrheinfeld* | *8-12 November 1993* | *PWR 1300 MW* |
| *25.* | *O* | *USA* | *Grand Gulf* | *1st half 1994* | *BWR 1370 MW* |

# THE ASSET (ASSESSMENT OF SAFETY SIGNIFICANT EVENTS TEAM) SERVICE

Background

1. The ASSET service, initiated in 1986, provides advice and assistance to Member States with a view to preventing safety-significant incidents at nuclear installations. The review procedures applied in ASSET missions are based on root cause analysis methodology and were refined in 1992 in the light of feedback from operating and regulatory organizations. Pending safety issues are identified and recommendations made on ways of eliminating the root causes of potential incidents.[1]

2. All Member States with operating nuclear installations stand to benefit from the advice and assistance of teams whose composition ensures an international perspective based on the best expertise available worldwide.

Developments since the 1992 session of the General Conference

3. Since the 1992 session of the General Conference, at which the Conference had before it the status report contained in Annex 2 to document GC(XXXVI)/INF/309, there have been seven full-scope ASSET missions - to the Balakovo nuclear power plant in the Russian Federation (three WWER units of 1000 MW each), the Paks nuclear power plant in Hungary (four WWER-440/213 units), the Dungeness B nuclear power plant in the United Kingdom (two AGR units of 480 MW each), the Khmelnitsky nuclear power plant in Ukraine (one WWER unit of 1000 MW), the Leningrad nuclear power plant in Russia (four RBMK units of 1000 MW each), the Borssele nuclear power plant in the Netherlands (one PWR unit of 480 MW) and the Smolensk nuclear power plant in Russia (three RBMK units of 1000 MW each); also, there have been four follow-up missions - to the Angra nuclear power plant in Brazil (one PWR unit of 625 MW), the Ignalina nuclear power plant in Lithuania (two RBMK units of 1500 MW each), the Bohunice nuclear power plant in Slovakia (two WWER-440/230 units) and the Kozloduy nuclear power plant in Bulgaria (four WWER-440/230 units).

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[1] Three basic questions are asked regarding plant operational safety performance: What are the operational safety problems? (events - deviations, incidents, accidents); Why did they happen? (direct cause); Why were they not prevented? (root cause). The teams do not review plant working practices - they analyse the root causes of safety performance deviations (more details are provided in the Nuclear Safety Review 1993). The "ASSET guidelines" are contained in IAEA-TECDOC-632.

4. From the two follow-up missions (carried out four years after the corresponding initial, full-scope missions) it was concluded that over the past few years significant progress has been made at the plants in question as regards incident prevention.[2]

5. In addition, since the General Conference's 1992 session four seminars have been held - at the Borssele nuclear power plant in the Netherlands, at the Rovno nuclear power plant in Ukraine, at the Ignalina nuclear power plant in Lithuania and at the Balakovo nuclear power plant in Russia - on the prevention of incidents. At the seminars, views were exchanged on the benefits to be derived from the systematic root cause analysis of safety performance deviations, which has become a regulatory requirement in many countries.

6. In June 1993 the Secretariat convened a technical committee to review the experience of users of the ASSET service. The committee made recommendations for further improving the service and further promoting the development of a consistent approach within the nuclear community to the prevention of incidents and accidents.

Transparency

7. In the interest of transparency, the operators of plants visited by ASSETs frequently invite observers - such as representatives of neighbouring countries and of local "green" movements - to participate in the reviews, the conclusions of which are nearly always presented to the press at a briefing organized by the operating organization.

8. The ASSETs openly state the still pending safety issues - without assigning blame, however - and offer practical suggestions for enhancing operational safety that can be immediately implemented. The ASSET reports always include the official response of the operating organization to the recommendations made by the ASSET, and all ASSET reports except one have been derestricted by the authorities of the countries visited for distribution upon request.

9. The increasing readiness of operating organizations to expose their installations to periodic follow-up missions is evidence of a positive attitude towards transparency.

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[2] As can be seen from the following table, follow-up missions have been requested for later this year to Kozloduy (Bulgaria) and Kola and Novovoronezh (Russian Federation), where there are altogether eight WWER-440/230 units in operation. It is hoped that, by providing more information on the implementation of ASSET recommendations and on progress in incident prevention, they will show how effective the ASSET service is in contributing to the safer operation of nuclear installations.

