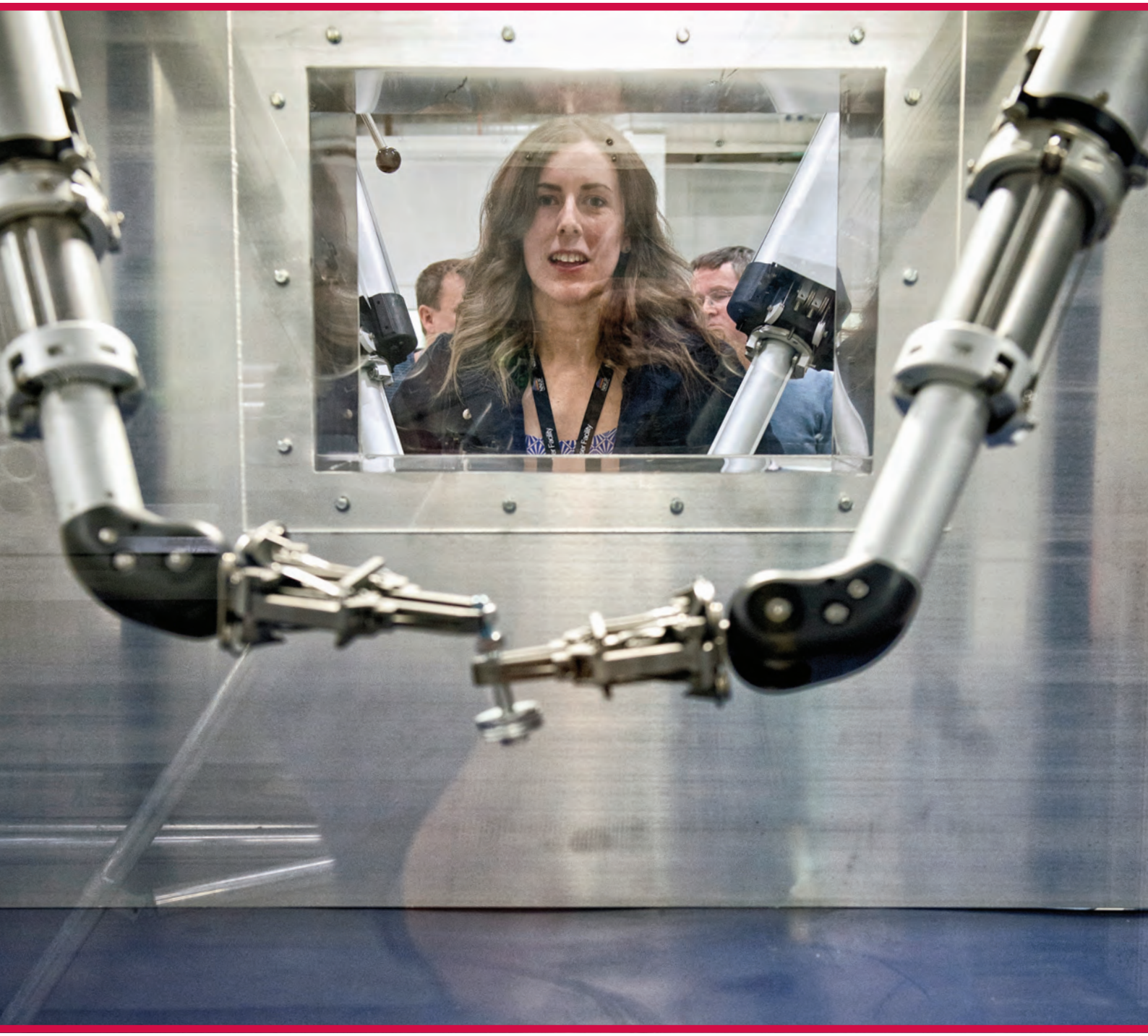
United Kingdom Atomic Energy Authority

Annual Report and Accounts 2015/16



UK Atomic Energy Authority

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Annual Report and Accounts 2015/16

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Contents

Front cover: Alex Cackett using the MRF master-slave manipulator

Chairman's Statement
Professor Roger Cashmore

Over the past few years we have been expanding our technology programme, creating a new technology department and expanding into areas which leverage and expand upon our traditional fusion-focused research. As a consequence, the Board had reviewed and refreshed UKAEA's mission statement recognising the relevance of our research to facilitate the resurgence of UK fission and other spin-off and growth technologies, in addition to our main priority of fusion.

Construction of the MAST Upgrade continued. With its innovative Super-X divertor design, it will enable us to probe the challenge of exhaust systems for future fusion reactors and influence the design of smaller DEMO fusion facilities. This exciting development is garnering interest from across the international fusion community.

The Board undertook a visit to Cadarache, France, to see progress on construction of the new international fusion device ITER. In discussion with senior members of the ITER organisation, UKAEA's fusion expertise was recognised as pivotal for ITER. Particularly critical is the forward scientific programme on JET, which UKAEA operates on behalf of Europe, which will be vital for successful ITER operations.

EPSRC instigated an independent review of fission and fusion research in the UK, which reported in March 2016. The report heralded the magnetic confinement fusion programme in the UK, which we lead, as "world-class quality in facilities, people and impact".

A triennial review of UKAEA was also undertaken, as part of the Cabinet Office's review process. The report, which was published in September 2015, also recognised UKAEA's world-class research and concluded that UKAEA's delivery of fusion research in the UK was needed. It recommended that UKAEA should continue as a non-departmental public body, but should explore with government closer alignment or a merger with another government agency, which we will continue to do.

In early 2016 we saw skyline changes at the Culham Science Centre, with the completion of the construction of two major new facilities; RACE a robotics and remote handling centre for challenging environments, which is a key part of the delivery of the government's robotics and autonomous systems strategy, and the Materials Research Facility (MRF), which is part of the National Nuclear Users Facility and the new Sir Henry Royce Institute for Advanced Materials. Both these facilities are essential for development of fusion, but also have much wider applications.

There will be further new facilities and building at Culham over the coming years, with construction of a new solid tritium waste handling facility starting in summer 2016, government announcement of funding for an Oxfordshire Advanced Skills building, expansions of RACE and MRF in the pipeline, and several opportunities which are currently under discussion with the private sector.

During the year, we bid farewell to Steve McQuillan as non-executive director. I would like to thank Steve for his valuable contribution to the Board and to UKAEA. It is a reflection of the expanding nature of UKAEA's remit that the government has appointed three new non-executive directors to the UKAEA Board. In March 2016, we welcomed Norman Harrison, former UKAEA CEO and Chris Theobald, who between them have 50-years' experience in the nuclear, energy and defence markets, and Jim Hutchins, who helped oversee the growth of a local high-tech company Oxford Instruments.

In October 2016, Steve Cowley will be leaving us to take on a new role of President of Corpus Christi College in Oxford. During his time, the laboratory has gone from strength to strength, he has ensured that Culham is a world centre of renown in fusion science, technology & engineering, and has enhanced its reputation. Fortunately Steve will only be a short distance away and will continue to be an advocate for fusion. I cannot thank Steve enough for his efforts for UKAEA and for UK science and technology.

I am very pleased that Professor Ian Chapman has been appointed by government to take over as CEO from 1 October 2016. Ian is an outstanding fusion scientist and his drive, ambition and energy for UKAEA shine through. I am confident that he can carry forward and enhance our vision for UKAEA.

Finally, though the vote on the EU referendum took place after the end of the financial year, I do not believe that it changes UKAEA's mission. The ultimate goal of fusion as a future power source is so important that we must continue to take forward our fusion research for the benefit of the world, for the benefit of ITER and for science and industry in the UK. The UKAEA Board will therefore work with the government to promote these aspirations, but are under no illusion that times will be easy. 'When the going gets tough, the tough gets going' and I have no doubt that we can fulfil that role.

Professor Roger Cashmore, CMG, FRS
Chairman
5 September 2016

Performance Report
Overview

Chief Executive's Statement
Professor Steve Cowley

On the 23rd of May 2016 Jo Johnson MP, Minister of State for Universities, Science, Research and Innovation visited Culham to open our two newest facilities, constructed during 2015/16: the Materials Research Facility (MRF) and the centre for Remote Handling in Challenging Environments (RACE). I was delighted to show the minister how the skills and innovations developed in UKAEA's fusion programme are being deployed to help UK business. UKAEA has always thrived at the interface between science and technology and these facilities are new frontiers of that productive intersection.

MRF is dedicated to developing the nuclear materials of tomorrow for both fusion and fission. Materials science is evolving rapidly and UKAEA is at the forefront with world class capability in nuclear materials modelling and (at MRF) in micro-scale testing. With this capability, UKAEA and its university and industrial partners aim to rapidly design, develop and deploy materials for market. I am enormously pleased therefore that the UKAEA has been named as one of the partners in the exciting new Sir Henry Royce Institute for Advanced Materials, an institute dedicated to this aim.

Fusion reactors, like JET, will be maintained by "remote handling" - by robots that are controlled by human operators. We have developed unrivalled remote handling capability on JET and this is being exploited in RACE. RACE is developing remote handling technologies with industrial partners to deliver solutions for ITER, the European Spallation Source, for JET and for future fusion reactors. Every time I visit RACE's new building I am struck by the variety and challenge of the engineering taking place.

One of the highlights of every year is the graduation ceremony for the UKAEA apprentices. I enjoy few things more than the opportunity to celebrate the young people who came to us straight from school and have become highly skilled engineers. The UKAEA apprentices are a fantastic set of young people and we are incredibly proud of them all. They won the 2016 Brathay apprentice challenge in the hills of the Lake District, becoming apprentice team of the year. The quality of our apprentice training has been recognised in this year's comprehensive spending review. The government awarded UKAEA funds for a new apprentice training centre, Oxford Advanced Skills (OAS), which will train up to a hundred high-skill engineering apprentices yearly. OAS is the vision of David Martin, our Chief Operating Officer and a former UKAEA apprentice himself. OAS will make a huge contribution to the development of high tech industry in Oxfordshire and indeed in the country.

During my tenure, MAST-U has gone from concept through detailed design and is now nearing completion. It is a stunning piece of engineering. This will not only give UKAEA a new, innovative fusion device, but also provide the UK with a world-leading scientific facility which will operate through the 2020s. The compact design offers a potential route to smaller & cheaper fusion power plants. The innovations in MAST-U, particularly the novel 'super-X divertor' (exhaust system), have generated great interest and we are expecting considerable participation from universities and laboratories from all over the world.

At the end of September I step down from UKAEA to return to academia. It has been a privilege and a joy to lead UKAEA. I will miss many things about UKAEA but most of all the daily interaction with our incredibly gifted staff – the world-class talent that is in all corners of the laboratory from the executive team to the frontline engineers and scientists. The extraordinary is commonplace at Culham. I am proud of the scientific output of the lab; 293 papers this year. Compared to our funding levels the output is 2 to 3 times higher than other major fusion labs. Thank you, all of you.

There is no more important mission than realising commercial fusion power and Culham is leading the quest. I remain dedicated to that mission and will continue to contribute personally to Culham's fusion research. My successor, Ian Chapman, is a brilliant scientist, a thoughtful strategist and a dynamic inspirational leader. UKAEA is in very good hands.

Finally I must acknowledge our board and most especially the chair, Roger Cashmore, who has guided a sometimes wilful Chief Executive tactfully and skilfully through many difficult situations.

Professor Steve Cowley, FRS, FREng
Chief Executive and Accounting Officer
5 September 2016

Steve Cowley with Jo Johnson MP

Purpose

The United Kingdom Atomic Energy Authority (UKAEA) was formed in 1954 when the British Government set up a new body to oversee the nation's nuclear research programme. UKAEA is a non-departmental public body (NDPB), under the Department for Business, Innovation and Skills (BIS).

UKAEA's principal mission is to

"lead the commercial development of fusion power and related technology and position the UK as a leader in sustainable nuclear energy".

This mission reflects national needs and covers both fusion and research relevant to the resurgence of UK fission and other spin-off and growth technologies.

During the year the UKAEA Board, with involvement of the Executive, programme leaders and business managers, reviewed the vision for UKAEA and developed five corporate goals.
These are:

1) Maintain the UK's position as a world leader in fusion research
2) Realise jobs and skills through growth in UK industry
3) Grow the UK's nuclear materials and technology capability
4) Design the first fusion power plant
5) Develop Harwell and Culham sites as Science and Innovation Centres.

To support these goals the enabling areas of capability, culture and stakeholder engagement are also required.

UKAEA undertakes a world-leading programme in tokamak operations, plasma physics, materials science and technology research and development (R&D), which is undertaken at its fusion laboratory, the Culham Centre for Fusion Energy (CCFE). UKAEA operates JET (Joint European Torus), the world's largest fusion facility, under a bilateral contract with the European Commission, as part of the EUROfusion work programme. CCFE also participates in the JET scientific programme as a EUROfusion member.

One of the scientific priorities for CCFE is to support ITER, a new international experimental fusion device, currently under construction in France. ITER is a key step in the European roadmap to the realisation of fusion energy and will lay the path for a demonstration power plant DEMO, which will for the first time supply fusion electricity to the grid.

UKAEA also has its own fusion device MAST (Mega Amp Spherical Tokamak), whose innovative design is aimed at furthering the route to smaller, cheaper, fusion reactors. MAST is undergoing a major multimillion rebuild to create a new machine MAST-U.

During the year, two new research facilities were constructed at Culham - Materials Research Facility (MRF) and the centre for Remote Applications in Challenging Environments (RACE).

The scientific research programmes are primarily funded by European funds and the Engineering and Physical Sciences Research Council (EPSRC). There is also strong input from around 25 UK universities and collaborations with major international industrial and academic players in fusion and fission.

ITER construction site

Key Risks

UKAEA is undertaking novel scientific research and cutting-edge design work, and as such, there are inherent technical risks. UKAEA continues to manage risks and opportunities proactively in line with the framework laid out in the Governance Statement. Risks and opportunities are assessed in accordance with the appetite for risk agreed by the Board and effective mitigations are put in place where threats exist.

External factors beyond the UKAEA's immediate control continue to influence the risk landscape. These include the general climate of austerity, foreign exchange fluctuations and securing funding in a highly competitive environment. Attracting and maintaining specialist skills in the organisation also remains a challenge due to the inability to keep pace with market pay rates because of the Government pay restraint policy. These external factors could combine to constrain UKAEA's ability to deliver its goals, but are being compensated by a strategy of increasing collaborations with international and industrial partners.

The positive outcome of the recent Government Comprehensive Spending Review will provide much needed infrastructure investment as well as funding to pursue new business development opportunities in both fusion and fission related sectors.

UKAEA's business development strategy promotes technology growth in the UK, with new enterprises acting as a catalyst for UK industry and enabling broader utilisation of skills now and in the longer term. The strategy is informed by the opportunity and risk identification, assessment and mitigation process and is actively tracked by the Executive Committee.

Further information on the management and governance of risk is provided in the Governance Statement.

Above MAST vacuum vessel being lifted

Performance Summary

Table 1: Outturn against the corporate performance measures

Performance Measures	Target	Outturn
Key Scientific and Engineering Measures		
Deliver the UK Fusion Programme milestones agreed with EPSRC	80-100%	30 out of 37 (81%) milestones achieved
Deliver the JET Operations milestone targets agreed with the European Commission	80-100%	35 out of 54 (65%) milestones achieved
Deliver the Tier 1 MAST Upgrade project milestones	Targets for each milestone	4 milestones achieved + 4 milestones missed
Deliver the Technology & Engineering milestones	80-100%	All 6 milestones (100%) achieved
Deliver the Material Research Facility	Oct - Dec 2015	Building handed over in February 2016
Deliver the RACE milestones	Targets for each milestone	~4 stretch targets achieved, but target for operating budget narrowly missed
Key Business and Financial Measures		
Achieve the targets for external business development revenue and margin	Budget figure	Income target missed, but margin target exceeded
Achieve the operating profit targets from commercial property management	Budget figure	Budget figure achieved
Key Process and Cultural Measures		
Deliver the Assurance Improvement Programme	80-100%	17 out of 18 (94%) milestones achieved
Deliver the Capability programme	Targets for each milestone	All 3 stretch targets exceeded
Deliver the SAP replacement & telecoms project	80-100%	Missed due to project delays
Deliver Project Management process improvements	80-100%	All 5 milestones (100%) achieved

UKAEA has a balanced scorecard for its corporate performance measures and performance is tracked through the year by the Executive. The outturn for 2015/16 against the performance measures is provided in Table 1.

On the scientific measures there has been good performance on the UK fusion programme, technology programme and with RACE. However, JET suffered several technical faults, which impacted on operations and caused the performance measure to be missed. The MAST Upgrade project suffered technical and resourcing problems. Construction of MRF did proceed to schedule, but building hand-over was later than targeted due to delays with the ventilation system.

On the financial measures commercial property income was positive reflecting high occupancy levels. The business development income target was missed, primarily due to delays in anticipated work from ITER contracts.

On the process measures there has been excellent performance on the safety & assurance, project management and capability programmes. However, defects in the system to replace SAP have delayed go-live of the new system, causing the measure to be missed.

More detail on specific activities and achievements during the year are provided in the Performance Analysis.

Performance Report
Performance Analysis
Tokamak Science Programme

The tokamak science area uses experiments, theory and modelling to understand the latest empirical observations and to guide the development and operation of present and future tokamaks towards the goal of commercial fusion power.

The work is focused on several key topics:

- role of fast particles in the plasma core, crucial for heating in a fusion power plant;
- behaviour of the high confinement region near the plasma edge, instrumental in determining the core fusion power;
- development of effective plasma exhaust systems, necessary to mitigate heat loads to the wall; and
- self-consistent integration of core, edge and wall to combine high fusion power production and compatibility with material and technology constraints.

Some highlights of the 2015/16 activities are summarised below.

Instabilities can be excited by fast particles in tokamak plasmas which, if large enough, can cause the fast particles themselves to be redistributed or lost entirely from the plasma. Predictive modelling of one such instability, the toroidal Alfvén eigenmode, has been performed to assess the impact in the next generation ITER tokamak, where alpha-particles will be relied upon to provide plasma self-heating and high fusion gain. The potential for nonlinear avalanche processes between spatially distributed modes was investigated and it was found that the final wave field amplitudes of the modes were a factor of 50 below the level required for the avalanches to occur. These results indicate that, at least for the parameters assumed in this reference ITER case, alpha-particle confinement should not be degraded by toroidal Alfvén eigenmodes.

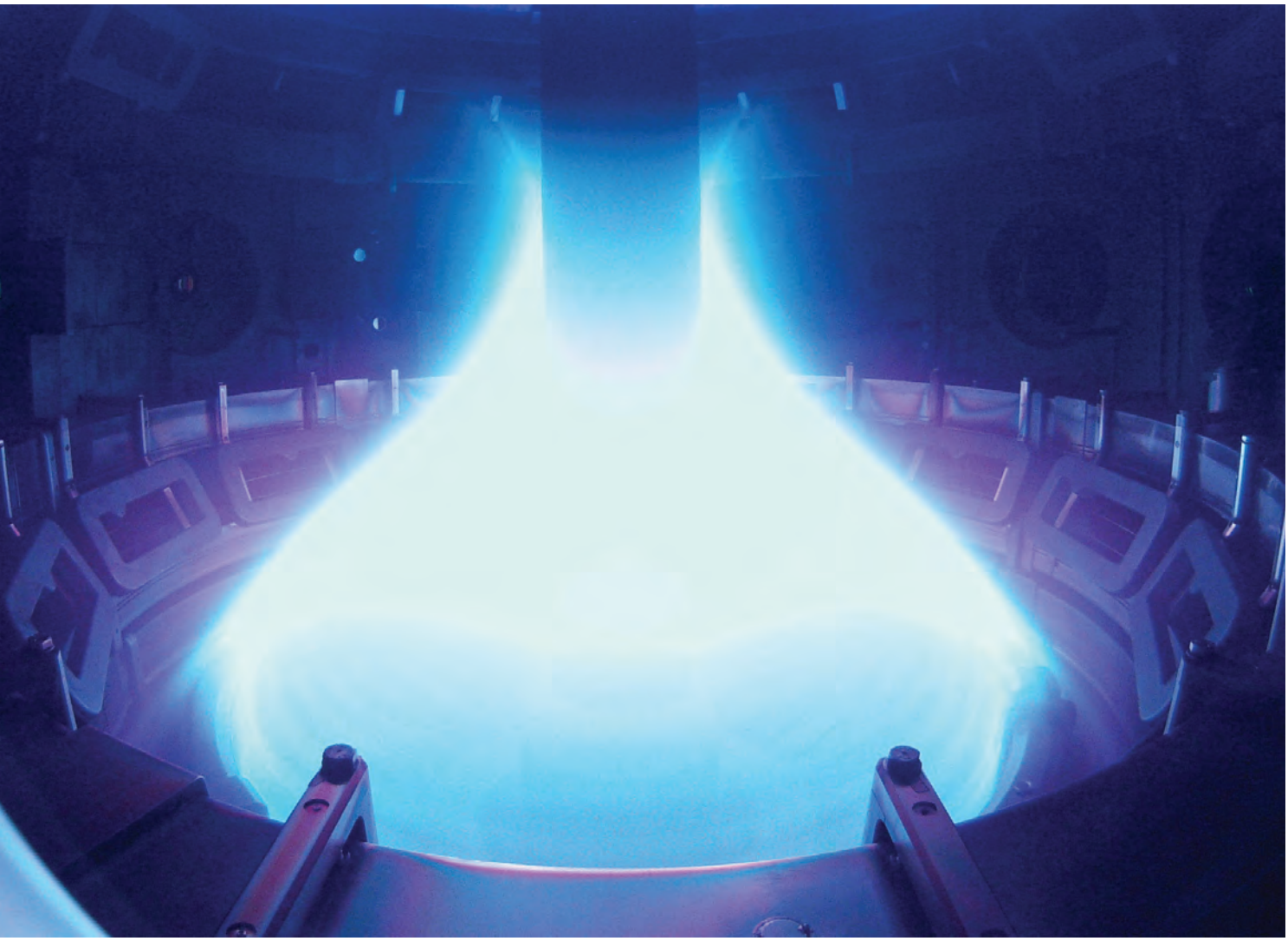
The distribution of the confining magnetic field in tokamak plasmas is known to affect the rate at which heat is transported from the core region. But analysis of JET plasmas with different initial magnetic configurations has shown that the dominant factors affecting the energy confinement were the thermal pressure of the plasma, normalised to the strength of the magnetic field, and the rate at which neutral fuel particles were injected into the vacuum vessel. Both of these factors affect the behaviour of the high confinement region near the plasma edge, called the pedestal, which acts as the pivotal element, reacting to influences from inside and outside the plasma and providing boundary conditions for the behaviour in both regions. This analysis shows that, in addition to local transport effects, an integrated approach is needed, including core, edge and wall, to fully understand and predict plasma energy confinement.

A key way that heat and particles are lost from the pedestal region near the plasma edge is by intermittent instabilities called Edge Localised Modes (ELMs). Simulations of ELMs have been performed for a range of JET plasma conditions using a 3D nonlinear magneto-hydrodynamic model. The results were then compared with experimental measurements of the plasma energy lost at each ELM. It was found that the use of realistic values of plasma viscosity and resistivity in the model is important to reproduce the experimental ELM behaviour and quantitative agreement was achieved for the ELM energy losses over a range of pedestal pressures (Figure 1). Key characteristics of the ELM instabilities, such as duration and amplitude, can also be reproduced, providing a valuable tool for modelling the contribution of ELMs to plasma energy confinement and exhaust.

Understanding how heat exhaust travels from the hot plasma core towards the vessel walls is crucial for safe tokamak operation. This journey passes through the scrape-off layer; a narrow region around the well confined core that is in direct contact with the material surfaces. As the hot plasma starts to cool in this region, it interacts with neutral particles that do not respond to electromagnetic fields. This creates a highly nonlinear environment in which the plasma becomes self-organised and generates coherent, filamentary structures. By measuring the light emitted by these filaments as they interact with neutral particles in MAST, it was possible to reconstruct the motion of individual structures in the scrape-off layer (Figure 2). State-of-the-art nonlinear 3D numerical simulations were then carried out to reproduce and interpret the physics of the filaments, understanding, for example that their propagation velocity depends on the relative balance between their temperature and density. This research will provide the basis for predicting the behaviour in future tokamaks where much larger power exhaust must be controlled.

A promising way to reduce the heat reaching the vessel wall is to transfer the exhaust power into radiation and uncharged atoms, which are not bound by magnetic fields and, therefore, allow the power to be distributed over a larger area of the vessel wall. This approach, called detachment, is being investigated experimentally on several tokamaks and will become a key line of research on MAST-U with its unique Super-X divertor capability. In preparation for this, simulations have been carried out using a transport model for the SOL, which models the interactions between the neutral and charged particles in this region. In these simulations detachment is achieved at lower density in the Super-X configuration compared with the conventional divertor geometry. The result is encouraging for the compatibility of a detached divertor with the hot plasma core needed for high fusion power.

