ANNEX 6 Evaluation of the Safety Performance Indicators Set
(year 2009)

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A. INTRODUCTION

State Office for Nuclear Safety (SUJB) executes the state administration and supervision of the utilisation of nuclear power and ionising radiation in order to assure achieving a required safety level. As the focus of the supervision consists in the evaluation and assessment of nuclear safety related activities and their results, SÚJB annually evaluates an achieved level of nuclear safety of operation of Dukovany NPP by using Safety Performance Indicators.

The Safety Performance Indicators evaluate four areas of the NPP operation:

1. Events,
2. Safety Systems Performance,
3. Barriers Integrity,
4. Radiation Protection.

The evaluation results of Safety Performance Indicators in the form of graphs for the monitored period (2004 - 2009 for Dukovany NPP and 2004 – 2009 for Temelin NPP) are stated in appendices. The graphs mostly represent local values in the form of sum totals or averages of the unit values. Only for Safety System Unavailability, the indicated values are also at the level of the systems and for Barriers Integrity at the unit level.

Input data for the evaluation were acquired both from documents submitted by the operator and by SÚJB supervisory activities at Dukovany NPP and Temelin NPP.

B. EVALUATION OF THE SET OF SAFETY PERFORMANCE INDICATORS FOR DUKOVANY NPP

This section includes an evaluation of particular indicators of the monitored areas of operation of Dukovany NPP and their graphic representation is shown in Annex – Part I.

The evaluation of Safety Performance Indicators for 2009 confirms a constant high level of assurance of nuclear safety and radiation safety in power generation in Dukovany NPP.

1. Events

Group 1.A – Reportable events

The basis for the group 1.A indicators is the evaluation of reportable events according to the NPP Event specification. The indicator 1.A.1 "Number of Reportable Events" was included into the set of Safety Performance Indicators in 2003 and it superseded indicator "The Number of Safety Related Events".

"There were 49 events assigned to the indicator 1.A.1 "Number of Reportable Events" (graph 1.A.1) in 2006. This value is along with 2007 the highest one since 2003.

As well the trends of BSE (Bellow Scale Events) and SSE (Safety Significant Events) values are shown on graph of the indicator 1.A.1. The number of events evaluated according to the International Nuclear Event Scale (INES) for the whole monitored period shows a steady state with an increase of approximately 50% in 2005 and 2007 and a fall in 2009. The growth of the values in the years 2005 and 2007 relates to commencement of renovation of Instrumentation and Control Systems.

The indicator „Human Factor" (graph 1.A.2) by means of index HFI expresses a share of human failures in total number of reported events. This indicator both in the number of the events affected by human factor and in its index in the period under consideration fluctuates around mean value and after the drop in previous three years, in 2009 the growth can be seen again.

Group 1.B – Actuation of the protection and limitation systems

There was 2 unplanned automatic reactor scram and any of the reactors of Dukovany NPP had to be manually shutdown in the year 2009.

Results of the indicator "Unplanned Unit Scrams" are shown on graph 1.B.1,2.

The number of actuation of automatic power reductions decreased in the last year, and this number was along with 2004 the lowest in the period under consideration. An increased number of actuation of automatic power reductions in the years 2006 – 2008 was partly caused by six actuations at all units in occurrence of NPP island operation on August 3, 2006 and partly it related to renovation of Instrumentation and Control Systems commenced in 2005.

The results of indicator "Automatic Power Reduction/Limitation" are shown in a common graph 1.B.3-5.

The last of the indicators of this group "Control Rod Drops" shown in graph 1.B.6 has been decreasing since 2005. In 2007, the cause of an increased number of "Control Rod

Drops" - insufficient cooling of newly installed components of reactor control system - was detected and eliminated. .

Group 1.D – Limits and Conditions

The indicator "Violations of the Limits and Conditions" (graph 1.D.1) increased and reached the value two in 2008 and three in 2009.

The indicator "Exemptions from the Limits and Conditions" (graph 1.D.3) reached the zero value as in previous years. This means that no approval of the Exemptions from the Limits and Conditions were required in 2009. When evaluating the whole six-year period, this result has been reached for the fourth time.

2. Safety Systems Performance

Group 2.A – Safety System Unavailability

The group is monitored by means of indicator "Safety System Unavailability" for specific safety systems.

The graphs of the system sub-indicators show an increase in the value for systems TQ and TJ in 2007 and 2008 and most of them for diesel-generators in 2008 and 2009. The value of SSU for the diesel-generators for the whole period under evaluation exceeds significantly the average.

Group 2.B – Failure of safety systems

According to the indicator "Starting Failures of Safety System" (graph 2.B.1), in 2009 one failure of REAZNII occurred. Other monitored systems did not fail in their start-up. In terms of the whole six-year period, this is one of the best results ever. Better results were recorded in 2008 only when no "Starting Failures of Safety System" occurred.

Similarly, the behaviour of safety systems in operation is monitored in the indicator 2.B.3. No failure occurred in safety system operation since 2005.

3. Barriers Integrity

Group 3.A – Nuclear fuel

The state of nuclear fuel is monitored by the indicator "Fuel Reliability Index" (FRI, graph 3.A.1) and the indicator "The Number of Leaky Fuel Assemblies" (graph 3.A.2). The fuel reliability formula is based on the empirical formulas and its results thus must be considered in terms of possible failure load. In practice, two or three levels of the values of the Fuel reliability factor are assessed: more than 19Bq/g – the reactor core contains, with great probability, one to two defects; less than 19Bq/g – the reactor core does not contain, with great probability, any fuel defect; all design values of the Fuel reliability factor less than 0.04 Bq/g are just corrected to the limit 0.04 Bq/g by reason of limited operation of the empirical formulas. Almost all annual values of indicator FRI since 2003 are at the level 0.04 Bq/g. A higher value of FRI was detected at the end of campaign 2007 at Unit 1. During outage, one leaky fuel assembly was identified and it was discarded. In total seven leaky fuel assemblies were discarded to the spent fuel storage pool in the whole operation period of Dukovany NPP.

Group 3.B – Containment

Graph 3.B.1 of the indicator evaluates, through the results of the Containment periodic integral tightness testing, the tightness condition of hermetic areas. The year 2009 confirms trend of systematic increase of Dukovany NPP unit tightness, which has been recorded on all four units since 2001, except for two minor deviations. All time low leakage values for 24 hours are recorded on Unit 1 and 4 during the Periodic integral tightness testing. In terms of containment tightness, the best results are recorded on Unit 4 on a long-term basis.

4. Radiation Protection

Group 4.A – Staff

The indicator "Collective Effective Dose per Unit" (graph 4.A.1) monitors collective effective dose of NPP staff, suppliers and visitors converted per one unit. The indicator fluctuated in last six years on the value less than 0.2 Sv, in 2008 it dropped close to 0.1 Sv. Graph 4.A.2 of the indicator "Collective Effective Dose" showing that this trend relates both to NPP staff and to suppliers.

At the indicator "Specific collective Dose per Capita" (graph 4.A.3), in 2008 a decrease by approx. 1/3 occurred. This improvement at the suppliers was temporary and in 2009 the return to almost previous values occurred. Indicator "Maximum Individual Effective Dose" (graph 4.A.4) developed in a similar way and at the suppliers in the years 2007 and 2009 it slightly exceeded 10 mSv/year. Both mentioned indicators also document that supplier's staff are exposed to radiation more than Dukovany NPP staff.

The indicator "The Number of Workers with Special Decontamination" (graph 4.A.5) shows permanently very low level and documents a high safety level at work with ionizing radiation sources of more than 1,800 radiation employees of Dukovany NPP. In 2008, four employees had to be subject to special decontamination, which is the highest number for the whole period under consideration. In 2009, no radiation staff had to be subject to special decontamination.

Group 4.B – Radioactive Releases

The indicators "Gaseous Releases" and "Liquid Releases" evaluate the operation of Dukovany NPP in terms of radioactive releases. Their graphs 4.B.1 and 4.B.2 document that the committed effective doses from the releases are in both cases lower for the population in a calendar year than the limits (the limit for gaseous releases is 40 μSv and 6 μSv for liquid releases).

C. EVALUATION OF THE SET OF SAFETY PERFORMANCE INDICATORS FOR TEMELIN NPP

This section includes an evaluation of particular indicators of the monitored areas of Temelin NPP operation and their graphic representation is shown in Annex – Part II.

The operation of Temelin NPP was evaluated by means of safety indicators in 2009 for the seventh time. Similar statistic comparison may be performed for this period as at Dukovany NPP.

1. Events

Group 1.A – Related events

Since 2007, the basis for the group 1.A indicators has been the evaluation of reportable events according to the NPP Event specification that are evaluated in feedback process (RE – Related events) such as at Dukovany NPP. The indicator 1.A.1 "Related Events" was included in the set of Safety Performance Indicators and it superseded indicator "The Number of Safety Related Events". Graph 1.A.1 was recalculated according to new criteria since commencement of operation of Temelin NPP (2003). The biggest number of events was recorded in 2004 – 201 events. The number of events was considerably dropping till 2007 when 81 events were recorded. In the following years, a slight growth has been recorded – up to 85 events in 2009.

A similar development can also be seen at the events evaluated according to INES with the minimum in 2008 – 1 event evaluated as INES1 and 19 events evaluated as INES0.

At indicator "Human Factor", graph 1.A.2, the number of events with HF as well as their share in total number of events has been growing since 2007. The comparison with older data is not possible due to a change in the methodology of monitoring and evaluation of the number of events in 2007.

Group 1.B – Actuation of the protection and limitation systems

There was no unplanned ROR (reactor scram on the basis of primary causes in PRPS system) in 2009 at Temelin NPP. Therefore, no actuation of ROR occurred for five years at Unit 1 and for two years at Unit 2. Three reactor shutdowns were recorded at Unit 1 by LS(d) type – one automatic actuation of the limitation system on the basis of primary causes in RCLS system and two manual shutdowns.

The number of actuation of safeguards in the form of limitation system by other types (a, b, c) significantly decreased in LS(a) actuation and increased in LS(c) actuation in the last three years (graph 1.B.3-5).

Group 1.D – Limits and Conditions

In 2008 and 2009, there was one case of Violation of the Limits and Conditions each year (graph 1.D.1), which is by one less than in previous years. The violation of the Limits and Conditions was detected by the operator in both cases. Therefore, Temelin NPP is near the acceptable level on a long-term basis, i.e. one violation of the Limits and Conditions per unit per year.

Two "Exemptions from the Limits and Conditions" were approved by SÚJB in the last year. One case concerned limitation system with an impact upon both units (for this reason, in graph 1.D.3. recorded as two changes) and one case concerning separating valves at Unit 1.

2. Safety Systems Performance

Group 2.A – Safety System Unavailability

For indicator "Safety System Unavailability" (graphs 2.A.1a-g), a slight increase in its values is documented in last two years for all monitored safety systems, except for hydro-accumulators and emergency steam generator feed-water system, where the growth in 2008 was followed by the drop in 2009.

Group 2.B – Failure of safety systems

In 2009, one starting failure occurred at the second diesel generator at Unit 1, see indicator "The Number of Starting Failures" (graph 2.B.1). Three cases of running failure occurred, one at the second diesel generator at Unit 2, one at low pressure emergency core cooling system at Unit 1 and one at the boric acid emergency injection system at Unit 2.

3. Barriers Integrity

Group 3.A – Nuclear fuel

The state of nuclear fuel is monitored by the indicator "Fuel Reliability Index" (FRI, graph 3.A.1) and the indicator "The Number of Leaky Fuel Assemblies" (graph 3.A.2).

There were three leaky fuel assemblies detected during the refuelling outage in 2009 at Unit 1. One assembly was repaired and used for the next fuel cycle. Five leaky fuel assemblies were detected at Unit 2. In the repair of the first leaky fuel assembly, its damage occurred, therefore it was decided not to repair other leaky assemblies and not to use them in Reactor core any more.

Group 3.B – Containment

In this group, there is only one indicator, which evaluates the results of the Periodic integral tightness testing, tightness condition of hermetic areas in graph 3.B.1. Lastly, Periodic integral tightness testing was performed in 2007 at Unit 1 and in 2009 at Unit 2. The trend of measurements performed in previous years corresponds to design expectations as well as international experience.

4. Radiation Protection

Group 4.A – Staff

The indicator "Collective Effective Dose per Unit" (graph 4.A.1) monitors collective effective dose of NPP staff, suppliers and visitors converted per one unit. The indicator "Collective Effective Dose" (graph 4.A.2) monitors total collective effective dose of Temelin NPP in distribution of NPP staff and suppliers. Compared to 2008, a significant decrease in

both of the indicators occurred, and both indicators dropped to the lowest levels since commencement of operation.

It will be appreciated that decrease in the indicator "Specific Collective Dose per Capita" (graph 4.A.3) by 50% for radiation employees of suppliers and NPP staff actively contributed to the above mentioned decrease in collective effective dose. The indicator "Maximum Individual Effective Dose" (graph 4.A.4) also decreased in both categories of radiation employees to 2008. It is apparent from both last mentioned indicators that exposure of suppliers' staff to radiation is much higher than exposure of Temelin NPP staff.

Occurrence of only one case in the indicator "The Number of Workers with Special Decontamination" (graph 4.A.5) in past three years documents a high safety level at work with ionizing radiation sources of approximately 1,500 radiation employee of Temelin NPP.

Group 4.B – Radioactive Releases

Graph 4.B.1 "Gaseous Releases - Committed Effective Dose" represents the exposure of individuals from the most exposed population group acquired by calculation from the authorized model for current radionuclide effluent to the air and the current meteorological situation in the evaluated year. The values show that the SÚJB annual authorized limit of 40 μSv is drawn on the level of approximately 0.1% in the last years.

Graph 4.B.2 "Liquid Releases - Committed Effective Dose" represents the exposure of individuals from the most exposed population group acquired from the authorized model for current radionuclide effluent to the stream and the current hydrological situation in the evaluated year. The SÚJB annual authorized limit of 3 μSv was drawn on the level of approximately 23% in 2009.

D. CONCLUSION

Based on the results of particular Safety Indicators for 2009 it may be stated that the previous high level of nuclear and radiation safety in power generation at **Dukovany NPP** was confirmed in all monitored areas.

A decrease in the number of events in 2006 was only temporary; in 2007 the number of events increased again and since then it has been kept at approximately constant level. In comparison with previous years, severity of events slightly decreased in 2009. The values of the indicator "Human Factor" indicate sustained difficulties of the NPP with the human factor, which caused 30% of "Reportable Events". Most cases involved supplier errors and the operator should focus its activity on this area in event prevention.

The first period of I&C System Renovation – T544 project, which was completed in 2009, slightly affected the results in the past years (temporary increase in the number of Control Rod Drops in 2007, in the number of Unplanned Unit scrams in 2008). I&C System Renovation will be fully completed in 2015.

After 5 years when the Limits and Conditions were not violated, two and three violations of the Limits and Conditions occurred in the years 2008 and 2009. All violations of the Limits and Conditions were caused by human failure. The values of the other indicators related to the Limits and Conditions of safe operation did not deviate from a long-range average.

The values of the indicator "Safety System Unavailability" show a considerable increase at diesel-generators in 2008 and 2009; for the whole period under evaluation they significantly exceed the average. The value of unavailability of TQ system is also higher than average. All values are well below the value of 10^{-2}, which is regarded as the acceptable limit for the value of safety system unavailability. The reliability of the systems improved; there was only one failure of REAZNII during start-up in 2009.

In the area "Barriers Integrity", one leaky fuel assembly in 2007 was identified and it was discarded. The results of integral tightness testing further decreased at all units.

Based on the above mentioned results of the indicators of the area "Radiation Protection" it may be stated that radiation protection assurance at Dukovany NPP is on a high level. After a considerable decrease in most values expressing collective and individual effective dose in 2008, the return to average values from previous years was recorded for the supplier staff in 2009.

Both liquid and gaseous effluents are maintained at a very low level.

The results of the evaluation of a set of Safety Indicators for **Temelin NPP** show that nuclear and radiation safety of power plant is at the level usual for NPP with pressurized water reactors.

In the area “Events”, a considerable decrease in "Safety Related Events" stopped in 2007 and in last two years it has slightly been rising. Similar trends can be seen in the events evaluated according to the International Nuclear Event Scale (INES). In last three years, the number of events with human factor effect has been rising both absolutely and relatively.

