



Gesellschaft für
Reaktorsicherheit (GRS) mbH

GRS-Bericht

Report about Abnormal Events in
Nuclear Power Plants in the
Federal Republic of Germany
in the Year 1980

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Abstract

Subsequent to a similar report for the previous year, this compilation of abnormal events in nuclear power plants in the Federal Republic of Germany in 1980 is made available to whom it may concern. Strict reporting requirements ensure that all events including even those having only remote safety significance, are reported to the authorities. The reporting performance of the operating organizations operating nuclear power plants does not give cause to any criticism. The abnormal events are stored in a data bank and analyzed in more detail by a special task force. The number of reported abnormal events (201) lies within the range experienced in the preceding years. The number of events in the category A (5) corresponds with the level of the previous years. None of them was of direct safety significance. The few events which caused radioactive discharges to exceed prescribed short-term limits did not put at risk neither the public at large nor the operating personnel.

Kurzfassung

Nach einem ähnlichen Bericht für das vorhergehende Jahr wird diese Zusammenstellung besonderer Vorkommnisse in Kernkraftwerken in der Bundesrepublik Deutschland 1980 allen Interessenten zugänglich gemacht. Die strenge Meldepflicht gewährleistet, daß alle Vorkommnisse, einschließlich solcher mit nur entfernter sicherheitstechnischer Bedeutung, den zuständigen Behörden gemeldet werden. Die Berichterstattung der Betreiber von Kernkraftwerken gibt keinen Anlaß zu Beanstandungen. Die besonderen Vorkommnisse werden in einer Datenbank gespeichert und im einzelnen von einer speziellen Arbeitsgruppe analysiert. Die Zahl der gemeldeten besonderen Vorkommnisse (201) liegt in dem in den Vorjahren beobachteten Bereich. Die Anzahl der Vorkommnisse in der Kategorie A (5) entspricht dem Anteil der Vorjahre. Keines dieser Vorkommnisse hatte direkte Sicherheitsbedeutung. Die wenigen Ereignisse, die zu radioaktiven Ableitungen oberhalb der Kurzzeit-Grenzwerte führten, stellten keine Gefährdung der Bevölkerung oder des Betriebspersonals dar.

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1. INTRODUCTION

This report comprises a complete list of abnormal events in German nuclear power plants which were reported to the Reactor Safety Company (Gesellschaft für Reaktorsicherheit (GRS) mbH) in 1980 and filed on behalf of the Federal Minister of the Interior (Bundesminister des Innern - BMI), according to contract SR 118.

Basis of the annually compiled lists are usually the reports on abnormal events which are submitted by the operating organizations to the State authorities responsible for supervising the nuclear power plants.

Purpose of the central collection and evaluation of abnormal events by GRS is to further improve the safety standard achieved through feedback of the experience gained in the nuclear power plants operated. These experiences allow to recognize potential deficiencies in the respective plants, guard against the occurrence of similar failures in other plants, and utilize the knowledge gained in the design of new nuclear power plants.

The report shall permit a complete but not detailed survey on the abnormal events which occurred in German nuclear power plants in 1980. For important events, more detailed investigations are performed by both the responsible supervisory State authorities and their expert organizations and the GRS on behalf of the BMI. Concrete individual measures as appropriate are derived from these investigations.

The significance of the events presented is to be judged before the background of the safety concept applicable to nuclear power plants. Technical malfunctions and human failures in the operation of plants cannot be excluded as is the case with other technologies. The safety concept takes this into account by providing a defense-in-depth to limit the consequences in addition to the measures for preventing incidents.

It is to be demonstrated in the course of the licensing procedure that the totality of the safety features provided will ensure a reliable protection against serious consequences, even if their efficiency is partially impaired.

The importance of the events summarized in this report varies significantly from case to case. Those events were listed up, where the safety systems were initiated, the availability of safety systems (e.g. redundancies) was reduced, as well as such initiation or reduction could have resulted. The majority of the malfunctions did not restrict the power generation. There were only a few case that increased radioactive discharges were recorded. Persons or the environment were not at risk. A major fraction of the recorded events was detected during inspections.

In the report, all reported events are recorded in their timely sequence according to the date of occurrence. It should be noted that some events listed did occur already in 1979 but were still reported in 1980.

The events are assigned to different categories (A, B and C). This assignment of events to the three mentioned categories follows according to the general reporting criteria established in 1975. These criteria reflect the different safety relevance and the urgency of interference by the authorities. Following this line, different time limits are defined for each category, within which the operating organization is required to report to the authority orally and in writing.

