

NON-INTERCONNECTED ISLANDS SYSTEM & MARKET OPERATOR

Project Implementation of the Athens Central Energy Control Center (ECC) and the Local ECC for the Electrical Power System in Rhodes

TECHNICAL AND FUNCTIONAL REQUIREMENTS

PART H: MAINTENANCE REQUIREMENTS

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List of Acronyms

DTS	Dispatcher's Training Simulator
DW	Data Warehouse
ECC	Energy Control Center
EMS	Energy Management System
HIS	Historical Information System
IT	Information Technology
MIS	Management Information System
MMS	Market Management System
NII	Non-Interconnected Islands
NII SMO	Non-Interconnected Islands System and Market Operator
R&D	Research & Development
RTU	Remote Terminal Unit
TFD	Time Frequency Device

1 Introduction

In this document, the main maintenance requirements of the systems installed in the Central Energy Control Center (ECC) in Athens and the Local ECC in Rhodes are presented.

The Contractor should meet the maintenance requirements throughout the three (3) year maintenance period as well as for the one (1) year warranty period which will commence immediately after the successful completion of the Trial Period.

In Section 2, the maintenance and technical support requirements are presented. Section 3 lists the provisions for the spare parts, and Section 4 lists the availability requirements.

2 Maintenance and Technical Support Requirements

2.1 General

The maintenance requirements are applicable to all **NII IT systems** that are as follows:

- Energy Management System (EMS);
- Market Management System (MMS);
- Corporate Systems:
 - DW/MIS;
 - Helpdesk.

The maintenance requirements consist of the services, tools and spare parts needed to keep up the NII IT Systems functionality, stability and reliability, while meeting the Systems Performance and Availability requirements.

The Contractor, throughout the Warranty and Maintenance Period, is obligated to provide expert engineers, hardware, software, spare parts, and all the other materials or services required to meet maintenance requirements.

The Contractor should warrant the NII IT System's reliability and performance of the system as well as spare part availability throughout the term of the warranty and maintenance period.

The Contractor should warrant the availability of all functions of the above NII IT Systems and solve any problem in hardware, software, configuration in the System within guaranteed time limits that are specified for each one System.

Maintenance consists of:

- Preventive maintenance and operation monitoring;
- Restoration of malfunctions;
- Technical support.

In the following Sections a detailed presentation of the maintenance requirements for each one of the NII IT Systems is provided.

2.2 Preventive Maintenance

Preventive maintenance shall be performed for all NII IT Systems cyclically at least on a yearly basis. In the case the equipment's / hardware's manufacturers suggests the preventive maintenance to be performed at shorter intervals, then preventive maintenance shall be executed periodically according to manufacturer recommendations.

Preventive maintenance works should be scheduled and executed during working hours.

For the preventive maintenance, the Contractor is obligated to organize and assign a specialized and experienced maintenance team with the appropriate equipment that will perform the necessary specialized preventive maintenance works, including cleaning of NII IT systems and running of diagnostic programs for the equipment, devices / hardware, peripherals and any other action necessary to preserve the NII IT Systems in excellent operating condition, reliability, stability and performance.

Any additional action such as, inspection, testing, tuning or intervention necessary to keep Systems operation within “performance limits” and Systems’ reliability consistent with the requirements, shall be scheduled and performed by the Contractor in coordination with the appropriate authorities of the NII SMO. The NII SMO after the Contractor’s related request shall schedule the availability of the above affected NII IT Systems, in order to enable such maintenance to be performed. Extra or more frequent maintenance activities properly justified can be requested by the NII SMO in the context of this contract. These activities will be scheduled and performed by the Contractor as soon as possible and without any additional cost to the NII SMO.

Following completion of each preventive maintenance activity, a “System Preventive Maintenance Report” shall be completed and signed by the Contractor’s authorized engineer. This report shall also be endorsed by the NII SMO responsible engineer and be kept in a NII SMO’s file.

The Contractor is obligated throughout the warranty and maintenance period to monitor the System’s reliable operation, including performance and alarms or events and to proceed with all necessary actions in collaboration with NII SMO, for the restoration of the System’s functionality and operation within the specified “operating limits” defined in the Technical Tender Technical and Functional Requirements, as updated in the Detailed Design Phase of the Project and as actually implemented.

2.3 Malfunctions

2.3.1 System Functions Classification

The functions of the procured NII IT Systems are classified according to their importance to the operation of the system as follows:

- **Crucial** that endanger the Electrical System and NII Market operation;
- **Main** that affect important serious functions of NII IT System but don't endanger or cause data loss of the Electrical System and NII Market operation.
- **Other** functions, that are neither crucial nor main, of lower importance to the operation of the system.

