Attachment 1
External Experts Areas of Expertise

**Accelerator related technology**
- High power, high intensity linear accelerators engineering
- CW high intensity ion sources (ECR sources)
- RF cavities development (RFQ, superconducting cavities)
- RF systems
- High power beam transport lines
- Beam diagnostics
- Beam Dynamics
- Control system
- Machine protection system
- Radioprotection system
- Accelerator commissioning
- Beam stopper
- Accelerator maintenance
- Low Level RF system
- Particle accelerator vacuum technology

**Analysis and modelling**
- Mechanical Analysis
- Civil engineering
- Earthquake, geotechnical and structural engineering
- Floor response spectra
- Soil structure interaction
- Structural Dynamics
- Analysis of reinforced concrete structure
- Analysis of fibre composite structures
- Experimental methods in structural mechanics
- Large-scale testing
- Blast and impact analysis
- Electromagnetic analysis
- Fluid dynamic,
- Computational Fluid Dynamics (CFD)
- Fatigue analysis
- Thermal mechanical analysis
- Nuclear analysis
- Neutronics analysis
- Nuclear Physics
- Superconductivity
- elasto-plastic analysis
- magnetohydrodynamics
- System identification and modelling
- Plasma modelling for engineering application
- Thermal fatigue
- High heat flux thermal fatigue
- Failure Mode Effects Analysis
- ANSYS
- ABAQUS
- MCPN
- Piping Stress analysis
- Heat and Mass Transfer

**Assembly, Installation, Validation and testing**
- Assembly of complex and large equipment
- Manipulator aided assembly
- Assembly of high vacuum components
- Assembly of optical components
- Acceptance tests
- Vacuum testing
- Pressure testing (including hydraulic and thermo-hydraulic)
- EB test facilities operation and commissioning
- Simulation analysis and product assembly studies
- Assembly/ Installation Documentation Management (SmartPlant)
- Construction management

**CAD-related technologies (CAD, Project Lifecycle Management)**
- CATIA
- CATIA V5
- Enovia SmarTeam
- Enovia v5
- Virtual Lab. Motion CATIA [Kinematics]
- DMU Kinematics (CATIA)
- CATIA assembly module
- DELMIA
- AutoCAD
- CAD/CAM integration in PLM

**Chemistry and Technology of liquid metals and ceramics**
- Lithium technologies
- Liquid Metal Technologies
- Liquid Metal chemistry & corrosion
- Lithium ceramics

**Communication**
- Science Communication
- External Communication strategy
- Stakeholder engagement and communication
- Internal Communication
• Social media strategy and application
• Website analysis and development

**Complex civil constructions, nuclear buildings**
• Secondary work
• Finishing
• Heating Ventilation and Air Conditioning
• Fluids
• Nuclear ventilation
• Cranes and handling device
• Architect
• Painting
• Commissioning
• Metal work
• Construction contract adjudication
• Construction claim assessment (schedule and cost)
• International construction contract administration (FIDIC, NEC, cost reimbursable, etc.)
• Work measurement
• Construction management

**Cryogenic technology**
• Cryolines
• Helium technology
• Cryogenic materials
• Structural materials at cryogenic temperatures

**Data Protection**

**Design codes and standards**
• Industrial codes and standards
• Nuclear codes and standards
• RCC-MR
• RCC-MRx
• RCC-E
• RCC-M
• ASME
• ISO/IEC/IEEE/ASTM

**Documentation and Business Process Management**
• Business Process Management (BPM)
• Documentation management (DMS)
• Improvement and organisational change management
• Lean Six-Sigma

**Engineering & Design**
• Nuclear systems design
• Mechanical Engineering
• Mechanical Design
• Electrical Engineering
• Civil Engineering
• System design and modelling
• Hydraulics
• Cooling systems engineering
• Nuclear engineering
• Geotechnical engineering
• SF6 gas handling: large SF6 gas handling system design (>1 ton)
• RAMI Analysis expertise - Dependability analysis
• Plant engineering