*INTERNATIONAL ATOMIC ENERGY AGENCY*
*ASSET (ASSESSMENT OF SAFETY SIGNIFICANT EVENTS TEAM) SERVICES*
*as of 1 July 1993*

| *SCHEDULE OF ASSET MISSIONS REQUESTED BY MEMBER STATES* | | | | | |
|---|---|---|---|---|---|
| *NO.* | *TYPE* | *COUNTRY* | *NPP/LOCATION* | *DATE* | *PLANT TYPE* |
| *1.* | *R* | *YUGOSLAVIA* | *KRSKO* | *1986* | *PWR 650 MW* |
| *2.* | *R* | *BRAZIL* | *ANGRA* | *1988* | *PWR 650 MW* |
| *3.* | *A* | *PAKISTAN* | *KARACHI* | *MAY 1989* | *PHWR 140 MW* |
| *4.* | *A* | *PAKISTAN* | *KARACHI* | *SEPT. 1989* | *PHWR 140 MW* |
| *5.* | *R* | *LITHUANIA* | *IGNALINA 1,2* | *NOV. 1989* | *RBMK 1500 MW* |
| *6.* | *R* | *GERMANY* | *GREIFSWALD 1,2,3,4* | *FEB. 1990* | *WWER 440/230* |
| *7.* | *I* | *GERMANY* | *GREIFSWALD 1,2,3,4* | *JUNE 1990* | *WWER 440/230* |
| *8.* | *S* | *GERMANY* | *GREIFSWALD* | *JULY 1990* | *WWER 440/230* |
| *9.* | *A* | *FRANCE* | *GRAVELINES* | *JULY 1990* | *PWR 950 MW* |
| *10.* | *S* | *HUNGARY* | *BUDAPEST* | *SEPT. 1990* | *WWER 440/213* |
| *11.* | *R* | *CZECHOSLOVAKIA* | *BOHUNICE 1,2* | *OCT. 1990* | *WWER 440/230* |
| *12.* | *R* | *BULGARIA* | *KOZLODUY 1,2,3,4* | *NOV. 1990* | *WWER 440/230* |
| *13.* | *A* | *SPAIN* | *VANDELLOS 1* | *DEC. 1990* | *GCR 450 MW* |
| *14.* | *I* | *PAKISTAN* | *KARACHI* | *6-10 JAN. 1991* | *PHWR 140 MW* |
| *15.* | *I* | *PAKISTAN* | *KARACHI* | *13-17 JAN. 1991* | *PHWR 140 MW* |
| *16.* | *S* | *BELGIUM* | *TIHANGE-DOEL* | *28 JAN.-1 FEB. 1991* | *PWR 1000 MW* |
| *17.* | *S* | *SPAIN* | *TRILLO* | *11-15 FEB. 1991* | *PWR 1000 MW* |
| *18.* | *R* | *MEXICO* | *LAGUNA VERDE* | *24 FEB.-8 MAR. 1991* | *BWR 675 MW* |
| *19.* | *S* | *KOREA, REP. OF* | *SEOUL-TAEJON* | *25-29 MAR. 1991* | *PWR 950 MW* |
| *20.* | *S* | *NETHERLANDS* | *THE HAGUE* | *8-11 APR. 1991* | *PWR 480 MW* |
| *21.* | *R* | *RUSSIAN FED.* | *KOLA 1,2* | *15-26 APR. 1991* | *WWER 440/230* |
| *22.* | *R* | *RUSSIAN FED.* | *NOVOVORONEZH 3,4* | *13-24 MAY 1991* | *WWER 440/230* |
| *23.* | *S* | *RUSSIAN FED.* | *KIEV* | *14-18 OCT. 1991* | *WWER-RBMK* |
| *24.* | *S* | *SWEDEN* | *STOCKHOLM* | *23-25 OCT. 1991* | *PWR - BWR* |
| *25.* | *S* | *CZECHOSLOVAKIA* | *BRATISLAVA* | *3-7 FEB. 1992* | *WWER 440* |
| *26.* | *S* | *SOUTH AFRICA* | *JOHANNESBURG* | *17-21 FEB. 1992* | *PWR 950 MW* |
| *27.* | *S* | *BULGARIA* | *SOFIA* | *2-6 MAR. 1992* | *WWER 440/230* |
| *28.* | *S* | *CHINA* | *WUHAN* | *9-13 MAR. 1992* | *PWR 300 MW* |
| *29.* | *S* | *FINLAND* | *HELSINKI* | *30 MAR.-3 APR. 1992* | *PWR-BWR* |
| *30.* | *S* | *BRAZIL* | *ANGRA* | *6-10 APR. 1992* | *PWR 650 MW* |
| *31.* | *R* | *FRANCE* | *FESSENHEIM* | *4-15 MAY 1992* | *PWR 920 MW* |
| *32.* | *I* | *BULGARIA* | *KOZLODUY* | *1-5 JUNE 1992* | *WWER 440/230* |
| *33.* | *S* | *HUNGARY* | *PAKS* | *15-19 JUNE 1992* | *WWER 440/213* |
| *34.* | *A* | *UKRAINE* | *CHERNOBYL* | *22-26 JUNE 1992* | *RBMK 1000 MW* |
| *35.* | *R* | *RUSSIAN FED.* | *KURSK* | *20-31 JULY 1992* | *RBMK 1000 MW* |
| *36.* | *S* | *UKRAINE* | *KHMELNITSKY* | *7-11 SEPT. 1992* | *PWR - RBMK* |
| *37.* | *S* | *BULGARIA* | *KOZLODUY* | *14-18 SEPT. 1992* | *WWER 440/230* |