In what follows, the functions are characterized accordingly, for the EMS and the MMS systems. The list is not exhaustive and will be finalized during the Detailed Design Phase of the Project.

2.3.1.1 EMS Functions Classification

The following EMS functions that endanger the operation of the Control Centers are classified as Crucial Functions:

- System Timing;
- Data Concentrator;
- Communication with other control centers, if applicable;
- Graphical User Interface and operator workstations;
- SCADA;
- Generation Control Applications;
- Network Applications that are executed in real time;
- HIS;
- TASE2;
- ALARM (including audio alarms);
- Workstations used for EMS administration and operation.

The following EMS functions that seriously affect but don't endanger the operation of the Control Centers are classified as Main Functions:

- Generation and Network applications in Study mode.

Other EMS functions that don't affect the operation of the Control Centers are as follows:

- DTS;
- EMS Development System.

2.3.1.2 MMS Functions Classification

The following MMS functions that endanger the Market Operation are classified as Crucial functions:

- Common Services:
 - MMS User Interface;
 - Validation System.
- Applications:
 - Master File;
 - Rolling Day-Ahead Scheduling;

- Dispatch Scheduling;
- Cost-based Real-Time Dispatch;
- Real-Time Data Recording and Logging System;
- Load and Generation Forecasting.

The following MMS functions that affect the Market Operation are classified as main functions:

- Common Services:
 - Market Publishing System;
 - Market Reporting System;
 - Market Communications System.

Other MMS functions that don't affect the Market Operation are as follows:

- Market Development System.

2.3.2 Malfunctions Classification

The malfunctions of the NII IT Systems that cause problems to the operation, redundancy and availability functions provided by the respective NII IT Systems are classified according to the importance, the impact to the NII SMO and the urgency to restore the malfunction.

The classification of the malfunctions is as follows:

2.3.2.1 Class A

The malfunctions that cause operational problems or interruptions of a crucial EMS or MMS function are classified as Class A.

Any malfunction that affects the data integrity is classified as Class A.

Class A malfunctions are considered as **critical** malfunctions.

2.3.2.2 Class B

The malfunctions that either cause operational problems or interruptions of a main EMS or MMS function or cause the unavailability of the redundant (backup) crucial EMS or MMS function are classified as Class B.

Any malfunction that may cause data loss is classified as class B malfunction.

It is noted that Class B malfunctions should be restored as soon as they appear, otherwise they may become Class A malfunctions, in case they cause an interruption of the function that was in operation.

Class B malfunctions are also considered as **critical** malfunctions.

Specifically for the Corporate Systems, any malfunctions that cause the total unavailability of any function of the DW/MIS and Helpdesk Systems are classified as Class B malfunctions.

2.3.2.3 Class C

The malfunctions that don't affect the operation and availability of crucial or main EMS or MMS functions, but only cause limitations or unavailability to the functions of lower importance, are classified as Class C.

Class C malfunctions are considered as **non-critical** as **Class C** malfunctions.

Specifically for the Corporate Systems, any malfunctions that causes limitations or partial unavailability of any function of the DW/MIS and Helpdesk Systems are classified as Class C.

2.3.2.4 Class D

This type of malfunctions refers to malfunction of equipment related to Data Concentrators, RTUs, TFDs, the Display Wall, and any other peripheral equipment, which are provided by the Contractor to support the EMS operation.

Class D malfunctions are considered as **critical** malfunctions.

2.4 Procedures Related to Malfunctions Repairs and Contractor's Response

2.4.1 Notification and Process of Malfunctions Restoration

The announcement of malfunctions should be executed as follows:

- All malfunctions should be notified to the Contractor's call center with a short description including the time the malfunction appeared and the respective classification of the malfunction if possible.
- All types of malfunctions shall be enunciated to the same call center (telephone numbers, web site and e-mail addresses).
- For urgent and serious malfunctions, notification should be communicated directly to Contractor's expert's team. In such case Contractor's expert who receives the notification is obligated to report the malfunction to the call center with the respective malfunction details.
- The time of malfunction notification and the relevant time of restoration activities should be recorded as they constitute the basis for calculating penalty clauses.

2.4.2 Call Center

The Contractor, during the warranty and maintenance period, shall maintain a malfunction reporting call center with appropriate infrastructure for receiving trouble

tickets via telephone, electronic correspondence and fax, 24 hours a day, 7 days a week (24/7/365).

The Contractor shall respond to each notification by recording the malfunction, issuing a Trouble Ticket with time stamp, and forwarding the malfunction issue to appropriate authorized experts for starting the restoration activities.

