Ente per le Nuove tecnologie,
l'Energia e l'Ambiente

Ministero dello Sviluppo Economico

RICERCA SISTEMA ELETTRICO

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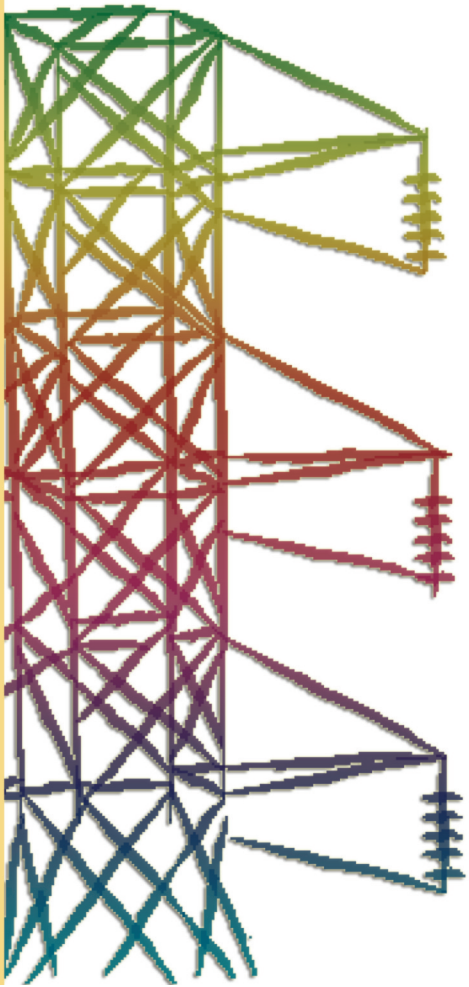

Report RSE/2009/72

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QUALITY PLAN OF IRIS SPES-3 PROJECT

Massimo Orsi, Stefano Botti (SIET)

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SUMMARY

1. INTRODUCTION

1.1 The SIET Company

SIET (Società Informazioni Esperienze Termoidrauliche) is a Research/Testing Company whose main programs concern the thermal-hydraulic experimentation on Nuclear Power Plants components and systems. SIET, whose facilities are located in Piacenza (60 km south of Milan), employs twenty people including seven engineers with university degree and has a net turnover of about three million US dollars per year.

Most of the SIET experiences are performed at real thermodynamic conditions on large-scale test sections with respect to the reference plants. They cover a quite large extent of applications as for instance:

- experimental studies on integral systems (PWR simulators) for code assessment;
- experimental studies on critical heat flux, void fraction and pressure drops in tubes, annuli and fuel bundles of LWRs;
- heat transfer in PWR Steam Generators;
- efficiency measurements of full scale steam-water separators of both PWR Steam Generators and Boiling Water Reactors;
- experimental qualification of Innovative Passive Safety System for ALWR;
- performance test on Steam Injector for ALWR applications;
- high heat flux test (up to 50 MW/m^2) related to the thermal-hydraulic design of the Fusion Reactor Tokamak.

The main SIET programs performed in the past concerned:

- the Certification Program of the Westinghouse AP-600 Reactor carried out on the SPES-2 plant, an integral facility simulating all the reference reactor primary and safety system (20 MPa – 365 °C design condition, 1:400 volume and power scaling factor, full elevations);
- the experimental qualification of full-scale prototypes of the Isolation Condenser (IC) and the Passive Containment Condenser (PCC) for the GE Simplified Boiling Water Reactor (SBWR).

Furthermore the SIET Company is usually involved also in non-nuclear activities as for instance experimental qualification/certification of conventional power plant or process plant components (heat exchanger, pumps, valves, etc.). Moreover SIET is able to perform the calibration of different instrumentation typologies in its instrument calibration laboratory.

1.2 The SIET Quality System

All above described SIET testing and calibration activities are performed in compliance with the requirements of an internal Quality System with the primary goal to satisfy the needs and expectations of its clients, the accreditation bodies and the regulatory boards.

This Quality System fulfils the requirements of UNI EN ISO 9001:2000, ASME NQA-1 and UNI EN CEI ISO/IEC 17025 international standards and it is certified by the Certification Body DNV (Det Norske Veritas Italia srl).

This certification covers the main SIET activities, in particular, all the service provision of thermo-fluid dynamic and mechanical testing on components/systems of power plants, process plants and fluid distribution plants. The design and construction of the testing facilities used for the conduction of all the testing are also included in the same certification.

A copy of the DNV certificate is reported in Attachment 1.

The SIET Laboratory is also accredited by SIT, the Italian Calibration Service, for the calibration of instruments for temperature measurements. A copy of the SIT certificate of accreditation is reported in Attachment 2.

The provision of the calibration service, both in house and on site, of instruments for measurements of pressure, temperature, fluid flow rate and velocity, heat, humidity, mass, fluid density and viscosity, time, force and torque, electrical parameters, length, acoustic parameters is covered by the above mentioned DNV certification.

The general features of this Quality System is described in the SIET Quality Manual (document 00001QQ90, III[a] Edition, Revision 0) which represents the "First Level" document.

This Quality Manual deal with the policy, principles, organization, responsibilities and relationships among the different internal units, the processes, resources, programmes, procedures and actions which are applied within the company in order to achieve the quality objectives set by the Top Management Team in accordance with the reference standards.

This Quality Manual is compiled and updated by the Quality Manager and approved by the Director of Operation.
The QA Manager is responsible for ensuring that the managerial and technical procedures are consistent with all the major rules outlined in this Quality Manual and should guarantee conformity between the contents of all QA documents issued by the Company.

The Quality Manual is distributed by the Quality Department through Distribution Lists.

A table of contents of SIET Quality Manual, including a cross reference among the different type of reference standards (UNI EN ISO 9001:2000, ASME NQA-1 and UNI EN CEI ISO/IEC 17025), is reported in Attachment 3.