Such incidents and events are to be assigned to Category A for which it cannot be excluded from the very beginning that they have direct safety relevance or could require immediate checks or actions by the authority to ensure safety for the operating personnel, the environment or the NPP. This would include events which caused radioactive discharges to exceed the prescribed release limits.

Incidents and events having potential but not direct safety relevance, belong to Category B. These are such events which do not call for immediate action to ensure the safety of persons or of the plant, but the causes of which have promptly to be eliminated for safety reasons. This would include the malfunction of components of safety systems which was detected during a functional test rather than an actual initiation.

All other abnormal events belong to Category C, e.g. those occurrences which reduced the reliability of a system, represented deviations from technical specifications or exceeded the range of routine operation without having direct or potential of safety relevance.

The categorization of abnormal events is done according to a first-glance judgement when reported. The criteria do not address every single event but classes of events and are defined in such a way, that the actual event will in case of doubt be assigned to a higher category than appropriate to its true safety relevance. This has to be kept in mind, when conclusions are to be made from the number of events in category A. For any conclusion, it is absolutely necessary to have a close look into the single case as demonstrated in chapter 3.4.

2. LIST OF NUCLEAR POWER PLANTS

The abnormal events described in detail in chapter 4 were recorded in those nuclear power plant which were in operation (including revision phases) in 1980. Nuclear power plants which have been shutdown most of the time, are included as well. The following tables reflect this distinction.

Nuclear power plants, which were operated most of the time in 1980:

Name	Type	Net power MW _{el}	Date of responsibility transfer to operating organization
Biblis-A (KWB-A)	PWR	1204	February 26, 1975
Biblis-B (KWB-B)	PWR	1300	January 31, 1977
Kahl (VAK)	BWR	15	September 1, 1962
Karlsruhe (KNK-II)	FBR	21	October 1, 1977
Isar (KKI)	BWR	907	March 5, 1979
Karlsruhe (MZFR)	PWR	57	December 19, 1966
Neckarwestheim (GKN)	PWR	855	December 1, 1976
Stade (KKS)	PWR	662	August 4, 1972
Obrigheim (KWO)	PWR	345	April 1, 1969
Würgassen (KWW)	BWR	670	November 11, 1975
Unterweser (KKU)	PWR	1300	January 21, 1980
Jülich (AVR)	HTR	15	May 28, 1969

Nuclear power plants, which were shutdown most of the time in 1980:

Name	Type	Net power MWe1	Down-time	Date of responsibility transfer to operating organization
Brunsbüttel (KKB)	BWR	806	till Oct. 80	February 9, 1977
Philippsburg 1 (KKP-1)	BWR	900	as of May 80	March 26, 1980
Lingen (KWL)	BWR	256	all year	October 1, 1968
Gundremmingen (KRB)	BWR	237	all year	April 29, 1967

The following table represents only those nuclear power plants, which have reported abnormal events.

Nuclear power plants, which were in the construction/commissioning phase in 1980:

Name	Type	Net power MWe1	Phase
Philippsburg 2 (KKP-2)	PWR	1362	Construction (planned nuclear commissioning in 1982)

3. ANALYSIS OF ABNORMAL EVENTS

In the following subsections, the events reported in 1980 are analyzed under various aspects:

- Year of events
- Operational time
- Mode of operation

- Category
- Kind of detection
- System involved
- Increased radioactive discharge
- Cause

3.1 Displayed for year of event

In 1980, a total of 201 abnormal events were reported 3 of which occurred already in 1979.

Total of events	Occurred in 1980	Occurred in 1979
201	198	3

3.2 Displayed for operational time

A display of the abnormal events for different operational times (predominantly operating, predominantly shutdown, in construction; see also chapter 2) shows:

Total of events	Nuclear power plants predominantly operating	Nuclear power plants predominantly shutdown	Nuclear power plants in construction
201	183	16	2
100 %	91 %	8 %	1 %

3.3 Displayed for mode of operation

The following table gives a display of the reported events for different modes of operation.

Total of events	Power operation (full or partial)	Start-up or shutdown	Shutdown or without fuel (outage, revision, refuelling, construction)
201	133	13	55
100 %	66 %	7 %	27 %

The deciding factor for the categorization in the above table was the date of the event or - if this is not reported - the date of the detection of the event.

Only some of the 133 events during power operation or of the 13 events during startup or shutdown of the plant caused operational restrictions due to operational or safety-related malfunctions. This can be deduced from the fact that only 25 events led to a reactor scram (automatically or manually). Also those events are included in which testing caused faulty activation of the reactor protection system and automatic reactor scram due to the fail-safe design of the plant.

The remaining 55 events occurred or were detected at shutdown or unloaded reactor (revision periods, other long outages or construction).