| | | | | | |
|---|---|---|---|---|---|
| 38. | S | ROMANIA | CERNAVODA | 21-25 SEPT. 1992 | PHWR 700 MW |
| 39. | R | RUSSIAN FED. | BALAKOVO | 5-16 OCT. 1992 | WWER 1000 MW |
| 40. | R | HUNGARY | PAKS | 2-13 NOV. 1992 | WWER 440/213 |
| 41. | F | BRAZIL | ANGRA | 23-27 NOV. 1992 | PWR 650 MW |
| 42. | R | UK | DUNGENESS "B" | 7-18 DEC. 1992 | AGR 600 MW |
| 43. | S | NETHERLANDS | BORSSELE | 12-14 JAN. 1993 | PWR 480 |
| 44. | F | LITHUANIA | IGNALINA | 1-12 FEB. 1993 | RBMK 1500 MW |
| 45. | R | UKRAINE | KHMELNITSKY | 8-19 MAR. 1993 | WWER 1000 MW |
| 46. | R | RUSSIAN FED. | LENINGRAD | 17-28 MAY 1993 | RBMK 1000 MW |
| 47. | R | NETHERLANDS | BORSSELE | 7-18 JUNE 1993 | PWR 480 MW |
| 48. | S | UKRAINE | ROVNO | 28 JUNE-2 JULY 1993 | WWER 440/213 |
| 49. | F | SLOVAK REP. | BOHUNICE | 5-9 JULY 1993 | WWER 440/230 |
| 50. | S | LITHUANIA | IGNALINA | 12-16 JULY 1993 | RBMK 1500 MW |
| 51. | R | RUSSIAN FED. | SMOLENSK | 19-30 JULY 1993 | RBMK 1000 MW |
| 52. | S | RUSSIAN FED. | BALAKOVO | 30 AUG-3 SEPT 1993 | WWER-RBMK |
| 53. | F | BULGARIA | KOZLODUY | 6-17 SEPT. 1993 | WWER 440/230 |
| 54. | F | RUSSIAN FED. | KOLA | 4-8 OCT. 1993 | WWER 440/230 |
| 55. | R | CZECH REP. | DUKOVANY | 11-22 OCT. 1993 | WWER 440/213 |
| 56. | F | RUSSIAN FED. | NOVOVORONEZH | 8-12 NOV. 1993 | WWER 440/230 |
| 57. | A | FRANCE | PALUEL | 15-19 NOV. 1993 | PWR 1400 |
| 58. | R | UKRAINE | ROVNO | 22 NOV-3 DEC 1993 | WWER 440/213 |
| 59. | S | SWITZERLAND | BEZNAU | 6-10 DEC. 1993 | PWR 360 MW |
| 60. | S | UK | AGE-CROFT | 17-19 JAN. 1994 | AGR |
| 61. | S | UK | OLDBURY | 21-25 JAN. 1994 | AGR MgX |
| 62. | S | UK | CLIFF-QUAY | 26-28 JAN. 1994 | PWR |
| 63. | S | UKRAINE | ZAPOROZHE | 7-11 FEB. 1994 | WWER 1000 MW |
| 64. | S | UKRAINE | SOUTH UKRAINE | 21-25 MARCH 1994 | WWER 1000 MW |
| 65. | R | RUSSIA | KALININ | 11-22 APRIL 1994 | WWER 1000 MW |
| 66. | S | SLOVENIA | KRSKO | 2-6 MAY 1994 | PWR |
| 67. | R | UKRAINE | ZAPOROZHE | 13-24 JUNE 1994 | WWER 1000 MW |
| 68. | R | UKRAINE | SOUTH UKRAINE | 3-14 OCT. 1994 | WWER 1000 MW |