2.4.3 Contractor's Experts Team

The Contractor should organize an expert team with responsibility and ready to provide technical support of all NII IT Systems and their respective applications. The Contractor's engineers should go to the NII IT site or intervene appropriately to start the malfunction restoration process as expeditiously as possible. The experts in this team should cover all area of expertise needed for the maintenance and restoration of malfunction of the NII IT Systems during the whole warranty and maintenance period.

The list of the Contractor expert team members with respective expertise should be submitted to the NII for approval.

2.4.4 Monitor of Contractor's Activities

The Contractor should monitor, record, and publish all activities with their respective time stamp of the malfunction restoration process.

Troubleshooting process publication

The Contractor is expected to provide access to the NII SMO to all information related to a malfunction. Specifically, the provided information shall contain an analytical list of all trouble tickets, tagged with unique ticket number, time and date of issuing, classification, the name of the person who reported the malfunction and the name of the person who received the call, Date & Time of malfunction restoration, and a brief description of the malfunction and spare parts used. Moreover, summary lists of all malfunctions per system, class, duration as well as historical information and statistical data should be provided.

2.4.5 Contractor's Response

The Contractor's response to malfunctions of NII IT Systems should be as follows:

- The Contractor should restore the operation and availability of the affected crucial and main functions of the NII IT Systems by repairing, replacing any hardware, or software or service that caused the disoperation or unavailability of the function.
- For the restoration of malfunction the Contractor should start and finalize the restoration within certain predefined time periods, depending upon the severity of the malfunction to the NII IT System that is affected from the announcement of the malfunction.

- In case the predefined time is exceeded, then the Contractor shall be subject to a penalty clause for delay to restore the malfunction. It is noted that the delays to restoration of the malfunction are also counted to the respective system availability and additional penalties may be applied for decreased availability.
- The Contractor is obligated to keep informed the NII SMO for the actions and time estimation of the restoration of the malfunction.
- This information should be communicated to the monitoring and publication system of the Contractor and should be accessible by NII SMO staff.
- At completion of the restoration of the operation a “System Operation Restoration Report” shall be completed and signed by the Contractor’s authorized engineer. This report shall also be signed by NII SMO’s responsible engineer and be kept in NII SMO’s files.

The Contractor response time to malfunctions and respective timeframes for restoration should be implemented for each NII IT System as follows:

2.4.5.1 Class A Malfunctions

In case of critical class A malfunctions, the Contractor shall be notified by NII SMO’s staff at any time of the day, throughout the week, and at any day of the year (24x7x365).

In case the failures occurred in the Central Energy Control Center (ECC) in Athens, the Contractor’s staff shall begin (either through remote access or physical presence on site) the repair works within two (2) hours from the time of notification.

If the failures occurred at the Local ECC of Rhodes, then the Contractor’s staff shall begin remotely repair works within two (2) hours, and in case that physical presence is needed at the site, then the Contractor shall begin repair works within six (6) hours from the time of notification.

The operation should be restored within four (4) hours from the time of start of repair by the Contractor’s staff.

In case the total restoration time (i.e., six (6) hours for the Central ECC or the Local ECC for remote restoration, and ten (10) hours for the Local ECC with physical presence from the time of notification) is exceeded, then the Contractor shall be subject to penalties for delayed restoration.

In case that there are no available means of transport to the Local ECC in order to meet the above deadlines, the time by which the on-site repair works should have started may be extended, but should not be later than the first available flight after the six (6) hours from the time of notification. The extension shall also apply to the total restoration time.

2.4.5.2 Class B Malfunctions

In case of critical class B malfunctions, the Contractor shall be notified by NII SMO's staff at any time of the day, throughout the week, and any day of the year (24x7x365).

In case the failures occurred in the Central ECC in Athens, the Contractor's staff shall begin (either through remote access or physical presence on site) the repair works within eight (8) hours from the time of notification.

If the failures occurred at the Local ECC of Rhodes, then the Contractor's staff shall begin remotely repair works within eight (8) hours, and in case that physical presence is needed at the site, then the Contractor shall begin repair works within twelve (12) hours from the time of notification.

The operation should be restored within four (4) hours from the time of start of repair by the Contractor's staff.

In case the total restoration time (i.e., twelve (12) hours for the Central ECC or the Local ECC for remote restoration, and sixteen (16) hours for the Local ECC with physical presence from the time of notification) is exceeded, then the Contractor shall be subject to penalties for delayed restoration.

In case that there are no available means of transport to the Local ECC in order to meet the above deadlines, the time by which the on-site repair works should have started may be extended, but should not be later than the first available flight after the twelve (12) hours from the time of notification. The extension shall also apply to the total restoration time.