Top Divertor region of the MAST plasma



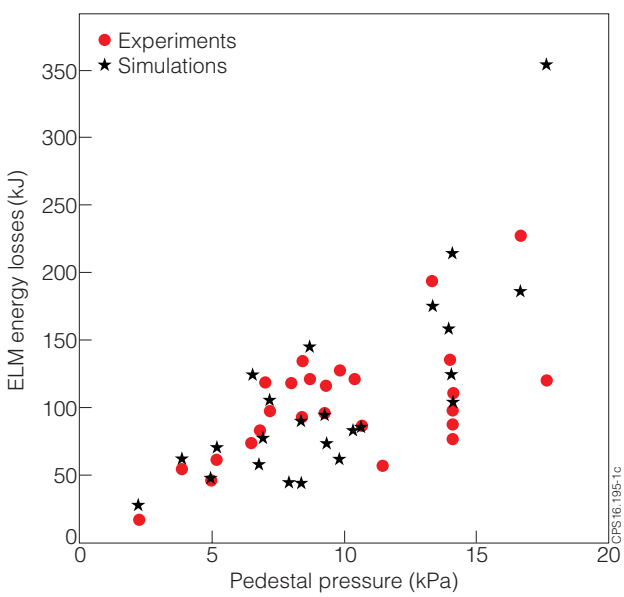


Figure 1 Plasma energy losses due to ELM instabilities as a function of the pressure in the good confinement region near the edge of the plasma, showing quantitative agreement between the trends in the measurements and simulations. (S Pamela et al., Plasma Phys Control Fusion 58 (2016))

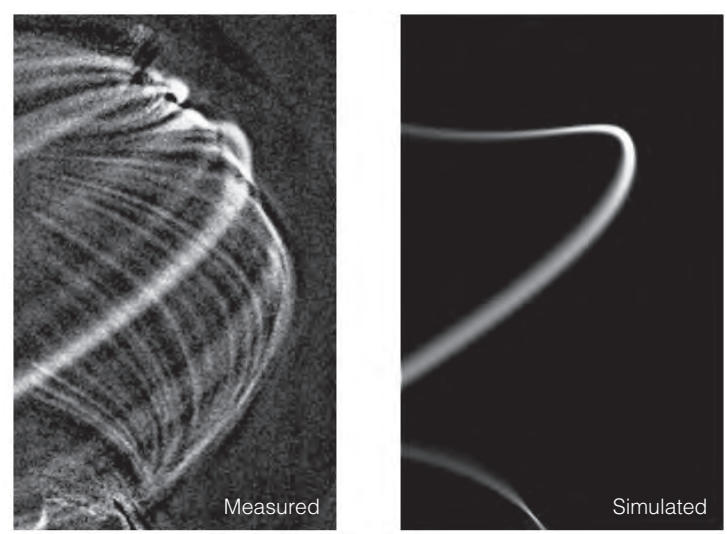


Figure 2 Filament structures in the edge scrape-off layer region of MAST imaged by a camera (left) and a single filament reproduced in a 3D numerical simulation and visualised using a synthetic camera diagnostic (right).

JET Operations

JET Restart

A planned shutdown of JET, which started in October 2014, allowed for maintenance and modifications to JET systems. A number of reactor vessel tiles were exchanged to allow for fuel retention and material erosion/migration studies. An extensive programme of ex-vessel activity was also completed, including:

- re-location of the High Frequency Pellet Injector for improved pellet injection reliability (figure 3);
- re-installation of the ITER-like Antenna for ion cyclotron resonance heating;
- removing one of the Neutral Beam Injection (NBI) system central support columns assembly for inspection/remedial work and repair;
- replacement of the 36kV switchgear of one of the three main pulsed-power distribution bus-bars; and
- installation of a third disruption mitigation valve.

All the shutdown activities were successfully completed, and vessel pumpdown was achieved on 1 June 2015, one day ahead of the schedule. This was followed by a transition into machine restart commissioning. The first plasma was re-established on 28 August 2015, around three weeks later than planned due to a number of technical problems.

A number of other projects continued throughout the year, including:

- technical preparations for deuterium-tritium (DT) operations;
- water detritiation system to provide on-site processing capability and full closure of tritium processing cycle (figure 4);
- planning for the Materials Detritiation Facility, which will decontaminate solid wastes and recover tritium; and
- enhancements to plasma diagnostics.

Experimental campaigns

The experimental campaign C35 started on 9 November 2015. However, the available neutral beam power and the reliability of the NBI system were not sufficient to carry out experiments to develop plasma scenarios relevant for DT operations. Two issues were affecting the performance of the power system: premature simultaneous turn-off of multiple beam sources, and high voltage (HV) breakdowns suspected to be in the high-voltage transmission system. About one third of the planned experimental sessions for the Campaign C35 were used for identifying the faults in the NBI system. A more definitive understanding of the problems in the HV transmission system had to await development of more extensive diagnostics.

During the 2015 JET Restart and Campaign C35, the NBI HV towers and transmission lines were operated with nitrogen as insulating gas instead of sulphur-hexafluoride (SF6), which was used previously. This decision was initiated by new European legislation related to the use of fluorinated gases to limit their release into the environment and resulted in a substantial reduction in UKAEA's environmental emissions. Although the initial tests with nitrogen as insulating gas, carried out in 2014, indicated that the voltage holding was sufficient for the maximum voltage of 125 kV, operation in 2015 continued to be unreliable. At the end of January 2016 it was decided to revert to SF6 gas but at sub-atmospheric pressure in the HV towers, to eliminate the possibility of leakage of SF6 gas into the environment. Unfortunately, HV breakdowns were again detected in the Octant 4 NBI system.

A number of different diagnostics (fast electrical and optical signals) were progressively installed in order to identify and localise the faults within the HV transmission system. As a result, the HV breakdowns were localised to the base of the tower. A thorough internal inspection of the HV towers was subsequently carried out. A very small water leak was detected, and the leaking element was isolated and fixed.

As a result of the problems, the programme in campaigns C35 and C36 was limited to experiments that could be carried out at reduced NBI power of about 18MW. But good progress was made in other areas and the performance and reliability of the pellet injector was shown to be significantly improved.

The experimental campaign C36 started on 25 January 2016, but was hampered by another technical problem when the Rotary High Vacuum Valve, which isolates the neutral injector box at machine octant no. 8 from the torus vessel, failed to open fully. An intervention was carried out in the first half of February followed by reconditioning of the JET vessel. A positive result during this troublesome phase of JET operation was the shortest period between vessel pump-down and stable plasma operation, established in two weeks and a favourable characteristic of the ITER-like tungsten and beryllium first wall components. Campaign C36 continued from 14 March 2016.

Top Joint European Torus, Culham Science Centre

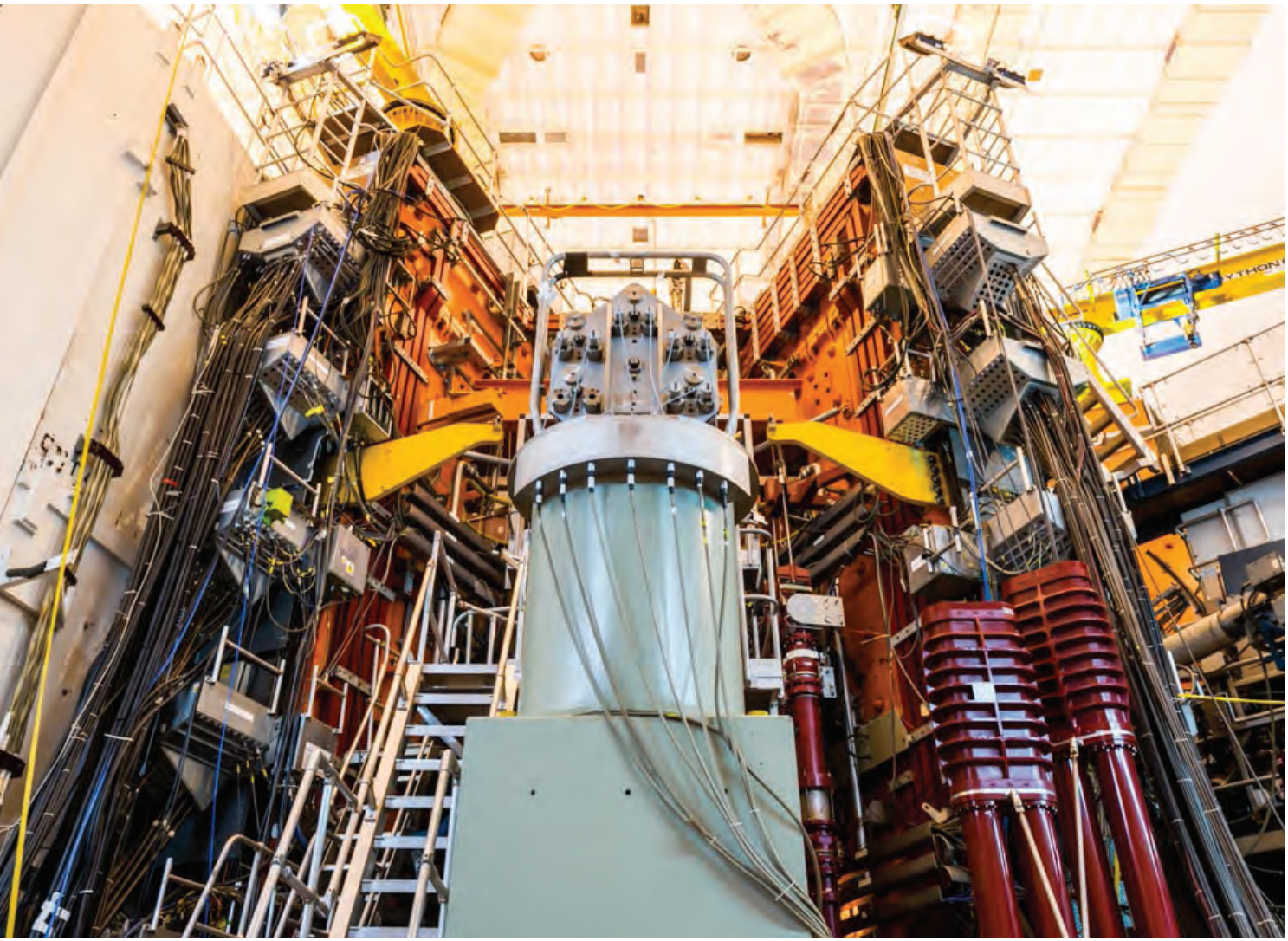


Figure 3 Multiple stream of pellets of deuterium ice in-flight launched from the improved JET High Frequency Pellet Injector system

Figure 4 Elements of cryodistillation system designed for the Water Detritiation System

MAST Upgrade

The upgrade of the MAST tokamak continued throughout the year. Assembly of the machine has continued to be technically challenging and there have been manufacturing issues with several key components. This has caused delays and more effort has been required than had been planned. By the end of the reporting period the construction of all of the major sub-assemblies (Figure 5) was well advanced and reassembly of the machine will continue through 2016. All efforts are being focused on starting plasma operation in 2017.

The assembly of the outer cylinder was finished in June 2015. In parallel the assembly of the lower cassette was completed and it was installed in the outer cylinder in September 2015. The assembly was then completed by installing the graphite protection tiles. The assembly of the upper cassette, which is a mirror image of the lower cassette, was also nearing completion by the end of the reporting period but it had not yet been installed.

The assembly of the lower end plate was also completed except for the installation of the graphite protection tiles with their integral heaters. The work on the upper end plate, which is the final part of the vacuum vessel to be installed, started with the installation of the 3 divertor coils and is on plan for completion in time for when it is needed for installation in the autumn of 2016.

The magnetic diagnostics were installed on the centre tube of the vacuum vessel and the graphite protection tiles and the pair of divertor coils that will be mounted on it were trial-fitted. In total (including the lower end plate and lower cassette) 400 out of 800 Langmuir probes and 450 out of 700 magnetic diagnostics that will ultimately be installed on MAST-U have been fitted.

The centre rod of the toroidal field coil was impregnated at the supplier and delivered in June 2015. The solenoid, which forms the other large component of the Centre Column, was also delivered in Q1 but was found to have faults in its electrical insulation requiring investigation and repair; these were completed by the end of the reporting period. The Pc coil and the two Px coils needed for the Centre Column were also delivered.

The 8 new power supplies needed for the 7 pairs of divertor coils plus the Px coil pair were installed and locally commissioned. The DC power supply that feeds these supplies (which reuses the main components from the power supply previously used for the MAST toroidal field coil circuit) was also completed. The new 133kA power supply that will be used for the toroidal field coils on MAST-U was also installed and locally commissioned. In addition the new power supply that will control the vertical stability of the plasma was installed.

The new components needed to upgrade the two neutral beam heating systems to 5s pulse duration were assembled during the year and are ready to fit.

Throughout the year work continued on the control, instrument and protection systems for MAST-U, as well as the access systems needed to ensure personnel safety.

Once completed MAST-U will be a unique facility with an international user base and continued strong involvement from UK universities. To support increased collaborations a new control room has been built, and was delivered ahead of schedule in June 2015.

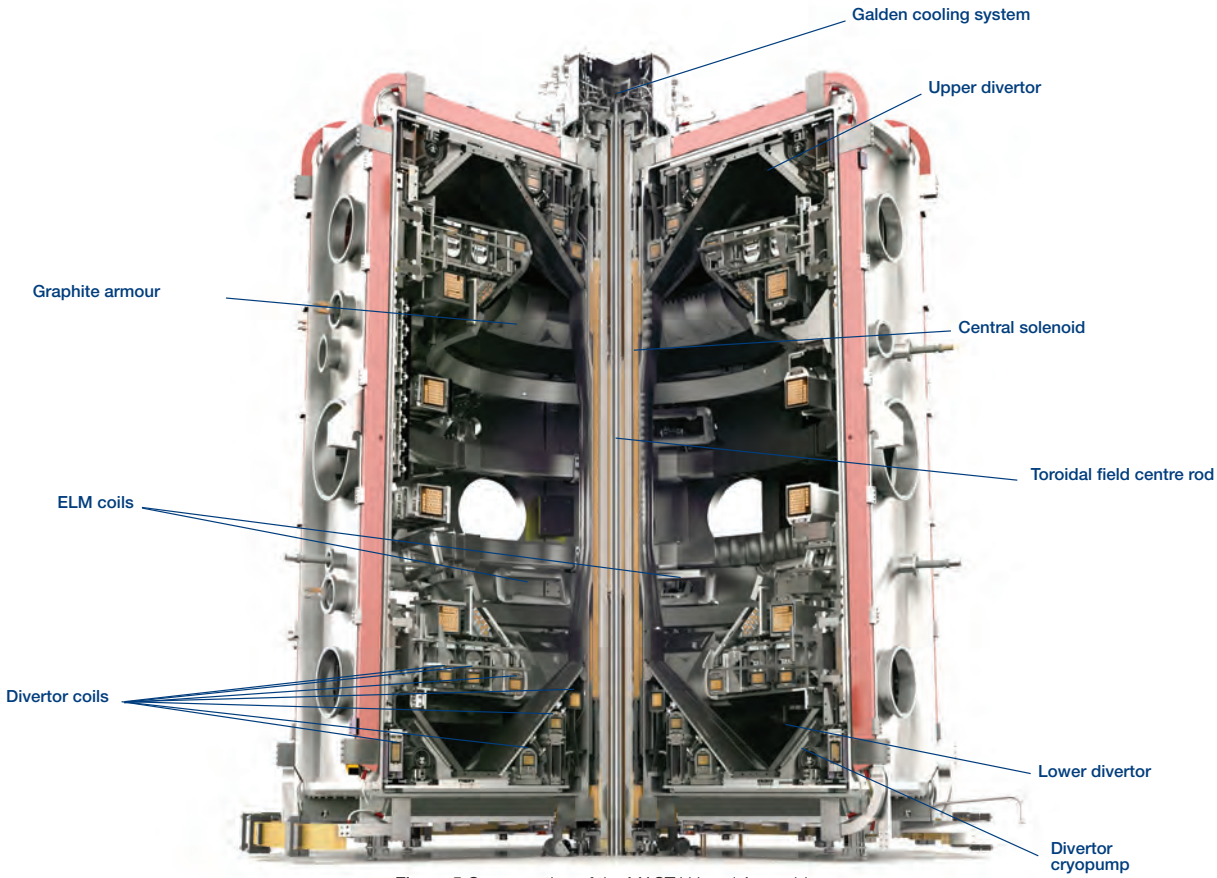
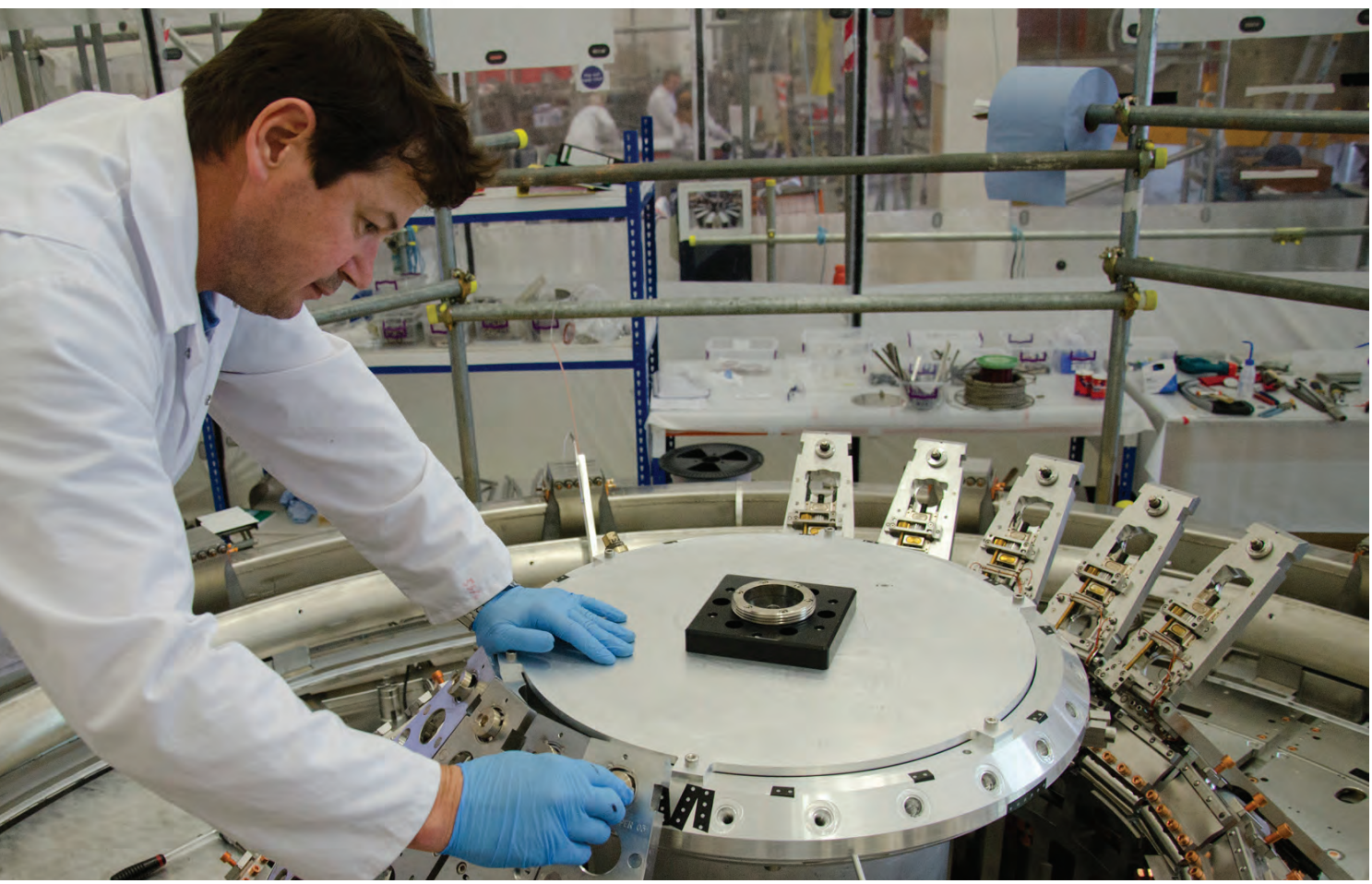


Figure 5 Cross section of the MAST-U Load Assembly



Above MAST-U Lower End Plate nearing completion

Technology Programme

UKAEA continued to contribute to EUROfusion's DEMO design effort, filling major roles in eight projects. A maturing level of systems integration analysis has developed using the industrial standard DOORS code. Further improvements to the PROCESS system code improved the modelling of impurity gases in the plasma (potentially used to reduce power loading on the divertor), core and pedestal transport and, with the University of York, a simple divertor model. The stellarator modelling capability of PROCESS has also been exploited in collaboration with the Max Planck Institute for Plasma Physics, to exploit results from the new Wendelstein 7-X fusion device. Advanced computational techniques allowed significant progress to be made in the application of a Super X divertor to DEMO-sized tokamaks.

UKAEA specialises in the design of high heat flux components and so plays major roles in the first wall and divertor design projects. A flexible design tool, THAMES, has been developed to calculate temperature and stress in coolant channels based on geometry, incident heat flux and coolant conditions. The code is able to explore different geometries, materials and coolants at different conditions, including gases, liquids and water with local boiling. When coupled to ANSYS software, this provides 2D temperature and stress fields for the component under the pertaining conditions. Different concepts of first wall have been assessed and the results show that de-coupling the first wall from the blanket structure reduces stress by a factor of three and provides more freedom of choice for the blanket structural material. For the divertor monoblock concept an analysis procedure has been devised based on elastic deformation that allows different concepts to be compared. Concepts under evaluation include ITER-like thermal break, functionally graded copper and tungsten composites. This work, by analysis experts in the Central Engineering Department, has demonstrated the power of systems engineering to identify solutions that may otherwise be missed by the traditional, incremental approach to design.

Analysis of the Water Cooled Lithium Lead blanket design using the APROS code showed that the primary coolant could be used as a heat storage medium during the down time of a pulsed DEMO. This potentially eliminates the need for energy storage in a pulsed system but controlling the output to deliver a constant rate of electricity will require careful balancing.

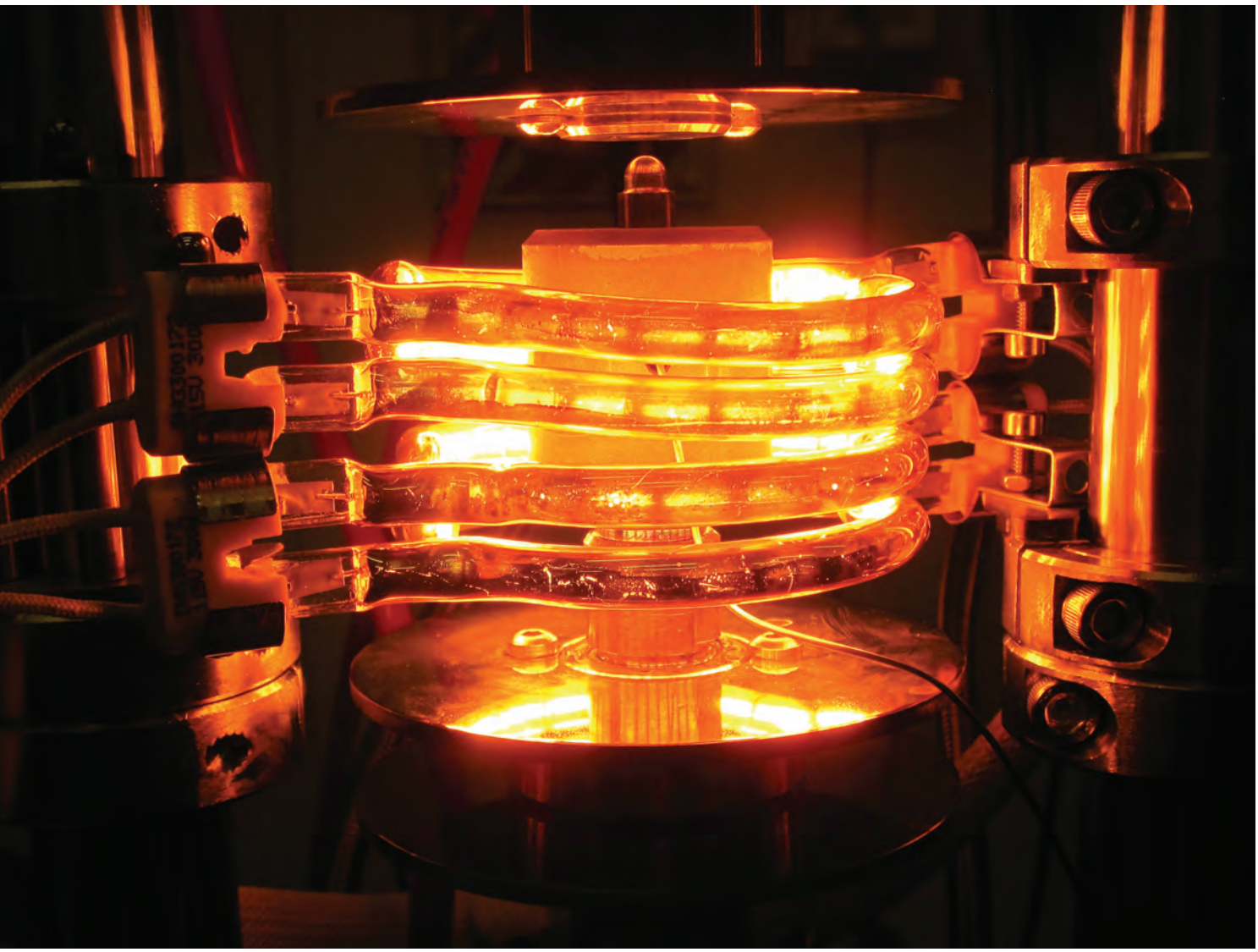
The Engineering Design Data Integration project, led by UKAEA, has established a framework for assessing the Readiness Level of materials for their application. Similar to the technology readiness concept this allows knowledge and qualification gaps to be identified and experimental testing programmesdevised. To promote the uptake of good design practice, UKAEA held a training school on the implementation of design rules for fusion attended by 30 engineers from across EU fusion laboratories.

