2020 Activity Report

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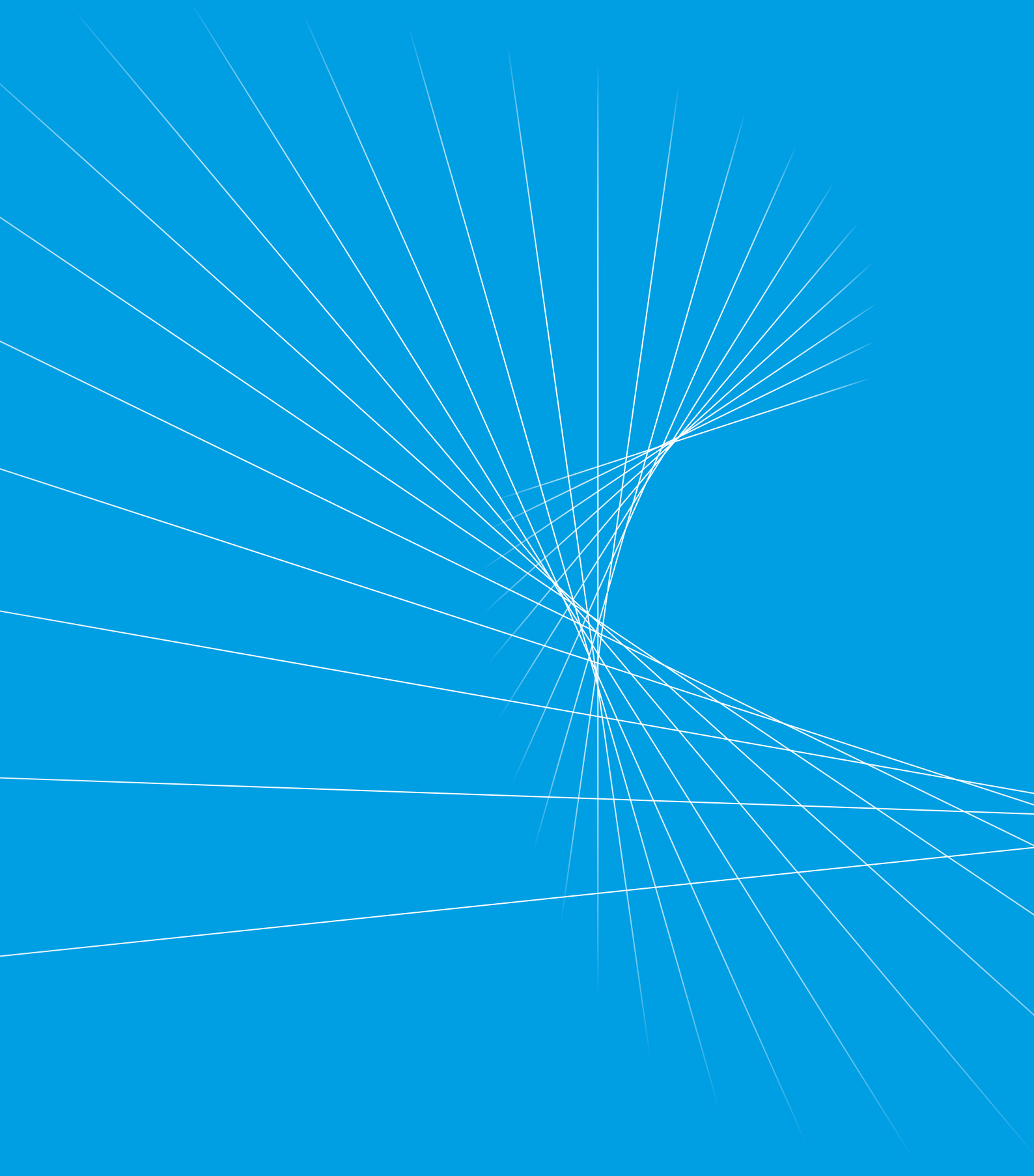

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Imagine the moment the scaffolding came away to reveal the Sydney Opera House. The moment passersby could clearly see that famous outline. No instruments or musicians filled its halls yet, but it was only a matter of time. There comes a moment in every project when it's no longer a construction site, but a recognisable facility shifting towards its new reality. ESS reached that moment in 2020.

If you went out on the ESS site at the end of the year and compared with the start, there was great visible progress. The buildings were largely complete. The tower cranes came down. No longer did we have large earth-moving machinery and nearly so much mud on everyone's boots. The site turned from brown to green. Still a scientific facility under construction, but no longer a building site. The nature of the work changed – from contractors with digging machines to electronic engineers with screwdrivers installing equipment. 2020 brought the next shift in turning ESS into a scientific facility.

Working around challenges

Of course, even as our focus onsite shifted, so did the world around us. As people everywhere adapted to a new reality with Covid-19, so did ESS. Looking back, we accomplished a surprisingly large fraction of what we set out to achieve in 2020. We did it in different ways, and not all as we'd hoped. Yet we can be proud of how we adapted to keep people safe and the project moving.

Along with progress in many areas, 2020 also brought disappointments. Many of the in-kind laboratories building equipment for us across Europe faced lockdowns and their suppliers had delays. Some of our own work was also delayed because people could not travel to Lund.

Yet, 2020 was not just a story about Covid. It was a story about integrating a highly complex, technically challenging, one-of-its-kind facility. With that came plenty of expected challenges. We had some quality control issues with equipment that didn't meet our specifications when it arrived. There were also new work safety processes to put in place – not just for Covid, but for working with electrical and pressurised equipment. Our people came together to handle all of these things well.

Safety first

Our priority in adapting to the Covid situation was protecting people. New risk assessments were carried out and additional health measures put in place. For a large fraction of the year, people worked from home whenever possible. Staff that needed to come on site for hands-on work had to learn to work in new ways with face masks and separation of 1.5 metres between each worker required. The changes affected everything from the way we did our jobs to the way we ate lunch.

Keeping spirits up

In all these changes, we took purposeful steps to maintain our ESS spirit and collaboration. We invested in new video conferencing systems and made sure we increased the ways we could interact. Creativity of the staff during the lockdown period was inspiring as people recorded humorous videos and songs about quarantine. These human displays of teamwork and friendship between colleagues across borders are part of what makes ESS truly unique.

We also felt a great sense of connection with our user community in spite of the pandemic. Our joint meeting with ILL for the European Neutron User Community became a virtual, interactive meeting with many hundreds of people connected. The adaptations in digital communication were well received and created new benefits that we will carry forward into our regular operations.

Delivering big

In 2020, ESS took delivery of notable pieces of equipment – in particular, the monolith vessel. Having crossed thousands of kilometres by sea and by land, the massive piece of engineering arrived from Spain to wholehearted cheers in Lund. It was a moving demonstration of teamwork between people on site, our partners in Spain, and the transport contractors.

The new Campus building also stood ready at the end of the year – a major achievement on time and on budget. It was disappointing, of course, that our equipment moved into the new buildings, but not yet our people. Designed for

by the Director General

Adapting to a shifting reality

collaboration, the building's full potential will have to wait until Covid restrictions relax. Yet, a year of social distancing only heightened the excitement of moving into this new home when the time is right.

Long-term vision perseveres

Looking forward, there are multifaceted challenges to be understood from the impact of Covid. We know there will be delays, unfortunately, and we plan to revisit our schedule to find clever ways to minimise the impact on First Science. We are also negotiating with our governance bodies, as ESS has not received the full funding originally planned which will also impact the schedule.

It is interesting to imagine that if ESS had been operational as a scientific facility during 2020, we would have been right at the front of the research into this virus and how to counteract it. The role of scientific research is a real reminder of why facilities like ESS are important and why we're building it. It is that vision of a future in which we can make a difference for everything from pandemics to climate change that motivates the people of ESS to adapt and persevere. Like any challenge, 2020 brought our team closer together – even if we were not physically closer. Common purpose and common goals are another way to measure proximity.

Personally, I felt a deep sense of pride after 2020; to have been part of a team unlike any other. The people of ESS are remarkable, and the future of scientific research is brighter because of them.

W. J. W

JOHN WOMERSLEY
ESS DIRECTOR GENERAL

Connecting to European industry

Research performed at ESS will generate important knowledge for European industry in taking the lead in a wide range of applications. A close cooperation between ESS and the industrial sector will advance European competitiveness and will be key in combating some of the great challenges facing humanity. During 2020, ESS established an Executive Advisory Board (EAB) with high level representatives from the industrial and academic world in order to strengthen its ties to the industrial sector and pave the way for future collaboration on a strategic level.

Big Science has always been strong when it comes to fundamental research. ESS will however be a facility where applied research will also play an important role. Research results from ESS will be of great value to many companies, allowing them to strengthen their R&D work and develop new, innovative products.

The awareness of ESS and the possibilities the facility will offer is however still low in the industrial sector. To remedy this, ESS has formed an Executive Advisory Board (EAB) with the task to promote ESS and establish new relationships with companies at top level. The members of the EAB have long experience from senior positions in the private sector and the academic world. With their experience, support and networks, they will open doors and help ESS initiate new collaborations in order to make future generations thrive.

Working together

Lars Börjesson, professor in materials physics at Chalmers University of Technology and former Chair of the ESS Council, is the Chair of EAB. He was one of the initiators of ESS Scandinavia and has been heavily involved in the project from the start.

"The solutions to many of humanity's greatest challenges can be found on the atomic level. With new materials and molecules, we can revolutionise areas such as energy, transport and health, just to name a few examples," explains Börjesson.

The practical implementation of these solutions will mainly be done in the private sector. Companies in a wide range of industries will develop new products that will allow us to make the shift to a more sustainable society where people have a higher quality of life.

"ESS is a unique tool that will make crucial contributions to the development of better batteries, more efficient medical treatments, lighter and stronger construction materials, better electrical conductors and much more," Börjesson continues. "It is imperative that we have a close collaboration between ESS and the industrial sector to ensure that European companies can take full advantage of the possibilities offered at ESS."


LARS BÖRJESSON


BERT NORDBERG

Taking the lead

Bert Nordberg is also a member of EAB. He can look back at a long career in the upper echelons of the European telecom industry, and is currently sitting on the board of a handful of international corporations. As Chair of Danish sustainable energy giant Vestas, an organisation with the long term vision to become the global leader in sustainable energy solutions, Bert is actively driving development and innovation in the energy sector.

"I believe technical leadership is the only way for European companies to stay competitive in the future. In Europe, we are at the frontline of sustainable energy development, and with ESS we will have great opportunities to further strengthen our position in this area and in many other sectors too," he says. "A central task for EAB is to facilitate the establishment of relationships between ESS and companies that could benefit from the research that will be performed here. But I also think we can make important contributions to the development of the visions for ESS."

One of the first initiatives from EAB is to arrange a one-day conference in cooperation with the global power and automation group ABB.

"We will invite CTOs from a number of companies that we believe would benefit from cooperating with ESS. This will be a recurrent event, arranged together with different companies, addressing different sectors," says Bert Nordberg. "We also have plans to use our contacts in the European Roundtable for Industries in the near future and look into how we can establish a cooperation."

Getting access

Lars Börjesson explains it will be possible for companies to take advantage of ESS in several ways.

"Apart from just accessing published research results and implementing these in their own development, companies can take active part in the design of the experiments. They can do this either by cooperating with a university or institute, or by doing experiments on their own. Researchers working at private companies will be able to apply for open beam time just as their university peers, but when using open beam time, the results must be published. Another alternative is for companies to buy beam time, in which case they can keep the results for themselves," Lars Börjesson says.

Staff at ESS will offer support regarding the instrument and the beam line. By cooperating with a university or institute, companies can get help designing experiments in case they do not have this competence inhouse. Lars Börjesson also foresees a market of consultants that will offer their services to companies that wish to make their own experiments.

Attracting competence

Both Lars Börjesson and Bert Nordberg expect many companies will establish R&D offices in the vicinity of the ESS site to take full advantage of the opportunities.

"I think ESS will be a magnet for development," Lars Börjesson says. "This will be a very exciting environment for people and companies interested in pushing the boundaries. There are other areas, such as Grenoble and Oxford where the combination of advanced research facilities and strong universities has attracted large corporations in a way that I think we will see at ESS. And we must not forget that ESS has a very exciting neighbour – Max IV. Neutron and X-Ray research complement each other in many ways and having two world-class facilities next to each other increases the attraction of the area significantly."

Bert Nordberg stresses the importance of having a wide perspective when promoting ESS.

"I think ESS has to have a global focus when trying to attract leading scientists and companies. I believe companies from all over the world will find it very interesting to establish R&D offices close to ESS. For example, I think it would be perfect for Microsoft to set up an office here," Bert Nordberg says. "Now it is up to us in the Executive Advisory Board to get the conversation about ESS started among the leaders of European industry and initiate some good collaborations. I'm very much looking forward to this," Bert Nordberg concludes.

ESS Executive Advisory Board members

Lars Börjesson, Chair
Professor in materials physics at Chalmers University of Technology

Bert Nordberg
Chair of the Board at Vestas, board member of SCA, Essity and Sigma Connectivity

Björn Savén
Founder of IK Investment Partners

Lena Olving
Former CEO of Mycronic, Chair of the Board at Academic Work

Arne Karlsson
Chair of the Board at Ecolean, board member of Maersk

Johan Söderström
EVP & Head of Regions EMEA Hitachi ABB Power Grids

Science that adapts today will serve tomorrow

It's the nature of science and scientists to adapt. When new challenges arise, like climate change or now the Covid situation, the research community dives in to uncover information and help solve the problem. As an organisation dedicated to giving scientists the most powerful new tool possible for that work, ESS dove in to adapt and keep moving towards 3 during our most challenging year yet.

Even as ESS is inventing new capabilities for neutron research, 2020 also demanded that we invent new ways of working that were unforeseen and untested. Yet, it turned out surprisingly well, with progress easily visible in everything from fully equipped labs to virtual events.

"The scientific nature of testing and learning is who we are," says Prof. Andreas Schreyer, Director for Science at ESS, "and we certainly adapted and learnt ways to work effectively in spite of the pandemic. For example, we found that certain meetings were good to hold online. We still need real, in-person connections. Yet now we've learned to integrate digital options which will change the way we do scientific collaborations for the better."

Embracing digital collaboration

One milestone for which ESS used an entirely new approach was the biennial event planned for the European science community – future users of ESS. Originally organized to be onsite in Lund for the first time, the entire planning pivoted on the fly, reconfiguring to an online event. The virtual user meeting garnered enormous interest with the highest attendance ever.

"When we concluded the user meeting after three intense days of good discussions and we saw the huge engagement of the community and the interest in ESS, that was really encouraging," shares Prof. Schreyer. "Because these are the people who will actually do all the science together with us. That was a key moment. We found a way. Despite the pandemic, we were able to create a great moment for them."

Filling big halls

As virtual work progressed, the physical results on site were unmistakable. The cavernous Long Instrument Hall completed in 2019 was empty no more after 2020. Two of the eight caves that will house the first instruments stood finished. Three storeys high, these caves

"The bunker is a complex puzzle, like massive Legos"

ANDREAS SCHREYER
DIRECTOR FOR SCIENCE, ESS

CLICK TO START VIDEO

provide the shielding around the area where the neutrons are scattered for experiments. The first computer hutches also appeared, along with shielding elements around the neutron guides and the foundation stones for the guides themselves.

The so-called bunker is on the critical path towards First Science. It serves as the interface and shared shielding with the target building and needed to be finished before installing instrument components. "The bunker is a complex puzzle, assembled somewhat like massive Legos stacked together," explains Prof. Schreyer. "Each block could only go in one place with highly detailed engineering for tolerances. With good work from our contractor in Hamburg, that happened on time last year."