**EU or International regimes/regulation for the control of exports, transfer, brokering and transit of dual-use goods and technology.**
• Compliance with the European Union Dual-Use Items Control Regime
• Dual Use items/technologies classifications
• International Export Control Regimes
• Environmental and Social Governance

**High and medium voltage technology**
• Power supplies
• Power electronics
• Power conversion
• High Voltage
• Electromagnetic compatibility
• Earthing/Grounding

**Human Resources Management**
• E-learning
• Talent Acquisition (competency frameworks, etc.)
• Talent Management
• General HR tasks (interims, administrative assistance, missions etc.)
• Workforce Planning
• Medical Insurance
• Medical Services related to HR
• People Analytics
• Change Management
• Digital Transformation
• Administrative Enquiries
• Diversity, Equality, and Inclusion
• Learning and Development
• General Procurement and Financial Assistance to HR

**I&C and CODAC**
• Information engineering
• Electronic engineering
• Instrumentation engineering
• Fusion instrumentation
• System Engineering
• Fusion CODAS
• Large Experiments CODAS
• Investment Protection System
• Plant Safety Systems
• Nuclear Systems
• Fusion Plant Control
• Fusion Diagnostic System
• ATCA
• Compact PCI
• PCI express
• Real-Time Systems
• Distributed Real-Time
• Data acquisition
• Industrial SCADA
• Industrial Networks and FieldBuses
• EPICS
• Cable & Conduits
• Cubicles Design
• EMC expertise
• Electronic Design
• FPGA design
• Radiation tolerant electronics
• Robotic I&C
• Virtual Reality
• RF systems
• Microwave Systems
• HVAC Systems
• Fire detection Systems
• Power Distribution Instrumentation
• Power Supplies Instrumentation
• Surveillance Systems

**Industrial (non-nuclear) and operational Health and safety**
• French Health & Safety legislation
• Italian Health & Safety legislation (DL 81/2008)
• German Health & Safety legislation
• Hydrogen handling: ATEX application to H2 handling
• Hydrogen handling: risk assessment techniques
• Non-nuclear hazards
• Spanish health & safety legislation
Industrial Intelligence
- Financial assessment and evaluation of companies
- Commodity markets
- International industrial markets
- International financial markets
- Economic and impact analysis of large projects
- Market survey methods
- Financial planning and analysis
- Budgeting and forecasting
- Probabilistic forecasting

Information Communication Technologies
- SQL, PL/SQL Programming, stored procedures, functions, triggers and database development
- Oracle databases: Programming, stored procedures, functions, triggers and database development
- Automation of manual processes
- SQL performance and Tuning
- ETL processes
- Database documentation management (development)
- SharePoint data bases
- Continuous integration, continuous delivery

Innovation
- Technology brokerage
- Technology Transfer
- Business Development

Insurance
- Decennial insurance
- Third party liability insurance
- Nuclear insurance
- Construction insurance
- Others

Large components for conventional and nuclear installations
- Pressure vessels for nuclear applications
- Regulations
- Complex welded structures
- Components subjected to high thermal loads

Legal Services
- Commercial law
- Construction law
- Contract law
- Private international law
• Union law
• FIDIC
• NEC
• FAC-1
• Collaborative contracts/alliancing
• French law
• Spanish law
• Staff law
• Labour law
• Alternative Dispute Resolution (ADR)
• Other areas of expertise

Materials testing (destructive, non-destructive)
• Destructive tests
• Non-destructive tests
• Post irradiation tests
• Definition of UT examination procedures
• UT level 3 (certificated) for 60 mm Stainless Steel
• Analysis of UT results in relation with codes and standards
• RX examination procedures and interpretation of defects on 60 mm Stainless Steel
• Digital radiography
• Material testing at cryogenic temperatures

Measurement Systems
• Requirements specification
• Engineering
• Design
• Manufacture
• Sensors