Engineering and physics combine in the multidisciplinary ITER Magnet Safety Study to create a code that can be used to assess the consequences of a quench in the ITER superconducting magnets under off-normal conditions. The quench rapidly heats the magnet, melting and vaporising the conductor, allowing electrical arcs to form that could damage the containment structures of the ITER installation. The code integrates models of superconducting quench, thermomechanical and electrical response and arcs to provide a tool to predict the events for a given fault condition. It was used to answer two such questions from the French safety regulator in 2015 and work continued to refine and benchmark it. This project, involving staff from 5 departments, has become a flagship for multidisciplinary projects in UKAEA.

The Materials Technology Laboratory was commissioned; the Laboratory hosts several test rigs for tensile, creep, fatigue and hardness measurements. Complementary to the MRF this facility will concentrate on creep and fatigue measurements to establish validation methods for materials formed by additive manufacturing and dispersion strengthened steels.

The nuclear modelling programme showed growth in activities funded by ITER, Fusion for Energy (F4E), EUROfusion and other industries and organisations in fields such as security, detectors and nuclear monitoring. The 3D modelling of whole plant and large structures has been particularly strong with contributions to the ITER divertor remote maintenance contract (with RACE) and the DEMO remote maintenance scheme.

Analysis of the latter showed that removal of the divertor presented the greatest dose rate to equipment which may need replacing during the maintenance period. The heating of the blanket due to decay of activated elements is also significant, showing that forced cooling will be necessary during maintenance operations and subsequent storage (Figure 6). This is likely to be an issue of concern to the regulator. Nuclear modelling was also undertaken in support of the Spherical Tokamak based Fusion Neutron Science Facility study conducted at Princeton Plasma Physics Laboratory.



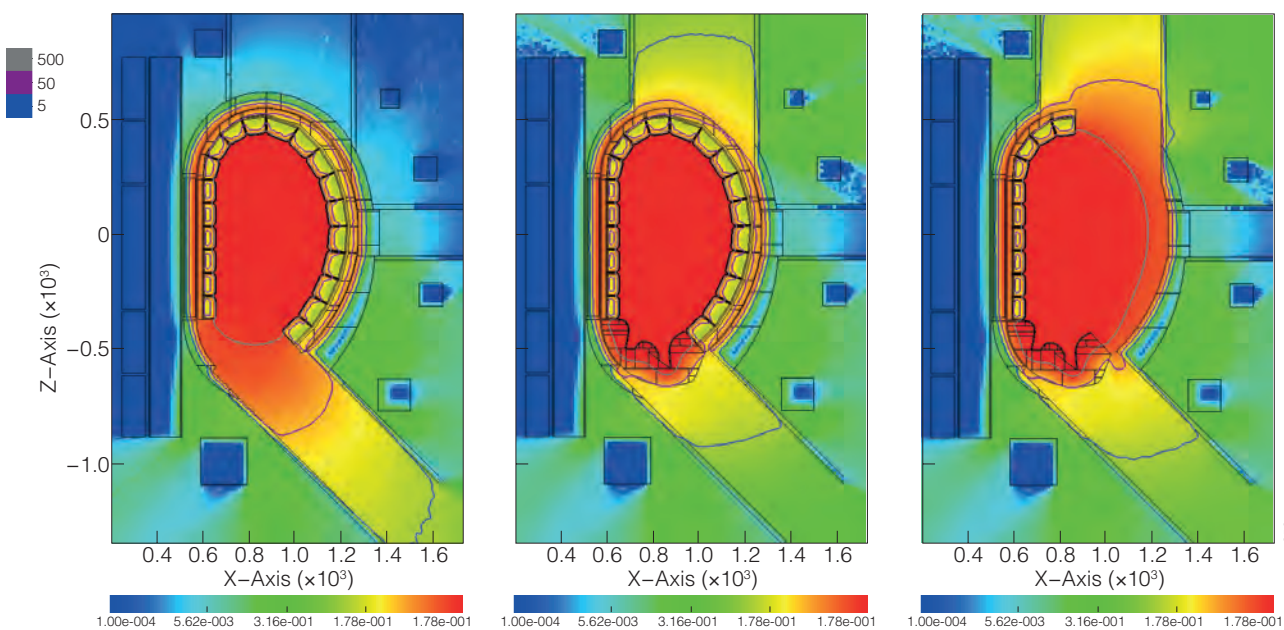


Figure 6 Shutdown dose rate to silicon (Gy h-1), left: divertor removed (decay time 8 weeks), middle: upper port plug removed (decay time 4 weeks), right: upper port plug and blanket segment removed (decay time 4 weeks)

Above Small Punch Creep testing in the Material Technology Laboratory

Materials Science Programme

The materials in a fusion power station will have to withstand high fluxes of neutrons and heat. The objective of the programme is to generate fundamental understanding of their behaviour in this environment to underpin choices for the design of components. This is a wide ranging and very challenging objective and is therefore tackled as part of EUROfusion and other international collaborations, with input from UK universities. There are many synergies with fission R&D and other materials science.

The programme has four strands. Three are long-established; plasma-facing materials in JET, modelling materials damage, and codes for calculating radioactive inventories & radiation transport. The fourth is new, and increasing, experimental work on irradiated steels and tungsten.

In February 2016, the new MRF building was completed (www.mrf.ukaea.uk). The facility has been part-funded by the UK Government's National Nuclear User Facility (NNUF, www.nnuf.ac.uk) initiative to provide hot cells and other facilities for UK fission researchers. Its purpose is to process and analyse samples that are too radioactive for university premises but do not require the facilities of a nuclear licensed site. Over the last year, the MRF scientific equipment was in continual use for non-active work by many universities and by UKAEA. Use of the MRF is gradually building up and a four year investment plan to install more equipment has commenced, with funding earmarked from the UK's Sir Henry Royce Institute materials science initiative as well as NNUF.

Fuel Inventory and material migration studies in JET with the ITER-like wall

One user of MRF equipment is UKAEA's Erosion Deposition Group, which participates in the EUROfusion JET2 work programme to provide analysis of components exposed in JET to study long term fuel retention and material migration of the metallic ITER-like wall in JET. New images showing layered beryllium deposits on JET tiles have been obtained using the Scanning Electron Microscope; this layering is due to variations in JET operating conditions. The evaluation of fuel retention using the Thermal Desorption Spectrometer has shown a range of fuel trapping sites dependent on the erosion and deposition condition of tile surfaces. Particles produced in JET remain a topic of interest for ITER. The evaluation of molten particles has demonstrated capability for detecting beryllium in particles using the scanning electron microscope (Figure 7).

Effects of Radiation on Materials

This research focuses on understanding the changes in behaviour and structure in materials exposed to the high energy neutrons escaping from fusion plasmas. These neutrons collide with the atoms of materials, displacing them from their lattice sites and leading to a cascade of atomic displacements, which result in defects whose build up as structural damage can profoundly influence the functionality of a material. UKAEA is developing a series of modelling techniques to describe the whole irradiation damage picture. This includes predicting the spectrum of initial displacement events caused by each neutron collision, which we now predict routinely and robustly using fundamental nuclear physics and newly developed computational methods.

In the absence of a suitable test facility with the correct high energy neutrons to irradiate materials, the current best experimental approach to investigate damage formation is to use high energy ions to initiate the cascades. With experimentalists from Oxford University, a new automated procedure has been developed for identifying and counting damage in ion-irradiated samples (Figure 8). This has allowed a more complete analysis of experiments performed on samples of the potential first wall material tungsten, revealing the size distribution of defects produced in damage cascades. The results have simultaneously been compared against equivalent atomistic computer simulations performed by collaborators at the University of Helsinki, demonstrating an equivalent size-scaling law and offering hope that atomistic simulations can be used to model the real situation (Figure 9).

As well as scattering, which makes up the majority of the collision events, neutrons also induce "transmutation" reactions, where an atom's mass and/or proton number can change, creating chemical impurities and radioactive isotopes. Application of modern computational methodologies, including UKAEA's own internationally recognised FISPACT-II simulation platform and the latest, more complete nuclear data libraries, to improve predictions of these changes. The infrastructure has even advanced to the point of being able to perform research beyond fusion conditions, including tackling scenarios for fission, medical physics, and high-energy astrophysics. FISPACT-II is available for applications in these and other fields (along with a new magnetic materials code SPILADY).

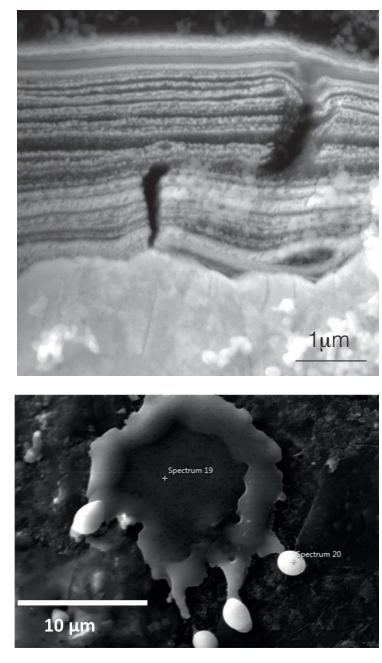
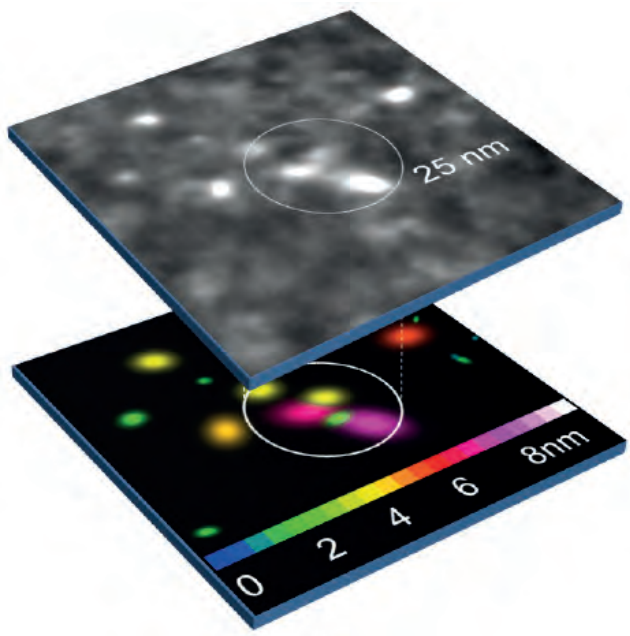


Figure 7

Top: Layered beryllium deposit on JET tile.
Bottom: Scanning Electron Microscope image of molten beryllium droplet



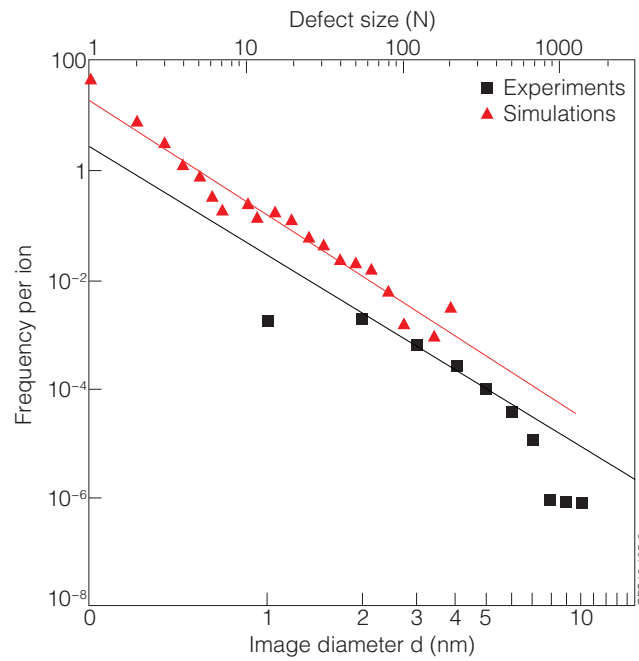


Figure 8 Defect clusters produced in collision cascades of tungsten irradiated at 30K by 400 keV W+ ions.

Top: Weak-beam dark-field Transmission Electron Microscopy image
Bottom: The equivalent computer-generated analysis of the position and size of the defects.

Figure 9 Size distributions of defects sampled from experiment and molecular dynamics simulations.

Above Materials Research Facility Team

RACE

RACE will enable UKAEA to apply R&D to many applications of remote handling and robotic technology. It builds upon experience acquired through the development of the JET fully-integrated remote handling systems and over 30,000 hours of operational experience over a 20-year period. It will also be a key centre for implementing the Government's Robotics and Autonomous Systems (RAS) strategy, which aims to equip the UK to compete in this emerging global industry.

JET remains a central component of RACE's work and work continues towards shutdowns in 2016. The JET Remote Handling System is also crucial to JET Internationalisation as a considerable amount of in-vessel work will be conducted post DT and hence with zero-manned entry. This work has great value to ITER.

RACE is in consortiums with leading nuclear engineering companies AMEC Foster Wheeler and Assystem for the delivery of major ITER framework contracts for the ITER Neutral Beam and for the ITER Divertor remote handling system.

RACE continues to lead the EUROfusion DEMO Remote Maintenance work package and provides 80% of the European resource. Hence expertise gained through operating JET is being applied to shaping the design of a future DEMO and this supports UKAEA's goal 4. This work also establishes a far reaching technology research program and enables international collaboration beyond Europe.

In July 2015, UKAEA was selected to supply the Hot Cell Remote Handling Facility for the new €1.8 billion European Spallation Source, which is currently under construction in Sweden. The UK's overall contribution to the project is being led by the Science & Technology Facilities Council (STFC). The design and development activities for the Hot Cell are being led by RACE. The Hot Cell is a critical downstream support facility to handle and process components from the target station. It consists of handling equipment such as power manipulators and cranes, processing equipment for remote cutting and welding, shielding and transit cases, all fully remote-controlled via a central control system.

Construction of a new, 3,000 square metre RACE facility at the Culham Science Centre was completed on budget and on schedule and the 75 strong team moved in during February 2016. The building was funded by BIS and the Oxfordshire Local Economic Partnership. The facility will act as a RAS-hub providing access to test facilities, robotic equipment and expertise for SMEs, multinationals, research laboratories and academia from sectors with challenging environments.

Early tenants include Oxbotica, a spin-out from Oxford University's Mobile Robotics Group. A 'People in Autonomous Vehicles in Urban Environments' collaboration has been set up, led by Amey and involving RACE, Siemens, Oxbotica and Westbourne Comms. A feasibility study will be undertaken as part of the 'smart cities' initiative, funded by the Centre for Connected and Autonomous Vehicles and Innovate UK.

Top RACE team
Bottom Trialling of autonomous systems

Property Development

Founded on its assets and expertise, one of UKAEA's key goals is to develop the Harwell Campus and Culham Science Centre as significant centres for science and innovation, thereby supporting growth and jobs.

CULHAM SCIENCE CENTRE

Culham Science Centre is one of the three internationally significant science and business centres in southern Oxfordshire, which underpin the County's economic development. Sustaining a consistently high level of occupancy, it already provides some 2,000 jobs in a high quality working environment benefitting from a range of amenities and facilities. Looking to the future, Culham Science Centre is earmarked to support a further 1,000 jobs during the course of the emerging Local Plan.

The long term strategy for Culham Science Centre is to provide:

- UKAEA with a suitable environment for its role as a key global centre for fusion and related technology, engineering and design, looking beyond JET operations;
- significant growth in employment by attracting additional co-located business activity

Both of these will require investment and property development. To support its own programmes, UKAEA has already completed and commissioned two new facilities – RACE and MRF – signalling its ambitions both in relation to the future of fusion work but also with regard to economic impact and collaboration with industry and academia. Further new facilities are planned. Of note is the announcement of the Oxfordshire Advanced Skills, the second phase of which is expected to require new training facilities at Culham.

To enable growing commercial activity on the site, planning permission has been secured for a first phase of new development and the UKAEA is in the process of identifying and attracting potential partners who can fund new development. The aim is to establish and realise the commercial investment potential of the site whilst protecting the UKAEA's future operational and strategic interests. It is hoped that a partnering arrangement can be put in place and marketing of the development opportunity be initiated during the latter part of 2016.

Proposals are emerging for residential development adjacent to the site. Properly planned and implemented, this could enhance the future of the site by providing sought-after housing for employees and, for example, improved transport infrastructure. UKAEA is already working with the promoters of this scheme.

Harwell

UKAEA is using its significant property assets to support the development of the Harwell Campus as one of the largest and most significant science and innovation centres in the world. Together with STFC, UKAEA also holds and manages the public sector's share in the joint venture Partnership that has been established to develop the Campus.

During 2015/16, the Partnership significantly raised the national and international profile of the Campus, completed vital new road infrastructure to support future development, completed Genesis, a new research and development building to support companies growing at or moving in to the Campus, and finalised plans for a new innovation/business centre.

The integrated mixed-use masterplan for the Campus also provides for residential development to help with the development of a vibrant work/life environment at the Campus.

Left Indicative commercial development at Culham
Above New Genesis R&D building at Harwell

Assurance

UKAEA was awarded a prestigious Gold Medal by the Royal Society for the Prevention of Accidents (RoSPA) in recognition of its sustained commitment to accident and ill-health prevention. The RoSPA Gold Medal is presented following five or more consecutive RoSPA Gold Awards, and recognises the achievement of all on site delivering on safety.

Health & Safety

UKAEA continues to deliver on safety and health, focussing on maturing a strong safety culture among both employees and contractors. This is achieved via proactive programmes of monitoring and training such as the Zero Injury Programme tours, management walkabouts, a highly effective near-miss and incident reporting system and a robust, peer-led behavioural safety programme.

Health and wellbeing remains a strong focus for the UKAEA and for the second year running a calendar of initiatives were undertaken, aligning with national programmes such as 'Stress Awareness Month' and 'Dry January'.

An excellent safety and health record has been maintained during 2015/16. The accident frequency rate (defined as the ratio of work related lost time injuries per 100,000 hours worked averaged over the year) is 0.18 (for employees and contractors combined), down from 0.22 in the previous financial year. This figure compares very favourably when benchmarked with other organisations.

Robust radiation control strategies are in place. The average radiation dose to the 713 monitored/classified workers during 2015/16 was 0.003mSv which is less than 1% of both the legal limit (20mSv/ year), the site dose constraint (5mSv/year) and average background radioactive dose received by members of the public (2.7mSv). The highest individual cumulative radiation dose this year was 0.316mSv which was again well within relevant limits.

UKAEA Accident Frequency Rate

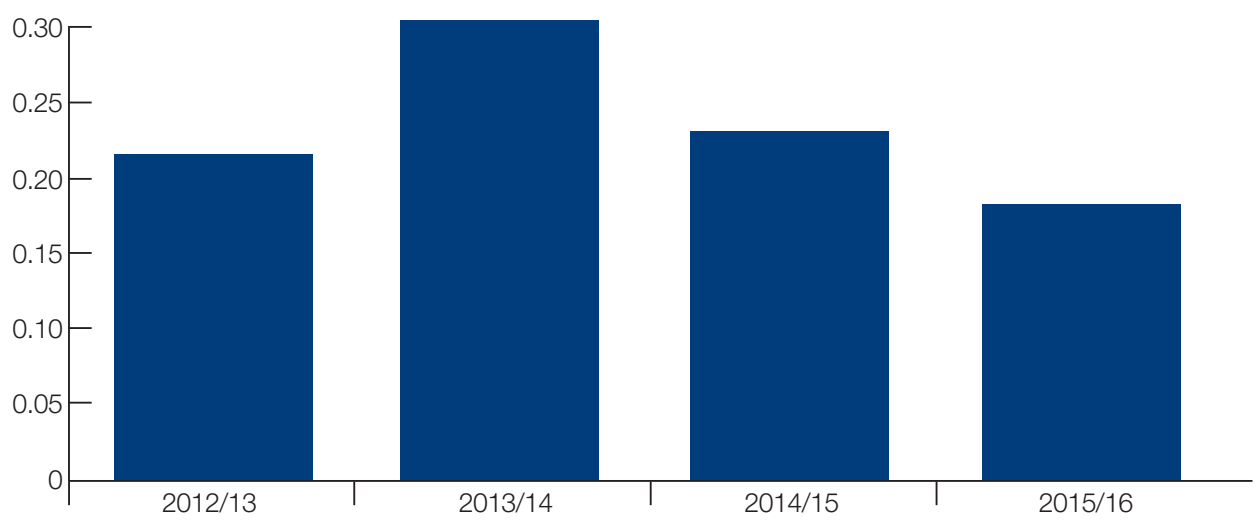


Figure 10 Accident frequency rate (employees and contractors)

Environment and Sustainability

UKAEA's annual carbon footprint has reduced by over 54%. This is primarily due to targeted re-engineering of certain processes, including those involving sulphur hexafluoride (SF6) where significant improvements have been made. 74% of the total reduced carbon footprint for 2015/16 comprises emissions due to non-pulsed electricity consumption and this area will be the focus for improvements in 2016/17. Waste figures show a reduction in the total volume of all waste types generated and better use of disposal routes. One key result is the reduction in cost of disposal of radioactive waste from an average of £7.50/kg in 2014/15 to £2.50/kg in 2015/16. Other improvements made in 2015/16 include:

- Follow-me printing roll-out has achieved an initial 5% reduction in total print volumes;
- PolyChlorinated Biphenyl liability has been reduced through hazardous waste disposals in 2015;
- The cost of wastewater disposal has been reduced through an abatement application; and.
- UKAEA has collaborated with Oxfordshire County Council to promote sustainable forms of commuting with further improvements planned for 2016/17.

The planned transition of the Environmental Management System to the new ISO 14001:2015 standard in line with the timescale for recertification will create an opportunity to embed sustainability practices across the organisation and maximise the benefits of environmental improvement and cost reduction.

Table 2: Summary of financial and non-financial sustainability information for 2015/16

Area		2012/13	2013/14	2014/15	2015/16
Greenhouse gas emissions (1,000 tCO_2e)		40.6	60.8	67.2	30.6
Estate Energy	Consumption (mill kWh)	54.4	67.1	60.0	65.0
	Expenditure (£k)	3,887	5,180	4,560	5,404
Estate Waste	Amount (tonnes)	857.7	802.1	693.1	693.5
	Expenditure (£k)	344	219	110	241
Estate Water	Consumption ('000 m^3)	69.4	99.8	110.5	79.8
	Expenditure (£k)	162	216	217	126

Note: More detail is provided in Tables 3-5. The information has been prepared in accordance with guidelines laid down by HM Treasury in 'Public Sector Annual reports': https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/512663/PU1935_Public_sector_ARA_sustainability_guidance_2015-16.pdf

Energy and water consumption and waste disposal volumes all vary year on year due to changes in plant operations, and this therefore affects the total greenhouse gas emissions. During periods of plant shutdown, waste production and staff numbers increase. During operational periods, electricity and water use increase. Previously, fugitive emissions would also have increased in operational periods. However due to re-engineering work in 2015/16, fugitive emissions are now independent of operational status. The reduction in fugitive emissions means that despite the energy consumption being greater in 2015/16 than the previous year, the overall greenhouse gas emissions have reduced.