Equipping the labs of tomorrow

In addition to the big hall, the adjacent lab buildings also transformed from empty to fully equipped and operational. Of course, future operations for these labs will support ESS users by creating samples, such as biomaterials, that can only be made shortly before they're put into the beam. Now before science begins, these labs serve project-related needs. The chemistry lab analyses components arriving onsite which will be in the neutron beam to ensure the materials conform to specifications. The labs also develop new building materials needed to withstand the high proton beam current at ESS.

"There are materials we need that we can't buy off the shelf," explains Prof. Schreyer. "How many 5-megawatt spallation sources get built on the planet? It's only us. Nobody else has that problem so we have to solve it ourselves by creating new materials."

Shifting to serve today

Yet some science-related lab work is already happening at ESS, and during 2020 that work shifted to prioritize help for the Covid-19 situation. The ESS Deuteration and Macromolecular Crystallisation lab (DEMAX) works with a technique valuable in studying viruses. As deuteration is a highly specialized capability that takes time to build up, DEMAX had already been working with pilot proposals to create samples for study at other neutron sources. When the pandemic came, DEMAX immediately called for Covid-related proposals and ESS is now part of part of a consortium aimed at rapid response to the current pandemic as well as future viral and microbial threats.

When in full operation, ESS will have a beam line, the NMX, optimized for investigation of biomolecules which will significantly contribute to understanding viruses and developing medications. And this is just one of many beams and countless opportunities at ESS to enable breakthroughs in science that will tackle all the most important societal changes of our time.

Seeing the future on Campus

Beyond covid, ESS is building the world's most cutting-edge neutron source to advance science so future generations can thrive. It's this purpose that drives us forward in spite of disappointing delays.

Having completed his first term at ESS in 2020 and assigned by Council for a new five-year term, Prof. Schreyer casts his eyes past current challenges. "We completed the ESS Campus in 2020. Sitting there over lunch in the restaurant and imagining the lively international science atmosphere we'll have at this place – I was completely thrilled. That's what keeps you going. We have some clouds on the horizon and it will still take a few years, but now you can really imagine how it will be when this is an operational facility with hundreds of scientists working in parallel on all these instruments. That was really good to feel for the first time in 2020."

Top highlights of 2020

1 Large-scale installation work happened in the Long Instrument Hall during 2020, including the bunker which is on the critical path for First Science. With this in place, we can begin installation of instrument components.

2 Both equipment and staff moved into the brand-new lab buildings adjacent to the Long Instrument Hall. Now in operation, these labs currently provide project-related services and will offer industrial and academic support for future user programmes.

3 In September, ESS hosted the first-ever wholly virtual user meeting. With the highest attendance on record, the meeting highlighted the great engagement and interest of the European science community in ESS and new neutron capabilities to come.

The Monolith Vessel arrives

In October, the first major technical component – the Monolith Vessel – was delivered to the ESS construction site. This huge component has been placed in the ESS target station and is a significant part of the Spanish in-kind contributions.

The vessel is six metres high, almost six metres wide and weighs a total of 45 tonnes. It will house the rotating target wheel which contains 7,000 tungsten blocks, from which the neutrons are released in the spallation process.

The delivery of the Monolith Vessel is not only a major step forward for ESS, but also demonstrates the strength of the collaboration between the facility and its partners in Spain.

"Spain's membership in ESS, the world's most powerful neutron source, is fundamental for our country as a science nation, especially benefitting Spanish researchers and industrial suppliers," said Mario Pérez, ESS Bilbao Executive Director. "The shipment of the Monolith Vessel marks a major milestone in the ESS project. I am very proud of the teams at ESS Bilbao and ESS, and wish to thank our industrial partners AVS for the engineering and Cadinox for the manufacturing."

A record-breaking digital meeting

In September, a user meeting co-hosted by ESS and Grenoble-based Institut Laue-Langevin (ILL) attracted a record number of neutron scientists from around the world. This meeting usually takes place physically but under the circumstances this was impossible.

More than 770 scientists met online to discuss neutron research and share news of progress and developments in what was the year's biggest gathering in this field. As a comparison, the previous conference in 2018, which was a physical meeting, attracted 500 participants, demonstrating there is a growing interest and that online conferences makes it easier for people to attend. The User Meeting was available to watch as a live stream, and the participants discussed everything from potential developments in new smart materials to more sustainable energy and transport solutions.

ILL has been leading the field of neutron research for more than 50 years, and the collaboration between ILL and ESS will help advance the science even further. ILL hosted the first user meeting in 2018, and this time it was set to be at ESS until the pandemic led to a change of plans. The change did not do anything to dampen the enthusiasm though, nor did it prevent valuable knowledge and insights from being shared.

"The joint ESS-ILL User meeting is a unique opportunity to interact with the European neutron user community before ESS starts operation," said Andreas Schreyer, Director for Science at ESS. "We are building ESS with the scientists – for the scientists, enabling European users to maintain their leading position in neutron research."

Operations warming up

In October, ESS received the permit for trial operations of the Normal Conducting Linac from the Swedish Radiation Safety Authority (SSM). The permit marks a major milestone and means the warm part of the accelerator may be commissioned.

SSM supervises activities across a wide range of research areas, and has previously granted two permits to ESS – one in 2014 to build the facility, and one in 2017 for the installation of equipment that can generate ionising radiation. This third permit is yet another step towards full operations, and more will be required before First Science.

The NCL makes up the first 50 metres of the 600-metre-long accelerator, and trial operations are essential. During the commissioning a temporary concrete wall will ensure that installation works can continue elsewhere in the tunnel while this warm part is in testing.

First staff move into the new laboratory buildings

Following the handover of one of the laboratory buildings from Skanska, the construction partner to ESS, the ESS Sample and User Laboratory Facilities team, led by Monika Hartl, and other members of the ESS Scientific Activities Division moved from their current site offices to these new lab workspaces.

The new lab buildings contain chemical laboratories and technical workshops, and the team moved in to better be able to oversee and support installations. The team was instrumental in the design of the two lab buildings, and now it is possible for them to remain close to the project as it develops.

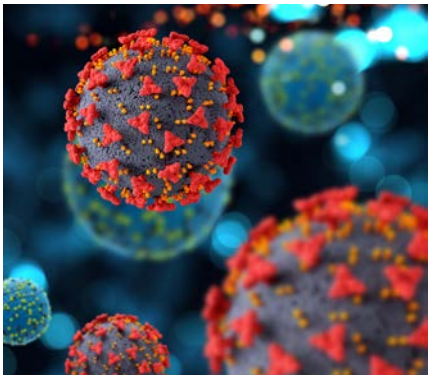
These laboratories will host work done by the Scientific Activities Division (SAD), which in turn is responsible for the Science Support Systems. SAD will play a vital role in the research carried out by ESS by ensuring optimal samples are provided for the experiments, as well as making sure that these samples are being handled and stored in the right way.

ESS joins consortium to combat pandemics

A consortium of private and public organisations has come together with the aim of building and utilising a platform for rapid response to current and future health threats. ESS joined this consortium, of which MAX IV is also a part, and it is hoped that the combined expertise, experience and technical capabilities will result in accelerated drug discovery.

The project team was put together by Dr. Wolfgang Knecht, Manager of LP3, the Protein Production Platform at Lund University. “I realised that Lund, due to the strong presence of academic and industrial infrastructure, has all the components for executing rapid drug discovery, and I am thrilled that we assembled such a strong public-private partnership in such a short time.”

Dr. Zoë Fisher, Group Leader for the Deuteration and Macromolecular Crystallisation platform at ESS, adds, “It is great to see what the large-scale infrastructures ESS and MAX IV in Lund can achieve to tackle real world hazards. With this collaboration we are in an excellent position to respond rapidly to the current pandemic and future threats.”



Taking neutron research to the next level

Photo: Mats Hulander

Faster memory devices for computers, more efficient batteries and superconducting quantum computing are some of the developments Yasmine Sassa, assistant professor at the Department of Physics at Chalmers University of Technology sees as possible outcomes from future research at ESS. She foresees a new era in neutron-based science and that ESS will be a catalyst for development in a wide range of applications.

Yasmine Sassa has specialised in researching so-called quantum materials, a class of compounds exhibiting unexpected exotic properties, which cannot be described with semiclassical approaches or low-level quantum mechanics. One of the most known example of quantum materials is high-temperature superconductors. After more than 30 years, the mechanism behind superconductivity is still unsettled and still fascinate researchers all over the world. Recently, a new era of quantum materials has attracted enormous attention such as topological insulators or quantum spin liquids among many other exceptional phenomena. Quantum materials have the potential to revolutionise areas ranging from ICT and electronics/spintronics to energy and transportation. Superfast computers, lossless energy transmission in power grids and better solar panels are a few examples of how quantum materials could be used in the future.

Long experience from working with large-scale facilities

"I have done a lot of research on magnetism in quantum materials and specifically on superconductivity. My science relies heavily on large-scale facilities since I use neutrons, X-rays and muons to study these materials," Yasmine Sassa says. "With ESS it will be possible to investigate these materials with much better precision since the energy resolution and neutron flux will be much higher than in existing facilities.

Thanks to the possibility to operate with tuneable pulsed beams, ESS will also make it possible to study dynamic processes over time."

The high neutron flux will make it possible to study smaller samples. Since new, exotic materials often only are available in very small amounts, ESS will make it possible to perform neutron research on them at an early stage.

Yasmine Sassa points out that being next door to MAX IV will be another benefit with ESS. Working at both these facilities will allow researchers to get a more complete understanding of quantum materials and the way they work. Neutron scattering at ESS will be used for investigating the magnetic properties, whereas X-rays will be used for parallel studies of the electronic properties. It will also be easy to transfer material samples between the two sites.

"The combination of ESS and MAX IV will strongly benefit the research I conduct in my group. We will get a fuller picture and grow our knowledge of quantum materials. More importantly, It will make Sweden more visible and attractive as a place for high impact science. We have seen this in other areas of the world where both neutron and synchrotron facilities are placed close to each other," she says.

BIFROST

The 15 instruments that will be available at ESS will be tailored for different types of research. Yasmine Sassa is taking part in the development of one of them, BIFROST, an instrument design that is specifically suitable for the investigation of quantum materials. Through collaborative work between the Chalmers X-ray and Neutron Initiative, Paul Scherrer Institute (PSI-Switzerland), Royal Institute of Technology (KTH), and ESS, a novel and unique uniaxial strain device is being developed for the BIFROST instrument. This will permit the Swedish and international scientific community to realize distinctive experiments as soon as ESS will be in operation.

"With BIFROST we will be able to investigate the fundamental properties of quantum materials under extreme conditions such as high pressures, ultralow temperatures and strong magnetic fields. This instrument has a revolutionary multiplexing technology (CAMEA) that will facilitate and speed up our research greatly," Yasmine Sassa explains. "We will get an opportunity to study physics that has been inaccessible until now and be able to perform early science on new materials that are only available in very small amounts."

Eager to get started

Just as many other scientists around the world, Yasmine Sassa is keen to get started doing research at ESS.

"Everyone in the neutron research community is impatient to get started with the experiments at ESS," she says. "The number of facilities in the world is limited and several of them are either shutting down soon or already have. There is a need for new capacity, where ESS will clearly be the world-leading neutron source based on state-of-the-art technology that is brighter, safer and more efficient than anything that we have ever seen before. I think ESS will be overbooked for a long time and that it will be challenging to get beamtime. However, this is how it is at all large-scale research infrastructures, only the best and most important projects will be awarded beamtime."

ESS will also be a place for companies from various industries to collaborate with academic researchers. Yasmine Sassa sees these types of partnerships as essential for the development of new products.

"I think it is important to promote the possibilities offered at facilities such as ESS and MAX IV to companies and offer them the help they need to get started. Toyota is a good example of a company that has been involved in research at several facilities around the world. They have been using both X-ray and neutron science to study and improve their batteries," Yasmine Sassa says.

"There are many practical applications for quantum materials. Once we get a better understanding of how they work on a fundamental level we can start developing devices and products based on them. In my own research, I am studying so-called skyrmions, that are nanometer-size objects with non-trivial spin structures that can be moved using low-current density. These properties make skyrmions ideal candidates for achieving high storage density, high data transfer rates, and low (more sustainable) power consumption. Such compounds could therefore lead a completely new generation of spintronics/quantum devices. Maybe we will see such devices implemented in our everyday technology in one or two decades," Yasmine Sassa concludes.

Solving the unknown is built right into ESS

Ultimately, ESS will be built to help scientists discover the unknown – to see the unseeable and answer questions we won't even think of in our lifetimes. Yet even in how it's being built, ESS is working with the unprecedented. From technological puzzles to global pandemics, these are challenges that the people of ESS and our partners handle on a daily basis. Here, the spirit of solving the unknown is built right in.

Progress in parallel

"Looking back, it's remarkable how the workforce stayed on focus in 2020," says Mark Anthony, Project Director for ESS. "They had unforeseen challenges, and they stepped up. When you get into the habit of problem solving, you establish a momentum. The more you do, it just flows. We have that momentum."

"Our organisation demonstrated that it's a remarkably resilient organisation," agrees Kevin Jones, Technical Director for ESS. "We learned how adaptable we really are – as an organisation, a community, and a business entity. It's an enormous credit to everyone who works here."

Making visible progress

The ESS project made significant progress during 2020, despite severe disruptions by Covid-19 and other challenges. With civil construction wrapping up and installation, testing and commissioning work ongoing in all areas, it was easy to see the difference between a site photo from January to December.

"It's no longer work that's down a tunnel, behind a wall, where nobody can see it," explains Anthony. "Now you can see the progress. And a picture only does it so much justice. When you're standing in the instrument hall and look up to see a 50-metre-long overhead crane that's part of the facility now, tested, commissioned and being fully utilised to install equipment, there's satisfaction in that."

Progress could even be felt in what was absent – in empty skies and silent streets. In 2020, the last of the construction tower cranes came down, which had been visible against the sky for miles. Civil construction also poured the last cubic metre of concrete, meaning no more concrete trucks rumbling down the roads.

Sharing the vision

Seeing momentous milestones in 2020 gave a new vision of ESS as a finished whole. According to Jones, "By the end of the year, you could see the physical reality coming together into the way it was envisioned."

"The most exciting personal moment for me," he continues, "was seeing the monolith vessel arrive. It had been shipped from Spain by sea, arrived in Sweden and put on a truck. Bright and early, before sunrise, the truck arrived and it was just great watching it back into the building, peel off all the protective layers and see this beautiful piece of stainless steel lifted up and put in place."

In a time when lockdowns, travel restrictions, and social distancing meant many people couldn't be on site to experience the progress personally, added priority was put on digital inclusion. Throughout 2020, ESS incorporated video walkdowns where managers onsite gave video tours and updates.

"You can't watch the movie from outside the theatre," explains Anthony, "so communication was essential. To show the folks who are sitting at their kitchen table how the analysis, calculation, design or licensing they were doing was connected to what was progressing in the field was important."

"We never lost the sense of why we're here"

KEVIN JONES
TECHNICAL DIRECTOR, ESS

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Creating advantages from disruptions

The ability to execute work was limited to an extensive degree by the Covid restrictions. ESS in-kind partners faced significant challenges. Many countries had shutdowns, lockdowns, travel restrictions and quarantines that delayed both supply chain and onsite work. The combination of those things, along with technical challenges, caused significant delays in plans for installing, testing and commissioning the accelerator, for example. Overall, the impact of 2020 to the project schedule was almost a full year.

"There's a lot of anxiety out there about when can we say with certainty that certain things will happen," says Anthony. "The situation is that there's still a pandemic. We're hoping, along with others, that after summer things will become more predictable. Right now, there are still too many variables at play and out of our control."

"Yet, we were able to advance some on-site work without having to install equipment that was delayed because our in-kind partners had work closures in their home regions," says Jones. "like putting in cable trays, RF wave guides, pulling cables and beginning the termination of those cables. We got a little further ahead with those items. That's one advantage that we actually realised."

"I also give credit to the civil contractors, led by Skanska," adds Anthony. "They overcame challenges of getting workers on site due to travel restrictions. As a result, I can sit here today and say that our civil contractor plans on demobilising and exiting at the end of 2021, which is really an accomplishment."

Seeing past today's circumstances

Building ESS is a complex and challenging endeavour even under the best of circumstances. We continually develop new and unique components and capabilities as part of the project. Impacts arising from both the pandemic and technical challenges during one of the most intensive phases in the project makes it even more challenging and as we enter the final parts of the project we anticipate delays and cost increases related to these impacts.

Given the unprecedented disruptions of 2020, the progress still made at ESS was heartening. And at the heart of it all were the people who made it happen. That is why keeping them safe was a priority, both for the immediate individuals and for the long-term function of the facility. In spite of schedule pressures, people did their work safely and ESS had an excellent record for 2020.

Along with being good stewards of people in terms of physical care, uplifting a sense of purpose and motivation was a big challenge with people off-site. Yet ESS is filled with people willing to adapt because they believe in advancing science so future generations can thrive.

"The important thing is that we never lost the sense of why we're here," says Jones. "Even though how we had to work changed, you could always see a spirit of creativity and dedication. Because we know that when it's ready, we will make a difference."

"Folks were faced with some disappointments when they had to re-work plans," shares Anthony, "but they didn't skip a beat. We did our best to pivot and move forward. That's also ingrained in the scientific community – to question, adapt, push boundaries. It's what the machine is capable of doing. No neutron source has this power level or capability to enable research that answers the unknowns. Knowing that we're part of building that is what's behind all the progress you see here after 2020.

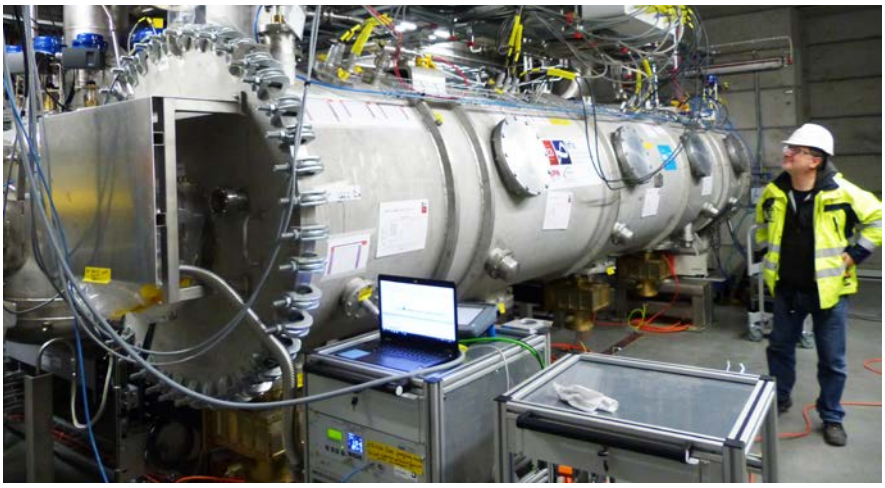
Top highlights of 2020

1 In October, the Monolith vessel arrived on site from Spain. The Monolith vessel will house the rotating target wheel which contains 7,000 tungsten blocks, from which the neutrons are released in the spallation process.

2 Our accelerator cryoplant was accepted, tested, and commissioned. This gives the capability to distribute the liquid helium, cool down all the cryogenic parts of the accelerator once they're installed, and do the commissioning activities of the machine.

3 We completed assembly of the first drift tube linac tank 1, provided by our in-kind colleagues in Italy. With this, we are actually seeing pieces of the accelerator coming together and function as we expect them to, under test conditions.

Creating outer space conditions



To ensure a trouble-free installation of the cryomodules in the accelerator tunnel, a prototype has been built in order to test all the systems and control logic around the cryomodules.

"Every module and component that will be used in the tunnel needs to be thoroughly tested," says Philipp Arnold, Head of ESS Cryogenics Section. "Using the prototype, we will test and debug our processes and programmes before the first cryomodule arrives later this spring. Thereafter we will receive one cryomodule per month and by then everything has to work smoothly."

During 2020 the cavities of the ESS cryomodule prototype were cooled down for the very first time. Using helium, temperatures reached as low as 2 Kelvin, or -271 °C, which is as cold as outer space. The test was carried out in two stages, with the first stage focusing on bringing the thermal shields of the cryomodule and cryogenic distribution system down to around 40 Kelvin and establishing stability.

"The ESS Superconducting Radio Frequency (SRF) team, which includes technical specialists from the IFJ Pan Krakow Institute in Poland, proceeded to monitor and analyse the temperature data," adds Arnold. "When it was confirmed all was stable, we proceeded to cool down the second circuit – the more delicate 4K circuit, to reach a stable pressure and a stable temperature. The second circuit cools to 2 K (-271 °C), which will be the operating temperature for the radio frequency (RF) cavities."

The cooling of the prototype was a success and an important step in the ramp-up of the activities in the accelerator tunnel.

ESS engaged in COVID-19 related research

The Deuteration & Macromolecular Crystallisation (DEMAX) platform is an essential part of ESS, and has already been accepting proposals and providing deuterated materials for researchers around the world.

As the COVID-19 pandemic took hold, DEMAX offered prioritised access to its laboratory services for those looking to carry out research related to the virus. As a result, a research project on viral proteins was accepted and the scientists involved subsequently solved one of the proteins, Nsp10, with help of the DEMAX instrument at ESS and the BioMAX beamline at MAX IV.

Developing efficient medical treatments relies upon finding ways to stop the virus from replicating its genomic material. There are a total of 16 non-structural proteins that play important roles in the viral replication and transcription of the coronavirus, so solving one of these is a significant step in the right direction.

The ultimate goal of this research project is to obtain high resolution crystal structures of all relevant proteins, which in turn will enable the discovery of inhibitors which will disrupt activity.

Drawing a new roadmap for the highway to science

How do you draw a map to a place no one's seen while the entire landscape shifts around you? With patience, perseverance, and a lot of adaptability. In paving the way to science, teams across all of ESS needed to redraw much of the map in 2020. The result is an even more experienced and agile organisation.

"Looking at what the organisation achieved in 2020, I'm impressed," says Agneta Nestenborg, Director Project Support and Administration (PS&A) for ESS. "It's been an all-time high in many areas. Just looking at PS&A, we had more procurements than ever – almost 6,000. We handled new HR legislations, Brexit and Covid-19 on top of everything. We really managed in a fantastic way."

"What makes me most proud, personally," shares Ralf Trant, Associate Director for Environment, Safety, Health & Quality (ESH&Q) at ESS, "is the way we adapted to the Covid situation and made progress. It shows the organisation's flexibility with working from home yet keeping good team spirit. That's an amazing thing."

Year of consolidation

For PS&A, drawing a new roadmap was already a goal headed into 2020, with a purpose to consolidate administration infrastructure, processes and systems in order to support the organisation to achieve First Science. "This was a year to reflect backwards and forwards," explains Nestenborg. "To see where we are, where the organisation expects us to be when we move into operations, and how to close that gap and prioritise."

The process involved interviewing the whole organisation, then dividing the input into four themes, culminating in a new "Highway to Science Roadmap." In 2021, the organisation will be able to use this as a tool to help reprioritise and to understand how things affect other parts of the organisation – truly invaluable now as smart reprioritization and adaptability are more important than ever.

Caring for people on site and at home

Even while drawing a new Highway to Science Roadmap, the organisation had to take detours in everyday operations due to Covid-19. Office support, for example, needed to spend more resources on hand sanitiser stations, cleaning, reshuffling desks, and putting up signs. IT developed a new remote VPN and deployed video conferencing systems. Logistics transported office chairs and screens to people's homes. Just to name a few.

"There were many things we've never dealt with before that we had to think about," says Trant. "Workplace risk assessments, for example. Our team are experts in such assessments, but we had to learn to adapt this to something else. For example, together with HR, we needed to look into the psychosocial impact of social distancing. We learned to more consciously care about our colleagues and what we could do to keep up the team spirit with people working in isolation."

With regards to physical safety, ESS had an excellent year with very few or zero working days lost due to accidents at work. We also saw an increase in individual, proactive risk observations, which help make the work environment safer for everyone. As Trant explains, "Our top priority is to ensure that people leave the workplace in the same good shape as they arrived to go back to their family, walk the dog, and enjoy.

"This was a year to reflect backwards and forwards"

AGNETA NESTENBORG
DIRECTOR FOR PROJECT SUPPORT AND ADMINISTRATION, ESS

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CLICK TO START VIDEO

Thinking ahead for information security

Next to people, information security is high priority. Last year saw the successful launch of a project for improved identity and access management. This takes a long-term perspective, beyond the current work-from-home situation, to First Science and the user program when ESS will have thousands of people both on site and accessing data remotely every year.

"People will come only for a couple of days to make their science," says Trant. "They need to prepare in advance, work efficiently on site, and access their data for research once they're done. We will support and help them by making information both secure and easy to use."

Becoming more real

As we look forward to science at ESS, 2020 brought a palpable shift in project focus. In particular, the work which is happening via in-kind partners across Europe felt more tangible. "In-kind partners are here in Lund now," shares Nesteborg. "They're doing installation. Stuff is coming. It's a big change, because now we're not talking about in-kind as something theoretical. It is happening. Arriving now are the high-tech components that will make ESS the world-leading facility we want it to be.

Yet perhaps the most exciting feeling of "realness" for the ESS organisation in 2020 was the completion of the Campus. After years of temporary offices and then social distancing, the idea of returning to the modern Campus purpose-built for collaboration felt like a gift.

"Everyone is energised by the idea," says Nestenborg. "It doesn't matter if you are here for the grand opening or if you think 'I will be there after summer,' because it still gives you energy. It is built to be a meeting place. I think that's a trademark of research – that you need to meet and exchange ideas to become creative. We are not finished building our culture yet, and this will be an amazing tool to do that. The vision for the project is "The Place To Be" and we think it has a good chance of becoming exactly that. Right now, we all definitely feel it's the place to be."

"Ensure that people leave in the same good shape as they arrived"

RALF TRANT
ASSOCIATE DIRECTOR FOR ENVIRONMENT, SAFETY, HEALTH & QUALITY, ESS

Top highlights of 2020

Project Support and Administration

1 The adaptability of our people in the face of Covid is a remarkable achievement. With the normal baseline of work still to do, they delivered while learning to serve the organisation in a new way under new circumstances. From IT video solutions and Logistics driving across southern Sweden with office chairs and screens so people could work from home, to the Office Support Group rising to the challenge of revamping both our temporary offices and our new Campus to be sanitised and socially distanced, every person in PS&A rose to the challenge.

2 With a goal to consolidate administration infrastructure, processes and systems in order to support the organisation to achieve First Science, we completed a year-long project to create the new "Highway to Science Roadmap."

3 Completion of our Campus is a huge milestone, and in preparation for its opening, we completed a project plan for the move. With Covid-19, much of the plan had to be revised – from adding hand sanitiser stations to a staggered move-in and occupancy.

Environment, Safety, Health and Quality

1 ESS acted quickly in 2020 to set up Corona Task Force, coordinating with host states and regional authorities for recommendations and actions. ESH&Q teams shifted to do new risk assessments and coordinate with HR to understand the psychosocial impact – prioritizing workplace safety while also ensuring right quality in the installation work. With travel restrictions and delays across Europe, the challenges were huge. Yet our people learned to be adaptable and proactive with great success.

2 Our team coordinated the licensing efforts for trial operation of the Normal Conducting Linac and we received the permit last year. This was a major milestone for the whole organisation in preparing to start the operation in 2021.

3 We launched our new learning management system, which is a software tool enabling much more efficient training. Achieving this milestone in 2020 had additional importance as we had to launch a mandatory Covid training, which we did very successfully.

Accelerating industrial evolution

There are many challenges facing various industries today as it becomes more important than ever to operate in a more efficient, sustainable and profitable way. Likewise, there are many global, societal challenges we need to solve to make future generations thrive. Through collaboration between science and industry we can make this happen. With the world's most powerful neutron source, advanced instruments and expert support, ESS will enable breakthroughs in science that will pave the way for significant, positive developments across a wide range of industries.

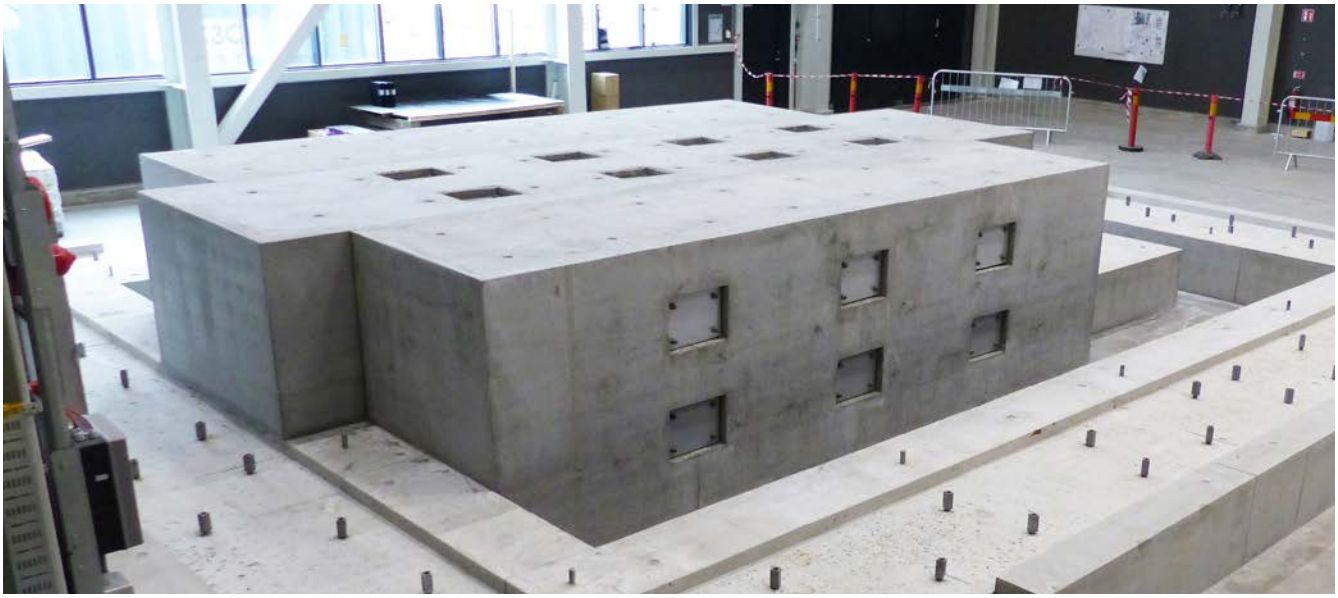
The true value of research carried out at ESS will only become apparent in the coming years, but it's already clear that the potential for a variety of industries is enormous. In collaboration with senior business leaders, ESS has identified four key areas where future research is likely to make an impact, but there are many more.

The material world

Deeper understanding of materials can lead to a whole host of changes and developments. The more we know, the more we can improve and innovate. New and better materials can bring dramatic improvements in cost, sustainability, safety and longevity.

The technology available at ESS will allow researchers to explore materials on a much deeper level than ever before, and investigate compositions, micro-structures and how stresses can impact surfaces. It will also be possible to get more detailed insights into real components and understand why they behave in certain ways and how they can be improved.