A low number of reactor scrams by means of PRPS is favourable, on the other hand, reactor scrams by means of LS increased up to three cases at Unit 1 in 2009. The actuation of other limiting functions of LS slightly decreased in the period under consideration.

In the area “Limits and Conditions”, the violations of the Limits and Conditions decreased to 1 case each year in 2008 and 2009, which is a positive trend. In 2009, three Exemptions from the Limits and Conditions were approved.

The value of the general safety system unavailability in the area "Safety System Unavailability" achieved in the period under consideration the lowest level in 2007. In the years 2008 and 2009, a slight increase in unavailability of most safety systems occurred, predominantly at the system of diesel-generators. The reliability of diesel-generators at start considerably improved, when in last 3 years the diesel-generators failed in total twice. In comparison with previous years, in 2009 reliability of safety systems in running deteriorated - 3 failures in one year is the worst result since commencement of operation.

In terms of leak tightness, in the area "Barriers Integrity" the worst results were recorded in 2006 at Unit 2 and in 2007 at Unit 1 (10 leaky fuel assemblies at each of the units in respective year). The condition of nuclear fuel is indicated by the values of both indicators, i.e. "Fuel Reliability Index" and "The Number of Leaky Fuel Assemblies". Efficiency of measures taken by the operator as well as fuel producer will document the indicator results since 2007.

The values of the indicators for the area "Radiation Protection" show a decrease for a predominant part of the period under consideration and some of them reached the lowest level since commencement of operation. A low drawing on allowable limits is documented in the group "Radioactive Effluents”. In 2008, the cause of high effluents of radioactive iodine isotope was eliminated; these effluents related particularly to Unit 2 outage in previous two years.

The above summary of the results in particular areas of the set of safety indicators provided a sufficient overview of the state and assurance of nuclear and radiation safety in operation of Dukovany and Temelin NPPs, and in spite of negative trends in some areas to be addressed by SÚJB inspections in 2010, did not indicate any immediate hazardous aspects.

E. ABBREVIATIONS:

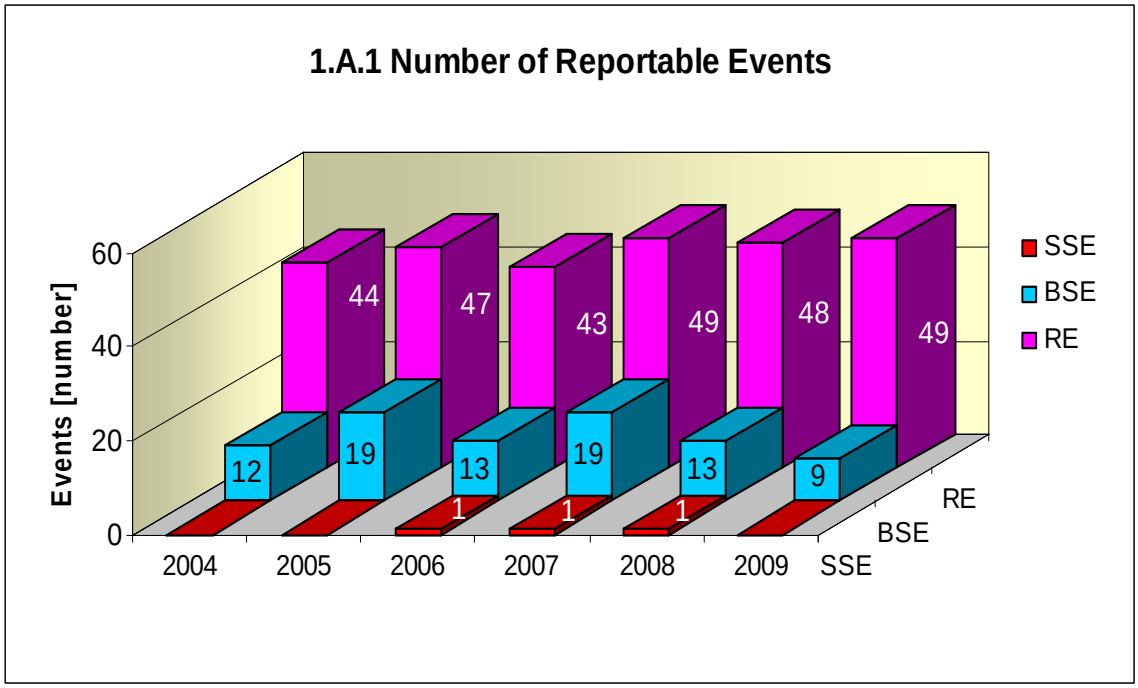
AŠP	Activated and fission products
AZ	Reactor core
BL	Safety limit
BS	Safety system
BSVP	Spent fuel storage pool
ČEZ	Business name of the Czech utility - joint stock company ČEZ, a. s.
DG	Diesel generator
E	Individual effective dose
EDU	Dukovany nuclear power plant
ETE	Temelin nuclear power plant
GO	Overhaul
HA	Hydro-accumulator
HMG	Time schedule
HP	Hermetic premises
HN PG	Steam generator auxiliary feed-water system (Dukovany NPP)
INES	International Nuclear Event Scale
JB	Nuclear safety
JE	Nuclear power plant
LIJB	SÚJB local inspectors
LS (a,b,c,d)	Limitation system (various actuation functions)
LaP (L&C)	Limits and Conditions
LPP	Limiting condition for operation
NT	Low-pressure system
NOS	Protection system setting
OKJZ	Nuclear installation inspection section
OROPC	Fuel cycle radiation protection section
OZIK	Repetitive containment integrity test
PG	Steam generator
PBU	Safety indicator(s)
PERIZ	Periodic integral tightness testing
PERZIK	Periodic containment integrity test
PRPS	Primary reactor protection system
RB	Reactor unit
RC	Regional center
REAZNII	Automatics of emergency power system – category II
ROR	Reactor scram
S	Collective effective dose
SAOZ (SHCHAZ)	Emergency core cooling system

SHN PG	Steam generator emergency feed-water system (Dukovany NPP)
SW	Software
SZB	Safety assurance system
TJ	High-pressure emergency core cooling system
TH	Low-pressure emergency core cooling system
TQ	Dukovany NPP spray system / Temelin NPP emergency core cooling systems and spray system
TX	Emergency steam generator feedwater system (Temelin NPP)
VT	High-pressure system
ZIK	Structural over-pressure test
ZKOB	Safeguards and protection testing

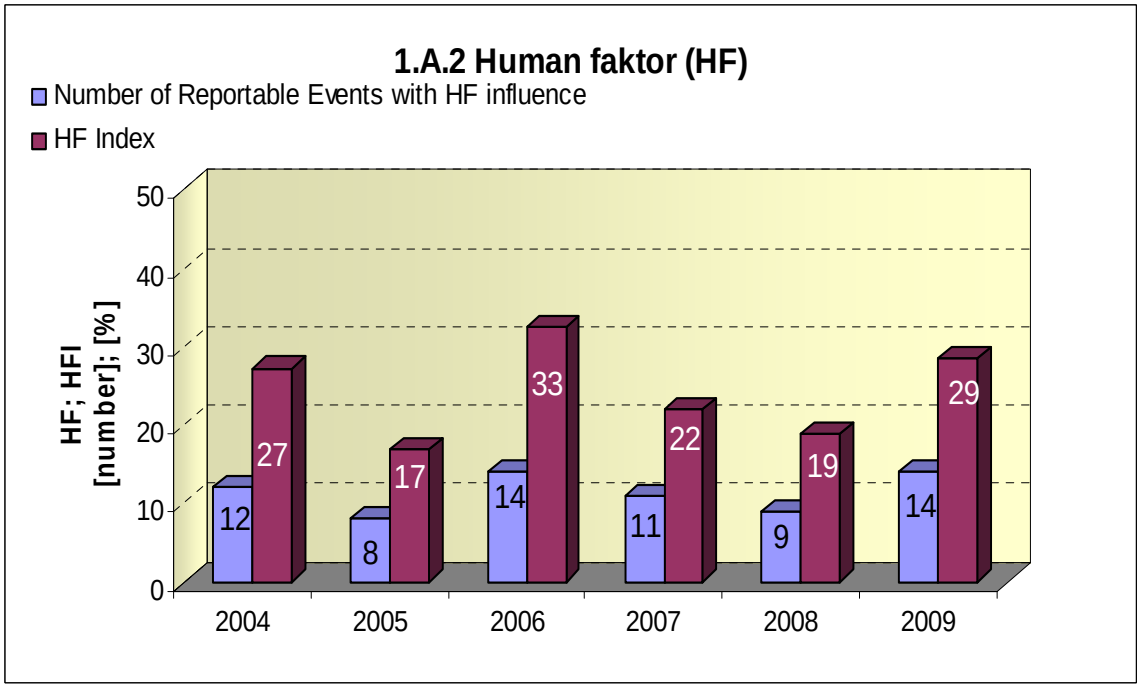
1. Significant Events

1.A Reportable events

Graph of indicator 1.A.1 monitors the development of number of reportable events (RE) including its division according to the evaluation of the International Nuclear Event Scale (INES) into significant events (SSE, INES > 0) and the below scale events (BSE, INES = 0). Until 2002 the RE indicator was equal to summary of SSE and BSE.

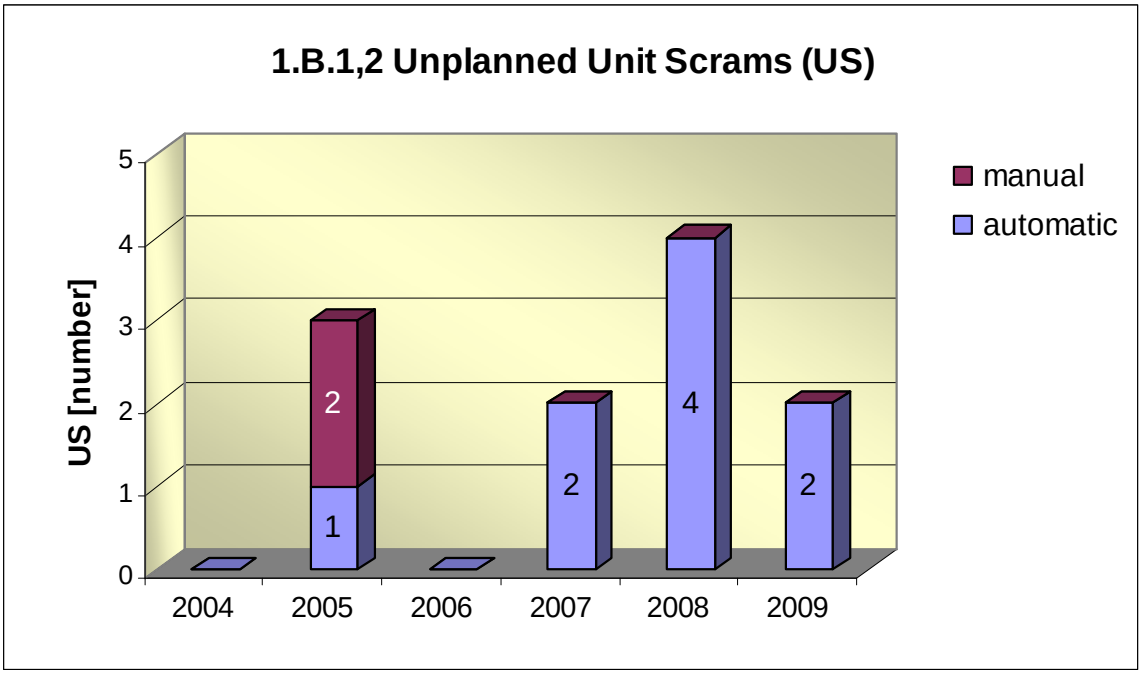


Graph 1.A.2 evaluates the influence of the human factor upon occurrence of reportable events. Until 2002 the number of reportable events corresponds with number of events according to INES. The indicator is expressed by the number of the reportable events with an influence of human factor (HF) and its percentage share (HFI).

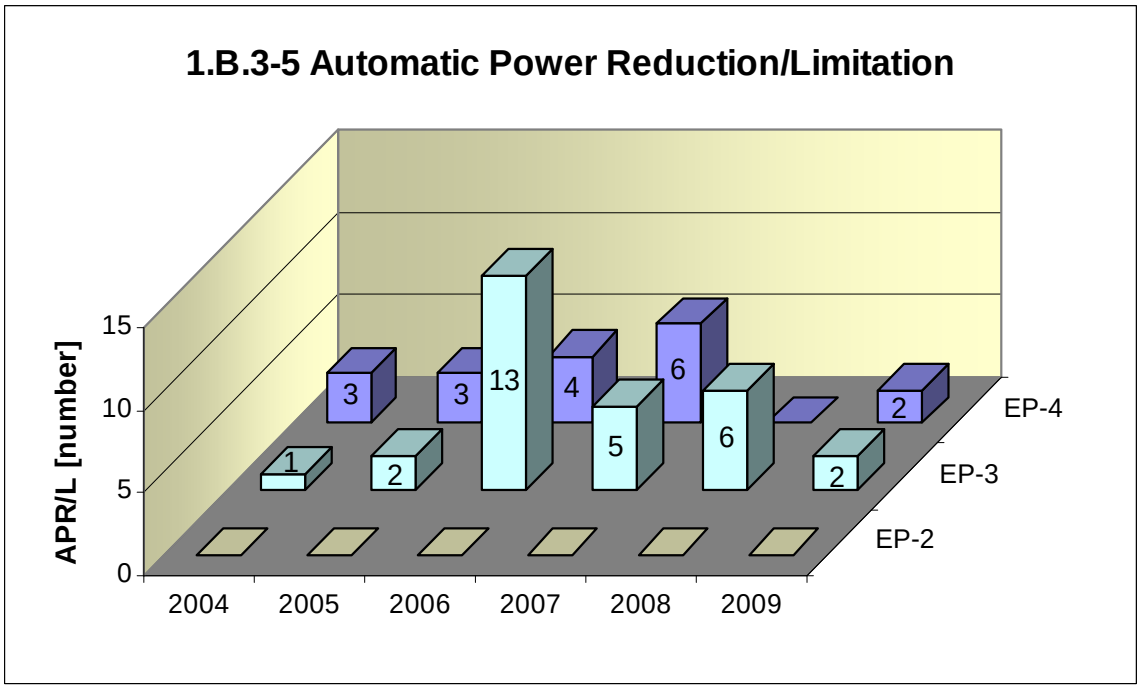


1.B Actuation of the protection and limitation systems

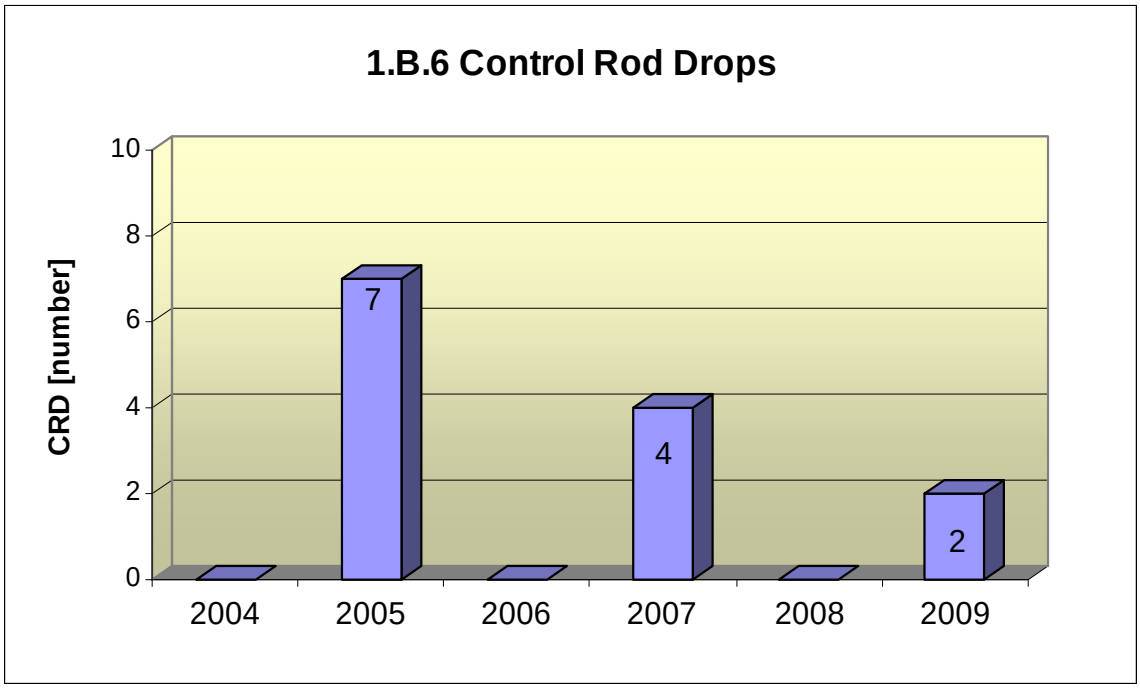
Graph 1.B.1,2 summarises the total number of unplanned unit scrams (US) (reactor in MODE 1 or 2) with resolution of manual and automatic shutdown. The term unplanned means that the scram was not an expected part of the planned test.



