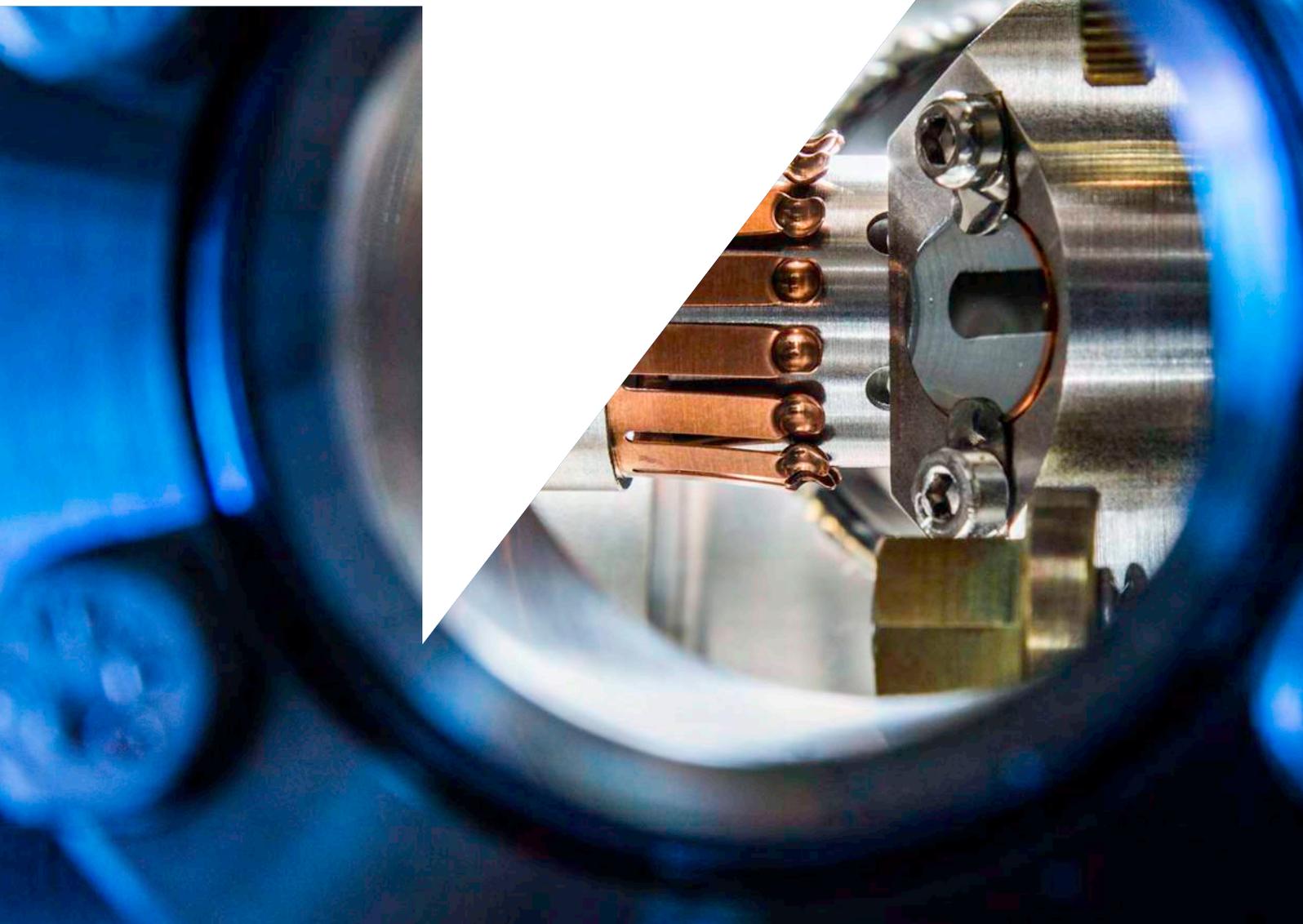




Science and
Technology
Facilities Council

Accelerators in a new light

ASTeC Strategy 2019 – 2029





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Professor Susan Smith
ASTeC Director & Head
of Daresbury Laboratory

Foreword

Particle accelerators underpin many of the existing and forthcoming research facilities supported directly by UK Research

and Innovation and STFC, such as Diamond Light Source, ISIS Neutron and Muon Source, the Large Hadron Collider, and the European Spallation Source (ESS). The Accelerator Science and Technology Centre (ASTeC) within STFC is a centre of excellence which brings together all of the skills and expertise required to develop world class accelerators for the UK's future research needs.

We have an established ability to lead and deliver full scale accelerator projects from start to end. Our capabilities enable the UK to make major in-kind contributions to new international facilities. Current projects which we are contributing to include the delivery of superconducting RF cavities to the ESS in Sweden and superconducting radio-frequency (RF) cryomodules to PIP-II in the USA. These activities, which are carried out seamlessly with Technology Department, are very high profile internationally and are enhancing the reputation of the UK as a trusted delivery partner. We look forward to making similar scale contributions to the Extreme Photonics Applications Centre (EPAC) in the near term as well as ISIS-II, Diamond-II, and a UK X-ray free electron laser (FEL) in the future, according to the needs and priorities established by the UK Research and Innovation Infrastructure Roadmap.

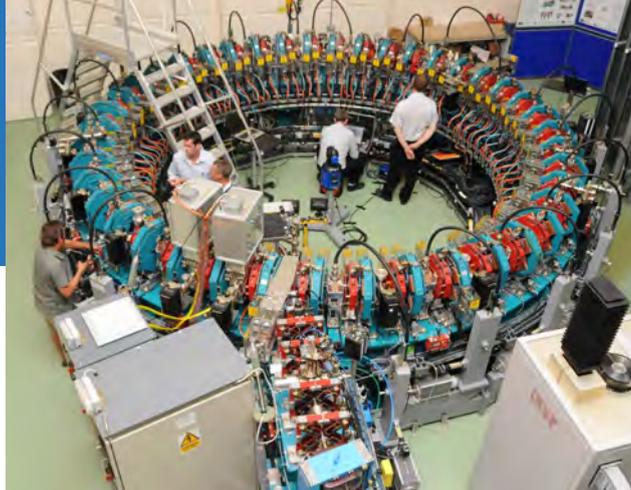
All leading accelerator centres must have access to world class accelerator test facilities, to test new ideas and to prove new technologies, and ASTeC is no exception. Previously we built and operated ALICE, an energy recovery linac with an FEL, and EMMA, a fixed field alternating gradient accelerator.

Currently our focus is on CLARA, which accelerates very bright electron bunches from an RF photoinjector up to 50 MeV. A key priority for ASTeC is to upgrade CLARA to 250 MeV in the near future as this will enable major research programmes, led by UK academics, such as novel acceleration techniques and potential new healthcare applications, and also prepare the ground for CLARA to become an FEL test facility ahead of a possible new X-ray FEL national facility.

ASTeC carries out research and development activities in areas where we believe we have distinctive capabilities and there is a clear need, such as in the application of thin films and coatings to enhance accelerator performance and in energy saving permanent magnet systems.

Often our research activities have broader societal and industrial relevance and we recognize that we have a responsibility to ensure that full advantage can be made of our innovations and capabilities. We have a proven track record of successful partnerships with industry and long may this continue.