Mechanical fabrication and Joining techniques
• Technologies of fabrication
• Standard manufacturing and joining processes (and simulation)
• Boiler production with thick (60mm) Stainless Steel
• Large Bellows design (>1m diameter)
• Bellows for nuclear application
• High precision machining
• Machining of large scale components
• Laser Sintering
• Electron Beam Sintering
• Additive manufacturing technologies
• Welding techniques
• EB welding
• TIG welding
• laser welding
• Arc welding processes
• Friction welding processes
• Brazing processes
• Hot Isostatic Pressing (HIP)
• Powder HIP
• HIP of heterogeneous materials
• Diffusion bonding
• EB and TIG welding shrinkage analysis on thick (60mm) Stainless Steel
• EB and TIG welding process qualification (WPS, WPQR) on Stainless Steel
• Explosion bonding
• WPS
• fitting of pieces
• field interaction knowledge
• Brazing (Metallic, Bi-metallic structures and Non-metallic to metallic structures)
• Heat treatment
• Surface treatment (metallic components)
• CNC machining
• Computer aided manufacturing (CAM)
• CMM (coordinate measuring machine)
• Beryllium manufacturing (fabrication, machining, handling and safety)
• Codes and standards related to joining and non-destructive testing

Metrology
• Geometrical survey
• Tolerance analysis
• Spatial Analyser
• Polyworks
• Metrology simulation
• Metrology plans
• Reverse Engineering
• Virtual Assembly

Nuclear fusion components design
• Breeding blanket
• First Wall
• Divertor

Nuclear Safety and radiation protection
• Risk assessment methodologies: HAZOP, HAZID, FMEA, fault tree analysis, failure analysis, probabilistic safety analysis (PSA)
• Incident and accident analysis: methods and tools, accident sequence analysis, advanced computer codes and simulations for accident analysis
• Internal hazard assessment (in nuclear facilities): fire, chemical risk, explosion (including hydrogen risk), mechanical (load drop)
• External hazard assessment (in nuclear facilities): flooding, earthquake, aircraft crash, external explosion.
• French and European Nuclear Safety regulations (support to analysis, inspection,
• Nuclear safety culture assessment and support
• Safety case documentation and safety report
• Nuclear facility licensing (technical and regulatory expertise)
• Supply chain supervision and nuclear safety inspections
• Radioactive and toxic releases: methods and tools for public dose and environmental impact assessment
• Beryllium safety: operational safety, waste management and regulations
• Radiation protection methods and tools, shielding and dose rate calculations, occupational radiation exposure (ORE) assessment, ALARA assessment, radiation protection regulations,
• Airborne radioactive contamination assessment
• Radiological and environmental monitoring
• Radwaste categorization and management, storage and disposal

**Plasma and First Wall diagnostics**

- Optical
- Imaging
- Spectroscopic
- Microwave
- Neutrons and gamma rays
- Magnetic field
- Particle and pressure
- Physics
- Engineering
- Modelling
- Design
- Integration

**Plasma Engineering**

- Plasma engineering (component design verification, engineering of scenarios, plant integration)
- Plasma-Wall interaction (normal, transient and off-normal events)
- Plasma Operations (Tokamak operation, Operational limits, plasma commissioning)
- Plasma Scenario simulation (1D, 2D simulations, integrated modelling)
- Plasma modelling (transport, MHD, plasma edge physics, fast ion physics, runaways, etc)
- Heating and Current drive physics and modelling (including NTMs)
- Plasma fuelling and pumping
- Disruptions

**Project and Programme Management**

- Planning and scheduling (Primavera, resource loading, baseline)
- Earned Value Management
- Risk Management (facilitation of identification or handling strategies workshops, schedule Montecarlo simulations)
• Cost Assessment (cost escalation, indexation, cost baseline, basis of estimate)
• Agile project management methodologies
• Contract and Performance Management
• Project Change Management
• Configuration Management
• Supplier management
• Engineering/production processes
• Complex manufacturing contracts
• PDM/PLM systems
• Work Breakdown Structure (WBS)
• Product Breakdown Structure (PBS)
• Systems engineering (INCOSE)
• Requirements management (DOORS)
• Interfaces Management

Quality
• Quality Assurance
• Quality Control

Remote Handling systems for nuclear environment
• Mechanical design of remote handling systems and/or nuclear material handling systems and/or robotics (kinematics design, simulation and calibration)
• Electrical design for machinery (such as cubicles, long cabling, on-board wiring, etc.) and/or I&C components: Component selection, testing and/or qualification (for radiation, EMC, vacuum, electrical safety, etc.)
• Motion control systems design and tuning, and/or Tele-operation with force reflection and haptic devices
• Design of software graphical user interfaces for operator’s command and control of remotely connected equipment
• Software engineering (Real-time software development, requirements management, software quality, and software testing)
• Monitoring cameras design, machine vision, cameras-based viewing systems over IP
• Radiation tolerant electronics design and/or testing and/or qualification
• Pipe welding and inspection

Reporting and Data Management
• Data analysis and Reporting
• Identification of dataset correlations and trends.
• Data management and maintenance of Databases
• Merging, quality control, extraction of datasets.
• Ad-hoc monitoring, processes and data tools
• Data warehouse
• SAP Business Objects
• Power BI
Specific Regulatory Matters

- European Directives
- European Pressure Equipment Directive (including nuclear)
- French ESP/ESPNI Regulation
- CE marking directives
- ATEX
- F-Gas
- EMC

Superconductivity and Superconductor Magnets

- Superconducting material
- Superconductor Magnet design and technology
- Superconductor cable and conductors production
- Superconductor cable and conductors test
- Magnet design
- Manufacturing of Superconducting coils (winding / impregnation)
- Testing of Superconducting coils (warm and cold testing)
- Cryogenics design and technology applied to magnet cooling and stabilization

TOKAMAK and PLASMA Control System Engineering

- Tokamak plasma control (experience in design and/or operation of plasma control systems in a tokamak)
- Additional Heating Control (Experience in design and/or operation of additional heating system in a fusion device, including Neutral beams, Ion Cyclotron, Electron Cyclotron and Lower Hybrid system)
- Tokamak control, operation and protection (Experience in design and/or operation of systems for the management of safe and efficient tokamak operation)

Tokamak Heating & current drive systems

- RF technologies,
- NB Systems
- Vacuum tubes
- Gyrotrons

Tokamak Ion Cyclotron Heating (ICH) antenna

- ICH engineering
- Electrical engineering for high power ICH antennas
- Brazing of metallic/non-metallic materials
- ICH wave transmission
- ICH special components
- ICH antenna control and protection
- ICH specific diagnostics (arc detection, reflectometry, component-specific diagnostics for ITER)
- ICH operation with fusion plasmas
- ICH physics
- Mechanical analysis
• Seismic analysis

Tokamak machine diagnostics
• Optical systems
• Metrology
• Machine vision
• Image processing

Tokamak mm-waves launchers
• mm-wave engineering
• mm-wave component design and testing
• mm-wave special components (such as windows, tapers, waveguides, etc.)
• mm-wave transmission (guided and quasi-optical)
• electro-magnetic aspects of mm-wave transmission (HEmn, TEMoo, specific modelling)
• mm-wave specific diagnostics (ECE, IR, component-specific diagnostics for ITER)

Transportation of nuclear and conventional large components
• Nuclear transportation regulation
• Incoterms
• Freight forwarding
• Logistics
• Technology
• Safety Analysis

Tritium technology
• Water detritiation system
• Isotope separation system
• Tritiated produce processing, storage and handling

Vacuum & Leak Detection Technologies
• Components
• High level vacuum component
• Baking and outgassing procedures
• (hot) leak tests
• Surface cleaning and conditioning
• High vacuum in scientific projects
• Leak Detection

Water cooling, chemistry & corrosion technologies
• Water cooling
• Erosion of coolant water interfaces
• Radiolysis effects
• Crevice corrosion
• Stress Corrosion Cracking (SCC)
• In-situ monitoring and assembly of monitoring facilities (electrochemical potential,
impurity accumulation, water sampling and test specimen assemblies using autoclaves)

- Qualification and assessment of metals and alloys used for coolant water interfaces