A common graph of indicators 1.B.3-5 presents the number of unplanned automatic power reduction (APR) by emergency protection of the 2nd – 4th type (HO-2, HO-3 a HO-4).

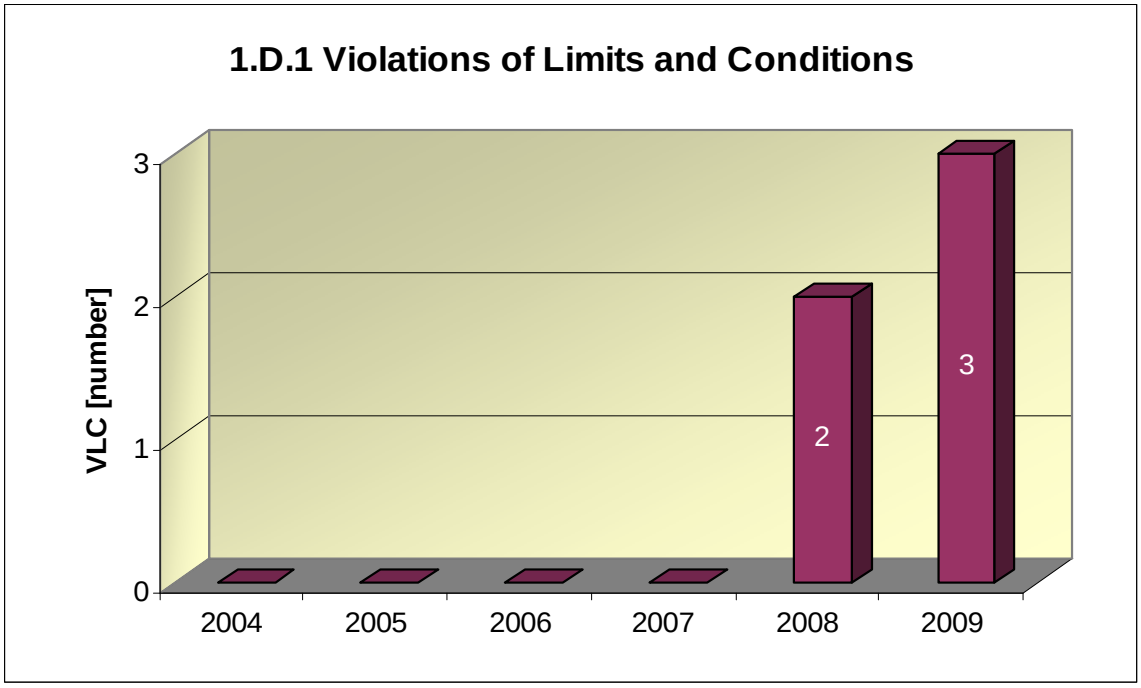


Graph 1.B.6 presents the development of the number of control rod drops (CRD).

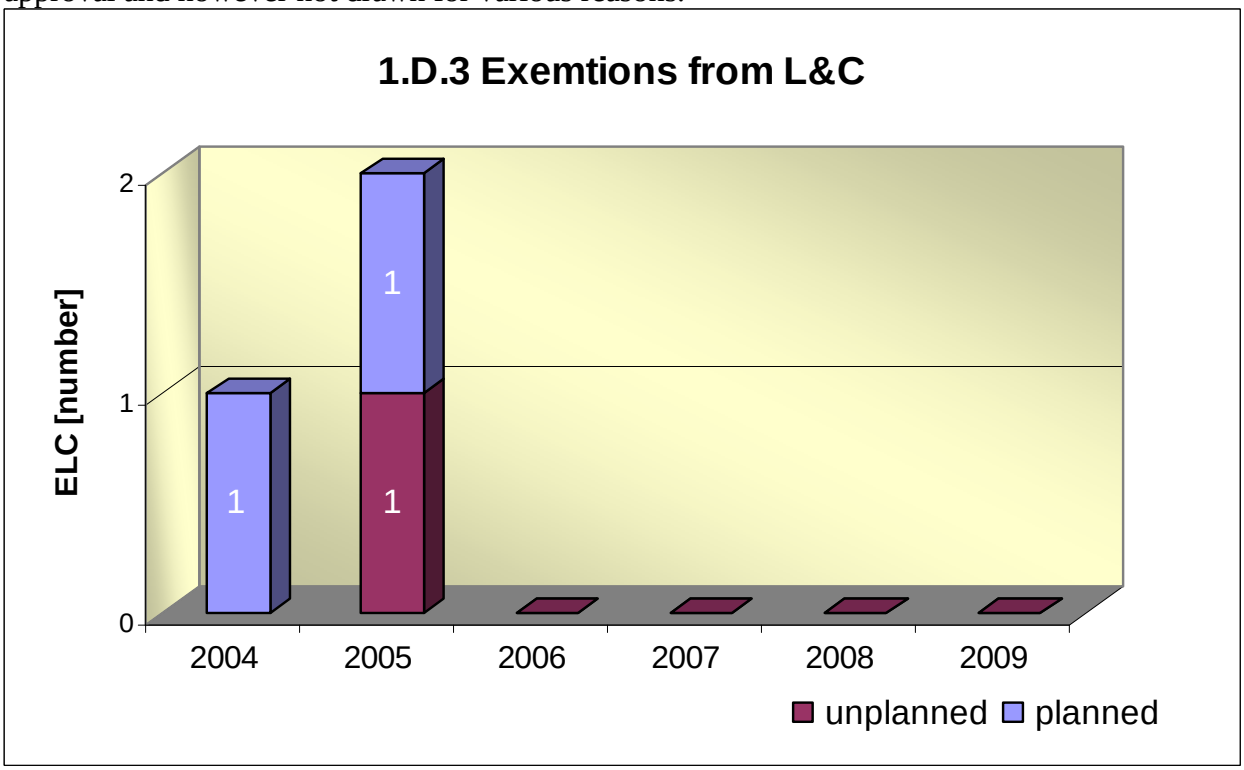


1.D Limits and Conditions

Graph 1.D.1 summarises violations of the Limits and Conditions (VLC) detected by the Regulatory body or reported to the Regulatory body by the licensee.



Graph 1.D.3 summarises the number of planned and unplanned exemptions from the Limits and Conditions (ELC) approved by the Regulatory body including those requiring SUJB approval and however not drawn for various reasons.



2. Safety Systems Performance

Area 2 monitors and evaluates availability of the following safety systems (BS) in group A:

- diesel generators	**DG**
- high pressure emergency core cooling system	**TJ**
- low pressure emergency core cooling system	**TH**
- spray system	**TQ**
- hydro-accumulators	**HA**
- steam generator auxiliary feed-water system	**HN PG**
- steam generator emergency feed-water system	**SHN PG**

and in group B failure of diesel generator (DG), high pressure emergency core cooling system (TJ), low pressure emergency core cooling system (TH) and spray system (TQ) in starting and operation.

2.A Safety system unavailability

Unavailability of particular safety systems (SSU_S) - graphs 2.A.1.a – g, is defined as the ratio of the total time of unavailability of an evaluated safety system to the total time when its availability was required. In addition, these combined graphs express the ratio of unavailability of respective safety system to the "general" safety system of the site.

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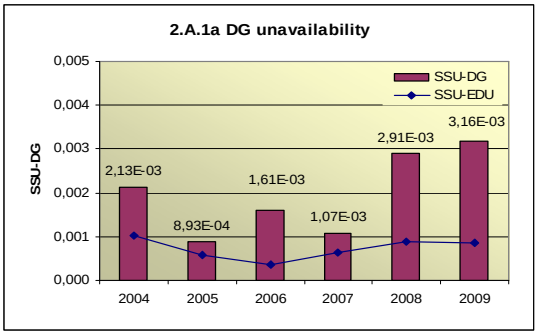
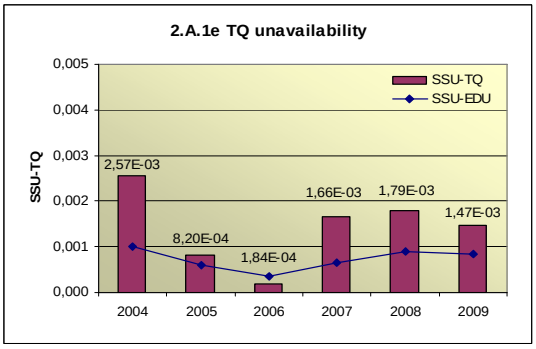
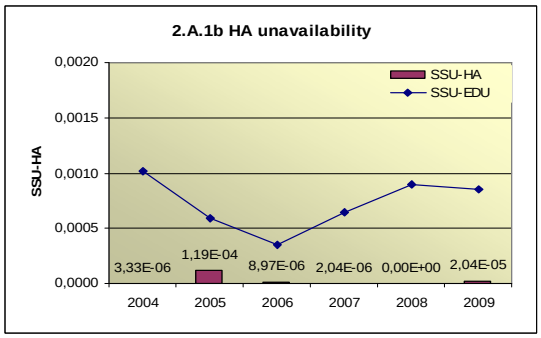
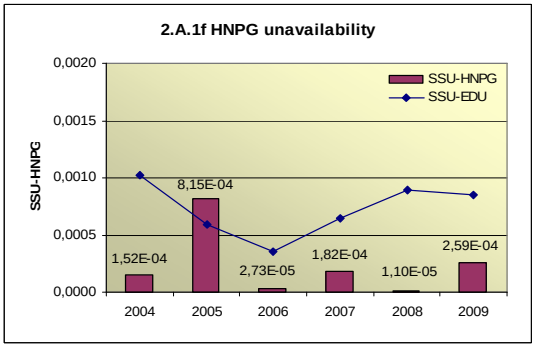
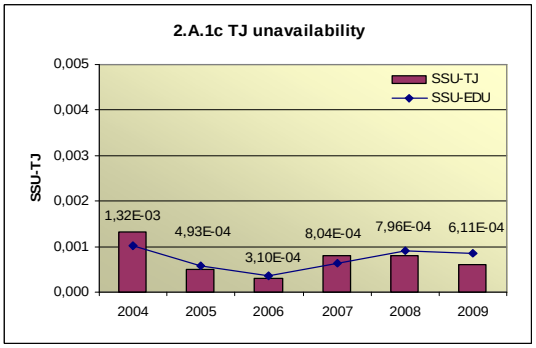
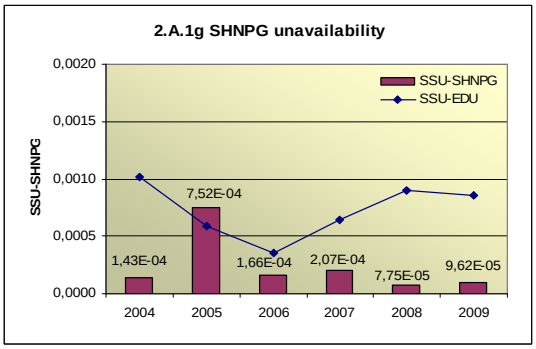


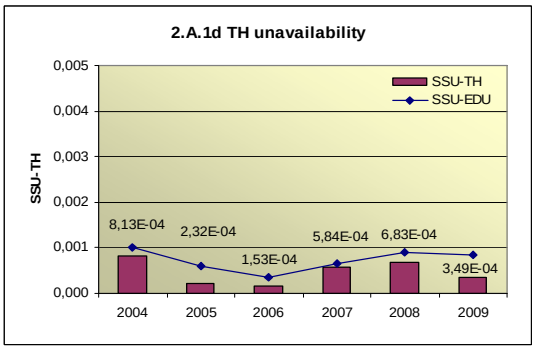






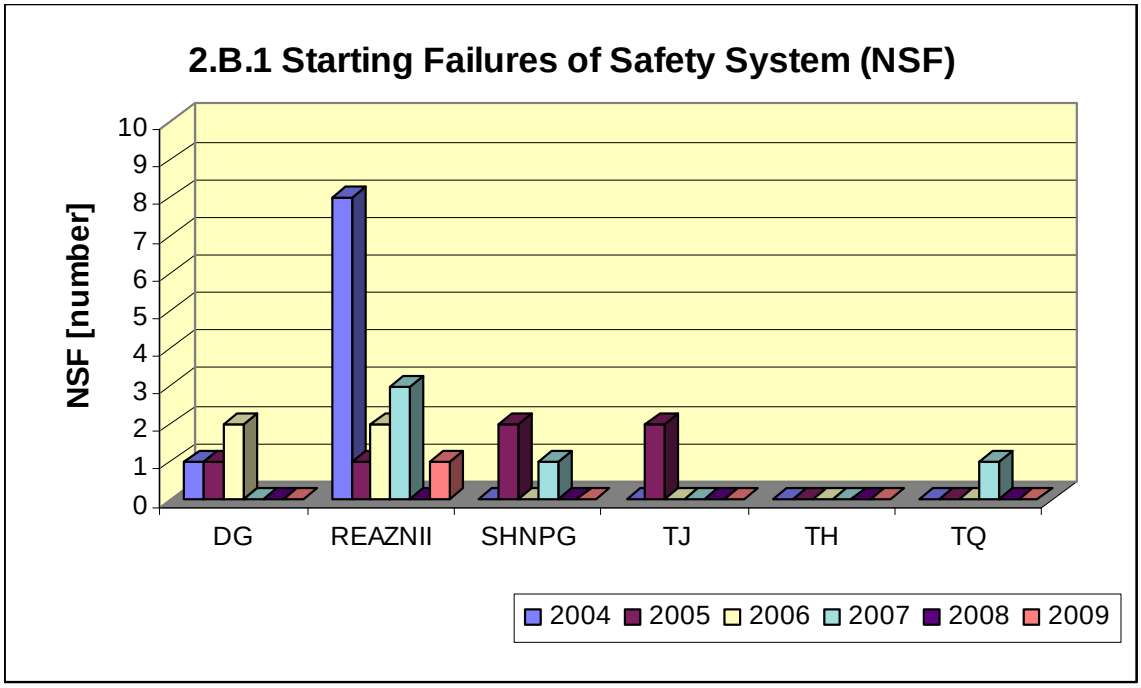




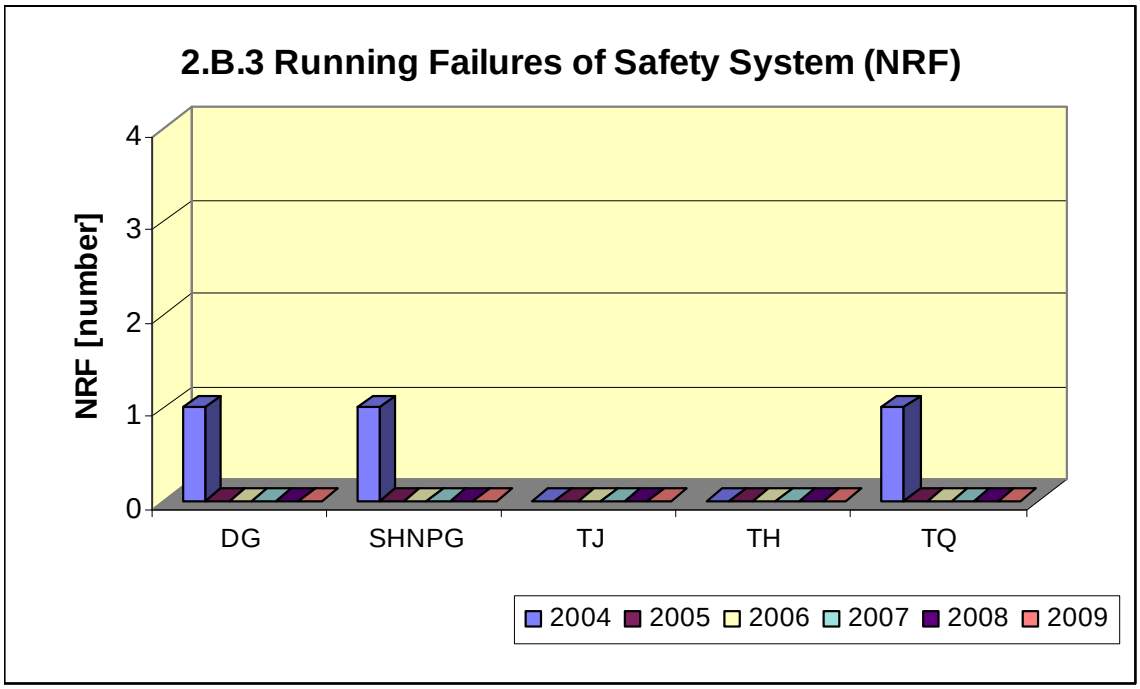


2.B.1 Failure of safety systems

Graph 2.B.1 indicates the number of starting failures of the safety system (NSF), i.e. the state when the respective system, possibly set after the command to start, does not achieve nominal performance characteristic or its failure (shutdown) occurs within 30 minutes after its start.



