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### REVISION HISTORY (Cont'd)

04	<p>Consolidated PCER update:</p> <ul style="list-style-type: none"> <li>- References listed under each numbered section or sub-section heading numbered [Ref-1], [Ref-2], [Ref-3], etc</li> <li>- Sub-chapter 2.1: Note added below figure in §2.2 stating that the NII was replaced by the ONR in April 2011.</li> <li>- Minor formatting and editorial changes</li> <li>- Additional information (on non-conformances) included in Sub-chapter 2.2 sections 2.1.9 and 2.1.10 (previously sections 2.1.8 and 2.1.9)</li> <li>- Alignment of structure of EDF and AREVA Management Systems in section 2.1.7 (moved from previous Sub-chapter 2.2 §2.2.2.1.1.2 and subsequent sections renumbered), and in section 2.2</li> <li>- Additional information on EDF and AREVA Management Systems included in Sub-chapter 2.2 §2.2.1.1, §2.2.1.1.1, §2.2.1.1.2, §2.2.2.1.3</li> </ul>	17.05.2012
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**SUB-CHAPTER 2.1 – PROJECT ORGANISATION**

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## 1. INTRODUCTION

A detailed description of the whole UK EPR project organisation requires that the organisational structure, interfaces, and responsibilities be clearly defined for the different phases, from design licensing through to plant operation.

For the present submission, the project organisation is focused on the scope of the GDA process. The post-GDA organisation can only be fully defined following a successful Generic Design Assessment, and will depend on the partnerships established for the future project phases, in particular the plant owner.

This section therefore outlines:

- the organisation for GDA project management;
- the main organisational arrangements foreseen to control the construction of a new plant in accordance with the applicable standards and regulations.

## 2. GDA PROJECT MANAGEMENT

### 2.1. SUMMARY

A joint project team has been established by co-applicants EDF and AREVA to manage the UK EPR GDA Project.

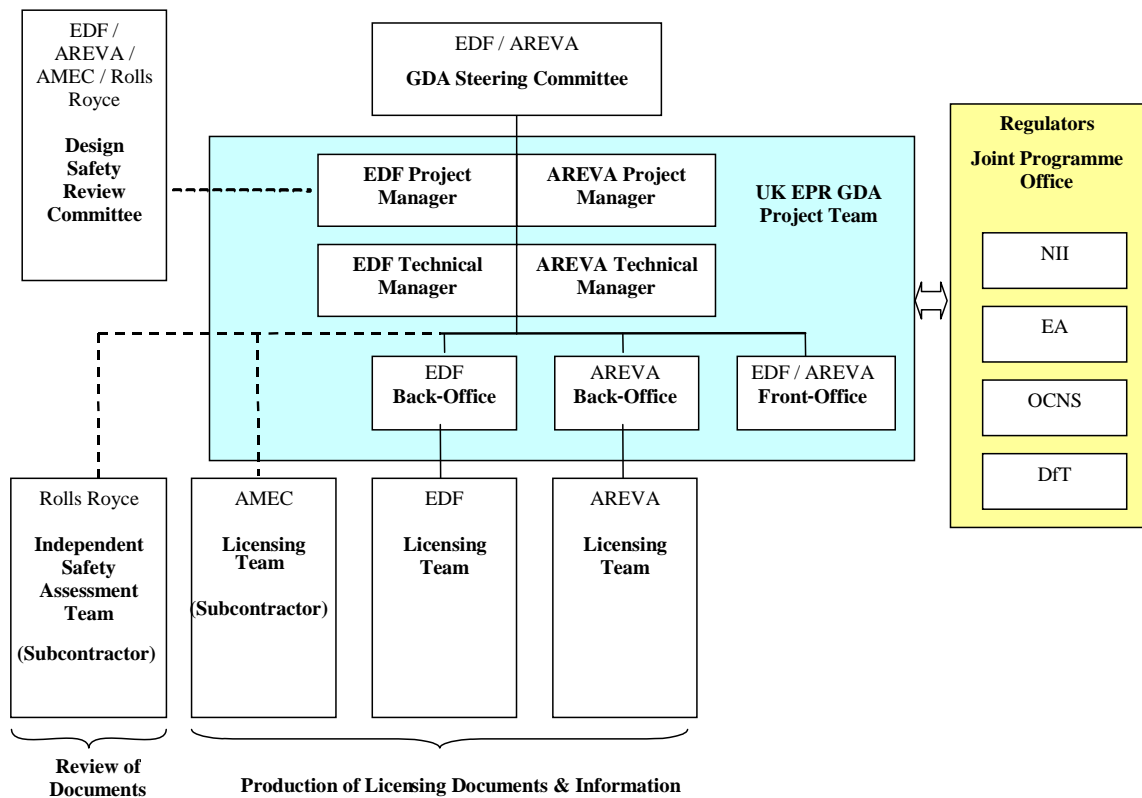
The Project uses the services of licensing teams drawn from the engineering organisations of AREVA, EDF and its subcontractor AMEC for the design activities and production of the licensing documents and information submitted to HSE and EA for the Generic Design Assessment of the EPR in the UK.

The main areas of technical responsibility of the three companies involved in the production of the licensing documents are as follows:

- **AREVA:** Nuclear Steam Supply System (NSSS) design and Balance of Nuclear Island (BNI) design;
- **EDF:** design of Balance of Nuclear Island (BNI), Conventional Island (CI), Balance of Plant (BOP) and overall design integration as well as plant operational considerations;
- **AMEC:** provision of technical support relative to UK practices (the EPR design is assessed against UK regulations).

**2.2. UK EPR GDA PROJECT**

The UK EPR GDA Project organisation and interfaces with external organisations are shown below:



Note: the NII was replaced by the Office of Nuclear Regulation (ONR) in April 2011.

The activities for the Generic Design Assessment of the EPR are carried out under the leadership of the joint UK EPR GDA Project Team comprised of the joint AREVA / EDF GDA Project Front Office based in the UK, and the AREVA and EDF Project Back Offices based in France, supported by the licensing teams from AREVA, EDF and their subcontractors.

Project Managers, who have been appointed by their respective co-applicant organisations AREVA and EDF, lead the UK EPR GDA Project Team and report to the GDA Steering Committee composed of EDF and AREVA senior management. The Project Managers are responsible for achieving the project objectives set by the GDA Steering Committee in terms of scope, schedule, quality and cost as well as the organisation and delivery of submissions and interfaces with the UK Regulators to obtain statements of acceptance for the UK EPR design.

The GDA Steering Committee has responsibility for governance over the GDA Project and also acts as an arbitration board for the joint Project if necessary.

UK EPR GDA Technical Managers are nominated from AREVA and EDF and report to their respective Project Managers. They are responsible for the technical coordination of the GDA work packages.

The joint GDA Project team members are geographically located in the Project Front Office and Back Offices. The staffing levels and division of roles and responsibilities between the Front Office and the Back Offices are adjusted in accordance with the GDA Project needs. The GDA Project Front Office provides a common UK base office for EDF and AREVA UK-based members of the GDA Project team.

The GDA Project team members in the Front and Back Offices ensure the day to day contact between the Project and the UK Regulators and ensure the management of formal and informal exchanges with the UK Regulators according to agreed interface processes. They support the Project through project administrative and control activities and through coordination support for the production of documents and information performed by the licensing teams, in respect of established quality management arrangements.

The Licensing teams within the EDF, AREVA and AMEC engineering organisations are responsible for the production of licensing documents and information in accordance with the Project requirements and with the respective Quality and Environmental (Q&E) Management systems within each organisation.

AMEC is a subcontractor of EDF, providing project and engineering services in support of the GDA Project.

An Independent Nuclear Safety Assessor (INSA), Rolls Royce Marine (or other suitable organisation for specific topics), provides independent review of specific submission documents, prior to their submission to the UK Regulators, which address safety case information not previously submitted and safety significant design changes depending on their categorisation. The INSA issues its recommendations in a formal report to the Project.

A Design Safety Review Committee (DSRC) composed of EDF, AREVA, AMEC and Rolls Royce independent senior level technical experts, is responsible for advising the Project on issues such as how to take INSA recommendations into account or recommendations on any safety significant issues. In all cases, final decisions are made by the Project Managers or, if necessary, by the Steering Committee.

In order to keep the UK EPR design as close as possible to the Flamanville 3 (FA3) EPR design (reference plant), any design change originating from the FA3 EPR Project or from interactions with UK regulators is dealt with by a UK EPR Design Change Committee (DCC), made up of the UK EPR Project Managers and Project Technical Managers and other technical experts. Depending on the DCC decision and of the safety significance of the change, an INSA review may be requested as well as the advice of the DSRC.

### **2.3. ENGINEERING AND PROJECT SUPPORT FOR THE GDA**

Engineering and project support to the UK EPR GDA Project is provided by the engineering organisations of EDF, AREVA and AMEC licensing teams and back offices.

In addition, further supplier organisations are contracted by EDF or AREVA for engineering and project support, as needed. EDF or AREVA leads on establishing the contract and its implementation in accordance with the requirements of its own management system.



### 2.3.1. EDF support for the GDA Project

The **Nuclear Engineering Division (DIN)** of EDF provides the engineering and project support for the UK EPR GDA Project.

Within EDF Generation Department (DPI), the Nuclear Engineering Division (DIN) covers the activities of plant design, construction, commissioning and decommissioning of installations.

The Nuclear Engineering Division consists of six Departments:

- Nuclear Department (**CNEN**) for nuclear design engineering;
- Electromechanical Department (**CNEPE**) for electricity production engineering;
- Operating Plant Services Department (**CIPN**) for nuclear base engineering;
- Deconstruction, Waste Management and Environmental Engineering Department (**CIDEN**) for decommissioning and environmental engineering;
- Basic Design Department (**SEPTEN**) for thermal and nuclear engineering and projects;
- Expertise and Inspection Department for Manufacturing and Operation (**CEIDRE**) for inspection and testing appraisal.

CNEN, CNEPE, CIDEN, CEIDRE and SEPTEN Departments are involved in the pre-licensing phase of the UK EPR Project. Their location and scope of activities are summarised hereafter.

**CNEN**, located in MONTROUGE, carries out the following tasks:

- Project management of future projects, including the UK EPR;
- Design engineering: EPR implementation studies on the nuclear island;
- Project management and maintenance of engineering Computer-Assisted Design (CAD) tools and Electronic Document Management software (GED) for the whole of the DPI and for customers outside the DPI;
- Administration of the EDF part of the UK EPR GDA Project Front Office.

**CNEPE**, located in TOURS, carries out activities in the following areas:

- Design studies for the conventional island, pumping station and EPR site buildings;
- Support for operators of all nuclear units with respect of the conventional island and pumping station.

**CIDEN**, located in VILLEURBANNE, is responsible for:

- Dismantling of shutdown nuclear reactors;
- Defining the nuclear waste management strategy for all waste resulting from dismantling, and the design and implementation of waste treatment installations;

- Preparing the environmental files required by regulations.

**CEIDRE**, located in SAINT-DENIS and AIX-EN-PROVENCE, provides:

- Technical expertise in metallurgy, electrical systems, nuclear fuel, mechanics, non-destructive testing (NDT) concerning the manufacturing, assembly and installation of equipment for Nuclear Power Plants (NPP);
- Technical expertise and laboratory testing in civil works, including participation in geology, hydrology and seismology reviews;
- Chemistry and radiochemistry requirements for system conditioning and for products used in NPPs;
- Inspection at suppliers' premises and on NPP sites with respect to regulatory and contractual requirements;
- Assistance for the definition of applicable industrial solutions to resolve technical issues arising during manufacturing, installation or operating phases;
- Conformity assessment services: CEIDRE hosts the EDF's User Inspectorate (UI) to assess the conformity of pressure equipment (nuclear and conventional) to the appropriate regulations. The UI is accredited according to the ISO 17020 Standard for inspection and is accepted by the French Safety Authority to carry out work on nuclear pressure equipment.

**SEPTEN**, located in VILLEURBANNE, has overall responsibility within EDF for the technical design philosophy and management of future plant designs, in connection with research and development. It carries out the following tasks:

- Developing future plant designs, taking account of technological monitoring, Research and Development and national and international experience feedback;
- Providing support to the engineering Departments for application of design philosophies;
- Ensuring the technical consistency of nuclear fuel products and their use in the reactors;
- Supporting international activities developed by EDF.

The interfaces between the UK EPR GDA Project Managers and the Departments described above are ensured by the designation of individuals in each Department, responsible for coordinating the engineering work performed in their Department.

### 2.3.2. AREVA support for the GDA Project

AREVA is the world's leading supplier of nuclear power equipment and services. Reactors built by the group represent 100,000 MWe of installed capacity.

The **Reactors and Services** (R&S) Business Group of AREVA is organised into six Business Units:

- **Products and Technology;**
- **New Builds;**
- **Equipment;**
- **Installed Base;**
- **Nuclear Measurements;**
- **Propulsion & Research.**

In particular, the *Products and Technology Business Unit* is responsible for "ensuring licensing and technical performance of R&S products, and providing advanced, high-performance products and necessary technologies". The *New Builds Business Unit* is responsible for "delivering new nuclear reactors, from proposal phase until commissioning and hand-over to the client".

The activities of these business units cover various types of nuclear reactor designs: Pressurised Water Reactors, Boiling Water Reactors, Fast Breeders, High/Very High Temperature Reactors and Research Reactors. They also provide various kinds of services for other reactor designs or nuclear facilities.

For new Nuclear Power Plants, depending on the customers, the supply of products covers either components for the primary circuit, the Nuclear Steam Supply System, the Nuclear Island or turnkey Nuclear Power Plants in cooperation with a turbine generator supplier and/or other contractors (EPC, civil works...).

**Engineering and Projects** (E&P), a resource organisation, has been created within AREVA with the purpose of providing the business units with design, construction and commissioning and inspection services. In addition E&P provides R&S with project management resources and develops project methods and tools at the Business Group's request.

For the UK EPR GDA Project, the AREVA project team belongs to the Products and Technology Business Unit and is supported by the E&P organisation. The interfaces between the UK EPR GDA Project and E&P described above are ensured by the designation of individuals in each department, responsible for coordinating the engineering work performed in their department.

### 2.3.3. AMEC support for the GDA Project

AMEC refers to **AMEC Nuclear Holdings Ltd (ANHL)**, which provides technical and project support to the UK EPR Project for the UK EPR Generic Design Assessment.

ANHL is the overarching organisation which covers work by subordinate Business Units including AMEC Nuclear UK Ltd. ANHL has appointed an overall Programme Director and Project Manager for the contract.

The general responsibilities for the key personnel are as follows:

- A Project Director who is accountable on behalf of ANHL for the overall project delivery and relationship management between ANHL and the UK EPR GDA Project, and is responsible for:
  - Receiving all work requests from the UK EPR GDA Project and, after consultation, allocating the work to the appropriate business unit;
  - Review and approval and maintenance of the Quality Management Plan;
  - Ensuring coordination of the work on behalf of ANHL;
  - Monthly project reporting and invoicing;
  - Ensuring the production of collated project accounts for the Project, using information provided by the business units;
  - The management of generic project issues;
- Individual Project Managers, responsible for ensuring delivery of work packages involving their areas under the contract, and compliance with each organisation's procedures.

AMEC has fifty years experience of working on UK civil nuclear sites, in all phases of the plant lifecycle from design through construction and maintenance to decommissioning. AMEC's UK Nuclear operations are undertaken by AMEC Nuclear Holdings Limited, The UK businesses as a whole employ some 13,000 people.

Programme, project management, and technical expertise is provided by AMEC Nuclear UK Ltd.

From the headquarters of AMEC's Nuclear business in Knutsford, Cheshire and further UK offices situated throughout the UK, AMEC provides a single multi-disciplinary organisation, capable of providing the wide range of skills necessary for the successful completion of projects. Adjacent to the Birchwood Park office in Warrington are fully equipped laboratories and workshops for physical and chemical testing and analysis, staffed by highly experienced consultant scientists and engineers.

### **3. ORGANISATION POST-GDA**

As explained in the Introduction, the post-GDA organisation will depend on the plant owner, which could be any one of a number of established utilities.

It is assumed that the main responsibilities for the post-GDA phase of the UK EPR project can be split into the following functions:

- The **Plant owner (Operator)** will have safety and environmental responsibility in relation to plant operation, wastes and effluent management. The plant owner will be responsible for setting up the plant operating organisation and the interface arrangements with the architect engineer and the suppliers. The owner will also be responsible for establishing arrangements for maintaining integrity of the design and for maintaining a level of detailed and specialised knowledge necessary to achieve safe operation of the plant over its lifetime.

- The Operator will have responsibility for applying for the nuclear site license for a specific UK EPR plant and for obtaining necessary environmental permits for plant construction and operation. The operator will also be responsible for ensuring compliance with the nuclear site license conditions and other statutory safety and environmental obligations, over the plant lifetime.
- The Architect Engineer will provide engineering and project management support to the Operator. The specific role and responsibilities assigned to the Architect Engineer will be dependent on the Operator's in-house capability.
- Suppliers are organised to meet the requirements of their contractor, in particular those requiring independent verification of engineering inputs/outputs by a competent person who is different from the originator. Third party independent review will be required for some activities involved in manufacturing and installation of equipment.

AREVA and EDF have arrangements in place to facilitate knowledge transfer and to fully support the plant owner and its organisation in all phases of nuclear new build projects. Data hand-over and comprehensive training programmes constitute the main elements of knowledge transfer which are discussed and agreed between the vendor and future plant owner during contract negotiations. The scope of the knowledge transfer package takes into account the scope of delivery, and the knowledge and experience of the involved plant owner (operator) and architect engineer.

In case open items remain at the end of the GDA, EDF and AREVA will apply processes to address these open items during the nuclear site licensing process including appropriate knowledge transfer to ensure the operator is able to close open items during that phase.

Detailed arrangements for knowledge transfer must account for a number of operator specific factors and therefore for the UK EPR may only be fully defined in later licensing phases.

**SUB-CHAPTER 2.2 – MANAGEMENT SYSTEM**

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## 1. INTRODUCTION

A detailed description of the overall Management System for the UK EPR Project requires that the partnerships and interfaces be clearly defined for the different phases, from design licensing through to plant operation.

A Management System is deployed to support the achievement of the UK EPR Project objectives in line with the quality commitments and in compliance with the GDA co-applicant's policies, directives and objectives as well as internal codes and standards, and national regulatory and statutory requirements.

For the present submission, the Project has focused on the quality programme needed to manage the design activities supporting the Generic Design Assessment (GDA) process.

This section outlines:

- the quality programme for the GDA Project;
- the Management Systems of the supporting organisations.

## 2. MANAGEMENT SYSTEM FOR THE UK EPR PROJECT

### 2.1. QUALITY PROGRAMME FOR THE GDA PROJECT

#### 2.1.1. Management documentation

The quality processes applicable to the GDA Project are monitored by a QA plan [Ref-1] considered as a top level document for the GDA Project, supplemented by specific Project Procedures and Instructions [Ref-2].

The QA plan describes the planned project activities and specific project arrangements to deliver detailed safety, security and environmental submissions, and responses to Technical Queries, Regulatory Observations, Regulatory Issues, and other queries to the UK Regulators, and responses to Public Comments.

The rules for the management of processes and procedures described in the management documentation of each co-applicant and their subcontractors remain applicable for the GDA Project as long as they are not amended or superseded by the project specific quality programme. The GDA quality programme has been developed in compliance with the UK Safety Assessment Principles for Nuclear Facilities [Ref-3].

### **2.1.2. Document and data control**

Specific control procedures are established by the Project and made available to the members of the project and licensing teams, in particular for Commercially Confidential Information (CCI), for Sensitive Nuclear Information (SNI), and for monitoring internal and external exchanges.

All reports, documents and data issued by the licensing team of each co-applicant, AREVA, EDF, and their subcontractors, are managed through their own IT document management systems, ensuring that documents and data are properly filed, traceable, retrievable and protected against outside intrusion.

All subcontractor reports, documents and information are reviewed by both co-applicants.

All documents are written in English, circulated within the co-applicant and subcontractor organisations for review (adequacy, consistency and completeness) by competent individuals, and approved by the organisation of the writer before endorsement by the Project, according to the applicable quality programme.

Final submission documents are assembled, controlled and transmitted to the UK Regulators by the Project according to the requirements of the Joint Project Office Interface Protocol [Ref-1].

The UK EPR GDA submission documents are recorded in a Submission Master List reflecting the UK EPR GDA submission structure.

During GDA Project execution, a Project SharePoint is used to record, share and exchange information between the co-applicant organisations, subcontractors and the Regulators.

### **2.1.3. Records**

Throughout the GDA process, all formal correspondence with the UK Regulators, responses to public comments, UK EPR GDA reference design documents and design change information, and GDA project procedures are recorded by the Project on the GDA Project SharePoint according to applicable GDA procedures.

GDA records are registered and filed by each co-applicant in accordance with their Management System procedures; at the latest by GDA Project close-out.

GDA records are committed to the lifetime records. They are preserved and retained, according to prescribed retention schedules, in the original or electronic form in both co-applicant organisations in accordance with the provisions of their Management System procedures and UK requirements.

### **2.1.4. Design control**

Technical reports and data are prepared by AREVA, EDF and subcontractor licensing teams, according to each company's Management System; in particular for any internal review by competent persons other than the originator.

A design file is kept for each technical report produced by the licensing teams and typically includes work specification, identification of responsibilities, input data references, codes and calculation references, modification and verification data as well as external review data.



The technical reports undergo technical and language review by competent persons from the co-applicant organisations, and subcontractor if required, to check the accuracy, consistency and compliance with the project requirements.

Specific submission documents undergo an independent review according to the process described in section 2.1.5.

All final status documents are assembled by the Project into the submission, which is then issued to the UK Regulators, following approval by the Project Managers.

Throughout this process the Project uses a document management register for tracking the version numbers of all submission documents and supporting documents which are distributed to the Regulators during the GDA process.

### **2.1.5. Independent reviews**

For the detailed SSER (PCSR and PCER) and later submissions, specific studies made for the UK EPR GDA Project are reviewed with respect to the methodology adopted, the completeness of the safety justification, and the validity of the results.

An Independent Nuclear Safety Assessor (INSA), Rolls Royce Marine or other suitable organisation, provides independent review of specific safety case submission documents prior to their submission to the UK Regulators. The INSA issues its recommendations in a formal report to the Project.

The conclusions of these reviews are discussed with the UK EPR GDA Project team and are presented to the Design Safety Review Committee (DSRC) composed of senior safety experts from EDF, AREVA, AMEC and Rolls Royce, each with broad experience in nuclear safety but who are not directly involved in the UK EPR GDA Project.

The DSRC is responsible for advising the Project on issues such as how to take account of INSA recommendations or recommendations on any safety significant issues. In all cases, final decisions are made by the Project Managers or, if necessary, by the Steering Committee. These decisions are recorded by the Project.

An independent peer review of PCER chapters is performed for the environmental submissions.

Following the end of 2008 design freeze (see section 2.1.6 below), changes related to nuclear safety, environment or security, which have a significant impact on the GDA submission are subject to an independent review unless other adequate review justification is provided.

### **2.1.6. Design change management process**

A UK EPR Reference Design Configuration has been established for the UK EPR GDA. This reference is based on the Flamanville 3 EPR design, discussed and developed over a period of 15 years by EDF, AREVA and the French and German Regulators.

A design freeze has been established at the end of 2008, corresponding to the Flamanville 3 reference plant design status at that time. The basis for this current issue of the SSER is the end of 2008 design freeze plus a small number of design changes as discussed below.

A process has been established by the UK EPR GDA Project for the GDA phase in order to manage all permanent changes affecting the functional design, layout design and technical specifications of equipment.

Changes to the UK EPR Reference Design may result from different sources:

- Flamanville 3 design changes (systematically reviewed for applicability to UK EPR), which include experience feedback from both EDF and international NPPs and also from the Technical Codes updates. It is noted that EDF and AREVA participate in the improvement of the technical codes (RCC and ETC) implemented in the EPR design through their involvement in AFCEN (French association for codes and standards).
- UK EPR specific changes proposed by AREVA and EDF based on feedback from other EPR construction projects.
- UK EPR specific changes resulting from interactions with the UK Regulators and from alignment with UK national standards and industrial safety policies.

Whatever the origin of the change (e.g. Flamanville 3 or UK specific), design changes are categorised in the UK EPR process by the co-applicant project teams according to their impact on the GDA submission:

- (A1): changes related to nuclear safety, environment or security, which have (or potentially have) a significant impact on the GDA submission;
- (A2): changes related to nuclear safety, environment or security, but having minor impact with regard to the GDA submission;
- (B): changes not related to nuclear safety, environment or security.

Based on design changes accepted for implementation on Flamanville 3, other EPR construction project feedback and on interactions with the UK Regulators, design change requests are issued by the licensing or project teams to the UK EPR Design Change Committee (DCC) for a decision on their applicability to the UK EPR.

The Design Change Committee (DCC) established for the UK EPR GDA Project decides on the applicability of the change to the UK EPR design, and also on the categorisation proposed.

The UK Regulators are informed of design change proposals identified for implementation during the GDA phase, since these changes may impact the on-going assessment. They are regularly provided with an overview status of planned submission packages for changes implemented within GDA. The co-applicants also maintain a tracking list of all changes.

The co-applicants have arrangements in place for transferring open design changes not fully implemented during the GDA phase to future licensing phases.

Subsequently, during construction and commissioning phases, a similar process will be developed to make decisions on design changes and to identify potential impact on licensing documents.

Throughout the operational life of the plant, Periodic Safety Reviews are performed to assess the safety performance of the plant and to ensure that the safety case continues to provide an adequate justification for the operational safety of the plant. These reviews are the opportunity to check for revisions of referential codes and standards and to make decisions on the implementation of resulting changes.

### **2.1.7. Safety culture**

The development of a strong Safety Culture throughout the organisation is essential to successful operations. The EDF, AREVA and AMEC Management Systems contribute to fostering and supporting a strong Safety Culture by:

- ensuring a common understanding of the key aspects of Safety Culture within the organisation;
- providing the means by which the organisation supports individuals and teams in carrying out their tasks safely and successfully, taking into account the interaction between individuals, technology and the organisation;
- reinforcing a learning and questioning attitude at all levels of the organisation; and
- providing the means by which the organisation continually seeks to develop and improve its Safety Culture.

The development of the Safety Culture within the organisation may be performed through:

- the presentation of the Quality Policy to all employees;
- systematic training offered to each new employee;
- specific refresher training on Safety Culture to employees during the year;
- kick-off-meetings with suppliers; and
- demonstration of Safety Culture through flyers, presentations and posters.

The deployment of Safety Culture within the organisation is periodically assessed.

### **2.1.8. Suitably Qualified and Experienced Personnel**

The co-applicant organisations AREVA and EDF, subcontractors AMEC and Rolls Royce and further subcontractors if any, ensure that Suitably Qualified and Experienced Personnel are allocated to the UK EPR GDA Project in accordance with the individual Management Systems of each member company.

The UK EPR GDA Project Managers are responsible for recruiting the human resources required to manage the Project and for engaging the licensing team personnel within their respective organisations to perform the technical analysis and production of submission documents in accordance with the requirements of the UK EPR GDA Project.

Assignment and training of staff are carried out as and when needed, in accordance with co-applicant and subcontractor processes, taking into account the project requirements defined by the Project Manager.

A quality correspondent from the quality department of each of the co-applicant organisations is assigned for the implementation and maintenance of the Management System for the UK EPR GDA Project. They are supported by the quality departments within each co-applicant organisation.

### **2.1.9. Control of non-conformances**

The Management System within each co-applicant organisation is designed to ensure that non-conforming products are identified, recorded and evaluated, and that processes are put in place to repair and prevent any future occurrence.

The Project Managers of both co-applicant organisations are notified in writing of any non-conformance and the organisation most directly concerned initiates the NCR process in accordance with the provisions of their Management System.

In order to facilitate learning across the organisation and projects, AREVA and EDF determine, during the application of the non-conformance process, whether the non-conformance is limited to a specific case or whether it could have affected other processes, products or projects, through dedicated cause and impact analyses.

### **2.1.10. Internal audits**

AREVA and EDF liaise to organise internal audits at the joint GDA Project level.

In addition, AREVA and EDF may perform audits internal to their organisations as they deem necessary.

Internal audits are performed to verify the Project's compliance with all aspects of the UK regulatory requirements and to assess the effectiveness of the co-applicant and subcontractor Management Systems to deliver work.

Internal audits are managed within each organisation in accordance with the requirements of its own Management System. Audits are planned and performed by qualified auditors who have no direct responsibility in the areas being audited. Follow-up actions, including re-audits of the deficient areas, are initiated where required.

The findings raised during audits are managed in the same way as non-conformances.

## **2.2. MANAGEMENT SYSTEM OF THE SUPPORTING ORGANISATIONS**

### **2.2.1. Overview of the Management System at EDF**

EDF and its subcontractors take steps to ensure that the structures, plant and equipment of the nuclear power stations are designed, implemented and operated in accordance with national laws, regulations, and best practices, and that they are of the quality required to perform satisfactorily in service.

To control quality and safety throughout the different phases of construction of a Nuclear Power Plant (NPP), EDF is used to preparing the preliminary designs itself, assigning to the Constructors the detailed design and implementation of the power station structures and equipment.

EDF project management ensures that appropriate technical and administrative requirements are included in the contracts with the subcontractors, consistent with the applicable standards and regulations; in particular, those associated with safety related products and activities performed either by the subcontractor itself or by its own subcontractors.

EDF supervises the work of subcontractors, both at the design stage and also during the manufacturing, assembly and installation of equipment, and building of civil structures.

EDF has arrangements to ensure personal safety, and these include the regulatory provisions applicable to the operator of nuclear power stations, including the requirements for safety reporting to applicable Authorities.

This process has proved to be effective throughout the EDF nuclear programme, and is being applied to EDF's EPR implementation. In addition, when preparing the EPR preliminary design, EDF was able to supplement its own experience by consulting German Utilities.

Lastly, EDF has specific procedures to ensure that best practices and operational experience feedback are taken into account as part of its continuous improvement process. This enables EDF to maintain a high level of capability as an intelligent customer.

#### **2.2.1.1. Organisation of the EDF Management System**

The Management Systems are developed and put into effect at a Business Unit (BU) level (Engineering Department, Nuclear Power Plant, ...), according to policies issued at a Division level (DIN : Nuclear Engineering Division, DPN : Nuclear Generation Division ...) and BU level.

The Management Systems implement, maintain and continually improve their effectiveness in accordance with the applicable regulations, codes and standards, customer needs and EDF objectives.

Reporting to the Deputy Director of these BUs, the Quality Management organisations have the required independence and authority for maintaining the Management Systems up to date, monitoring internal audits programmes, preparing the periodical management reviews, and maintaining a follow-up process for tracking the existing or potential deficiencies up to their resolution.

##### **2.2.1.1.1. General requirements – Regulations, Codes and Standards**

The Management Systems implemented by the EDF Divisions involved in nuclear are designed to comply with the following regulations and standards:

- Order of August 10, 1984 relating to the quality of the design, construction and operation of Basic Nuclear Facilities (French Regulation consistent with IAEA 50-C-QA);
- ISO Standard 9001 : 2008 Quality Management Systems – Requirements;
- ISO Standard 14001 : 2004 Environmental Management Systems – Requirements;
- OHSAS18001:2007 - Occupational Health & Safety Management System – Requirements (BSI - British Standard Institution) for BUs involved in site construction.

It should be noted that the DIN Engineering Departments are certified to the requirements of the above ISO Standards and that all EDF BUs involved in nuclear activities are covered by the overall ISO 14001 certificate issued to the EDF Group.

#### **2.2.1.1.2. Documentation of the Management System**

The documentation of the Management Systems describes the BU organisation, authorities and responsibilities, requirements, decision making procedures, methods and expected results, evidences and records.

The Management System documentation is made available to the employees on the Business Units' intranets and includes over all Business units:

- **The Quality Policy and Objectives** detailed by the DIN and BU executive management
- **The Management System Manual**, which describes, at the BU level, the missions and architecture of the Management System. It also describes the general sequence of measures adopted by the BU to fulfil the requirements of regulations, codes and standards and to enforce the Quality Policy and Objectives.
- **The main processes**: the BUs have adopted a process approach and have identified sets of main processes which apply to all BU activities at a general level. For CNEN, the processes are identified as Operational processes, Support processes, Management processes or Basic processes.
- **Organisation notes** describing the BU functioning and coordination measures. These also include measures related to the quality programmes, improvement of quality, environment, health and safety, and management of non-conformances.
- **Procedures or instructions** providing additional information for implementing the main processes. According to the Management Systems, the procedures or instructions may be specific to a Project.

The CNEN Management System includes a Project Management System. As such, in addition to its leading role in the Project Management of nuclear projects, CNEN is responsible for issuing a Project Quality Plan (PQP), which defines the arrangements for quality management applicable to the BU involved in the Project. Each BU has the responsibility for incorporating the provisions of this PQP into its own quality management system. The Project Quality Plan may be supplemented by Design Quality Plans (DQP) for the activities related to the design and development.

#### **2.2.1.1.3. Measurement assessment and improvement**

In addition to the internal audits performed by each BU, in the context of the continuous improvement process, the BUs are regularly audited by a Divisional-level board of qualified auditors, in particular to check the effectiveness of the process implementation and the consistency of the interfaces required to ensure overall quality across the Divisions.

In particular, these various Management Systems ensure a high level of control regarding:

- **Design activities** performed by the DIN Engineering Departments. Input and output data are checked, and design verification and reviews are held by competent persons other than the authors of technical reports in order to guarantee that the design meets the applicable standards, regulations and rules, and to prevent any discrepancy once the design has been approved. Design files are kept to track the set of assumptions and decisions made to validate a design; they include the references to the calculation codes used, those being duly qualified;

- Purchasing activities jointly performed by the DIN Engineering Departments (technical requirements) and the Purchasing Division (DA). The process is based on the assessment of the capability of the suppliers to meet the EDF requirements, including those concerning safety related products. QA audits of suppliers are performed. Once a subcontractor has been selected, contracts stipulate the quality and technical scope of the supply and the relevant regulatory and Management System requirements to be cascaded down, in particular for safety related products. Contractual clauses are reinforced as needed, taking account of the feed back experience with suppliers;
- Surveillance of safety related activities, internally or at the suppliers' premises. In particular, surveillance of manufacturing is CEIDRE's specific responsibility, whereas surveillance of design activities, plant erection and equipment installation is the responsibility of any DIN Engineering Department according to its scope of activities;
- Management of non-conformances EDF pays particular attention to safety related issues, in order to be able to approve the decisions made, or to be able to report to the owner for a decision by the owner on the proposed treatment, and to permit him to report to the Authorities, where appropriate.

#### 2.2.1.2. Suitably Qualified and Experienced Personnel (SQEP)

The following measures ensure the allocation of human resources appropriate to each of the activities:

- The policy for managing key competences is developed at the company level within EDF (the SA Level). Each Division contributes to the identification of these key competences, and to the definition and implementation of the process to maintain their availability.
- There is an emphasis on succession management, at the different levels of the organisation (Division, Departments ...).
- Recruitment is carried out in response to regular assessments of Human Resource needs. It takes into consideration qualifications, training and experience, as well as specific criteria concerning competence for the job. New recruits undergo training in nuclear safety cases.
- An annual review meeting takes place between each employee and their supervisor to check their professional performance, and to define training needs in order to maintain the level of skill required for the job.
- In performing design studies, personnel do not work alone: they work as part of a technical group and thus have the benefit of the support of their colleagues and their management, in addition to having access to procedural documents and manuals.
- The Department Head is responsible for the allocation of work to skilled personnel, and for managing the priorities for the work assigned to the department.

### **2.2.2. Overview of the Management System at AREVA**

The AREVA organisation is based on the principle that the "quality assurance function" and "production function" are independent. Implementation of this principle ensures that personnel carrying out a quality assurance function have sufficient authority and organisational freedom to:

- Identify quality problems;
- Initiate, recommend or provide solutions to quality problems;
- Verify implementation of solutions;
- Ensure that further processing, delivery, installation, or use is controlled until proper resolution of a non-conformance, deficiency, or unsatisfactory condition has occurred.

Measures are established to ensure that planning of the quality management system meets AREVA general requirements and quality objectives. These measures include activities such as:

- Identification of processes, provision of production equipment, inspection and test equipment, resources and skills required to meet quality requirements;
- Definition of methods, procedures and associated documentation for design, production, installation, servicing, inspection and test;
- Up-to-date quality control, examination, inspection and test techniques;
- Identification and development of process capability to ensure product requirements and product verification requirements;
- Preparation of inspection plans;
- Establishment of acceptance criteria.

The interfaces, responsibility and authority of personnel who manage, perform and verify work affecting quality are documented.

#### **2.2.2.1. Organisation of the AREVA Management system**

The Product & Technology Business Unit has established and documented a Management System to achieve and enhance Nuclear Safety, Quality, Occupational Health and Safety, Environmental, Security and economic requirements.

This Management System implements, maintains and continually improves its effectiveness in accordance with the applicable regulations, codes and standards, customer requirements and AREVA Quality Policy and objectives.

##### **2.2.2.1.1. General requirements – Regulations, Codes and Standards**

The Management System has been developed in compliance with the following regulations, codes and standards:



#### International codes

- IAEA GS-R-3 (2006). The Management System for Facilities and Activities: Safety Requirements. Vienna, 2006 (IAEA International Atomic Energy Agency), supersedes Safety Series 50-C-Q.

#### National standards and regulations

- Order of August, 10, 1984 relative to the quality of the design, construction and operation of Basic Nuclear Facilities (French Regulation).
- KTA 1401 (06/96): General Requirements Regarding Quality Assurance; (KTA - German Nuclear Safety Standards Commission).
- 10 CFR 50 Appendix B: Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants (U.S. Regulation).
- ANSI/ASME NQA-1- 2008 Edition with 2009 Addenda: Quality Assurance Program Requirements for Nuclear Facilities (ASME – American Society of Mechanical Engineers).
- CSA N286-05: Management System Requirements for Nuclear Power Plants (CSA Standards = Canadian).
- CAN3 Z299.1: Quality Assurance Programme – Category 1 (Canadian Standards Association).

#### Other international standards

- ISO 9001:2008 Quality Management Systems – Requirements.
- ISO 14001:2004 Environmental Management Systems – Requirements with guidance for use.
- OHSAS18001:2007 - Occupational Health & Safety Management System – Requirements (BSI- British Standard Institution).

#### **2.2.2.1.2. Documentation of the Management System**

The documentation of the Management System describes its organisation, authorities and responsibilities, requirements, decision making procedures, methods and expected results, evidence and records.

The Management System documentation is made available to the employees on the organisation's intranet. The documentation describing the Management System includes:

- **The Quality Policy and Objectives** detailed by the executive management of the Business Units.
- **The Management System manual** which describes the characteristics of the organisation and its activities and the principles selected to enforce the Quality Policy. It also describes the functional interfaces with other entities within the company. The organisational documentation (including memorandum and appointment notices) complements the manual in providing the detailed description of the organisation, the assignment of responsibilities and authorities.

- **The main processes**: the Business Unit has adopted a process approach and has identified a set of main processes which apply to all Business Unit activities at a global level. The processes are identified as Management processes, Realisation processes or Support processes.
- **Quality Programmes** (including HSE Programmes) are established when needed to complement, adapt or clarify the provisions of the Management System. Quality Programmes cover either a defined scope of activities to integrate specific additional quality requirements or a particular project to fulfil specific customer requirements and expectations.
- **Procedures** provide the instructions for implementing the Management System. The hierarchy of these procedures involves:
  - the general Management System procedures providing implementing instructions on fundamental aspects of the Management System;
  - the Proposal & Project Process Manual collecting a set of standard project management procedures applicable to Large Projects;
  - project, region, local unit or subsidiary specific documents describing and detailing procedures, process descriptions and work instructions valid for those units within the Management System; and
  - external procedures which are established to transfer applicable requirements to the suppliers.

The safety significance of activities is considered in planning and implementing the Management System and any modification to it.

A graded approach for applying requirements is used to place the most emphasis on and to allocate appropriate resources to those products and/or activities that may have the greatest effect upon nuclear safety, personnel, environment, health, security, quality and economic elements.

The Management System is defined to identify the control of safety related activities and contains procedures to assess and manage the associated risks relating to the Project activities, including design, procurement, construction, commissioning as well as fabrication and testing.

These procedures are based on the complexity of the work and the safety related function of the product and / or activity.

The nuclear safety related effects of products and activities are considered in defining the requirements applicable to them. The requirements are determined by the safety significance of the products and activities such that the quality requirements of the products and activities most important to nuclear safety are the most strictly controlled, and the actions carried out to ensure this are the most extensive.

The safety class of a product is documented and approved by senior management. When applicable, the safety classification may also be designated by the customer.

**2.2.2.1.3. Measurement assessment and improvement**

Measures are established for the monitoring, measurement, analysis, and improvement of processes needed to:

- Demonstrate conformity with product requirements,
- Ensure conformity of the Management System,
- Achieve objectives,
- Continually improve the effectiveness of the Management System,
- Ensure that safety authority, customer and stakeholder needs and requirements are identified and fulfilled with the aim of enhancing their satisfaction.

**2.2.2.2. Suitably Qualified and Experienced Personnel (SQEP)**

AREVA maintains the highest level of staff capability to respond to the needs of its international clients. The company applies a fully auditable process to manage its human resources and to ensure that the capacity and capability of its personnel are fully maintained to meet company short term and long term objectives. As a designer and constructor of nuclear power plant, AREVA ensures that the skills and knowledge within its technical disciplines are continuously developed to maintain the highest standards in nuclear safety.

This process requires Department Heads to define the short term and long term resource requirements; Human Resources to identify and provide solutions to those requirements; and employees to develop the necessary skills and to achieve a suitable level of performance in company activities.

The overall process covers:

- internal and external recruitment;
- training, management and maintenance of skills and capabilities;
- measurement of staff performance and analysis of capability;
- management of staff mobility and responsibilities; and
- ensuring staff recognition.

Provisions are made by management at all levels within the organisation, to ensure that individuals are competent to perform their assigned work and that they understand the consequences for safety of their activities.

The provisions ensure, in particular, that the personnel:

- have acquired and maintain the required proficiency for their activities; and
- are trained and instilled in the objectives, content and provisions of the implementation of the Management System covering their activities.

### **2.2.3. Overview of the Business Management System at AMEC**

The AMEC Business Assurance System meets the requirements of ISO 14001:2004, ISO 9001:2008, BS OHSAS 18001:2007 and the TickIT Guide Issue 5.5. These arrangements are set out in the AMEC Power and Process Europe (PPE) Business Assurance Manual (BAM) and referenced Business Processes, which cover all aspects of the company's business.

In addition, where contracts specify client requirements for quality, which are additional to the requirements of ISO 9001:2008, AMEC develops a project specific controlled Project Assurance Plan to describe how these requirements are met by project specific arrangements.

#### **2.2.3.1. Project Management**

AMEC PPE project management arrangements are outlined in the Business Assurance Manual and set out in detailed project management business processes. These processes describe the controls applied at each stage of the project management lifecycle and include the controlling documents, responsibilities and requirements for control of project and technical change. Project managers are trained and, dependent upon their skills and knowledge, are appointed to projects of appropriate size and complexity.

Major purchases of design or plant are supported by supply chain processes and technical processes for the generation of technical specifications and the management and review of contractor submissions.

A comprehensive Project Assurance Plan and associated business processes are maintained for the management and control of project site activities. This plan covers all aspects of site activity including project management, environmental controls and health and safety arrangements.

#### **2.2.3.2. Design and Safety Case Management**

AMEC PPE has documented processes to control the production of safety case documents. These processes are based on the specific requirements of its clients.

Safety cases evolve with the design. The safety case is verified at each stage and the design is substantiated against the constraints, assumptions and arguments in the safety case chapters. Safety case development and the design reconciliation process are integrated into the AMEC engineering business processes.

Software is used extensively for plant operational and transient analysis to support safety case development. The technical processes and software development manuals provide the high levels of control and verification appropriate for the control of software used for analysis of nuclear safety significant plant. These processes are based on the requirements of relevant international nuclear safety related software standards.

#### **2.2.3.3. Technical processes**

AMEC technical work is controlled in accordance with the technical business processes. All technical work is formally planned. These plans include design inputs, responsibilities for design outputs, including checking and verification levels, interface review requirements for multi-discipline outputs and approval requirements.

Suitably Qualified and Experienced (SQEP) Responsible Engineers are appointed to manage the discipline deliverables, and appropriate task engineers and specialists are appointed for the production, verification and control of discipline outputs. These appointments are identified in the technical plans.

Technical documents are verified in accordance with the technical document verification process. Verification levels and methods are determined based on the importance to nuclear safety and are detailed in the technical plans.

#### **2.2.3.4. Engineering**

AMEC PPE business processes are based on the AMEC PPE design lifecycle, which embraces the design phases and deliverables for a typical nuclear safety related plant design. The lifecycle identifies the design sequence and typical deliverables including design output documents, design substantiation and nuclear and industrial safety documents. The engineering schedule tracks those items whose function is essential to the nuclear safety of the built plant. These items are subject to special defined controls applied during design, manufacture, testing and construction activities, to ensure and verify that the intent of the design for which the safety case has been made is implemented in the as built plant. The lifecycle is consistent with the design processes of AMEC clients and can accommodate client design phase definitions and nomenclature.

#### **2.2.3.5. Software**

Technical activities undertaken within AMEC which require the development and use of analysis software or the development of "Applications" software for control of nuclear safety related plant are controlled by software business processes, which are based on the requirements of relevant international nuclear safety related software standards. These processes are the basis of the AMEC PPE TickIT Certification.

All AMEC software processes are owned and maintained by appropriate technical staff under the guidance of the Head of Profession for software. AMEC software processes are consistent with the following standards and guidelines:

- ISO 9003:2004 (Software Engineering. Guidelines for the application of ISO 9001:2000 to computer software);
- ISO 9001:2008 (Quality Management Systems. Requirements);
- IEC 61508 and BS EN 61508-6:2010 (Functional safety of electrical electronic/ programmable electronic safety related systems);
- The UK "TickIT" scheme for certification to ISO 9001 for software development and use.

#### **2.2.3.6. Monitoring, review and continual improvement**

All AMEC activities are subject to measurement, audit and periodic management review. These and well defined business improvement processes ensure that its activities are subject to continual improvement.

**2.2.3.7. Suitably Qualified and Experienced Personnel (SQEP)**

All AMEC PPE activities important to nuclear safety are conducted and managed by Suitably Qualified and Experienced Personnel.

AMEC ensures that Suitably Qualified and Experienced Personnel are used to lead and control all key project management and technical aspects of projects. These appointments are clearly identified in project control documents and technical plans. The AMEC SQEP process includes robust and user friendly systems for ensuring that personnel are suitably qualified and experienced.

The SQEP process establishes a skills framework for all technical disciplines. Team members' SQEP records are verified and maintained by team leaders. The verification activity is controlled and supported by the Heads of Profession and Technical Discipline Mentors, who also support and develop the skills framework, to meet the evolving requirements of the company and its clients.

The SQEP process comprises three elements:

- Establishment of a Skills Framework: the Technical Plan describes the full spectrum of the technical processes undertaken on AMEC projects and this is a key input in determining the Skills Framework;
- Input to the Qualifications and Experience Register: the vehicle for recording and verifying the qualifications, experience and skills of employees is the Qualifications and Experience Register (commonly referred to as the Q&E Register within AMEC), a database which is accessible to all employees via the AMEC intranet (AMECnet);
- Selection of SQEP Personnel.

## **SUB-CHAPTER 2.2 – REFERENCES**

External references are identified within this sub-chapter by the text [Ref-1], [Ref-2], etc at the appropriate point within the sub-chapter. These references are listed here under the heading of the section or sub-section in which they are quoted.

### **2. MANAGEMENT SYSTEM FOR THE UK EPR PROJECT**

#### **2.1. QUALITY PROGRAMME FOR THE GDA PROJECT**

##### **2.1.1. Management documentation**

**[Ref-1]** UK EPR GDA Project Quality Assurance Plan. UKEPR-O-001. (E)

**[Ref-2]** UK EPR GDA Project QA Documentation Master List and Format. UKEPR-I-001. (E)

**[Ref-3]** UK Health and Safety Executive (HSE). Safety Assessment Principles for Nuclear Facilities. 2006 Edition Revision 1. January 2008. (E)

##### **2.1.2. Document and data control**

**[Ref-1]** Nuclear Power Station Generic Design Assessment. Interface Protocol between HSE Nuclear Directorate / Environment Agency and Requesting Parties. JPO/003 Issue 2. August 2008. (E)