The research and development of more advanced materials has the potential to change the world for the better in terms of sustainability and safety, but it can also help businesses improve profit margins and reduce manufacturing costs. If the right research is done, and the right



actions are taken, ESS will have a significant and lasting impact on materials and material development.

Transforming the energy industry

Finding more sustainable and environmentally friendly ways to power our lives is essential, and becomes more of a priority with each passing day. Neutron research has the potential to help us discover new ways of making energy more sustainable, and ESS can accelerate that process with its advanced technology and capabilities.

It should be possible to make energy conversion more efficient, which means sustainable sources become more viable while existing sources can do more with less. Batteries could also be made smaller, more powerful and quicker to charge. This could revolutionise their use in a range of applications, including electric vehicles.

Research could also lead to the discovery and further development of alternative sustainable energy sources. Hydrogen-powered fuel cells, for instance, are in their relative infancy, but ESS could help accelerate our understanding of how they work and, crucially, how they can be improved.

ESS can even facilitate the study of lithium ions in operandi, which in turn could lead to improved energy density and more charging cycles per battery. The right research will be able to transform the way energy is supplied all over the world.

Big developments in data processing

Computer technology has developed at an explosive pace over the last decades. Research facilitated by ESS has the potential to increase the speed of this development even further, not only in terms of higher performance but also lower cost for high-capacity computing.

New superconductors, for example, would likely lead to more powerful computers with better efficiency, while advances in storage could make mountains of data immediately accessible. Then there will also likely be

quality-of-life improvements like sharper, more robust screens and lighter materials to improve portability.

These improvements to computing power and performance could change a number of things for the better, from making data centres more energy efficient to helping developers find the performance they need to be able to offer unique digital solutions.

Health and well-being

As ESS can help researchers explore down to the molecular level, it will be possible to see how drugs react with proteins, and how these structures can be altered and changed. This will have a huge impact on drug development and drug delivery systems, and could lead to life-changing solutions for millions.

Functional food is also an increasingly important research area, where ESS will help researchers gain new insights into how to use food as a delivery system. However, the neutron techniques will also help researchers understand many other areas in the food sector, such as how to preserve food longer, understand emulations and why certain foods change viscosity when shaken.

The research could also allow scientists to ensure better interaction between the human body and prosthetics or pacemakers, helping minimize risk and secure higher success rates for various medical procedures.

These developments will likely change the medical and pharmaceutical industries, and in turn this will have a positive impact on everyone who may need any of the treatments that have been improved through research carried out at ESS.

Limitless potential

These are just a few industries that will benefit from ESS and its research outputs, but the deeper understanding of our world afforded by the technology on site in Lund will likely lead to developments beyond the boundaries of what we can imagine at this moment in time. The use of neutrons, the fields studied and the depths of research are ever growing.

Keeping a straight course during a turbulent year

"I think the word that best sums up 2020 is agility", says Sharon Cosgrove, Associate Director for Strategy at ESS. "During the pandemic, everybody at ESS had to demonstrate agility, constantly adapting to new circumstances while not losing sight of our end goals."

Sharon Cosgrove is responsible for the Strategy Directorate at ESS, that coordinates the work of a range of stakeholders, projects and committees with participants across Europe. Her teams include the Governance Office, Host State Relations, In Kind Management, External Relations and EU Grants, plus Industry and Innovation.

"As you can imagine, working with external stakeholders has not been straightforward this year. We adapted most work to fit the new situation, but with all meetings moving online, there was a real risk that people would develop 'Zoom fatigue'. So, our ambition was to retain interest and engagement, and we had a lot of success with virtual coffee breaks, site visits and breakouts using interactive software to visualise participant feedback. We even held remote Conference tapas evenings to encourage contributors to stay online and chat" says Sharon. "Our External Relations and EU Grants team led the way on this and we were flattered that many international facilities copied our lead!"

"Working remotely certainly increased our workload", Sharon noted, "with a 25% increase in our Governance meetings alone." However, for a team with a high workload it also provided some welcome flexibility to strike a balance between work and personal life. "Despite the challenges, we kept healthy while working at a good pace and delivering to all our stakeholders," says Sharon Cosgrove.

The team are rightly proud of its achievements – simplifying ESS' governance documentation, positioning ESS in Horizon Europe, developing a Public Engagement Strategy and delivering the UK's assurance reviews to unlock 81 MEUR of contributions. The team also published many firsts including a Technology Innovation Catalogue, our first patent and our first Socioeconomic Impact Report (see page 36). In addition, the team identified how to resolve the In-Kind VAT challenge, finalized 95% of Technical Annexes and concluded negotiations for all Collaboration Agreements with partner countries.

With the In-Kind contractual work largely complete, Sharon supported the consolidation of In-Kind activities under the management of Dimitri Argyriou, Associate Director In-Kind to focus on timely and high-quality In-Kind deliveries. This transition was in the best interests of the ESS project and allows Strategy to on focus on its core business and support the transition to Initial Operations.

Despite the success delivered in 2020, Sharon and team are eager for working life to return to some semblance of normality. "Staff and partners have adapted well to the new situation, demonstrating the strength of the ESS partnership", Sharon observes, "however, we are now really looking forward to getting back together."

"Despite the challenges, we kept healthy while working at a good pace and delivering to all our stakeholders"

SHARON COSGROVE
ASSOCIATE DIRECTOR
FOR STRATEGY, ESS

Business as unusual

Building a world-class research facility is quite tricky as it is. It is even trickier to do during a pandemic with travel bans, colleagues not allowed to leave their homes, delivery problems, half the staff working from home and a myriad of restrictions to stop the spread of the infection. In March 2020, as many parts of the world were put under lockdown, the ESS management team quickly decided that it would do everything to keep the project going and always with safety as the top priority. With passion and creativity, the whole ESS team found solutions to the new challenges and relentlessly carried on its work.

Early 2020, the planning for all major activities at ESS during the coming year was completed and things were moving on smoothly. Then came Covid 19. Martin Sjöstrand, Head of Communications at ESS remembers how everything changed in March.

"We quickly realised this would be a year like no other. And we also realised that communication will be more important than ever," he says. "From a communication perspective, the pandemic became a catalyst for change and accelerated the transition to a more digital way of communicating."

Going digital

The communication at ESS was already moving in a more digital, dialogue centred direction. The pandemic increased the speed of this transition dramatically. Before, regular so-called town meetings with all staff at ESS was a standing arrangement. With roughly 500 attendees, the communication at these meetings had its limitations.

"Instead of these mass meetings we started streaming content via our intranet instead. This could be interviews and updates from management, for example weekly reports from our General Director on the progress of the ESS project," Martin Sjöstrand explains. "The communication became more continuous, updates more regular."

With roughly half the staff working from home, the IT department did a fantastic job quickly ensuring the required IT infrastructure and all the video conference software licenses were in place. People soon found new ways to communicate, digitally, to keep the project running. Among the creative solutions was an inspection by the Swedish Radiation Safety Authority performed remotely by walking around and filming the site with a mobile phone under the direction of the authority officials.

Another example was the ESS ILL User Meeting that was scheduled to take place in Lund in September 2020. Instead of cancelling the meeting, it was held digitally and attracted around 700 participants, which was 200 more than the previous time.

New types of communication

"At the same time as we were exploring new ways to communicate digitally, we also had to increase our physical communication on the site," Martin Sjöstrand continues. "It involved making safety instructions that could be posted around the site, various signs, posters, restriction guides, etc. This meant a new type of internal communication had to be developed and our colleagues really rose to the challenge."

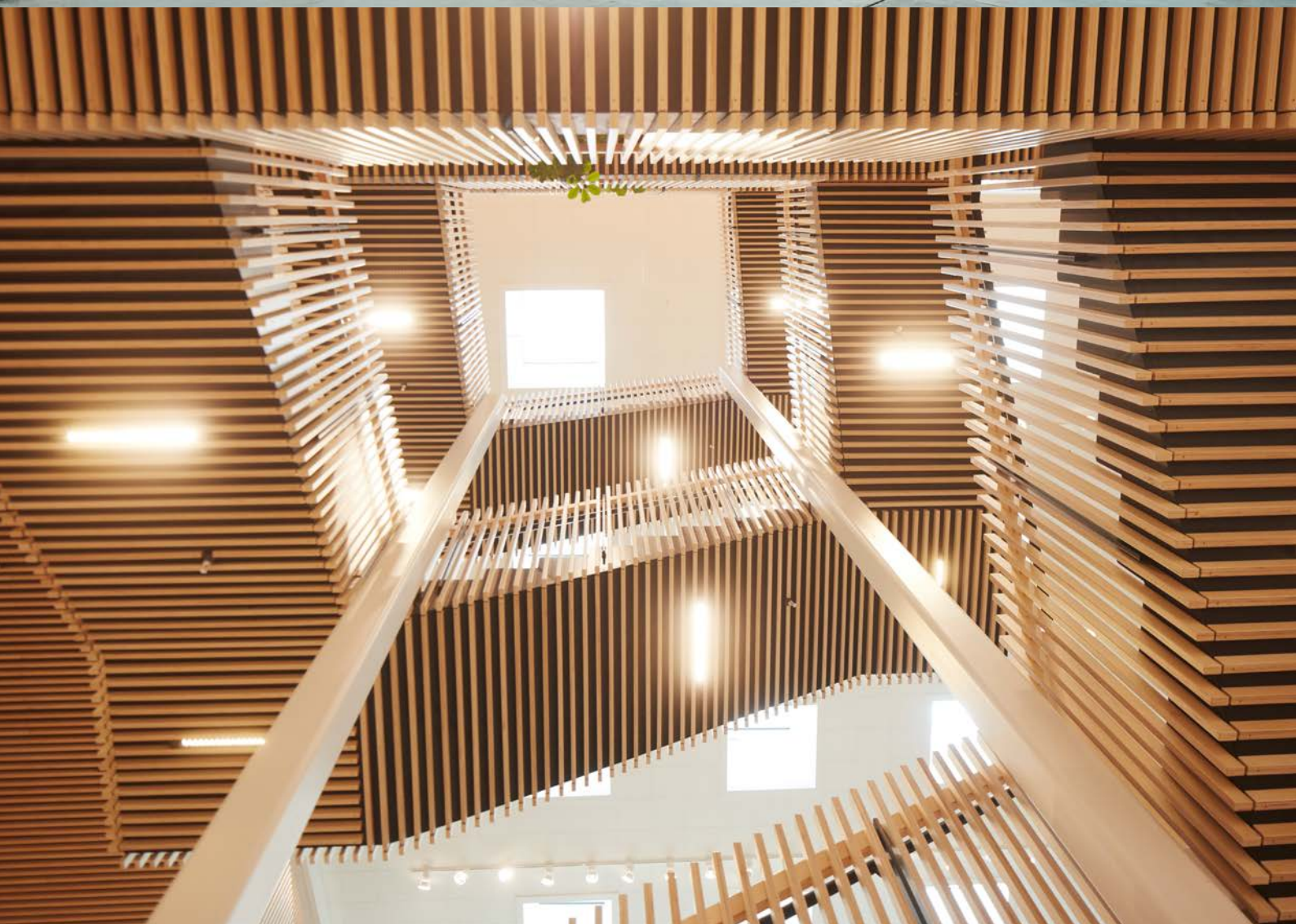
ESS also noticed a large interest from its partners and the media wondering how the pandemic affected the ESS project. Many were amazed that the ESS project was still in progress since research facilities in many other countries had been shut down due to lockdowns.

A year that will be remembered

"2020 was a terrible year in many ways, but from a strict communications perspective, it was also an interesting year. It has been a year of trial-and-error. We have tested new ways of working, evaluated and adjusted them. Of course, we have suffered from delays and increased costs, but we have been moving forwards every day," says Martin Sjöstrand. "Everybody working at ESS have had an admirable getting-things-done attitude despite all the limitations. It has been fantastic to feel the positive energy and see how people have stepped up to the challenges, even during these trying times. It makes me really proud to be a part of the ESS team," Marin Sjöstrand concludes.


EUROPEAN
SPALLATION
SOURCE
Hot drinks


THE
KITCHEN
CLUB



Building for the future

With First Science on the horizon, final work and preparations are underway across all departments of ESS, from the instruments to the infrastructure. One essential component of the facility is the ESS Campus, where employees, visitors and researchers will gather and collaborate in the search for knowledge which will improve the world. The construction was completed during 2020, and officially handed over to ESS.

With the global pandemic taking hold, 2020 was a challenging year for everybody. There wasn't a project, let alone a person, that was immune from the impact of Covid-19, and the ESS Campus was no different. The ESS Campus project started back in 2015 and most of the construction work took place in 2019 and 2020. Meeting the challenges caused by the pandemic required a unique approach.

"2020 was a very busy year," explains Linda Björk, Group Leader Office Support for ESS. "We had to be really flexible, and always think about safety while also working as fast as we could to get everything done on schedule."

"We were worried about how the pandemic would affect us, of course," adds Karin Svedin, Senior Design Engineer for ESS, "but we're really grateful for the year we had. We managed to meet all of our targets, and we enjoyed fantastic teamwork throughout. The challenging circumstances only made this teamwork more effective."

The teamwork and determination paid off, as the ESS Campus was officially handed over to ESS early in 2021. It's a result of extensive collaboration, innovation and the vision to create a space which is more than an office, and more than a communal area. It's a multi-faceted and multifunctional meeting point which has been carefully designed to be a great place to work, while contributing to the sustainability of ESS. Simply put, it's the place to be.

A carefully considered campus

"We had a number of core values and goals in the early design stages," says Therése Welander, Head of Strategic Projects and ESS Stakeholder for the Campus project at ESS. "We carried out an exercise with the whole organisation to get a full picture of people's requirements, use cases and expectations for a campus like this. Collaboration was one of the key words in this process. We also saw that flow and flexibility were very important."

It's clear now that this early feedback helped to form the ESS Campus as it is today. The atrium is a bright, modern open space where people can gather, and where presentations can be held. The 'Iceberg' is a centrepiece of audio-visual innovation, where presentations and films can be shown and seen from a range of different places. There are a variety of workspaces to cater for every mood and every work habit, and everything has been decorated to help give a sense of home comfort to anyone who may visit.

"Our guiding star was designing the place to be," says Welander. "Attractiveness was essential, as people should want to be here."

"We want people to feel good," adds Björk, "and to feel like they belong. That's when people work at their best."

Facilities fit for purpose

In addition to the well-designed shared spaces, meeting rooms and workspaces, it was also essential for the team to provide the best possible facilities for needs beyond neutron research.

Karin Svedin , Senior Design Engineer for ESS, and Therése Welander, Head of Strategic Projects and ESS Stakeholder for the Campus project at ESS.

"We tried to think of everything, and for the reasons why we were making each choice," says Björk. "So we put curtains in meeting rooms, but based the decision not only on light factors, but on how they impact sound and atmosphere. We looked at everything like this, right down to the coat hangers. However, one of the bigger decisions was choosing the right partner for food. We want our guests to have everything they need, including healthy, energy-giving food that's not too expensive and preferably local. I think we found that in the partner we have."

"That's right," adds Welander. "We believe there's real added value in offering a restaurant with good food and a nice atmosphere where you can meet people and talk in comfort. We already have the best instruments and technology, but the ESS Campus can address the other needs for when the mind needs something else."

Sustainability in mind

In addition to the aesthetic considerations, sustainability was at the centre of many decisions made in the Campus project. ESS was committed to achieving BREEAM certification with the ESS Campus. BREEAM is one of the leading internationally recognised environmental assessment method for buildings, and although meeting the standards is a challenge, it's also a worthwhile endeavour.