*The ASSET Services*
*Options*

**Type S** *Mission to conduct a Seminar on "Prevention of Incidents: Safety Awareness and Management". Training of operators and regulators on use of the ASSET methodology for identifying safety issues, assessing their safety consequences and eliminating the root causes of potential accidents and incidents.*

**Type R** *Mission to Review installation operational safety performance, to assess the appropriateness of corrective actions and to exchange views on the further enhancement of installation safety awareness for effective management of incident prevention.*

**Type A** *Mission to review the root cause Analysis of a very safety-significant event in order to disseminate generic recommendations on safety awareness for the effective prevention of incidents with similar root causes at any nuclear installation.*

**Type I** *Mission to assist installation management in Implementing the ASSET recommendations relating to incident prevention (quality verification, preventive maintenance, surveillance) and to experience feedback (root cause analysis, repairs and remedies).*

**Type F** *Mission to Follow-up and to assess the enhancement of installation safety awareness regarding management of the prevention of incidents as a result of the implementation of the recommendations of an ASSET mission of Type R.*

# THE INCIDENT REPORTING SYSTEM (IRS)

Background

1. The IRS was established in 1983 for the international collection, assessment and distribution of information on incidents at nuclear power plants in a manner which complements national systems. It is operated by the Agency in close co-operation and co-ordination with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (NEA/OECD), which operates a system for OECD countries.

2. The information handled by the IRS, which is of value mainly to technical people working in the field of nuclear power, covers not only incidents at nuclear power plants but also safety-significant matters which come to light as a result of surveillance, maintenance, testing and other activities at such plants.

Developments since the 1992 session of the General Conference

3. Since the 1992 session of the General Conference, at which the Conference had before it the status report contained in Annex 3 to document GC(XXXVI)/INF/309, IRS information has been used in two in-depth studies, one on common-cause failures and one on Safety Culture issues. The Secretariat considers that the lessons learned from such a common-cause failure study, involving the basic safety concepts of "redundancy" and "diversity", can be helpful in connection with nuclear power plant operations and can provide insights of use in PSA activities and safety analyses. In the study on Safety Culture issues, the focus has been on IRS information which illustrates the value of Safety Culture when coping with incidents, and the Secretariat considers that the lessons learned will be useful to the ASCOT service (see para. 3 of the cover note).

4. In October 1992, representatives of 23 countries and two international organizations participating in the annual meeting of IRS National Co-ordinators discussed - inter alia - recent events at nuclear power plants, actions taken in various countries as a result of IRS reports, IRS-related studies performed in 1991-92, IRS database enhancement/modifications (software and hardware) and IRS classification code changes.

5. In December 1992 Ukraine became a participant in the IRS, and in October 1992 Slovenia replaced Yugoslavia as a participant (the Krsko nuclear power plant is located in Slovenia). With regard to the former Czechoslovakia, the Nuclear Regulatory Authority of the Slovak Republic nominated an IRS National Co-ordinator in March 1993 and the State Office for Nuclear Safety of the Czech Republic nominated an IRS National Co-ordinator in April 1993.

## PARTICIPANTS IN THE NUCLEAR POWER PLANT INCIDENT REPORTING SYSTEM

| | |
|---|---|
| Argentina | since May 1983 |
| Brazil | since November 1983 |
| Bulgaria | since February 1985 |
| Canada | since May 1987 |
| China | since May 1992 |
| Czech Republic | since April 1993 |
| Finland | since May 1983 |
| Hungary | since October 1984 |
| India | since June 1984 |
| Korea, Rep. of | since February 1983 |
| Mexico | since May 1991 |
| Netherlands | since June 1983 |
| Pakistan | since August 1984 |
| Slovak Republic | since March 1993 |
| Slovenia | since October 1992 |
| South Africa | since April 1990 |
| Spain | since January 1983 |
| Russian Federation | since September 1984 |
| Ukraine | since December 1992 |
| United Kingdom | since March 1986 |

