

## Safety issues solution status for the NPPs with VVER-440/2130 in the Dukovany NPP

<b>Ident.</b>	<b>Name of the safety findings</b>	<b>Cat.</b>	<b>State</b>	<b>Implement.</b>
<b>G</b>	<b>GENERAL PROBLEMS</b>			
G01	Equipment classification	II	3,4	2001
G02	Equipment qualification	III	3	2001
G03	Class 1 and 2 safety systems reliability analyses	II	4	Implemented
<b>RC</b>	<b>CORE</b>			
RC01	Prevention of uncontrolled H <sub>3</sub> BO <sub>3</sub> dilution	II	2	2002
<b>CI</b>	<b>COMPONENTS INTEGRITY</b>			
CI01	TNR brittle fracture and TNR condition checks	II	4	Implemented
CI02	Non-destructive checks	III	4	Implemented
CI03	Primary piping swing limiters	II	2	2005
CI04	SG primary collector integrity	II	4	Implemented
CI05	SG pipes integrity	II	4	Implemented
CI06	Feedwater inlet piping in the SG	I	4	Implemented
<b>S</b>	<b>SYSTEMS</b>			
S01	Primary circuit protection against cold pressurizing	II	4	Implemented
S02	Measures for the SG primary collector break solution	II	4	Implemented
S03	Main coolant pump packing cooling system	II	3,4	2004
S04	Qualification of PVKO and OVKO for work with water media	II	3,4	2002
S05	SAOZ suction wells blocking risk	III	4	Implemented
S06	SAOZ suction line integrity	II	4	Implemented
S07	SAOZ shower exchanger integrity	II	4	Implemented
S08	RČA in the SAOZ discharge lines	I	4	Implemented
S09	Qualification of PVPG and PSA in the steam lines for work with water media	II	2	2005
S10	PVPG operation on low-pressure steam lines	II	2	2005
S11	Control valves for the SG level control	I	4	Implemented
S12	Regulations for fast super-emergency feed water delivery	I	3	2004
S13	Feedwater piping vulnerability	III	4	Implemented
S14	Main control room ventilation system	II	2	2007
S15	Post-emergency hydrogen recombination system	II	4	Implemented
S16	Primary circuit de-aeration under emergency conditions	II	2,4	2002
S17	Important service water system	II	2	2003
<b>I&amp;C</b>	<b>I&amp;C</b>			
I&C01	I&C reliability	II	2,3	2009
I&C02	Safety systems design	I	2	2007
I&C03	Reactor trip initiation signals check	II	4	Implemented
I&C04	Control rooms design from the human factor viewpoint	II	2	2009
I&C05	Physical and functional separation between the main and emergency control room	II	2	2007
I&C06	Enginery condition monitoring	I	2,4	2003
I&C07	Primary circuit diagnostic system	II	2,3	200463

<b>Ident.</b>	<b>Name of the safety findings</b>	<b>Cat.</b>	<b>State</b>	<b>Implement.</b>
I&C08	Monitoring of releases from reactor cover	II	4	Implemented
I&C09	Equipment for emergency monitoring	II	2	2009
I&C10	Technical support center	II	2	2004
I&C11	Chemical water regime check (PO and SO)	I	3,4	2002
<b>EL</b>	<b><i>ELECTRIC POWER SUPPLY</i></b>			
EL01	Emergency DG starting logic	I	4	Implemented
EL02	Diesel generators reliability	I	2,4	2002
EL03	DG protection signals	I	2	2004
EL04	Power supply system in case of emergency and emergency regulations	II	4	Implemented
EL05	Emergency accumulator batteries discharge time	II	4	Implemented
<b>C</b>	<b><i>CONTAINMENT</i></b>			
C01	Force stress of the pressure relief condenser (max. overpressure) under LOCA conditions	III	3	2002
C02	Thermodynamic behavior of the pressure relief condenser	II	3	2002
C03	Value of releases from the hermetic zone	II	4	Implemented
C04	Maximum pressure difference across the walls of the hermetic boxes rooms	II	4	Implemented
C05	Pressure peak in the containment and occurrence of underpressure after the spraying	I	4	Implemented
<b>IH</b>	<b><i>INTERNAL RISKS</i></b>			
IH01	Fire risk systematic analyses	II	4	Implemented
IH02	Fire prevention	III	3,4	2003
IH03	Detection and fire-extinguishing systems	II	3,4	2004
IH04	Fire consequences mitigation	II	2,4	2007
IH05	Flood systematic analyses	I	3,4	2003
IH06	Flying objects initiated by the turbine	I	1,4	2006
IH07	Internal risk due to VT piping break	III	2	2003
IH08	Falling of heavy objects	I	4	Implemented
<b>EH</b>	<b><i>EXTERNAL RISK</i></b>			
EH01	Seismic design	III	2	2005
EH02	Analyses of specific external natural conditions	I	4	Implemented
EH03	External events caused by man	II	4	Implemented
<b>AA</b>	<b><i>EMERGENCY ANALYSES</i></b>			
AA01	Scope and methodology of emergency analyses	II	3,4	2003
AA02	Securing the quality of NPP data used in the emergency analyses	I	4	Implemented
AA03	Validation of the calculation codes and NPP model	II	4	Implemented
AA04	Availability of the emergency analyses results for the NPP operation support	I	4	Implemented
AA05	Main steam lines break emergency analyses	I	4	Implemented
AA06	Transients leading to undercooling in relation to p-t shocks	II	3	2002