Assurance continued

Table 3: Greenhouse gas emissions

Greenhouse gas emissions		2012/13	2013/14	2014/15	2015/16
Non-financial indicators (1,000 tCO_2e)	Total emissions (Scope 1-3)	40.56	60.76	67.20	30.64
	Gross emissions Scope 1 (direct)	18.19	32.84	41.22	3.95
	Gross emissions Scope 2 & 3 (indirect)	22.37	27.92	25.95	26.69*
Related energy consumption (million kWh)	Electricity: Non-Renewable	39.81	53.69	45.78	53.22*
	Electricity: Renewable	–	–	–	–
	Gas	14.56	13.38	14.22	11.76
	LPG	–	–	–	–
	Other	–	–	–	–
Financial indicators (£k)	Expenditure on Energy	3,887	5,180	4,560	5,404*
	CRC Licence expenditure	426	412	402	504*
	Expenditure on accredited offsets	–	–	–	–
	Expenditure on official business travel	419	525	509	394

Note:

1) The greenhouse gas emissions were calculated (from the raw data) using DEFRA/DECC conversion factors (http://www.ukconversionfactorscarbonsmart.co.uk/)

2) Figures with an asterisk have been estimated as follows:

i. CRC Licence Expenditure – The estimated figure for 2014/15 has been updated. The 2015/16 figure is an estimate.
ii. Electricity consumption and Scope 2&3 emissions – Figure includes an estimate for one month on one supply rather than recorded consumption due to late billing by the contractor. This should not significantly affect the total figures.

3) Gas consumption and Scope 1 emissions figures have been updated for 2014/15 to rectify an error in reporting. Electricity consumption and Scope 2&3 emissions figures have been updated for 2014/15 to update a previously estimated figure.

Management Systems and Quality

UKAEA operates an integrated management system and is certified to the internationally recognised core ISO Management Standards. Following independent external audit UKAEA was successfully recertified in July 2015. In addition, Health Physics Group is accredited to ISO17025, the international standard for testing laboratories.
The internal audit programme provides assurance to management and stakeholders that the required standards are being maintained and where areas requiring improvement are identified these are actively tracked and reported to management.

As part of a process of continual improvement a number of initiatives are underway to modernise and strengthen the Management System including ensuring it is fully compliant with enhanced ISO standards. Initiatives include improving structure and user friendliness of the Management System as well as specific improvement to the Project Management and Engineering Change Control processes. The focus of these changes is to better serve the delivery of the fusion programme and UKAEA's other strategic objectives.

Security

The UKAEA maintains an effective level of security working together with BIS and Office of Nuclear Regulation. Audits and the annual Department Security Health Check continue to show that the security standards are being maintained.

A review of all aspects of security (personnel, information and physical security) was carried out during 2015, supported by a full analysis of all security related risks. A Security Policy framework provides a balanced set of security requirements and these have been translated into a new Security Strategy. Approval of a new access control system across site will further enhance security.

Information security and risks are actively managed and monitored by the Information Assurance Steering Committee.

Table 4: Waste Disposal

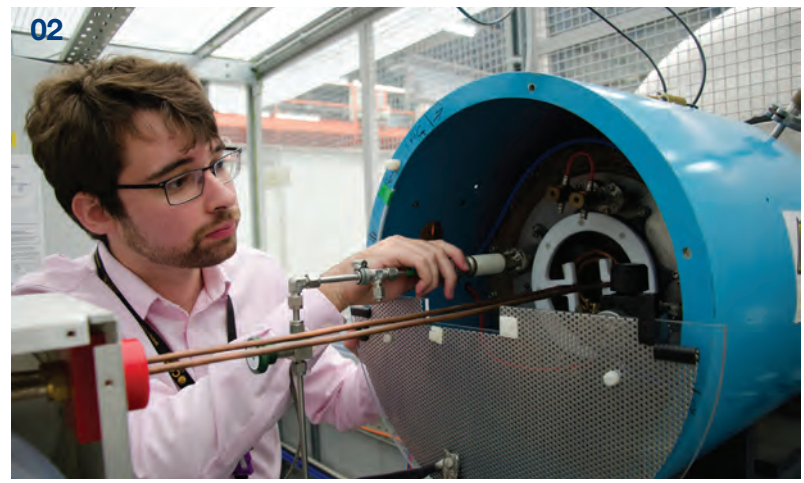
Waste			2012/13	2013/14	2014/15	2015/16
Non-financial indicators (tonnes)	Total waste disposed of		857.67	802.06	693.07	693.50
	Hazardous waste	Total	122.31	37.27	36.83	50.99
	Non-hazardous waste	Landfill	161.05	149.32	52.98	14.96
		Reused/Recycled	511.49	470.09	434.62	422.56
		Composted	24.96	24.96	27.04	37.44
		Incinerated (energy recovery)	–	95.24	115.90	97.30
		Incinerated (no energy recovery)	0.05	–	0.05	26.14
		Total non-hazardous waste	697.55	739.61	630.59	598.41
	Radioactive	Produced	20.59	129.72	46.89	31.05
		Disposed	19.13	19.07	18.66	44.10
	OSR (see note below)	Produced	1.59	28.77	13.19	10.90
		Incinerated (no energy recovery)	18.69	6.90	6.99	–
	Total Radioactive / OSR waste disposed of		37.82	25.97	25.65	44.10
Financial Indicators (£k)	Total disposal cost		344	203	110	241
	Hazardous waste disposal cost		7	37	22	92
	Non-hazardous waste disposal costs	Landfill	29	35	7	9
		Reused/recycled	(5)	(102)	(81)	28
		Composted	1	2	2	2
		Incinerated (energy recovery)	–	14	10	11
		Incinerated (no energy recovery)	–	–	–	–
	Radioactive	Disposed	271	209	138	99
	OSR	Incinerated (no energy recovery)	41	7	13	–

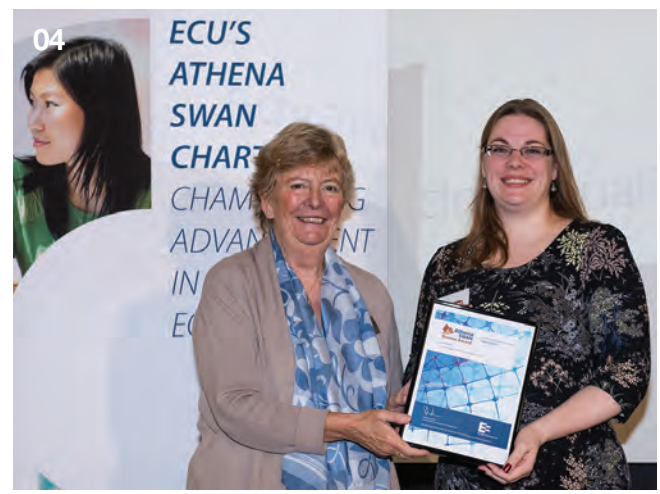
Note:
1) The figure for 'Compost' is food waste sent for anaerobic digestion. Negative financial figures for 'Reused/Recycled' reflect rebates received from scrap metals.
2) Out of Scope of Regulations (OSR) waste is material where the activity is low enough to fall below the threshold set by the Environmental Permitting Regulations to be classified as radioactive waste.

Table 5: Finite Resource Consumption

Finite resource consumption			2012/13	2013/14	2014/15	2015/16
Non-financial indicators ('000m^3)	Water consumption (whole site)	Supplied	69.38	99.77	110.54	79.79
		Abstracted	N/A	N/A	N/A	N/A
		Supply per FTE	0.08	0.09	0.10	0.07
	Average number FTE staff/contractors		907	998	1,090	1,080
	A4 paper reams equivalent		6,000	5,800	8,200	5,600
Financial indicators (£k)	Water supply costs (whole site)		162	216	217	126
	Paper supply cost		10	13	17	11

Capability





1. UKAEA Apprentice Emily Swatton being presented with a Women in Science & Engineering Apprentice Scholarship by HRH The Princess Royal.
2. Alastair Shepherd in his role in neutral beams group, after completing the 2-year graduate scheme.
3. Employees at an IoP chartering event to promote the benefits of accreditation.
4. Physicist Joanne Flanagan receiving the Bronze award from the patron of Athena SWAN, Professor Dame Julia Higgins.

UKAEA's continued world class reputation relies on the ability to attract, retain and develop first-class talent. Recruitment over the year has focussed on building UKAEA's capability requirements for the future in specialist skills areas in science, engineering, technology and project management. Improvements are continually being made to the selection and assessment process to ensure we recruit people who will embrace and drive forward our culture of passion, innovation, accountability, leadership, delivery and business-mindedness in all aspects of our scientific and engineering work.

UKAEA is committed to developing all its employees, and offers a wide range of programmes. This includes a highly valued two-year graduate scheme certified by IMechE, IET, and IoP, that provides a talent stream of committed, high performing graduates to take up permanent posts across the business. Similarly accredited continuous professional development schemes encourage employees from all disciplines to become professionally recognised. PhD and MSc opportunities are offered. In addition, a successful Mentoring Programme has been running for a number of years, helping to motivate and develop staff personally and professionally.

Each employee has structured job descriptions through the career framework. There is an annual performance management cycle, which includes cascading of objectives, based on corporate goals and deliverables. This process is supported by internal 'market-days'; where department leaders and programme managers outline their plans to each other to ensure that these objectives are focussed and consistent and that the resource is made available to deliver programmes and projects.

UKAEA operates an IMechE, IET, & NI accredited advanced apprentice scheme, tailored to meet the business needs of UKAEA and maintain the engineering skills base at technician and "hands on" engineer level. The scheme, now in its 11th year, has developed a reputation for its technical and academic excellence. UKAEA is expanding the apprenticeship offering from September 2016, when UKAEA will commence training apprentices on site in the first phase of its new training centre Oxford Advanced Skills (OAS).

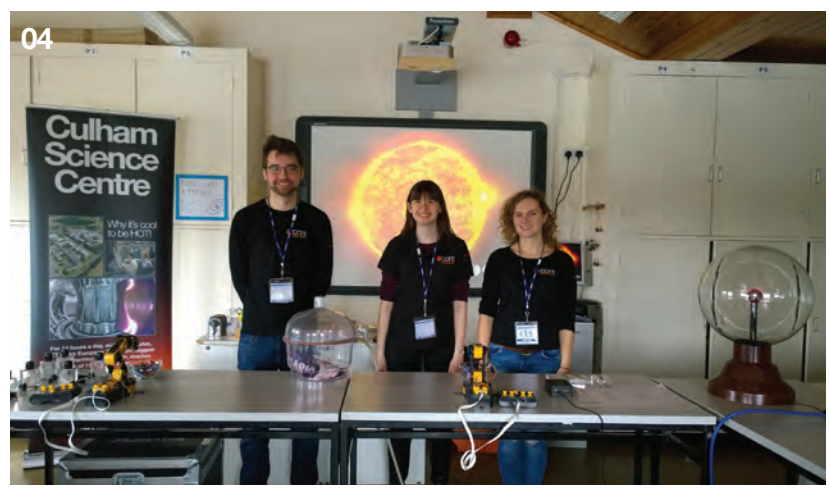
UKAEA secured a bronze Athena SWAN award in October 2015. The Athena SWAN awards recognises good practice in gender equality for women in Science, Technology, Engineering & Mathematics (STEM) disciplines and provide a framework for continued development. There are strong business benefits in supporting gender equality, such as increasing the ability to attract and retain scarce skills. UKAEA's engagement with Athena SWAN demonstrates a commitment to gender equality to prospective and current employees.

University Collaborations

UKAEA has links with over 20 universities. They contribute extensively to UKAEA's research programme, not only in plasma science but also in materials science, technology and engineering. UKAEA helps to fund studentships and a number of key university posts. Many of the students are part of the EPSRC-funded Fusion Centre for Doctoral Training (CDT), which is led by the University of York and also involves Durham, Liverpool, Manchester and Oxford. In July 2015, UKAEA held its annual showcase for work by PhD students and in November 2015 hosted the annual PhD recruitment event. There are around 80 PhD students working on magnetic fusion projects at any one time. In addition, about a dozen fusion and nuclear masters students do their projects each year at Culham. UKAEA also host undergraduates doing degree course projects.

Collaboration with UKAEA gives universities an opportunity to leverage EUROfusion funding for Enabling Research, Research on JET and Medium Sized Tokamaks and Educational Support. They also have access to other facilities at Culham such as MRF and the ADRIANA facility (advanced gamma detectors). Several universities have EPSRC grants of their own for research projects with UKAEA as a collaborator. In 2015, FuseNet conducted an assessment of the quality and fusion relevance of PhD training in member countries on behalf of EUROfusion. The UK programme scored full marks and was rated more highly than any other programme.

Stakeholder Engagement



1. Clare Moody, MEP, seeing how Culham has benefited from European funding.
2. UKAEA holds regular open evenings for the public and 'show & tell' events for staff.
3. The 'Star Power' exhibition at Abingdon Museum, which celebrated 50 years of the Culham site.
4. UKAEA Graduates leading a fusion workshop, which they designed to inspire the next generation of scientist and engineers.

Outreach and public engagement

September 2015 saw the 50th anniversary of Culham Laboratory's opening. The occasion was an opportunity for UKAEA to remind its stakeholders of the advances in fusion since 1965 and the progress scientists and engineers are making towards the goal of electricity from nuclear fusion. A Culham exhibition at Abingdon County Hall Museum attracted thousands of visitors from the local community and further afield, with educational activities and talks accompanying the main display. At the site itself, a series of events were organised for staff to celebrate the anniversary.

UKAEA continued its programme of educational and public outreach activities. These included the Sun Dome roadshow, which was attended by almost 2,000 primary school students in 2015/16, visits to Culham by A-Level and university groups, and public open evenings. Appearances at external events ranged from the Big Bang London schools science fair to STFC's open day at Rutherford Appleton Laboratory, and talks around the UK by speakers from Culham.

Trainees on UKAEA's apprenticeship and graduate schemes made an important contribution to these activities. Apprentices were particularly involved in supporting the new University Technical College which opened at Didcot in September 2015; UKAEA is an industrial partner in the college. UKAEA graduates developed an educational workshop on fusion for GCSE students, and built two new interactive exhibits for use at science festivals.

Updating key stakeholders at local, national and European level continues to be a high priority. UKAEA CEO Steve Cowley gave evidence at the House of Lords Science and Technology Committee's hearing on fusion in July 2015. In January 2016, Clare Moody MEP, a member of two key European Parliament committees with an interest in fusion research, visited Culham for a tour of the facilities and a briefing on JET's importance to the ITER project.

Media interest in fusion has been high due to the start-up of the Wendelstein 7-X stellarator in Germany and the emergence of privately-financed fusion companies, alongside the continuing story of ITER construction. Culham itself made over 130 appearances in the national and international media during 2015/16, including coverage on the BBC's 'The Sky at Night' programme, technical press features on MAST-Upgrade in Science magazine and Physics World and the local media such as a two-page spread on Culham's 50th Anniversary in the Oxford Mail.

Industry liaison

UKAEA has fostered close links with British firms during 2015/16, with the aim of achieving maximum benefits to industry from fusion research and, in particular, the ITER project. UK industry has so far secured contracts worth in excess of £300M from ITER, and with UKAEA support will be well placed to secure significant future contracts. As a participant in the ITER Business Forum conference in Monaco in February 2016, UKAEA supported both the ITER Organization and F4E in round table discussions on industry involvement in fusion. UKAEA also held industry meetings at Culham throughout the year, allowing companies to explore procurement opportunities for specific ITER technologies. A further series of themed events and exhibitions is planned for 2016/17.

The opening of the RACE and MRF at Culham has created new avenues for involvement with industry. Meanwhile, F4E's industrial liaison network (of which UKAEA is a member) has begun to connect with business networks in other large research projects (for example CERN and the European Spallation Source) to improve cross-promotion between physics and industry.

Financial Review

Operating Performance

Revenue for the year was £88,813k (2015: £100,374k). This reduction related to the Fusion operating segment. The Group made an operating loss of £2,119k (2015: profit of £2,426k), mainly due to a lower revaluation credit in 2016 (credit of £1,484k compared with a credit of £5,694k in the previous year.) The retained loss for the year after financing but before income tax was £2,198k compared with a profit in 2015 of £2,672k, for the same reason. Profit for the year after taxation was £7,879k compared with £1,182k in 2015, for reasons explained below.

Taxation

Current Tax

UKAEA has early adopted the Research and Development Expenditure Credit ("RDEC"), which replaces the previous R&D tax relief regime and will be mandatory from 1 April 2016. Early adoption is available for expenditure incurred after 1 April 2013, and UKAEA has submitted claims for the RDEC since the year ended 31 March 2015. The RDEC will generate extra income for UKAEA and offset any non-trading profits from property and other activities. The change to RDEC has resulted in total current tax credits to the income statement of £6,716k. Further details are at note 10 of the Accounts.

Deferred Tax

The total deferred tax credit in the income statement is £3,361k. As a result of the adoption of RDEC, UKAEA now expects to utilise tax losses carried forward from previous years, and has recognised a deferred tax asset of £2,754k in the Accounts. The remaining credit of £607k is due to the effect of reductions in future tax rates which have reduced the deferred tax provision in the Accounts. Further details are in Note 19.

Site restoration provision

The estimated cost of decommissioning and environmentally restoring the JET facilities at UKAEA's Culham site is £281,805k, in 2015/16 money values and discounted, at rates and using the methodology advised by HM Treasury, to the date of the Statement of Financial Position. It is expected that the part of the Culham site on which the facilities are located will be designated to the NDA after the current research programme has ended and the liabilities will be transferred to NDA at that time. Further details of the provision, and the effect of certain key factors on the estimate, are disclosed in Note 20.

Professor Steve Cowley, FRS, FREng
Chief Executive and Accounting Officer
5 September 2016

Accountability Report
Corporate Governance Report

Directors' Report

United Kingdom Atomic Energy Authority Board

The Directors of the Board, and where appropriate the period for which they served during the year, are set out below.

Chairman
Professor Roger Cashmore, CMG, FRS

Executive Directors
Professor Steve Cowley FRS, FREng, Chief Executive Officer (CEO)

Non-Executive Directors
Professor Sir Keith Burnett, CBE, FRS
Norman Harrison (from 1 March 2016)
Dr Jim Hutchins (from 1 March 2016)
Peter Jones, FCCA
Steve McQuillan (to 31 January 2016)
Chris Theobald (from 1 March 2016)

Authority Secretary
Catherine Pridham, ACA

Biographical details of the Directors are included on pages 34 to 36. The responsibilities of the Directors are included on page 38.

The Executive Committee

Professor Steve Cowley, Chief Executive Officer (CEO)
Martin Cox, Director
David Martin, Chief Operating Officer
Catherine Pridham, Director of Finance and Corporate Affairs and Authority Secretary

The Executive Team listed above are members of the wider UKAEA Executive Committee which comprises UKAEA senior managers.

Biographical details of the Executive team members above are included on page 36 to 37. Their remuneration has been included in the Remuneration Report.

Chairman and Non-Executives

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1 Professor Roger Cashmore, CMG, FRS
Appointed Chairman of the UK Atomic Energy Authority on 30 July 2010. He is a Fellow of the Royal Society and in 2010 led the Royal Society working group on Nuclear Proliferation. He is a former Principal of Brasenose College in Oxford, and is a Professor of Experimental Physics in Oxford.

Before returning to Oxford, he was Director of Research and Deputy Director General of CERN, the European high energy physics laboratory in Geneva, Switzerland, where he was responsible for the experimental programme at the Large Hadron Collider. Before leaving for CERN he was Chairman of Physics in Oxford and during his teaching and research career he has more than 200 publications in learned journals. He has been a Visiting Professor in Tsukuba in Japan, Brussels, Padua, Fermilab in the United States and holds an Honorary Doctorate from the Joint Institute of Nuclear Research in Dubna, Russia. He was awarded the C V Boys Prize of the Institute of Physics (IOP) and a Research Award by the Alexander von Humbold Foundation in Germany.

In 2004 he was made a Companion of the Order of St Michael and St George (CMG) for services to international particle physics.

2 Professor Sir Keith Burnett, CBE, FRS
AAppointed to the UKAEA Board on 1 November 2010. He is Vice-Chancellor of the University of Sheffield (since 2007). Previously he was Head of the Division of Mathematical, Physical and Life Sciences at the University of Oxford. Before this he was Chairman of the Physics department at Oxford.

His research is in the area of ultra-cold atomic physics. His direct involvement in fusion science policy started when he was head of Physics at Oxford and chaired the review of fusion science for the DTI. This report led to EPSRC taking up the funding role for the UK effort in fusion research. He was from 2001 to 2007 Chair of the Fusion Advisory Board which advised EPSRC, and hence the UKAEA, on fusion strategy. He later chaired the expert group that helped develop the Research Councils UK Fusion strategy, and had the opportunity to assess the UK's programme for the years ahead.

Keith is a member of the Prime Minister's Council for Science and Technology. He was knighted for services to science and Higher Education in 2013. He is a member of the Higher Education Funding Council for England Board.

3 Norman Harrison
Appointed to the UKAEA Board on 1 March 2016. He is currently a Trustee and Director of the Nuclear Liabilities Fund and the Deputy Chair of the Board of Governors at Manchester Metropolitan University. He also runs his own consultancy business.

He has 35 years' experience in the power and nuclear power sector. He has a long track record of successfully running nuclear power stations including Heysham 1 and Sizewell B. He delivered a major change programme at Dounreay and was CEO of UKAEA from 2006 to 2010 and led on the privatisation programme for UKAEA.

Norman is a Chartered Chemist and holds Fellowships with Nuclear Institute, Royal Society of Chemistry and Royal Society of Arts.

4 Dr Jim Hutchins
Appointed to the UKAEA Board on 1 March 2016. He is currently MD and owner of Evolution Business Consulting Ltd, offering business consulting services to the high technology sector. He is also a Non-executive Director and chairman of the Technology Advisory Board of Keronite Ltd. He was recently a member of the Oxfordshire Local Enterprise Partnership and Chair of Science Vale.

He is an experienced senior manager from the high technology sector, with a track record of converting R&D into marketable and profitable income streams. From 1991 to 2013 he held senior roles in Oxford Instruments, his most recent as Chief Technical Officer where he was responsibility for the technical and R&D functions and helped grow it from an SME to a FTSE 250 listed company with 2000 employees worldwide.

Jim has a DPhil in Experimental Physics and is a Fellow of the Institute of Physics

5

5 Peter Jones, FCCA

Appointed to the UKAEA Board on 1 November 2010. He is Secretary to the Gas and Electricity Markets Authority and Adviser to its Chairman. He was a non-executive director of National Nuclear Laboratory Limited and Chairman of its Audit Committee from 2009 to 2014 and was a Reporting Panel Member of the Competition Commission from 2005 to 2013.

His previous roles have included: Principal Private Secretary to the Chairman of the National Coal Board, and during a subsequent 19 year career in Corporate Finance at Samuel Montagu & Co. Limited and HSBC Investment Banking, as a senior adviser to the Department of Trade and Industry during the 2003-4 strategic review of BNFL, as a senior adviser to Scottish Power and British Coal during their respective restructurings and privatisations and to British Nuclear Fuels Ltd during the implementation of the strategic review and also as a consultant to the Shareholder Executive and Department of Trade and Industry during the final preparations for the restructuring of the civil nuclear clean-up sector in 2004-2005.

Peter is also a qualified Chartered Certified Accountant and has had exposure to a wide range of financial management and planning issues in a variety of sectors varying from financial services to electricity production.

6

6 Steve McQuillan

Appointed to the UKAEA Board in November 2010, he ceased to be a non-executive director of UKAEA on 31 January 2016. He is currently the CEO of the listed UK Engineering group, Avingtrans plc. He also has advisory board roles in Engineering UK and the EEF. A graduate electronics engineer, he started his career in the oil industry, working for American Oil giant Conoco in the North Sea. He was part of the team that sold Marconi Instruments to IFR, Inc. Recent positions include Managing Director of Oxford Instruments Superconductivity Division, Director of the National Physical Laboratory and Managing Director of the Serco Defence Operations business.

Steve is a Fellow of the IOP and a Fellow of the Institute of Directors.

7

7 Chris Theobald

Appointed to the UKAEA Board on 1 March 2016. He is a senior executive from the nuclear, energy and defence markets. During the last 15 years he has held leadership roles including MD of Serco's nuclear consulting business and Divisional MD at a joint venture between BAE Systems and Finmeccanica. Previously he held senior roles in BAE Systems Avionics and GEC-Marconi. He led the £140m sale of Serco's nuclear consulting business to AMEC in 2012. He served as a board director for the UK Low Level Waste Repository at Drigg, Cumbria and was a founding member of the board for the National Skills Academy for Nuclear. He was recently Vice- President UK/Europe for BWXT Inc (formerly Babcock and Wilcox) leading business development in the civil nuclear market.

Chris has a degree in Aeronautical Engineering and is a Member of the Royal College for Defence Studies.

Executive Team

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1 Professor Steve Cowley, FRS, FREng
Joined the UKAEA in September 2008 as Director of Culham and was appointed to the Board as Chief Executive Officer and Accounting Officer for the UKAEA on 31 October 2009. He is part time Professor at Imperial College London and is Chair of Princeton's Plasma Physics Laboratory Science Advisory Committee. He is also a member of the Prime Minister's Council for Science and Technology.

A qualified physicist and Fellow of the American Physical Society and the IOP, Professor Cowley started his career at Princeton University in 1987 following his post-doctoral work at Culham. In 1993, he joined University of California, Los Angeles (UCLA) and became a Professor in 2000. From 2001, he led the plasma physics group at Imperial College, London for three years. In 2004, he was appointed Director of the Centre for Multi-scale Plasma Dynamics at UCLA and held this position before joining the UK Atomic Energy Authority in 2008. He recently co-chaired the US National Academy's decadal assessment of, and outlook for plasma science. He has published over 120 papers and articles covering theory of fusion plasmas, the origin of magnetic fields in the universe, the theory of plasma turbulence and explosive behaviour in both laboratory and astrophysical plasmas.

In 2012, he was awarded the Glazebook Medal from the IOP. In 2014, he was elected a Fellow of both the Royal Society, and the Royal Academy of Engineering.

2 Catherine Pridham, ACA
Appointed as Chief Financial Officer, Director of Support Division and Secretary of the United Kingdom Atomic Energy Authority in January 2014, she previously held the role of Head of Finance, Contracts and Integrated Planning, from 2012. She was appointed Director of Finance and Corporate Affairs in December 2014. She qualified as a chartered accountant with Arthur Andersen and has worked in the pharmaceutical sector for SmithKline Beecham, Amersham plc and GE Healthcare, where she supported a number of different business areas including a commercial clinical trials business, a large R&D portfolio and a Joint Venture looking to exploit research capabilities commercially with large pharmaceutical companies. Prior to joining the UKAEA she completed several finance restructuring and process improvement projects for the Ministry of Justice and Department of Transport.

3 David Martin
Appointed Chief Operating Officer in March 2016. He is a Chartered Mechanical Engineer and Fellow of the Institution of Mechanical Engineers who joined Culham after completing an apprenticeship at Harwell in 1979. Following a role in the build and operation of the Neutral Beam Testbed on JET, he joined the Engineering Group in Neutral Beams before establishing the Engineering Analysis Section. He became Engineering Group Leader and then Department Manager in 2008. In 2011 he was appointed Head of Physics and Engineering Development Division. He has held other senior engineering posts such as Engineer in Charge and Deputy Chief Engineer. In 2013 he was appointed Operations Director.

David is committed to staff development and has initiated many of the training schemes presently being run at CCFE – including the apprentice and graduate programmes – helping to achieve accreditation by IET, IMechE and the Power Academy.

4

4 Martin Cox
Appointed Director and Project Sponsor for the MAST Upgrade Project, in 2015, his main responsibility is for ensuring the successful delivery of MAST-U. He also has a key role regarding the contract with the EU Commission to operate JET on behalf of Europe. He was previously appointed to the UKAEA Board as Chief Operating Officer on 1 November 2010, when he was responsible for the day-to-day running of the UK's fusion research programme, and for the operation of JET on behalf of EURATOM and fusion laboratories across Europe.

Martin is a theoretical physicist who joined Culham upon graduating, working on plasma modelling. He then became involved in the operation of the experimental facilities. In 1994 he was appointed the Project Manager for the design and construction of the MAST device. From 2000, when the UKAEA assumed responsibility for the operation of JET on behalf of the European fusion community, he became manager of the Machine Operations Department, overseeing the operation of most of the JET facilities as well as MAST. In 2007 he was appointed Senior Manager for all aspects of JET operation and in 2008 was appointed Assistant Director (Operations). He was appointed Operations Director on 1 November 2009.

Statement of Accounting Officer's Responsibility

Section 4(3) of the Atomic Energy Authority Act 1954 requires the United Kingdom Atomic Energy Authority to prepare a statement of accounts for each financial year in the form and on the basis set out in the Accounts Direction. The financial statements are prepared on an accruals basis and must give a true and fair view of the state of affairs of the Authority and of its net resource outturn, application of resources, change in taxpayers' equity and cash flows for the financial year.

In preparing those financial statements, the Accounting Officer is required to comply with the requirements of the Government Financial Reporting Manual and in particular to:

- observe the Accounts Direction issued by HM Treasury, including the relevant accounting and disclosure requirements, and apply suitable accounting policies on a consistent basis;
- make judgements and estimates that are reasonable and prudent;
- state whether applicable accounting standards as set out in the Government Financial Reporting Manual have been followed, and disclose and explain any material departures in the financial statements; and
- prepare the financial statements on a going concern basis.

The Accounting Officer of the Department for Business, Innovation and Skills (BIS) has appointed the Chief Executive as Accounting Officer of the United Kingdom Atomic Energy Authority. The responsibilities of an Accounting Officer, including responsibility for the propriety and regularity of the public finances for which the Accounting Officer is answerable, for keeping proper records and for safeguarding the Authority's assets, are set out in Managing Public Money published by HM Treasury.

The Accounting Officer confirms that

- the Annual Report and Accounts as a whole are fair, balanced and understandable; and
- as Accounting Officer he takes personal responsibility for the Annual Report and Accounts and the judgements required for determining that they are fair, balanced and understandable.

External audit

The Accounting Officer and Directors confirm that:

- there is no relevant audit information of which the auditors are unaware;
- all relevant steps have been taken to ensure that they are aware of relevant audit information; and
- all steps have been taken to establish that the auditors are aware of the information.

Details of the remuneration of the Group's auditors are set out in Note 7.

Governance Statement

Scope of Responsibility

As Accounting Officer, I have responsibility for maintaining a sound system of governance and internal control that supports the achievement of the United Kingdom Atomic Energy Authority's policies, aims and objectives, whilst safeguarding the public funds and assets for which I am personally responsible, in accordance with the responsibilities assigned to me in Managing Public Money. I am assisted in this across the Authority (UKAEA) Group as a whole by the Director of Finance and Corporate Affairs.

Purpose of the Governance Statement

The Governance Statement, for which I am personally responsible, sets out how I have discharged my responsibility to manage and control UKAEA's resources during the year. It also sets out the governance framework and control structure of UKAEA, its stewardship and corporate governance, and the framework for and effectiveness of the risk management process in place.

The Authority's Governance Framework and Structure

The Board

The United Kingdom Atomic Energy Authority is controlled through its Board of Directors, who are appointed by the Secretary of State of BIS. The Board's main role is to establish UKAEA's vision, mission and values, set strategy and structure, and exercise accountability to UKAEA's stakeholders.

The Board, which met six times during the year, has a schedule of matters reserved for its approval. This includes: establishing the overall strategic direction of UKAEA within the policy and resources framework agreed with the responsible Government Minister; reviewing UKAEA's corporate objectives and goals; approving the annual accounts, budget and corporate plan; reviewing and approving proposals to start new activities or to discontinue existing activities; ensuring that high standards of corporate governance are observed at all times; and reviewing the safety, environmental and security performance of UKAEA.

The Board delegates responsibility for day-to-day and business management control to the Chief Executive who is assisted by key senior managers comprising the Executive Committee. The Executive Committee meets monthly. Specific responsibilities delegated to the Executive Committee include: development of UKAEA performance measures; implementation of the strategies and policies as determined by the Board; monitoring of the operating and financial results against plans and budgets; developing and implementing risk management systems, and reviewing progress on major projects.

The roles of the Chairman and Chief Executive

The division of responsibilities between the Chairman of the Board and the Chief Executive is clearly defined and has been approved by the Board. The Chairman leads the Board in the determination of its strategy and in monitoring the achievement of its objectives.

The Chief Executive has direct charge of UKAEA on a day-to-day basis and is accountable to the Board for the financial and operational performance of UKAEA and its subsidiaries. The Chief Executive is also UKAEA's Accounting Officer and is responsible to Parliament through the Committee of Public Accounts and other Select Committees for the stewardship of resources. His responsibilities are set out in a letter from the BIS Permanent Secretary and the accompanying Accounting Officer Memorandum. The Accounting Officer has a personal responsibility for the propriety and regularity of the public finances for which he is answerable; for the keeping of proper accounts; for prudent and economical administration; for the avoidance of waste and extravagance; and for the efficient and effective use of all available resources. He is also responsible for taking formal action by issuing an Accounting Officer Direction, if the UKAEA Board is contemplating a course that would infringe these requirements. No Directions were issued during the year.

Change of Accounting Officer

I will be leaving UKAEA to take up another position at the end of September 2016. My successor has been appointed and a structured hand-over is underway.

Governance Statement continued

Directors and Directors' independence

During the year up to the end of January 2016, the Board comprised the Chairman, one Executive Director and three independent Non-Executive Directors. The Director of Finance and Corporate Affairs was in attendance as Authority Secretary. The composition of the UKAEA Board is in line with other bodies that report to BIS. A list of Board members and their biographical details is included in the Directors' Report.

One Non-Executive Director left at the end of January 2016, as his term of appointment came to an end. Three new Non-Executive Directors were appointed in March 2016. They have received appropriate training and induction.

The Non-Executive Directors constructively challenge and help develop proposals on strategy, and bring strong, independent judgement, knowledge and experience to the Board's deliberations. The independent Directors are of sufficient calibre and number that their views carry significant weight in the Board's decision making.

The Board considers all its Non-Executive Directors to be independent in character and judgement. No Non-Executive Director:

- has been an employee of UKAEA within the last five years;
- has, or has had within the last three years, a material business relationship with UKAEA or its former or current subsidiaries;
- receives remuneration from the Authority other than a Director's fee;
- has close family ties with any of UKAEA's advisers, Directors or senior employees;
- holds cross-directorships or has significant links with other Directors through involvement in other companies or bodies; or
- has served on the Board for more than nine years.

Board Committees

Attendance

The number of full Board meetings and committee meetings attended by each Director during the year was as follows:

	Board	Remuneration Committee	Audit Committee
Roger Cashmore	6 (6)	3 (3)	4 (4)
Keith Burnett	3 (6)	1 (3)	2 (4)
Steve Cowley	5 (6)	–	–
Peter Jones	6 (6)	3 (3)	4 (4)
Steve McQuillan	4 (5)	2 (2)	3 (3)
Norman Harrison	1 (1)	1 (1)	1 (1)
Jim Hutchins	1 (1)	1 (1)	1 (1)
Chris Theobald	1 (1)	1 (1)	1 (1)

Figures in brackets indicate the maximum number of meetings in the period in which the individual was a Board member.

Remuneration Committee

The Remuneration Committee met three times during the year. All its members are independent Non-Executive Directors. Where necessary, non-committee members are invited to attend.

The Committee's principal responsibility is to make recommendations to BIS on the level of Directors' remuneration. In addition the Committee regularly reviews UKAEA's executive remuneration policy in relation to its competitors and industry norms and contract periods. The Committee also advises on any Human Resources policy issue or any proposed change to remuneration arrangements or terms and conditions of UKAEA staff generally which would require the agreement of Government.

As the members of the UKAEA Board are appointed by BIS, UKAEA does not maintain a nominations committee.

Audit Committee

The Audit Committee met four times during the year. All its members are independent Non-Executive Directors.

During the year, the Committee had at least one member possessing what the Smith Report describes as recent and relevant financial experience (Peter Jones). It will be seen from the Directors' biographical details included in the Directors' Report that the other members of the Committee brought to it a wide range of experience from positions at the highest level in the UK scientific and business community.

Under its terms of reference, the Committee is responsible for: monitoring the effectiveness of the external audit process and approving the terms of engagement and remuneration of the external auditor; endorsing UKAEA's policy on the provision of non-audit services by the external auditor (none were provided in 2015/16); monitoring and reviewing the effectiveness of the internal audit programme and the implementation of recommendations arising from it; reviewing the actions and judgements of management in relation to annual and other financial statements before submission to the UKAEA Board; reviewing annually the system of internal control and the processes for monitoring and evaluating the risks facing UKAEA; and reviewing UKAEA's procedures for detecting and preventing fraud and its whistleblowing policy.

Other Committees reporting to the Board

The Culham Programme Advisory Committee (CPAC), which has an external chairman and membership, all of whom have backgrounds in fusion and industry, provides expert external scrutiny of UKAEA programmes and strategy, and reports directly to the Board. During the year it met three times. A key part of its remit was to review the MAST upgrade project and provide assurance to the Board.

The Board Assurance Committee, chaired by one of the non-executive directors, is intended to strengthen Board oversight of assurance matters and met once during the year as its previous non-executive chairman left at the end of January 2016. Chris Theobald has been appointed as the new chair, and has been appropriately briefed. The Committee includes expert external members, in addition to the non-executive chair, to bring independent views on relevant issues. The committee looked at a number of topics including preparation for future tritium operations.

Corporate Governance Review Processes

UKAEA's corporate governance arrangements are kept under constant review to ensure that they are compliant with best practice as applicable to the public sector, and with any additional Treasury requirements. In addition, the Board keeps its own performance under review. It made a formal assessment during the year of its compliance with the Corporate Governance Code, and concluded that UKAEA met the requirements of the Code. The Board also conducted a self-assessment of its own performance, based on the National Audit Office's template, and identified project reporting as an area for improvement. A dashboard for progress on major projects has been implemented, covering areas such as project risk, financial performance and safety. These are reviewed monthly by the Executive Committee and reported at each Board meeting. The frequency of Board meetings was increased from 5 to 6 per year in recognition of the increase in business at board meetings.

Following suggestions made by the Triennial Review of UKAEA, the Board held a strategy meeting with UKAEA senior managers to discuss UKAEA's future plans. Board members have also attended an all-staff talk.

The Remuneration Committee and Audit Committee conducted self-assessments of their performance. The Board reviewed the effectiveness of the Remuneration and Audit Committees, and concluded that both Board committees were operating satisfactorily.

The Audit Committee now receives regular progress reports on pensions issues, including the move to new pension arrangements and the management of the UKAEA current schemes.

UKAEA's subsidiary, AEA Insurance Ltd, has appropriate governance arrangements in place. These are formally reviewed and updated as necessary by its Board of Directors, which includes UKAEA's Director of Finance and Corporate Affairs.

The UKAEA Group has a 50% interest in a joint venture, Harwell Science and Innovation Campus Public Sector Limited Partnership (HSIC PubSp), the public sector partner in Harwell Science and Innovation Campus Ltd Partnership (HSIC), which is responsible for the development of the Harwell Campus. Both HSIC PubSp and HSIC have appropriate and fully documented governance arrangements in place, covering such matters as membership of and decisions made by their Boards of Directors, appointment and removal of Directors, funding and confidentiality. There is a UKAEA Director on the Boards of both HSIC PubSp and HSIC. In addition, BIS as sponsor is kept regularly informed of developments on the Campus.

The Risk and Internal Control Framework

The Board has delegated day-to-day responsibility for risk management to the Chief Executive who is responsible for ensuring that a sound system of risk management is in place.

On behalf of the Chief Executive, the Head of Assurance has been appointed to co-ordinate deployment of the risk management arrangements, ensure consistency of approach and periodically report risk to the Executive Committee and Board. Ownership of divisional or functional risk registers is assigned to relevant senior managers and ownership of individual risks is assigned to the most appropriate manager.

Governance Statement continued

The UKAEA Director of Finance and Corporate Affairs is nominated as the Senior Information Risk Owner (SIRO), with special responsibilities for information risks.

During the year, risk processes were reviewed and improvements made to the risk framework to ensure robust management oversight and good corporate governance.

The Board formally reviews key risks biannually in conjunction with UKAEA's risk appetite statement. The risk landscape is used to inform the business strategy and aid the management of the delivery of business objectives. Performance of major projects includes current status, risk and financial metrics, and is also reviewed on a regular basis.

The Corporate Risk Review Group, which reports to the Executive Committee, provides oversight of corporate and major project risks and their interactions. In accordance with UKAEA's risk management arrangements, it reviews the status of the risk register and progress of mitigations identified by the risk owners.

Information Assurance

Information risks are overseen by an Information Assurance Steering Committee (chaired by the SIRO), which feeds significant risks into the Corporate Risk Review Group. During the year an information security internal communications campaign was undertaken and a number of improvements were made to reporting and to the information asset register, in response to an internal audit on information security. Progress continues to be made to prepare for accreditation to Cyber Essentials, a Government-backed cyber security certification scheme.

The SIRO has confirmed that there are no issues relating to information risks or information assurance that require inclusion in the governance statement. There have been no reportable data breaches or data loss incidents during the year.

Key Risks

UKAEA is exposed to a number of key risks which can be grouped into the following areas:

- funding and the development of future programmes and business development activities that enable future growth;
- recruitment and retention of employees with key skills and capabilities required for the success of the organisation;
- technical aspects of scientific research and delivery of bespoke engineering solutions;
- implementation of major projects including MAST upgrade, new transaction processing software and new capabilities such as RACE, MRF and DT operation;
- Maintenance of building and site infrastructure;
- Exchange rate risk; and
- Maintenance of UKAEA's reputation as a world leader in fusion research.

The wider economic downturn and political pressure created by delays to ITER have heightened the external risk environment. Although external risks are beyond its direct control UKAEA seeks to influence them through all available channels.

MAST Upgrade Project

Last year I reported on measures taken to address issues with UKAEA's key MAST upgrade project, as agreed with both BIS and EPSRC. During 2015/16 the project has been kept under close scrutiny by UKAEA senior management, and has been regularly reviewed by CPAC to provide external assurance to the Board. During the year, CPAC noted that the project had taken account of its previous recommendations for project management and that the effectiveness of management had therefore improved. The revised project schedule agreed with CPAC and the Board anticipates operation of the facility to start in 2017, with experiments commencing towards the end of the year. The funding position is being discussed with BIS.

Project Management

I noted in last year's Governance Statement that UKAEA would need to monitor project performance closely. During this year, an internal audit of UKAEA project management arrangements identified a number of areas for improvement, while recognising that there were some good areas of practice, for example internal project management training courses. A Project Management Office (PMO) has been established to provide a focus for improvements in this area. UKAEA's project manager competency framework has been updated and published, a Project Management Forum has been reinstated with revised terms of reference, and a standard project dashboard reporting format has been introduced. Following a stakeholder consultation, the PMO will implement activities in programme and project governance, project management and project support in the latter half of 2016, in parallel with addressing management system audit actions from recent project audits. In addition, UKAEA is gradually introducing an Integrated Delivery Process, a project to deliver increased and consistent competence in project management across the organisation, where output will ultimately be administered and maintained by the PMO. The monthly reviews of major project performance at the Executive Committee, noted earlier, provide additional control.

New transaction processing system

During the year, work continued on the implementation of a new transaction processing system, which was expected to go live from 1 April 2016 at the start of the 2016/17 financial year. Implementation has however been delayed to September 2016 to ensure that the new system is as robust and well tested as possible; appropriate mitigation strategies and planning have been in place throughout the project, including detailed data migration procedures to ensure the integrity of business data transferred.

Triennial Review

In July 2014, the Minister of State for Universities, Science and Cities, Department for Business, Innovation and Skills, made a written ministerial statement to Parliament announcing the Triennial Review of UKAEA. This was part of the Government's commitment to review all public bodies, with the aim of increasing accountability for actions carried out on behalf of the state. The statement confirmed that the review was not a review of the policy relating to Fusion research, to which the Government remains committed.

The review was carried out in two stages. The first stage identified and examined the key functions of UKAEA and assessed the requirement for these to continue, the delivery option if they were to continue, and, if it was concluded that UKAEA should still carry them out, how they scored against the Government's three tests of technical function, political impartiality and independence from Ministers.

Stage one confirmed that UKAEA should continue as a Non-Departmental Public Body carrying out its present functions, with three recommendations (in summary): (1) That the Government, UKAEA and possible partners investigate in more detail the possibility of a much closer alignment or merger with another government agency, with the timing most likely to be aligned with the end of the JET contract; (2) That until this work is complete, UKAEA should continue to operate as an NDPB; and (3) continue to investigate alternative options for the development of the Culham site in support of UKAEA's business.

Stage two moved on to ensure that UKAEA was operating in line with the recognised principles of good corporate governance. This stage confirmed that UKAEA met these requirements, and made recommendations on a number of points which UKAEA is reviewing and taking action on.

The results of both stages of the review were published in September 2015. I can confirm that UKAEA is working with Government and other partners in considering its recommendations.

Going Concern

The financial statements have been prepared on a going concern basis. UKAEA relies on funding from the European Commission to finance the operation of the JET programme. The current contract between UKAEA and the Commission for the operation of JET covers a five year period to 31st December 2018. The Board, Executive team and I therefore believe that the commitment of Europe to fusion research is sufficient to support continuing operations for the foreseeable future.

As noted above, the Triennial Review concluded that UKAEA should continue to operate, and did not therefore raise any going concern issues.

In addition, UKAEA's Statement of Financial Position includes liabilities of over £334m for site restoration and restructuring costs. Matching reimbursement receivables are recognised for the majority of these liabilities on the basis of assurances from BIS that it continues to accept responsibility in principle for these costs, and provides for them in the BIS departmental resource accounts. These assurances are re-confirmed annually.

Other Matters

UKAEA has robust processes in place to comply with the current austerity measures introduced across the public sector, which aim to reduce expenditure and monitor use of limited public sector resources. Acting on behalf of the Accounting Officer, the Director of Finance and Corporate Affairs reviews and signs off monthly data-sets of accounts payable transactions, with particular emphasis on procurement, travel, events and hospitality.

During the year under review, UKAEA has reviewed the tax arrangements of all its off-payroll appointments. All contractors within the scope of this exercise have been required to provide evidence of tax compliance. All off-payroll appointments were tax compliant as at 31st March 2016. UKAEA also has arrangements in place to ensure that any future off-payroll appointments are fully tax compliant.

Governance Statement continued

Completion of Internal Audit recommendations and actions

The following table summarises progress during the year on completing recommendations and actions arising from Internal Audit reviews:

Carried forward from previous years	25
2015/16 Internal Audit recommendations raised	45
Completed on time	45
Overdue at 31st March 2016	3
Total actions outstanding but not overdue at 31st March 2016	22

The overdue actions at 31 March 2016 included one red recommendation (requiring immediate corrective action). This was completed by the end of April 2016, within one month of the due date. Action is in hand to complete the remaining overdue recommendations as quickly as possible.

Review of effectiveness of risk management and internal controls

As Accounting Officer, I have responsibility for reviewing the effectiveness of the systems of risk management and internal control. My review of the effectiveness of these systems is informed by the work of the internal auditors and the senior managers within UKAEA who have responsibility for the development and maintenance of the internal control framework, the SIRO's report on how risks to information are being managed and controlled, and comments made by the external auditors in their management letter and other reports.

UKAEA has an internal audit department which operates in accordance with Public Sector Internal Audit Standards and an Audit Charter approved by the Audit Committee. The work of the internal audit department is determined by analysis of the risks to which UKAEA is exposed. The annual internal audit programme is based on this analysis and additionally includes a 3 year rolling programme to test key financial controls. It includes reviews which test and challenge the effectiveness of the management of risks and information.

During the year, a number of improvements to Internal Audit processes were introduced, including the introduction of Key Performance Indicators for Internal Audit, and alignment of Internal Audit Assurance and Consultancy recommendation ratings with those of the Government Internal Audit Agency.

The Head of Internal Audit provides me, as Accounting Officer, with regular reports on internal audit activity in UKAEA. These reports include an independent opinion on the adequacy and effectiveness of UKAEA's system of risk management and internal control. Internal audits undertaken during the year took into account an assessment of where the greatest control risks were, and this approach resulted in the following classifications:

Classification	Substantial Assurance	Moderate Assurance	Limited Assurance
Number of reports	3	4	4

The Head of Internal Audit has however confirmed that there is a generally sound system of risk management, governance and internal control within the UKAEA group and that the adequacy and effectiveness of the control environment has operated to an acceptable standard through the year. This confirmation took into account the risk based approach to the audit plan and the generally timely completion of high priority audit recommendations. However, some key risk areas such as MAST-Upgrade and Project Management, where additional controls to address recommendations had not yet been fully implemented, were recommended for inclusion within the Governance Statement. These areas have been covered earlier in the Statement.

I have considered the evidence provided to support the annual Governance Statement. My conclusion is that UKAEA's overall governance and internal control structures are generally sound and fit for purpose.

Professor Steve Cowley, FRS, FREng
Chief Executive and Accounting Officer
5 September 2016

Accountability Report
Remuneration and Staff Report

Remuneration policy

The remuneration of Directors is set by the Secretary of State for BIS with the approval of HM Treasury in accordance with the Atomic Energy Authority Act 1954. The UKAEA Remuneration Committee makes recommendations to BIS on the overall remuneration package for Executive Directors. The Non-Executive Directors who form the Committee are not involved in decisions relating to their own remuneration.

In reaching its recommendations, the Committee has regard to the following considerations:

- the need to recruit, retain and motivate suitably able and qualified people to exercise their different responsibilities; and
- the funding available to UKAEA.

The Committee takes account of the evidence it receives about wider economic considerations and the affordability of its recommendations.