## PARTICIPANTS THROUGH NEA/OECD

| | |
|---|---|
| Belgium | since February 1983 |
| France | since June 1983 |
| Germany | since July 1983 |
| Italy | since March 1985 |
| Japan | since February 1991 |
| Sweden | since October 1983 |
| Switzerland | since February 1987 |
| United States | since August 1985 |

6. Last year 153 IRS reports were received. The events reported were attributable to one or a combination of the following:

| | |
|---|---|
| Mechanical failure | 58% |
| Human factors | 29% |
| Electrical failure | 18% |
| Instrumentation failure | 14% |
| Fire and chemical reactions | 10% |
| Hydraulic failure | 8% |
| Environmental conditions inside the plant | 3% |
| Core physics failure | 1% |
| Environmental conditions outside the plant | 0.7% |

Note: As some events were attributable to more than one factor, the percentages add up to more than 100%.

# THE INTERNATIONAL NUCLEAR EVENT SCALE (INES)

Background

1. INES was developed by the Agency and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (NEA/OECD), with the help of experts from Member States, for the purpose of facilitating rapid communication on nuclear events between the nuclear community, the media and the public. Events are classified as being "out of scale", "below scale" or "on scale". Events "out of scale" do not have any nuclear safety relevance. Events "below scale" are safety-relevant, but not safety-significant. Events "on scale" - i.e. of safety significance - are categorized on the basis of their consequences: defence-in-depth degradation; on-site impact; and off-site impact. "On scale" events are categorized at seven levels - those categorized at levels 1 to 3 are termed "incidents", and those categorized at levels 4 to 7 are termed "accidents".[1]

2. Fifty-two States have now officially informed the Agency that their regulators and operators are using INES. As a result of the extension of INES to non-reactor facilities on a trial basis, in March 1992, more countries have joined the INES Information System. An updated list of participants in the INES Information System is given at the end of this Annex.

3. The media appear to have had no major difficulties in using INES when reporting on nuclear events, and INES is gaining acceptance by the public.

4. The time taken to rate nuclear events has been reduced, but there is still room for improvement. Efforts to minimize delays should continue. If necessary, a provisional rating should be given, particularly when an event is attracting media interest.[2]

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1 In 1992 the INES Information System received 72 notifications of operational events. Of the 42 events "on-scale" (i.e. above the threshold of safety significance), two were of level 3, 13 of level 2 and 27 of level 1. Twenty-eight events were stated to be "below scale" and two to be "out of scale". Among the level 0-3 rated events, 40 were rated on the basis of defence-in-depth degradation, one was rated on the basis of on-site impacts and one was associated with off-site impact (more details are given in the Nuclear Safety Review 1993).

2 Following an event at the Leningrad nuclear power plant in March 1992, an INES rating was available within a few hours. This helped to prevent media over-reaction.

Developments since the 1992 session of the General Conference

5. A review was carried out in October 1992 of the ratings given to a number of nuclear events. On the basis of the information provided to the INES Information System, there was consensus that in some cases the rating should have been different by one level. However, there was no evidence of consistent under-rating or over-rating of events. In a few cases, insufficient information had been provided for the event in question to be rated.

6. The first meeting of the INES Advisory Committee[3] took place from 29 to 31 March 1993. A review of the information provided since October 1992 confirmed the satisfactory application of INES to all types of nuclear events at nuclear power plants and other nuclear facilities. It was concluded, however, that some refinement of the INES rating procedure might be necessary at the end of the period of trial extension of INES to non-reactor facilities (see para. 2 above).[4]

7. The INES Advisory Committee also considered the idea of extending INES to cover industrial - as opposed to nuclear - safety aspects of the events occurring at nuclear facilities. While recognizing the potential value of a scale reflecting the safety significance for the public of any event, nuclear or non-nuclear, the Committee concluded that the development of an "Industrial Event Scale" - if undertaken - should be conducted independently of activities relating to INES.

Transparency

8. In most countries, the emphasis on confidentiality traditionally associated with the reporting of nuclear events is gradually declining, thanks to the availability of an internationally agreed technical "language" which prevents misunderstandings about safety significance. INES is playing an important part in this process.

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3 The role of the Committee, which was established in 1992 and consists of a small number of experts familiar with the development and application of the INES rating procedures for both reactor and non-reactor installations, is - inter alia - to assist the Agency INES Co-ordinator in clarifying the guidance contained in the INES Users' Manual at the request of INES National Officers (see paras 3-5 in Annex 4 to document GC(XXXVI)/INF/309) and to provide advice, at the request of INES National Officers, on the consistency of the rating of an event.