The "Second Level" documents of the SIET Quality System include both the QA procedures describing in details the main processes and activities, as:

- organization (00005QQ94)
- document control (00002QQ92, 00012QQ95)
- measurement equipments (00003QQ92)
- internal audits (00007QQ92)
- plant control (00008QQ94, 00009QQ94, 00011QQ95)
- customer complaints (00017QQ99)
- non conformity (00018QQ02)
- corrective and preventive actions (00019QQ02)
- job management (00023QQ06)

- business process management (00025QQ06)
- design process management (00026QQ06)
- procurement process management (00027QQ06)
- communication and correspondence processes management (00028QQ06)

and the Quality Plans which are usually issued for specific testing activities in order to describe how the SIET structure and Quality System conform with specific contractual requests. Examples are the followings:

- Quality Plans for product certification testing (00004QQ92, 00016QQ99)
- Quality Plan for calibration activity (00010QQ95)
- Quality Plans for steam water separator testing (00013QQ95, 00015QQ98, 00020QQ03, 00021QQ04)
- Quality Plan for steam generator testing (00014QQ96)

The "Third Level" documents of the SIET Quality System include operating procedures and quality records. Examples are the followings:

- Test Plan & Procedures
- calibration procedures and working instructions (reference list of documents 00367ED94)
- check lists
- audit reports, management reviews, etc.

In the framework of the IRIS Project described in detail in the following Section 1.3, the activities performed by SIET, summarized in Section 1.4, takes upon characteristics of great complexity, both technical and managerial.

For this reason the SIET Management decided to issue a specific Quality Plan, which characteristics are fully described in Section 2, with the main objective to support and complete the SIET QA System and to guarantee the compliance of the requirements of the applicable contractual documents.

1.3 The IRIS Project

Among the many new designs that have been proposed in these recent years at the sight of a possible nuclear power renaissance, IRIS (International Reactor Innovative and Secure) is the one that has moved most rapidly from an idea to the preliminary design.

IRIS is a small-scale advanced grid appropriate pressurized water reactor with an integral configuration: all primary system component (i.e.: pumps, steam generators, pressurizer and control rod drive mechanism) are inside the reactor vessel. It is offered in configurations of single or multiple modules, each having a power rating of 1000 MWt (about 335 MWe).

The IRIS program began in October 1999 as one of the winning proposal in the first Nuclear Energy Research Initiative (NERI) by the US Department of Energy (DOE) and it has since progressed through the conceptual design and moved to a stage in the preliminary design, which has allowed initiation of the licensing process, with the first meeting with the Nuclear Regulatory Commission (NRC) on pre-application licensing held in October 2002.

IRIS is a very advanced reactor design with many new features, especially in the safety area, but at the same time its technology is grounded on well-proven and universally familiar water reactor experience. The IRIS design was conceived to satisfy the four objectives stated by the DOE for the new generation reactors: improved proliferation resistance, enhanced safety, improved economics and reduced waste. Distinguishing and defining characteristics of IRIS are:

- integral configuration, which, to a greater or lesser degree, addresses all the four a.m. objectives;
- the capability of employing high burnup, long-life cores, wich, together with the capability of operating four years without shutdown for maintenance, addresses the proliferation-resistance requirement and increases the capacity factor and decreases the operation and maintenance costs;
- integral configuration design, which practically eliminates small-to-medium loss of coolant accidents as a safety concern;

- the "safety by design" approach, where, rather than coping with their consequences, accidents are eliminated from occurring.

IRIS is an international Project with partnership of industry, research organizations, academia, and power producers from the countries as follows: USA, Italy, UK, Spain, Mexico, Brazil, Japan, and Croatia.

1.4 Job description

The IRIS licensing process required by the US Nuclear Regulatory Commission (NRC) foresees a series of experimental tests on properly built facilities suitable to verify the capabilities of the new plant and its safety systems to cope with postulated accidents.

One of the most important experiments to be performed in the framework of the reactor licensing process is the so called "Integral Test". It consists of an experimental campaign to be performed on a large scale test facility properly simulating all the safety–related systems of the reference reactor. Such facility, named SPES-3, will be built at SIET laboratories with 1:100 volume scaling factor and with a full scale in elevation with respect to the IRIS reactor. It will be suitable to perform both integral and separate effect tests and will allow to investigate the thermal hydraulic interaction among the various systems (primary and secondary systems, containment, safety systems, etc.).
The primary goal of testing on the SPES3-IRIS facility is to demonstrate the vessel to containment coupling as the main safety issue of IRIS plant in mitigating small break LOCAs.

The SPES-3 facility will be built by using both the existing auxiliary system and infrastructures of the SIET SPES-2 facility (already used in the past for the Westinghouse AP-600 reactor certification programs) as much as possible.

The SIET role in the SPES-3 Project concerns the design, procurement, manufacturing, installation of all the facility components with exception of the reactor simulator (including the relevant auxiliary components) and the special instrumentation. Furthermore SIET will

conduct the facility commissioning, the facility operation for matrix tests, data validation and reporting. Moreover SIET will be involved in both the pre-test and post-test calculations by using the RELAP-5 code.

All the above mentioned activities will be funded by ENEA in the framework of the agreement between ENEA and the Italian Ministry of the Economic Development.

More in detail the SIET scope of supply concerns the works as follows:

a) Quality Plan issue

b) conceptual design of the SPES-3 facility;

c) pre-test analysis by using the Relap-5 code in support of both the SPES-3 conceptual design and test procedures;

d) design of the SPES-3 facility;

e) removal of SPES-2 facility components;

f) modification and set up of the facility auxiliary systems;

g) issue of the SPES-3 facility components technical specification;

h) procurement of the facility components (except the reactor simulator and special instrumentation);

i) installation of the components (except the reactor simulator and special instrumentation), setting up the facility;

j) conduction of the facility commissioning;

k) conduction of the matrix tests;

l) post test calculations.

2. THE QUALITY PLAN

Within the IRIS SPES-3 Project all the activities pertaining to SIET shall be strictly carried out following the requirements of its Quality System whose representative structure and documentation are summarized in Section 1.2.

The present Quality Plan has to be considered a part of the SIET QA System having as main objectives to implement the specific requests included in the applicable parts of the contractual documents, to take into consideration the characteristics of this job and to manage the of Project items able to assure the quality of the final results.

The following sections represent a detailed description of the peculiarities of this Quality Plan.

