AtkinsRéalis

FUSION ENGINEERING

ATKINSRÉALIS AT A GLANCE

A global team of over **37,000 employees**

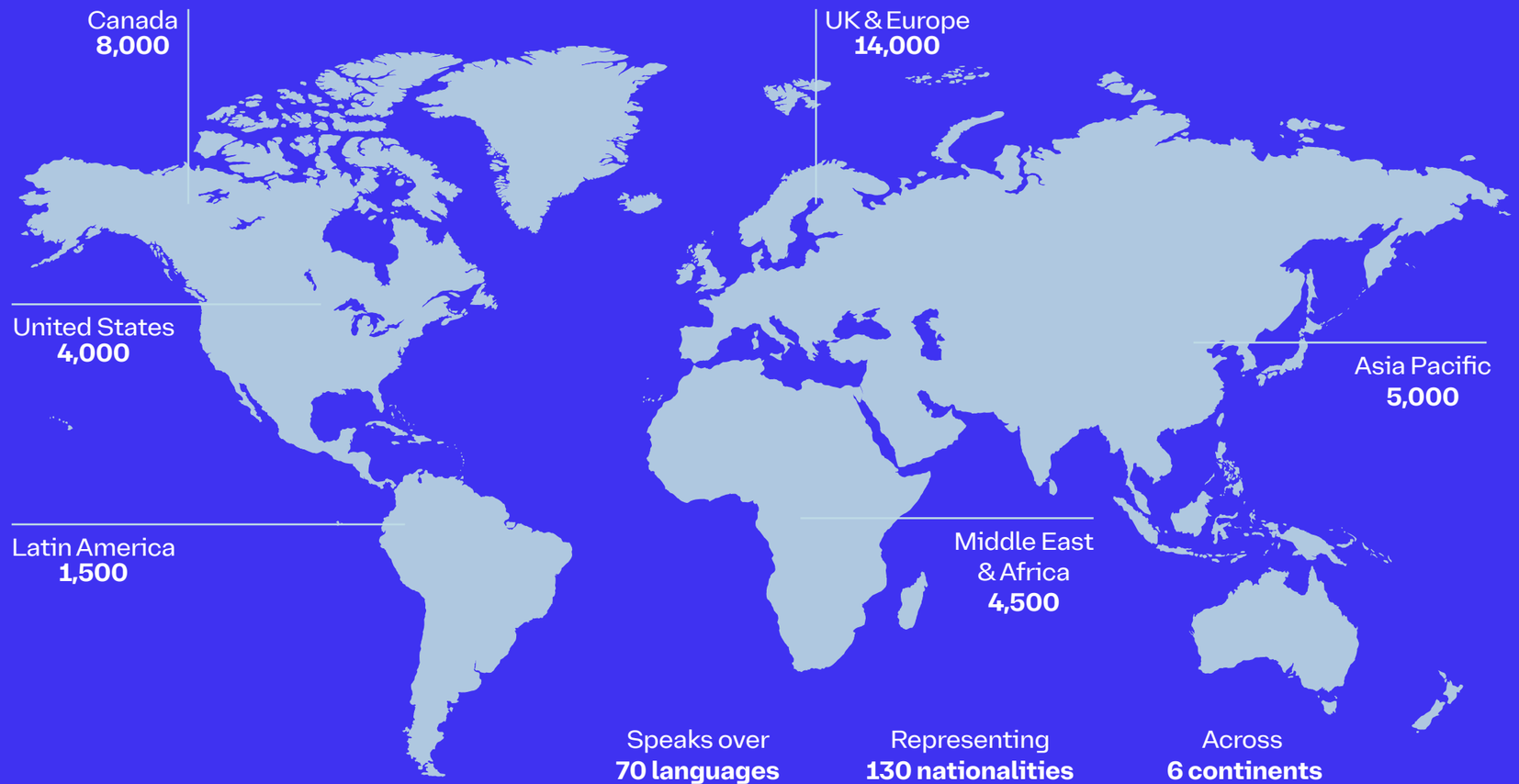
Steward of **CANDU®** nuclear technology