2.4.5.3 Class C Malfunctions

In case that the occurred malfunction is not critical, the Contractor shall be notified by the NII SMO's staff during working hours. The Contractor's staff shall arrive at the affected site and shall begin repair works on the next calendar day and the restoration of the malfunction should be finished by the end of the next working day from the date of notification.

2.4.5.4 Class D Malfunctions

In case of class D malfunctions, the Contractor shall be notified by NII SMO's staff at any time of the day, throughout the week, and any day of the year (24x7x365).

In case the failures occurred in the Central ECC in Athens, the Contractor's staff shall begin (either through remote access or physical presence on site) the repair works within four (4) hours from the time of notification.

If the failures occurred at the Local ECC of Rhodes, then the Contractor's staff shall begin remotely repair works within four (4) hours, and in case that physical presence is needed at the site, then the Contractor shall begin repair works within twelve (12) hours from the time of notification.

The operation should be restored within four (4) hours from the time of start of repair by the Contractor's staff.

In case the total restoration time (i.e., eight (8) hours for the Central ECC or the Local ECC for remote restoration, and sixteen (16) hours for the Local ECC with physical presence from the time of notification) is exceeded, then the Contractor shall be subject to penalties for delayed restoration.

In case that there are no available means of transport to the Local ECC in order to meet the above deadlines, the time by which the on-site repair works should have started may be extended, but should not be later than the first available flight after the twelve (12) hours from the time of notification. The extension shall also apply to the total restoration time.

2.5 Contractor Remote Access to NII IT Systems

The Contractor shall organize a system, at his own expense, for the remote monitoring, diagnosis and restoration of malfunctions in the NII IT System operation, whenever this is possible, for the purposes of reducing response time and considering all safety measures, which must be approved by NII SMO, in order to protect the system and its information.

Provided that the restoration of the malfunction at the ECCs (Central and Local) is made by the Contractor through "remote access", the presence of the Contractor's staff at the NII SMO's sites shall not be necessary while the restoration time should be calculated according to the Class of malfunctions defined in this Tender document.

2.6 Technical Support

The Contractor should provide specialized and experienced engineers (one or more), dedicated to the NII IT Systems, at the SMO's facilities in Athens and Rhodes, who will cover the entire range of the project scope of the NII IT Systems expertise, and should be able to move to any NII SMO sites affected within the scope of this project, whenever and for as long as it is necessary.

These Contractor engineers shall be present on the NII SMO site during working hours for monitoring, system tuning and available during non-working hours for immediate intervention whenever or wherever this will be required according to the provisions of the maintenance contract. In particular, the Contractor engineers shall be present during working hours in the Central ECC in Athens, and the Local ECC of Rhodes, for the entire period of on-site technical support and assistance, as this is foreseen in Part F "Project Execution" of the Technical Tender. In case the Contractor's Engineers do not fulfill their duties, NII SMO may demand their replacement and the Contractor is required to replace them within a period of two (2) months. In the case of particular personnel absence for several consecutive days,

the Contractor is obligated, at his own expense, to substitute this staff with equivalent during the entire period of its absence.

The Contractor is required to organize a team made up of specialized and experienced staff responsible for the technical support of all NII IT System applications. This team shall be assembled by both Contractor's and Manufacturer's experts, including also experts from the manufacturer's R&D departments relevant to the NII IT Systems. The Contractor shall communicate the names, expertise, addresses, e-mails, telephone and fax numbers as well as any other information necessary for NII SMO to communicate with these experts when necessary. The organization of this team must be suitable to support fast updating, mobilization and action coordination of the most appropriate resources in order to support NII IT Systems operation, maintenance, malfunction restoration and extension etc.

The Contractor is required to provide any information that is relevant to the modification, improvement or any addition to the NII IT Systems, in order to be able to satisfy new NII SMO's requirements, which shall be implemented under NII SMO's responsibility. Furthermore, the Contractor shall provide on-line access to the technical support and technical information database of the company owning the intellectual property of the software and system architecture, by providing to NII SMO's personnel (which will be disclosed in writing by NII SMO) a relevant Username and Password for submitting technical questions and issues.

2.7 Third Party Products Support

The Contractor, in addition to its own technical support for the third party products used in NII IT Systems, should have a contract for the entire duration of the warranty and maintenance period for the maintenance, upgrade, and technical support of the respective third party manufacturers (of hardware and software), in order to provide updates, patches, firmware, etc., in the products used in the NII IT systems that affect the operation and security of the respective systems.

The Contractor should submit to the NII SMO the Certificates of the respective Contracts.