Service contracts

Executive Directors are appointed by the Secretary of State for BIS. This is normally for a three year term that may be renewed upon expiry in accordance with the guidelines issued by the Commissioner for Public Appointments.

Remuneration and pension entitlements

The individual components of the remuneration packages are:

Salary and fees

The CEO as Executive Director receives a basic salary which is reviewed annually by UKAEA's Remuneration Committee. The Chair and Non-Executive Directors receive fees for their services. Members of the Executive Team also receive a basic salary which is reviewed annually by the Remuneration Committee. The Remuneration Committee makes recommendations to BIS as appropriate.

Benefits

The CEO as Executive Director is entitled to certain benefits under the terms of his service contract. These comprise private health care, financial advice and relocation assistance. At 31st March 2016, the CEO had a advance of salary for house purchase outstanding of £39,844.

Members of the Executive Team receive a car allowance.

Executive Directors, and members of the Executive Team, are also reimbursed for reasonable expenses incurred in line with the policy for UKAEA's employees. These reimbursements are not included in the table below.

Performance related bonuses

The performance bonuses for Executive Directors are calculated in accordance with performance against agreed objectives, confirmed by BIS on the basis of recommendations from the Remuneration Committee. The total bonus is made up of two components: the performance of UKAEA against specific quantified targets, and the performance of the individual against specific targets. Members of the Executive Team receive bonuses based on formulae that are agreed each year by the Remuneration Committee, and which are subject to approval by BIS where applicable. The performance-related bonuses for 2015/16 shown in the table below are subject to approval by BIS.

Remuneration and Staff Report continued

Individual Directors' remuneration for the year is shown in the table below, with salaries disclosed on an accruals basis.

This part of the report is subject to audit.

	Salary/ Fees £	Benefits[2] £	Annual Bonus £	Pension benefit[4] £	2015/16 Total £
Chairman					
Roger Cashmore	25,000	–	–	–	25,000
Non-Executive Directors					
Keith Burnett	15,000	–	–	–	15,000
Norman Harrison (from 1 March 2016)[1]	1,250	51	–	–	1,301
Jim Hutchins (from 1 March 2016)[1]	1,250	41	–	–	1,291
Peter Jones	15,000	2,353	–	–	17,353
Stephen McQuillan (to 31 January 2016)[1]	12,500	405	–	–	12,905
Chris Theobald (from 1 March 2016)[1]	1,250	403	–	–	1,653
Executive Directors					
Steve Cowley	205,000	4,971	20,911	38,762	269,644
Members of the Executive Committee					
Martin Cox	114,119	5,000	7,247	24,613	150,979
David Martin[1]	125,739	6,060	10,838	140,191	282,828
Catherine Pridham	114,000	6,060	10,978	29,523	160,561
	630,108	25,344	49,974	233,089	938,515

	Salary/ Fees £	Benefits[2] £	Annual Bonus[3] £	Pension benefit[4] £	2014/15 Total £
Chairman					
Roger Cashmore	25,000	–	–	–	25,000
Non-Executive Directors					
Keith Burnett	15,000	–	–	–	15,000
Peter Jones	15,000	2,006	–	–	17,006
Stephen McQuillan	15,000	878	–	–	15,878
Executive Directors					
Steve Cowley	205,000	4,051	–	38,355	247,406
Members of the Executive Committee:					
Martin Cox	114,119	5,000	–	23,452	142,571
Eric Hollis (to 31st July 2014)[1]	34,333	1,667	–	-	36,000
David Martin	114,000	6,060	–	39,978	160,038
Catherine Pridham	106,667	6,060	–	30,364	143,091
	644,119	25,722	-	132,149	801,990

(1) The annual salary for Norman Harrison, Jim Hutchins and Chris Theobald is £15,000; Steve McQuillan's annual salary was also £15,000. David Martin's salary increased from £114,000 to £125,000 with effect from 7th March 2015, to reflect his new role as Chief Operating Officer. Eric Hollis's annual salary was £103,000.

(2) Expenses disclosed for the Chairman and Non-Executive Directors in 2016 and in the comparatives for 2015 relate to travel for Board and other meetings and include the tax liability on these expenses which was met by UKAEA.

(3) The Executive Team voluntarily agreed to forego their personal and annual bonuses for 2014/15.

(4) The value of pensions benefits accrued during the year is calculated as (the real increase in pension multiplied by 20) plus (the real increase in any lump sum) less (the contributions made by the individual). The real increases exclude increases due to inflation or any increase or decrease due to a transfer of pension rights. Figures for pensions benefit have been rounded to the nearest £ where applicable.

Remuneration ratios

These figures are subject to audit.

	2015/16 £	2014/2015 £
Highest Paid Director's Total Remuneration	230,882	209,051
Median Total Remuneration	41,643	39,219
Ratio	5.5	5.3

Reporting bodies are required to disclose the relationship between the remuneration of the highest paid director in their organisation and the median remuneration of the organisation's workforce.

The remuneration of the highest paid director in UKAEA in the year 2015/16 was £230,882 (2014/15: £209,051). This was 5.5 times (2014/15: 5.3 times) the median remuneration of the workforce, which was £41,643 (2014/15 : £39,219). The increase in the median remuneration of the workforce compared with 2014/15 was mainly due to recruitments at middle management levels in the organisation required for UKAEA's corporate objectives.

No employee received remuneration in excess of the highest-paid Director in either 2015/16 or 2014/15.

Total remuneration includes salary, performance-related pay and benefits in kind. It does not include pensions benefit, employer pension contributions and the cash equivalent transfer value of pensions.

The range of staff remuneration included in the calculation above was £11,200 to £230,882 (2014/15: £10,893 to £209,051).

Pension entitlements

Executive Directors and members of the Executive Committee are members of the United Kingdom Atomic Energy Authority Combined Pension Scheme that pays an annual pension based on pensionable final earnings together with a lump sum at normal retirement age. Benefits are also payable in the event of death or ill health retirement. UKAEA also operates an unfunded pension arrangement for three former Chief Executives to take account of pensionable pay above the earnings cap introduced by the Finance Act 1989.

Further details of the pension schemes and unfunded pensions can be found later in the Remuneration and Staff Report.

The pension entitlements shown in the table below (which is subject to audit) are those that would be paid annually on retirement based on service to 31 March 2016 and include the value of added years paid for by Directors.

	Accrued Pension 2014/15 £	Lump sum 2014/15 £	Real increase in accrued pension [1] £	Real increase in lump sum £	Accrued Pension 2015/16 £	Lump Sum 2015/16 £
Executive Directors						
Steve Cowley	12,430	37,290	2,188	6,564	14,618	43,854
Members of the Executive Committee						
Martin Cox	50,390	151,171	1,477	4,431	51,867	155,602
Eric Hollis [2]	51,500	154,500	–	–	–	–
David Martin	49,592	148,775	6,513	19,539	56,105	168,314
Catherine Pridham	3,791	11,373	1,690	5,071	8,593	25,779
	167,703	503,109	11,868	35,605	131,183	393,549

(1) The real increase excludes service transferred into the Scheme during 2015/16.
(2) The accrued pension and lump sum disclosed for Eric Hollis were as at the date of his retirement from UKAEA in July 2014.

Remuneration and Staff Report continued

The following table (which is subject to audit) sets out the Cash Equivalent Transfer Value (CETV) of the Executive Directors' and Executive Team members' accrued pension entitlements which have been calculated by the Scheme managers in accordance with the Occupational Pension Schemes (Transfer Values) Regulations 1996 as amended, having taken actuarial advice. The transfer values do not represent sums paid or payable to the Directors or Executive Committee members but represent a potential liability of the pension scheme or UKAEA.

	CETV at 31 March 2015 £	Real increase in CETV £	CETV at 31 March 2016 [1] £
Steve Cowley	261,946	36,007	317,794
Members of the Executive Committee			
Martin Cox	1,142,540	25,434	1,209,224
Eric Hollis [2]	1,091,511	–	–
David Martin	1,032,422	131,566	1,208,120
Catherine Pridham	64,876	18,763	153,311
	3,593,295	211,770	2,888,449

(1) The factors used to calculate the CETV were reviewed by the actuary to the pension scheme in 2016, so the tables of factors used to calculate the CETV in 2016 are not the same as those used to calculate the CETV in 2015.

(2) The transfer value disclosed for Eric Hollis was at the date of his retirement from UKAEA in July 2014.

Members of the pension scheme have the option to pay Additional Voluntary Contributions; neither the contributions nor the resulting benefits are included in the above tables.

Staff Report

This section is subject to audit.

Staff costs

Staff costs comprise:

	2016 £k	2015 £k
Permanently employed staff:		
Salaries, bonuses and allowances	29,618	28,723
Social security costs	2,680	2,618
Pension costs – defined contribution plans (see below)	4,084	3,960
	36,382	35,301
Other staff	17,528	20,925
	53,910	**56,226**

Staff numbers

The average number of full-time equivalent staff during the year was as follows:

	2016	2015
Directly employed	667	647
Other staff	413	443
	1,080	**1,090**

Directly employed staff included 9 senior staff.

Other staff are hired staff. The majority of these are used to carry out specialist work in UKAEA's scientific facilities.

Staff composition

At 31st March 2016 all seven of UKAEA's Board members were male. Three of the Executive Team were male and one female. Three of the ten members of the wider Executive Committee were female. UKAEA has 9 senior grade staff, of whom 8 were male and one female. At 31 March 2016, 150 (22%) of employees were female and 534 (78%) were male, compared with 147 (22%) female and 534 (78%) male employees at 31 March 2015.

Sickness absence

The average sickness absence per employee for UKAEA during the 2015/16 year was 4.5 days per person, compared with 5.0 days in 2014/15. This is considerably lower than the public sector average of 8.7 days per employee for all public services workers as disclosed in the Chartered Institute of Personnel and Development 2015 Absence Management annual survey report.

UKAEA Pension Schemes

(a) Defined benefit schemes

UKAEA has three defined benefit schemes: the Combined Pension Scheme (CPS), the Principal Non-Industrial Superannuation Scheme (PNISS) and the Protected Persons Superannuation Scheme (PPSS). These schemes have members from other employers as well as UKAEA. No information in these financial statements relates to other employers participating in the CPS, PNISS or PPSS, although the Group has overall responsibility for the management of the schemes. No contingent liability is expected to arise from this responsibility.

In common with other public sector schemes, the CPS, the PNISS and the PPSS do not have many of the attributes of normal pension schemes. All contributions are paid to and benefits paid by HM Government via the Consolidated Fund. Any surplus of contributions made in excess of benefits paid out in any year is surrendered to the Consolidated Fund and any liabilities are met from the Consolidated Fund via the annual Parliamentary vote. The Government does not maintain a separate fund and actuarial valuations are based on a theoretical calculation as to how a typical UK pension scheme would have invested the historical surplus of contributions over payments.

In accordance with the FReM, the schemes are accounted for as defined contribution schemes.

Employer contributions are calculated in accordance with HM Treasury methodology "Superannuation Contributions Adjusted for Past Experience" and are based on the expected cost of members' benefits as they accrue. The total contributions paid by the Group during the year were £4,065k (2015 : £3,941k).

(b) Defined contribution schemes

UKAEA manages two defined contribution schemes, the Additional Voluntary Contribution (AVC) scheme and the Shift Pay Pension Savings Plan (SPPP) scheme, both of which are fully insured schemes administered by Prudential Assurance Company Ltd to whom contributions are paid.

The AVC scheme includes members from UKAEA and from other employers who are members of CPS or PPSS and who have opted to pay additional voluntary contributions. No employer contributions are made to this scheme.

The members of the SPPP scheme include shift working employees of UKAEA and other employers who are members of CPS or PPSS. The costs of the SPPP scheme, which are directly linked to shift pay earnings, are charged to the statement of comprehensive income at the time the shift pay is paid. The total contributions paid by UKAEA during the year were £17k.

(c) Unfunded retirement benefits

Three former UKAEA chief executives have unfunded retirement benefits which are not included in the UKAEA pension schemes.

The movement in the liability for these benefits is shown below:

	Group and Authority	
	2016 £k	2015 £k
At 1 April	2,057	1,923
Change in discount rate	(17)	147
Interest on liability	72	82
Benefits payable	(78)	(76)
Actuarial (gain) loss	(48)	(19)
	1,986	**2,057**

The interest on liability is included in the statement of comprehensive income and the actuarial loss is included in taxpayers' equity. The closing liability, discounted at the appropriate pensions liability discount rate, is included in other provisions for liabilities and charges in the statement of financial position (Note 20).

Staff Policy

UKAEA has an equal opportunities policy which requires that all job applicants enjoy equal opportunity for employment on the basis of ability, qualifications, experience and suitability for the work. We deliver in-house training on diversity and equality, unconscious bias and specific recruitment training. Both courses cover diversity and equality, ensuring that line managers are aware of their responsibilities towards, and the benefits of, these topics.

UKAEA's equal opportunities policy provides a framework for ensuring that equality is considered throughout the employment of staff. For those who become disabled during their employment, we provide occupational health facilities which provide direct support to the employee and also advise line managers on modifications and restrictions which are required. In addition to the training mentioned above, HR Business Partners provide coaching on flexible working and unconscious bias to ensure that disabled persons are given equal opportunity in training, career development and promotion.

Expenditure on consultancy

There was no expenditure on consultancy in either the current or the previous year.

Off-payroll appointments

UKAEA employed 12 individuals who were deemed "board members or others having significant financial responsibility" during the year. None of these individuals were off-payroll appointments.

Exit packages paid to employees

Exit package cost band	Number of compulsory redundancies		Number of other departures agreed		Total number of exit packages by cost band	
	2015/16	2014/15	2015/16	2014/15	2015/16	2014/15
< £10,000	_	_	_	1	_	1
£10,000 - £25,000	_	1	_	2	_	3
£25,000 - £50,000	_	1	_	1	_	2
£50,000 - £100,000	_	1	_	5	_	6
£100,000 - £150,000	_	_	_	1	_	1
Total number of exit packages	_	3	_	10	_	13
Total resource cost £	_	147,395	_	599,017	_	746,412

The departure costs disclosed above relate to early release costs which are within the terms set out in UKAEA's Conditions of Employment Manual. Where applicable, the additional costs of early releases are met by UKAEA and not by UKAEA's CPS. Ill-health retirement costs are met by the CPS and are not included in the table.

On behalf of the Board

Professor Sir Keith Burnett, CBE, FRS
Chairman of Remuneration Committee
5 September 2016

Professor Steve Cowley, FRS, FREng
Chief Executive and Accounting Officer
5 September 2016

Accountability Report
Parliamentary Accountability and Audit Report

The Certificate and Report of the Comptroller and Auditor General to the Houses of Parliament

I certify that I have audited the financial statements of the United Kingdom Atomic Energy Authority for the year ended 31 March 2016 under the Atomic Energy Authority Act 1954. The financial statements comprise: the Group and Authority Statements of Comprehensive Net Expenditure, Financial Position, Cash Flows, Changes in Taxpayers' Equity; and the related notes. These financial statements have been prepared under the accounting policies set out within them. I have also audited the information in the Remuneration and Staff Report and the Parliamentary Accountability disclosures that is described in that report as having been audited.

Respective responsibilities of the Board, Accounting Officer and auditor

As explained more fully in the Statement of Accounting Officer's Responsibilities, the Board and the Accounting Officer are responsible for the preparation of the financial statements and for being satisfied that they give a true and fair view. My responsibility is to audit, certify and report on the financial statements in accordance with the Atomic Energy Authority Act 1954. I conducted my audit in accordance with International Standards on Auditing (UK and Ireland). Those standards require me and my staff to comply with the Auditing Practices Board's Ethical Standards for Auditors.

Scope of the audit of the financial statements

An audit involves obtaining evidence about the amounts and disclosures in the financial statements sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of: whether the accounting policies are appropriate to the Group's and the United Kingdom Atomic Energy Authority's circumstances and have been consistently applied and adequately disclosed; the reasonableness of significant accounting estimates made by the United Kingdom Atomic Energy Authority; and the overall presentation of the financial statements. In addition I read all the financial and non-financial information in the Annual Report to identify material inconsistencies with the audited financial statements and to identify any information that is apparently materially incorrect based on, or materially inconsistent with, the knowledge acquired by me in the course of performing the audit. If I become aware of any apparent material misstatements or inconsistencies I consider the implications for my certificate.

I am required to obtain evidence sufficient to give reasonable assurance that the expenditure and income recorded in the financial statements have been applied to the purposes intended by Parliament and the financial transactions recorded in the financial statements conform to the authorities which govern them.

Opinion on regularity

In my opinion, in all material respects the expenditure and income recorded in the financial statements have been applied to the purposes intended by Parliament and the financial transactions recorded in the financial statements conform to the authorities which govern them.

Opinion on financial statements

In my opinion:

- the financial statements give a true and fair view of the state of the Group's and of the United Kingdom Atomic Energy Authority's affairs as at 31 March 2016 and of the Group's and the Authority's net income for the year then ended; and
- the financial statements have been properly prepared in accordance with the Atomic Energy Authority Act 1954 and Secretary of State directions issued thereunder.

Opinion on other matters

In my opinion:

- the parts of the Remuneration and Staff Report and the Parliamentary Accountability disclosures to be audited have been properly prepared in accordance with Secretary of State directions made under the Atomic Energy Authority Act 1954; and
- the information given in the Performance Report and Accountability Report for the financial year for which the financial statements are prepared is consistent with the financial statements.

Matters on which I report by exception

I have nothing to report in respect of the following matters which I report to you if, in my opinion:

- adequate accounting records have not been kept or returns adequate for my audit have not been received from branches not visited by my staff; or
- the financial statements and the parts of the Remuneration and Staff Report and the Parliamentary Accountability disclosures to be audited are not in agreement with the accounting records and returns; or
- I have not received all of the information and explanations I require for my audit; or
- the Governance Statement does not reflect compliance with HM Treasury's guidance.

Report

I have no observations to make on these financial statements.

Sir Amyas C E Morse
Comptroller and Auditor General
National Audit Office
157-197 Buckingham Palace Road
Victoria, London, SW1W 9SP
8 September 2016

Consolidated Statement of Comprehensive Income

for the year ended 31 March 2016

	Note	Group 2016 £k	Group 2015 £k	Authority 2016 £k	Authority 2015 £k
Income					
Revenue	5	88,813	100,374	88,084	99,812
Other income		714	1,367	2,478	1,895
Share of revenue of joint venture		(635)	(487)	–	–
		88,892	**101,254**	**90,562**	**101,707**
Expenditure					
Raw materials and consumables		18,979	23,007	18,979	23,007
Other external expense		26,544	23,164	26,544	23,164
Staff costs	6	53,910	56,226	53,910	56,226
Depreciation, amortisation and impairment		735	795	735	795
Other expense		2,452	4,531	2,979	1,074
		102,620	107,723	103,147	104,266
Revaluation credit		(1,484)	(5,694)	(1,484)	(5,694)
Costs capitalised		(10,125)	(3,201)	(10,125)	(3,201)
		91,011	**98,828**	**91,538**	**95,371**
Operating (loss)/profit		**(2,119)**	**2,426**	**(976)**	**6,336**
Finance Income	8	182	216	89	103
Finance expense		(36)	9	(36)	9
Share of profit (loss) of joint venture after tax	8	(225)	21	–	–
Profit/(loss) before tax		**(2,198)**	**2,672**	**(923)**	**6,448**
Current tax credit – RDEC	10	6,716	–	6,716	–
Deferred tax credit (debit)	19	3,361	(1,490)	3,361	(1,490)
Profit for the year		**7,879**	**1,182**	**9,154**	**4,958**
Other comprehensive income					
Net gain (loss) on revaluations		(372)	6,050	821	3,986
Actuarial gains (losses) on defined benefit pension plans		67	(129)	67	(129)
Income tax (debit)/credit relating to components of other comprehensive income		215	(797)	215	(797)
Other comprehensive income for the year		**(90)**	5,124	1,103	3,060
Total comprehensive income for the year ended 31/3/2016		**7,789**	**6,306**	**10,257**	**8,018**

The notes on pages 58 to 80 are an integral part of these financial statements.

Consolidated Statement of Financial Position

as at 31 March 2016

	Note	Group 2016 £k	Group 2015 £k	Authority 2016 £k	Authority 20154 £k
Non-current assets					
Property, plant and equipment	11	33,678	22,335	33,678	22,335
Investment property	12	61,692	60,208	61,692	60,208
Financial assets	13	11,648	13,064	13,523	13,523
Other receivables	15	325,565	265,552	325,565	265,552
Total non-current assets		432,583	361,159	434,458	361,618
Current assets					
Inventories		10	8	10	8
Trade and other receivables	15	18,864	13,489	19,516	14,005
Financial assets	13	7,745	9,718	–	1,052
Cash and cash equivalents	16	50,825	27,479	48,160	24,412
Total current assets		77,444	50,694	67,686	39,477
Total assets		**510,027**	**411,853**	**502,144**	**401,095**
Current Liabilities					
Trade and other payables	17	40,140	18,156	40,127	18,145
Provisions for liabilities and charges	20	9,572	8,150	7,398	7,077
Total current liabilities		49,712	26,306	47,525	25,222
Non-current assets plus net current assets		**460,315**	**385,547**	**454,619**	**375,873**
Non-current liabilities					
Other payables	17	1,510	305	1,510	305
Deferred income	18	6,042	3,314	6,042	3,314
Deferred income tax liabilities	19	8,082	11,659	8,082	11,659
Provisions for liabilities and charges	20	338,262	279,694	336,460	276,382
Total non-current liabilities		358,896	294,972	352,094	291,660
Assets less liabilities		**106,419**	**90,575**	**102,525**	**84,213**
Taxpayers' equity					
General reserve		13,658	13,658	13,658	13,658
Revaluation reserve		12,766	12,042	12,766	12,042
Retained earnings		79,975	64,875	76,101	58,513
		106,419	**90,575**	**102,525**	**84,213**

The notes on pages 58 to 80 are an integral part of these financial statements.

The Financial Statements on pages 54 to 80 were approved by the Board on 5th September 2016 and were signed on its behalf by:

Professor Steve Cowley, FRS, FREng
Chief Executive and Accounting Officer

Consolidated Statement of Cash Flows

for the year ended 31 March 2016

	Note	Group 2016 £k	Group 2015 £k	Authority 2016 £k	Authority 2015 £k
Cash flows from operating activities					
Profit for the year		7,879	1,182	9,154	4,958
Adjustments for non-cash transactions:					
– Depreciation, amortisation, and impairment		735	795	735	795
– Deferred income released	18	(179)	(170)	(179)	(170)
– Change in fair value of investment property	12	(1,484)	(5,694)	(1,484)	(5,694)
– Net finance income recognised		(146)	(225)	(53)	(112)
– Income tax debit (credit)	10	(10,077)	1,490	(10,077)	1,490
– Income relating to financial asset recognised	13	–	(1,052)	–	(1,052)
– Share of loss (profit) of joint venture		225	(21)	–	–
Changes in working capital:					
– (Increase)/Decrease in trade and other receivables		1,348	11,040	1,212	10,895
– (Increase)/Decrease in inventories		(2)	19	(2)	19
– (Increase)/Decrease in current financial assets		1,973	(92)	1,052	–
– Increase/(Decrease) in trade and other payables		25,931	(9,097)	25,931	(9,096)
– Use of provisions		164	781	573	(2,541)
Net cash inflow (outflow) from operating activities		**26,367**	**(1,044)**	**26,862**	**(508)**
Cash flows from investing activities					
Purchase of property, plant and equipment	11	(11,258)	(3,565)	(11,258)	(3,565)
Interest received		182	216	89	103
Net cash inflow (outflow) from investing activities		**(11,076)**	**(3,349)**	**(11,169)**	**(3,462)**
Cash flows from financing activities					
Capital grant from sponsoring department		8,055	1,553	8,055	1,553
Net Financing		8,055	1,553	8,055	1,553
Net increase/(decrease) in cash and cash equivalents in the period		23,346	(2,840)	23,748	(2,417)
Cash and cash equivalents at the beginning of the period		27,479	30,319	24,412	26,829
Cash and cash equivalents at the end of the period		**50,825**	**27,479**	**48,160**	**24,412**

The notes on pages 58 to 80 are an integral part of these financial statements.