Decades of major EPCM experience delivering end-to-end solutions

Critical roles with Small Modular and Advanced Reactor vendors to **develop new reactor technologies**

Experienced in the **development of revolutionary fusion technologies**

Managed over **20 licensed radwaste facilities** with access to our world class proprietary technology



Speaks over **70 languages**

Representing **130 nationalities**

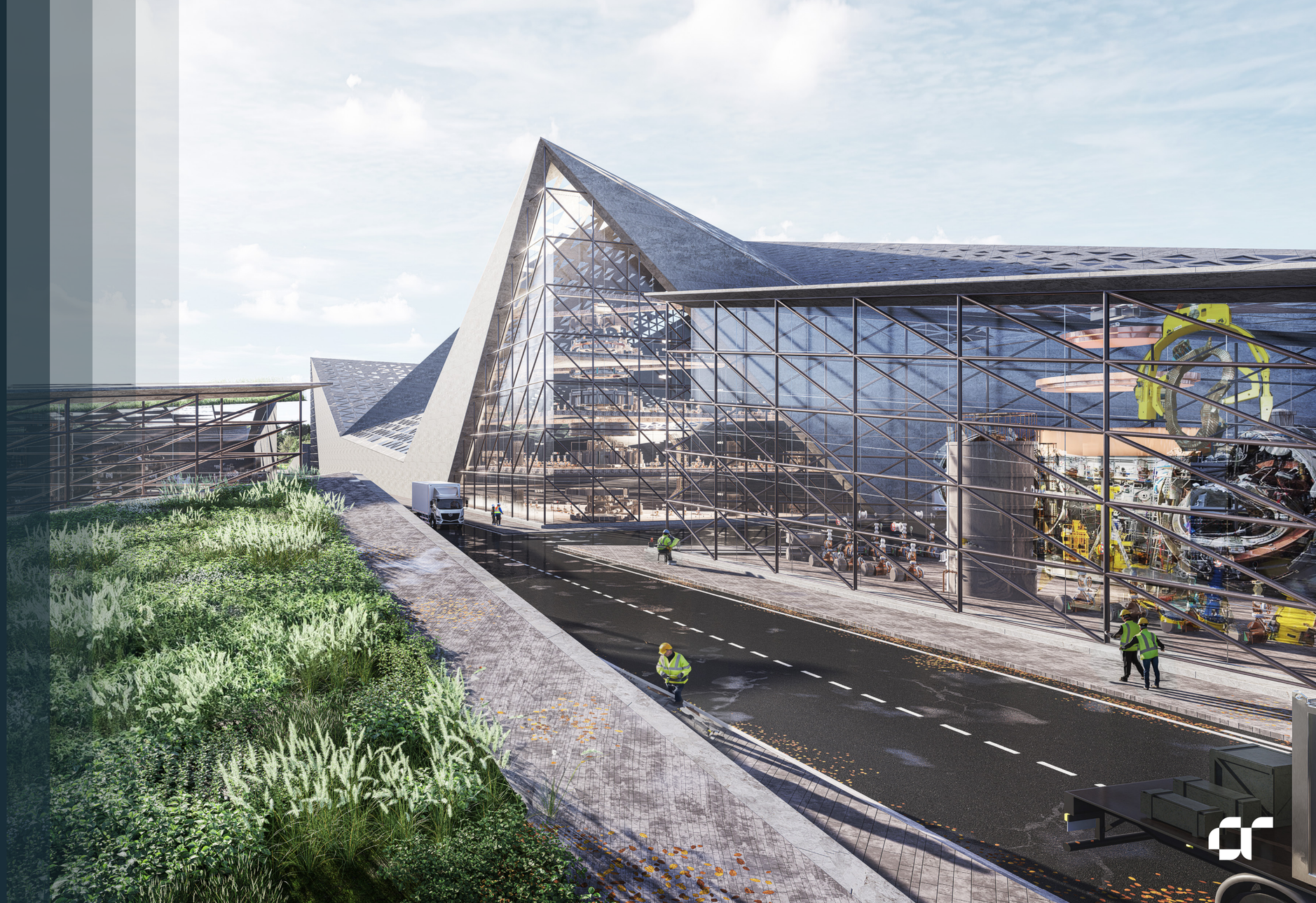
Across **6 continents**

HERE TO MAKE THE EXTRAORDINARY A REALITY

We understand the engineering challenges posed by fusion technologies and provide the critical link between research and commercial deployment.

