# Selected Technical Data of NPPs

1. NUCLEAR POWER PLANT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 | BNPP-1 |
| Reactor type |  | PWR |  |  |
| Number of reactors |  | 1 |  |  |
| Reactor thermal power | MW | 1994 |  |  |
| Gross electrical output | MW | 727 |  |  |
| Net electrical output | MW | 696 |  |  |

1. REACTOR VESSEL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Coolant |  | H2O |  |  |
| Additives |  | H3BO3 |  |  |
| Number of primary loops |  | 2 |  |  |
| Total mass flow | kg/s | 9220 |  |  |
| Pressure | MPa | 15.41 |  |  |
| Total volume | m3 | 197 |  |  |
| Temperature at reactor inlet | °C | 287 |  |  |
| Temperature at reactor outlet | °C | 324 |  |  |

1. REACTOR COOLANT PUMPS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Number of pumps |  | 2 |  |  |
| Pump capacity | m3/s | 6.3 |  |  |
| Design pressure | MPa | 17.13 |  |  |
| Design temperature | °C | 343.3 |  |  |
| Seal water injection | m3/s | 1.82 |  |  |
| Seal water return | m3/s | 0.68 |  |  |
| Cooling water flow | m3/s | 49.97 |  |  |
| Motor power | kW | 5222 |  |  |

5 PRESSURIZER

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Design pressure | MPa | 17.13 |  |  |
| Design temperature | °C | 360.0 |  |  |
| Surge line nozzle diameter | m | 0.35 |  |  |
| Heatup rate of pressurizer using heaters only | °C/h | 30.6 |  |  |
| Volume of liquid at nominal power | m3 |  |  |  |
| Total internal volume | m3 | 28.3 |  |  |

4 STEAM GENERATORS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Number of steam generators |  | 2 |  |  |
| Steam pressure at steam generator outlet | MPa | 6.5 |  |  |
| Design pressure, reactor coolant side | MPa | 17.2 |  |  |
| Design pressure, steam side | MPa | 8.3 |  |  |
| Feedwater temperature at steam generator inlet | °C | 219.4 |  |  |
| Total steam mass flow | kg/s | 1088 |  |  |
| Total volume of collapsed coolant in SG secondary side | m3 |  |  |  |
| Steam generator height | m | 20.7 |  |  |
| Steam generator weight | t | 345 |  |  |
| Number of U-tubes in one steam generator |  | 5428 |  |  |
| Total heat surface | m2 | 7177 |  |  |
| U-tube outside diameter | mm | 19.05 |  |  |
| U-tube Thickness | mm | 1.09 |  |  |

1. NUCLEAR FUEL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Number of fuel assemblies |  | 121 |  |  |
| Number of fuel rods per assembly |  | 235 |  |  |
| Fuel rod array in fuel assembly |  | 16×16 |  |  |
| Fuel rod length | m | 3.658 |  |  |
| Clad thickness | mm | 0.572 |  |  |
| Clad material |  | Zirlo |  |  |
| Total mass of Zr-based material in the core | t |  |  |  |
| Fresh fuel composition |  | UO2 |  |  |
| Pellet diameter | mm | 8.192 |  |  |
| Pellet height | mm | 13.460 |  |  |
| Total mass of nuclear fuel in the core | t | 48.7 |  |  |

1. CONTROL RODS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Number of control rod assemblies |  | 33 |  |  |
| Number of absorber rods per assembly |  | 20 |  |  |
| Total weight of control rod assembly | kg | 53.07 |  |  |
| Neutron absorber |  | Ag-In-Cd |  |  |
| Percentage composition | % | 80-15-5 |  |  |
| Diameter | mm | 8.36 |  |  |
| Density | g/cm3 | 10.16 |  |  |
| Clad thickness | mm | 0.447 |  |  |
| Clad material |  | SS 304 |  |  |