3.4 Displayed for category

According to the reporting criteria, the recorded abnormal events in 1980 can be categorized as follows:

Total of events	Category		
	A	B	C
201	5	107	89
100 %	3 %	53 %	44 %

About half of the abnormal events, 44 % of them, fall into category C. These are so-called other events, predominately events related to construction, material, manufacturing or operation as far as they exceeded routine cases.

More than half of the events, namely 53 %, belong to category B. These are events which certainly do not require immediate measures to ensure the safety of persons or plant, the cause of which, however, must immediately be eliminated for safety reasons.

5 abnormal events (3 %) fall into category A. The detailed analyses carried out subsequently have shown that none of them were of immediate safety relevance. In none of the cases neither the plant personnel nor the population at large were endangered. The reporting criteria, established by the Federal Ministry of the Interior, require, however, assignment to category A even in such cases, where it cannot be excluded from the very beginning that an event might have immediate safety relevance or might require immediate regulatory checks or measures.

The 5 events in category A were as follows:

1. A damage at the main transformer caused a turbine trip and loss of station power supply during full power operation of a nuclear power plant. This again caused a reactor scram and other protective actions. The emergency diesels started and the switch-over to the 110 kV grid was executed in an orderly manner. After switch-over to the 110 kV grid, the reactor was shutdown using the main heat sink. The plant is designed against loss of station power supply. The safety systems operated as expected.

This event was assigned to category A for formal reasons according to the reporting criteria, although it had neither immediate safety relevance nor did it require immediate regulatory checks or measures. A revision of the reporting criteria will take into account that such event would better be assigned to a lower category.

2. During the revision of a nuclear power plant, the lowering of the water level in the reactor compartment resulted in the transfer of approximately 20 m³ pool water into the auxiliary building sump due to an inadvertently open drain valve in the coolant purification system. Consequently, iodine 131 was discharged via the stack. The water transfer was detected by the rise of the iodine activity at the stack and the start-up of the sump pumps. The drain valves were then closed. At this time, the fuel elements were located at their positions in the fuel storage pool. The gate between the fuel storage pool and the reactor compartment was inserted. This event was assigned to category A since the iodine discharge slightly exceeded the prescribed short-term limit. The measurements immediately carried out by the competent authority did not indicate increased radiation levels in the environment. Neither the plant personnel nor the population at large were endangered by this event.

3. During the revision of a nuclear power plant, iodine was discharged via the stack in the course of a draining process. The cause was a defective activated carbon filter at a coolant storage tank.

This event was assigned to category A, since the iodine discharge slightly exceeded the prescribed short-term limit. The measurements immediately carried out by the competent authority did not indicate increased radiation levels in the environment. Neither the plant personnel nor the population at large were endangered by this event.

4. During partial power operation of a nuclear power plant with boiling water reactor, a defective gasket at a draining tank caused low-active steam to escape into the turbine building. The activity discharged with the exhaust air was below the prescribed limits.

This event was assigned to category A, since it was a damage to an activity containing component together with an activity discharge into the plant. Such event is required to be assigned to category A, independent of the amount of

activity discharged. Neither the plant personnel nor the population at large were endangered by this event.

5. During start-up after an outage of a nuclear power plant with boiling water reactor, an increased leakage within the containment was detected. The plant was shutdown again in order to determine the cause of the leakage. The inspection revealed a crack of approximately 40 mm length in a weld between a main steam line and the relief line. This crack caused a minor leakage of low-level radioactive main steam. The activity discharged with the exhaust air was below the prescribed limits.

This event was assigned to category A, since it was a damage to the pressure-retaining boundary together with a leakage. Such a damage is required to be assigned to "A" independent of its magnitude. Neither the plant personnel nor the population at large were endangered by this event.

3.5 Displayed for kind of detection

A further differentiation of the collected 201 events can be made according to the kind of detection.

Total of events	Kind of detection	
	Inspection	Spontaneous
201	90	111
100 %	45 %	55 %

About half of the events was detected during inspections. The rest was detected spontaneously, i.e. by signals, changes of signals, initiation of protective actions, etc. The large fraction of events detected during inspections demonstrates clearly the importance of recurrent inspections.

3.6 Displayed for system involved

The following table shows a differentiation of the events according to the most important system involved.

The systems are predominantly those with safety functions, a minor fraction are service systems malfunctions of which may require the activation of safety systems.