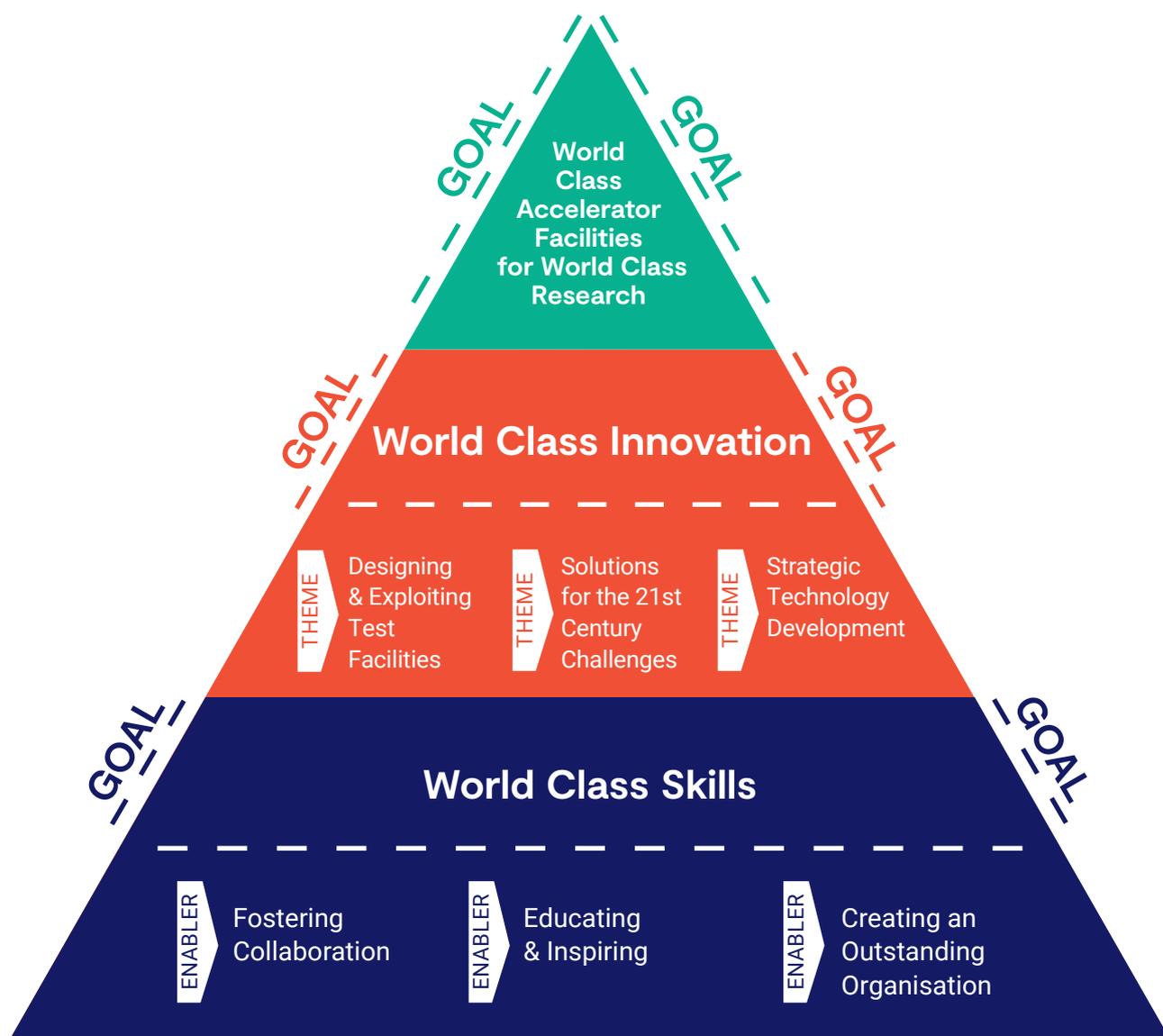
In this strategy, which is fully aligned with the STFC Delivery Plan 2019 and the UK Research and Innovation Strategic Prospectus, we set out our longer-term ambitions together with the shorter-term actions we will take to deliver our strategy. I look forward to working closely with my colleagues across STFC and UK Research and Innovation and with all of our many collaborators to ensure we deliver our ambitious goals.



Our Vision

Our distinctive capabilities and contribution as part of STFC and UK Research and Innovation are encapsulated in our Vision Statement: **Accelerators in a New Light**. This vision expresses our conviction that we strive to approach all of our goals with a creative and innovative mind set. It also articulates our belief that accelerators are inspirational in themselves as well as the outstanding science that they enable.

Our strategy is centred on three enduring long-term strategic goals, supported by three strategic themes. Three strategic enablers underpin our ability to deliver and play a major role in making STFC and UK Research and Innovation greater than the sum of their parts, ensuring we use our collective resources to generate maximum scientific, economic, social and cultural impact.



Our Mission

Our Mission Statement, Making a brighter future through advanced accelerators, is a simple message for our staff and stakeholders encompassing what we do and why we do it. By building and developing outstanding accelerators we will enhance our society, economy, culture, and science.

Our Mission Elements:

- To employ advanced accelerator technology to enable scientific discovery.
- To make new advances in particle accelerator science and technology.
- To share advanced accelerator technology for the benefit of UK society and industry.
- To share the excitement and benefits of accelerator science and technology with the public.

Our Values

Our values are Excellence, Collaboration, Innovation, and Integrity. These values bond us together and underpin what we do:

- Excellence – we will strive to be among the best in everything we do, from our science and technology to our support services and business processes.
- Collaboration – we will work cooperatively in partnership with others to achieve the best result possible.
- Innovation – we will produce innovative ideas and performance and maximise the impact of our research for society and the economy.
- Integrity – we will be honest and open in our dealings with others, following through on our promises and commitments, and treating all with respect.

“**Making a brighter future through advanced accelerators**”



Strategic Goals

World Class Accelerator Facilities for World Class Research

Long Term Strategic Goals

Ensure that UK Research and Innovation's existing national and international accelerator facilities enable world class research by UK scientists and industry and remain world-class by directly supporting a balanced suite of major upgrades and targeted developments.

Develop the capability to lead the provision of new world class accelerator facilities.

For ASTeC to be the "partner of choice" and make a positive impact on all the world leading international facilities that we contribute to.

Context

Particle accelerators are central to much of STFC's major research programmes, such as the discovery of the Higgs boson with the Large Hadron Collider, the pursuit of novel energy technologies with ISIS, or drug discovery with Diamond Light Source. Through the activities and capabilities of ASTeC, accelerators are recognised as one of STFC's five world leading capabilities. Our goal is to ensure that we enable UK scientists to carry out world leading research by ensuring that they have access to world leading accelerators. We enable STFC and UK Research and Innovation to credibly contribute to, and be a partner of choice of, leading international facilities, such as ESS and the Long-Baseline Neutrino Facility (LBNF), to pursue vigorous upgrades of existing facilities, such as Diamond-II and ISIS-II, and also to have the capability to host major new facilities such as an X-ray FEL.

A distinctive feature of ASTeC, in close partnership with our colleagues within Technology Department, is our demonstrated ability to lead full scale accelerator projects through the complete life cycle of specification, design, procurement, assembly, commissioning, operation, and ultimately decommissioning. It is this vertically integrating capability which means we can confidently agree to lead in-kind contributions of major sub-systems to the world's top accelerator projects. ASTeC was launched in 2002 and since then we have led the design of Diamond Light Source and two X-ray FEL facilities (4GLS and NLS) and made major contributions to the design of future electron-positron colliders

(ILC and CLIC) and a neutrino factory. In addition we have built and operated a number of medium scale accelerator test facilities (ALICE, EMMA, VELA, and CLARA). Currently, we are assembling, testing, and delivering major parts of ESS, High Luminosity-LHC (HL-LHC), and Proton Improvement Plan-II (PIP-II) and look forward to making similar scale contributions to EPAC, ISIS-II, Diamond-II, and a UK X-ray FEL according to the needs and priorities established by the UK Research and Innovation Infrastructure Roadmap.

Long Term Ambitions

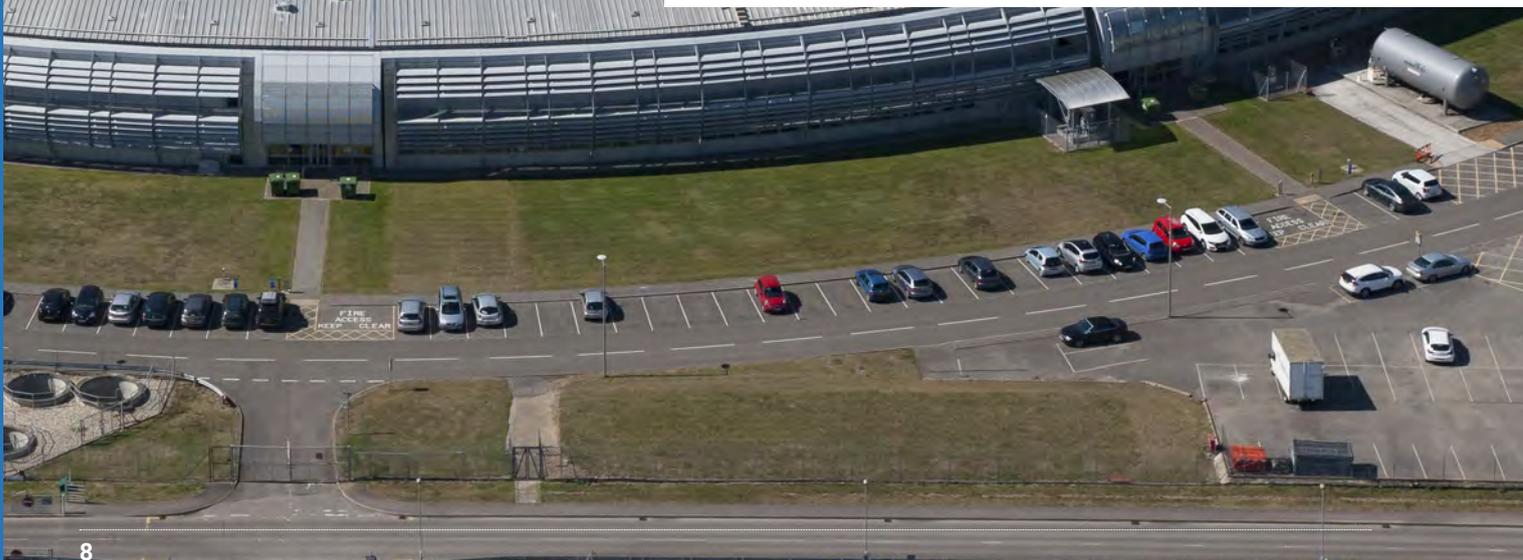
- Strengthen ASTeC's position as UK leader and partner of choice in accelerator research and development, ensuring our programme remains world-leading, vibrant and ambitious.
- Seize opportunities to retain and enhance ASTeC leadership in accelerator science and technology by taking responsibility for major sub-systems for new and emerging national and international accelerator facilities, including upgrades to our multidisciplinary facilities.
- Enhance the UK's reputation and influence through the delivery of world-leading accelerator research and innovation, attracting international investment and providing opportunities for UK companies.
- Look for opportunities to partner with international colleagues to enhance the performance of their facilities through the application of our skills and technologies.
- Leverage ASTeC's research leadership in large-scale international projects to promote STFC and UK Research and Innovation on the international stage.
- Deliver the underpinning technology and infrastructure in support of new world class accelerator facilities according to the aims and priorities of the UK Research and Innovation Infrastructure Roadmap and European Strategy for Particle Physics.
- Increase our engagement with end users of all UK accelerator facilities to ensure we understand their long term needs.



World Class Accelerator Facilities for World Class Research cont'd

Near-term Actions

- Meet all of our agreed deliverables to ESS, HL-LHC, and PIP-II on time, to budget, and to specification.
- Work closely with Central Laser Facility to design and deliver significant parts of the charged particle beamlines of the Extreme Photonics Applications Centre to achieve the project's specifications.
- Strengthen our engagement with the Diamond-II and ISIS-II upgrade projects and take responsibility for specific areas where we have distinctive capabilities.
- Contribute to the development of future accelerators for particle physics (e.g. FCC, CLIC, LHeC, etc) according to the priorities of the UK Research and Innovation Infrastructure Roadmap and European Strategy for Particle Physics.
- Support the development of a possible national X-ray Free Electron Laser (UK XFEL) facility, driven by science needs and with clearly-defined critical decision gateways, and lead the upfront R&D, the design, and the delivery if approved.
- Make use of our distinctive capabilities in energy recovery accelerators to enhance international facilities and to develop a concept for a national cross-cutting facility.
- Support the development of science-driven cases for National Research Facilities based upon accelerators, such as ultrafast electron diffraction or infra-red FEL, and deliver these if funded.



World Class Innovation

Long Term Strategic Goal

Have delivering innovation through accelerator science and technology at the heart of what we do as a department.

Context

ASTeC has always appreciated the value of partnering with industry and has a long track record of knowledge exchange activities to our mutual benefit. We have become known internationally as an accelerator centre that is enthusiastic about sharing our expertise with industry and providing access to our suite of electron beam facilities. This has led to a number of blue chip companies investing significantly in the Sci-Tech Daresbury campus and carrying out major research and development activities in collaboration with ASTeC. Examples include the demonstration of new airport cargo scanning technologies, the design of intense short-wavelength light sources for future chip lithography factories, and the full scale demonstration of a novel proton therapy technology for future clinical use. We want this trend to continue, to support the ambitions set out in the Industrial Strategy, indeed we want to make it even more straightforward for companies to exploit our distinctive capabilities and to gain access to our unique facilities. We also recognise that much of the technology that we develop in-house could be commercialised and we will work closely with colleagues in STFC's Business and Innovation Department to ensure all opportunities are properly assessed and taken forward appropriately.

As a centre of excellence in accelerator science and technology we encourage and value the creativity of our staff in generating innovative solutions. We endeavour to create an environment where novel ideas are welcomed and taken forward if resources allow and the end goal is aligned with our programme. Often these research driven innovations can lead to opportunities for commercial exploitation downstream and so we regularly share our new ideas as they develop with colleagues from Business and Innovation Directorate.

Long Term Ambitions

- Make our capabilities and infrastructure more accessible to companies, ensuring that businesses of all sizes can leverage UK Research and Innovation's infrastructure investment to enhance their competitiveness.
- Regularly scan for opportunities to exploit our innovative solutions with appropriate industrial partners.
- Coordinate a vibrant academic and industrial programme on our suite of facilities; CLARA, VELA, Compact Linac, eBeam and Linac Test Facility.
- Accelerate the commercialisation of novel ideas and technologies arising out of our frontier research and facilities.

Near-term Actions

- Meet all of our agreed deliverables with Advanced Oncotherapy to time, budget, and specification to establish suitable accelerator infrastructure on the Sci-Tech Daresbury Campus.
- Provide ongoing collaborative support to Advanced Oncotherapy when our skills can make a difference and can be made available.
- Work in close partnership with Teledyne e2v to ensure the Linac Test Facility and Compact Linac exploitation is carried out efficiently and with impact for all.
- Build and install a permanent magnet quadrupole into Diamond to demonstrate the day to day operation to potential customers.
- Proactively engage more broadly with industry to market our distinctive capabilities in vacuum science (e.g. offering vacuum precision cleaning and surface technologies).
- Establish and operate a suite of serviced ionizing radiation-tight enclosures on the Sci-Tech Daresbury Campus available for industrial and academic exploitation.



World Class Skills

Long Term Strategic Goal

Attract, develop, and foster the world class skills necessary for our accelerator science and technology projects and programmes and support the skills pipeline within STFC and UK Research and Innovation.

Context

All of our activities depend upon a highly skilled workforce of accelerator scientists, engineers, and technicians, many of whom are recognised internationally as experts in their fields. Jointly with our colleagues from Technology Department, who provide complementary capabilities, we cover all of the skills needed to enable STFC to contribute major accelerator systems to international facilities or to consider hosting major new facilities within the UK. We need to continuously assess our skills needs as a department as the requirements evolve with time.

Examples where we have proactively built up new capabilities in the past decade or so include the application of lasers to accelerators, in large scale cryogenic systems, and in superconducting RF systems. Recently we recognised that the application of machine learning to particle accelerators will be a game changer and so we have now initiated skills development in that area. We also benefit greatly from the skills brought by our collaborators and so we actively help to train post graduate students and postdoctoral researchers within the UK, especially within the Cockcroft Institute. We support the skills pipeline in general within the critical STEM areas by recruiting predominantly via apprenticeships or STFC's graduate scheme.

Long Term Ambitions

- Strengthen our process of continuous improvement and adaptation of skills, matched to the evolving needs of our accelerator science and technology programme delivery through periodic workforce planning exercises.
- To be internationally recognised as a centre of excellence in the development of accelerator science and technology skills.
- Use our inspirational high-tech facilities and programmes to attract, retain, and develop a pipeline of skilled engineers, technicians and scientists from diverse backgrounds.
- To recruit via the apprentice and graduate programmes as a matter of course to support the national skills pipeline.
- Revolutionise future accelerator facility operation and optimization through the application of machine learning, building core skills in this area by working with experts from academia, business, and other parts of STFC.

Near-term Actions

- Carry out a workforce planning review of ASTeC to establish our rolling skills, capabilities, and recruitment needs.
- Use CLARA as a test bed for development of our machine learning skills applied to accelerators, in collaboration with machine learning experts from academia, business and other STFC departments.
- Help shape the Cockcroft Institute education programme to ensure it is appropriate for our new recruits as well as post-graduate students and postdoctoral researchers.



Strategic Themes

Designing & Exploiting Test Facilities

Long Term Strategic Goal

Develop and deliver cutting edge accelerator test facilities for researchers from throughout UK Research and Innovation, academia and industry, advancing accelerator science and innovation and paving the way for major new national and international accelerator facilities.

Context

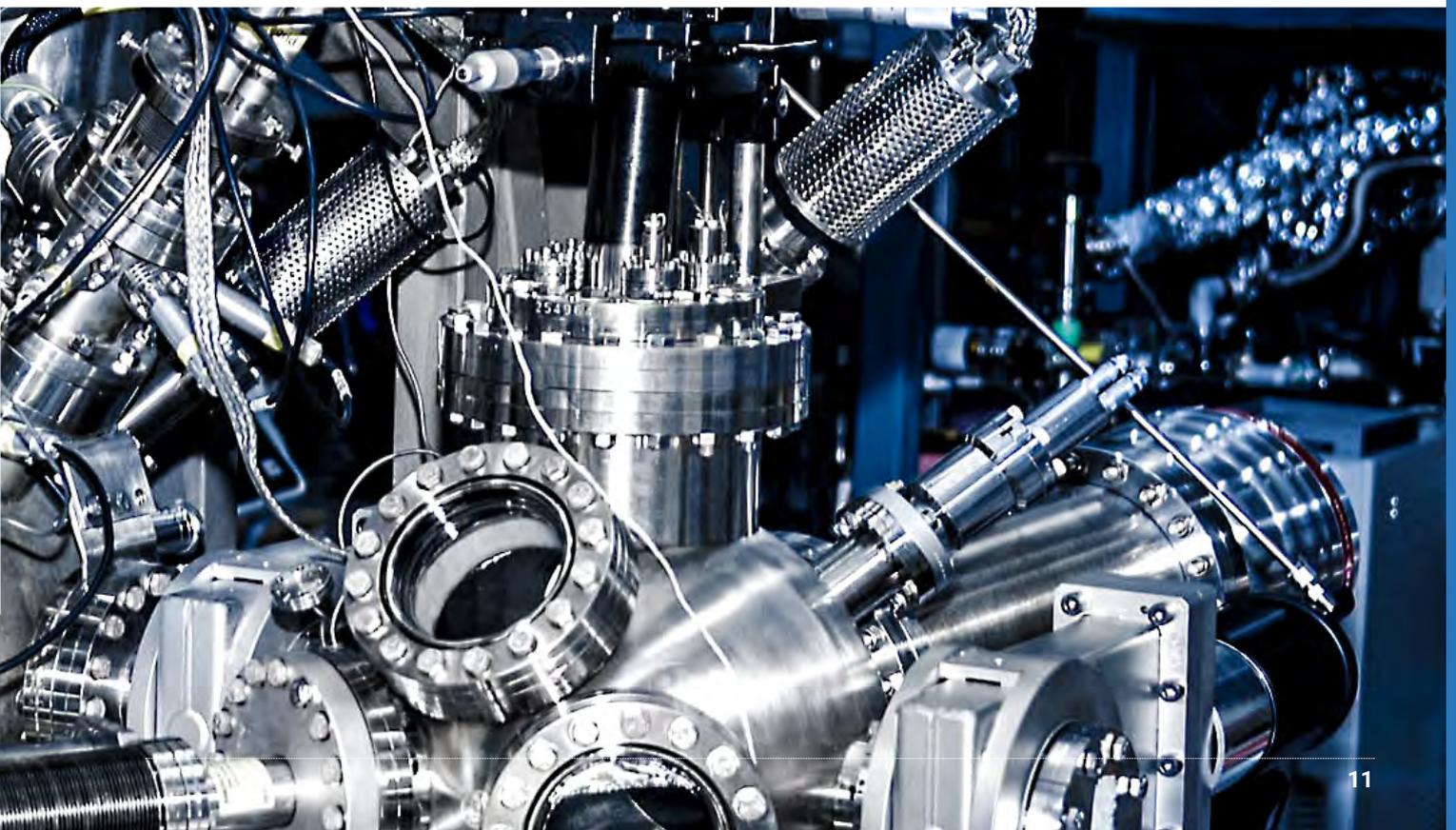
Leadership in accelerator science and technology relies upon access to state of the art accelerators. ASTeC has an excellent track record of developing and exploiting accelerator test facilities that have taken the field forward. Our experience from our first test facilities, ALICE and EMMA, has provided us with an international reputation in energy recovery linacs and fixed field alternating gradient accelerators that continues to generate numerous opportunities for us to engage with leading international projects. Importantly, we have always been willing to take the difficult decisions to cease operating a test facility, when the project goals have been achieved, to enable us to move onto the next challenge. Currently our main focus is on the CLARA accelerator test facility, which will generate extremely bright, FEL quality, electron bunches, once completed.