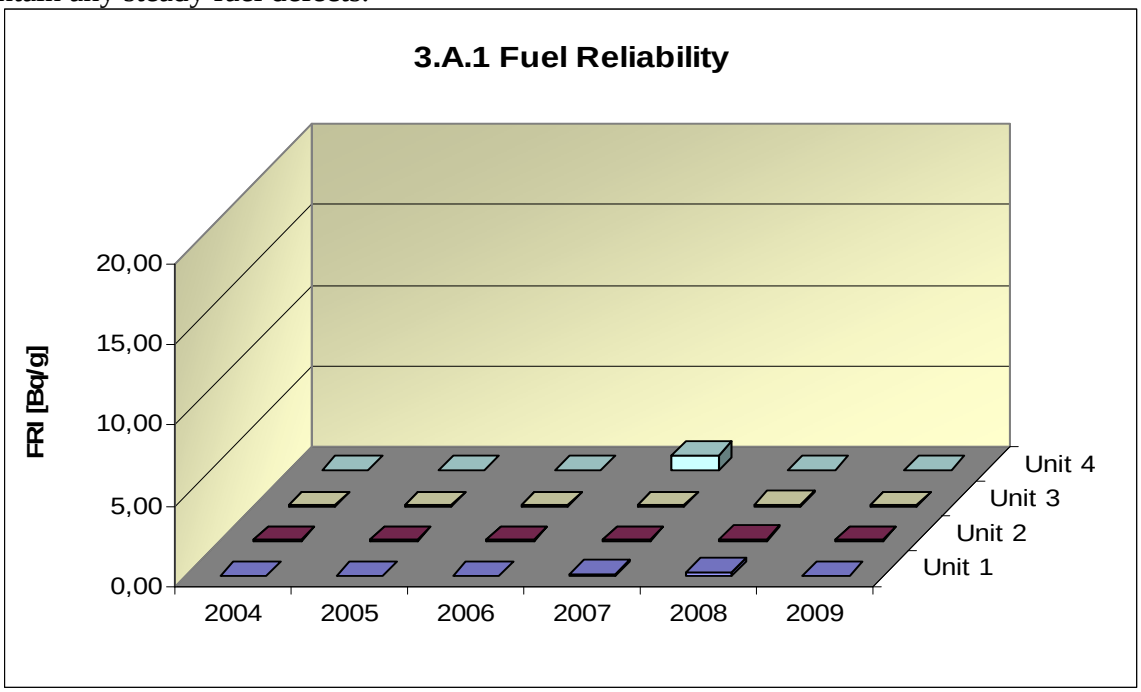
Graph 2.B.3 indicates the number of running failures of safety system (NRF), i.e. the number of states when failure shut down of respective system, drive, possibly set occurs at nominal performance characteristics for the time exceeding 30 minutes since its starting.



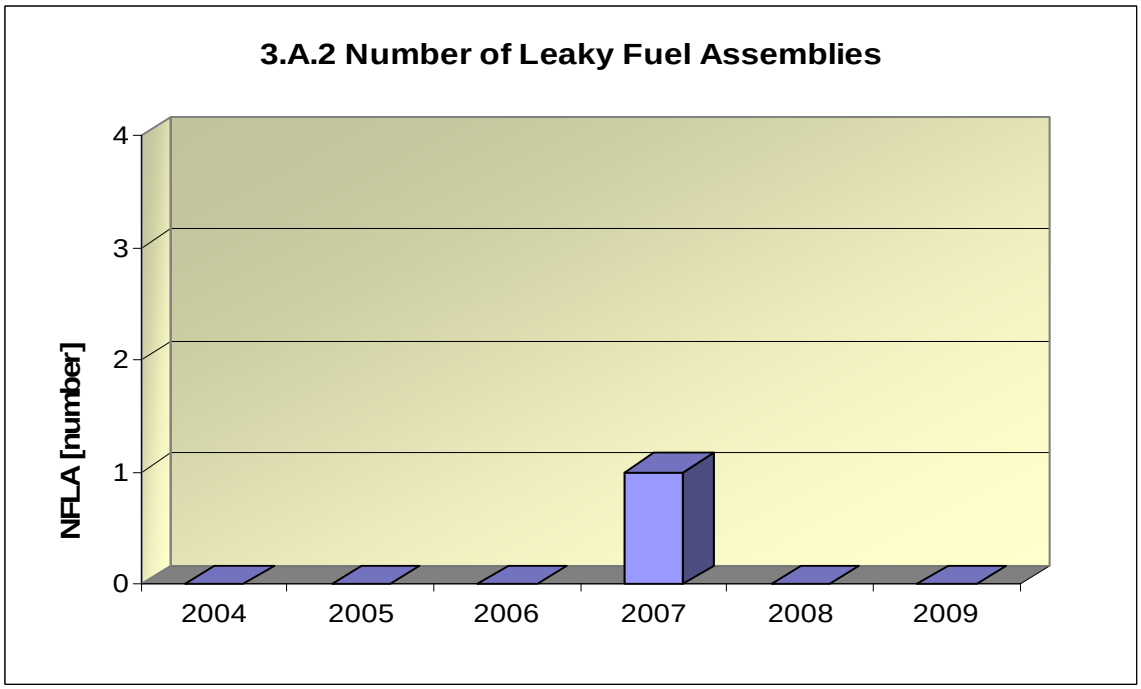
3. Barriers Integrity

3.A Nuclear fuel

Graph 3.A.1 monitors fuel reliability of particular units through the values of FRI - Fuel reliability index. The value FRI ≤ 19Bq/g expresses that reactor core most likely does not contain any steady fuel defects.

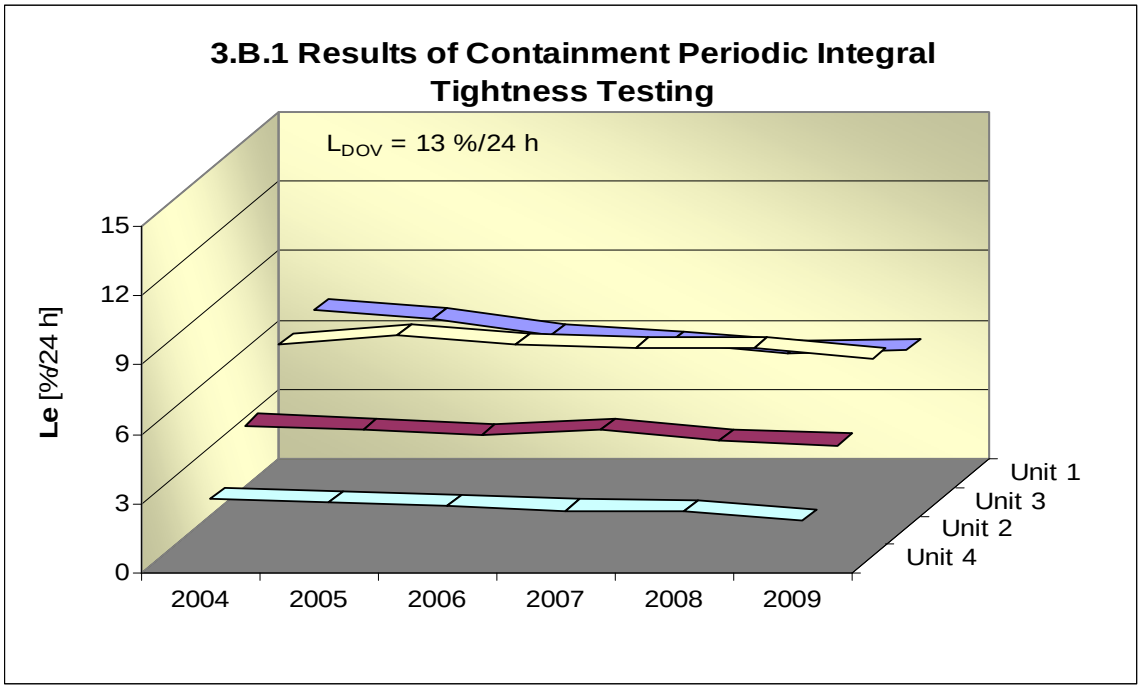


Graph 3.A.2 indicates the number of leaky fuel assemblies (NLFA) that had to be put out of operation due to their inadmissible leakage.



3.B Containment

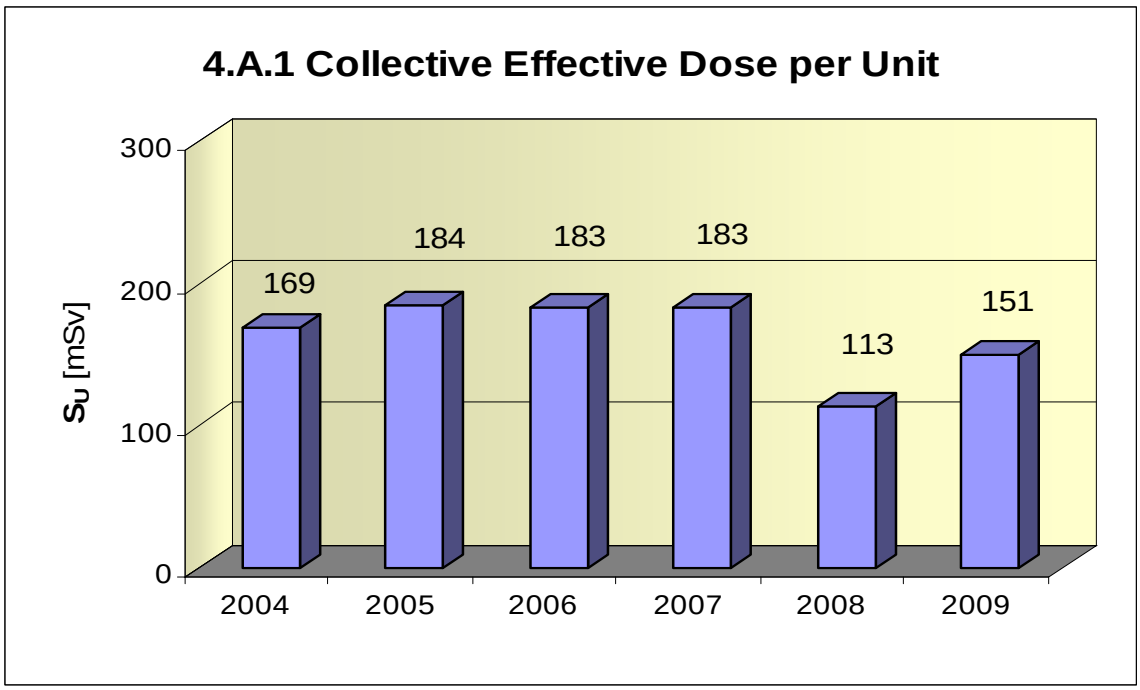
Graph 3.B.1 states the results of Containment periodic integral tightness testing (L_e), i.e. the results of leakage tests of hermetic areas executed by overpressure 150 kPa lasting 24 hours. Extrapolated results are included for the tests with a lower pressure and dwell.



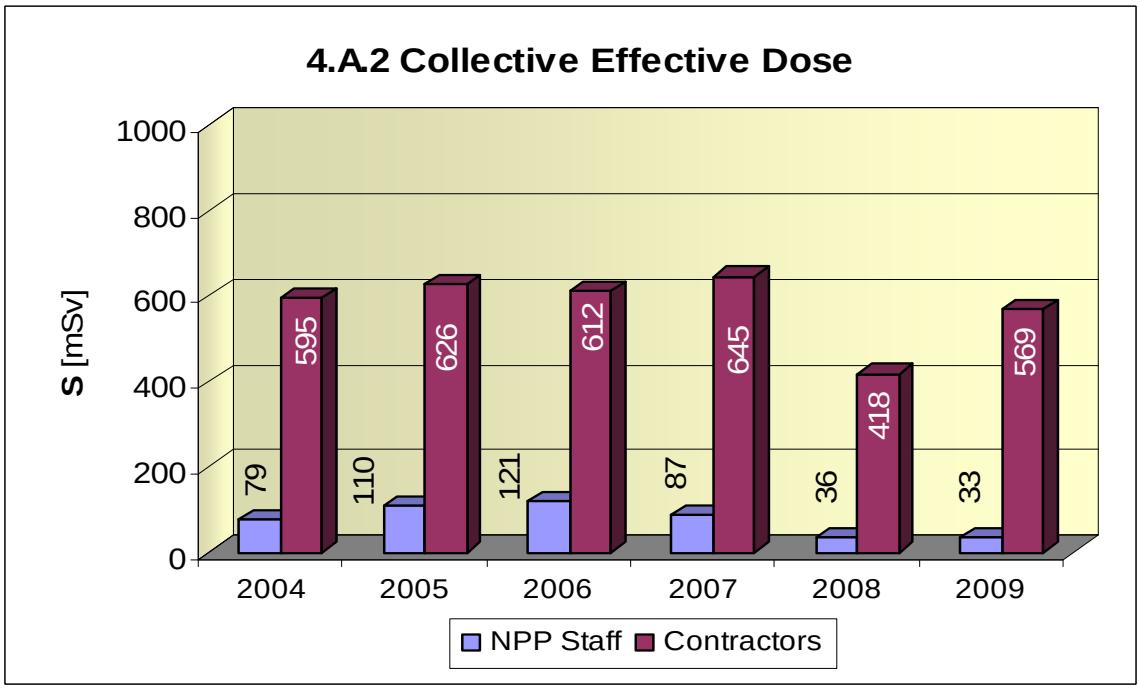
4.Radiation Protection

4.A Staff

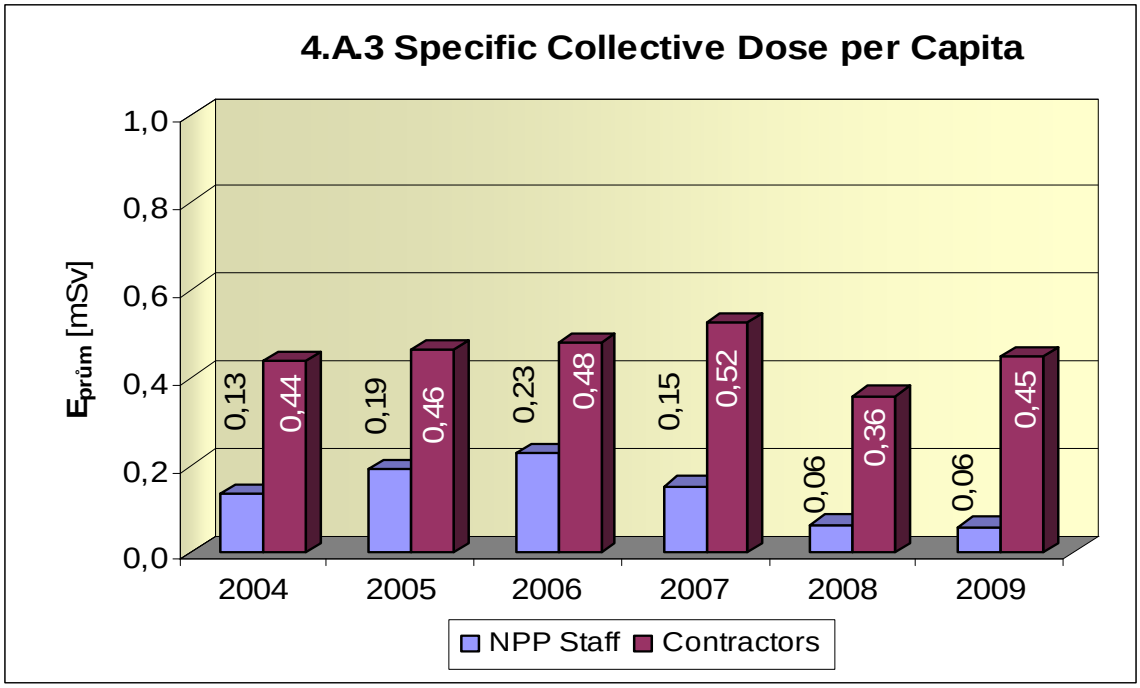
Graph 4.A.1 indicates collective effective dose (CED) received by the staff of NPP (including suppliers and visitors) during monitored period, measured by basic film dosimeters and expressed by mean value per unit.