Systems	Events	
	Number	Percentage
Reactor protection system including instrumentation	25	13
Emergency cooling and residual heat removal system including the associated component cooling systems and service cooling water systems	28	14
Emergency power system (among them emergency diesel generators)	29	14
Emergency feedwater system	(19)	(9)
Shutdown system	6	3
Containment	4	2
Pressurizer and pressure relief system	3	2
Fuel elements and reactor pressure vessel internals	10	5
Activity monitoring	4	2
Ventilation system	9	4
Reactor coolant system	4	2
Main feedwater and condensate system	3	2
Main steam system	13	6
Service control and instrumentation	12	6
Turbine, generator	9	4
Miscellaneous	5	3
	37	18
Total	201	100

When interpreting this table, the varying complexity of the systems, the varying extent of inspections as well as the importance of the individual malfunctions have to be taken into account. Systematic weak points cannot be seen.

3.7 Displayed for increased radioactive discharge

17 cases during operation and shutdown caused increased activity discharges to the environment.

Total of events	Events with increased activity discharge	
	exhaust air	waste water
201	16 ¹⁾	3 ¹⁾
100 %	8 %	1,5 %

¹⁾ The total number of these events is 17. Two of them were simultaneously associated with increased activity discharges with the exhaust air and the waste water. These events are to be found in both columns, i.e. they are counted twice.

Two events included activity discharges which exceeded the prescribed short-term limits for periods of 1 - 2 hours. These events which belong to category A, are described in section 3.4. There was no danger for persons or the environment.

3.8 Displayed for cause

When analyzing the causes of an event, the particular aspects of each individual case have to be considered in detail. It is usually a number of factors that play a role in this respect. Any grouping into cause classes, therefore, inadvertently introduces a formalism which on one hand inadequately treats the individual case and on the other hand leaves much freedom to interpretation. The following table permits only a condensed qualitative survey. These limitations especially apply to dam-

ages at pipes and vessels for which the interaction of such factors as design, materials, manufacture and operational conditions are to be taken into account. For these events, no grouping according to single causes has been attempted.

Cause	Events	
	Number	Percentage
Failure of components or parts	76	38
Handling, maintenance, repair, installation	42	21
Design	18	9
Manufacturing	7	3
Operation	9	4
Damages to pipes and vessels	21	11
Other and unidentified causes	28	14
Total	201	100

4. SUMMARY LIST

4.1 Abnormal events in the reporting period January 01 through December 31, 1980

Date of event	Plant	Event	No.	Category
01-03	KWB-B	Transfer of radioactive material into the component cooling circuit due to defective sampling cooler, at partial reactor power	001	B
01-04	VAK	Reactor scram caused by high neutron flux density due to subcooled primary steam condensate, at partial reactor power	002	C
01-05	KKP-1	Malfunctioning at the auxiliary air lock, at reactor shutdown	003	B
01-07	KKP-1	Valve failure in the component cooling circuit, at reactor shutdown	004	B
01-10	KNK-II	Dc/ac converter failure, at zero reactor power	005	B
01-12	KWW	Cracking of a sensing line of the flow rate meter for the primary steam system, at full reactor power	006	B
01-14	KKU	Leakage at a welding seam of a sensing line of the emergency feedwater system, at full reactor power	007	B
01-17	KWO	Malfunction of an emergency feedwater pump, at full reactor power	008	B
01-21	KKU	Failure of a neutron flux density pulse measuring line, at full reactor power	009	C
01-22	KKS	Rectifier failure in the emergency power system, at full reactor power	010	B

Date of event	Plant	Event	No.	Category
01-23	KWB-A	Malfunction at the breaker of a 400V-emergency bus bar, at full reactor power	011	B
01-23	KKU	Comparator failure in the reactor protection system, at full reactor power	012	C
01-30	VAK	Reactor scram due to faulty initiation of a defective relay, at reactor start-up	013	B
01-30	VAK	Manual reactor scram due to malfunctioning control rod, at reactor start-up	014	B
02-04	KKS	Defective limit value monitor in residual heat removal system, at full reactor power	015	C
02-05	KKS	Malfunctioning of valve at steam generator blowdown demineralizer, at full reactor power	016	B
02-07	GKN-1	Leakage at hp cooler of volume control system, at full reactor power	017	C
02-07	KKP-1	Malfunctioning of quick-closing valve, at partial reactor power	018	B
02-08	KKI	Reactor scram caused by irregularities in the measurement of reactor pressure vessel level, at partial reactor power	019	B
02-08	KWO	Failure of one channel of steam generator level measurement, at full reactor power	020	C
02-09	KNK-II	Malfunctioning of a dc/ac converter, at zero reactor power	021	B
02-09	KWO	Excessive friction of an interposing relay prevents start-up of component cooling circuit pump, at full reactor power	022	C