1. EMERGENCY CORE COOLING SYSTEM (ECCS)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| SAFETY INJECTION SYSTEM (SI) | | |  |  |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| Number of pumps |  | 2 |  |  |
| Design pressure (gauge) | MPa | 17.06 |  |  |
| Design temperature | °C | 148 |  |  |
| Design flow rate | m3/h | 159 |  |  |
| RESIDUAL HEAT REMOVAL SYSTEM (RHR) | | |  |  |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| Number of pumps |  | 2 |  |  |
| Design pressure (gauge) | MPa | 4.12 |  |  |
| Design temperature | °C | 204 |  |  |
| Design flow rate | m3/h | 511 |  |  |
| ACCUMULATORS 1st STAGE | | |  |  |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| Number of accumulators |  | 2 |  |  |
| Connection point to RCS |  |  |  |  |
| Relief valve setpoint | MPa | 5.49 |  |  |
| Design temperature | °C | 148 |  |  |
| Normal pressure | MPa | 5.17 |  |  |
| Total volume | m3 | 56.6 |  |  |
| ACCUMULATORS 2nd STAGE | | |  |  |
| Safety class |  | NA |  |  |
| Seismic category |  | NA |  |  |
| Number of accumulators |  | NA |  |  |
| Connection point to RCS |  | NA |  |  |
| Relief valve setpoint | MPa | NA |  |  |
| Design temperature | °C | NA |  |  |
| Normal pressure | MPa | NA |  |  |
| Total volume | m3 | NA |  |  |
| BORON INJECTION TANK | | |  |  |
| Safety class |  | 3 |  |  |
| Seismic category |  | I |  |  |
| Number |  | 1 |  |  |
| Design pressure (gauge) | MPa | 18.83 |  |  |
| Normal pressure (gauge) | MPa | 0.69 |  |  |
| Total volume | m3 | 3.4 |  |  |
| Range of boric acid concentration | ppm | 2550 – 3330 |  |  |
| NORMAL OPERATING STATUS OF ECCS COMPONENTS FOR CORE COOLING | | |  |  |
| Number of SI pumps operable |  | 2 |  |  |
| Number of RH pumps operable |  | 2 |  |  |
| Number of heat exchangers operable |  | 2 |  |  |
| Minimum refueling water storage tank volume | m3 | 1250 |  |  |
| Boron concentration in RWST | ppm | 2550 – 3130 |  |  |
| Boron concentration in accumulators | ppm | 2550 – 3130 |  |  |
| Number of accumulators |  | 2 |  |  |
| Minimum accumulator pressure | MPa | 4.8 |  |  |

1. CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| Seal water supply flow rate for each RCP | m3/h | 1.8 |  |  |
| Seal water return flow rate for each RCP | m3/h | 0.68 |  |  |
| Letdown flow, normal / maximum purification | m3/h | 17 / 27 |  |  |
| Charging flow, normal / maximum purification | m3/h | 14.7 / 25 |  |  |
| Temperature of letdown reactor coolant | °C | 281.9 – 288.1 |  |  |
| Temperature of charging flow to RCS | °C | 270 |  |  |
| Temperature of effluent directed to boron recycle system | °C | 46 |  |  |
| POSITIVE DISPLACEMENT PUMP | | |  |  |
| Number |  | 1 |  |  |
| Design pressure | MPa | 21.38 |  |  |
| Design temperature | °C | 121 |  |  |
| Design flow | m3/h | 7.9 |  |  |
| CENTRIFUGAL CHARGING PUMPS | | |  |  |
| Number |  | 2 |  |  |
| Design pressure | MPa | 21.38 |  |  |
| Design temperature | °C | 121 |  |  |
| Design flow | m3/h | 36.3 |  |  |
| BORIC ACID TRANSFER PUMPS | | |  |  |
| Number |  | 2 |  |  |
| Design pressure | MPa | 1.03 |  |  |
| Design temperature | °C | 121 |  |  |
| Design flow | m3/h | 7.9 / 22.7 |  |  |

1. COMPONENT COOLING SYSTEM (CC)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 3 |  |  |
| Seismic category |  | I |  |  |
| Number of loops |  | 2 |  |  |
| Number of pumps |  | 3 |  |  |
| Pump rated capacity | m3/h | 1828 |  |  |
| Pump design pressure | MPa | 1.38 |  |  |
| Number of heat exchangers |  | 2 |  |  |

1. ESSENTIAL SERVICE WATER SYSTEM (SW)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 3 |  |  |
| Seismic category |  | I |  |  |
| Number of loops |  | 2 |  |  |
| Number of pumps |  | 3 |  |  |
| Pump rated capacity | m3/h | 2880 |  |  |
| Pump design pressure | MPa | 0.59 |  |  |
| Cooling water temperature | °C | 0.6 – 26.7 |  |  |

1. AUXILIARY FEEDWATER SYSTEM (AF)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 3 |  |  |
| Seismic category |  | I |  |  |
| MOTOR DRIVEN PUMPS | | |  |  |
| Number of pumps |  | 2 |  |  |
| Rated capacity | m3/h | 84.1 |  |  |
| Design pressure | MPa | 12.41 |  |  |
| TURBINE DRIVEN PUMP | | |  |  |
| Number of pumps |  | 1 |  |  |
| Rated capacity | m3/h | 191 |  |  |
| Design pressure | MPa | 12.41 |  |  |
| Steam inlet pressure, minimum / maximum | MPa | 0.57 / 6.55 |  |  |