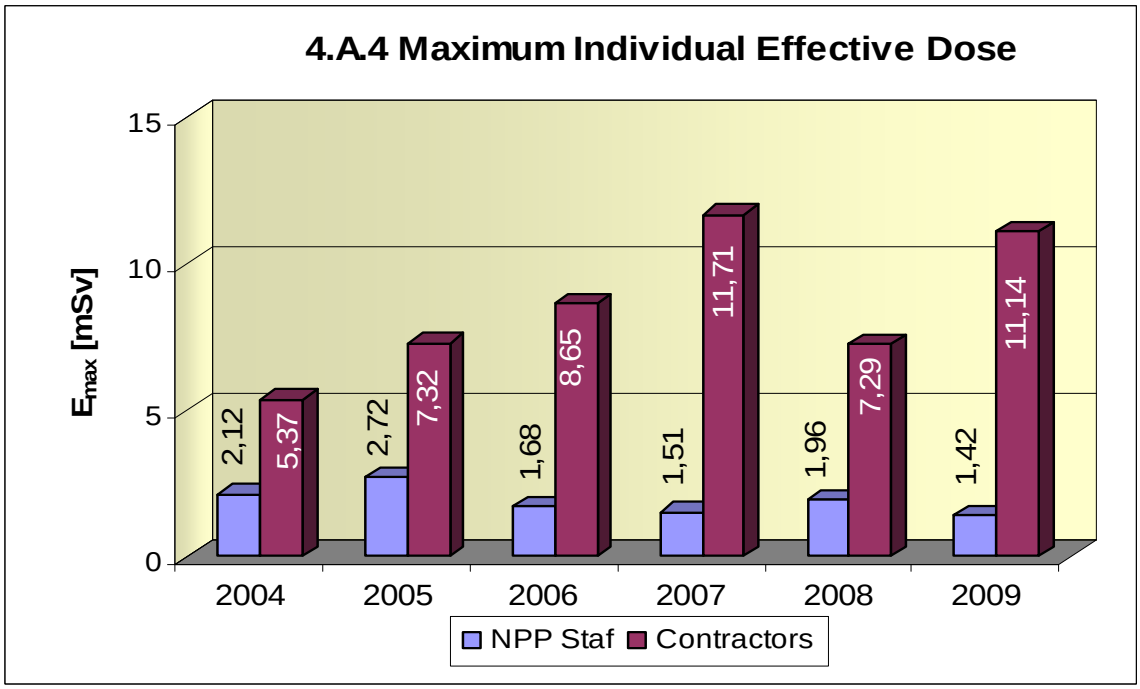
Graph 4.A.2 indicates collective effective dose received by the staff of NPP and suppliers during monitored period, measured by basic film dosimeters.



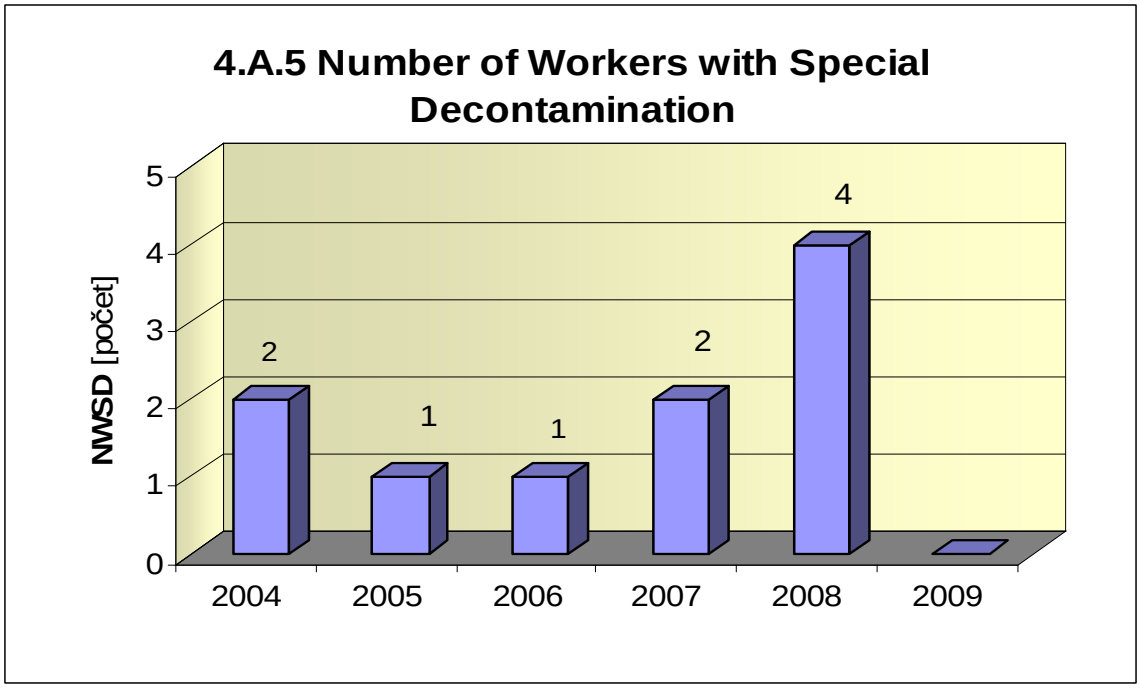
Graph 4.A.3 indicates specific collective effective dose received by the staff of NPP and suppliers during monitored period, measured by basic film dosimeters and express by value per one radiation worker.



Graph 4.A.4 indicates maximum individual effective dose received by one particular employee of NPP and one particular employee of supplier during monitored period, measured by basic film dosimeters.

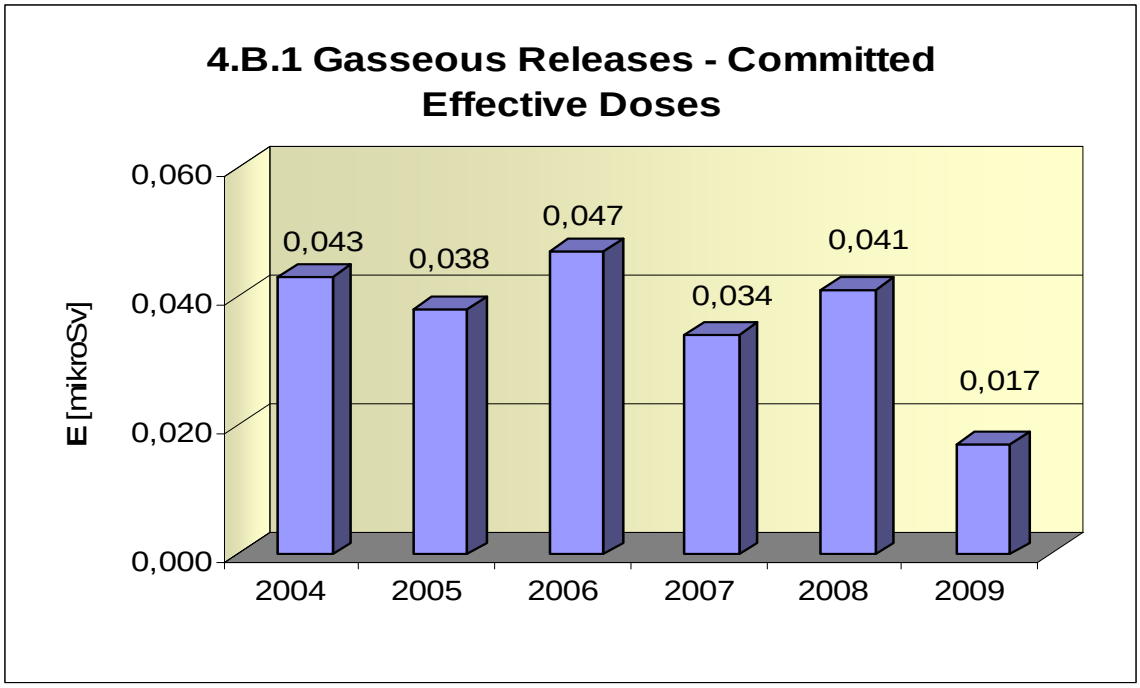


Graph 4.A.5 indicates number of workers (NPP and suppliers) subjected to a special decontamination under medical supervision.

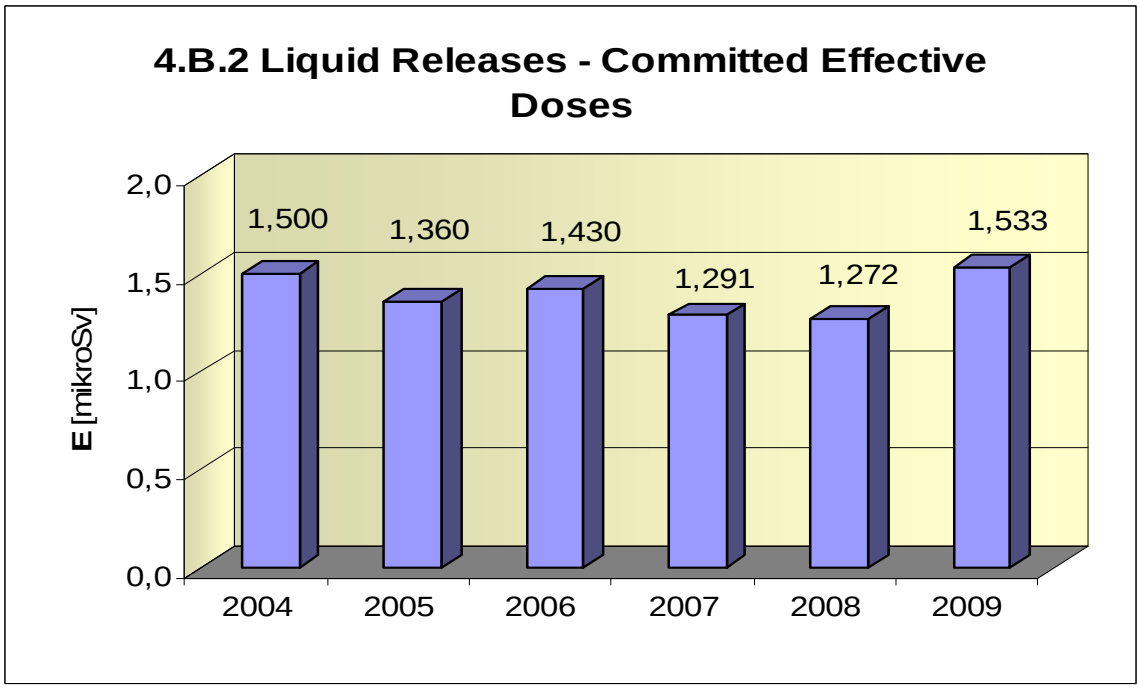


4.B Radioactive Releases

Graph 4.B.1 indicates the committed effective dose for an individual, which arises from radioactive gaseous releases from NPP.



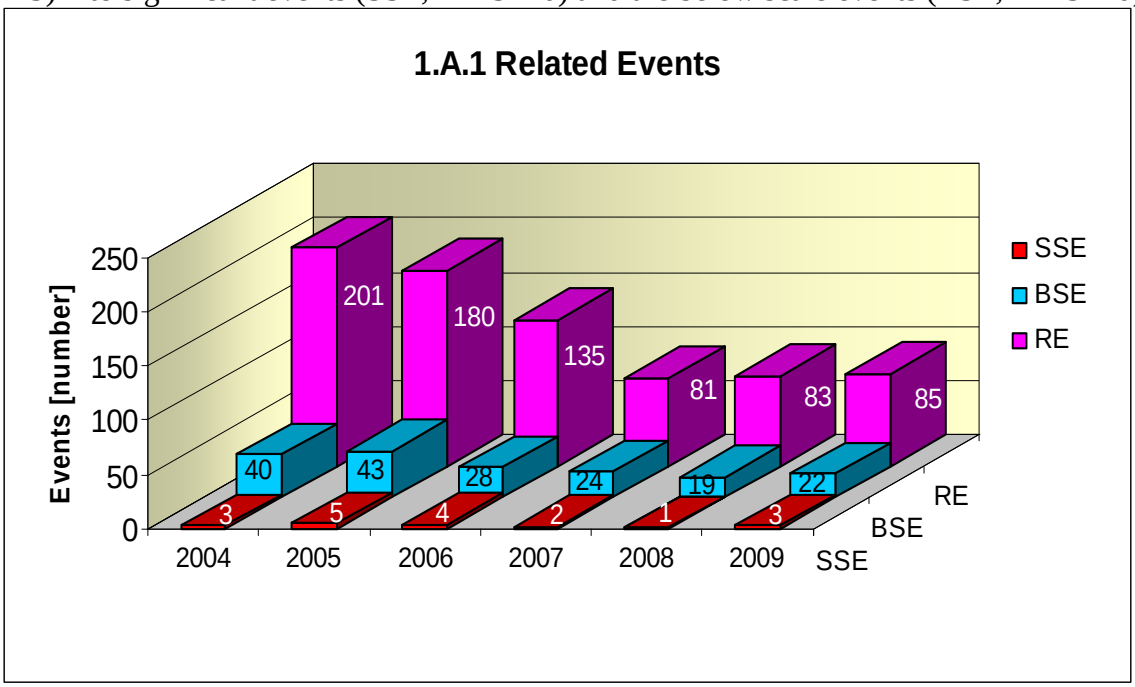
Graph 4.B.2 indicates the committed effective dose for an individual, which arises from radioactive liquid releases from NPP.



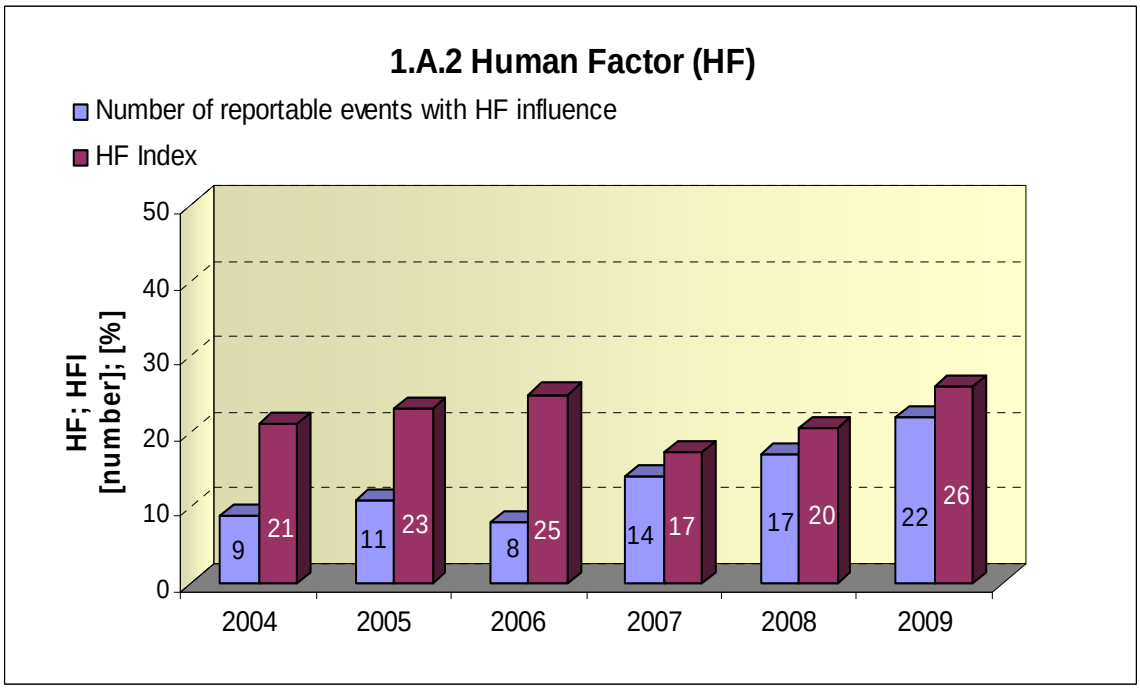
1. Significant Events

1.A Related events

Graph of indicator 1.A.1 monitors the development of the number of related events (RE) including their division according to the evaluation of the International Nuclear Event Scale (INES) into significant events (SSE, INES > 0) and the below scale events (BSE, INES = 0).