Date of event	Plant	Event	No.	Category
02-11	KKP-1	Crack in cylinder head of emergency diesel generator, at reactor shutdown	023	B
02-11	KWW	Damage to throttle valve for adjustment of component cooling water flow, at full reactor power	024	C
02-19	KWO	Failure of one channel of primary coolant saturation measurement in loop 1, at full reactor power	025	C
02-19	KWB-B	Failure of permanent cooling water heater of emergency diesel generator, at partial reactor power	026	C
02-20	KKP-1	Lowering of header of main coolant lines, at full reactor power	027	C
02-21	GKN-1	Defective star point converter of emergency diesel generator, at full reactor power	028	B
02-23	KKP-1	Failure of station power supply due to damage to main transformer, at full reactor power	029	A
02-25	KWW	Defective plug-in module for nominal voltage of emergency diesel generator, at full reactor power	030	B
02-25	KKP-1	Rupture of stand-by sensing line of relief valve, at reactor shutdown	031	B
02-26	KKU	Closure of auxiliary steam valve for the main feedwater storage tank caused by defective pressure controller, at full reactor power	032	C
02-27	KWW	Cracking in sensing line for flow measurement of main steam system, at full reactor power	033	B

Date of event	Plant	Event	No.	Category
02-27	KKS	Damage to service cooling water line caused by ground lowering, at full reactor power	034	B
02-28	KKP-1	Failure of lifting drive brake of bridge crane in feedwater pump gallery, at shutdown reactor	096	C
03-01	GKN-1	Reactor scram caused by failure of main coolant pump and malfunction of feedwater isolation valve, at full reactor power	035	B
03-02	KKB	Unplanned flooding of reactor building, at shutdown reactor	036	B
03-03	KKU	Defective check valve at main feedwater system, at shutdown reactor	037	B
03-03	KWB-A	Increased iodine 131 discharge with exhaust air, at shutdown reactor	038	B
03-05	KWB-B	Failure of permanent pre-lubricating pump for emergency diesel generator, at partial reactor power	039	C
03-06	GKN-1	Power reduction caused by spurious signal, at full reactor power	040	C
03-06	KWB-A	Increased iodine 131 discharge via stack, at shutdown reactor	041	B
03-07	MZFR	Failure of speed indication of refueling machine shaft, at shutdown reactor	042	C
03-07	KKU	Malfunctioning of drain valve of reactor pool, at shutdown reactor	043	B
03-09	KWW	Cracking in sensing line for flow measurement of main steam system, at full reactor power	044	B
03-10	KWB-A	Increased iodine 131 discharge with exhaust air, at shutdown reactor	045	B

Date of event	Plant	Event	No.	Category
03-10	KWW	Cracked governor oil line of turbine governing valve, at full reactor power	046	B
03-11	KKI	Droplet leakage at pipe bend of heating steam condensate line for gland steam generator, at partial reactor power	047	C
03-11	KWO	Failure of blower of aerosol monitor for stack exhaust air, at full reactor power	048	B
03-11	KKP-1	Defective servo-motor of speed controller for emergency diesel generator, at reactor start-up	049	C
03-12	KKU	Loss of reactor pool water via open drain valve of coolant purification system, at shutdown reactor	050	A
03-13	KKU	Uncomplete filling of water loop at waste water collecting tank, at shutdown reactor	051	B
03-13	KKP-1	Defective servo-motor at speed controller of emergency diesel generator, at reactor start-up	052	C
03-14	KKU	Increased radioactive discharge with exhaust air, at shutdown reactor	053	A
03-15	KKS	(Erroneous) trip of limit value monitor N 16 activity, at full reactor power	054	C
03-15	KWB-A	Cracks in the connecting welds of the feedwater inlet nozzle of the steam generators, at shutdown reactor	098	B
03-19	KKB	Cracking in service water pump housing, at shutdown reactor	055	C
03-21	KWB-A	Defective speed measuring unit of emergency diesel generator, at shutdown reactor	056	B

Date of event	Plant	Event	No.	Category
03-23	KNK-II	Defective limit value module of reactor protection system, at full reactor power	057	C
03-27	KNK-II	Reactor scram caused by fuel element outlet temperature drop due to defective switch-over card, at full reactor power	058	B
03-27	KKI	Main steam leakage in turbine hall, at partial reactor power	059	A
03-27	KKP-1	Overloaded cable insulation of reactor building crane, at full reactor power	060	C
03-28	GKN-1	Defective in-core detector, at full reactor power	061	C
03-28	KKP-1	Reactor scram caused by excessive friction of switching damper in turbine auto-tester, at full reactor power	062	C
03-28	KKB	Defective transducer of emergency diesel generator, at shutdown reactor	063	C
03-28	KKP-1	Failure of braking mechanism for main and auxiliary lifting drive at turbine hall bridge crane, at shutdown reactor	097	C
03-30	KWB-A	Defective screws of core baffle, at shutdown reactor	099	B
03-31	KKI	Crack adjacent to weld at condensate draining system, at shutdown reactor	064	C
04-03	KKP-1	Failure of analogue indication of iodine monitor for the exhaust air, at full reactor power	065	B
04-10	KKB	Leaking isolation valve of residual heat removal and emergency cooling system, at shutdown reactor	066	B