Phase 1 of CLARA is already operational and the electron bunches are being exploited by ASTeC, university academics, UK industry, and European accelerator laboratories for a broad range of applications from proving advanced accelerator technology, to testing novel acceleration schemes, through to possible new cancer treatments.

We offer access to CLARA through a science-driven competitive call process to ensure the beamtime is utilised appropriately and the facility is typically oversubscribed by a factor of two. A key driving force behind the establishment of CLARA was the need for an FEL prototype facility for the UK prior to investment in a national X-ray FEL facility.

Once the priority for this national facility is established within UK Research and Innovation, we will be able to rapidly implement a FEL on CLARA that will then test and prove new FEL concepts for enhancing the light output properties. These new techniques can then be designed and built into the national facility providing unique capabilities for UK researchers. CLARA has been deliberately designed to be inherently flexible and we can foresee a suite of ongoing future enhancements that will keep CLARA at the cutting edge for many years, with or without this FEL implementation.

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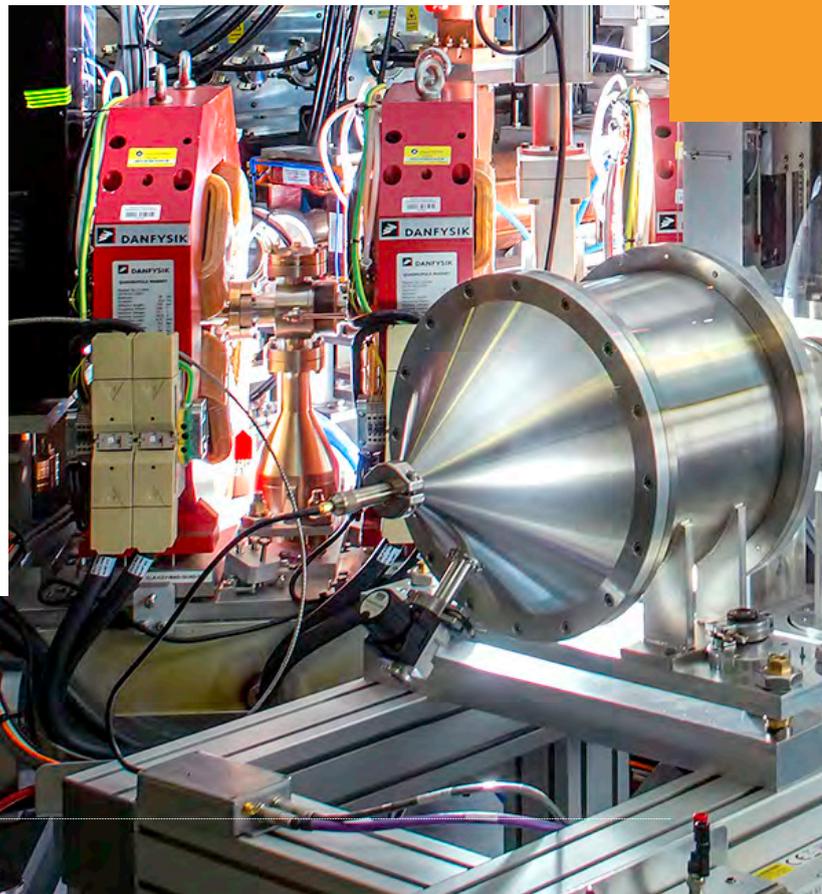
Designing & Exploiting Test Facilities cont'd

Long Term Ambitions

- Establish CLARA as the European test bed for accelerator research and development, bringing together international collaborations and investments to support inspirational global science projects.
- Vigorously pursue the open access exploitation of CLARA to enable and encourage the UK academic, industrial, and health sectors to develop new accelerator-based technologies, treatments, and frontier research for the benefit of the economy and society.
- Implement an ambitious programme of upgrades to CLARA aligned with the priorities established by the UK Research and Innovation Infrastructure Roadmap.
- Lead our own priority research programmes, exploiting our test facilities, in our areas of distinctive capability and on research with an explicit end purpose.

Near-term Actions

- Deliver CLARA Phase 2, raising the beam energy to 250MeV, significantly enhancing the bunch brightness, and implementing an independent user end station hutch with world leading laser-electron interaction capabilities.
- Expand the CLARA user community by proactively targeting non-accelerator researchers and industry, via trans-national access routes, and by hosting an annual CLARA User Meeting.
- Issue regular open calls for CLARA beam access and dedicate at least four months per year to beam exploitation periods.
- Bid to UK Research and Innovation for funds to upgrade CLARA to include an innovative FEL able to test new schemes when the UK XFEL mission need is established and the priority is reflected in the UK Research and Innovation Infrastructure Roadmap.
- Lead and facilitate research programmes that exploit CLARA for novel acceleration and diagnostics, including dielectric acceleration.



Solutions for 21st Century Challenges

Long Term Strategic Goal

Realise the full potential of our science, technology and facilities to play their part in providing solutions for industrial and societal challenges.

Context

In this context the 21st century challenges are defined as the big and often complex social, environmental, and economic challenges facing the UK and other countries. Examples include energy, infrastructure, resources, health, development, defence, security, and resilience. Accelerators are versatile tools that are already helping to address many of the challenges society faces such as in radiotherapy systems for cancer treatment, in cargo scanning systems at our borders, and for treating wastewater from factories.

We want to expand and develop the applications of accelerators globally to address further challenges.

We are already actively collaborating on several cancer treatment projects with world leading organisations.

Examples of activities with our partners include our work to develop a robust and affordable radiotherapy system for wide scale deployment across Africa, the use of CLARA for direct electron therapy tests, and our support for industry in the development of a new type of proton therapy facility.

We also recognise that large scale accelerator facilities can consume significant amounts of electrical power and that we have a role to play in addressing this. ASTeC has already established international leadership in the development and deployment of zero power consumption permanent magnets within accelerators and we want to broaden our research activities in the area of energy efficiency to other disciplines, such as RF and vacuum, to offer low or zero power alternatives to current day accelerator technologies. Furthermore, we want to set an example to similar organisations globally by working to become carbon neutral across the whole of ASTeC's activities by 2040, ten years ahead of the government's own target.

We will start by carefully auditing our carbon emissions across the whole of the departments activities, from accelerator operations to international travel, and then put in place a long term action plan towards our ambitious but important target.

cont'd





Solutions for 21st Century Challenges cont'd

Long Term Ambitions

- Pursue a coherent, collaborative, and strategic approach to tackling 21st century challenges based upon our research strengths, facilities and technological capabilities.
- Collaborate with multidisciplinary teams and non-traditional partners to address challenges articulated by on-the-ground communities in Official Development Assistance (ODA) countries, supported by the Global Challenges Research Fund and Newton Fund.
- Decrease the power consumption of particle accelerators globally by targeting our major research and development activities specifically on increasing the energy efficiency of key accelerator systems.
- Lead by example amongst the global accelerator community by achieving carbon neutrality, across all of our activities, by 2040.
- For sustainability to be a key theme in all of our future accelerator facility designs.

Near-term Actions

- Play a major role in the collaboration addressing robust radiotherapy systems for ODA countries and bid for funds to take the project to the next level.
- Engage with wider STFC, UK Research and Innovation, universities, and health professionals on the development of a cancer therapy research centre on the Sci-Tech Daresbury Campus.
- Proactively scan for new opportunities with high potential for global impact with particular focus outside of the well-established healthcare and security areas.
- To routinely record our carbon emissions across all of our activities and to develop a plan towards carbon neutrality.
- Ensure that all of our design and prototyping tasks properly consider long term sustainability.

Strategic Technology Development

Long Term Strategic Goal

To identify, develop, and implement cutting-edge accelerator technology which is required to meet the ambitious goals of the UK's research priorities.

Context

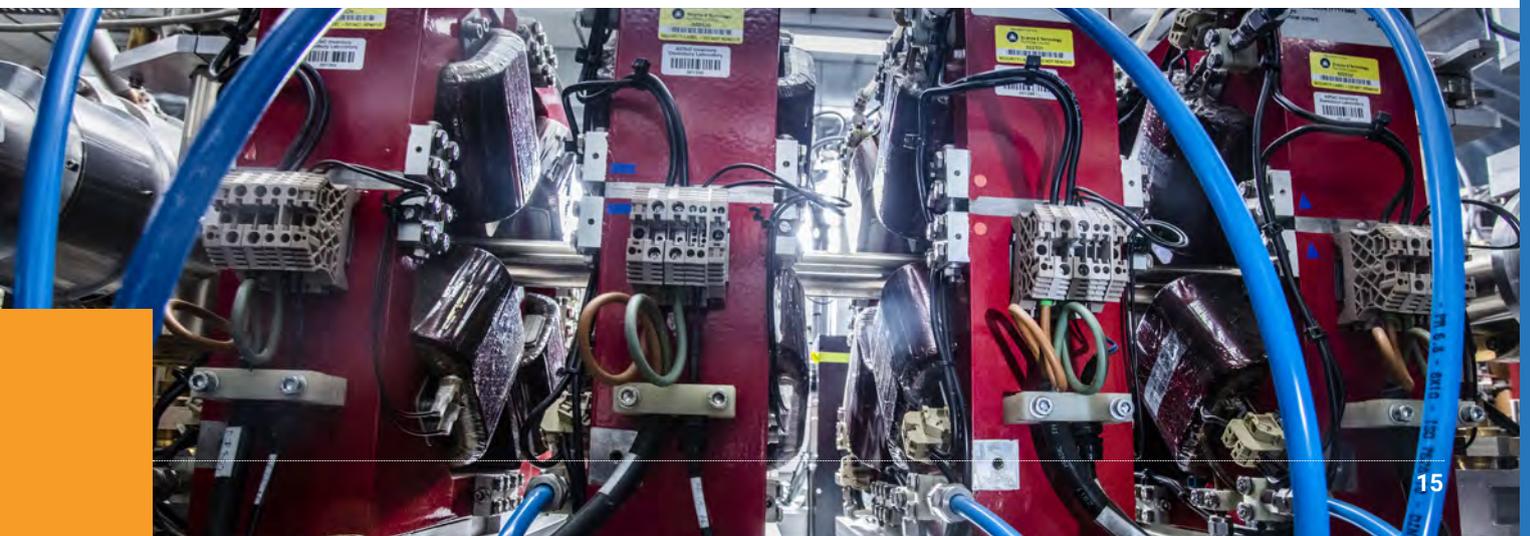
The continuous ongoing development and enhancement of accelerators relies upon a large underpinning technology development activity internationally, and is often carried out in large multi-national collaborations. The development of new accelerator technologies can take many years before full implementation on a user facility and so these developments require a long term strategic approach and commitment. ASTeC fully understands the need to have a balanced approach to technology development, we must prioritise the key areas that we choose to invest our resources in whilst keeping abreast of new developments from other accelerator centres. We select to invest our resources in technologies which will have a clear impact on STFC and UK Research and Innovation strategic priorities, such as in major facility upgrades or in possible new facilities. Examples include superconducting undulators, permanent magnet systems, and non-evaporable getter (NEG) coatings, which will all have a major influence over the Diamond-II upgrade and in our 400 Hz photoinjector which will enable high brightness beams at high repetition rate for future FELs. We also choose to work on technologies that will help address the 21st century challenges as described earlier. We do not work in isolation in the accelerator community and we intend for our technological developments to be taken up by our global partners either through collaborative activities or as a commercial product as appropriate.

Long Term Ambitions

- Identify the key technological challenges which our national and international facilities must overcome and lead or collaborate on programmes to address these.
- Develop long term programmes, with partner organisations where possible, for each of our selected strategic technology priorities, with milestones, decision points, and success factors.
- Build on our areas of strength, establishing ASTeC as a recognised international centre of excellence in:
 - Thin films and coatings applied to accelerators to modify surface properties;
 - Photoinjector and photocathode research;
 - Permanent magnet systems;
 - Superconducting RF technology (bulk and thin film);
 - Superconducting undulators.
- Seize opportunities to translate our technologies into marketable products and to address real-world challenges.

Near-term Actions

- For each of our long term research programmes develop and implement a roadmap, with decision points, that articulates the stages that must be passed to achieve the clearly stated end goal.
- Condition and then characterize the beam from our influential 400Hz RF photoinjector.





Strategic Enablers

Fostering Collaboration

Long Term Strategic Goal

Maximise the opportunities to build stronger, mutually beneficial, research and innovation partnerships with expert groups around the world.

Context

The vast majority of ASTeC's activities are carried out in collaboration with other accelerator professionals from around the world. These experts can be from universities, other leading accelerator laboratories, or industry. The fundamental international nature of particle accelerators, especially those supported by multiple countries, such as European XFEL, ESS, and LHC, naturally encourage the accelerator community to work collaboratively in project teams. Within the UK we are active partners within the Cockcroft Institute and work very closely with the John Adams Institute. We jointly supervise a significant number of PhD students who are based on the Sci-Tech Daresbury campus and who work seamlessly within our project teams. As well as sharing our knowledge within our collaborations, we also share our infrastructures and test facilities. ASTeC staff regularly carry out advanced accelerator experiments on overseas facilities, for example, as do our partners on our facilities at Daresbury Laboratory.

We recognise the benefits of working collaboratively with members of the wider accelerator community and so we want to broaden our activities to include more cross Research Council partnership activities and also to develop cross government department connections. One idea we are pursuing is to establish a National Thin Film Deposition and Characterisation Centre, sharing the skills and infrastructure that we have in this area with broadly similar groups across the country. This could lead to a virtual centre which lowers the barrier for researchers and industry to rapidly access these capabilities and infrastructures in a simple and efficient manner. We are also keen to pursue similar ideas in the health sector, to combine our skills with academics and clinicians to form large multi-disciplinary collaborations that could work together towards a set of common goals, such as cancer treatments.

Long Term Ambitions

- Continue to strengthen and deepen our engagement with the two accelerator institutes (Cockcroft and John Adams) to the benefit of the UK.
- Exploit the opportunities presented by the UK Research and Innovation cross-cutting funds to build deeper collaborations with Research Councils and international partners.
- Bring together and facilitate global partnerships and collaborations to support the next big inspirational science projects, including the development of plans for new scientific facilities to be hosted in the UK.
- Enhance our engagement across UK Research and Innovation and government to unlock the potential of our expertise and technology to help deliver our partners' goals, for example via cross-cutting and multidisciplinary projects funded through the Strategic Priorities Fund.
- Establish scientific and technological collaborations in countries that are not our traditional partners to grow capability, strengthen the global accelerator community and improve outcomes for developing countries, supporting the UK's International Research and Innovation Strategy.

Near-term Actions

- Develop and implement Stakeholder Engagement Plans for our most significant projects.
- Increase our presence within UK Research and Innovation and across government to support future multidisciplinary initiatives and bids, to funds such as ISCF and SPF.
- Develop our concept of a National Thin Film Deposition and Characterisation Centre by consulting widely with potential stakeholders.

Educating and Inspiring

Long Term Strategic Goal

Harness our passion, enthusiasm, and inspirational facilities to galvanize the next generation to explore and choose a career in accelerator science and engineering.

Context

UK Research and Innovation's vision is of a society where research is created, used, challenged, valued and shared by all. Attracting and building a skilled workforce is essential to this vision and to meeting the government's target to invest 2.4% of GDP in research and development by 2027. For our area of science, this means sharing the curiosity, excitement, and ambition that comes from developing our incredible technologies and facilities and explaining how the outcomes of our work deepen our understanding and can improve lives. We offer many routes for students, up to age 18, to directly interact with us to learn about our research and the benefits that accelerators bring to society. These opportunities include work experience placements and summer placements and specific outreach events such as the Particle Physics Masterclass. We also regularly offer a small number of Year in Industry placements for undergraduates. We want to increase the diversity of people taking STEM subjects in higher education and as part of this we have worked closely with the Cockcroft Institute on specific outreach programmes targeting non-traditional audiences, such as the award winning Tactile Collider that has helped us connect with visually impaired young people.

We also recognise that we have a role to play in educating the next generation of accelerator scientists and engineers. ASTeC staff deliver around a quarter of all the formal lectures to the Cockcroft Institute postgraduate students and early stage researchers every year. We also deliver occasional lectures at topical CERN Accelerator Schools, at the John Adams Institute, and deliver vacuum training to industry and academia through the national vacuum symposium. In addition to this formal training, we host a significant number of post graduate students and early stage researchers at Daresbury and pass on our knowledge directly through supervision and informal interactions.



Long Term Ambitions

- Inspire people to value and participate in scientific discovery through the awe and wonder of our accelerator science, engineering and technology.
- Enhance public awareness of the economic, scientific and wider public benefits of investment in accelerator science and technology.
- Target non-traditional audiences to increase the diversity of the future UK science and engineering community.
- Encourage the next generation to study and work in accelerator science and technology by offering a wide variety of opportunities to interact with our staff and facilities.
- Directly support the education of early stage researchers via formal lectures, expert schools, and as supervisors.

Near-term Actions

- Continue and expand upon our successful programme of student placements and the Particle Physics Masterclasses, increasing the number of placements offered year on year.
- Partner with the Cockcroft Institute on our outreach activities at schools and festivals, and further develop initiatives for non-traditional audiences such as the Tactile Collider.
- Fully engage as a department with the Daresbury Open Week 2020 planning and delivery activities.



Creating an Outstanding Organisation

Long Term Strategic Goal

Provide the best environment for ASTeC staff to deliver world-leading research and innovation in accelerator science and technology, by providing access to all the necessary infrastructure and ensuring an inclusive culture which values and encourages diversity.

Context

Our research, our projects, and our test facilities are all long-term, collaborative endeavours. A programme of this nature requires the ability to plan and commit resources for the longer term and to have robust management practices to ensure that progress is achieved in line with agreed milestones and stakeholder expectations.

The reputation of UK Research and Innovation and STFC is enhanced every time that ASTeC delivers major systems on time to leading international facilities such

as ESS and LHC and so we take project management very seriously. We have a number of full time project management professionals within the department and have teamed up with Technology Department to create a Portfolio Management Office (PMO) at Daresbury.

Together, these measures are ensuring that the management of our whole programme is continuously improving year on year. We want to be recognised as outstanding in Project Management as well as in accelerator science and technology.

The development and operation of our test facilities and laboratories brings together an elaborate mix of technologies (e.g. vacuum, RF, magnets, lasers, cryogenics, etc), each with their own particular hazards.

The safe operation of our infrastructure is embedded within our culture and we work closely with safety professionals within STFC to continuously monitor and improve our practices and procedures within the remit of the UK Research and Innovation and STFC Safety Policies.

We publish a Safety, Health, and Environment (SHE) Improvement Plan annually which includes specific objectives to be achieved during the year. These plans also now include objectives relating to the health and wellbeing of our staff which is equally as important as their safety.