1. CONTAINMENT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Containment type |  |  |  |  |
| Primary containment shape |  |  |  |  |
| Primary containment material |  |  |  |  |
| Primary containment inside diameter | m | 32 |  |  |
| Primary containment thickness |  |  |  |  |
| Primary containment free volume | m3 |  |  |  |
| Primary containment design pressure |  |  |  |  |
| Primary containment test pressure | MPa | 0.357 |  |  |
| Secondary containment shape |  |  |  |  |
| Secondary containment material |  |  |  |  |
| Secondary containment outside diameter | m | 38 |  |  |
| Secondary containment thickness |  |  |  |  |
| Total height | m | 71 |  |  |

1. CONTAINMENT AIR RECIRCULATION AND COOLING SYSTEM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| CONTAINMENT SPRAY SYSTEM (CI) | | |  |  |
| Number of loops |  | 2 |  |  |
| Design pressure (gauge) | MPa | 2.41 |  |  |
| Design temperature | °C | 148 |  |  |
| Design flow rate | m3/h | 270 |  |  |
| Auto actuation on cont. HI-3 pressure signal | MPa | 1.59 |  |  |
| CONTAINMENT RECIRCULATION FANS (RCFC) | | |  |  |
| Number of units |  | 4 |  |  |
| Capacity to remove heat of each unit during normal operation | MW | 0.73 |  |  |
| Capacity to remove heat of each unit during post-LOCA conditions | MW | 17.0 |  |  |

1. COMBUSTIBLE GAS CONTROL IN CONTAINMENT

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 2 |  |  |
| Seismic category |  | I |  |  |
| Number of electric hydrogen recombiners |  | 2 |  |  |
| Processing capacity (per unit) | m3/min | 2.83 |  |  |
| Hydrogen control system (as a backup of recombiners) |  | 2 |  |  |

1. FIRE PROTECTION SYSTEM (FP)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | NNS |  |  |
| Seismic category |  | - |  |  |
| Dedicated FP water tank volume | m3 | 379 |  |  |
| Jockey pump for pressure maintaining | m3/h | 4.54 |  |  |
| Jockey backup pump | m3/h | 432 |  |  |
| Primary FP water supply pump (electric) flow rate | m3/h | 568 |  |  |
| Primary FP water supply pump (electric) discharge pressure | MPa | 0.86 |  |  |
| Primary FP water supply pump (diesel) flow rate | m3/h | 568 |  |  |
| Primary FP water supply pump (diesel) discharge pressure | MPa | 0.86 |  |  |

1. INSTRUMENT AND COMPRESSED AIR SYSTEMS (IA & CA)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | NNS |  |  |
| Seismic category |  | Non |  |  |
| INSTRUMENT AIR SYSTEM | | |  |  |
| Number of loops |  | 2 |  |  |
| Number of compressors |  | 3 × 100% |  |  |
| COMPRESSED AIR SYSTEM | | |  |  |
| Number of loops |  | 1 |  |  |
| Number of compressors |  | 1 |  |  |

1. SPENT FUEL POOL (SFP)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 3 |  |  |
| Seismic category |  | I |  |  |
| Spent fuel pool storage capacity (all) |  | 1694 |  |  |
| Spent fuel pool water volume (free volume) | m3 | 1629 |  |  |
| Nominal boron concentration | ppm | 2000 |  |  |
| STORAGE | | |  |  |
| a. Design case 40% of a core load with 40 yrs. storage from previous refuelings | | |  |  |
| Decay heat production | kW | 3590 |  |  |
| SFP temperature | °C | <51.8 |  |  |
| SFP heatup rate assuming loss of cooling | °C/h | 1.89 |  |  |
| b. Maximum heat load case – 1694 elements stored (full rack plus complete unloading of the core) | | |  |  |
| Decay heat production | kW | 8360 |  |  |
| SFP temperature | °C | 73.5 |  |  |
| SFP heatup rate assuming loss of cooling | °C/h | 4.41 |  |  |
| SPENT FUEL STORAGE RACKS | | |  |  |
| Number of cells |  | 621 |  |  |
| Rack material |  | Austenitic SS |  |  |
| NEW SPENT FUEL STORAGE RACKS | | |  |  |
| Number of cells |  | 1073 |  |  |
| Rack material |  | Borated SS |  |  |
| SPENT FUEL POOL COOLING AND CLEANUP SYSTEM (SFPCCS) | | |  |  |
| Number of SFP pumps |  | 2 |  |  |
| Design pressure | MPa | 1.03 |  |  |
| Design temperature | °C | 93 |  |  |
| Design flow | m3/h | 318 |  |  |
| Number of refueling water purification pump |  | 1 |  |  |
| NEW FUEL STORAGE POOL | | |  |  |
| Number of dry storage for new fuel elements |  | 42 |  |  |
| Rack material |  | Austenitic SS |  |  |