Date of event	Plant	Event	No.	Category
04-16	KKP-1	Droplet leakage at start-up line of main feedwater system, at full reactor power	067	B
04-18	KKI	Cracked governor line of safety and relief valves, at shutdown reactor	068	B
04-18	KNK-II	Faulty valve operation during functional testing, at full reactor power	069	B
04-19	KKP-1	Droplet leakage at high pressure auxiliary condensate system, at partial reactor power	070	B
04-23	KWO	Failure of one channel of steam generator level measurement, at full reactor power	162	C
04-27	KWB-B	Failure of permanent cooling water heater of emergency diesel generator, at full reactor power	071	C
04-28	KWB-A	Defective auxiliary contactor of additional magnetic load at primary safety valve, at shutdown reactor	072	B
04-30	KWW	Cracked isolation valve housing of service water system, at full reactor power	073	C
04-30	KKS	Wall thinning at heating tubes of steam generators, at shutdown reactor	100	C
05-06	KWO	Failure of measuring device for monitoring pipe rupture in reactor coolant system, at full reactor power	074	C
05-08	KNK-II	Increased contact resistance at limit value module of reactor protection system, at shutdown reactor	075	C
05-08	KKU	Defective ventilator of nuclear ventilation system, at full reactor power	076	C

Date of event	Plant	Event	No.	Category
05-09	KKU	Steam leakage at draining line of turbine high-pressure stage, at full reactor power	077	B
05-14	KKU	Malfunction of feedwater control valve at emergency system, at full reactor power	078	B
05-15	KWB-A	Cracks in plastics vessels of 220 V batteries, at shutdown reactor	079	C
05-17	AVR	Defective motor of main feedwater pump, at partial reactor power	080	C
05-20	VAK	Reactor scram caused by high reactor pressure, at partial reactor power	081	B
05-21	KKS	Cracks in connecting welds at feedwater inlet nozzle of steam generator, at shutdown reactor	082	B
05-28	KWW	Defective time relay at reactor protection system, at partial reactor power	083	B
05-28	KWW	Defective time relay at reactor protection system, at partial reactor power	084	B
06-05	KNK-II	Failure of main feedwater pumps, at full reactor power	085	B
06-10	KKB	Droplet leakage at pressure measuring line at residual heat removal system, at shutdown reactor	086	C
06-12	KWO	Steam generator tube leakage, at partial reactor power	087	B
06-18	KWW	Defective time module in reactor protection system, at partial reactor power	088	B
06-20	KWB-B	Defective power relay at 220 V DC system, at full reactor power	089	C

Date of event	Plant	Event	No.	Category
06-23	KKU	Defective limit value monitor in reactor protection system, at full reactor power	090	B
06-24	KNK-II	Gaseous leakage at wall penetration of return line of primary sodium sampler, at full reactor power	091	B
06-25	KWB-B	Failure of one channel of DNB measurement in a loop, at full reactor power	092	C
06-26	KWO	Failure of residual heat removal pump, at shutdown reactor	093	B
06-27	KNK-II	Failure of sensing channel for fuel element monitoring, at shutdown reactor	094	C
06-29	KKS	Leaking flange connecting weld of safety valve at residual heat removal system, at shutdown reactor	095	B
07-02	KWW	Non-closure of main steam isolation valves, at partial reactor power	101	B
07-04	KKU	Reactor scram caused by faulty device of generator power measurement, at full reactor power	102	C
07-07	KKB	Corrosion of governor lines for safety and relief valves, at shutdown reactor	103	B
07-09	KKU	Failure of auxiliary feedwater control valve, at test and full reactor power	104	B
07-09	KKP-1	Failure of recirculating ventilator in pressure suppression system, at shutdown reactor	105	C
07-15	KKS	Malfunction at pump switch-over of low-pressure safety injection, at full reactor power	106	B