2.1 Scope and applicability

Within the SIET job this Quality Plan applies to all the IRIS SPES-3 Project phases and establishes as major objectives to:

- specify the applicable contractual documents both for Technical and Quality Assurance requirements to be fully comply with;

- arrange a detailed internal organization fixing duties and responsibilities of SIET involved personnel;

- define the criteria for the issue, the periodical revision and the proper application of a Project Time Schedule;

- plan a set of documents (Document Plan) to be issued according to the contractual documents and the time schedule;

- guarantee the recording of all information affecting the quality of results through all the Project phases and its quick traceability by the arrangement of an efficient Design Record File (document archive);

- set up an independent quality asurance control able to assure the compliance to the requirements of the applicable contractual documents;

- include a detailed cross reference among the QA contractual documents and the sections of the SIET Quality Manual to put in evidence the fulfilment of all QA requirements and supply a tool able to define where each QA argument is described.

A copy of this Quality Plan shall be distributed to the SIET Management and to all SIET personnel involved in the IRIS SPES-3 Project.

2.2 Contractual documents

2.2.1 ENEA documents

In the framework of a R&D multi-annual program between ENEA and MSE (Italian Ministry of Economical Development) having many subjects, including the study of the new generation Nuclear Power Plants based on fission technology, ENEA and SIET drew up a research contract for the activities on the IRIS (International Reactor Innovative & Secure) integral test (First Annual Plan).

At the time of writing of the present Quality Plan, the only available contractual documents issued by ENEA are the following:

a) Research contract between ENEA and SIET (ENEA Letter prot. No ENEA/2008/16706/FPN)

b) Technical specification ENEA (attached to the above mentioned research contract)

These two documents refer to the execution of the first annual plan of the above mentioned ENEA-MSE agreement. In particular, this plan includes the design of the IRIS experimental simulator, the preliminary works to prepare the installation area of this new facility at the SIET laboratory in Piacenza (Italy) and the first phase of the facility auxiliary systems setup.

A third reference document (to be issued) for the IRIS-SPES3 design and manufacturing is:

c) IRIS Integral System Test Specification

The list of ENEA contractual documents described in this clause of the Quality Plan shall be updated every time a new documents will be issued.

A copy of the contractual documents shall be distributed to the SIET Personnel as follows:
- Managing Director and President;
- Director of Operation;
- Production Responsible;
- IRIS-SPES3 Project Leader.

The contractual documents will be recorded in the Design Record File.

2.2.2 QA reference documents

The applicable requirements of the following QA reference documents shall be fulfill.

d) UNI EN ISO 9001:2000 - Quality Management System. Requirements;
e) UNI EN CEI ISO/IEC 17025:2005 - General requirements for the competence of testing and calibration laboratories;
f) ASME NQA-1 - Quality assurance program requirements for nuclear facilities;
g) 10CFR50 Appendix B - Quality assurance criteria for nuclear power plants and fuel reprocessing plants.

A copy of the QA documents f) and g) shall be distributed to the SIET Personnel as follows:

- Director of Operation;
- Production Responsible;
- IRIS-SPES3 Project Leader;
- QA Responsible.

These documents will be recorded in the Design Record File.

A copy of the QA documents d) and e) are already available to the SIET Personnel according to the criteria defined in the SIET QA System. They will not be recorded in the Design Record File.

2.2.3 SIET documents

The applicable requirements of the following SIET documents shall be fulfill.

h) 00001QQ90 Third Edition, Rev. 0 - Quality Manual;

i) 00367ED94 - List of internal documents and procedures.

A copy of the documents h) and i) are already available to the SIET Personnel according to the criteria defined in the SIET QA System. They will not be recorded in the Design Record File.

2.2.4 Other documents

Some technical or management documents might be assumed as contractual documents during the IRIS SPES-3 Project as conseguence of the importance of their content provided that ENEA and SIET should agree.

These documents will be stored in the Design Record File with the stamp "AS C" and the signature of ENEA and SIET Contract Responsibles.

2.3 SIET Organization

The SIET general organization is described in Section 5.5.1 of the Quality Manual and reported in the Organization Chart of Attachment 4 of this QA Plan. Responsibilities and duties of each Unit and Function are described in Section 5.5.2 of the Quality Manual as well as in the operating quality procedure 00005QQ94 (Organization).

A nominative SIET organization for the IRIS SPES-3 Project activity has been proposed by the Director of Operation (DO) and authorized by the Top Management (i.e: SIET Managing Director) through the issue of the present Quality Plan, according to our Quality System requirements.

This operating Organization Chart is shown in Figure 1; its main functions are the following:

- SIET Manager (DO)
- Production Responsible (RP)
- Project Leader (PL)
- Responsible of Task (RT)
- Responsible of Competence Unit (IEC, MEC, CAL, OPR)
- QA Responsible (UGQ)
- Project Controller (PC)

At the time of this QA Plan issue, the ENEA-SIET contract scope of supply is limited to the following defined tasks:

#1 Conceptual design of the SPES-3 experimental facility
#2 Quality Plan issue
#3 Pre-test calculation
#4 Design of the SPES-3 test facility
#5 SPES-2 removal
#6 Auxiliary systems set-up (first phase)
#7 Procurement of SPES-3 components (first phase).

The Responsible of each task has been defined by RP in co-operation with DO and it is reported in the IRIS SPES-3 Project organization chart.

Every time that a new task will be defined, RP, based on the characteristics of the activity, shall identify the relevant Responsible according to its qualification and experience; after the approval of DO, RP will inform all the personell involved in the IRIS SPES-3 Project organization without revising the organization chart.

Additional technical competences have been identified for supporting the activities linked up with RP and PL. In particular, they refer to:

- Instrumentation, Data Acquisition & Control System, Electrical Power Components - IEC
- Thermal-Hydraulics, Mechanical Structures, Plant Build-up - MEC
- Instrument Calibration - CAL
- Test Facility Operation - OPR

The specific responsibilities of each involved function have been defined to satisfy all the contractual requirements and the specific needs of IRIS SPES-3 Project specification and they are described in the following paragraphs.

2.3.1 Director of Operation

The SIET Director of Operation (DO) has the authority and responsibility to spot, promote, plan, co-ordinate and supervise all IRIS SPES-3 Project activities.
DO has the responsibility to arrange the programs, processes and resources necessary to carry out the quality policy and to achieve the defined aims referred to both technical and economical aspects, involvement of personnel and compliance with the requirements of the contractual documents and applicable standards, ensuring the quality of the provided services.
DO relates directly to the Top Management Team.

2.3.2 Production Responsible

The Production Responsible (RP) has the global responsibility of monitoring and controlling all the IRIS SPES-3 project acivities with the aim of satisfy the contractual requirements and to ensure that the customer needs, expectations and satisfaction are completely fulfilled.