Consolidated Statement of Changes in Taxpayers' Equity

for the year ended 31 March 2016

Group	General reserve £k	Revaluation reserve £k	Retained earnings £k	Total £k
Balance at 1 April 2014	13,658	9,074	59,984	82,716
Changes in Taxpayers' Equity 2014/15				
Capital Grant from sponsoring department	–	–	1,553	1,553
Total comprehensive income for the year	–	3,189	3,117	6,306
Depreciation transfer	–	(221)	221	–
Balance at 31 March 2015	**13,658**	**12,042**	**64,875**	**90,575**
Changes in Taxpayers' Equity 2015/2016				
Capital Grant from sponsoring department	–	–	8,055	8,055
Total comprehensive income for the year	–	1,036	6,753	7,789
Depreciation transfer	–	(312)	312	–
Balance at 31 March 2016	**13,658**	**12,766**	**79,995**	**106,419**

Authority	General reserve £k	Revaluation reserve £k	Retained earnings £k	Total £k
Balance at 1 April 2013	13,658	9,074	51,910	74,642
Changes in Taxpayers' Equity 2014/2015				
Capital grant from sponsoring department	–	–	1,553	1,553
Total comprehensive income for the year	–	3,189	4,829	8,018
Depreciation transfer	–	(221)	221	–
Balance at 31 March 2014	**13,658**	**12,042**	**58,513**	**84,213**
Changes in Taxpayers' Equity 2015/16				
Capital grant from sponsoring department	–	–	8,055	8,055
Total comprehensive income for the year	–	1,036	9,221	10,257
Depreciation transfer	–	(312)	312	–
Balance at 31 March 2016	**13,658**	**12,766**	**76,101**	**102,525**

Notes to the Financial Statements

1 General information

UKAEA is an NDPB and was established by the Atomic Energy Authority Act 1954. The address of UKAEA's registered office is Culham Science Centre, Abingdon, Oxfordshire, OX14 3DB. Its sponsoring government department is the Department for Business, Innovation and Skills. UKAEA and its subsidiaries are referred to as "the Group".

2 Basis of preparation

The financial statements comply with the provisions of the Atomic Energy Authority Act 1954 and the Accounts Direction issued by HM Treasury. The latter requires the financial statements to be prepared in accordance with the Government Financial Reporting Manual (FReM) issued by HM Treasury as updated annually. The accounting policies contained in the FreM apply International Financial Reporting Standards (IFRS) as adapted or interpreted for the public sector. Where the FReM permits a choice of accounting policy, the accounting policy which is judged to be most appropriate to the particular circumstances of the Group for the purpose of giving a true and fair view has been selected.

The financial statements have been prepared on a going concern basis. UKAEA relies on funding from the European Commission to finance the operation of the JET programme. A new contract between UKAEA and the Commission for the operation of JET was signed in June 2014 and backdated to 1 January 2014, covering a five year period to 31st December 2018. The Directors therefore believe that the commitment of Europe to fusion research evidenced by the contract, and the acceptance by BIS of responsibility for costs associated with UKAEA site restoration and restructuring liabilities, are sufficient to support continuing operations for the foreseeable future.

The financial statements are presented in pounds sterling, which is UKAEA's functional currency, and have been prepared under the historical cost convention, except for land and buildings, investment properties, assets held-for-sale and derivative financial instruments which are stated at fair value.

The preparation of financial statements in conformity with IFRS requires judgements, estimates and assumptions to be made that affect the application of accounting policies and the reported amounts of income, expenses, assets and liabilities. Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised and in any future periods affected. Information about significant areas of estimation uncertainty and critical judgements in applying accounting policies that have the most significant effect on the amounts recognised in the consolidated financial statements is included in the notes to the financial statements.

3 Significant accounting policies

The principal accounting policies applied by UKAEA in the preparation of these financial statements are set out below. These policies have been applied consistently in dealing with all items that are considered material to the financial statements.

3.1 Consolidation

(a) Subsidiaries

Subsidiaries are entities controlled by the Group. Control exists when the Group has the power to govern the financial and operating policies of an entity so as to obtain benefits from activities and actually exercises this power. In assessing control, potential voting rights that are currently exercisable are taken into account. The financial statements of subsidiaries are included in the consolidated financial statements from the date that control commences until the date that control ceases. The accounting policies of subsidiaries are changed when necessary to align them with the policies adopted by the Group.

(b) Joint ventures

Joint ventures are those entities over which the Group exercises joint control through a contractual arrangement. The results, assets and liabilities of joint ventures are incorporated in the consolidated financial statements using the equity method of accounting. Investments in joint ventures are initially carried in the statement of financial position at cost and subsequently adjusted by post-acquisition changes in the Group's share of the net assets of the joint venture, less any impairment in the value of individual investments. Losses of joint ventures in excess of the Group's interest in those joint ventures are not recognised, except where the Group has made a commitment to make good those losses.

(c) Transactions eliminated on consolidation

Inter-group transactions, balances and unrealised gains and losses on transactions between Group companies are eliminated on consolidation.

3.2 Revenue recognition

Revenue is recognised when the amount can be reliably measured, it is probable that future economic benefits will be received and when specific criteria have been met as described below. The amount of revenue is not considered to be reliably measurable until all contingencies relating to the sale have been resolved. Revenue is shown net of value added tax, returns, rebates and discounts.

(a) Service contracts

Revenue from cost recovery contracts for managing the UK's fusion research programme and the European Union's JET facility is recognised to the extent of costs incurred in the period that are expected to be recoverable from customers.

Revenue from other service contracts is recognised under the percentage-of-completion method. Revenue is generally recognised based on the services performed to date as a percentage of the total services to be performed. If circumstances arise that may change the original estimates of revenues, costs or extent of progress toward completion, estimates are revised. These revisions may result in increases or decreases in estimated revenues or costs and are reflected in income in the period in which the circumstances that give rise to the revision become known.

(b) Rental income

Rental income from investment properties is recognised in the statement of comprehensive income on a straight-line basis over the term of the lease. Lease incentives granted are recognised as an integral part of the total rental income over the term of the lease.

(c) Grant-in-aid

Grant-in-aid relating to revenue expenditure is recognised in the statement of comprehensive income in the same period as the related expenditure that it is intended to fund.

This departure from the specified treatment in the FReM has been agreed with HM Treasury.

Capital grants from UKAEA's sponsoring department are recognised as financing and credited to reserves in line with the FReM.

3.3 Research expenditure

Expenditure on research activities, undertaken with the prospect of gaining new scientific or technical knowledge and understanding, is recognised in the statement of comprehensive income when incurred.

3.4 Employee benefits

(a) Short-term employee benefits

Short-term employee benefits are recognised in the year in which the related service is provided. A liability is recognised for the amount expected to be paid under short-term bonus arrangements if the Group has a present legal or constructive obligation to pay this amount as a result of past service provided by employees and the obligation can be estimated reliably.

(b) Termination benefits

Termination benefits are payable when employment is terminated by the Group before the normal retirement date, or whenever an employee accepts voluntary redundancy in exchange for these benefits. The Group recognises termination benefits when it is demonstrably committed to either: terminating the employment of current employees according to a detailed formal plan without possibility of withdrawal; or providing termination benefits as a result of an offer made to encourage voluntary redundancy. Benefits falling due more than 12 months after the reporting date are discounted to their present value.

(c) Retirement benefits

Obligations for contributions to defined contribution schemes are recognised as an expense when they are due. The Group has no further payment obligations once the contributions have been paid.

The Group operates three defined benefit schemes for the benefit of its employees. Two of these are closed to new members. The schemes are unfunded multi-employer defined benefit schemes. In accordance with the FReM, these schemes are accounted for as defined contribution schemes in these financial statements and the obligations recognised are limited to the contributions due.

The Group also has a separate liability in respect of unfunded retirement benefits relating to three individuals. The liability recognised in the statement of financial position is the present value of the defined benefit obligation at the reporting date, together with adjustments for unrecognised past-service costs. The defined benefit obligation is calculated annually by independent actuaries using the projected unit credit method. The present value of the defined benefit obligation is determined by discounting the estimated future cash outflows using a real rate of interest set by HM Treasury. Actuarial gains and losses arising from experience adjustments and changes in actuarial assumptions are charged or credited to equity in the period in which they arise.

3.5 Segment reporting

Operating segments are reported in a manner consistent with the internal reporting provided to the chief operating decision-maker. The chief operating decision-maker, who is responsible for allocating resources and assessing performance of the operating segments, has been identified as the UKAEA Board.

3.6 Foreign currency translation

Transactions in foreign currencies are translated to the functional currency of the Group using the exchange rates at the dates of the transactions. Monetary assets and liabilities denominated in foreign currencies at the reporting date are retranslated to the functional currency using the exchange rates at that date. Foreign exchange gains and losses resulting from the settlement of transactions and from the translation of monetary assets and liabilities are recognised in the statement of comprehensive income except when deferred in taxpayers' equity as qualifying cash flow hedges.

3.7 Property, plant and equipment

Land and buildings are occupied by the Group and are shown at fair value, based on periodic, but at least quinquennnial, valuations by external independent valuers, less subsequent depreciation for buildings. In the intervening years, these valuations may be updated by the Group with the assistance of independent advice as required. A valuation of all the properties was carried out in February 2015.

Fair value is based on market values for existing use as there are no alternative uses for the land and buildings. Where this basis is not applicable because of the specialised nature of the asset, valuations are carried out on a depreciated replacement cost basis.

Increases in the carrying amount arising on revaluation of land and buildings are credited to the revaluation reserve. Decreases that offset previous increases of the same asset are charged against the revaluation reserve; all other decreases are charged to the statement of comprehensive income. Each year the difference between depreciation based on the revalued carrying amount of the asset charged to the income statement and depreciation based on the asset's original cost is transferred from the revaluation reserve to retained earnings.

In accordance with the FReM, other classes of property, plant and equipment with short useful lives or low book values are stated at historical cost less depreciation as a proxy for current valuations. Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the Group and the cost of the item can be measured reliably. All other repairs and maintenance are charged to the statement of comprehensive income during the financial period in which they are incurred.

Land is not depreciated. Assets under construction are not depreciated until they are in use. Depreciation on other assets is calculated using the straight-line method to allocate their cost or revalued amounts to their residual values over their estimated useful lives, as follows:

- Buildings — up to 40 years
- Plant, machinery and equipment — up to 10 years

The assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each reporting date.

Property, plant and equipment may have component parts with different useful lives. In accordance with the provisions of IAS 16 Property, plant and equipment, each part of any newly recognised item of property, plant and equipment with a cost that is significant in relation to the total cost of the item is depreciated separately.

An asset's carrying amount is written down immediately to its recoverable amount if the asset's carrying amount is greater than its estimated recoverable amount (Note 3.11).

Gains and losses on disposals are determined by comparing the proceeds with the carrying amount and any amounts to be released from deferred income on disposal and are recognised in the statement of comprehensive income. When revalued assets are sold, any amounts included in the revaluation reserve are transferred to retained earnings.

3.8 Investment property
Investment property, comprising freehold land and buildings, is held either for rental yields or capital appreciation and is not occupied by the Group. Investment property is carried at fair value, representing open market value determined annually by external independent valuers.

Fair value is based on active market prices, adjusted, if necessary, for any difference in the nature, location or condition of the specific asset. In the absence of current prices in an active market, the valuations are prepared by considering the aggregate of the estimated cash flows expected to be received from renting out the property. Valuations reflect the allocation of maintenance and insurance responsibilities between the Group and the lessee and the remaining economic life of the property.

Changes in fair values are recognised in the statement of comprehensive income.

3.9 Intangible assets
Intangible assets comprise acquired computer software licences and are stated at cost, net of amortisation and any provision for impairment. The cost of intangible assets, less estimated residual value, is amortised on a straight line basis over their estimated useful lives of up to five years.

3.10 Non-current assets held for sale
Non-current assets are classified as assets held for sale when their carrying amount is to be recovered principally through a sale transaction and a sale is considered highly probable. They are stated at the lower of carrying amount and fair value less costs to sell if their carrying amount is to be recovered principally through a sale transaction rather than through continuing use.

3.11 Impairment of non-financial assets
Assets that are subject to depreciation or amortisation are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs to sell and value in use. For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows. Non-financial assets that suffered impairment are reviewed for possible reversal of the impairment at each reporting date.

3.12 Inventories
Inventories are stated at the lower of cost and net realisable value. Cost is determined using the first-in, first-out method. The cost of work in progress comprises raw materials, direct labour, other direct costs and related production overheads. Net realisable value is the estimated selling price in the ordinary course of business, less applicable selling expenses.

3.13 Cash and cash equivalents
Cash and cash equivalents includes cash in hand, deposits held at call with banks and other short-term highly liquid investments with original maturities of three months or less.

3.14 Current and deferred income tax
The tax charge or credit for the period comprises current and deferred tax. Tax is recognised in the income statement, except to the extent that it relates to items recognised directly in equity. In this case, the tax is also recognised in equity.

Current tax is the expected tax payable or receivable on the taxable income for the year, using tax rates enacted or substantially enacted at the reporting date, and any adjustment to tax payable in respect of previous years.

RDEC credits payable by HM Revenue and Customs are treated as tax credits in line with the provisions of IAS12, and disclosed separately in the income statement.

Deferred tax is recognised, using the liability method, on temporary differences arising between the tax bases of assets and liabilities and their carrying amounts in the consolidated financial statements. Deferred tax is determined using tax rates (and laws) that have been enacted or substantially enacted by the reporting date and are expected to apply when the related deferred tax asset is realised or the deferred tax liability is settled.

Deferred tax assets are recognised only to the extent that it is probable that future taxable profit will be available against which the temporary differences can be utilised.

3.15 Provisions

Provisions are recognised when: the Group has a present legal or constructive obligation as a result of past events; it is probable that an outflow of resources will be required to settle the obligation; and the amount has been reliably estimated.

Where there are a number of similar obligations, the likelihood that an outflow will be required in settlement is determined by considering the class of obligations as a whole. A provision is recognised even if the likelihood of an outflow with respect to any one item included in the same class of obligations may be small.

Provisions are measured at the present value of the expenditures expected to be required to settle the obligation using real rates of interest. The increase in the provision due to passage of time is recognised as finance expense.

Where assurances have been received from another party that they will reimburse some or all of the expenditure required to settle a provision, a reimbursement asset will be recognised to the extent of the amount expected to be reimbursed. The reimbursement asset is shown separately from the related provision in the statement of financial position.

3.16 Financial instruments

Non-derivative financial instruments comprise trade and other receivables, investments, cash and cash equivalents and trade and other payables and are recognised initially at fair value. Subsequent to initial recognition, non-derivative financial instruments are measured as described below.

Loans and receivables are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. They are included in current assets, except for maturities greater than 12 months after the reporting date which are classified as non-current assets. The carrying values, less impairment provision, of loans and receivables are assumed to approximate their fair values.

Other financial liabilities are non-derivative financial instruments with fixed or determinable payments that are not quoted in an active market. They are included in current liabilities, except for maturities greater than 12 months after the reporting date which are classified as non-current liabilities. The carrying values of other financial liabilities are assumed to approximate their fair values.

3.17 Operating leases

Payments made under operating leases are recognised in the statement of comprehensive income on a straight-line basis over the term of the lease. Lease incentives are recognised as an integral part of the total lease expense over the term of the lease.

3.18 New and Amended Accounting Standards

Certain new standards, amendments and interpretations to existing standards have been published but are not effective on UKAEA's accounting period.

The following new standards, amendments and interpretation to existing standards are not yet effective or are not yet effective in HMT's 2015/16 FReM and have not been early adopted by the Authority:

IAS 7 – Disclosure Initiative (amendment) - effective date 1 January 2017 (not yet EU adopted)
IAS 12 – Recognition of Deferred Tax Assets for Unrealised Losses (amendment) – effective date 1 January 2017 (not yet EU adopted)
IFRS 9 – Financial Instruments (IAS 39 replacement – Financial Instruments: Recognition and Measurement) – effective date 1 January 2018 (not yet EU adopted)
IFRS 15 – Revenue from Contracts with Customers (IAS 18 replacement – Revenue) – effective date 1 January 2018 (not yet EU adopted)
IFRS 16 – Leases (IAS 17 replacement – Leases) – effective date 1 January 2019 (not yet EU adopted)

The Board anticipate that the adoption of these standards and interpretations in future periods will have no material impact on the financial statements of the Authority.

4 Financial Risk Management

Due to the nature of its activities, the Group is not exposed to the same degree of financial risk faced by other business entities. Financial instruments play a much more limited role in creating or changing risk and generally financial assets and liabilities are generated from day-to-day operational activities and not held to change the risks facing the Group in undertaking its activities. While the Group has significant financial liabilities relating to decommissioning and restructuring, most of the risks attached to these liabilities do not rest with the Group as they are broadly matched by reimbursement assets.

(a) Foreign exchange risk

Foreign exchange risk arises when future commercial transactions or recognised assets or liabilities are denominated in a currency that is not the Group's functional currency. The Group operates internationally and is exposed to foreign exchange risk arising from various currency exposures, primarily with respect to the Euro. To manage foreign exchange risk, the Group may use forward contracts for the purchase or sale of foreign currencies.

(b) Interest rate risk

As the Group has no borrowings or significant interest-bearing assets, the Group's income and operating cash flows are substantially independent of changes in market interest rates. Cash balances on deposit are held in highly rated fixed term deposits and the exposure to interest rate risk is minimal and appropriately managed.

(c) Credit risk

The Group's income is received primarily from public sector bodies in the UK and Europe and the exposure to credit risk is therefore considered to be low.

(d) Liquidity risk

The Group is primarily financed by income from other public sector bodies, in the UK and in Europe. Uncertainties about the timing and amount of some of this income, particularly income from Europe, expose the Group to liquidity risk. The Group has a facility to request temporary working capital funding from the Department for Business, Innovation and Skills should the need arise.

5 Segment information

As the majority of the Group's activities do not represent the provision of public services, segment information in accordance with IFRS 8 is included in these financial statements and the fees and charges analysis required by the FReM is not disclosed.

5.1 Reportable segments

The Group has two reportable segments, as described below, which are the Group's main business areas reported to the Authority Board. The business areas offer different services and are managed separately because they require different strategies and have different funding streams.

The following summary describes the operations in each of the Group's reportable segments:

(a) Fusion research – research into using fusion to create a new source of energy that is safe and environmentally benign

(b) Property management – management and development of the Culham and Harwell campuses for future scientific use.

Other segments include grant-in-aid funding and insurance. None of these segments meets any of the quantitative thresholds for determining reportable segments in 2015 or 2014. The results of these segments are included in the "other" column in the segmental analyses below.

Notes to the Financial Statements

The segment information for the reportable segments for the years ended 31 March 2016 and 31 March 2015 is as follows:

	Fusion research £k	Property management £k	Other £k	Total £k
Year ended 31 March 2016				
External segment revenue	80,791	4,578	3,444	88,813
Less: share of revenue of joint venture	–	(635)	–	(635)
Other income	351	62	301	714
Expenditure	(81,142)	(4,005)	(7,348)	(92,495)
Investment property revaluation	–	1,484	–	1,484
Operating profit/(loss)	–	1,484	(3,603)	(2,119)
Finance income	89	–	93	182
Finance expense	–	–	(36)	(36)
Share of profit/(loss) of joint venture	–	(225)	–	(225)
Profit/(loss) before income tax	89	1,259	(3,546)	(2,198)
Year ended 31 March 2015				
External segment revenue	91,744	4,835	3,795	100,374
Less: share of revenue of joint venture	–	(487)	–	(487)
Other income	169	–	1,198	1,367
Expenditure	(92,634)	(4,513)	(7,375)	(104,522)
Investment property revaluation	–	5,694	–	5,694
Operating profit/(loss)	(721)	5,529	(2,382)	2,426
Finance income	103	–	113	216
Finance expense	–	–	9	9
Share of profit/(loss) of joint venture	–	21	–	21
Profit/(loss) before income tax	(618)	5,550	(2,260)	2,672

Revenue from external parties is measured in a manner consistent with that in the statement of comprehensive income.

5.2 Reconciliation between Reportable Segments and Statement of Comprehensive Income

	2016 £k	2015 £k
Revenues		
Total revenue for reportable segments	85,369	96,579
Other revenue	3,444	3,795
Consolidated revenue per Statement of Comprehensive Income	**88,813**	**100,374**
Profit or loss		
Total profit or loss for reportable segments	1,348	4,932
Other profit or loss	(3,546)	(2,260)
Consolidated profit before income tax per Statement of Comprehensive Income	**(2,198)**	**2,672**

5.3 Geographical segments

In presenting information on the basis of geographical segments, segment revenue is based on the geographical location of customers.

Group	Revenue	
	2016 £k	2015 £k
United Kingdom	32,001	39,097
Europe	56,711	61,116
Rest of the world	101	161
	88,813	**100,374**

5.4 Revenue from major customers

	2016 £k	2015 £k
European Commission	46,314	60,738

Revenue from the European Commission is attributable to the fusion research segment.

Notes to the Financial Statements

6 Staff Costs and Operating profit

Staff costs

Staff costs comprise:

	2016 £k	2015 £k
Permanently employed staff:		
Salaries, bonuses and allowances	29,618	28,723
Social security costs	2,680	2,618
Pension costs – defined contribution plans (see below)	4,084	3,960
	36,382	35,301
Other staff	17,528	20,925
	53,910	**56,226**

Full details of UKAEA's pension schemes are given in the Remuneration Report. The total contributions paid by the Group to the CPS during the year were £4,065k (2015: £3,941k). The total contributions paid by UKAEA during the year to the SPPP were £17k.

Operating profit has been arrived at after charging/(crediting):

	2016 £k	2015 £k
Change in fair value of investment property	(1,484)	(5,694)
Net foreign exchange losses (gains)	(94)	276
Operating lease rentals – plant, machinery and vehicles	196	173
Non-cash items:		
–Depreciation	735	795

7 Auditor's remuneration

The total remuneration of the Group's auditor, National Audit Office, for services provided to the Group was:

	2016 £k	2015 £k
Audit fees		
UKAEA	53	49
UKAEA pension schemes	–	23
	53	**72**

In 2016 the UKAEA pension schemes' audit fee has been paid by BIS. In 2015 the fee was paid by UKAEA.

The audit fee paid to the auditors of AEAIL was £10k (2015: £8k). The audit fee paid to the auditors of HSIC PubSP, in which UKAEA has a share of one half, was £14k (2015: £17k). The audit fee paid to the auditors of HSIC LP, in which UKAEA has a share of one quarter via HSIC PubSP, was £15k (2015: £14k).

8 Finance income and expense

	Group		Authority	
	2016 £k	2015 £k	2016 £k	2015 £k
Income				
Interest on term bank deposits	182	216	89	103
Expense				
Revalorisation of provisions:				
– Roll forward of discount rate schedule and unwinding of discount (see below)	6,872	10,021	6,872	10,021
– Escalation of reimbursement receivables	(6,908)	(10,112)	(6,908)	(10,112)
Interest on unfunded retirement benefits	72	82	72	82
	36	**(9)**	**36**	**(9)**

A £6,908k charge to the income statement in 2015/16 relates to the provision for the decommissioning of JET, and is matched by escalation of the reimbursement receivable. It is the net of £8,601k discount charge and a credit of £1,693k unwinding of discount. Full details are provided in Note 20.

9 Analysis of Net Expenditure

	2016 Total £k	2015 Total £k
Income		
Income from activities	88,813	100,374
Other income	714	1,367
Interest receivable	182	216
Share of revenue of Joint Venture	(635)	(487)
Share of profit(loss) of joint venture	(225)	21
	88,849	**101,491**
Expenditure		
Raw Materials and Consumables	18,979	23,007
Other External Expense net of costs capitalised	16,419	19,963
Staff costs	53,910	56,226
Other expense	2,452	4,531
Revaluation credit	(1,484)	(5,694)
Non-cash items:		
–Depreciation	735	795
Finance expense	36	(9)
	91,047	98,819
Net Expenditure after Interest and before tax	**(2,198)**	**2,672**

Notes to the Financial Statements

10 Income tax (expense)/credit

	Group and Authority	
	2016 £k	2015 £k
Current tax		
Current tax credit	3,208	–
Current tax credit – adjustment relating to 2014/15	3,508	–
	6,716	**–**
Deferred tax		
Origination and reversal of temporary differences	607	(1,490)
Recognition of deferred tax asset (Note 19)	2,754	–
	3,361	**(1,490)**
Income tax credit (debit)	**10,077**	**(1,490)**
Share of income tax of joint venture	–	–
Total income tax (expense)/credit	**10,077**	**(1,490)**

The current tax on the Group's profit before tax differs from the theoretical amount that would arise using the weighted average tax rate applicable to profits of the consolidated entities as follows:

	2016 £k	2015 £k
Profit/(loss) for the year	7,879	1,182
Income tax expense/(credit)	(10,077)	1,490
Profit/(loss) excluding income tax	(2,198)	2,672
Tax calculated at the standard UK corporation tax rate of 20% (2015 – 21%)	(440)	561
Tax effects of:		
– Reversal of timing differences	111	131
– Expenses not deductible	367	(1,171)
– R&D expenditure credit under s104A CTA 2009	802	–
– Brought forward losses set against trading profits	(929)	–
– Non-trading profits offset by RDEC credit	(166)	–
– Net RDEC claim 2015/16	(3,208)	–
– Net RDEC claim 2014/15	(3,508)	–
– Enhanced relief for research and development expenditure (2014/15 only)	–	(314)
– Tax losses for which no deferred income tax asset was recognised	255	793
Current tax expense (credit) for the year	**(6,716)**	**–**

The income tax charged/(credited) to equity during the year is as follows:

	2016 £k	2015 £k
Fair value gains on property, plant and equipment	(215)	797

UKAEA has early adopted RDEC, which replaces the previous R&D tax relief regime and will be mandatory from 1 April 2016. Early adoption is available for expenditure incurred after 1 April 2013, and UKAEA has submitted claims for the RDEC since the year ended 31 March 2015. The net claim to 31 March 2015 has been recognised in the 2015/16 Accounts as shown above.