Date of event	Plant	Event	No.	Category
07-16	KWW	Short-term opening of pre-purging valves, at full reactor power	107	B
07-17	KWB-B	Failure of emergency diesel generator, at shutdown reactor	108	B
07-17	KWW	Blocked steam valve in auxiliary steam line, at shutdown reactor	109	C
07-17	KWW	Loose shock absorber at main steam relief lines, at shutdown reactor	110	C
07-17	KWB-A	Loss of control element fingers, at shutdown reactor	111	C
07-22	KKS	Defective valve of safety injection system, at full reactor power	112	B
07-23	KKP-1	Failure of service cooling water pump due to damaged motor, at shutdown reactor	113	C
07-24	KKU	Fuel element grabble hooked-up at fuel storage rack, at full reactor power	114	B
07-31	KWO	Cracked weld in main feedwater line, at shutdown reactor	115	B
07-31	KKP-1	Failure of emergency diesel generator, at shutdown reactor	116	B
08-03	KWB-B	Increased iodine 131 discharge via stack, at shutdown reactor	117	B
08-05	MZFR	Defective bellows of drain valve in the moderator circuit, at full reactor power	118	B
08-05	KKI	Failure of emergency diesel generator, at full reactor power	119	B
08-06	KWW	Malfunction of pre-purging valve, at full reactor power	120	C

Date of event	Plant	Event	No.	Category
08-06	KWW	Crack in valve cage at nuclear component cooling system, at full reactor power	121	C
08-07	KKU	Failure of SPN detector in the power distribution control, at full reactor power	122	B
08-07	KKB	Malfunction of power switch at main feedwater pump, at shutdown reactor	123	C
08-11	KWW	Failure of relief valves, at full reactor power	124	B
08-12	KKS	Defective foot valve in fuel supply line of emergency diesel generator, at full reactor power	125	B
08-14	KKS	Defective module in reactor protection system, at full reactor power	126	C
08-16	KKU	Ventilator failure in nuclear ventilation system, at full reactor power	127	C
08-18	KKI	Droplet leakage at piping of storage pool purification system, at full reactor power	163	C
08-19	GKN-1	Reactor scram after recurrent inspection of reactor scram signals, at full reactor power	128	C
08-19	KNK-II	Fuel can failure, at full reactor power	129	B
08-19	VAK	Tripping of 20 kV switch caused by overcurrent due to lightning, at partial reactor power	130	C
08-21	KWB-B	Increased iodine discharge via stack, at shutdown reactor	131	B
08-21	GKN-1	Non-opening of main steam bypass of three-phase turbine-generator, at partial reactor power	132	B

Date of event	Plant	Event	No.	Category
08-22	GKN-1	Non-opening of two pilot valves in main steam system, at reactor shutdown	133	B
08-22	GKN-1	Low pressurizer level, at reactor start-up	134	B
08-25	KKB	Failure of area monitor in the upper doughnut within the pressure-suppression system, at partial reactor power	135	B
08-26	KKB	Injection turbine failure to start-up at test, at partial reactor power	136	B
08-27	KKI	Failure of 24 V rectifier in the emergency diesel system, at full reactor power	137	C
08-28	KKS	Failure of isolation amplifier for N 16 measurement in main steam system, at full reactor power	138	C
08-31	KKU	Failure of ventilator in nuclear ventilation system, at full reactor power	139	C
09-01	KKB	Failure of continuous iodine measurement in turbine hall exhaust air, at shutdown reactor	140	C
09-02	GKN-1	Defective pool lining of emergency system, at shutdown reactor	141	C
09-04	GKN-1	Fuel element socket fracture in upper core structure, at shutdown reactor	142	C
09-08	KKU	Lowered sensitivity of iodine monitor, at full reactor power	143	B
09-08	GKN-1	Bent aeroball measuring finger at instrument lance of core instrumentation, at shutdown reactor	144	C
09-09	KWO	Malfunction of automatic start-up of auxiliary feedwater pump, at full reactor power	145	B

Date of event	Plant	Event	No.	Category
09-09	GKN-1	Bent throttle finger of neutron source, at shutdown reactor	146	C
09-09	KKS	Defective speed transducer of reactor coolant pump, at full reactor power	147	C
09-09	KKS	Failure of emergency diesel generator, at full reactor power	148	B
09-10	KKS	Leakage of borated water into reactor building sump during reactor protection system test, at full reactor power	149	B
09-10	KKS	Transducer failure in safety injection system, at full reactor power	150	C
09-10	KKS	Failure of isolation amplifier at level indicator of steam generator, at full reactor power	151	C
09-11	KKB	Leakage at cooler cluster tube of storage pool cooler, at shutdown reactor	159	C
09-12	KKS	Faulty activation of comparator in reactor protection system, at full reactor power	152	C
09-13	MZFR	Control rod failure to reach end position when tested, at full reactor power	153	B
09-13	KKS	Failure of isolation amplifier at activity monitor of main steam line, at full reactor power	154	C
09-15	KKS	Geiger tube failure in main steam activity monitoring system, at full reactor power	155	C
09-16	GKN-1	Defective fuel elements, at shutdown reactor	156	B
09-24	AVR	Activation of main steam safety valve caused by clogged nozzle of pilot device, at partial reactor power	157	B

Date of event	Plant	Event	No.	Category
09-27	KKS	Defective power amplifier in neutron flux density measuring system, at full reactor power	160	B
09-30	KWW	Malfunction at 0.4 kV switching plant, at partial reactor power	158	B
09-30	KKU	Water leakage into reactor sump, at full reactor power	161	B
10-02	KWB-A	Failure of emergency diesel generator, at full reactor power	164	B
10-02	KWB-A	Malfunction of automatic switching-over of lubricating oil pump for reactor coolant pump, at partial reactor power	165	C
10-08	KKI	Droplet leakage at piping of residual heat removal system, at full reactor power	166	B
10-18	GKN-1	Non-opening of pilot valve for main steam safety valve, at warm test operation of reactor	167	B
10-23	KKI	Closure of main steam isolation valve caused by reactor scram, at full reactor power	168	B
10-24	KWW	Failure of core flooding pump, at partial reactor power	169	B
10-25	GKN-1	Leakage in safety valve branch of discharge line of high-pressure injection pump, at partial reactor power	170	C
10-25	KWB-A	Leakages at safety valves of the emergency cooling and residual heat removal systems caused activity discharges, at reactor start-up	171	B
10-27	KKS	Reactor scram caused by low water level in steam generator, at full reactor power	172	B
10-27	KWW	Malfunction in the flow control of core flooding system, at partial reactor power	173	B

Date of event	Plant	Event	No.	Category
10-27	KWB-A	Increased activity discharge at waste-water processing, at reactor start-up	174	B
10-28	KWW	Rectifier failure in the D.C. supply, at partial reactor power	175	B
10-31	AVR	Non-decoupling of rod drive at manual scram, at reactor start-up	176	B
11-01	GKN-1	Failure of noble gas monitoring due to defective Geiger tube, at full reactor power	177	C
11-02	KKS	Faulty level indication in steam generator, at full reactor power	178	B
11-03	KKB	Failure of iodine 131 monitor in turbine-hall exhaust air, at partial reactor power	179	C
11-06	KKS	Droplet leakage at coolant recirculation cooler of conventional component cooling system, at full reactor power	180	B
11-12	KKB	Increased water leakage into containment, at partial reactor power	181	A
11-13	KKI	Failure of emergency diesel generator at recurrent testing, at full reactor power	182	B
11-13	GKN-1	Failure of 2 incore neutron flux density measuring channels, at full reactor power	183	C
11-14	KKI	Low leakage from fuel storage pool, at full reactor power	184	C
11-14	KKP-1	Failure of activity monitoring system in the stack, at shutdown reactor	185	C
11-17	KWB-A	Faulty signal due to defective electronic modul caused opening of 2 relief valves and reactor scram, at full reactor power	186	B

Date of event	Plant	Event	No.	Category
11-18	GKN-1	Non-opening of minimum flow control valve caused power reduction to 50 %, at full reactor power	187	C
11-18	KKS	Failure of area monitoring system, at partial reactor power	188	C
11-25	KWW	Faulty equipment isolation caused appr. 50 cubic meter river water to flood the reactor building, at partial reactor power	189	C
12-01	KKU	Auxiliary steam valve for the main feedwater storage tank closed by defective pilot valve, at full reactor power	190	C
12-05	KWO	Destruction of relay switch coil at the feed side of emergency power distributors, at full reactor power	191	C
12-05	KKB	Failure of radial gate valve of pressurized bearing water system, at partial reactor power	192	C
12-12	KWB-A	Pump failure at service cooling water system, at full reactor power	193	C
12-15	KKU	Emergency diesel generator failure at recurrent testing, at full reactor power	194	B
12-17	KWO	Failure of safety injection pump, at full reactor power	195	C
12-18	KKB	Droplet leakage at cylinder head of emergency diesel generator, at partial reactor power	196	C
12-21	KKU	Loss of suction of drain pump in plant drainage system, at full reactor power	197	C
12-30	KWO	Failure of safety injection pump due to bearing damage, at full reactor power	198	B

4.2 Delayed reported events

Date of event	Plant	Event	No.	Category
09-18	KKP-2	Crashing-down of containment section in the pre-operational phase	219	C
09-18	KKP-2	Crashing-down of containment section in the pre-operational phase	220	C
12-18	KKP-1	Neutron flux density and pressure transient during testing of reactor pressure control at partial reactor power	221	B