Operating in close joint effort with PL, the responsabilities of RP include:

- the design of the integral test facility and pre-test analysis;
- the supervision of the procurement of components, instrumentation, services, etc. both for the integral test facility and for the auxiliary systems;
- the supervision of the assembly phases of the new integral test facility;
- the design and updating of the operating test procedures;
- the supervision of all the testing phase;
- the definition of the Responsible of each Task;
- the supervision and coordination of the SIET operating personnel involved in the different Tasks and Competence Units;
- the approval of the contractual document issue;
- the respect of time schedule;

RP relates directly to DO.

2.3.3 Project Leader

The Project Leader (PL), operating in co-operation with RP, has the responsibility for:

- keeping up the relationships with ENEA (reference Contractor) and all the other involved subjects, as SIET representative;
- attending, as SIET representative, to the conference calls involving the Contractor and the other participants to the IRIS SPES-3 project;
- define those technical items arising during the conference calls that can have a basic impact on the activities performed by SIET or represent requirements equivalent to contractual documents;

- opening and keep updating the Design Record File, as described in the following paragraph 1.6;
- inform all the SIET personnel involved in the IRIS SPES-3 project about the technical decisions agreed during conference calls, IRIS meeting, e-mail communications, etc.;
- supporting the acivities performed by each Task operating in cooperation with the relevant Responsibles;
- supporting the activities of the Competence Units (IEC, MEC, CAL, OPR) for suppling with any technical requirements defined among SIET and all the other partners involved in the IRIS SPES-3 project .

PL relates directly to RP.

2.3.4 Quality Manager

The Quality Manager (UGQ) has the responsibility of the arrangement and the correct application of the present Quality Plan in compliance with the policy and aims established in the Quality Manual, with the requirements of internal operating procedures and applicable standards and with the needs of ENEA (Contractor).

UGQ supervises all the phases of IRIS SPES-3 Project activity through controls, audits, interviews, document checks, etc. and guarantees his continuous presence during all the activities in order to identify all that could affect the quality of the final results.

UGQ has the duty to inform DO of any aspect that could have a negative impact on the correctness of all the activities, on the quality of the provided service and of the efficiency of the quality system management and to suggest the most suitable corrective and preventive actions.

UGQ leads internal audits as described in Section 8.2.2 of Quality Manual and in the operating procedure 00007QQ92, in order to verify the application of the Quality System.

Internal Audit reports are sent to all the SIET personnel involved in the IRIS SPES-3 Project activity and directly to DO.

UGQ relates directly to DO.

2.3.5 Project Controller

The Project Controller (PC), operating in close co-operation with RP and PL, has the responsibility of supervise the IRIS SPES-3 Project activities in terms of:

- arrange periodical meetings involving all the functions of the IRIS SPES-3 Project organigram with the main scope of respecting the timing of the internal scheduled activities;
- put in evidence those activities having a strong impact on the reference project time schedule which can affect the quality of the final results of the SIET activities:
- prepare and distribute the relevant meeting minutes.

PC relates directly to DO.

2.3.6 Task Responsible

The Task Responsible has the main responsibility to perform the contractual activity operating under the supervision of RP and on the basis of the imput supplied by PL.
The Task Responsible shall assure:

- the quality of the activity in terms of respect of the requirements defined in the contractual documents;
- the fulfilment of the time planning scheduled during the periodical meetings;
- the issue of the final documents (when expected);
- the submittion of the document to the verifiers and to the final approval responsible according to the Document Plan, as described in the following paragraph 2.5;
- the final issue of the approved documents and their distribution;

- the delivering of the document to PL for the final storage in the DRF and to all the others Companies/Person according to the agreed Distribution List;
- the review of the documents after the comments of the Contractor or any other involved subjects.

The Task Responsibles relate directly to RP and co-operate with PL.

2.3.7 Instrumentation, Data Acquisition & Control, Electrical power components

The Responsible of the IEC Competence Unit, operating under the supervision of RP and on the basis of the imputs supplied by PL, has the main responsibility of:

- define the technical specification for the instrumentation procurements to be used on the SPES-3 facility based on the requirements of the applicable technical documents and after the review of PL;
- issue the orders for the instrumentation and follow their procurement in compliance with the time planning scheduled during the periodical meetings;
- guarantee that the instrumentation procurement has no impact on the time schedule define by the Contractor;
- installation of the instruments on the test facility and connection of the line/cable to the DAS;
- define the technical specification for the DAS (Data Acquisition System) procurement, issue the relevant orders and follow their procurement;
- define the technical specification for the procurement of the componnts of the Electrical Power System, issue the relevant orders and follow their procurement and installation.

The Responsible of the IEC Competence Unit relates directly to RP.

2.3.8 Thermal-hydraulic and mechanical structures build-up competences

The Responsible of the MEC Competence Unit (Technical Office), operating under the supervision of RP and on the basis of the imputs supplied by PL, has the main responsibility of:

- thermal-hydraulic and mechanical design of the SPES-3 facility including auxiliary systems;
- all the operations concerning the mechanical construction and/or modification of the SIET experimental plants to assure the required performances of the SPES-3 facility;
- supervision of activity affering the procurement, construction and assembly of the testing equipments and facility, including the auxiliary systems;
- issuing, updating and filing of all the drawings related to the experimental facility;
- issue the final document (Plant Report), submit it to the verifiers and to the final approval responsible according to the Document Plan, as described in the following paragraph 2.5;
- issue of the distribution of the approved document and their review;
- supervise the activity of purchasing of products and services;
- control the incoming components;
- operate in cooperation with RP for any kind of technical items that can occur during the test facility design and assembly.

The Responsible of the MEC Competence Unit relates directly to RP.

2.3.9 Instrumentation calibration

The Responsible of the CAL Competence Unit (Technical Office), operating under the supervision of RP and in co-operation with the Responsible of the SIET calibration laboratory, has the main responsibility of:

- prepare the list of the used instrumentation complete with its main characteristics;
- assure that the used instruments shall be calibrated before their use on the testing facility with traceability to national or international primary instruments;

- assure that those instrument not well operating will be replace without any impact on the testing schedule and guaranteeing the same quality of the final results.

The Responsible of the CAL Competence Unit relates directly to RP.