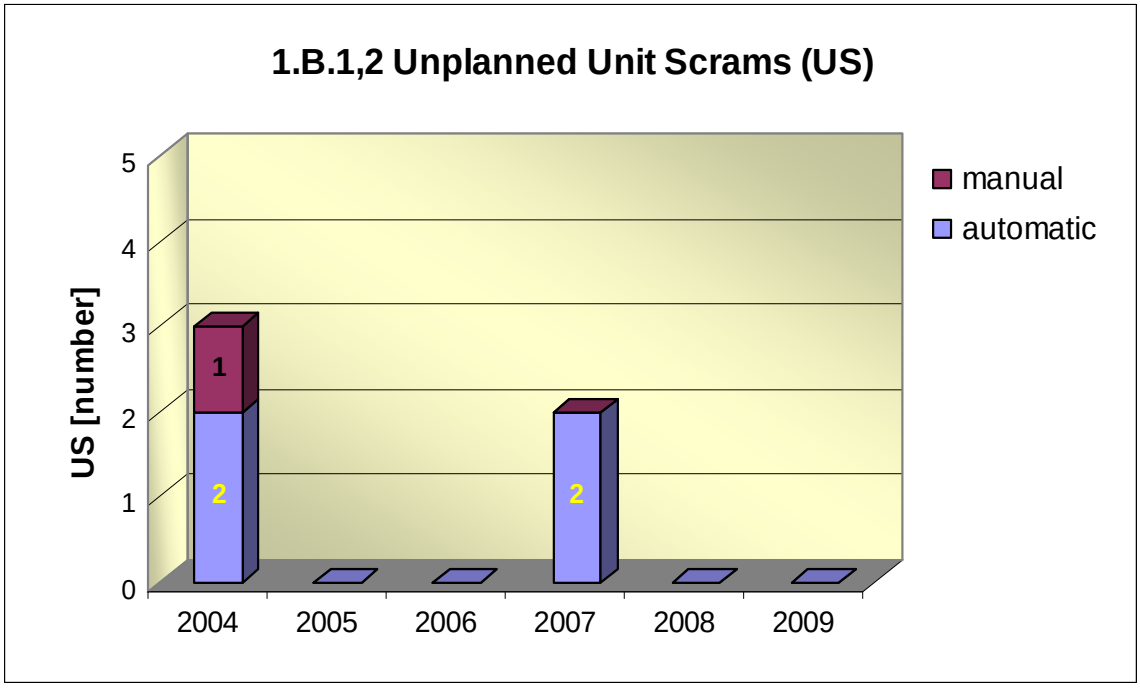


Graph 1.A.2 evaluates the influence of the human factor upon occurrence of safety related events. The indicator is expressed by the number of the safety-related events with an influence of human factor (HF) and its percentage share (HFI).

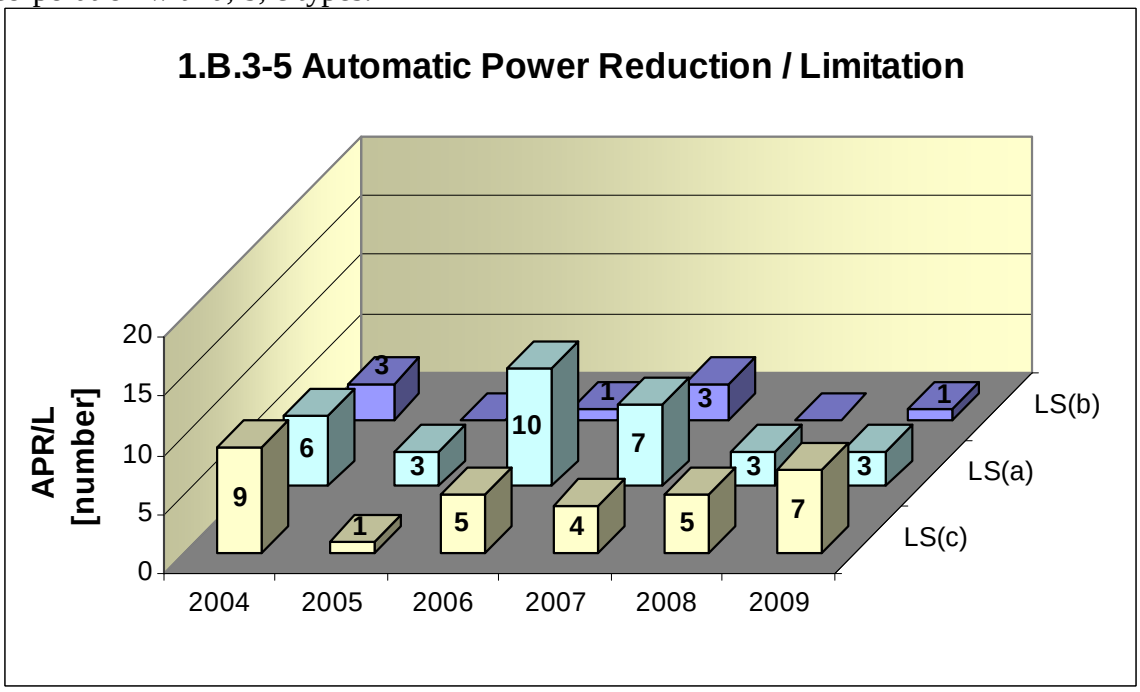


1.B Actuation of the protection and limitation systems

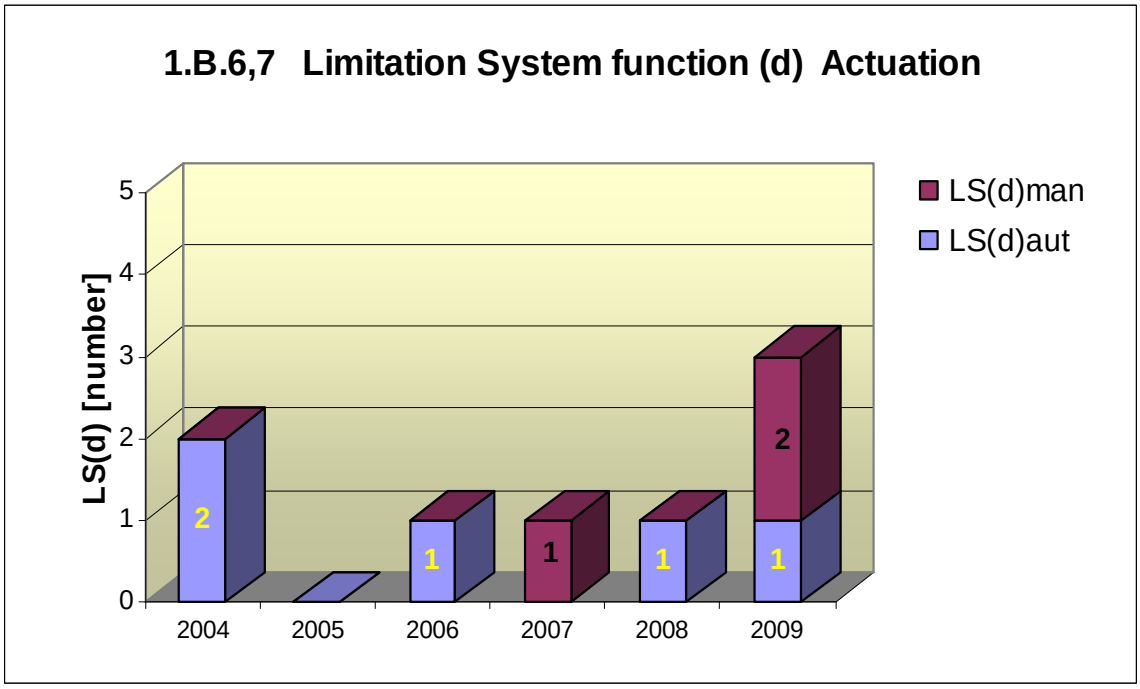
Graph 1.B.1,2 summarises the total number of unplanned unit scrams (US) (reactor in MODE 1 or 2) with resolution of manual and automatic shutdown. The term "unplanned" means that the scram was not an expected part of the planned test.



A common graph of indicators 1.B.3-5 indicates the number of limitation system (LS) incorporation with a, b, c types.

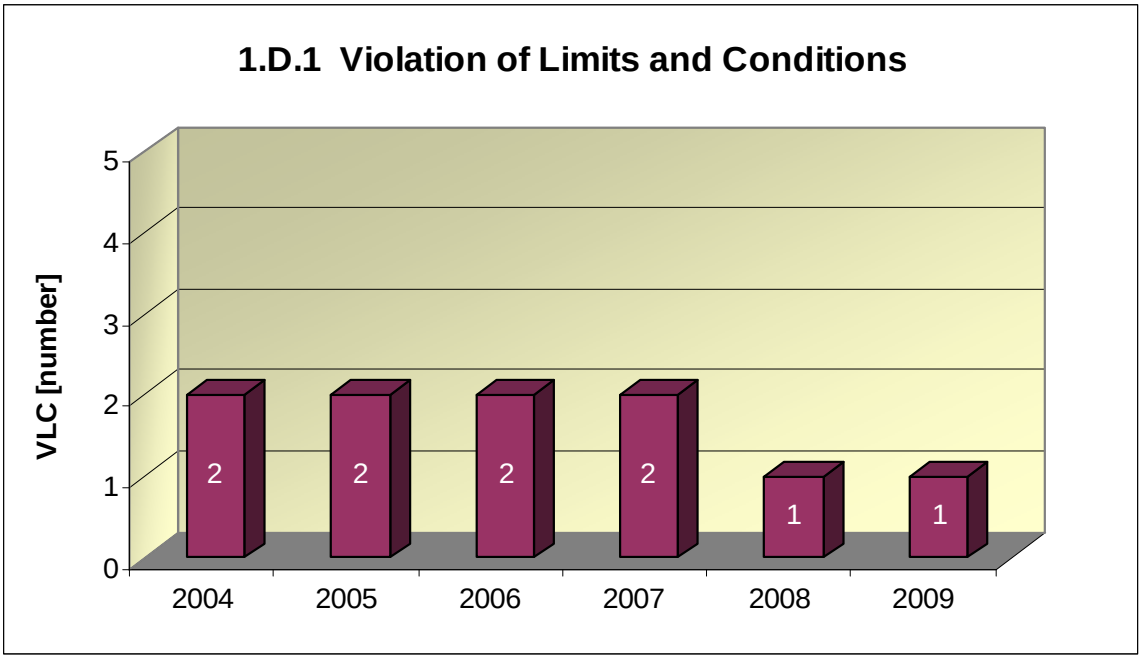


Graph 1.B.6,7 summarises the total number of unplanned reactor scrams with action of the limitation system (LS(d)) (reactor in MODE 1 or 2) with resolution of manual and automatic shutdown. The term "unplanned" means that the scram was not an expected part of the planned test.

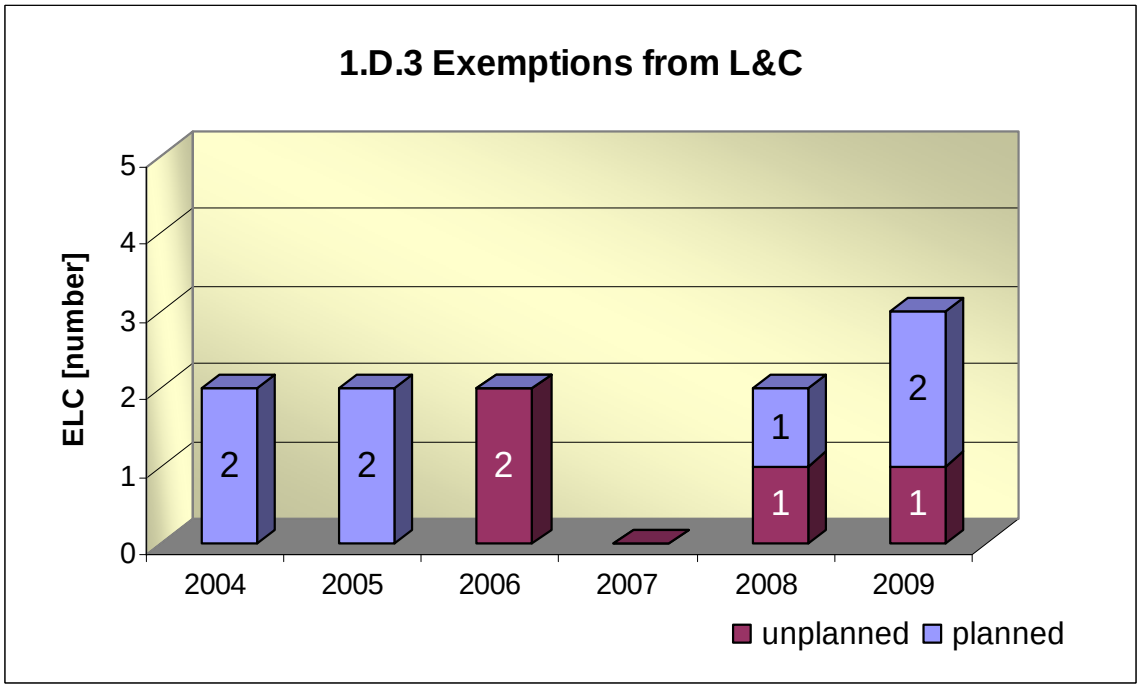


1.D Limits and Conditions

Graph 1.D.1 summarises violations of the Limits and Conditions (VLC) detected by the Regulatory body or reported to the Regulatory body by the licensee.



Graph 1.D.3 summarises the number of planned and unplanned exemptions from the Limits and Conditions (ELC) approved by the Regulatory body including those requiring SUJB approval and however not drawn for various reasons.



2. Safety Systems Performance

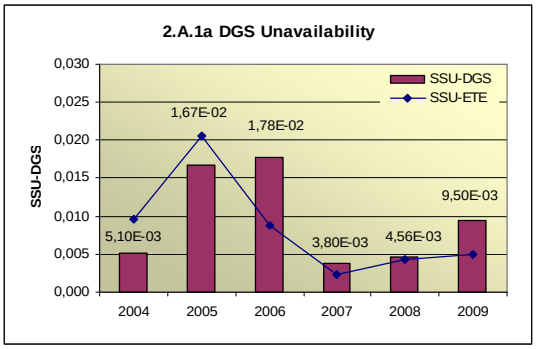
Area 2 monitors and evaluates availability of the following safety systems (BS) in group A:

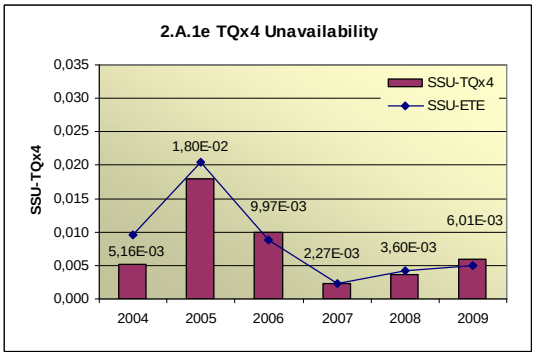
- system diesel generators	**DGS**
- spray system	**TQx1**
- low pressure emergency core cooling system	**TQx2**
- high pressure emergency core cooling system	**TQx3**
- boric acid emergency injection system	**TQx4**
- hydro-accumulators	**HA**
- steam generator emergency feed-water system	**TX**

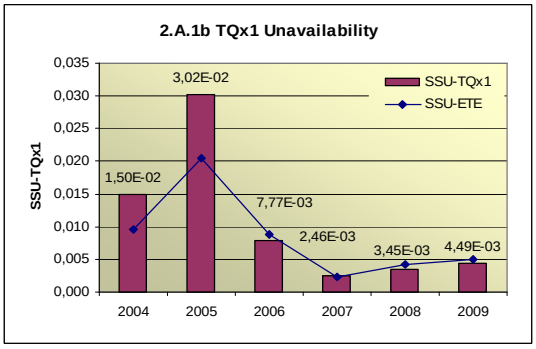
and in group B failure of diesel generator (DG), spray system (TQx1), low pressure emergency core cooling system (TQx2), high pressure emergency core cooling system (TQx3), boric acid emergency injection system (TQx4) in starting and operation.