Our global experience delivering major energy infrastructure projects has positioned us as a trusted delivery partner on the journey to bring fusion energy to the grid. We are paving the way for a sustainable and clean energy future.

Click here to watch a short video highlighting our focus on fusion energy.



OUR KEY CAPABILITIES IN FUSION

Our multi-disciplinary teams bring together knowledge from large Nuclear Fission across the globe, conventional mega-projects and the unique technical challenges of Fusion to deliver innovative and cost-effective solutions to engineering problems.

Our key skills include;

- Project Management and Controls
- Systems Integration and Requirements Management
- Systems Engineering and Collaboration and Management
- Safety Case and Regulatory
- Energy System Integration
- Tritium Management and Fusion Fuel Cycle
- Mechanical Handling, Robotics and Maintenance
- Civil, Structural and Architectural Design
- Shielding, Transportation, Radiological Protection and Neutronics
- Human Factors and Ergonomics
- Digital and Data Management Strategy
- Decommissioning, Environmental Management and Waste Planning

We work collaboratively with our clients, partners and suppliers to bring commercial fusion energy to life.

The following case studies highlight our experience across the full project lifecycle and geographical reach for both private and public sector clients.

ENERGY STRATEGY AND LANDSCAPE

ENERGY MARKET STUDY

Tokamak Energy

We delivered a market analysis to help inform target price, reactor output, plant configurations and **target markets** for Tokamak Energy's ST-E1.

AtkinsRéalis assessed the electric power market for each country considering fossil fuel plants with and without CCS, renewables, and nuclear power generation. Within each country the **electrical demand and energy mix was projected out to 2050**. We assessed the attractiveness of markets and suitability of Fusion in different countries, considering domestic and industrial demand.

UK FUSION REGULATION

UKAEA

AtkinsRéalis was commissioned by UKAEA to deliver a **roadmap for future regulation of Fusion Energy in the UK**. This study detailed the initial steps required to develop a regulatory and compliance framework for the UK fusion industry, providing guidance to fusion businesses on the route to becoming a compliance organisation.

COMMERCIAL PATHWAYS

STEP COMMERCIAL PATHWAYS PARTNER

UKAEA

We were commissioned as Commercial Pathways partner for Tranche 1 of UKAEA's STEP programme, delivering techno-economic studies to define the roadmap for Gigawatt scale roll out of commercial fusion energy in the UK and abroad. Our scope included;

- Improving plant availability
- Carbon and sustainability strategy
- Resource scarcity and supply chain assessments
- Lithium enrichment studies
- Energy storage technology evaluation

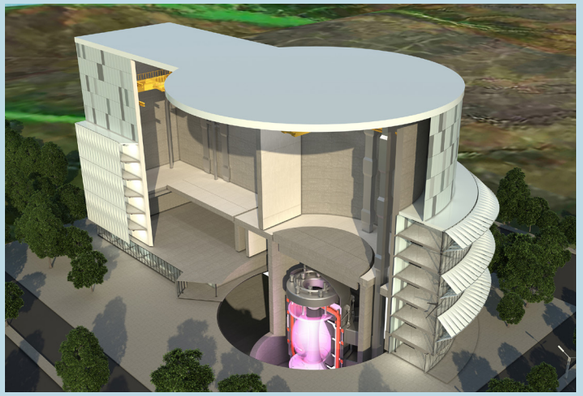


Image courtesy of and © UKAEA

STEP COST MODELLING PARTNER

UKAEA

AtkinsRéalis was appointed as UKAEA's Cost Modelling partner for **Tranche 1** of STEP in early 2021. We have been **integral in developing cost estimates for the full plant**, leading on estimating capital investment for new manufacturing facilities for fusion relevant technologies, and evaluating material supply chains.