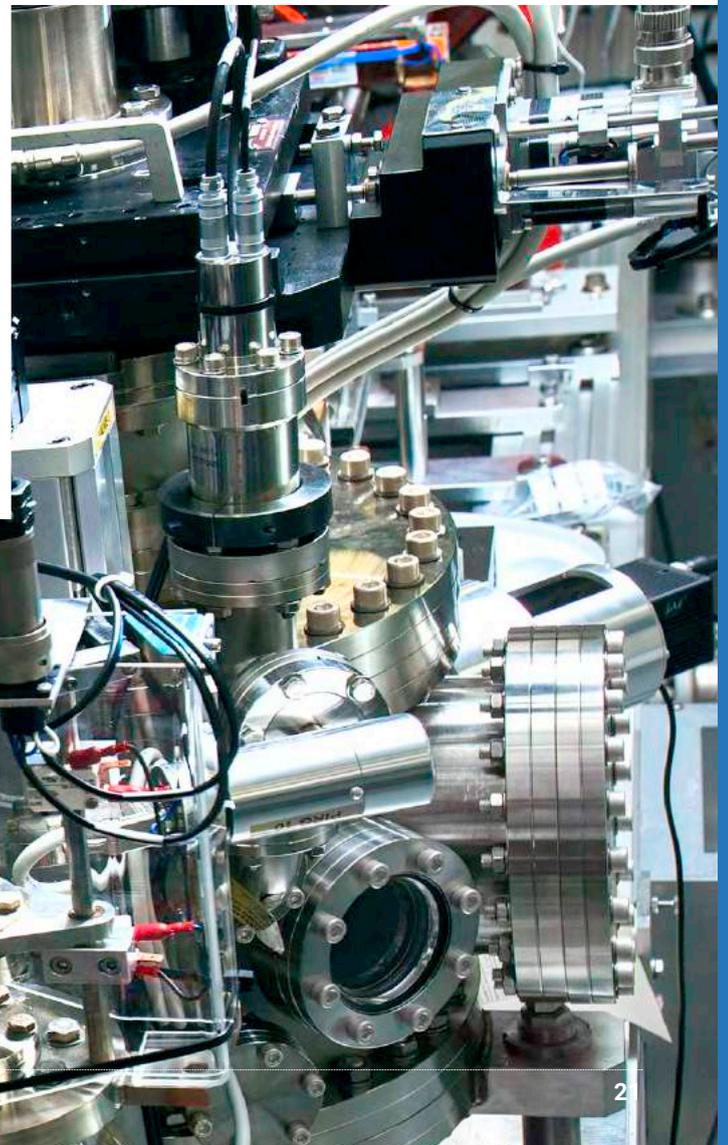


Long Term Ambitions

- Take a strategic lead in promoting, championing and implementing UK Research and Innovation equality, diversity and inclusion (ED&I) policies and practices, removing barriers wherever we can.
- Create an outstanding and inclusive working environment within ASTeC based on our shared values of collaboration, innovation, integrity and excellence.
- Continuously improve our underpinning administrative practices and processes.
- Make the health and wellbeing of our staff as important as their safety.
- Strengthen our engagement with Corporate Services Directorate to ensure we coordinate our plans for developing the Sci-Tech Daresbury Campus.
- To have a clear and well-articulated five year rolling ASTeC Project Delivery Plan with implementation supported by our PMO to ensure efficient resource planning.
- Continuously improve our Project Management practices and processes.
- Ensure that ASTeC staff have access to all necessary infrastructure, including laboratories, software, and test facilities, in support of our priority development activities.
- Ensure all staff have access to high quality, reliable, and robust e-Infrastructure, including High Performance Computing where appropriate.

Near-term Actions

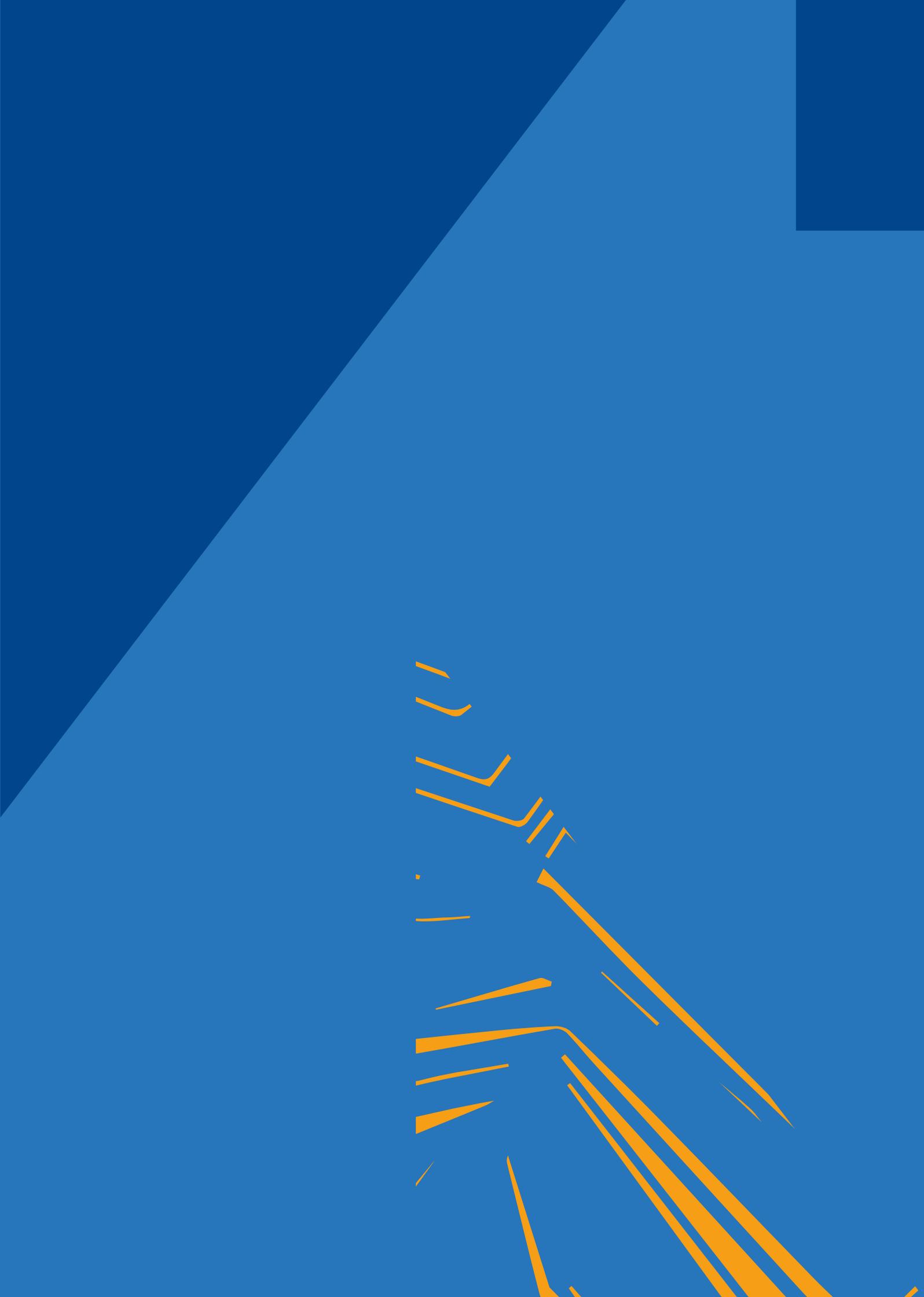
- Fully embed the PMO into our business and strive to increase our Portfolio, Programme and Project Management Maturity Model (P3M3) rating by developing and implementing an improvement plan.
- Retain and review the implementation of ISO9001 within ASTeC and analyse whether other parts of our business should also be covered.
- Ensure that ED&I becomes embedded in our culture and values, in the same way that SHE already is, by the routine consideration and discussion as part of our daily business practices.
- Host a weekly ASTeC Coffee Break, encouraging all staff to attend, to socialise, network, and relax away from their desks.
- Encourage all staff to consider their wellbeing when organising business travel (e.g. by making more use of public transport).



Glossary



4GLS	Fourth Generation Light Source
ALICE	Accelerators and Lasers in Combined Experiments
ASTeC	Accelerator Science and Technology Centre
CLARA	Compact Linear Accelerator for Research and Applications
CLF	Central Laser Facility
CLIC	Compact Linear Collider
ED&I	Equality, Diversity and Inclusion
EMMA	Electron Model of Many Applications
EPAC	Extreme Photonics Application Centre at CLF
ESS	European Spallation Source
FEL	Free Electron Laser
GCRF	Global Challenges Research Fund
HL-LHC	High Luminosity Large Hadron Collider
ILC	International Linear Collider
ISCF	Industrial Challenge Strategy Fund
LBNF	Long-Baseline Neutrino Facility
LHC	Large Hadron Collider
NEG	Non-evaporable Getter
NLS	New Light Source
ODA	Official Development Assistance
P3M3	Portfolio, Programme and Project Management Maturity Model
PIP-II	Proton Improvement Plan-II
PMO	Portfolio Management Office
RF	Radio-frequency
SHE	Safety, Health and Environment
SPF	Strategic Priorities Fund
STEM	Science, Technology, Engineering and Mathematics
STFC	Science and Technology Facilities Council
UK XFEL	UK X-ray Free Electron Laser
VELA	Versatile Electron Linear Accelerator





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