11 Property, plant and equipment

Group and Authority	Land £k	Buildings £k	Plant and equipment £k	Assets under construction £k	Total £k
Cost or valuation					
At 1 April 2014	6,952	7,828	4,850	8,211	27,841
Additions	–	–	81	3,484	3,565
Disposals	–	–	–	–	–
Revaluation	3,651	335	–	–	3,986
Transfer from/(to) investment property	–	457	–	(7,474)	(7,017)
At 31 March 2015	**10,603**	**8,620**	**4,931**	**4,221**	**28,375**
Additions	–	–	1,133	10,125	11,258
Disposals	–	(3)	(245)	–	(248)
Revaluation	614	207	–	–	821
Transfers	–	10,703	283	(10,986)	–
At 31 March 2016	**11,217**	**19,527**	**6,102**	**3,360**	**40,206**
Depreciation and impairment					
At 1 April 2014	**–**	**2,614**	**2,640**	–	**5,254**
Depreciation charge	–	500	294	–	794
Disposals	–	–	–	–	–
Transfer to investment property	–	(8)	–	–	(8)
At 31 March 2015	**–**	**3,106**	**2,934**	**–**	**6,040**
Depreciation charge	–	391	345	–	736
Disposals	–	(3)	(245)	–	(248)
Transfers	–	–	–	–	–
At 31 March 2016	–	**3,494**	**3,034**	**–**	**6,528**
Net book value					
At 31 March 2015	**10,603**	**5,514**	**1,997**	**4,221**	**22,335**
At 31 March 2016	**11,217**	**16,033**	**3,068**	**3,360**	**33,678**

All property, plant and equipment is owned by the Group.

There was £19k capital expenditure contracted for at the reporting date but not recognised in the financial statements. (2015 : £4,084k). This related entirely to assets in course of construction on the Culham site. The majority of the 2015 comparative related to buildings in course of construction on the Culham site. These buildings have been completed and capitalised during the year.

Notes to the Financial Statements

12 Investment property

	Group and Authority	
	2016 £k	2015 £k
At 1 April	60,208	47,505
Change in fair value	1,484	5,694
Transfer from assets in course of construction	–	7,474
Transfer to owner-occupied property	–	(465)
At 31 March	**61,692**	**60,208**

Investment properties were valued at fair value at 28 February 2016 by independent valuers. The valuations were undertaken by Carter Jonas in accordance with the Valuation Standards of the Royal Institute of Chartered Surveyors, IFRS and guidelines in HM Treasury's FReM. The Group has adopted this valuation at the reporting date on the grounds that there were no material changes between the valuation date and the reporting date.

Investment properties are held for their investment potential. Rental income from tenants outside the Group is negotiated at arm's length. The following amounts have been recognised in the income statement:

	2016 £k	2015 £k
Rental income	1,818	1,888
Direct operating expenses:		
– Investment properties that generated rental income	1,586	1,614
– Investment properties that did not generate rental income	400	556

13 Financial Assets

	Group		Authority	
	2016 £k	2015 £k	2016 £k	2015 £k
Non-current				
At 1 April	13,064	10,980	13,523	13,523
Revaluation	(1,416)	2,084	–	–
At 31 March	**11,648**	**13,064**	**13,523**	**13,523**
Investment in subsidiary undertakings	–	–	3,000	3,000
Investment in joint venture	11,648	13,064	10,523	10,523
	11,648	**13,064**	**13,523**	**13,523**
Current				
Term bank deposits	7,745	8,666	–	–
Other financial assets	–	1,052	–	1,052
	7,745	**9,718**	–	**1,052**

a) Investment in subsidiary undertakings

Name	Country of incorporation	Ownership interest % 2016	2015
AEA Insurance Limited	Isle of Man	100	100

All subsidiary undertakings are included in the consolidation. The proportion of voting rights in the subsidiary undertakings held directly by the Group does not differ from the proportion of shares held.

b) Investment in joint venture

The Group has a 50% interest in a joint venture, Harwell Science and Innovation Campus Public Sector Limited Partnership, the public sector partner in Harwell Oxford, which is responsible for the development of the Harwell Oxford Campus. The interest in the joint venture is accounted for using the equity method in the Group financial statements.

	Group 2016 £k	2015 £k
At 1 April	13,064	10,980
Share of profits(loss) net of tax	(225)	21
Additions	(1,191)	2,063
At 31 March	**11,648**	**13,064**
Analysed as follows:		
Cost or valuation	12,571	13,762
Share of retained profits(losses)	(923)	(698)
	11,648	**13,064**

The following amounts represent the Group's share of the income, results, assets and liabilities of the joint venture. They are included in the Statement of Comprehensive Net Income and Statement of Financial Position:

	2016 £k	2015 £k
Profit/(loss) net of tax		
Income	153	187
Expenses	(378)	(166)
	(225)	21
Assets		
Current assets	9,030	10,719
Non-current assets	7,382	6,391
	16,412	17,110
Liabilities		
Current liabilities	1,138	621
Non-current liabilities	3,626	3,425
	4,764	4,046
Net assets	**11,648**	**13,064**

There are no contingent liabilities relating to the Group's interest in the joint venture, and no significant contingent liabilities of the venture itself.

(c) Term bank deposits
Term bank deposits are held with major UK banks. The average interest rate on the deposits held at 31 March 2016 was 0.99% (2015 : 1.07%). The credit risk associated with these investments is considered to be low because of the size and status of the banks involved.

(d) Other financial assets
The 2014/15 balance related to an overage payment due from a previous sale of UKAEA land at Harwell, which was received in 2015/16.

14 Financial instruments by category

Term deposits (Note 13c) are categorised as held to maturity investments, and Other financial assets disclosed in Note 13d are designated at fair value through profit and loss on initial recognition. With the exception of UKAEA's interest in its subsidiary and joint venture (Notes 13a and b), which are exempted from the application of IAS 39, all other financial assets of the Group and the Authority were categorised as loans and receivables at both 31 March 2016 and 31 March 2015. All financial liabilities of the Group and the Authority were categorised as other financial liabilities at both 31 March 2016 and 31 March 2015.

The majority of financial instruments relate to contracts to buy non-financial items in line with the Authority's expected purchase and usage requirements and the Authority is therefore exposed to little credit, liquidity or market risk.

15 Trade receivables, financial and other assets

	Group		Authority	
	2016 £k	2015 £k	2016 £k	2015 £k
Amounts falling due after more than one year				
Reimbursement receivables (Note 20):				
– Site restoration	281,639	256,360	281,639	256,360
– Restructuring	43,926	9,152	43,926	9,152
Other receivables	–	40	–	40
	325,565	**265,552**	**325,565**	**265,552**
Amounts falling due within one year				
Trade receivables	2,444	3,661	2,444	3,661
Reimbursement receivables (Note 20):				
– Site restoration	166	166	166	166
– Restructuring	3,402	3,600	3,402	3,600
Prepayments and accrued income	4,685	4,622	4,657	4,573
VAT	917	889	917	889
Corporation Tax	6,881	–	6,881	–
Other receivables	369	551	1,049	1,116
	18,864	**13,489**	**19,516**	**14,005**

There are no impaired assets in any of the classes of trade and other receivables.

The reimbursement receivables have been discounted at the rates applicable to the provisions to which they relate. Further details of these rates are disclosed in Note 20.

16 Cash and cash equivalents

	Group		Authority	
	2016 £k	2015 £k	2016 £k	2015 £k
Balance at 1 April	27,479	30,319	24,412	26,829
Net change in cash and cash equivalent balances	23,346	(2,840)	23,748	(2,417)
Balance at 31 March	**50,825**	**27,479**	**48,160**	**24,412**
The following balances were held at 31 March:				
Commercial banks and cash in hand	50,825	27,479	48,160	24,412
Balance at 31 March	**50,825**	**27,479**	**48,160**	**24,412**

Notes to the Financial Statements

17 Trade payables and other current liabilities

	Group		Authority	
	2016 £k	2015 £k	2016 £k	2015 £k
Amounts falling due after more than one year				
Payments received on account	1,510	305	1,510	305
Amounts falling due within one year				
Trade payables	1,104	1,486	1,104	1,486
Accrued costs	7,519	7,770	7,506	7,758
Payments received on account	29,886	7,000	29,886	7,000
Social security and other taxes	889	757	889	757
Corporation tax	166	–	166	–
Other payables	576	1,143	576	1,144
	40,140	**18,156**	**40,127**	**18,145**

18 Deferred income

Deferred income received in 2016 related to capital grants for the construction of the RACE building and for the purchase of equipment for the Materials Research Facility. Both these new buildings are on the Culham site.

	Group and Authority	
	2016 £k	2015 £k
At 1 April	3,314	2,030
Deferred income received	2,907	1,454
Released to income statement	(179)	(170)
As at 31 March	**6,042**	**3,314**

19 Deferred income tax

Group and Authority

	Investment property £k	Land and buildings £k	Total £k
Deferred Tax Liability			
At 1 April 2014	7,237	2,135	9,372
Income statement debit/(credit)	1,490	–	1,490
Charged directly to equity	–	797	797
At 31 March 2015	**8,727**	**2,932**	**11,659**
Income statement debit/(credit):			
- Revaluation	298	–	298
- Effect of change in tax rate	(905)	–	(905)
Charged directly to equity:			
- Revaluation	–	86	86
- Effect of change in tax rate	–	(302)	(302)
At 31 March 2016	**8,120**	**2,716**	**10,836**

Deferred Tax Asset	
At 31 March 2015	–
At 31 March 2016	2,754
Net Deferred Tax Liability at 31 March 2016	**8,082**

Deferred Tax Liability
A change to the UK corporation tax rate from 20% to 19% was substantively enacted on 26 October 2015, with effect from 1 April 2017, and a further reduction to 18% was enacted on the same date with effect from 1 April 2020. An additional reduction to 17% for periods from 1 April 2020 was announced in the March 2016 budget, however is yet to be substantially enacted. The closing deferred tax liability has therefore been recalculated at 18% as the liability is not expected to unwind before 1 April 2020. The additional reduction to 17% would reduce the deferred tax liability by a further £602k. This has not been included in the financial statements as the rate is not substantially enacted.

Deferred Tax Asset
Deferred income tax losses are recognised for tax depreciation and tax loss carry-forwards to the extent that the realisation of the related tax benefit through future taxable profits is probable. In 2014/15, UKAEA did not recognise deferred income tax assets of £6,913k in respect of tax losses of £14,256k that could be carried forward against future taxable income. The adoption of the RDEC (see Note 10) means that previous trading losses are now brought into the annual corporation tax computation. UKAEA now therefore expects to utilise these losses over the period 2016/17 to 2019/20. A deferred income tax asset of £2,754k has been recognised in the 2015/16 Accounts, calculated at the tax rate expected to be in force in each of these years. This has been netted off UKAEA's deferred tax liability in the Accounts as it fulfils the conditions for offsetting in IAS12.

UKAEA did not recognise deferred income tax assets of £1,184k in respect of RDEC set-off amounts that can be carried forward against future taxable income, on the basis that, under the RDEC rules, these can only be utilised after existing trading losses have been exhausted, and the probability of utilisation is therefore remote.

Notes to the Financial Statements

20 Provisions for liabilities and charges

Group	Site Restoration £k	Restructuring £k	Other £k	Total £k
At 1 April 2014	241,876	18,462	13,933	274,271
Changes in price levels	971	194	2	1,167
Roll forward of discount rate schedule and unwinding of discount	10,112	332	(172)	10,272
Provided in the year	3,599	1,543	3,321	8,463
Provisions not required written back	–	–	(804)	(804)
Provisions utilised in the year	(33)	(4,365)	(1,127)	(5,525)
At 31 March 2015	**256,525**	**16,166**	**15,153**	**287,844**
Changes in price levels	1,681	–	40	1,721
Unwinding of discount	(1,693)	210	(88)	(1,571)
Discount charge (note 1)	22,811	–	–	22,811
Provided in the year	2,631	40,122	1,357	44,110
Provisions not required written back	–	–	(1,911)	(1,911)
Provisions utilised in the year	(150)	(4,073)	(947)	(5,170)
At 31 March 2016	**281,805**	**52,425**	**13,604**	**347,834**

Note 1: The £22,811k discount charge in the table above includes £8,601k which is the result of rate changes in years 5 and 10 when the unwinding of the discount is calculated at 2014/15 discount rates rolled forward by one year in line with HMT guidance. Discount rates in this unwinding calculation changed from -1.5% to -1.05% at year 5 and -1.05% to 2.2% at year 10. The most significant factor affecting the discount charge is the change in long term discount rates in 2015/16. Further details are disclosed in the text below.

At 31 March 2015				
Non-current	256,359	12,047	11,288	279,694
Current	166	4,119	3,865	8,150
	256,525	**16,166**	**15,153**	**287,844**
At 31 March 2016				
Non-current	281,639	48,556	8,067	338,262
Current	166	3,869	5,537	9,572
	281,805	**52,425**	**13,604**	**347,834**

Authority	Site Restoration £k	Restructuring £k	Other £k	Total £k
At 1 April 2014	241,876	18,462	12,869	273,207
Changes in price levels	971	194	2	1,167
Roll forward of discount rate schedule and unwinding of discount	10,112	332	(172)	10,272
Provided in the year	3,599	1,543	-	5,142
Provisions not required written back	–	–	(804)	(804)
Provisions utilised in the year	(33)	(4,365)	(1,127)	(5,525)
At 31 March 2015	**256,525**	**16,166**	**10,768**	**283,459**
Changes in price levels	1,681	–	40	1,721
Unwinding of discount	(1,693)	210	(88)	(1,571)
Discount charge (note 2)	22,811	–	–	22,811
Provided in the year	2,631	40,122	1,261	44,014
Provisions not required written back	–	–	(1,406)	(1,406)
Provisions utilised in the year	(150)	(4,073)	(947)	(5,170)
At 31 March 2016	**281,805**	**52,425**	**9,628**	**343,858**

Note 2: Further details are at Note 1 in the Group table.

At 31 March 2015				
Non-current	256,359	12,047	7,976	276,382
Current	166	4,119	2,792	7,077
	256,525	**16,166**	**10,768**	**283,459**
At 31 March 2016				
Non-current	281,639	48,556	6,265	336,460
Current	166	3,869	3,363	7,398
	281,805	**52,425**	**9,628**	**343,858**

(a) Site restoration

The decommissioning provision represents the estimated costs of decommissioning fusion research facilities at UKAEA's Culham site, including the storage, processing and eventual disposal of radioactive wastes.

Calculation of the liabilities is based on the technical assessments of the processes and methods likely to be used in the future to carry out the work. Estimates are derived from the latest technical knowledge and commercial information available, taking into account current legislation, regulations and Government policy. Summary figures are built up by aggregating detailed estimates for individual liabilities. Allowance is also made for infrastructure costs, which are an appropriate share of site running costs and other overhead costs attributable to plant and buildings. The calculation is reassessed annually.

The best estimate of the cost of dealing with the liabilities at 31 March 2016 is discounted at rates advised by HM Treasury to the reporting date. The rates now applied are:

	2016 Rate %	2015 Rate %
Short term – 0 to 5 years from the date of the Statement of Financial Position (SFP)	-1.55	-1.50
Medium term – after 5 and up to 10 years from the date of the SFP	-1.00	-1.05
Long term – over 10 years from the date of the SFP	-0.80	2.20

The discount charge shown in respect of the year to 31 March 2016 represents the effect of changes in discount rate applying to the cash flows in each year, which increased the discounted value of the liability by £22,811k as at 31 March 2016. The majority of this increase is due to the change in long term discount rates compared with 2015. As noted above, £8,601k of the discount charge is the result of rate changes within the unwinding of discount calculation. In 2014/15, rate changes within the unwinding of discount calculation increased the discounted value of the liability at 31 March 2015 by £10,436k.

The provision is expressed in 2015/16 money values using an inflation rate of 0.6% to uplift the provision from 2014/15 values. The analysis of expected timing of discounted flows is as follows:

	Group and Authority	
	2016 £k	2015 £k
Not later than one year	166	166
Later than one year and not later than five years	18,846	48,262
Later than five years	262,793	208,097
	281,805	**256,525**

The best estimate of the undiscounted cost of dealing with the liabilities is £257,842k (2015 : £256,544k).

A letter issued by the then Secretary of State for Energy in 1986 stated that the Government was prepared to continue to accept responsibility in principle for those costs which the Authority incurs in treating and disposing of nuclear wastes and in decommissioning plant arising from:

(i) programmes carried out by the Authority and its predecessors prior to 1 April 1986; and
(ii) programme agreement work undertaken for BIS and its predecessors after 1 April 1986.

These assurances were reconfirmed by BIS in May 2016. On the basis of these assurances a matching receivable is included in the statement of financial position.

Since much of the work required to deal with the liabilities will not be undertaken until well into the future, there is a significant uncertainty as to the amount of the provision and the associated receivable due from BIS. This significant uncertainty does not impact on either net assets or the net profit reported in the financial statements.

During the year, a Water Detritiation System was constructed as an extension to an existing building, J20. Decommissioning costs for this small extension are estimated at around £0.1m and have not been included in the provision as they are immaterial. A Material Detritiation Facility will be constructed during 2016/17. The costs of decommissioning this facility have not been included in the provision.

UKAEA has assessed the impact of the date of JET closure, which is a key variable, on the best estimate recognised in the 2015/16 Annual Accounts. This gives a range of undiscounted and discounted costs (including the best estimate) as follows:

Undiscounted costs -.£257,916k to £257,655k (2015 : £256,544k to £256,592k)
Discounted costs -.£279,174k to £289,432k (2015 : £224,997k to £256,526k)

The effect of changes in the discount rates advised by HMT is another key variable which affects the liability. As noted above, the long term discount rate has changed from +2.2% in 2014/15 to -0.8% in 2015/16. This has increased the estimate in later years.

(b) Restructuring

The restructuring provisions represent termination benefits payable under early retirement arrangements to employees who had retired early, or had accepted early retirement, before 31 March 2016. These benefits continue at least until the date at which the employee would have reached normal retirement age, and in many cases part of the benefit is payable for life. The restructuring provisions are discounted to the reporting date at the discount rate for pension liabilities, which is 1.37% in 2015/16. The undiscounted cost of the group provisions is £58,825k (2015 : £17,034k) and the benefits are estimated to be payable over a period up to 37 years.

During the year, the mortality assumptions used to calculate the period over which the benefits are payable beyond normal retirement age were reviewed by the Government Actuary's Department. This review has led to a £36.3m increase in the discounted provisions balances.

The analysis of the expected timing of discounted flows is as follows:

	Group and Authority	
	2016	2015
	£k	£k
Not later than one year	3,869	4,119
Later than one year and not later than five years	14,190	6,921
Later than five years	34,366	5,126
	52,425	**16,166**

Part of the expenditure required to settle the restructuring liabilities will be reimbursed by other parties as follows:

(i) Lump sums paid to employees on early retirement are refundable to the Group from the appropriate pension scheme at or after the date on which the individual concerned would have reached normal retirement age.

(ii) Assurances covering restructuring provisions made before 1 April 2004 have been received from BIS, and reconfirmed in May 2016, and expenditure related to these provisions is reimbursed by BIS.

On the basis of these reimbursement arrangements, receivables have been included in the statement of financial position.

(c) Other provisions

The largest single provision is for £6,265k and relates to the disposal of operational waste arising from UKAEA's previous contract to operate JET, which ended in December 2013. The provision was discounted at the Treasury rates for general provisions referred to in note 20a) above. The undiscounted cost of the provision is £6,155k. In addition, UKAEA has made provision of £523k during the year for the eventual decommissioning of the newly-built MRF at its Culham site. The remaining provisions mainly comprise unfunded retirement benefit obligations and claims relating to industrial-related injuries.

21 Operating leases

(a) The Group as lessee

Non-cancellable operating lease rentals are payable as follows:

	2016	2015
	£k	£k
Not later than one year	210	172
Later than one year and not later than five years	211	24
Later than five years	–	–
	421	**196**

The Group leases vehicles and office equipment under operating leases.

(b) The Group as lessor

The Group leases its investment property with lease terms of between 0.5 and 25 years. The leases contain market review clauses in the event that the lessee exercises the option to renew. The lessee does not have an option to purchase the property at the expiry of the lease period.

The future minimum lease payments under non-cancellable leases are as follows:

	2016 £k	2015 £k
Not later than one year	1,375	1,384
Later than one year and not later than five years	2,629	2,603
Later than five years	163	95
	4,167	**4,082**

Rental income received during the year is disclosed in Note 12.

22 Related-party transactions

UKAEA is an NDPB sponsored by BIS which is regarded as a related party. During the year, the Group had various material transactions with BIS and with other entities for which BIS is regarded as the responsible department, in particular EPSRC. STFC is UKAEA's partner in the Harwell Science and Innovation Campus Public Sector Limited Partnership (note 13).

In addition, the Group had various material transactions with other government departments and other central government bodies. Most of these transactions have been with the Civil Nuclear Constabulary.

No Board member, key manager or other related party has undertaken any material transactions with the Group during the year.

23 Statutory borrowing limit

During 2015/16, the statutory borrowing limit set by Section 3 of the Atomic Energy Authority Act 1986 as amended by The United Kingdom Atomic Energy Authority (Limit on Borrowing) Order 1991 remained at £200m. There were no borrowings by UKAEA during the current or previous year.

24 Events after the reporting period date

In accordance with the requirements of IAS10, Events after the reporting period, post Statement of Financial Position events are considered up to the date on which the Accounts are authorised for issue. This is interpreted as the same date as the date of the Certificate Report of the Comptroller and Auditor General.

On 23 June, the EU referendum took place and the people of the United Kingdom voted to leave the European Union. Until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of EU membership remain in force. During this period the Government will continue to negotiate, implement and apply EU legislation. It will be for the Government, under the new Prime Minister to begin negotiations to exit the EU. The outcome of these negotiations will determine what arrangements apply in relation to EU legislation and funding in future once the UK has left the EU. This is therefore a non-adjusting event for which no estimate of its financial effect on the reporting entity can be made.

More details on UKAEA's interaction with the EU can be found in the Performance Analysis section of the Annual Report and in Note 5 of the financial statements.

On 14 July 2016, following a machinery of Government change it was announced that UKAEA's sponsoring department, the Department for Business, Innovation and Skills, is having its responsibilities changed. The sponsor department for UKAEA is now the Department for Business, Energy and Industrial Strategy.

Glossary

AVC	Additional Voluntary Contribution
AEAIL	AEA Insurance Ltd
BIS	Department for Business Innovation and Skills
CRC	Carbon Reduction Commitment Energy Efficiency Scheme
CETV	Cash Equivalent Transfer Value
CEO	Chief Executive Officer
CERN	European Laboratory for Particle Physics
CPS	Combined Pension Scheme
CCFE	Culham Centre for Fusion Energy
DEMO	Demonstration fusion power station
DT	Deuterium-tritium
ELMs	Edge Localised Modes (plasma instabilities)
EPSRC	Engineering and Physical Sciences Research Council
FReM	Government Financial Reporting Manual
FTE	Full Time Equivalent
F4E	Fusion for Energy
HSIC PubSp/LP	Public sector partnership for the Harwell joint venture
HV	High voltage
IAS	International Accounting Standards
IET	Institution of Engineering and Technology
IMechE	Institution of Mechanical Engineers
IoP	Institute of Physics
IFRS	International Financial Reporting Standards
ITER	Next generation international experimental fusion reactor
JET	Joint European Torus
MRF	Materials Research Facility
MAST/MAST-U	Mega Amp Spherical Tokamak and its successor device
NNUF	National Nuclear Users Facility
NBI	Neutral beam injection
NDPB	Non-Departmental Public Body
NDA	Nuclear Decommissioning Authority
NI	Nuclear Institute
OAS	Oxfordshire Advanced Skills
OSR	Radioactive and Out of Scope of Regulations
PMO	Project Management Office
PPSS	Protected Persons Superannuation Scheme
PNISS	Principal Non-Industrial Superannuation Scheme
RACE	Remote Applications in Challenging Environments facility
R&D	Research & Development
RDEC	R&D Expenditure Credit
RAS	Robotics and Autonomous Systems
RoSPA	Royal Society for the Prevention of Accidents
STEM	Science, Technology, Engineering and Maths
STFC	Science & Technology Facilities Council
SIRO	Senior Information Risk Officer
SPPP	Shift Pay Pension Savings Plan
SFP	Statement of Financial Position
UKAEA	UK Atomic Energy Authority

Notes

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