3 Spare Parts

The Contractor is required to provide spare parts, hardware, software and all other materials, required for the preventive maintenance and repair of malfunctions occurring to the hardware and software provided within this Project, at his own expense and with no further financial charge for the NII SMO.

The Contractor is required to keep sufficient stock of spare parts, hardware, units, peripheral devices, tools and all other materials required for the preventive maintenance and repair of malfunctions that may occur in the NII IT Systems provided with this Project, for the entire warranty and maintenance period, so as to have readily available spare parts after the repair of every breakdown.

The exact list of the equipment to be under maintenance will be filled in after its delivery by the Contractor and will be attached as an Annex to the Maintenance Contract. The Contractor is not required to maintain a spare parts stock only in the case that submits relevant maintenance Contracts either directly with the hardware manufacturer or any authorized hardware support center, which will provide the necessary spare parts in time.

The Contractor shall be responsible for the availability and quality of these materials (tested and approved regarding reliability of operation).

The Contractor shall be responsible for keeping up to date records of the spare parts, hardware and all other materials located in his warehouse in Central ECC in Athens and in Local ECC of Rhodes, and shall notify authorized NII SMO staff of all changes made as to the items and quantity of such items in the warehouse.

Throughout the warranty and maintenance period, the spare parts required to restore malfunctions occurring in critical system operations shall be allocated to relevant warehouses. Every time a spare part is used, it shall be replaced immediately by another or it shall be repaired promptly so as to be ready for use again.

In case peripheral units or hardware units remain out of order for a period exceeding three (3) consecutive calendar days or cumulatively per year for more than three (3) days from the date of Contractor's notification on the malfunction, or in case the breakdown occurs more than three (3) times per month, or six (6) times per annum, then the NII SMO is entitled to demand immediate replacement of such units. Moreover, the Contractor is required to investigate the cause of such malfunction and to notify the NII SMO as to the measures to be taken to avoid such similar malfunction from occurring in the future.

4 NII IT Systems Availability during Warranty and Maintenance

4.1 Availability Requirements

The Contractor warrants the minimum availability requirements for each one NII IT System located in the Central ECC and the Local ECC, as they are defined in this document.

If the availability, calculated for each year of the warranty and maintenance periods is less than the minimum availability, penalties should be applied for decreased availability.

The availability requirements for each NII IT System are as follows:

4.1.1 EMS Availability

The availability of the entire EMS system should be better than 0.9999.

4.1.2 MMS Availability

The availability of the MMS should be better than 0.999.

4.1.3 Corporate Systems Availability

4.1.3.1 DW/MIS

The availability of the DW/MIS should be better than 0.99.

4.1.3.2 Helpdesk

The availability of the Helpdesk should be better than 0.99.

4.1.4 Networking Equipments (firewall, routers, switches)

The availability of the Networking Equipments should be better than 0.99

4.2 Calculation of the NII IT Systems Availability

The availability of each NII IT System should be calculated according to the following formula:

$$\frac{\text{reference time} - \text{downtime}}{\text{reference time}}$$

where

downtime: is the total time of interruption of main and crucial functions of the NII IT System (Class A, Class B, and Class D malfunctions for the NII IT System).

For the calculation of availability the following cases are not considered as downtime:

- The time that the system remains out of order due to a malfunction caused by staff not employed by the Contractor;
- The time that the system remains out of order due to a malfunction caused by natural forces (fire, earthquake, etc.);
- The time that the system remains out of order for the purposes of interventions required by the NII SMO;
- The time the system remains out of order for jointly scheduled power shutoffs for inspection and testing purposes;
- The duration of the malfunction if this is restored within the timeframe foreseen for each malfunction class. Only the delays, i.e., the time that exceeds the timeframe for the restoration, should count as downtime.

reference time: is the availability reference of one (1) year.

The calculation of availability shall be made on an annual basis starting from the date the maintenance contract will be effective. Therefore, the reference time is set to 8760 hours for a whole calendar year of 365 days, or 8784 hours in case of 366 days. An annual calculation should also apply for the yearly warranty period.

4.3 Malfunctions Frequency Requirements

The Contractor warrants for each one NII IT System located in the Central ECC and the Local ECC, a maximum number of malfunctions on an annual basis, regardless of their restoration time. This number is calculated as the sum of any Class A, B or D malfunctions even if they do not constitute downtime for the system.

If this number of malfunctions calculated for each year of the warranty and maintenance periods is exceeded, then penalties should be applied for increased frequency of malfunctions.

The maximum number of malfunctions for each NII IT System are determined as follows:

- **EMS:** 20;
- **MMS:** 40;
- **Corporate Systems:**
 - DW/MIS: 60;
 - Helpdesk: 60.