SITE SELECTION AND DEVELOPMENT

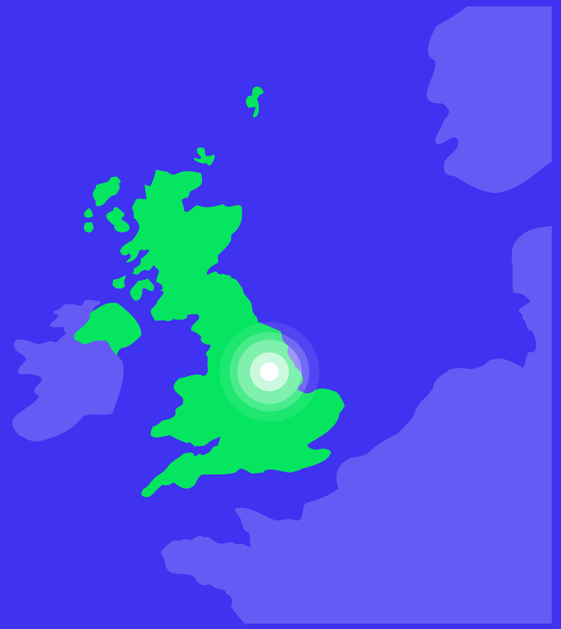
UKAEA STEP PROGRAMME

Site Selection and Development Partner

Through a contract worth £1.5m, AtkinsRéalis was UKAEA's partner for the **selection of West Burton** as the preferred site for UKAEA's STEP prototype plant. The scale of the siting task was significant, requiring the assessment and down selection of 15 nominated site to a credible shortlist of 5 deployable sites, followed by a recommendation of a single preferred location.

Innovation and sustainability were at the heart of our siting approach. From the very earliest stages of the project, we designed an assessment that appropriately recognised the environmental and socioeconomic impacts of developing each site.

The project received UKAEA's **Outstanding Contribution to STEP** award; the first time it has ever been awarded to an external supplier.



ARCHITECTURE AND VISION

COMMERCIAL FUSION

Various Clients

We have worked with both private and public section developers of commercial fusion power plants to develop forward thinking architectural visions to redefine the image of energy. Our architects continue to work with our wider engineering teams to develop site masterplans which are both functional, but also emotive and internationally recognisable.

Image courtesy of and © Tokamak Energy

WHOLE PLANT DESIGN

FUSION PILOT PLANT

Type One Energy

In 2024 we were appointed by Type One Energy to develop the Pre-Conceptual Design for their stellarator based Fusion Pilot Plant. Using our full multi-disciplinary capabilities, we are developing the full plant requirement set, pre-concept designs, and preliminary site layout.

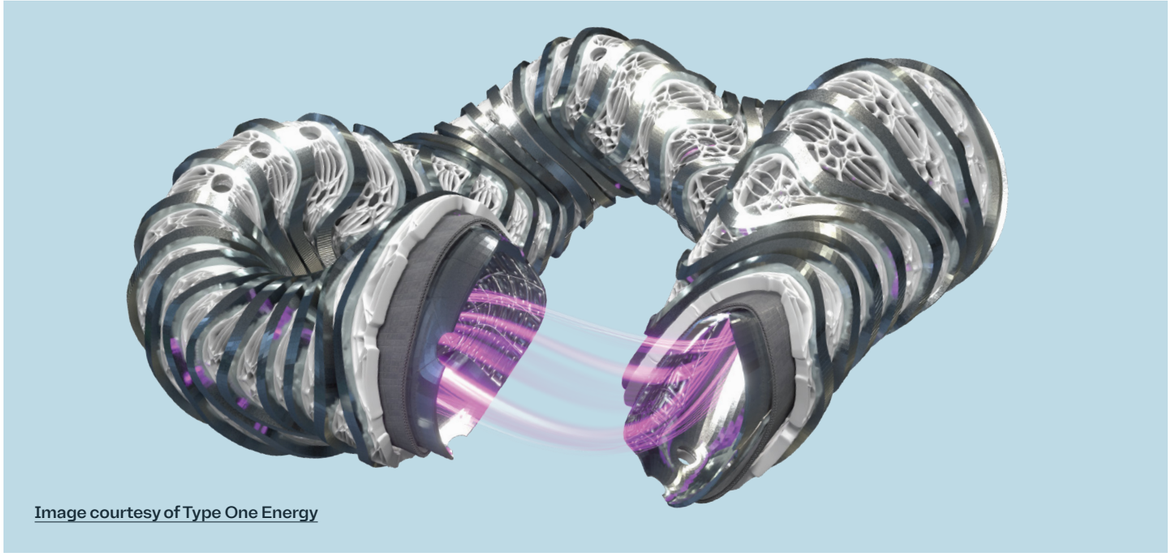


Image courtesy of Type One Energy

STEP TRANCHE 1 ENGINEERING DELIVERY PARTNER

UKAEA

AtkinsRéalis led the STEP Tranche 1 Engineering Delivery Partner consortium, alongside our partner organisations. Through this appointment we provided strategic advice and engineering services to the Plant Architecture, Integration and Validation (PAIV) and In-Vessel Component Design (IVC) functions.

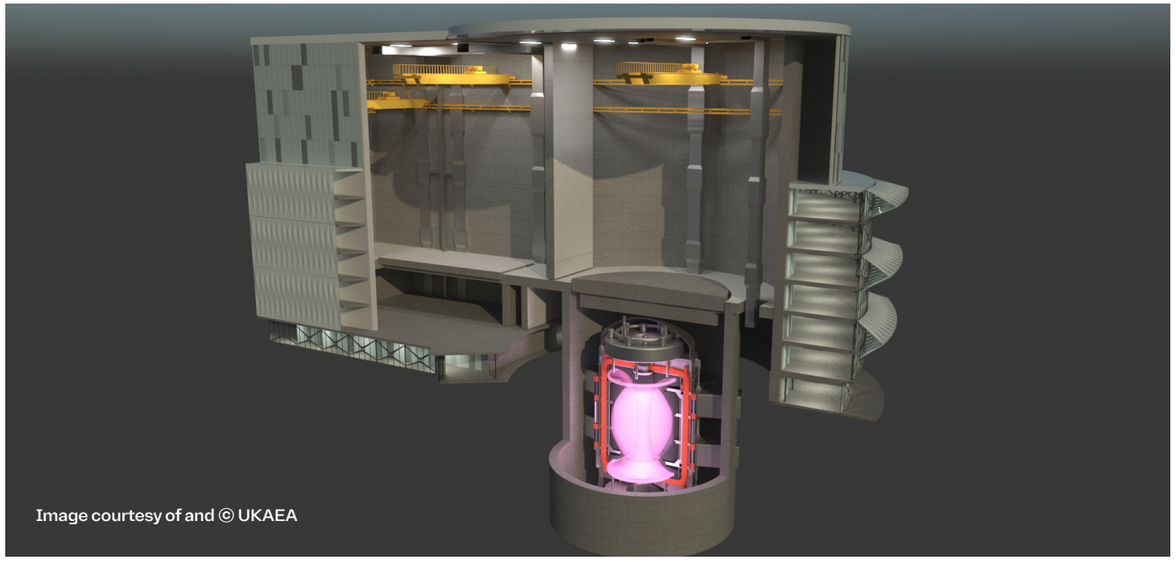


Image courtesy of and © UKAEA

MULTI-DISCIPLINARY DESIGN SERVICES

ARCHITECT ENGINEER

ITER

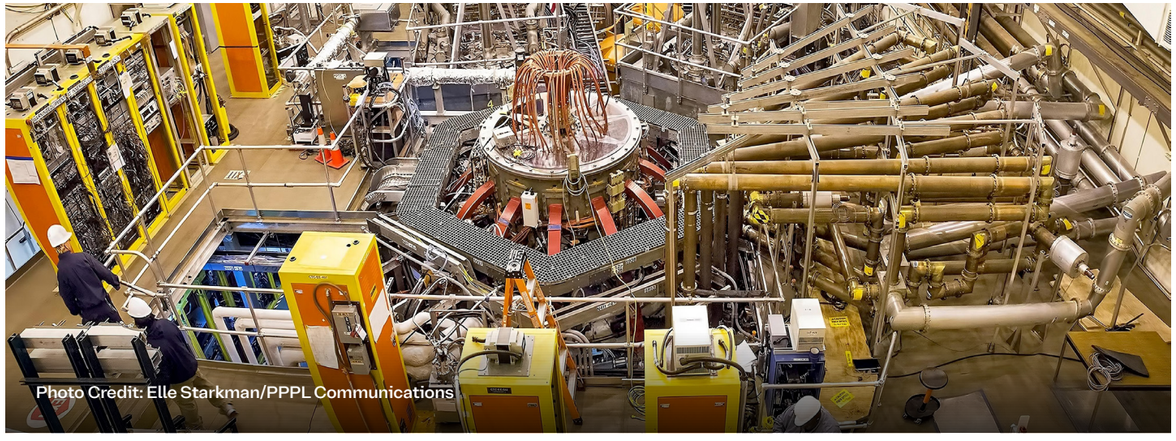
AtkinsRéalis, as part of the 4 way Engage consortium, has acted as Architect Engineer on the ITER international nuclear fusion research project since 2010. Engage is responsible for the integrated design, construction management and commissioning oversight of the 39 buildings, including associated services and site infrastructure, from requirements and initial concept to final hand over.

We have been involved in all the design stages for the Tokamak Complex, including the conceptual design of the building and the structural support of the 20,000t reactor.

ENGINEERING MULTIDISCIPLINARY SUPPORT SERVICES

Princeton Plasma Physics Laboratory

In 2023, AtkinsRéalis, alongside our partners, was awarded the EMSS framework for Princeton Plasma Physics Laboratory. Through this we are supporting the design of plasma diagnostic and heating systems for ITER, updates to the US NSTX-U facility, and conceptual design of future electricity generating fusion plants.



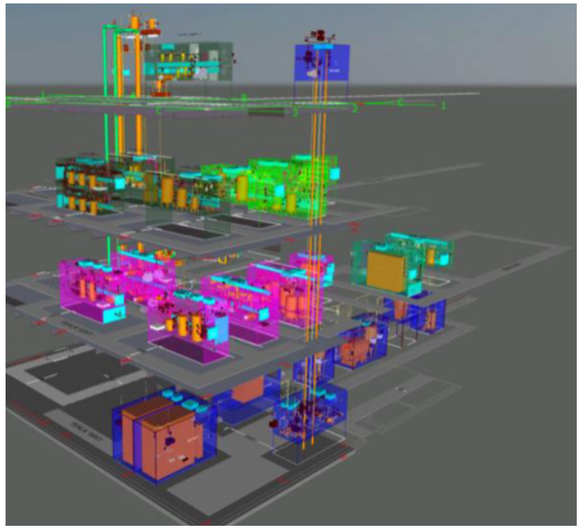
FUSION FUEL CYCLE

HYDROGEN-3 ADVANCED TECHNOLOGY

UKAEA

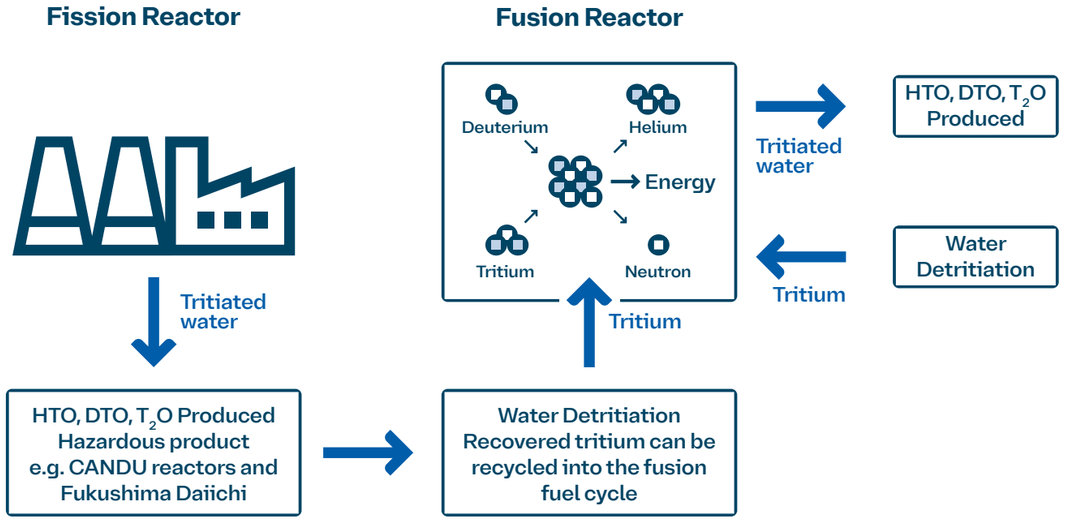
UKAEA's Hydrogen-3 Advanced Technology (H3AT) facility will be a **pioneering tritium research centre**, enabling both academic and industrial users to study how to process, store and recycle tritium. It will enable R&D which is crucial to a sustainable fusion fuel cycle, and for technology transfer beyond fusion energy.

AtkinsRéalis is the plant designer for all the H3AT systems including the cryogenic isotope separation system (ISS). Leveraging decades of tritium experience from our own CANDU reactors, AtkinsRéalis developed a UK based centre of excellence for tritium process design to successfully deliver the full H3AT system scheme. Our multi-disciplinary team collaborated with international experts in tritium modelling and cryogenic separation, transferring knowledge to the UK which will be essential in developing the fuel cycle for future commercial fusion energy plants.



NOVEL NANOPOROUS MATERIAL FOR TRITIUM ISOTOPE SEPARATION

AtkinsRéalis is working with the University of Liverpool to develop a **novel approach for tritium management** in both future fusion energy systems, and existing nuclear fission plants. We have received grant funding from the Small Business Research Initiative (SBRI) fusion innovation competition, run by UKAEA, to develop a design for a pilot plant.



POWER INFRASTRUCTURE

STEP POWER INFRASTRUCTURE

UKAEA

AtkinsRéalis is providing engineering consultancy to UKAEA to develop the system for **capturing the thermal energy** produced by the STEP prototype plant, as part of a 3-year commission. Our process engineers are exploring novel technologies and energy recovery cycles which can integrate with the unique pulsed output of a tokamak device to reliably produce electricity for export to the grid.

ST-E1 BALANCE OF PLANT

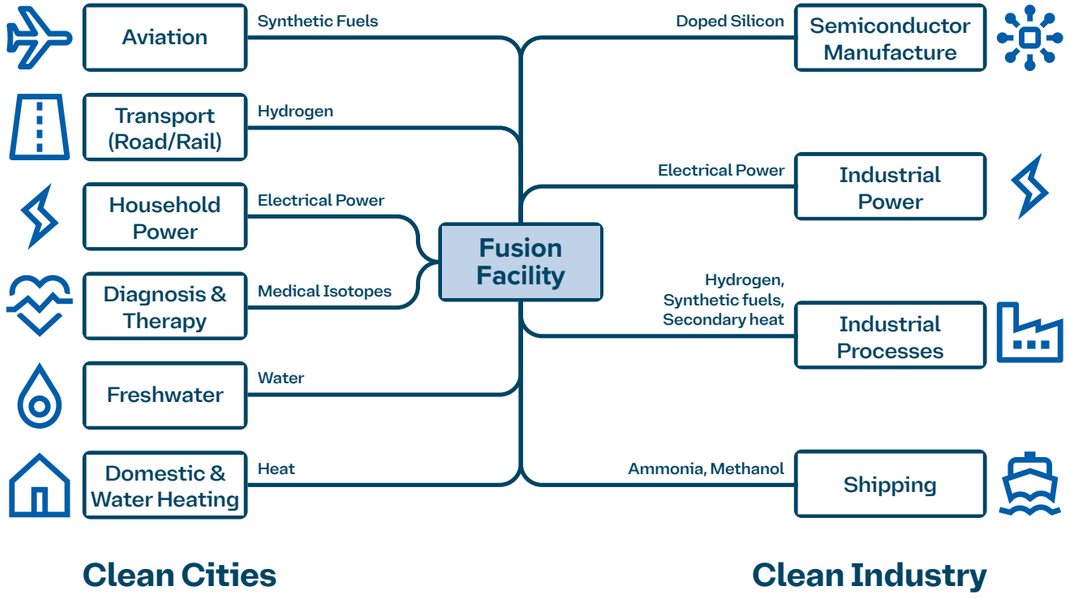
Tokamak Energy

As part of an application for funding, AtkinsRéalis was responsible for the preparation of the **concept design for the Balance of Plant (BOP)** aspects of Tokamak Energy's planned ST-E1 reactor. This work was also used to derive cost estimates for the BOP.

ALTERNATIVE USES FOR FUSION

UKAEA

AtkinsRéalis has explored alternative uses for Fusion Energy through our role as Commercial Pathways partner, and multiple appointments on UKAEA's Engineering Design Services (EDS) Framework. This included the **viability of using waste and direct heat** for hydrogen or ammonia production, district heating, desalination or industrial processes.



OPERATIONS AND MAINTENANCE

STEP INTEGRATED PLANT SOLUTION

UKAEA

AtkinsRéalis developed the concept for an **integrated approach to maintaining a fusion power station**, considering heavy lifting, horizontal transportation, facility layout, containment, shielding and HVAC. One key pillar of the maintenance strategy was the transportation of large tokamak components, up to 2,500T, following plasma operations.

AtkinsRéalis formed a **multi-disciplinary delivery team** covering civil, structural design, human factors, nuclear safety case development, radiological protection, shielding, nuclear building services and containment, and digital design methods. We engaged equipment vendors to contribute to ensure both existing and future technologies were considered in the concept.

STEP AVAILABILITY MODELLING

UKAEA

AtkinsRéalis developed Throughput and Availability models for STEP from 2021 to 2023. Using our proprietary RAMP software, our teams supported UKAEA to make key design decisions which consider plant availability and maintenance.

CRANES AND HEAVY DOORS

ITER

The AtkinsRéalis team within Engage authored the tender documents for the port cell doors, lift lobby doors, shielding and confinement doors, cargo lift and Tokamak Cranes. The team also supported IO & F4E in the evaluation of tenders and the design process.

Our engineers assessed **mechanical handling within the Hot Cell Complex**, including the process flow of port equipment in remote handled casks from the Tokamak through the building and into the HCC.

TECHNOLOGY DEMONSTRATION AND TEST RIGS

NOVEL TEST RIGS

UKAEA

AtkinsRéalis has developed the designs of rigs and test platforms to validate and mature low Technology Readiness Level (TRL) systems and components relevant for fusion. Our ability to call upon full multi-disciplinary teams allows us to develop safe and robust designs, and we work with partners and the supply chain to ensure they can be manufactured cost effectively. Fusion technology demonstration requires the integration of mechanical, process, EC&I, materials, human factors and safety disciplines, all of which we provide in-house.

Our commissions have included;

- Early Concept and FEED development of CHIMERA
- Concept design of ANNA Thermal Hydraulic Test Loop
- Concept design of Supercritical CO2 Test Rig
- Pre-Concept Design of Cryogenic Irradiation Test Rig
- Concept design of Uniaxial Test Rig, for combined mechanical, thermal and magnetic field testing.
- Concept to Detailed design of the H3AT Isotope Separation System
- Concept to Detailed design of a pilot plant for Tritium isotope separation

OUR VISION

Our vision is to be “The delivery partner of choice for fusion technology developers, integrating science and engineering to accelerate safe, clean, and affordable energy from fusion.”

We are not fusion scientists; we are the integrator which can help bring ideas to life.

We see our role as contributing real-world engineering pedigree to accelerate the commercialisation of fusion energy.

Our broad capability across markets and geographies uniquely places us to provide a full lifecycle, integrated service.

Fusion is not Fission; we have a deep understanding of the inherent differences and how to avoid past mistakes.

We are comfortable working with low TRL technologies and ambiguity, aiming to offer a pragmatic perspective on achieving the best cost v benefit solution.

Our global workforce of over

37,000 employees speaks over

70 languages and represents
130 nationalities across
six continents.

These differences are one of our greatest strengths – and key to understanding the needs of our clients worldwide.

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