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**Technical and commercial proposal (TCP)**

for the activities related to BNPP-1 FSS upgrade (IRI)

Moscow

 2016.

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# Summary

This TCP was elaborated in compliance with the provisions stipulated in the technical part of “The protocol of the meeting related to the FSS software and hardware modification and the BNPP-1 FSS upgrade” among the representatives of the Contractor (ASE JSC) and the Principal (NPPD/BNPP/OCE), which took place in Tehran on 23-24.05.2016.

The following scope of issues related to the BNPP-1 FSS upgrade is considered in the TCP:

- development/revision of the power unit model – prototype - operating in a new FSS software-hardware environment.

- implementation of all the changes performed on the prototype power unit from the latest “freezing” date (31.12.2014) till the date of signing the contract for FSS upgrade

- execution of FSS handover and acceptance tests upon its upgrade.

 Currently the scope and nature of all the changes performed and planned to be performed on the BNPP-1 power unit from the latest “freezing” date (31.12.2014) till the date of signing the contract for FSS upgrade is unknown. Therefore an average volume estimated on the basis of FSS upgrade in russian NPPs and the BNPP-1 FSS upgrade was applied in TCP. In particular, modifications due to introduction of the new generation nuclear fuel on the power unit 1 were not taken into account. Upon preparation of the FSS upgrade contract the cost shall be specified in accordance with actual volume of modifications implemented on a prototype power unit.

It is assumed that computer facilities for FSS hardware upgrade, such as: servers (IRANSIM, IRANVU, IRANASU), IRANIS1, IRANIS2, IRANGATE computers, ULCS workstations: IRANWS1:14, shall be purchased by the Principal at the IRI internal market as per the technical specifications provided by FSS Developer (VNIIAES).

# List of adopted abbreviations and designations

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| **No.** | **Abbreviation** | **Interpretation** |
|  | R.C. | Reactor core |
|  | NPP | Nuclear Power Plant |
|  | MCR/MCB | Main Control Room/ Main Control Board |
|  | FSS at BNPP | Full Scale Simulator at BNPP |
|  | The Principal | BNPP |
|  | The Contractor | ASE JSC  |
|  | FSS developer | VNIIAES JSC |
|  | SPTA | Spare parts, tools and accessories |
|  | VAT | Value added tax |
|  | Neutronic | Neutronic (model, characteristics) |
|  | EMA | A set of equipment, materials and accessories for MCR simulator upgrade |
|  | FSS user | The organization, which performs acceptance and operation of the FSS: TC for the Bushehr NPP. |
|  | DD | Design documentation |
|  | FSS | Full-Scale Simulator |
|  | CW | Commissioning Works |
|  | SW | Software |
|  | AT | acceptance tests |
|  | HSC | Hardware-software complex |
|  | IWS | Instructors’ work place |
|  | TCP | Technical and commercial proposal |
|  | TM | Training materials |
|  | TC | Training Center |
|  | NF | Nuclear fuel |