"We thought about sustainability all the way through," says Svedin. "It was really important to analyse what we were doing at every step, from planning to building. It was a tough journey, as we looked to comply with BREEAM, but it was important. We had to think about what materials we were using, where they were coming from, and how we would be powering the ESS Campus. All involved big decisions, but they have paid off as we achieved certification and a score to be proud of."

Part of the heat generated during the operation of the neutron beams will be used for heating the ESS Campus building, limiting wasted energy and optimising power consumption. Then there's the furniture, some of which is completely new but others which are recycled or repurposed from the temporary offices.

"We hope people see that we've thought about the environment with the decisions we've made," adds Svedin.

"People will likely notice that some of the furniture is used," Björk explains, "and that's a good thing. We wanted to reuse what we could, and make every buying decision wisely. In some cases, we kept the table legs but had a new table top made to better fit the dimensions of a room."

Green spaces and the plaza outside also contribute to the positive feeling of the ESS Campus, and to the sense that it is a building and area which is designed from the ground up to be considerate to the environment as well as the visitors.

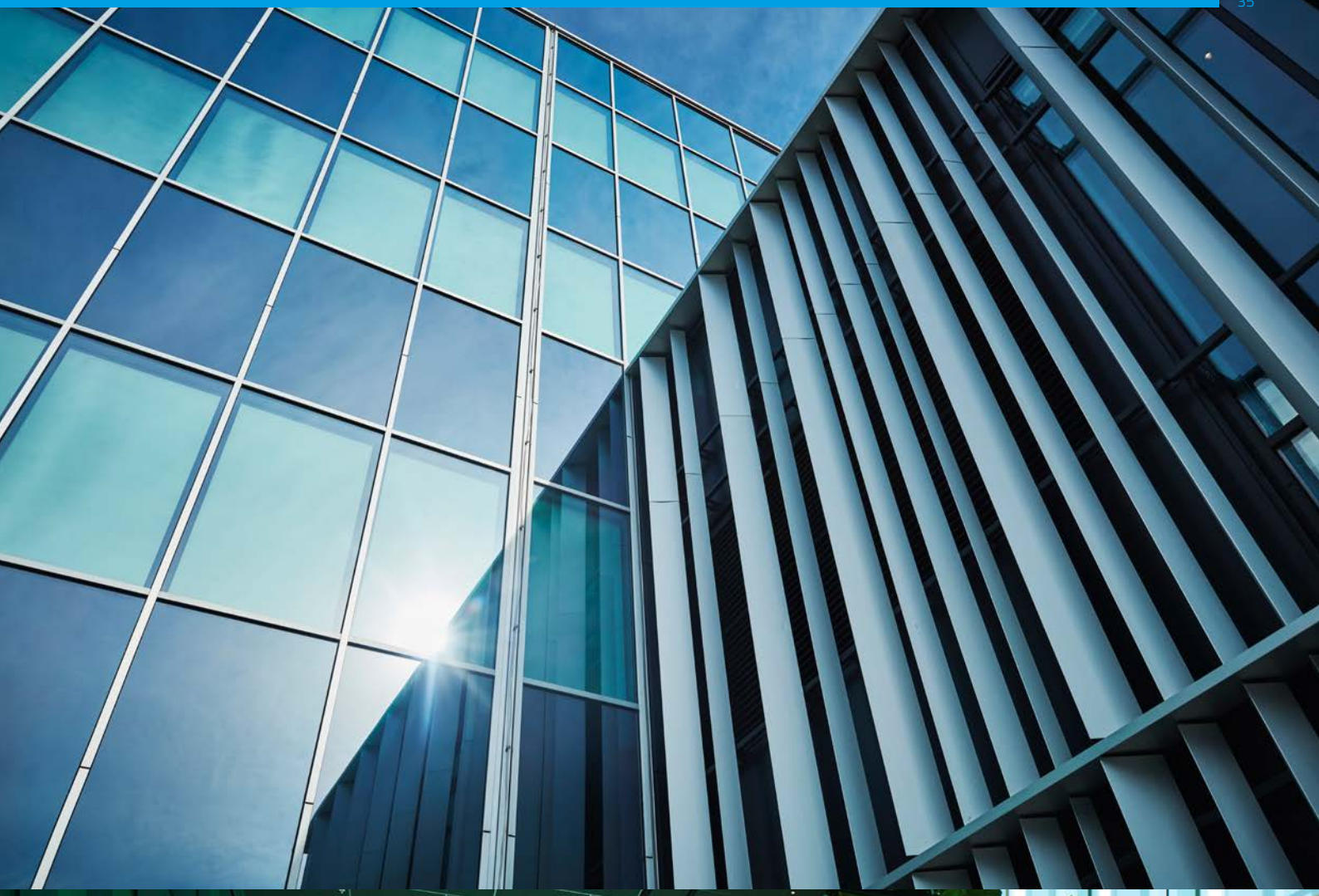
The end is just the beginning

The handover of the ESS Campus is a major milestone, and one that was much easier to achieve thanks to the extensive construction expertise that ESS had available in-house. This meant that even in this most challenging of years, everything could proceed on schedule and within budget.

"Trust has been a big factor," Welander says. "There was a great collaboration between ESS and Skanska, our construction partner, and we all came together to solve the big challenges. I think we can be proud of what we achieved."

If the instruments and the beam tunnel are the brains of ESS, the Campus is the beating heart. It's the place where, once normality returns, people will gather to discuss ideas and research over great food and coffee, and where visitors will learn more about the wonders of neutron research.

"I think people are really missing other people now," Björk says. "Everyone is really looking forward to moving into this new workspace, and we're making sure that when they do it will be safe, spacious and inspiring."



Making an impact

When First Science is complete at ESS, we will start to see just how much this new neutron research facility can contribute to discovering more about the world around us. However, ESS as a facility is already having a significant, positive impact on the host and member countries from a socio-economic perspective. A report published during 2020 highlighted the many areas where ESS has been able to make an impact so far.

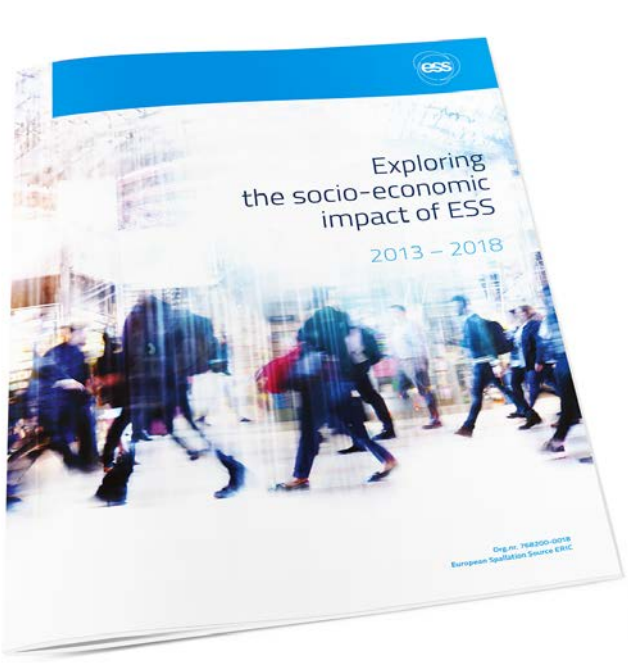
The research for the reports consists of various data sets which were gathered between 2013 and 2018, and covers everything from publications and collaborations to construction and partnerships. The data has shown that there are many areas where ESS is already having a tangible impact, and this trend is set to continue as activity increases in the lead-up to First Science.

Early scientific outputs

One key factor to consider when measuring socio-economic impact, especially for a research infrastructure like ESS, is that of influence in the scientific field. Influence can be measured in a variety of ways, but one that points to real scientific value is the number of publications and research outputs, as well as the number of citations from other papers.

The number of citations to publications either authored or co-authored by ESS grew from 571 in 2013 to 4,671 in 2018, which represents a huge increase considering that the facility is not yet operational. This number is only likely to increase once research is carried out on site.

In addition to the citations, ESS has also consistently been able to publish research output, and released 541 publications between 2013 and 2018. 54% of these were co-authored together with partner universities, so the impact isn't just in the field of neutron research, but also in education. Many publications are also open access, which makes it much easier for the wider research community to access and refer to them. All of these data points tell us that ESS is already influential in the global scientific community.



Welcoming the world

Success in science relies upon an interested and engaged community, and ESS will depend upon the world's neutron scientists to sustain activity and innovation. However, the community outside researchers is just as important, as this opens the doors for potential future users and wider knowledge of the field.

ESS opened to visitors in 2015, and between then and the end of 2018 it welcomed a total of 19,465 people. Almost half of these visitors came just to learn more about ESS in general, and came from schools, local associations, student groups and various other places. These visitors could be the next generation of neutron scientists, or vocal supporters in the local community, so this open approach during the construction phase can help make a positive impact on both scientific and social levels.

News about ESS has also been travelling far and wide, as this world-renowned project has been written and referenced in articles more than 11,000 times between 2013 and 2018. This shows the high levels of interest in ESS, and also shows the impact the facility is already having.

Influencing innovation and boosting economies

Even though First Science hasn't been achieved, ESS suppliers have already seen significant benefits from working with the facility. More than a third of suppliers have increased their own profitability, while many have also been able to open new research and development units or enter entirely new markets.

These developments have also driven the innovation levels for many In-Kind Partners, as nearly three quarter of the contributions required either highly customized technology or entirely new and advanced products. This kind of innovation can have a lasting impact, as these In-Kind Partners now have new experience and expertise which can be applied elsewhere.

This is just the beginning in terms of the socio-economic impact of ESS. There are many more areas covered in the full report, but it is also important to remember that this is only based on data gathered up until 2018. As we approach and eventually move beyond First Science, the socio-economic impacts will only become more significant and lasting. It's an inspiring time for neutron research, but the potential for the research outputs to change the world is even more exciting.

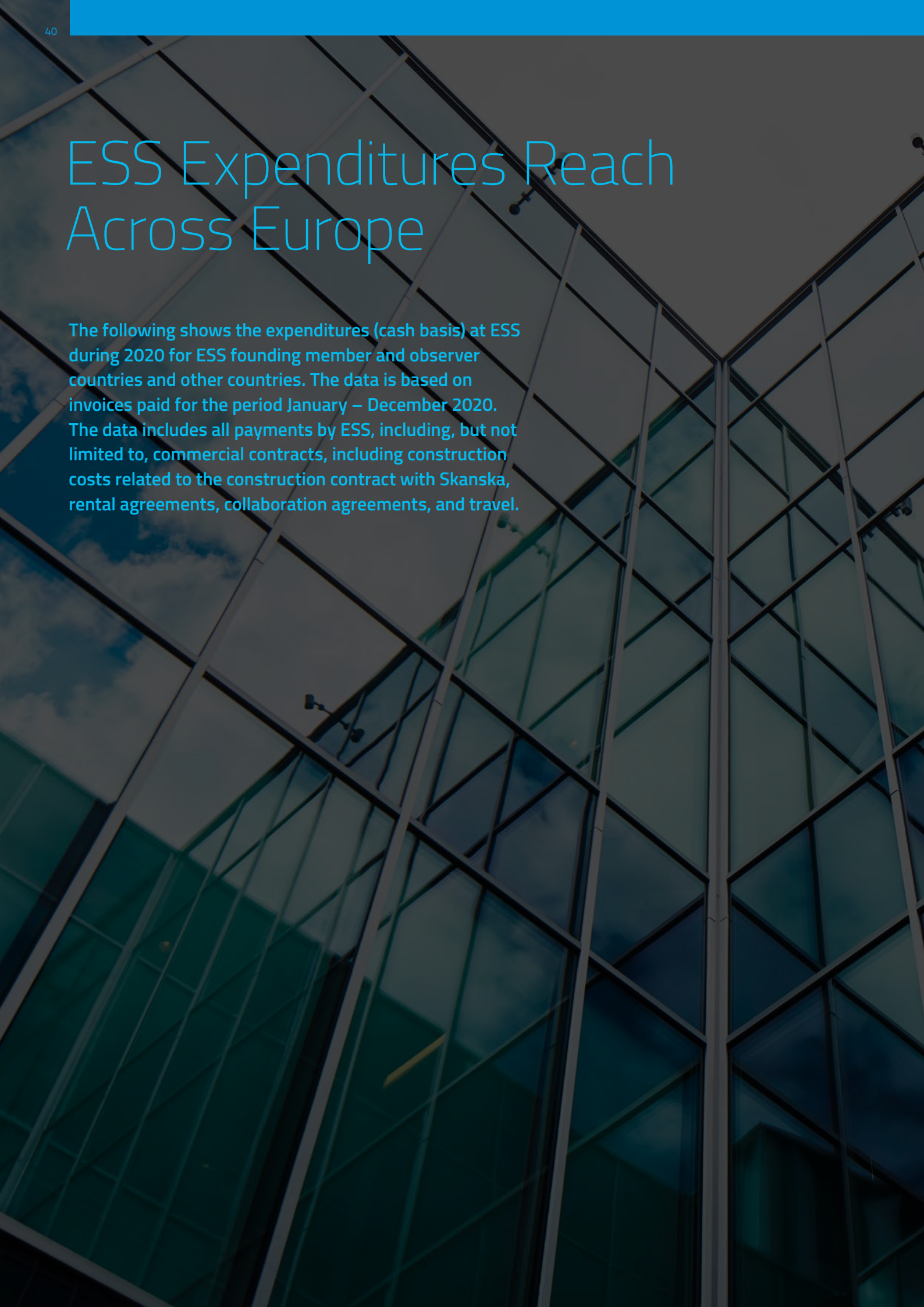
DOWNLOAD THE REPORT

Statutory Report

European Spallation Source ERIC
Org. no. 768200-0018

ESS Expenditures Reach Across Europe

The following shows the expenditures (cash basis) at ESS during 2020 for ESS founding member and observer countries and other countries. The data is based on invoices paid for the period January – December 2020. The data includes all payments by ESS, including, but not limited to, commercial contracts, including construction costs related to the construction contract with Skanska, rental agreements, collaboration agreements, and travel.



SUPPLIERS 2020 BY COUNTRY		
	SEK	EUR
Austria	3 940	367
Belgium	232 951	22 151
Bosnia	503 606	48 105
Canada	605 732	57 142
China	151 649	14 248
Czech	2 890 817	273 603
Denmark	44 539 534	4 514 294
Estonia	7 239 684	683 580
Finland	9 809 471	921 501
France	111 015 605	10 420 151
Germany	86 455 604	8 104 501
Greece	21 616	2 000
Hungary	15 991 445	1 510 342
Ireland	79 730	7 583
Italy	7 288 560	758 993
Japan	28 722 065	2 713 512
Latvia	852	95
Luxembourg	7 087	656
Netherlands	387 637	37 189
Norway	210 356	20 000
Poland	2 434 699	230 321
Russia	583 950	55 972
Slovenia	621 745	58 537
South Africa	7 770	728
Spain	70 839 211	6 647 961
Sweden	1 384 504 726	152 773 295
Switzerland	5 142 950	494 166
United Kingdom	36 254 504	3 457 826
USA	7 030 491	678 312
TOTAL	**1 823 577 987**	**194 507 129**

Governance, Management and Advisory Committees

Delegates to the ESS Council

The European Spallation Source ERIC Council is composed of up to two delegates from each Member Country in addition to a Chair and Vice Chair appointed by the Council.

Beatrix Vierkorn-Rudolph
Chair

Kurt Clausen
Vice Chair

Lukáš Levák
CZECH REPUBLIC

Petr Lukáš
CZECH REPUBLIC

Bo Smith
DENMARK

Jane Hvolbæk Nielsen
DENMARK

Toivo Räim
ESTONIA

Priit Tamm
ESTONIA

Emmanuelle Lacaze
FRANCE

Pascal Debu
FRANCE

Andrea Fischer
GERMANY

Martin Müller
GERMANY

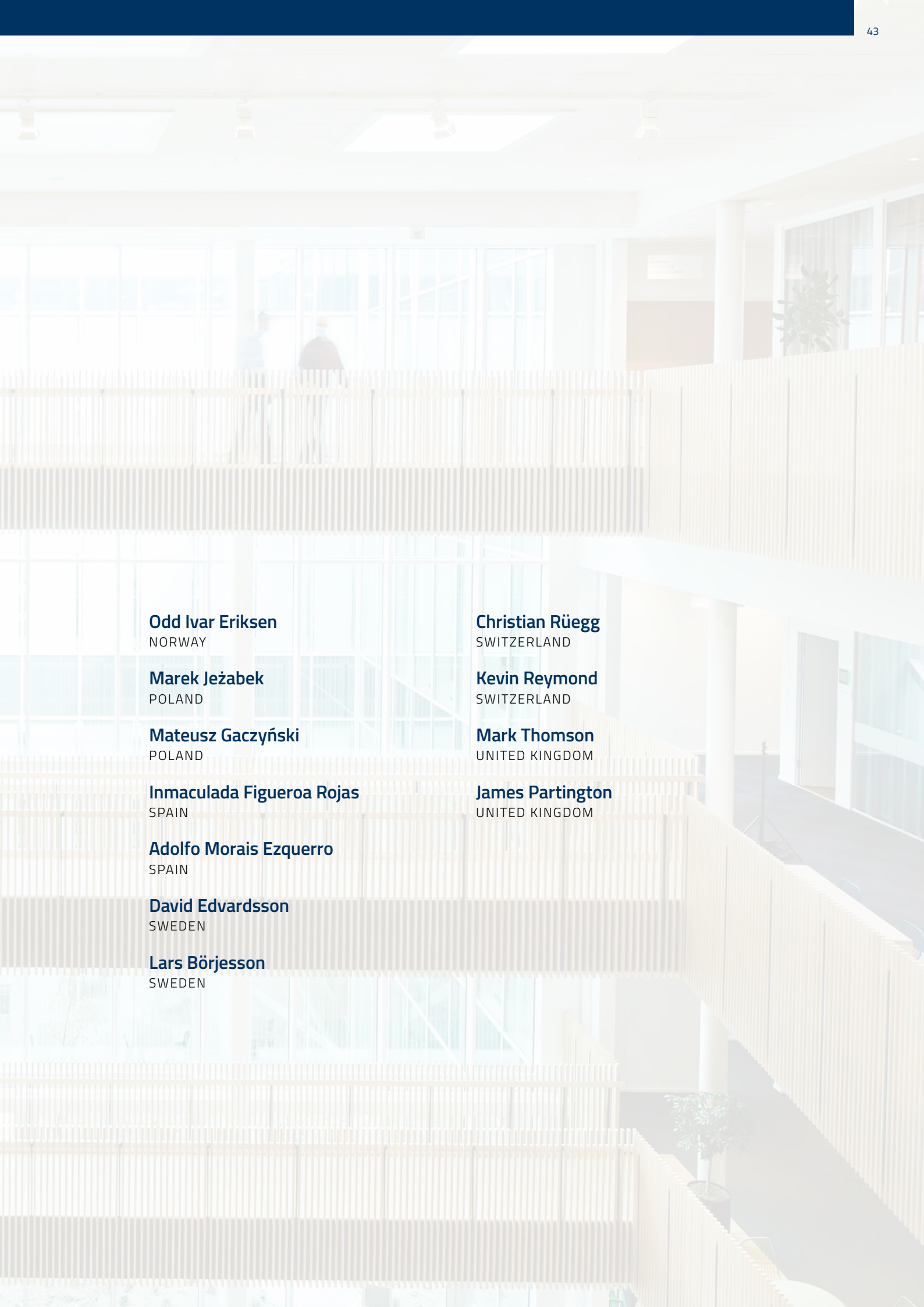
Ákos Horváth
HUNGARY

Balázs Kápli
HUNGARY

Aldo Covello
ITALY

Pierluigi Campana
ITALY

Current as of 31 December 2020



Odd Ivar Eriksen
NORWAY

Marek Jeżabek
POLAND

Mateusz Gaczyński
POLAND

Inmaculada Figueroa Rojas
SPAIN

Adolfo Morais Ezquerro
SPAIN

David Edvardsson
SWEDEN

Lars Börjesson
SWEDEN

Christian Rüegg
SWITZERLAND

Kevin Reymond
SWITZERLAND

Mark Thomson
UNITED KINGDOM

James Partington
UNITED KINGDOM

ESS EXECUTIVE TEAM (EET)

Director General	**John Womersley**
Director for Project Support & Administration	**Agneta Nestenborg**
Director for Science	**Andreas Schreyer**
Technical Director	**Kevin Jones**
Associate Director for Environment, Safety & Health, and Quality	**Ralf Trant**
Associate Director for Strategy	**Sharon Cosgrove**
Project Director	**Mark Anthony**
Head of Operations Planning	**Dimitri Argyriou**
Head of Communications	**Martin Sjöstrand**
Senior Executive Assistant	**Karin Hélène**

ADMINISTRATIVE & FINANCE COMMITTEE (AFC)

Chair	**Stéphanie Le Van**
Vice Chair	**Xavier Reymond**
Czech Republic	**Ondřej Svoboda**
Denmark	**Morten Scharff**
Denmark	**Ditte Nissen Lund**
Estonia	**Priit Tamm**
France	**Claire Lechevalier**
France	**Roxanne Casemayou**
Germany	**Ingo Pfeil**
Germany	**Marthe Klotz**
Hungary	**Balázs Kápli**
Italy	**Ileana Gimmillaro**
Italy	**Antonella Tajani**
Norway	**Odd Ivar Eriksen**
Poland	**Michal Rybiński**
Poland	**Michal Wójtowicz**
Spain	**Guadalupe Córdoba Lasuncion**
Spain	**Javier Losada**
Sweden	**Johan Holmberg**
Sweden	**Mikaela Rapp**
Switzerland	**Xavier Reymond**
United Kingdom	**Philippa Kingston**
United Kingdom	**Laura Sewell**

Current as of 31 December 2020

TECHNICAL ADVISORY COMMITTEE (TAC)

Chair **Alberto Facco**

TAC TARGET

Co-Chair	**Graeme Murdoch**
Delegate	**Eric Pitcher**
Delegate	**Masatoshi Futakawa**
Delegate	**Michel Butzek**
Delegate	**Francisco Martin Fuertes**
Delegate	**Jörg Welte**
Delegate	**Jürgen Neuhaus**

ICS

Co-Chair	**Mark Heron**
Delegate	**Eugenia Hatziangeli**
Delegate	**Markus Janousch**
Delegate	**Cyrille Berthe**

Accelerator

Co-Chair	**Frank Gerigk**
Delegate	**Stéphane Chel**
Delegate	**Joachim Grillenberger**
Delegate	**Maud Baylac**
Delegate	**Igor Syratchev**
Delegate	**Mei Bai**
Delegate	**Glen Johns**

SCIENTIFIC ADVISORY COMMITTEE (SAC)

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Vice chair	**William Stirling**
Delegate	**Thomas Hellweg**
Delegate	**Monika Budayova-Spano**
Delegate	**Sabrina Disch**
Delegate	**Bela Farago**
Delegate	**Fred E. Wietfeldt**
Delegate	**Bella Lake**
Delegate	**Juan Colmenero De Leon**
Delegate	**Emmanuelle Dubois**
Delegate	**Victoria Garcia Sakai**
Delegate	**Pascal Manuel**
Delegate	**Henrik Rønnow**
Delegate	**Daniel Söderberg**
Delegate	**Luise Theil-Kuhn**
Delegate	**Alessandro Triolo**

IN-KIND REVIEW COMMITTEE (IKRC)

Chair	Bjørn Christian Hauback
Vice Chair	Dániel Csanády
Czech Republic	Petr Šittner
Denmark	Søren Pape Møller
Estonia	Rasmus Palm
France	Jean-Luc Biarrotte
Germany	Tania Claudio Weber
Hungary	Dániel Csanády
Italy	Giuseppe Gorini
Norway	Erik Wahlström
Poland	Adam Maj
Spain	Fiamma García-Toriello
Sweden	Björgvin Hjörvarsson
Switzerland	Peter Allenspach
United Kingdom	Robert McGreevy

PROJECT ADVISORY COMMITTEE (PAC)

Chair	Mark Reichanadter
Delegate	Diane Hatton
Delegate	Reinhard Brinkmann
Delegate	Christiane Alba Simionesco
Delegate	Winfried Petry
Delegate	Stuart Henderson
Delegate	Lina Rodriguez-Rodrigo
Delegate	Pedro Fernandes Tavares

COMMITTEE ON EMPLOYMENT CONDITIONS (CEC)

Chair	Beatrix Vierkorn-Rudolph
Member	Lukáš Levák
Member	N.N.
Host State Ex-Officio Members	Bo Smith
Host State Ex-Officio Members	Katarina Bjelke

Current as of 31 December 2020

ENVIRONMENT, SAFETY & HEALTH ADVISORY COMMITTEE (ESHAC)

Chair	**Paul Berkvens**
Delegate	**John Anderson**
Delegate	**Enrico Cennini**
Delegate	**Doris Forkel-Wirth**
Delegate	**Sam Jackson**
Delegate	**Frank Kornegay**
Delegate	**Stefan Roesler**
Delegate	**Steven Wakefield**

CHAIR'S COMMITTEE (CC)

Chair	**Beatrix Vierkorn-Rudolph**
Vice Chair	**Kurt Clausen**
Delegate	**Odd Ivar Eriksen**
Delegate	**Aldo Covello**
Host State Delegate	**Bo Smith**
Host State Delegate	**Lars Börjesson**
Ex-officio member	**John Womerley**
Ex-officio member	**Florian Weissbach**

Statutory Administration Report

The Director General of European Spallation Source ERIC (Organisation Number 768200-0018), with its registered office in Lund, hereby submits the Annual Report for the financial year 1 January – 31 December 2020.

General information on the Company

European Spallation Source (ESS) is an ERIC, European Research Infrastructure Consortium, a legal form of organisation which the European Commission has developed to facilitate major European research facilities. Through the establishment of European Spallation Source ERIC, ESS has acquired a legal status in all Member States and observer countries, enabling the countries to participate in decision-making and directly contribute to the funding. See also Notes, note 2.

ESS will be the world's next-generation neutron source, and will be one of the most powerful spallation neutron sources in the world when it is completed. The facility will be used for materials research in areas such as energy, health and environment, and will be of great importance in the long-term with regard to the competitiveness of Swedish and European research and industry. The facility is under construction on the outskirts of Lund and is scheduled to be in full operation with 15 instruments in 2026. The user programme for researchers is scheduled to begin in 2023 with a smaller number of instruments. The project is one of the largest research infrastructure projects in Europe, and is prioritised by the European Strategy Forum for Research Infrastructures (ESFRI).

ESS comprises the research facility with associated Campus and laboratories under construction in Lund, Sweden, and the Data Management and Software Centre (DMSC), in Copenhagen, Denmark. DMSC is operated through the Swedish company with its office in Copenhagen as an "overseas, other company".

At the end of the year, the personnel comprised 519 employees from 57 different nations.

In addition to its own activities, ESS collaborates with partners from all over Europe and other parts of the world. ESS has 13 member countries: Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Norway, Poland, Spain, Sweden, Switzerland and the United Kingdom.

When the ESS user programme is in full operation, an estimated two to three thousand researchers from around the world will conduct experiments at the facility each year.

The Construction Project

During 2020, work has continued on following the schedule in order to be able to complete the project within the established cost framework. By 31st December 2020, 76% of the facility was completed. As the buildings have been completed, they have been handed over to ESS Facility Management, which is responsible for managing the buildings, and the respective division for the installation work.

ESS adheres to the permitted noise levels regulated in the environmental ruling and has special contact routes with the local residents to inform about ongoing and future work, and to receive any complaints. No complaints have been received related to the construction of the facility during the year.

During the Construction Phase, rain water and drainage water from excavation pits are diverted to two of the three surrounding drainage companies via a delay reservoir located on the property. One of these three drainage companies leads on to Kungsmarken, a Nature Reserve 2000 area approximately one kilometre south of the property. No emissions of significant impact have taken place at the associated drainage companies during the period.

In-kind Contributions

The ESS project is based on extensive collaboration with research institutions in partner countries, to exchange knowledge, personnel, and experience. ESS is expected to be partially funded through in-kind contributions (approximately 30% of the total estimated construction cost, 1.843 B€, 2013 price level), in particular, significant parts of the instruments, the target station, and the accelerator will be delivered as in-kind. During the year, extensive work has continued to secure in-kind collaborations with partner institutions across Europe. More than 100 institutions are now actively involved in the ESS project.

Environment, Safety & Health and Quality

The Environment, Safety & Health (ESH) and Quality (Q) Divisions play a key role at ESS, and shall ensure that safety and quality requirements are implemented throughout the organisation and during the actual construction of the facility.

ESH ensures ESS's safety and environmental objectives for personnel and users, as well as the surrounding area. This is done by setting requirements regarding the design, installation, and operation of the facility, among other measures. ESH has an important duty in coordinating and leading the work in order to obtain the required permits from Swedish authorities. The largest and most important task is the permit for ionising radiation, which is being handled by the Swedish Radiation Safety Authority (SSM).

In 2020, ESS received a permit for trial operation of the first 50 m of the accelerator, the so-called warm part. This means that work on the commissioning of this part can start at the beginning of 2021.

Information on Risks and Uncertainties

Active and structured Risk Management contributes to successful execution of the ESS project and fulfilment of ESS's overall objectives. The knowledge ESS accumulates in relation to risks is used to further develop ESS's management system, personnel, and project plans.

ESS has a risk management framework, which is described in two main documents: ESS Risk Management Policy and ESS Risk Management Process. The Risk Management Policy describes in general why and how risk management work is to be carried out. The Risk Management Process describes processes and flow charts, as well as criteria for how risks are assessed at ESS. In addition to these two documents, the Risk Management Plan specifies roles, responsibilities, and timeframes for risk-related activities within the organisation.

Risk Management objectives

ESS has established the following Risk Management objectives:

- Frequent and open risk communication that enables a clear and shared view of risks and uncertainties within ESS, as well as among European partners, suppliers, etc.
- A continuously updated risk register for an overview of risks, uncertainties, and risk mitigation measures.
- Reduced risk exposure through rapid and active application of measures.
- Focus on risks and uncertainties through effective risk reporting, internally and externally. Risk analyses should be based on qualitative estimates as well as quantitative calculations, and decisions are made after careful consideration of the results of such analyses, in combination with an impact assessment.

Risks and uncertainties

Any potential event that may affect ESS's overall objectives poses a risk. Risk identification and risk analysis are part of ESS's daily work, and aim at contributing to effective risk management by providing increased insight into the consequences of a particular risk, as well as the probability that it might occur. Structured risk analysis enables comparisons, simplifies risk communication, and is crucial in understanding whether a risk is acceptable or not. A number of accident scenarios have been analysed, and these form the basis of the classification work on which the design of ESS's safety system is based.

Risks are judged from several different perspectives:

1) Risks related to personal injury.