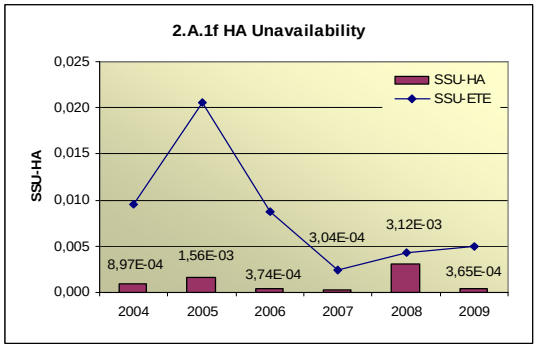
2.A Safety system unavailability

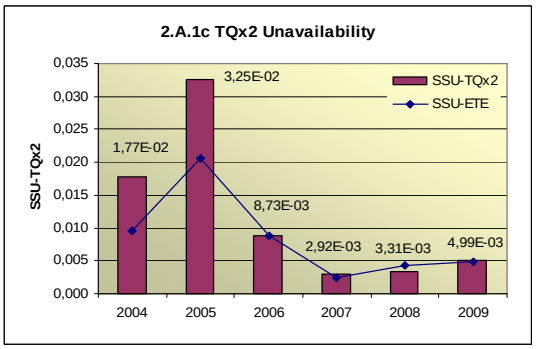
Unavailability of particular safety systems (SSU_S) - graphs 2.A.1.a – g, is defined as the ratio of the total time of unavailability of an evaluated safety system to the total time when its availability was required. In addition, these combined graphs express the ratio of unavailability of respective safety system to the "general" safety system of the site.

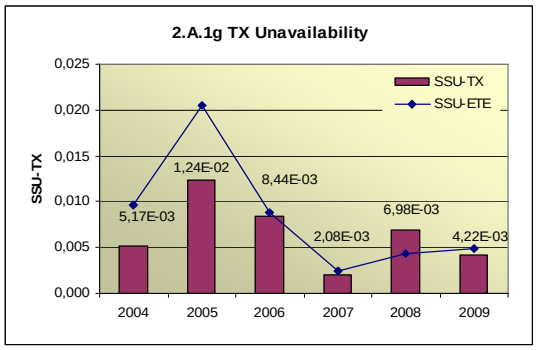


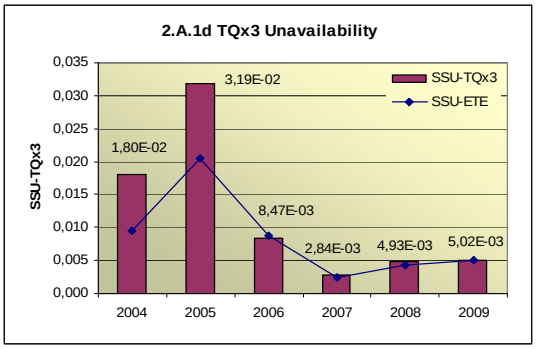






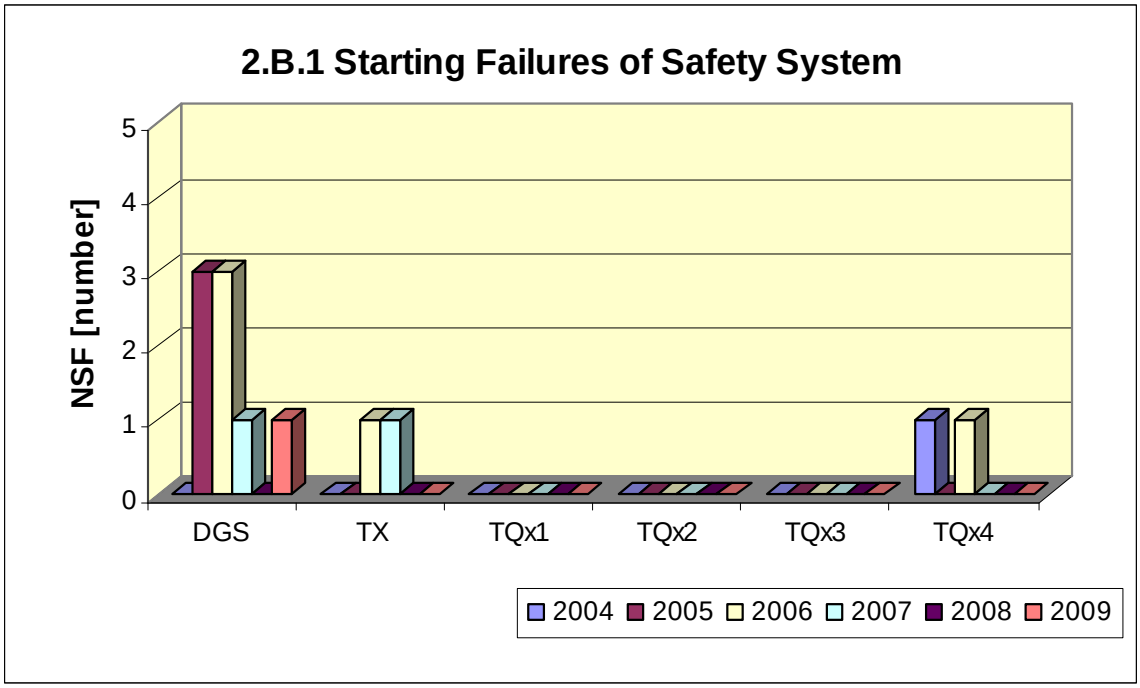




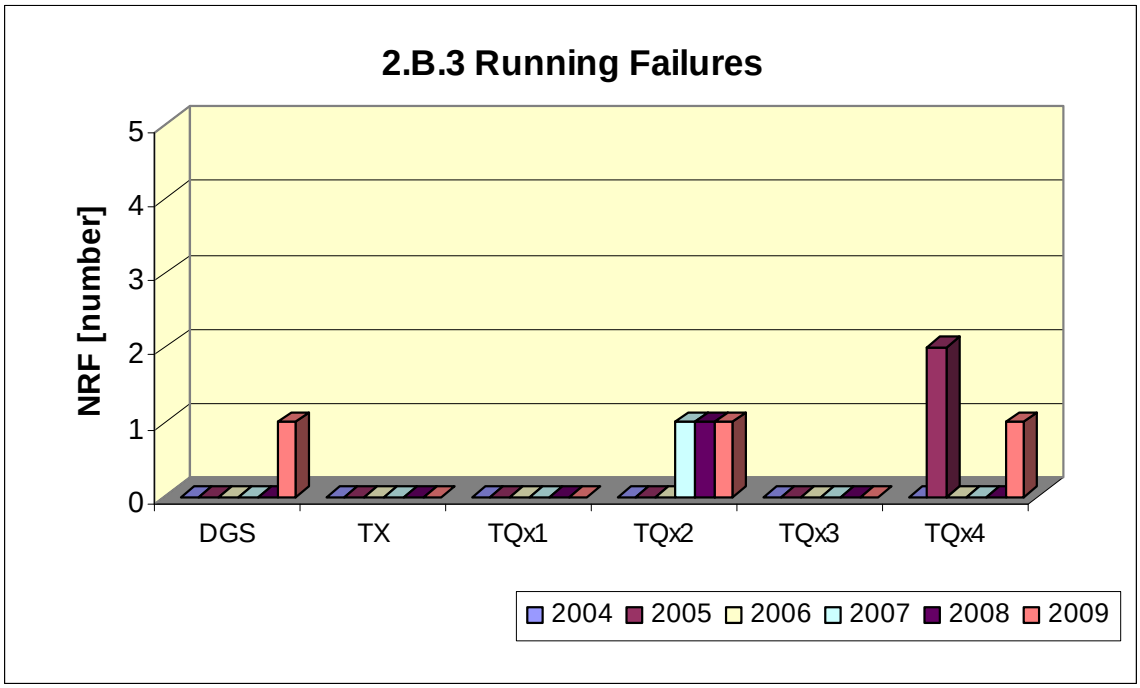


2.B Failure of safety systems

Graph 2.B.1 indicates the number of starting failures of the safety system (NSF), i.e. the state when the respective system, possibly set after the command to start, does not achieve nominal performance characteristic or its failure (shutdown) occurs within 30 minutes after its start.



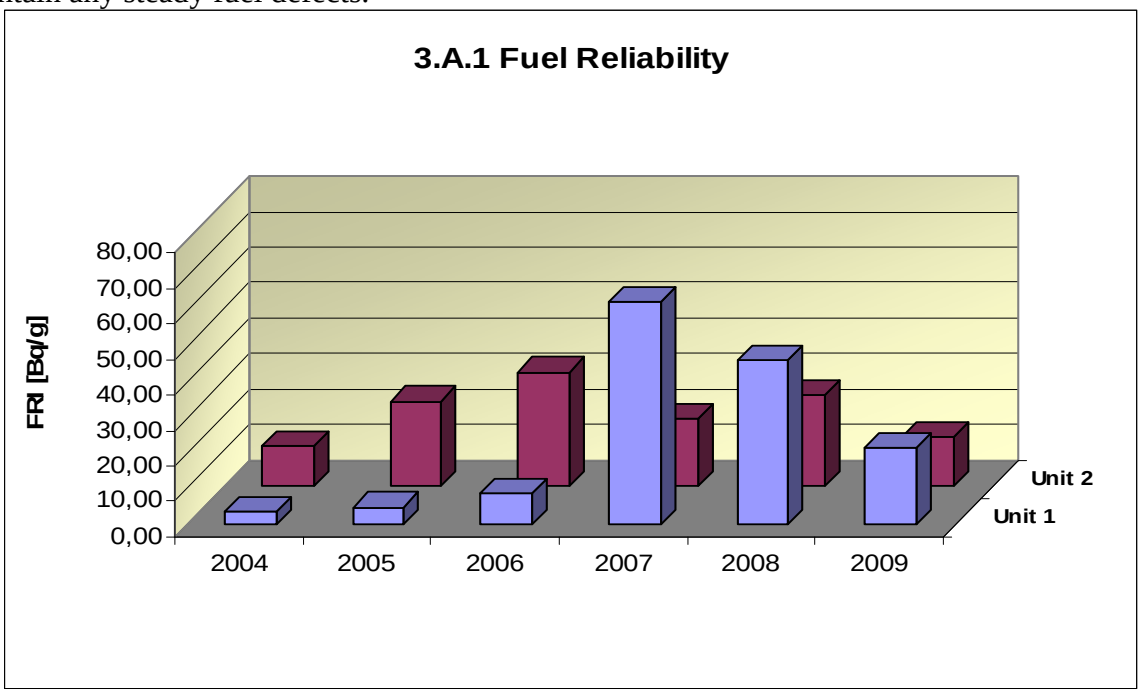
Graph 2.B.3 indicates the number of running failures of safety system (NRF), i.e. the number of states when failure shut down of respective system, drive, possibly set occurs at nominal performance characteristics for the time exceeding 30 minutes since its starting.



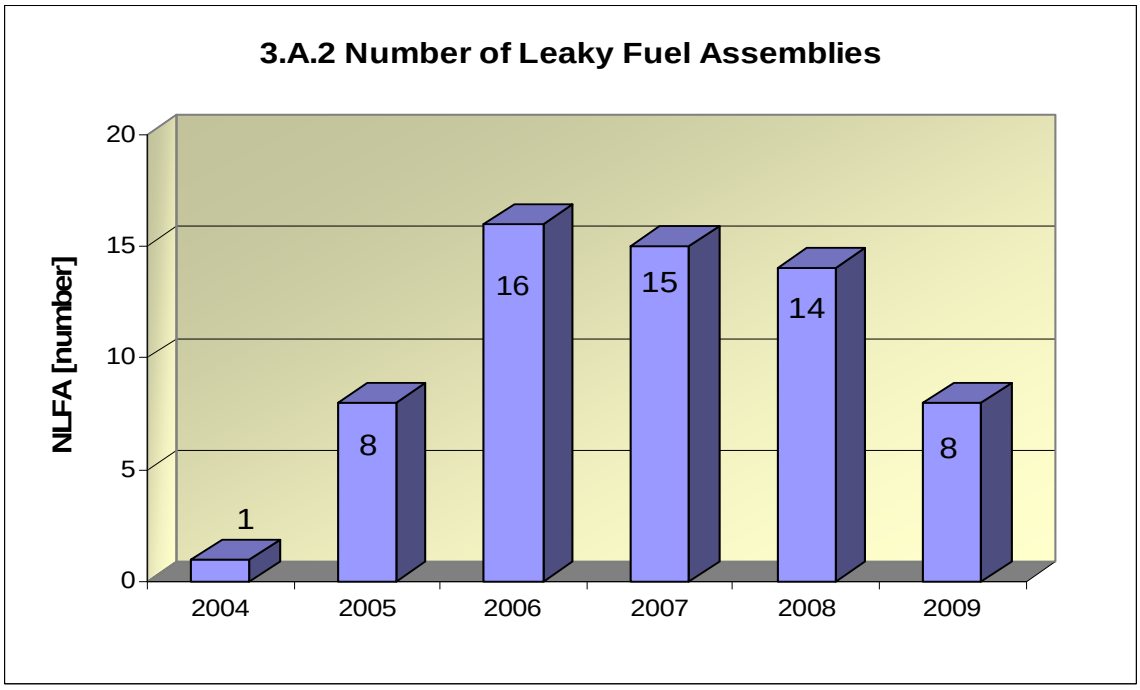
3. Barriers integrity

3.A Nuclear fuel

Graph 3.A.1 monitors fuel reliability of particular units through the values of FRI - Fuel reliability index. The value FRI ≤ 19Bq/g expresses that reactor core most likely does not contain any steady fuel defects.

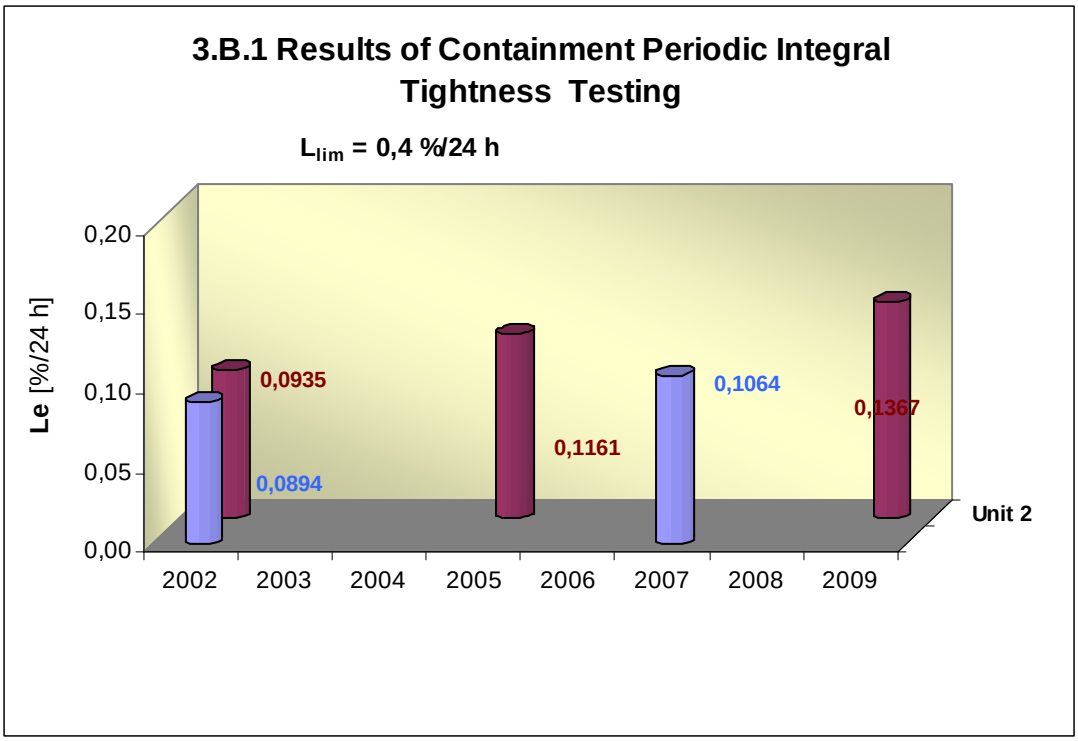


Graph 3.A.2 indicates the number of leaky fuel assemblies (NLFA) that had to be put out of operation due to their inadmissible leakage.



3.B Containment

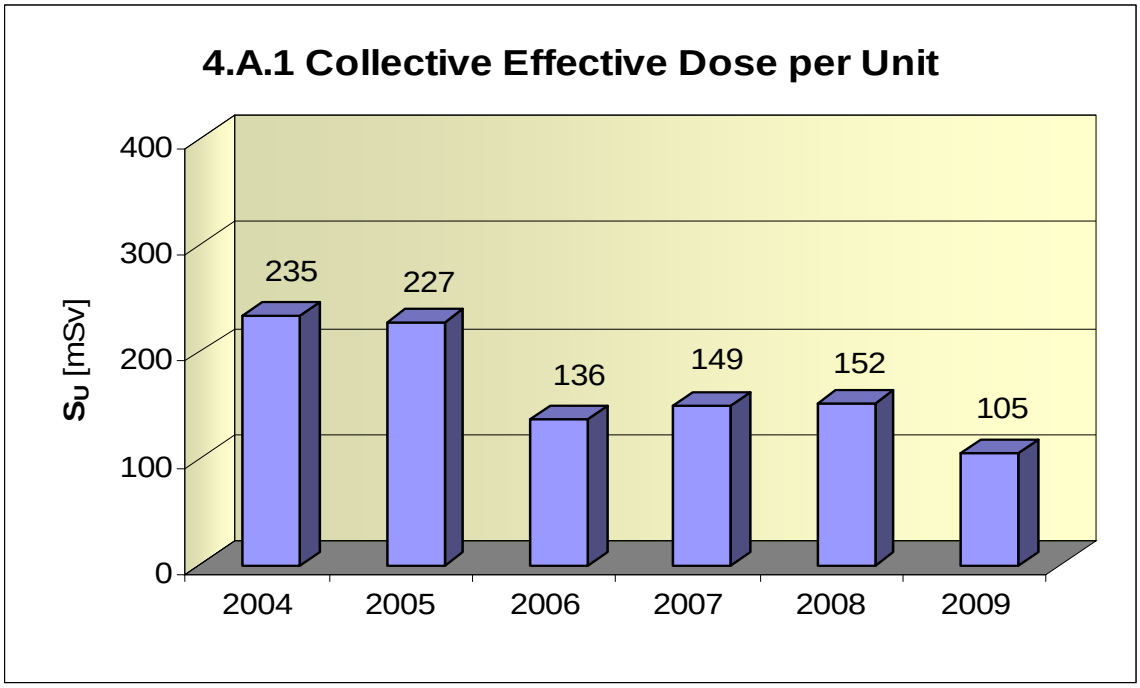
Graph 3.B.1 states the results of Containment periodic integral tightness testing (L_e), i.e. the results of leakage tests of hermetic areas executed by overpressure 400 kPa lasting 24 hours during Containment integrity testing and extrapolated results are stated for Containment integrity repeated testing and Containment integrity periodic testing with lower pressure of 70 kPa and dwell.



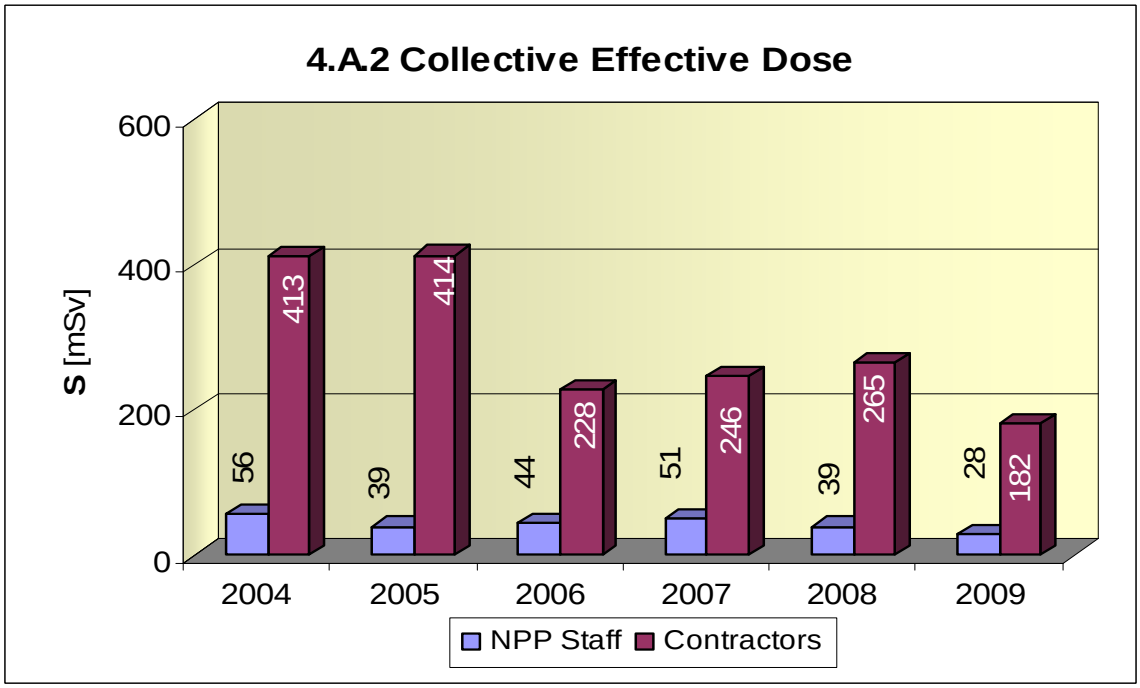
4.Radiation Protection

4.A Staff

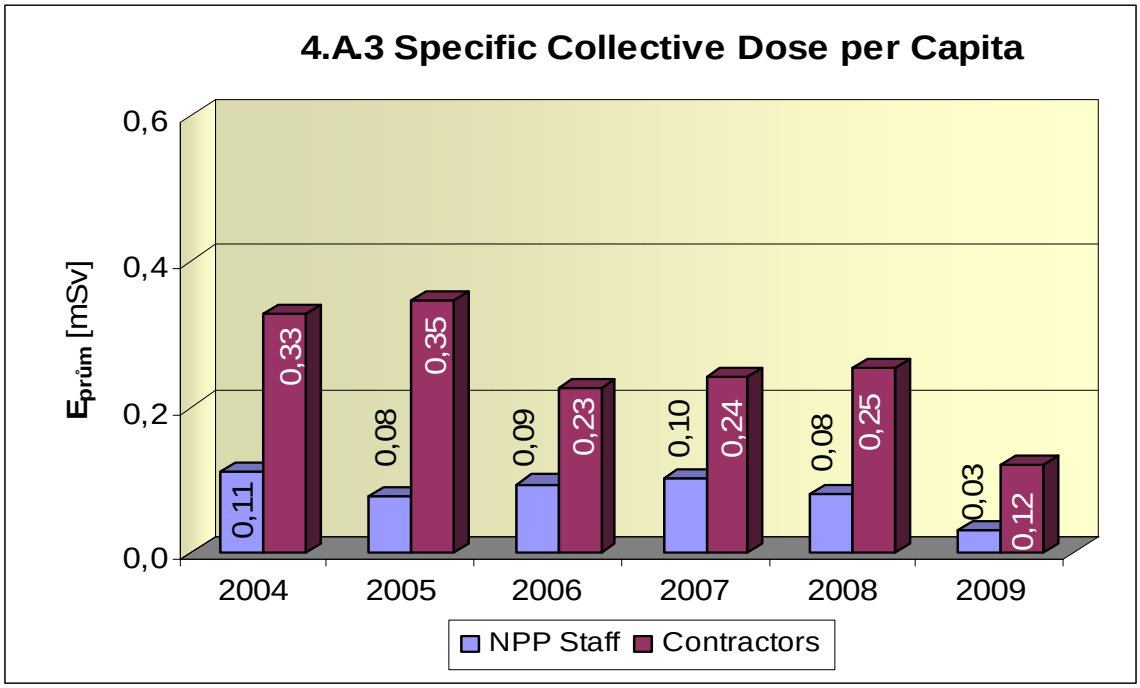
Graph 4.A.1 indicates collective effective dose (CED) received by the staff of NPP (including suppliers and visitors) during monitored period, measured by basic film dosimeters and expressed by mean value per unit.



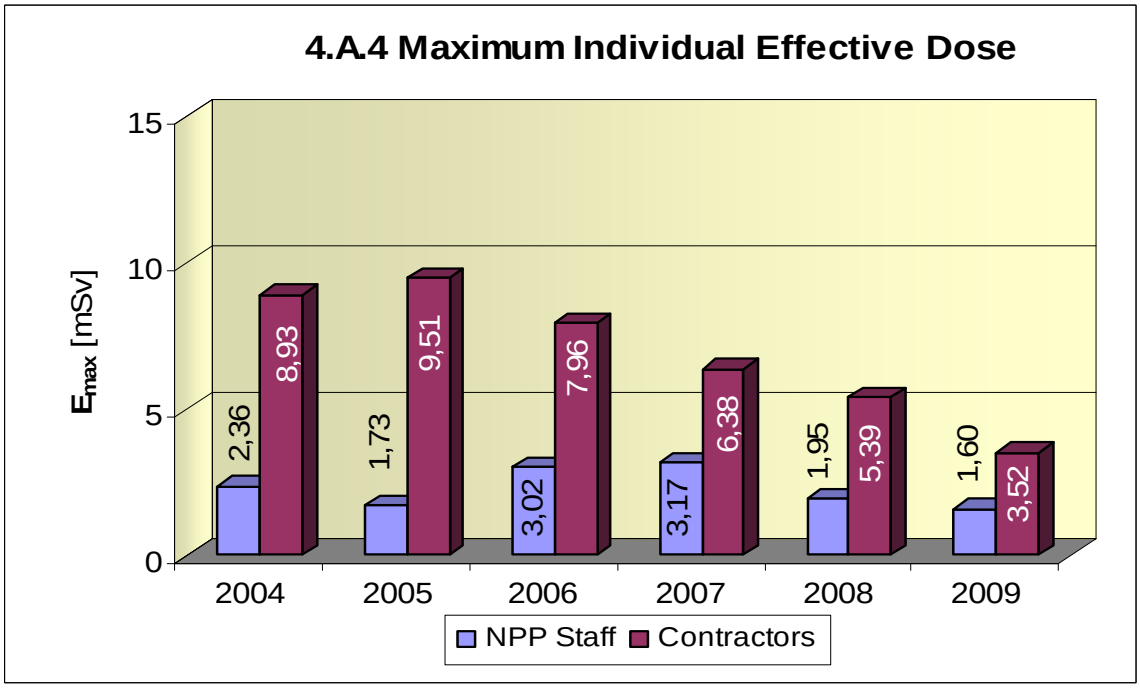
Graph 4.A.2 indicates collective effective dose received by the staff of NPP and suppliers during monitored period, measured by basic film dosimeters.



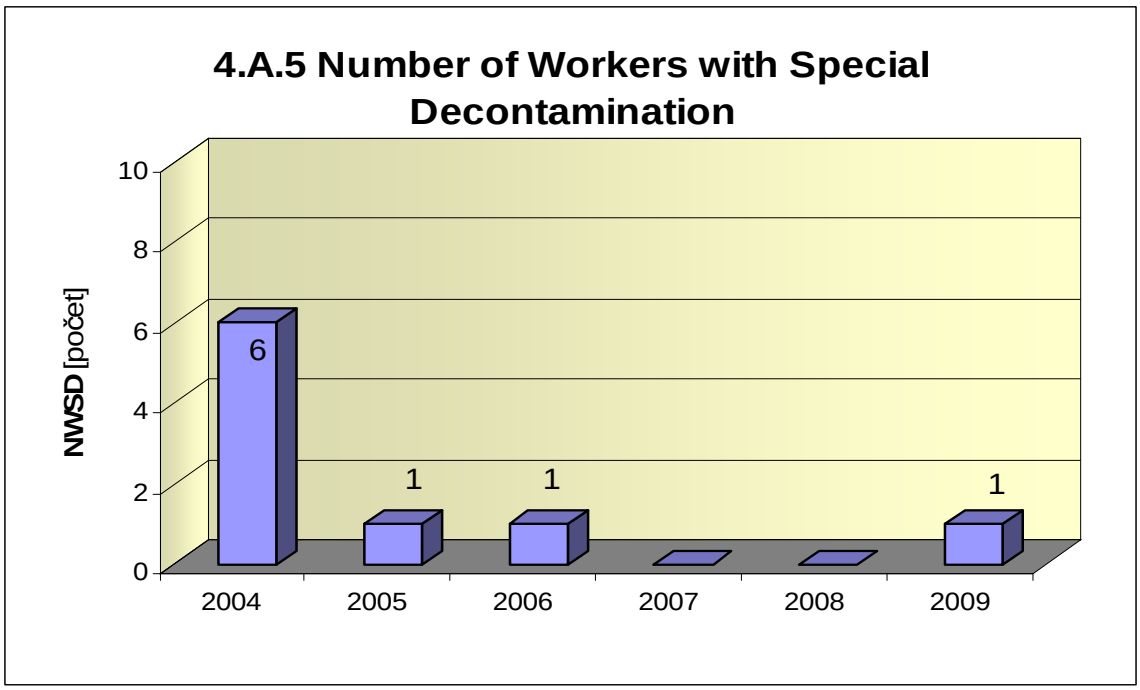
Graph 4.A.3 indicates specific collective effective dose received by the staff of NPP and suppliers during monitored period, measured by basic film dosimeters and express by value per one radiation worker.



Graph 4.A.4 indicates maximum individual effective dose received by one particular employee of NPP and one particular employee of supplier during monitored period, measured by basic film dosimeters.

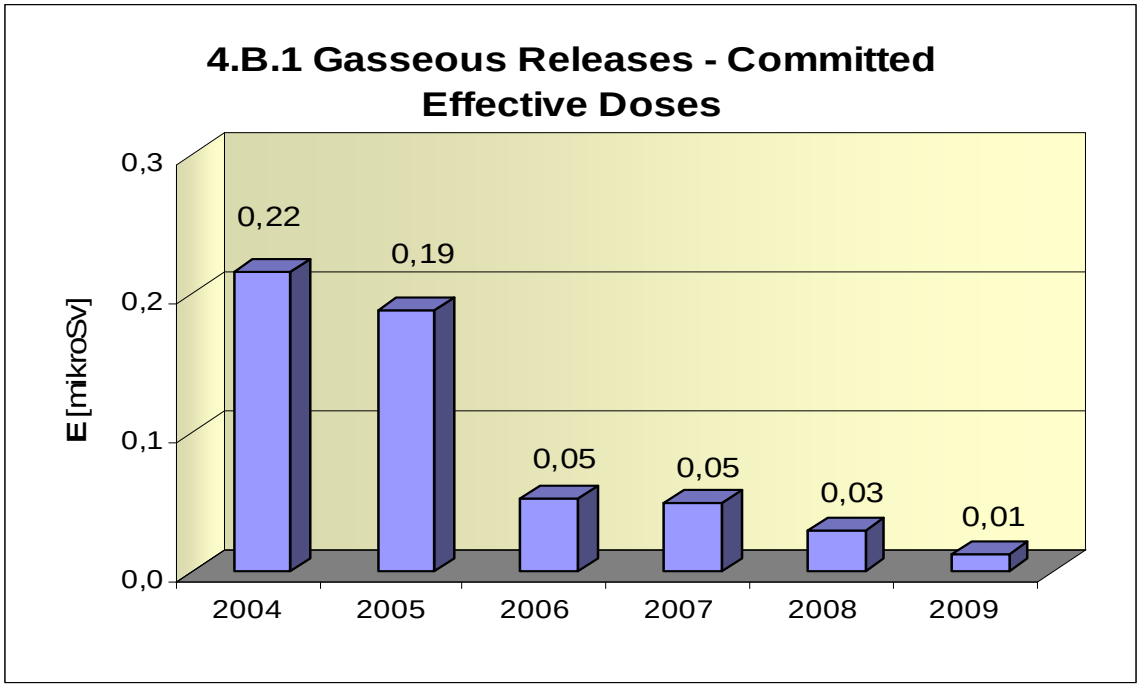


Graph 4.A.5 indicates number of workers (NPP and suppliers) subjected to a special decontamination under medical supervision.



4.B Radioactive Releases

Graph 4.B.1 indicates the committed effective dose for an individual, which arises from radioactive gaseous releases from NPP.



Graph 4.B.2 indicates the committed effective dose for an individual, which arises from radioactive liquid releases from NPP.