# Calendar Plan

# for the activities related to BNPP-1 FSS upgrade

| No.Stage | Name of the Works | Deadline | Reporting Document |
| --- | --- | --- | --- |
| 1 | 2 | 3 | 4 |
| **1** | **The stage of pre-design works****Technical Assignment (on RF territory)** | **~1.5 months** | Technical assignment for FSS upgrade (in Russian and in English, in soft and hard copies) |
| 1.1 | Collection and analysis of the input data related to the resource and the current status of the FSS components according to modifications performed at the prototype power unit from the last “freezing” date (31.12.2014) till the date of the FSS upgrade contract signing | ~0.5 monthsD1+0.5 months |  |
| 1.2 | Development, finalization and approval of the Technical Assignment for the FSS upgrade | ~ 1.0 month + D1+1.5 months |  |
| 2 | **Basic Design (on the RF territory)** | **~5.0 months** |  |
| 2.1. | Analysis of the process and design documentation related to the modifications at the prototype plant; development of solutions on modification of the FSS main configuration (SW and HW) | ~0.5 monthsD2+0.5 months |  |
| 2.2 | Correction of the project database according to the input data related to modifications. Legalization, finalization and “freezing” of the input data. | ~0.5 monthsD2+1.0 months | A soft copy of the project database corrected to the agreed scope of upgrade. |
| 2.3 | Development/correction of the design (functional and technical) specifications (FDS) for the FSS upgrade, including SW, the computer complex (servers, ULCS computers, IS etc.) upgrade, MCR simulator equipment, spares | ~2.0 monthsD2+3.0 months | Developed/corrected design specifications of the FSS systems to be upgraded  |
| 2.4 | Preparation, finalization and approval of the FSS upgrade design/program.Submission of design specifications for the software upgrade for purchasing the servers, computers and others at the IRI internal market.  | ~2.0 monthsD2+5.0 months | FDS of the modified systems. FSS Design/Upgrade program |
| **3** | **The stage of purchasing equipment and components:** | **~3.0 months** |  |
| 3.1 | Procurement procedures for supply of a computer complex (servers, ULCS computers, IS etc.) (at IRI internal market) | done by BNPP | BNPP notice to VNIIAES  |
| 3.2 | Procurement and tax-export procedures for supply of MCR simulator components, spare parts, system SW and SW development tools (at the RF internal market) | ~3.0 monthsD3+3.0 months | Consignment note(s) as per the TORG-12 form |
| **4.** | **Detailed Design (on the RF territory)** | **~6.0 months** | Handover certificate(s) for the performed works.Design, electrical, detail design and operation documentation (in Russian and in English, as soft a copy and a hard copy). |
| 4.1 | Development/Correction of the FSS design, detailed design and operation documentation with respect to the modified systems. Preparation and finalization with a foreign Principal of the FSS AT program and procedures upon upgrade | ~2.0 months+ D3+2.0 months |  |
| 4.2 | Development/modification of the application programs for the FSS simulated systems: |  | Software as a soft copy |
| 4.2.1 | - revision of mathematical models for its sustainable operation in a new software-hardware environment  | ~2.0 months+ D3+2.0 months |  |
| 4.2.2 | - implementation of all FSS modifications performed on the prototype power unit from the latest “freezing” date (31.12.2014) till the date of signing the contract for upgrade  | ~1.0 months+ D3+3.0 months |  |
| 4.3 | Integrated tests and FSS adjustment at the Developer’s test bench | ~2.0 months+ D3+5.0 months |  |
| 4.4 | Delivery of developed SW and documentation to the BNPP Site | ~1.0 months+ D3+6.0 months | Consignment note(s) as per the TORG-12 form |
| **5** | **Putting into operation at the BNPP site:** | **~3.5 months**  | Handover certificate(s) for the performed works.FSS handover and acceptance tests certificate after upgrade.Detailed design and operation documentation (in hard and soft copies) corrected as per the results of CW and ATReport on the AT performed |
| 5.1 | Upgrade of the MCR simulator control boards and panels in compliance with the to design and installationdocumentation | ~1.0 months D4+1.0 months |  |
| 5.2 | Installation of the system SW, software tools to the new servers of the FSS computer complex | ~0.5 months D4+0.5 months |  |
| 5.3 | Follow-up of the installed servers’ interface part in compliance with the existing hardware-software environment up to FSS operable state in general | ~0.5 months D4+1.0 months |  |
| 5.4 | Assembly, mechanical inspection, electrical and functional tests of the computer complex (servers, ULCS computers etc.) and FSS hardware | ~0.5 months D4+1.5 months |  |
| 5.5 | Installation and adjustment of the software systems’ models on new servers | ~1 month D4+2.5 months |  |
| 5.6 | Integrated tests and FSS adjustment | ~1 month D4+3.5 months |  |
| **6** | **AT and FSS handover to a foreign Principal** | **~3.0 months** |  |
| 6.1 | Testing  | ~1 month D4+4.5 months |  |
| 6.2 | Elimination of revealed non-conformances | ~0.5 month D4+5.0 months |  |
| 6.3 | Correction of FSS detail design and operationdocumentation upon the results of adjustmentand AT | ~0.5 month D4+5.5 months |  |
| 6.4 | Report preparation and finalization | ~0.5 month D4+6.0 months | Report on the AT performed |
| 6.5 | Signing handover and acceptance documentation | ~0.5 month D4+6.5 months | FSS handover and acceptance tests certificate upon upgrade. |
| **TOTAL for the stages 1-6** | **~22 months** |  |

*Note: D1 - contract signing date; D2 - approval date of the TA for FSS and Software complex concept upgrade; D3 - approval date of the FSS upgrade project/program; D4 - delivery date of a set of EMA, software and documentation to the BNPP site*

**Activities specified in the timetable are planned to be performed within 22 months period. Cost of activities shall be Euro 551 100.**