<b>Ident.</b>	<b>Name of the safety findings</b>	<b>Cat.</b>	<b>State</b>	<b>Implement.</b>
AA07	Primary SG collector break analyses	II	4	Implemented
AA08	Accident at low power and in the tripped state	II	4	Implemented
AA09	Severe accidents	I	3	2010
AA10	Probabilistic safety assessment	I	4	Implemented
AA11	Accident with boric acid dilution	I	4	Implemented
AA12	Accident with the drop of spent fuel assemblies	I	4	Implemented
AA13	ATWS	I	4	Implemented
AA14	Total blackout	I	4	Implemented
AA15	Total loss of residual heat removal	I	4	Implemented

### Explanations:

- State:**
- 0** – does not apply
  - 1** – not yet decided
  - 2** – project preparation
  - 3** – project implementation
  - 3, 4** – partially completed
  - 4** - completed

- Category:**
- I** Deviation from recognized international procedures. It is suitable to include them as a part of activities for the solution of safety issues with higher priority.
  - II** Safety relevant. Defense in depth is degraded. An intervention is required to solve the issue.
  - III** Highly safety relevant. Defense in depth is insufficient. Immediate corrective interventions are necessary. Provisional measures may be also necessary.
  - IV** The most relevant safety problem. Defense in depth is unacceptable. Immediate intervention is required. Compensation measures must be defined before the solution of the safety problem. **Safety problem of this category was never identified in VVER 440/213.**

**Year 2000 – Fulfilled in total - EDU 39**

## Safety issues solution status for the NPPs with VVER-1000 in the Temelín NPP

IDENT.	NAME OF THE SAFETY FINDINGS	CATEG.	IMPLEMENT.
<b>G</b>	<b>GENERAL</b>		
G1	Components classification	II	F
G2	Equipment qualification	III	F
G3	Class 1 and 2 safety systems reliability analyses	II	F
<b>RC</b>	<b>CORE</b>		
RC1	Prevention of uncontrolled boron dilution	II	F
RC2	Control rods insertion reliability /fuel assembly deformation	III	F
RC3	Sub-criticality monitoring during the reactor outage	II	F
<b>CI</b>	<b>COMPONENTS INTEGRITY</b>		
CI 1	TNR embrittlement and its monitoring	III	F*
CI 2	Non-destructive checking	III	F*
CI 3	Primary piping swing limiter	II	F
CI 4	Steam generator collector integrity	III	F
CI 5	Steam generator pipes integrity	II	F
CI 6	Steam and feed piping integrity	III	F
<b>S</b>	<b>SYSTEMS</b>		
S1	Primary circuit protection against cold pre-pressurizing	II	F
S2	Steam generator primary collector break mitigation	II	F
S3	Main coolant pump packing system	II	F
S4	Qualification of pressurizer safety and relief valves for water flow	II	F
S5	Emergency core cooling wells grids blocking	III	F
S6	Water reservoir and emergency cooling system intake piping integrity	II	F
S7	Emergency cooling system exchanger integrity	II	F
S8	Power control of the valves in the emergency cooling system intake	I	F
S9	Qualification of safety and relief valves for water flow	III	F*
S10	Operation of steam generator safety valves at low pressure	II	F
S11	Steam generator valves for level control	I	F
S12	Regulations for feed water emergency make-up	I	F
S13	Steam generator emergency feeding by cold water	I	F
S14	Main control room ventilation system	II	F
S15	Hydrogen recombination system	II	F
<b>I&amp;C</b>	<b>INSTRUMENTATION AND CONTROL</b>		
I&C 1	Instrumentation and control system reliability	II	F
I&C 2	Safety system start-up project	I	F
I&C 3	Automatic reactor protection for power distribution and DNB	I	F
I&C 4	Min control room working engineering	II	F

I&C 5	Power distribution monitoring and control in the load follow mode	II	F
I&C 6	Monitoring conditions for mechanical equipment	I	F
I&C 7	Primary circuit diagnostic system	II	F
I&C 8	Monitoring system of releases from reactor vessel cover	III	F
I&C 9	Emergency monitoring instrumentation	II	F
I&C 10	Technical support center	II	F
I&C 11	Chemical regime control and monitoring (primary and secondary circuits)	I	F
<b>EL</b>	<b>ELECTRICAL SYSTEMS</b>		
El 1	External power supply through start-up transformers	I	F
El 2	Diesel generators reliability	I	F
El 3	Diesel generators protection signals	I	F
El 4	Local power supply for failures and emergency control	II	F
El 5	Emergency batteries discharge time	III	F
El 6	DC circuits earthing failure	I	F
<b>CONT</b>	<b>CONTAINMENT</b>		
Cont 1	Containment by-pass	II	F
<b>IH</b>	<b>INTERNAL RISK</b>		
IH 1	Fire risk systematic analysis	II	F
IH 2	Fire prevention	III	F
IH 3	Fire annunciation detection	II	F
IH 4	Fire effects mitigation	II	F
IH 5	Flood systematic analysis	I	F
IH 6	Protection against emergency power distribution panels flooding	II	F
IH 7	Protection against dynamic effects of main steam and feeding piping break	II	F*
IH 8	Polar crane blocking	II	F
<b>EH</b>	<b>EXTERNAL QUALITY (?MAY BE RATHER RISK)</b>		
EH 1	Seismic design	II	F
EH 2	Analysis of plant specific external effects	I	F
EH 3	External events caused by man	II	F
<b>AA</b>	<b>EMERGENCY ANALYSES</b>		
AA 1	Emergency analyses scope and methodology	II	F
AA 2	Securing the quality of NPP data used in the emergency analyses	I	F
AA 3	Calculation programs and plant model validation	I	F
AA 4	Availability of the emergency analyses results for the NPP operation support	I	F
AA 5	Main steam line break emergency analyses	I	F
AA 6	Transients leading to undercooling in relation to pressure-temperature shocks	II	O
AA 7	Steam generator collector break analysis	II	F
AA 8	Accident at low power or outages	II	F
AA 9	Severe accidents	I	F

AA 10	Probabilistic safety evaluation	I	F*
AA 11	Accident with boron dilution	I	F
AA 12	Accidents caused by the drop of spent fuel container	I	F
AA 13	Expected transients without shut-down (ATWS)	II	F
AA 14	Total blackout	II	F
AA 15	Total loss of heat removal	II	F
<b>OP</b>	<b>OPERATION</b>		
OP 01	Regulations for normal operation		F
OP 02	Emergency operational regulations		F
OP 03	Normal operation technical specifications		F
Man 1	Need for safety culture improvement		O, (R)
Man 2	Feedback in operation		F, (R)
Man 3	Quality assurance program		F, (R)
Man 4	Data and documents control		F
PO 01	Regulations application philosophy		F
PO 02	Supervision schedule		O, (R)
PO 03	Communication system		F
RP 01	Radiation protection and monitoring		F, (R)
Tr 01	Training programs		F, (R)
EP 01	Emergency center		F

**Legend:** F - measure finished  
F\* - additional evaluations carried out, or solution amendment  
O - measure under progress  
R - recommended by the OSART mission 2001