2.3.10 Test facility operation

The Responsible of the OPR Competence Unit, operating under the supervision of RP and in co-operation with its staff, has the main responsibility of:

- performing all the actions described in the testing procedures;
- managing of the plant and the SAD log
- guarantee the efficiency of the plant components through a defined program of ordinary and extraordinary maintenance operations;
- performing any other activity related to the safety items.

The Responsible of the OPR Competence Unit relates directly to RP.

2.3.11 Technical personnel experience and training

DO has identified the minimum qualification requirements for the SIET technical personnel. A detailed description for each function foreseen in the SIET general organization is available in the internal procedure 00005QQ94 (Organization), Section 5. This procedure also specifies the education and experience requirements to perform the main tasks and in Section 6 the personnel training procedure.

A personal experience card reporting the professional experiences is available for each SIET personnel.

2.4 Project time schedule

The Production Responsible (RP) in co-operation with the Project Leader (PL) issues a detailed Project Time Schedule (PTS) and defines the criteria of its periodical updating.

For every single activity, each identified with a proper code, this Project Time Schedule shall include at least:

- a concise description;
- the initial and final date;
- the responsible personnel or function, both for SIET and other involved subjects;
- the necessity of the Customer (ENEA) approval;
- the necessity of other approvals.

When required, a single activity of the PTS shall be described with more detail using a proper time schedule.

2.5 Document Plan

The Document Plan (DP) is the tool used by RP for controlling and managing the design of the IRIS SPES-3 Project. It contains the list of documents (Quality Plan, Test Plan & Procedures, Facility Report, Drawings, Analysis Report, Data Report, etc.) to be issued by SIET during the different phases of the IRIS SPES-3 Project which could affect the quality of the final results. It is updated as the project develops.

For each planned document the Document Plan specifies the following information:

- title and identification code;
- drawing up, verifications and final approval responsibilities;
- time schedule issuing;
- authorization (when required);
- distribution list.

Section 4.2 of the SIET Quality Manual and the internal procedure 00002QQ92 (Documents Control) ensure the correct issue of the documents.
RP assigns the responsibility of issuing, defines the list of the verifiers (qualified SIET experts) and the function in charge for approval of these documents and reports this information in the IRIS SPES-3 Project Document Plan.

Results of the activities performed by each involved personnel (writer, verifiers and approver) are recorded on a "Document Approval Sheet" - FAD (Mod. 00002QQ/b).

Some calculations and technical solutions can require additional check by a qualified SIET experts either or not directly involved in the IRIS SPES-3 Project activity. All the phases of this verification are planned and recorded in a "Verification Cover Sheet" (Mod. 00002QQ/c).

Preliminary documents (draft version) can be issued and they shall be identified by a letter (A, B, etc.) and do not follow the approval procedure.

Document approval and verification cover sheets are filed in the IRIS SPES-3 Project Design Record File (DRF) by PL.

After each modification of a technical document SIET shall issue a new revision of the document following the same verification and approval procedure, as specify in the internal procedure 00002QQ92.

The SIET documents shall be delivered according to the distribution list.

ENEA or any other subject according to the contractual documents notifies its comments and approves the SIET documents by letter, fax or e-mails.

PL shall review the documents taking the comments into account and reports the reference detail of the approval letter, fax or e-mail on the front page of the documents.

2.6 Design Record File

A Design Record File (DRF) will be opened and managed by PL in order to keep the full traceability of any information and to document the development of the IRIS SPES-3 Project activities (design and testing).

The DRF is used to record and file all the documents received and issued by SIET, all the documents and approvals, letters, faxes, e-mails between SIET and the other Companies involved in the IRIS SPES-3 Project, the verification cover sheets, drawings, procedures, deviations, corrective and preventive actions, QA audit, testing results, Reports and more generally any information that can affect the quality of the results of experimental activity.

Documentation filed in the DRF is taken as official documents for the IRIS SPES-3 Project activity.

Documents in the DRF are subdivided according to their subjects and issuing organization (IRIS SPES-3 Project Partecipants, SIET, others) and recorded in chronological order. The DRF is placed in a dedicated room to make its management easier, to avoid damages or losses and to prevent the access of unauthorized people.

All the information in the DRF is kept for a five years period of time after date of the end of job.

2.7 Quality Assurance Activity

A quality assurance control system able to assure the compliance to the requirements of the applicable contractual documents has been set up for the IRIS SPES-3 Project through the following activities.

a) INSPECTIONS AND AUDITS

Inspections and audits are carried out as described in Section 8.2.2 (internal audits) of the SIET Quality Manual and following the requirements of the operating procedure 00007QQ92.

An inspection program covering all the activities affecting the quality of the of the final results shall be planned by the SIET Quality Manager (UGQ) at the opening of the job. Following this program UGQ, or a deputed qualified person, shall carry out the planned audits and inspections to ensure that the Quality Manual, the Quality Plan and the applicable procedures are being applied as well as to assess their effectiveness.

UGQ shall sets up the dates and the units to be inspected in agreement with RP usually considering the following aspects:

- importance and extension of each activity;
- duration of the single activity;
- variations occurring during the contract;
- corrective actions applied following previous audits;
- intensity of surveillance from outside bodies.

b) CONTROLS OF PURCHASED COMPONENTS

The components and any other material directly procured by SIET shall be purchased according to the technical specifications and/or drawings attached to the SIET orders.

At the receiving and before the installation on the plant, the SIET responsible of the purchase order shall check these components in order to verify the respect of their characteristics and their capability to correctly operate on the testing facility. The verifier shall report their signature on the technical specifications and/or drawings to documents this check.

For all the other material and components not directly procured by SIET, RP shall perform an incoming control based on the same procedure.

The instruction for incoming material control are reported in Section 7.4 (procurement process) of the Quality Manual and following the requirements of the operating procedure 00027QQ07.

c) CONTROL OF MEASURING AND TEST EQUIPMENTS

The responsible for the IRIS instrumentation, operating in cooperation with RP, shall have the duty to manage and control the measuring and test equipments according to the instruction reported in Section 7.6 (testing and measurement equipments) of the Quality Manual and following the requirements of the operating procedure 00003QQ92.

This procedure specifies the methods for management of the measurement and control equipment used in SIET for the testing activities as well as the first and second line standard instruments used in the instrumentation laboratory for calibration verifications.

Calibration of used instruments shall be performed according to appropriate SIET procedure (l00367ED94) and assuring the traceability to the national and/or international reference samples.

Each instrument shall be identified by a code number that shall be reported on the instrument itself, on the instrument sheet together with all the other technical data (range, period of calibration validity, etc.).

A detailed description of the instruments used for the testing activities shall be reported in the Test Plan & Procedur document.

The instrument set used in each test shall be reported in the final Test Report.

d) CONTROLS OF TEST PLANT CONFIGURATION

A detailed test plant description shall be reported in the SIET Test Plan & Procedures (TP&P) document.

The dimensions of the facility that can affect the test performances and the results of the tests shall be measured and verified according to the procedure 00011QQ95 (Test Plant Configuration Control). In this case a list of these critical dimensions shall be included in the TP&P.

The control results of the plant configuration shall be directly marked out on the construction drawings together with the date of the check and the verifier signatures. The construction drawings and all the other records used to store the control results shall be filed in the DRF and they will be used during the data analysis phase.

e) CONTROLS PRIOR TO AND DURING TESTING

The tests on the IRIS SPES-3 integral test facility shall be performed according to SIET written procedures.

Each test procedure shall include a "pre-test check list" and a "test procedure check list" to be used during the test performance.

Preliminary controls shall be performed by OPR before the beginning of each test type by means of a specific check list in order to verify the correctness of the plant configuration.
The evidence of this control shall be guaranteed by the signature of OPR in the dedicated area of the check list filed in DRF.

Each test procedure shall include a detailed check-list with the main object to verify the correct performance of every test phase. The evidence of the performed actions shall

be guaranteed by the signature of RC on the check list. At the end of each testing day this list shall be filed in the DRF.

During the test performance RP can introduce some modifications in the test procedures in order to achieve the test results. In this case the modifications shall be recorded in the test procedure check list.

The Client (ENEA) shall be informed of any deviation from the approved testing procedure.

Any instrument replacement shall be recorded in the test DRF and reported in the instruments list.

Each test shall be identified by:

- date of execution
- identification number

All the test procedures and the test reports can be traceable through this set of identification number.

f) CONTROLS OF TEST RESULTS

Test validity shall be determined by the criteria specified in the TP&P document.

An independent controls of the testing data shall be performed according to the criteria specified in the TP&P document.

Preliminary data can be released to the Test Requestor (ENEA) at the end of each test for an additional control.

At the end of these controls the final test results shall be reported in the Test Data Report as specified in TP&P document.

Test Data Report shall be sent to Test Requestor (ENEA) for approval.

g) NON CONFORMITIES, CORRECTIVE AND PREVENTIVE ACTIONS

If during the controls described at clause 2.7, points a) to f), some non conformities should put in evidence on respect to the quality management system procedures, the applicable standards, the technical specifications and contractual requirements, they will be dealt as are described in section 8.3 of the Quality Manual and the procedure 00018QQ02

Specific or general corrective and/or preventive actions shall put into effect by UGQ, as a result of identified non-conformity arising during the controls a) to f).

The operating details and the related responsibilities are described in section 8.5 of the Quality Manual and procedure 00019QQ02.

Quality records, managed as described in Section 5 of the Quality Manual and procedure 00002QQ92, shall be maintained to furnish evidence of activities affecting quality.