1. ELECTRICAL POWER

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 | BNPP-1 |
| OFFSITE POWER | | |  |  |
| Number of 400 kV transmission circuit terminals |  | 3 |  |  |
| Number of 110 kV transmission circuit terminals |  | 1 |  |  |
| ONSITE POWER - AC | | |  |  |
| Number of independent 1E 6.3 kV buses (powered also by emergency diesel generators) |  | 2 |  |  |
| Number of independent non-1E 6.3 kV buses |  | 2 |  |  |
| ONSITE POWER - DC | | |  |  |
| Number of 1E 125 V DC system |  | 2 |  |  |
| Number of non-1E 220 V DC system |  | 1 |  |  |

1. DIESEL GENERATOR SYSTEM (DG)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Safety class |  | 1E |  |  |
| Seismic category |  | I |  |  |
| Number of diesels |  | 2 |  |  |
| Rated voltage | V | 6300 |  |  |
| Rated power | kW | 3500 |  |  |
| 30 min. short time rating | kW | 4178 |  |  |
| 2000 hour rating | kW | 3893 |  |  |
| Day tank capacity (for each DG) | hours of operation | 4 |  |  |
| Oil storage capacity (for each DG) | days of operation | 7 |  |  |
| Time from SI start to rated speed | s | 10 |  |  |

1. TURBINE GENERATOR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Krsko NPP | Temelin 12 NPP | BNPP-1 |
| Maximum power | MW | 727 |  |  |
| Steam flow rate | kg/s | 1090 |  |  |
| Fresh steam inlet pressure | MPa | 6.2 |  |  |
| Fresh steam temperature | °C | 275.5 |  |  |
| Turbine speed | rad/s rotation/min | 157  1500 |  |  |
| Steam moisture at high-pressure turbine inlet | % | 0.46 |  |  |
| Condenser pressure | kPa | 5.1 |  |  |
| Average condensate temperature | °C | 33.0 |  |  |
| Number of feedwater pumps |  | 3 × 50% |  |  |
| Generator rated power | MVA | 813 |  |  |
| Rated voltage | kV | 21 |  |  |
| Generator rated frequency | Hz | 50 |  |  |

1. PORTABLE EQUIPMENT

PORTABLE EQUIPMENT KRSKO NPP

|  |  |
| --- | --- |
| Item | Krsko NPP |
| Portable generator AE900AGR-001 | 0.4 kV / 5 kW |
| Portable generator AE900AGR-002 | 0.4 kV / 5 kW |
| Portable generator AE900AGR-003 | 0.23 kV / 2.6 kW |
| Portable generator AE900AGR-004 | 0.23 kV / 2.6 kW |
| Portable oil free compressor AE900CPR-001 | 1620 m3/h / 1.03 MPa |
| Portable oil free compressor AE900CPR-002 | 1620 m3/h / 1.03 MPa |
| Mobile diesel generator AE900DSL-001 | 0.4 kV / 600 kVA |
| Mobile diesel generator AE900DSL-002 | 0.4 kV / 1000 kVA |
| Mobile diesel generator AE900DSL-004 | 0.4 kV / 150 kVA |
| Mobile diesel generator AE900DSL-005 | 0.4 kV / 150 kVA |
| Mobile diesel generator AE900DSL-006 | 0.4 kV / 150 kVA |
| Portable fire protection pump AE900PMP-001 | 50 kW / 60 m3/h / 1.5 MPa |
| Portable fire protection pump AE900PMP-002 | 50 kW / 60 m3/h / 1.5 MPa |
| Submersible pump AE900PMP-003 | 2.8 kW / 7 m3/h / 0.2 MPa |
| Submersible pump AE900PMP-004 | 2.8 kW / 7 m3/h / 0.2 MPa |
| Submersible pump AE900PMP-005 | 2.8 kW / 7 m3/h / 0.2 MPa |
| Submersible pump AE900PMP-006 | 2.8 kW / 7 m3/h / 0.2 MPa |
| Trailer with HS60\* HIGH PRESS AE900PMP-008 | 60 m3/h / 0.3 MPa |
| Portable transformer AE900XFR001 | 230/118 V / 3 kVA |
| Portable transformer AE900XFR002 | 230/118 V / 3 kVA |

PORTABLE EQUIPMENT ETE 12

|  |  |
| --- | --- |
| Item | ETE 12 |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

PORTABLE EQUIPMENT BNPP-1

|  |  |
| --- | --- |
| Item | BNPP-1 |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |