



## Board of Directors' Report for 2016

SINTEF is a universally beneficial research institute, organised in the form of a foundation with subsidiary companies. SINTEF utilises its outstanding solution-oriented research and knowledge production to generate significant value for its Norwegian and overseas clients, the public sector, and society as a whole. Our vision is "Technology for a better society".

SINTEF performs very well in competition for funding from the EU and the Research Council of Norway. This demonstrates that we are in the forefront of international research, which is essential if we are to realise our vision and promote development and value generation for our clients.

SINTEF has its head office in Trondheim and conducts most of its activities in Trondheim and Oslo. SINTEF has operational centres in several locations in Norway under the umbrella of the SINTEF Foundation and its subsidiary companies. We are committed to working closely with industry, and during 2016 have established offices in Mo i Rana and Ålesund.

SINTEF has established a partnership, and a close strategic and collaborative relationship with the Norwegian University of Science and Technology (NTNU) in Trondheim. SINTEF also has close working relationships with the University of Oslo and a number of other Norwegian and overseas research institutes. These partnerships contribute to SINTEF's high levels of technical quality and strong international profile.

Substantial earnings over several years have enabled SINTEF to make investments in laboratories, scientific equipment and research premises, as well as in self-financed technical projects in high-priority research areas. SINTEF aims to deliver a sound financial profit that

reflects the value it generates, enabling it to make necessary future investments. In recent years SINTEF has experienced profitability pressures, and since 2014 we have taken major steps to safeguard operations.

Alexandra Bech Gjørsvik was appointed as SINTEF's new CEO on 1 January 2016. The year continued to be a challenging time for both the oil and gas sector and the shipping industry. The onshore industries exhibited positive growth, and there were high levels of activity in the fisheries and aquaculture, and construction sectors. Following a very difficult year in 2015, there has been some improvement in financial results for the SINTEF Foundation and the SINTEF Group, but these remain unsatisfactory. In 2016, steps such as redundancies, the more efficient use of building premises, and other cost reducing measures have been implemented in some parts of the organisation. Moreover, we have launched a process of organisational restructuring and realignment. One major change that has helped towards the improvement of our financial results has been the introduction of new pension arrangements, which have resulted in considerable cost reductions and greater financial stability.

### Strategy and our role in society

SINTEF's role is to contribute to the development of society by means of contract research projects and innovation. Our main aim is to be a world-leading research institute which, together with our clients in the private and public sectors, generates value and develops solutions to some of the great challenges facing society today. Our overall strategy document sets out five joint areas of focus in which Norwegian industrial and research expertise offer particular strengths. Much of the force inherent in these thematic areas of focus lies in the exploitation of radical new ideas, linked to enabling

technologies, that interact with business-oriented innovation in fields where Norway has specific prerequisites for success.

The strategy focuses strongly on the concept of "One SINTEF", which entails a cross-disciplinary approach and our ability to make use of the best skills and expertise available across the entire SINTEF organisation as a means of safeguarding our role in society and meeting our clients' needs.

In spring 2016, the SINTEF Board decided to begin the process of consolidating all marine research at SINTEF into a single institute. This involved a merger of the institutes MARINTEK, SINTEF Fisheries and Aquaculture, and the Department of Environmental Technology at SINTEF Materials and Chemistry. The new institute, SINTEF Ocean, became operative on

1 January 2017. The Board intends that the institute will become an attractive business partner for all sectors operating in ocean space, and contribute towards making the entire scope of SINTEF's skills and expertise available to our clients in this field. This integration of expertise shall fuel our ambition to generate research-related, strategic, market- and cost-related synergies for SINTEF's future activities in ocean space.

### **Technology for a better society**

By means of our high technical standards, combined with the excellent efforts of our employees, SINTEF continues to generate results for its clients and society at large, helping towards achieving our vision of "Technology for a Better Society". The following are some examples of our activities in 2016.

In the construction sector, digital tools, systems and processes all combine to promote better collaboration and shorter construction times. SamBim is a research project that addresses interaction during the construction process. It demonstrates that better planning and collaboration among technical disciplines prior to the commencement of construction, combined with digital aids such as 3D-modelling and Building Information Modelling (BIM), make the construction process both more efficient and less expensive. Together with organisations such as Skanska, Fafo, Statsbygg, Link arkitektur and Multiconsult, both NTNU and SINTEF have participated in projects that, among other things, have utilised the new Urbygget on the campus of the Norwegian University of Life Sciences (NMBU) as a case study. This project introduced BIM kiosks to the construction site, enabling both designers and craftsmen to follow the construction process digitally. It has demonstrated that we can make considerable savings by getting construction right first time, and that the sector can increase its competitiveness by utilising digital aids such as BIMs, 3D models and sensor technologies.

SINTEF's traffic researchers are working to bring know-how from neuroscience to studies of people's behaviour and performance in traffic. Key topics in this research include risk willingness, learning, and child and adolescent development and performance capability. The way children cycle in traffic requires more than just keeping their balance. Children have to observe and interpret what the traffic is doing, make decisions and take action – all within variable frameworks of time and distance. There is a constant interaction between a child's neurobiology and the surroundings he or she inhabits. A child's brain is in a constant state of change, involving the gradual

development of many functions such as attention control. SINTEF has been heading a project that aims to find out how proficient children are at consciously adhering to a plan and focusing their attention. The results will give us indications as to what cycling instruction in schools should focus on, and provide us with new knowledge about when it is safe for children to start cycling independently in traffic. The project was funded by Trygg Trafikk, the Sør-Trøndelag county traffic safety board, Trondheim municipality's "Green Initiatives Package" and Bodø municipality.