4 To assist INES National Officers in ensuring consistency in the safety significance rating of nuclear events by facility operators, the Agency will continue to offer seminars on the use of INES.

*PARTICIPANTS IN THE INTERNATIONAL NUCLEAR EVENT SCALE (INES) INFORMATION SYSTEM*

| COUNTRY | STARTING DATE | FAX NUMBER |
|---|---|---|
| Argentina | January 1991 | 0054 1 544 92 52 |
| Austria | March 1991 | 43 1 713 79 52 |
| Bangladesh | November 1992 | 0088 02 863051 |
| Belarus | January 1993 | 007 0172 467615 |
| Belgium | June 1990 | 0032 253 68 585 |
| Brazil | January 1991 | 0055 21 546 23 79 |
| Bulgaria | January 1991 | 0035 92 72 35 23 |
| Canada | October 1990 | 001 416 506 65 90 |
| Chile | September 1992 | 0056 26 99 16 18 |
| China | March 1991 | 0086 1 851 37 17 |
| Costa Rica | January 1993 | 00506 229625 |
| Czech Republic | October 1990 | 0042 2 255 262 |
| Denmark | October 1990 | 0045 45 82 65 65 |
| Egypt | October 1990 | 0020 2 354 09 82 |
| Finland | June 1990 | 00358 0 708 23 92 |
| France | May 1990 | 0033 1 43194869 |
| Germany | January 1991 | 0049 221 206 84 42 |
| Greece | September 1992 | 00301 65 44 525 or 65 44 520 |
| Guatemala | October 1992 | 00502 2 762007 |
| Hungary | January 1991 | 0036 11 42 75 98 |
| India | January 1991 | 0091 22 556 07 50 |
| Iran, Islamic Rep. | September 1992 | 0098 21 8000404 |
| Ireland | January 1993 | 00353 1 2697437 |
| Italy | January 1991 | 0039 6 500 72 916 |
| Japan | July 1991 | 0081 3 3581 24 87 & 3503 73 66 |
| Korea, Rep. of | January 1991 | 0082 2 503 76 73 |
| Kuwait | October 1992 | 00965 2461761 |
| Lithuania | February 1993 | 0037001266 29350 |
| Luxembourg | March 1992 | 00352 454794 |
| Mexico | January 1991 | 0052 5 5906103 |
| Netherlands | August 1990 | 0031 70 333 40 18 |
| Norway | October 1992 | 0047 67 147407 |
| Pakistan | October 1990 | 0092 51 82 49 08 |
| Peru | September 1992 | 0051 14 885233 |
| Poland | September 1992 | 0048 2 6144252 |
| Romania | April 1991 | 0040 1 7813476 |
| Russian Federation | September 1990 | 007 095 274 00 71 |
| Saudi Arabia | September 1992 | 00966 1 4882681 |
| Slovak Republic | March 1993 | 0042 7 221560 |
| Slovenia | October 1990 | 0030 61 343 667 |
| South Africa | March 1991 | 0027 12 663 55 13 |
| Spain | October 1990 | 0034 1 346 05 88 |
| Sri Lanka | October 1992 | 0094 1 501 468 |
| Sweden | October 1990 | 0046 8 661 90 86 |
| Switzerland | October 1990 | 0041 56 99 39 07 & 0041 12 56 94 97 |
| Syrian Arab Rep. | August 1992 | 00963 11 24 93 17 |
| Turkey | April 1991 | 0090 4 127 28 34 |
| Ukraine | March 1992 | 007 044 2121094 |
| UK | November 1990 | 0044 71 7274116; 0044 452 654914 |
| USA | October 1992 | 001 301 492 7142 |
| Viet Nam | August 1992 | 0084 63 21107 |
| Zaire | August 1992 | |
| **ORGANIZATION** | **STARTING DATE** | **FAX NUMBER** |
| CEC Luxembourg | September 1990 | 00432 4301 4646 (Lux) |
| Nuclear Publications | November 1992 | 0033 1 42 890400 |
| NucNet Berne | December 1991 | 0041 31 212758 |
| OECD Paris | March 1990 | 0033 1 45 24 11 10 |
| USCEA | February 1992 | 001 202 785 4019 |
| WANO London | September 1990 | 0044 71 828 6691 |
| Chairman INES | | 0044 452 652560 |
| Chairman INES Adv. Committee | | 0044 452 652560 |
| INES Co-ordinator (IAEA) | | 43 1 23 09 723 |