Health and accident risks are assessed for all activities performed, and also cover the management of radiation safety when ESS is in operation. This also includes managing risks related to accidents during the Construction Phase. Processes and rules for the work environment at ESS's construction site have been established in collaboration with our contractors. The transfer of buildings from the contractor to ESS has begun, which creates new conditions that must be handled. As such, ESS takes greater responsibility and will continuously increase the proportion of the facility controlled by ESS and its personnel. This transition is managed in a controlled manner to ensure the highest possible level of safety.

2) Risks related to quality and function
Risks that could potentially impair the quality and thereby the function of technical structures, systems, and components are of great importance to ESS. To handle such risks, ESS has refined existing processes for configuration work and developed a new set of rules for design and installation work. Processes and systems for quality management and governance have been continuously developed and implemented with an increasing demand, and in consultation with the ESS management team. Since May 2016, ESS has been a member of EFQM (European Foundation for Quality Management), and, through that network, is able to ensure a world-wide analysis of best practice in the area. Significant focus has been on compliance with the European Product Safety Directives applicable to ESS, and that these are also complied with by suppliers and collaborative partners.

3) Risks related to the environment and the surrounding area
ESS has the ambition of becoming the world's first major research facility with energy-sustainable operations, thereby paving the way for a new way of building and operating the facilities of the future. This means, among other things, that the facility will be energy efficient, that it will be supplied with electricity from renewable energy sources, and that some of the surplus heat will be utilised in the district heating network. Implementation is based on the energy policy with the energy concept "Responsible, Renewable, Recyclable" and with the goal of consuming less than 270 GWh of electricity per year.

4) Risks regarding society's view of ESS
ESS is committed to providing a positive social contribution to the local community in which the organisation is located; to operate the company as a responsible social actor; to respect the laws, customs and needs regarding the countries that contribute to the development, construction and operation of the research facility; to respect internationally recognised human rights; and to act in an environmentally responsible way by minimising the environmental impact of the activities. In this way, ESS actively contributes to sustainable development. Sustainability is one of ESS's four core values: *Excellence, Openness, Collaboration, Sustainability.*

By 2014, ESS had already established a code of conduct based on the 10 principles of the UN's Global Compact relating to human rights, working conditions, the environment, and anti-corruption, as well as the International Chamber of Commerce's rules on combatting anti-corruption. As such, ESS has undertaken to comply with these principles and rules. The ESS Code of Conduct encompasses all employees and others who have ESS as their permanent or temporary workplace. ESS also requires equivalent codes of conduct of external collaboration partners.

ESS evaluates its suppliers through competitive procurement processes in accordance with Article 23 of the European Spallation Source ERIC procurement rules.

ESS may not invite any supplier to submit a bid, or award a contract, if the supplier, or its board of directors, or any other person empowered to represent, decide, or control the supplier when they:

a) have been convicted of any of the following offenses in the last three years: participation in criminal organisation, corruption, fraud, money laundering, terrorist offenses, or a crime related to terrorist activity, child labour, or other forms of illegal trafficking;

b) have failed to comply with current environmental, social, or labour laws in the last three years;

c) are guilty of gross professional shortcomings, which cast doubt on the supplier’s or tenderer's integrity;

d) are involved in, or in the past three years has been involved in, a secret agreement; or where the organisation has knowledge of the occurrence of any of the following circumstances:

e) have an unfair advantage that may distort competition as a result of the supplier’s or tenderer's previous participation in the preparation of the procurement process in accordance with Article 28.4.

f) have significant previous shortcomings in the performance of previous contracts awarded by ESS,

g) have committed serious misrepresentation of information in that submitted as part of a tendering procedure, or

h) if the supplier or tenderer is in bankruptcy, or is subject to insolvency or liquidation, or is in an equivalent situation arising from a similar procedure under the laws and regulations of a state.

ESS often requests proof of quality assurance and sustainability, in accordance with ISO 9001 or ISO 14001, or equivalent.

ESS’s general procurement terms include requirements on anti-corruption. The supplier shall guarantee that no offer, payment, remuneration, or benefit of any kind which constitutes an illegal or corrupt practice has been, or shall be, made, either directly or indirectly, as an inducement or reward for entering into the contract or implementing the agreement.

5) Risks regarding timetable
Risks related to the ESS timetable concern the processes and activities that could delay implementation of the project plan.

6) Risks regarding annual operational costs
In order to achieve ESS's overall objectives, a number of requirements related to the annual operational costs are required. Risks in the form of, for example, maintenance and service, energy consumption, downtime, insurance premiums, and/or loss of property have therefore been identified. Established plans and cost estimates for ESS's Initial Operations Phase have been continuously evaluated and updated during the year, and been presented to the ESS Council.

7) Risks related to finances and funding
Understanding and managing risks that may have financial consequences in terms of exceeding the project budget are central to ESS, and are managed through established processes related to the identification and analysis of uncertainties in cost estimates. Each part of the project has its own budget, and each risk of exceedance is handled individually. Such measures are handled by the management team in a well-defined process.

The activities undertaken by ESS are funded by all Member Countries contributing to the financing. The remaining funding risks connected to the Construction Phase relate to reaching a hundred percent commitment, and financing to secure the project's liquidity needs.

Sustainability Report

Environment

One of the cornerstones of ESS's operations is the environment, both in terms of the research that will be carried out at the facility and the actual construction and operation of the facility. All surplus heat produced in the plant will be utilised and sold to the district heating network in the surrounding area. A fraction of waste heat that maintains lower temperatures will go to the low-temperature district heating network that is being built up in north-eastern Lund.

On the facility side, ESS has worked to maintain mass balance; that the masses that have been excavated for construction shall remain on the site and be used for the construction of the bank for the accelerator tunnel and for the earthworks that have been carried out to create an attractive environment. The organisation has also endeavoured to ensure that vehicles leaving the construction site during autumn and winter are cleaned of mud and the like to reduce the impact on the living environment of our neighbours.

The new office building, which will become operational during 2021, has been designed and built with the goal of achieving the 'outstanding' certification under BREEAM International.

All suppliers who have components or tools to be installed in or used at ESS must ensure that these comply with EU regulations in relation to CE marking. This applies to both external suppliers and deliveries from in-kind partners.

Social Environment

The Work Environment Policy at ESS regulates that well-being and health are important issues for the organisation. The Health and Well-being Policy is a clarification of the promotion of health and well-being work within ESS.

The main objectives of the Health and Well-being Policy are to prevent illnesses and accidents by:

1. Making it easier for employees to be better aware of their health and to increase their own welfare.
2. Facilitating access to physical and social activities, and encouraging ESS personnel to participate in these.
3. Being an attractive workplace where people feel good and are satisfied with their work situation.
4. Identifying physical and psychological risks with the personnel through different analyses, and taking preventive measures to minimise and reduce sick leave, both in the long- and short-term.

ESS has hired someone with the task of working with schools and the local community to involve and interest them in working with ESS as a research institution. Over the past ten years, several meetings have been arranged every year with the closest neighbours to inform both them and the organisation about what is happening in the project and how it affects the neighbours. During the pandemic period in 2020, these meetings have unfortunately not been possible. Planning is underway to be able to carry out the first meeting post-Covid.

Personnel

All personnel working at ESS are required to comply with the ESS Code of Conduct. It consists of rules describing responsibilities and appropriate procedures for employees at ESS. The rules define business principles, values and norms, and appropriate behaviour for ESS personnel.

The Work Environment Policy at ESS regulates that well-being and health are important issues for the organisation. The Health and Well-being Policy is a clarification of the promotion of health and well-being work within ESS.

The main objectives of the Health and Well-being Policy are to prevent illnesses and accidents by:

1. Making it easier for employees to be better aware of their health and to increase their own welfare.
2. Facilitating access to physical and social activities, and encouraging ESS personnel to participate in these.
3. Being an attractive workplace where people feel good and are satisfied with their work situation.
4. Identifying physical and psychological risks with the personnel through different analyses, and taking preventive measures to minimise and reduce sick leave, both in the long- and short-term.

The diversity of the workforce and an open and appreciative culture are important success factors in a globalised world, and with over 500 employees from

a total of 57 countries, cultural diversity is a well-established part of everyday life at ESS.

Since the relocation of the offices to the construction site in June 2018, ESS has introduced a drug and alcohol policy, in order to ensure a safe and healthy workplace.

The number of sick leave cases has remained low in 2020, despite the ongoing pandemic.

Respect for Human Rights

The diversity of ESS's employees is its strength. ESS wants to create an inclusive work environment where each employee is valued and individual achievement is recognised.

ESS does not tolerate discriminatory behaviour, either in recruitment or in our daily interaction with each other. We strive to develop the full potential of our employees, regardless of external conditions. To do that, we endeavour to identify and remove obstacles in our thinking and in our processes.

Anti-Corruption

The ESS Code of Conduct specifies that the organisation actively works against corruption in all its forms, including extortion, bribery and other influences directed at the organisation, any of its employees, or related parties. In addition, a Code of Ethics in Contracting has been developed.

This means that ESS has prepared a regulatory framework for how procurements shall be conducted based on five items, where integrity is item 3 with the wording "All procurements shall be carried out in an impeccable manner with full objectivity and without benefits for any person or organisation".

Significant Events during the Year

In January, the transfer of equipment from the temporary Data Centre at the University of Copenhagen to the permanent Data Centre at DMSC began. This also increased the rate of the tests that took place in Test Stands 1 and 2, in combination with the successful commissioning of the Accelerator Cryoplant at 3 kW and 2 K. This enables the cooling necessary for the superconducting linear accelerator to reach 5 MW. ESS has also received a permit from the Swedish Radiation Safety Authority, SSM, for the first section of the accelerator.

In the instrument hall for the long instruments, two Instrument Caves have been completed, in which the research instruments will be placed.

COVID-19

In mid-March 2020, a work-from-home policy was introduced at ESS, which basically means that the personnel who can work from home shall work from home. The aim of this policy is to ensure that personnel working with installations and other tasks that cannot be handled remotely shall have sufficient space to be able to work safely with minimal risk of contamination.

This policy has been followed by restrictions where only visits and trips that are deemed to be Business Critical have taken place. Other meetings have been rescheduled so that they can be held digitally instead.

The result has been that large parts of the project have been able to continue with some re-planning. However, we have been affected by the restrictions and measures that have taken place in the rest of Europe, with delays in deliveries of In-kind grants, both in the form of equipment and work. In some cases, measures have been taken where Swedish suppliers have been able to replace, but with certain delays as a result.

It is difficult to see in December 2020 how this has affected the schedule and budget in general, but the organisation has begun a review of the project plan in order to be able to make a total impact assessment during the second half of 2021.

Expected Future Development and Significant Risks and Uncertainties

In the coming quarters, we expect to increase the purchase of components for the instruments that will be in the facility.

Since the United Kingdom left the EU, negotiations have started on the country's future relationship with the EU and as such indirectly with the EU legislation that forms the basis for the membership of the European Spallation Source ERIC. However, the United Kingdom has previously announced its intention to remain as a member and thereby ratify the agreements and adopt the necessary national legislation.

The Development of the Company's Financial Performance and Position

The net result for the year amounted to –1 334 MSEK (–1 336). The result includes costs for personnel and consultants, as well as the administrative and technical infrastructure during the Construction Phase.

Equity amounted to 4 069 MSEK (3 633).

Investments

Investments were made during the year in fixtures and fittings and ongoing new facilities totalling 1 564 MSEK (1 456).

Financing and liquidity

During its fiscal year 2020, ESS received contributions from member countries totalling 1 771 MSEK (1 923). Further information on the contributions received can be found in Note 18. Cash and cash equivalents amounted to 1 629 MSEK (1 929).

Income Statement

KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Net turnover	-	-
Gross profit	**-**	**-**
Administration expenses (Note 5, 6)	–521,215	–505,046
Research and development expenses (Note 6)	–828,116	–839,461
Other operating income (Note 7)	47,231	31,704
Operating profit	**–1,302,100**	**–1,312,803**
Financial income (Note 8)	4	3
Financial expenses (Note 9)	–31,829	–22,935
Profit before tax	**–1,333,925**	**–1,335,735**
Tax (Note 10)	-	-
NET RESULT	**–1,333,925**	**–1,335,735**

Balance Sheet

KSEK	2020-12-31	2019-12-31
ASSETS		
Non-current assets		
Buildings (Note 11)	22,116	22,688
Land (Note 12)	64,250	64,250
Equipment, tools and installation (Note 13)	49,407	39,830
Construction in progress and advance payments (Note 14)	6,312,175	4,771,313
Total non-current assets	6,447,948	4,898,081
Current assets		
Other current receivables (Note 15)	234,597	306,110
Prepaid expenses and accrued income (Note 16)	43,844	48,512
Cash and bank	1,628,823	1,929,169
Total current assets	1,907,264	2,283,791
TOTAL ASSETS	**8,355,212**	**7,181,872**

KSEK	2020-12-31	2019-12-31
EQUITY AND LIABILITIES		
Equity		
Capital contribution (Note 18)	5,403,368	4,968,349
Net result	–1,333,925	–1,335,735
Total equity	4,069,443	3,632,614
Non-current liabilities		
Interest-bearing liabilities to credit institutions (Note 19)	3,462,425	3,000,160
Current liabilities		
Account payables	276,959	292,107
Other liabilities (Note 20)	28,857	37,710
Accrued expenses and prepaid income (Note 21)	517,528	219,281
Total current liabilities	823,344	549,098
TOTAL EQUITY AND LIABILITIES	**8,355,212**	**7,181,872**

Equity

KSEK	Cash contribution	Previous year result	Net result	Total equity
Opening balance 2019-01-01	6,567,570	–3,522,672	-	3,044,898
Contributions	1,923,451	-	-	1,923,451
Net result 2019	-	–1,335,735	-	–1,335,735
Opening balance 2020-01-01	8,491,021	–4,858,407	-	3,632,614
Contributions 2020	1,770,754	-	-	1,770,754
Net result 2020	-	-	–1,333,925	–1,333,925
CLOSING BALANCE 2020-12-31	**10,261,775**	**–4,858,407**	**–1,333,925**	**4,069,443**

Cash Flow

KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Operating activities		
Income after financial items	–1,333,925	–1,335,735
Adjustment for non-cash items	14,479	10,386
Cash flow from operating activities before changes in working capital	–1,319,446	–1,325,349
Cash flow from changes in working capital		
Increases (–) / Decreases (+) in current receivables	76,181	–122,946
Increases (+) / Decreases (–) in current liabilities	274,247	207,686
Cash flow from operating activities	–969,018	–1,240,609
Investment activities		
Acquisition of tangible fixed assets (Note 12, 13)	–23,484	–22,238
Acquisition of construction in progress (Note 14)	–1,540,862	–1,433,691
Cash flow from investing activities	–1,564,346	–1,455,929
Financing activities		
Cash contributions	1,770,753	1,923,451
Changes in interest-bearing non-current liabilities	462,265	992,630
Cash flow from financing activities	2,233,018	2,916,081
Cash flow for the year	**–300,346**	**219,543**
Liquid assets at the beginning of the financial year	1,929,169	1,709,626
Liquid assets at the end of the financial year	1,628,823	1,929,169

Notes

NOTE 1: NOTES WITH ACCOUNTING PRINCIPLES AND COMMENTS ON THE ACCOUNTS

The annual report has been prepared in accordance with the Annual Accounts Act (*Årsredovisningslagen*) and the Swedish Accounting Standards Board BFNAR 2012: 1 Annual report and group consolidation (K3) (*Bokföringsnämndens allmänna råd BFNAR 2012:1 Årsredovisning och koncernredovisning* (K3)).

The Company's Registered Office etc.

European Spallation Source ERIC (ESS) is a European Research Infrastructure Consortium, which is a legal entity and has its registered office in Lund, Sweden. The head office's visiting address is Partikelgatan 2 in Lund, with post box address P.O. 176, 221 00 Lund, Sweden. The company's corporate identity is 768200-0018.