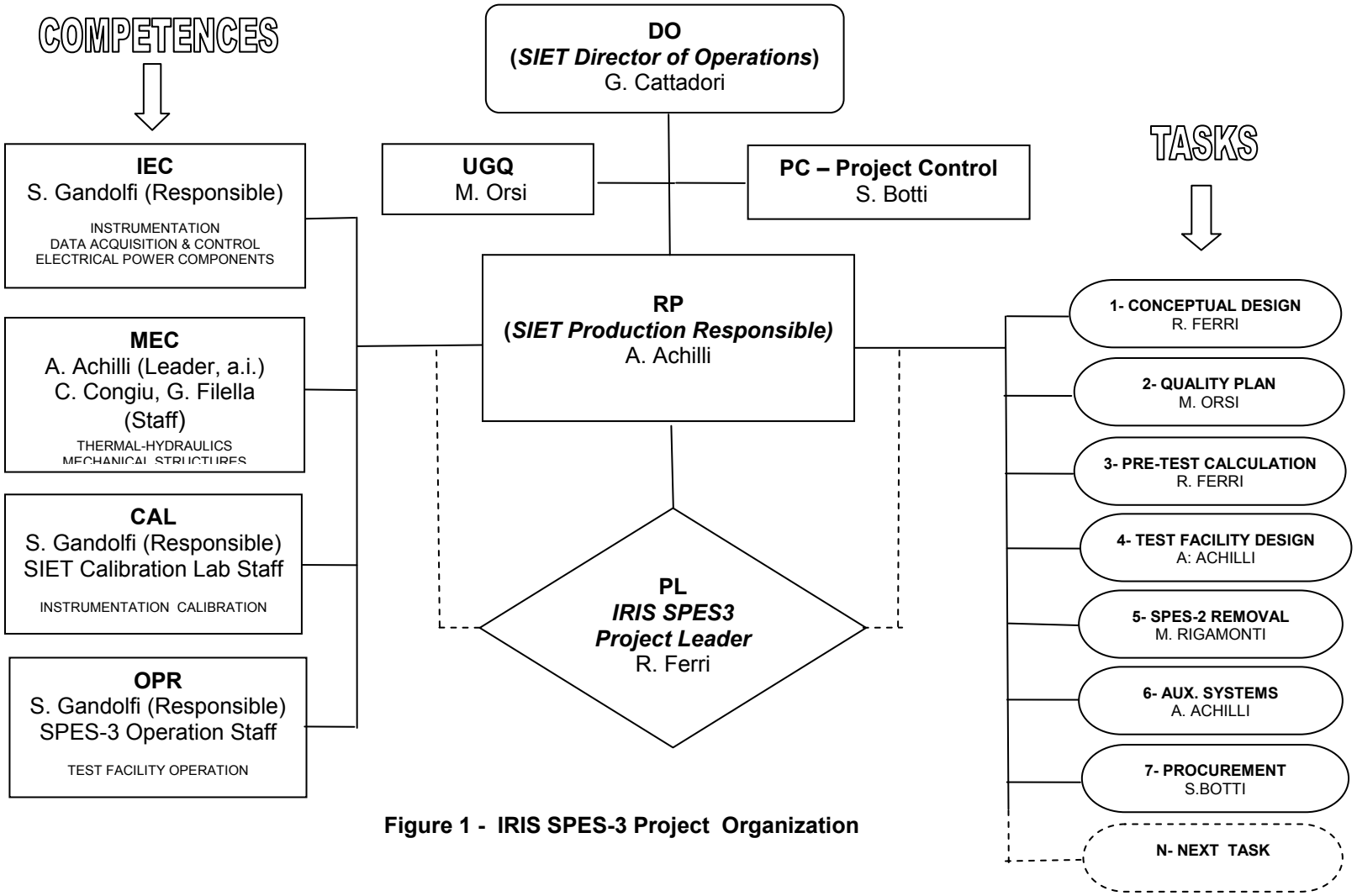

Figure 1 - IRIS SPES-3 Project Organization

ATTACHMENT 1

ISO 9001:2000 DNV CERTIFICATE FOR SIET COMPANY

DET NORSKE VERITAS

QUALITY MANAGEMENT SYSTEM CERTIFICATE

Certificato No. / Certificate No. ***CERT-17640-2006-AQ-MIL-SINCERT***

Si attesta che / This certifies that

IL SISTEMA DI GESTIONE PER LA QUALITÀ DI / THE QUALITY MANAGEMENT SYSTEM OF

SIET S.p.A.

Via Nino Bixio, 27 - 29100 Piacenza (PC) - Italy

È CONFORME AI REQUISITI DELLA NORMA PER I SISTEMI DI GESTIONE PER LA QUALITÀ
CONFORMS TO THE QUALITY MANAGEMENT SYSTEMS STANDARD

UNI EN ISO 9001:2000 (ISO 9001:2000)

Questa certificazione è valida per il seguente campo applicativo:
This certificate is valid for the following products or services:

(Ulteriori chiarimenti riguardanti lo scopo e l'applicabilità dei requisiti della normativa si possono ottenere consultando l'organizzazione certificata)
(Further clarifications regarding the scope and the applicability of the requirements of the standard(s) may be obtained by consulting the certified organization)

Erogazione di servizi di taratura in sede e presso il cliente, di strumenti per la misura di pressione, temperatura, portata e velocità di fluidi, energia termica, umidità, massa, densità e viscosità di fluidi, tempo, forza e coppia, grandezze elettriche, dimensionali ed acustiche. Erogazione di servizi di prove termo-fluidodinamiche e meccaniche su componenti/sistemi di impianti di produzione dell'energia, di processo e di distribuzione dei fluidi.
Progettazione e realizzazione degli impianti per l'esecuzione delle suddette prove

Service provision of calibration both in house and on site of instruments for measurements of pressure, temperature, fluid flow-rate and velocity, heat, humidity, mass, fluid density and viscosity, time, force and torque, electrical parameters, length, acoustic parameters. Service provision of thermo fluid-dynamic and mechanical testing on components/systems of power plants, process plants and fluid distribution plants.
Design and construction of test facilities for the conduction of above mentioned testing

Luogo e data
Place and date
Agrate Brianza, (MI) 2006-08-04

Lead Auditor: ALBERTO MORO

Settore EA: 35 - 18

SINCERT

per l'Organismo di Certificazione
for the Accredited Unit
Det Norske Veritas Italia S.r.l.

Vittore Marangon
Management Representative

La validità del presente certificato è subordinata a sorveglianza periodica (ogni 6, 9 o 12 mesi) e al riesame completo del sistema con periodicità triennale
The validity of this certificate is subject to periodical audits (every 6, 9 or 12 months) and the complete re-assessment of the system every three years

ATTACHMENT 2

SIT ACCREDITATION CERTIFICATE OF SIET CALIBRATION LABORATORY

SIT

SERVIZIO DI TARATURA IN ITALIA

ATTESTATO DI ACCREDITAMENTO

Centro di taratura n. 096

Il Responsabile della Segreteria Centrale del SIT attesta che il laboratorio metrologico della ditta

SIET S.p.A.
Sede: Via Nino Bixio, 27
29100 PIACENZA

è accreditato quale Centro di taratura SIT per le grandezze, i campi e le incertezze di misura riportati nella tabella allegata al certificato di accreditamento. Il laboratorio accreditato è conforme ai requisiti della norma UNI CEI EN ISO/IEC 17025:2005.

Il presente attestato è valido dal 09 Maggio 2007 al 14 Marzo 2009.

Torino, 09 Maggio 2007

Il Responsabile della Segreteria Centrale del SIT

(Dott. Ing. M. Mosca)

Mario Mosca

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated 18 June 2005).

ATTACHMENT 3

CROSS REFERENCE AMONG THE SIET QUALITY MANUAL SECTIONS AND THE REFERENCE STANDARD

MQ SIET Section		Title	Cross reference			
			10CFR50 App. 'B'	NQA-1	ISO 9001:2000	ISO IEC 17025:2005
0		**FOREWORD**		**I -** 1	**-**	**-**
0.1		SIET SpA description			0.1	-
0.2		Factory processes description			0.2	-
0.3		Quality system management description	**I**		0.3	-
0.4		Agreement with other factory management system	**I**		0.4	-
1		**Scope and field of application**		I - 2	1	**1**
1.1		Scope	**I**		1.1	
1.2		Field of application			1.2	
2		**REFERENCE DOCUMENT**			**2**	**2**
2.1		Standards			-	-
2.2		Documents			-	-
	2.2.1	Internal documents				
	2.2.2	External documents				
2.3		Law				
2.4		Priority				
3		**TERMS AND DEFINITION**		**I – 4, III**	**3**	**3**
4		**QUALITY SYSTEM MANAGEMENT**	**II**	**I** - 3	**4**	**4**
4.1		General requirements	**II**	**II**	4.1	4.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 4.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4
4.2		Documents requirements	**II**	**II** 5	4.2	4.2.2, 4.2.3, 4.2.4, 4.3.1
	4.2.1	General	**V**		4.2.1	4.2.2, 4.2.3, 4.3.1
	4.2.2	Documents	**V, XVII**	**II** - 17	4.2.2	4.2.2, 4.2.3, 4.2.4
	4.2.3	Documents control management	**VI, XVII**	II 6	4.2.3	4.3
	4.2.4	Documents distribution	**VI, XVII**	II 6	4.2.4	4.3.1, 4.12