Classification etc.

Fixed assets, long-term liabilities and provisions consist of amounts expected to be recovered or settled after more than twelve months from the balance date. Current assets and current liabilities consist of amounts expected to be recovered or paid within twelve months from the balance date.

Valuation Principles etc.

Assets, provisions and liabilities have been valued at cost, unless otherwise stated below. ESS comprises the activities with the facility under construction in Lund, Sweden, and the Data Management and Software Centre (DMSC) in Denmark. DMSC is operated by the Swedish company with its headquarters in Copenhagen as "udenlandsk, anden virksomhed"/ "overseas, second company". For DMSC, monetary items in the balance sheet are valued at the rate when closing the accounts and profit and loss items at the closing rate for each month.

Tangible Fixed Assets

Tangible assets are recognised as assets if it is probable that future economic benefits will accrue to the business and the cost of the asset can be measured reliably. Property plant and equipment is stated at cost less accumulated amortisation and impairment losses. The cost includes purchase price and costs directly attributable to the asset to bring it on place and condition to be utilised in accordance with the intended purpose. Other additional expenses are expensed in the period they occur. The assessment of whether a subsequent expenditure is added to cost is whether the replacement of identified components or parts is capitalised. Additional components will be added and capitalised. Values of replaced components, or parts of components will be discarded and expensed in connection with the replacement.

Depreciation According to Plan

Depreciation is based on cost less estimated residual value. Depreciation is linear over the asset's estimated lifetime.

The following depreciation schedules are applied:
Buildings: 40 years
IT equipment: 3–5 years
Machinery and equipment: 5–7 years

Impairments

The recorded value of the assets at balance date is reconciled for any indication of impairment. If any such indication exists, the asset's recoverable amount is the higher of value in use and net realisable value. Impairment loss is recognised if the recoverable amount is less than the balance value. When calculating the value in use, future cash flows at a pre-tax rate are discounted to reflect the market's assessment of risk-free interest and risk associated with the specific asset. An asset that is dependent on other assets is not considered to generate any independent cash flows. Such assets are instead attributed to the smallest cash-generating unit where the independent cash flows can be determined.

An impairment loss is reversed if there has been a change in the estimates used to determine the recoverable amount. A reversal is made only to the extent that the assets balanced amount does not exceed the amount that would have been determined, after depreciation, if no impairment loss had been recognised.

ESS operates without profit in accordance with the requirements of the EU regulation relating to ERIC. Financing the future operation of the facility is planned to be achieved through contributions that ensure full cost recovery. This means that the assessment of external and internal indicators related to impairment

review according to K3 regulations for ESS, is taking into account ESS ERIC´s specific conditions. This specific application complies in all material respects with the principles and methods as expressed in the "*Utkast till redovisningsuttalande från FAR Nedskrivningar i kommunala företag som omfattas av kommunallagens självkostnadsprincip*", which thereby is applied similarly for ESS.

Receivables

Accounts receivable are recorded to the expected value to be received after deductions for bad debts, which are assessed individually.

Receivables and Liabilities in Foreign Currencies

Receivables and payables in foreign currencies are converted using the closing balance rate. Exchange rate differences for operating receivables and liabilities are included in operating income, while differences in financial receivables and liabilities are reported among financial items.

Short-Term Investments

Short-term investments are valued in accordance with Annual Accounts Act (*Årsredovisningslagen*) to the lower value when comparing cost and fair value.

Financial Instruments

A financial asset or financial liability is entered into the balance sheet when the organisation becomes a party to the instrument's contractual terms. Accounts receivable are recorded in the balance sheet when the invoice has been sent. Accounts payable are booked when the invoice is received. A financial asset is removed from the balance sheet when the contractual rights are realised, expire or the company loses control over them. A financial liability is removed when the contractual obligation is fulfilled or otherwise concluded.

Leasing

All leases are accounted for as operating leases. Leasing fees are expensed over the term of the usage, as well as with regard to benefits paid or received at the signing of the agreement.

Liquid Assets

Cash and cash equivalents, immediately available bank balances and other money market instruments with original maturities of three months or less are converted to the closing balance rate.

Accounts Payable

Accounts payable have a short expected duration and are valued at nominal value.

Employee Benefits

Defined contribution pensions

Operational payments for defined contribution pension plans are recognised as an expense during the period the employee performed the services covered by the fee. Consequently, no actuarial assumptions for calculating the obligation or the cost are needed and there is no possibility of any actuarial gains or losses. The obligation is calculated without discount, except in cases where they are not entirely due for payment within twelve months after the end of the period during which the employees perform the related services.

Tax

The tax consists of current tax and deferred tax. Taxes are recognised in the income statement except where the underlying transaction is recorded directly against equity, whereby the associated tax effect is recognised in equity. Current tax is tax to be paid or received for the current year. This includes adjustment of current tax with taxes from prior years. Deferred tax is calculated using the liability method for temporary differences between the booked and the tax value of the assets and the liabilities. The amounts are calculated based on how the temporary differences are expected to be settled and by applying the tax rates and tax rules adopted or announced at the balance sheet date. Temporary differences do not take into account the differences relating to investments in subsidiaries and associates, which are not expected to be taxable in the foreseeable future. Untaxed reserves are reported including deferred tax liabilities. Deferred tax assets for deductible temporary differences and loss carry forwards are only recognised to the extent that it is probable that these will entail lower tax payments in the future.

Contributions

ESS is partly financed with cash and partly with in-kind contributions (non-financial contributions) from the member countries.

Cash contributions

Received contributions from members are recognised in equity in the balance sheet. See capital contributions in note 17.

In-kind contributions

The process for approving in-kind contributions are during the construction period performed by the Committee (In-kind Review Committee). The Committee reviews underlying agreements and recommends them to the ESS Council, with delegates from the member countries, for final approval. After approval it is required in order for the in-kind contributions to be recorded, finally documented agreements between the parties regarding the value of completed deliveries and signed contribution documents from the contributors.

NOTE 2: ASSOCIATED PARTIES WITH A CONTROLLING INFLUENCE

The Council is the governing body of the organisation and is composed of up to two delegates from each member of the organisation. The delegates may be assisted by experts. Each member is entitled to the number of votes equal to its contribution relative to the construction costs. Observers are entitled to participate in the Council but have no voting rights.

NOTE 3: SIGNIFICANT EVENTS AFTER THE END OF THE FINANCIAL YEAR.

Preparations for the operational phase continue with planning of organisational changes and a timetable for their implementation. The transition to operations from construction will take place gradually over the coming years.

NOTE 4: EMPLOYEES, STAFF COSTS AND FEES TO AUDITORS

AVERAGE NUMBER OF EMPLOYEES

SWEDEN	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Men	341	321
Women	148	142
Sum	489	463
DENMARK		
Men	26	26
Women	4	4
Sum	30	30
TOTAL	**519**	**493**

GENDER DISTRIBUTION IN THE MANAGEMENT

	2020-12-31	2019-12-31
Management Directors and Director General	8	6
Whereof women	25%	17%

SALARIES, OTHER REMUNERATION AND SOCIAL COSTS		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Sweden	332,059	315,361
Denmark	29,053	29,700
TOTAL	361,112	345,061
Social costs	96,527	91,216
Pension costs incl. wage tax	57,197	57,596
TOTAL SOCIAL COSTS AND PENSION COSTS	153,724	148,812
Salaries and other remuneration include:		
to Director General	2,577	2,560
to Management Directors	12,741	9,093

ALLOWANCES TO MANAGEMENT DIRECTORS 2020				
KSEK	Basic salary	Other benefits	Pension costs	Total
Director General	2,526	51	674	3,251
Management Directors (8 pers.)	12,667	74	1,835	14,576
TOTAL	**15,193**	**125**	**2,509**	**17,827**

ALLOWANCES TO MANAGEMENT DIRECTORS 2019				
KSEK	Basic salary	Other benefits	Pension costs	Total
Director General	2,511	49	592	3,152
Management Directors (7 pers.)	9,064	30	935	10,029
TOTAL	**11,575**	**79**	**1,527**	**13,181**

Incentive scheme

European Spallation Source ERIC has no incentive scheme.

Severance pay to senior executives

In Director General and senior executive employment agreements there are no severance payments.

FEES AND REMUNERATION TO AUDITORS		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Audit assignments KPMG	399	-
Audit assignments PWC	-	475
Other assignments:		
KPMG	92	43
PWC	488	938
TOTAL	**979**	**1,456**

Audit assignments involve examination of the annual report and accounts, other duties that are the responsibility of the Company's auditors to perform, as well as advice or other assistance arising from observations during such examination or implementation of such duties.

NOTE 5: LEASING FEES IN RESPECT OF OPERATIONAL LEASES		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Leasing agreements where the company is the lessee:		
Minimum leasing fees	21,018	21,048
Variable fees	10	42
TOTAL LEASING COSTS	**21,028**	**21,090**
Contractual future minimum leasing fees relating to non-retractable contracts which become due for payment:		
Within one year	8,681	20,913
Between two and five years	9,390	12,531
TOTAL	**18,071**	**33,444**

NOTE 6: DEPRECIATIONS		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Depreciation according to plan by asset:		
Buildings	–572	–191
Equipment, tools and installations	–13,907	–10,195
TOTAL	**–14,479**	**–10,386**
Depreciation according to plan by function:		
Administration expenses	–1,633	–1 883
Research and development expenses	–12,846	–8 503
TOTAL	**–14,479**	**–10 386**

NOTE 7: OTHER OPERATING EXPENSES		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Exchange rate gain on receivables/liabilities of operations	25,056	4,465
Contributions for EU Grants	17,978	18,453
Other income	4,197	8,786
TOTAL	**47,231**	**31,704**

NOTE 8: FINANCIAL INCOME		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Interest income	4	3
TOTAL	**4**	**3**

NOTE 9: FINANCIAL EXPENSES		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Interest expenses	–31,829	–22,935
TOTAL	**–31,829**	**–22,935**

NOTE 10: TAX ON INCOME FOR THE YEAR		
KSEK	2020-01-01 – 2020-12-31	2019-01-01 – 2019-12-31
Current tax	0	0
Deferred tax	0	0
TOTAL	**0**	**0**

ESS currently has costs that incur ongoing losses from an income tax perspective. Uncertainty regarding the possibilities and timeframe to make use of these is the reason deferred taxes have not been accounted for.

NOTE 11: BUILDINGS		
KSEK	2020-12-31	2019-12-31
Accumulated cost of acquisition:		
Beginning of the financial year	22,879	0
Transfer from Construction in progress	0	22,879
TOTAL	22,879	22,879
Accumulated depreciation according to plan:		
Beginning of the year	–191	0
Depreciation according to plan	–572	–191
Closing balance accumulated depreciation	–763	–191
TOTAL NET VALUE	**22,116**	**22,688**

NOTE 12: LAND		
KSEK	2020-12-31	2019-12-31
Accumulated cost of acquisition:		
Beginning of the financial year	64,250	64,250
Sales	0	0
TOTAL	**64,250**	**64,250**

NOTE 13: EQUIPMENT, TOOLS AND INSTALLATION		
KSEK	2020-12-31	2019-12-31
Accumulated cost of acquisition:		
Beginning of the financial year	66,826	44,588
Acquisitions	23,484	22,238
TOTAL	90,310	66,826
Accumulated depreciation according to plan:		
Beginning of the financial year	–26,996	–16,801
Depreciation according to plan	–13,907	–10,195
Closing balance accumulated depreciation	–40,903	–26,996
TOTAL NET VALUE	**49,407**	**39,830**

NOTE 14: CONSTRUCTION IN PROGRESS AND ADVANCE PAYMENTS		
KSEK	2020-12-31	2019-12-31
Accumulated cost of acquisition:		
Beginning of the financial year	4,771,313	3,360,501
Acquisitions	1,540,862	1,433,691
Transfer to buildings	0	–22,879
TOTAL	**6,312,175**	**4,771,313**

NOTE 15: OTHER CURRENT RECEIVABLES		
KSEK	2020-12-31	2019-12-31
VAT receivables	171,926	270,285
Other tax receivables	16,012	16,182
Contributions from member countries	40,911	19,408
Other	5,748	235
TOTAL	**234,597**	**306,110**

NOTE 16: PREPAID EXPENSES AND ACCRUED INCOME

KSEK	2020-12-31	2019-12-31
Prepaid rental costs	1,527	1,530
Prepaid insurance	14,036	16,538
Accrued income EU projects	19,356	21,025
Accrued interest	172	155
Other	8,753	9,264
TOTAL	**43,844**	**48,512**

NOTE 17: FINANCIAL INSTRUMENTS AND FINANCIAL RISK MANAGEMENT

Finance policy
In view of the phase in which ESS currently operates, no financial instruments are at present being used to hedge flows or the Balance Sheet.

Liquidity risks and interest rate risks
Cash surplus are placed in bank accounts or other equivalent.

Credit risks
Credit risks are considered limited, as the company's receivables consist of minor amounts.

Exchange rate risks
Exposure to exchange rate changes has been low and the exchange rate earnings that occurred during the year relates to exchange rate differences on account payables and bank balances mainly in EUR.

NOTE 18: CAPITAL CONTRIBUTION		
KSEK	2020-12-31	2019-12-31
Czech Republic	180,907	99,625
Denmark	1,587,728	1,281,781
Estonia	17,615	14,380
France	371,132	178,524
Germany	1,766,589	1,798,192
Hungary	59,436	32,024
Italy	352,929	223,432
Norway	397,834	299,785
Poland	108,922	61,121
Spain	42,073	9,213
Sweden	3,554,033	3,030,033
Switzerland	341,491	246,888
United Kingdom	635,472	370,410
TOTAL	**9,416,161**	**7,645,408**

NOTE 19: INTEREST-BEARING LIABILITIES TO CREDIT INSTITUTIONS		
KSEK	2020-12-31	2019-12-31
External loans, due <5 year	1,003,750	0
External loans, due >5 year	2,458,675	3,000,160
TOTAL	**3,462,425**	**3,000,160**

NOTE 20: OTHER LIABILITIES		
KSEK	2020-12-31	2019-12-31
Employee taxes and fees	19,149	16,310
VAT	8,946	15,533
Other	762	5,867
TOTAL	**28,837**	**37,710**

NOTE 21: ACCRUED EXPENSES AND DEFERRED INCOME		
KSEK	2020-12-31	2019-12-31
Accrued vacation salary	30,924	25,057
Accrued social costs	8,671	6,462
Accrued wage tax	10,185	10,350
Accrued payments for EU projects	58,617	50,395
Cash in-kind	344,984	104,038
Accrued interest	4,667	3,353
Other accrued expenses and deferred income	59,480	19,626
TOTAL	**517,528**	**219,281**

NOTE 22: CONTINGENT LIABILITIES AND PLEDGED ASSETS		
KSEK	2020-12-31	2019-12-31
Contingent liabilities	None	None
Pledged assets	None	None

NOTE 23: SIGNIFICANT EVENTS AFTER THE BALANCE SHEET DATE

Director General John Womersley decided not to apply for an extension of his mandate and submitted his resignation on 1 March 2021. On 9 March, the Council decided to temporarily appoint Technical Director Kevin Jones as Acting Director General until a new Director General has been appointed.

The Council of European Spallation Source ERIC will decide upon the adoption of the financial statement and Annual report.

Director General certify that, based on my best knowledge, belief and understanding, the Annual Report is prepared in accordance with applicable accounting rules, the information provided is in accordance with the facts, and nothing of significance that could affect the image of the company as a result of the Annual Report, is omitted.

JOHN WOMERSLEY
ESS DIRECTOR GENERAL

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esss.se