MQ SIET Section		Title	Cross reference			
			10CFR50 App. 'B'	NQA-1	ISO 9001:2000	ISO IEC 17025:2005
5		**MANAGEMENET RESPONSABILITY**			**5**	**-**
5.1		Management commitments	**I**	**II** - 2	5.1	4.2.2, 4.2.3
					5.1 a)	4.1.2, 4.1.6
					5.1 b)	4.2.2
					5.1 c)	4.2.2
					5.1 d)	4.15
					5.1 e)	4.1.5
5.2		Customer focus			5.2	4.4.1
5.3		Quality Policy	**II**	**II** - 2	5.3	4.2.2
5.4		Quality system planning	**II**	**II** - 2	5.4	
5.5		Organization, responsibility communication	**I**	**II** - 1	5.5	
	5.5.1	Organization structure	**I**	**II** - 1	5.5.1	4.1.5 a), f), h)
	5.5.2	Job and responsibility	**I**		5.5.2	4.1.5 i)
	5.5.3	Communication			5.5.3	4.1.6
5.6		Management review	**II**	**II** - 2	5.6	
	5.6.1	Forward	**II**		5.6.1	4.15
	5.6.2	Input	**II**		5.6.2	4.15
	5.6.3	Output	**II**		5.6.3	4.15
6		**RESOURSE MANAGEMENT**	**I**		**6**	
6.1		Provision of resources			6.1	
6.2		Human resources		**2S -1** - 1	6.2	
	6.2.1	Personnel requirements and qualification		**2S-1 –** 2, 2S-4	6.2.1	5.2.1
	6.2.2	Personnel training, competence and knowledge		**2S -1 –** 2 2S-4	6.2.2	5.2.1, 5.2.2, 5.5.2
6.3		Infrastructure			6.3	
6.4		Work environment			6.4	5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5
7		**PRODUCT REALIZATION**			7	
7.1		Planning of product realization and processes management	**II, XIV**	II – 2, 14	7.1	5.1

MQ SIET Section		Title	Cross reference			
			10CFR50 App. 'B'	NQA-1	ISO 9001:2000	ISO IEC 17025:2005
	7.1.1	Project activation	**II**		7.1 a) - 7.1 b)	4.2.2, 4.1.5 a), 4.2.1, 4.2.3
	7.1.2	Project management	**II, XIV**		7.1 c); 7.1 d)	5.4, 5.9; 4.1, 5.4, 5.9
7.2		Customer related processes		II - 4	7.2	
	7.2.1	Identification of customer requirements			7.2.1	4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 5.4, 5.9, 5.10
	7.2.2, 7.2.3	Evaluating and communication of product and service requirements; Review of product and service requirement			7.2.2	4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 5.4, 5.9, 5.10
	7.2.4	Communication with the customer			7.2.3	4.4.2, 4.4.4, 4.5, 4.7, 4.8
7.3		Design control	**III**	II - 3	7.3	5, 5.4, 5.9
	7.3.1, 7.3.2	Generality, planning and development of design	**III**		7.3.1	
	7.3.3	Design input	**III**		7.3.2	
	7.3.4	Design output	**III**		7.3.3	
	7.3.5	Design review	**III**		7.3.4	
	7.3.5	Design verification	**III**		7.3.5	
	7.3.6	Design validation	**III**		7.3.6	
	7.3.7	Design modify	**III**		7.3.7	
7.4		Purchasing	**IV**	II – 7, 8	7.4	4.6
	7.4.1	Purchasing process	**IV**		7.4.1	4.6.1, 4.6.2, 4.6.4
	7.4.2, 7.4.3	Suppliers qualification, Purchase order process	**IV**		7.4.2	4.6.3
	7.4.4	Purchasing product and material verification	**VII**	II - 7	7.4.3	4.6.2
7.5		Production process	**IX, XIV**	Ii - 9	7.5	
	7.5.1, 7.5.2: 7.5.2.1, 7.5.2.2, 7.5.2.3, 7.5.2.4, 7.5.2.5, 7.5.2.6, 7.5.2.7, 7.5.2.8, 7.5.2.9, 7.5.2.10	ISO 17025 SECTION 5 - REQUIREMENTS	**IX, X, XI**		7.5.1	5.1, 5.2, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10

MQ SIET Section		Title	Cross reference			
			10CFR50 App. 'B'	NQA-1	ISO 9001:2000	ISO IEC 17025:2005
	7.5.2, 7.5.2.4	Process control	**IX**	II – 9, 14	7.5.2	5.2.5, 5.4.2, 5.4.5
	7.5.3	Identification and traceability	**VIII**	II - 8	7.5.3	5.8.2
	7.5.4	Customer product control			7.5.4	4.1.5 c), 5.8
	7.5.5	Storage product management	**VIII, XIII**	II - 13	7.5.5	4.6.1, 4.12, 5.8, 5.10
7.6		Inspection, measurement and test equipment	**X, XII**	II - 12	7.6	5.4, 5.5
8		**MEASUREMENT ANALISYS AND IMPROVEMENT**				
8.1		Forward			8.1	4.10, 5.4, 5.9
8.2		Management system monitoring and measurement	**X, XVII**		8.2	
	8.2.1	Customer satisfaction			8.2.1	4.10, 4.8
	8.2.2	Internal audit	**XVIII**	II – 18, **2S-3**	8.2.2	4.11.5, 4.14
	8.2.3	Processes monitoring and measurement	**X, XVII**	II – 10, 11	8.2.3	4.11.5, 4.14, 5.9
	8.2.4	Product and services monitoring and measurement	**X, XI, XVII**	II 10, 11	8.2.4	4.5, 4.6, 4.9, 5.5.2, 5.5.9, 5.8, 5.8.3, 5.8.4, 5.9
8.3		Control of non-conforming product or service	**XV**	II - 15	8.3	4.9
8.4		Analysis of quality information	**XVI**	II - 11	8.4	4.10, 5.9
8.5		Improvement	**XVI**	II - 11	8.5	4.10
	8.5.1	Continual improvement	**XVI**	II - 11	8.5.1	4.10, 4.12
	8.5.2	Corrective action	**XVI**	II - 16	8.5.2	4.11, 4.12
	8.5.3	Preventive action	**II**	II - 11	8.5.3	4.9, 4.11, 4.12

ATTACHMENT 4

SIET ORGANIZATION CHART