All forms of energy production have an impact on the natural environment. The question is how, and by how much? The research centre CEDREN, headed by SINTEF, employs both biologists and technologists, and has developed an approach called "environmental design". The method facilitates the co-existence of energy production with healthy populations of salmon and other wildlife in rivers close to hydropower plants. In short, the approach enables the assessment, development and implementation of measures that enhance the living conditions of salmon and other wildlife in the river, while minimising consequent losses in power production. CEDREN is one of the Centres for Environmentally-Friendly Energy (CEERs), established and funded by the Research Council of Norway.

In spring 2016, the world's first industrial-scale experiment involving the three-phase transport of oil, water and gas in the same pipeline was carried out in the 'big loop' at SINTEF's Multiphase Laboratory. Technology developments such as this can contribute to major wealth generation. Reliable predictions of pressure drop are crucial to the optimal design of long, wet gas pipelines. Existing models are not equipped to describe the complexities of three-phase flow in pipelines. A campaign of experiments was carried out to study pressure drop at high gas flow rates in the presence of small fluid volumes while varying the volumes of water and oil. The experiments demonstrated a strong and complex relationship between pressure drop and water content. Measurement of these phenomena has provided the industry with important new knowledge, and new experiments are planned to examine this in detail.

A team of Norwegian, French and Australian researchers is the first in the world to succeed in quantifying the effects of radiation on individual cancer cells. This means that radiation therapies can now be tailored to individual tumours and thus be more effective. The recently developed sensor is the first of its kind and can measure radiation doses at the level of the individual cell. It enables doctors to obtain a picture of how much damage each cell has incurred following treatment. The very first sensor prototype saw the light of day at SINTEF's microsystems and nanotechnology lab (MiNaLab) following a major multinational project involving researchers in the field of medical radiation physics.

The spread of antibiotic resistance among pathogenic bacteria is a growing global threat to human health. New technology is essential if we are to counteract this trend and guarantee effective treatment of life-threatening infections in the future. In 2016, SINTEF Biotechnology and Nanomedicine launched a research project called INBioPharm, which is one of six projects linked to the Research Council of Norway's new biotechnology programme called "Digital Life". The INBioPharm project links key infrastructure platforms with leading Norwegian expertise in the fields of system biology and marine bio-prospecting at SINTEF and NTNU. The new technology platform will make it possible to discover new naturally-occurring antibiotic

substances more quickly, and thus enable new medicines to reach their markets faster.

In 2016, Norway took the initiative in the global race towards the development of autonomous (unmanned) vessels. Autonomous vessels can reduce emissions from shipping by up to 50 per cent and make considerable improvements to transport systems. In September, Trondheimsfjord became a centre for the testing of such vessels, and the fjord will be used as a laboratory for revolutionary new concepts. This is a global-scale pioneering project and the result of a research collaboration between NTNU, Kongsberg Seatex, Maritime Robotics and SINTEF. October also saw the establishment of the Norwegian Forum for Autonomous Ships (NFAS), which represents the establishment of a full-scale marine laboratory as well as a Norwegian collaborative project in the field of autonomous shipping technology.

In December 2016, based on its past and present achievements, SINTEF was awarded a prize by the UN Secretary-General for "leadership and innovative practice aimed at meeting current global energy challenges". The prize was awarded by Secretary-General Ban Ki-moon at UN headquarters in New York, following an international competition involving 157 nominees under the umbrella "sustainable transport". The first prize is a grant of USD 1 million to be used towards an activity designed to enhance the sustainability of global energy consumption. Specifically, the UN chose to award the prize to a joint Norwegian-Tunisian project application submitted by SINTEF and its partners in Tunisia. SINTEF will use the prize money to head a three-year project in Tunisia, together with partners from Tunisia and Hungary. The aim is to rebuild a traditional Tunisian coastal vessel and transform it into a green demonstration vessel by using a battery-powered electric engine. This initiative will enable the construction of a solar panel farm close to the vessel's home port. Power from the solar panels will be used to charge the vessel with green electricity.

## Commercialisation

At the close of 2016, SINTEF TTO had 15 companies in its portfolio, and during the course of the year invested a total of NOK 28 million via the SINTEF Venture fund. One of the funding recipients is a company called SpinChip Diagnostics, which is currently developing a device that analyses blood samples more quickly and more accurately than is currently possible at health clinics and by hospital laboratories. Rapid diagnosis ensures that critical treatment of serious conditions can be commenced more quickly. Instead of waiting for hours or days for an answer from a distant, centralised, laboratory, SpinChip Diagnostics' innovative tool will ensure that samples can be analysed at the treatment location, which may be a local health clinic, hospital ward or accident and emergency clinic. The device looks like a coffee capsule machine, and is just as easy to use. All you need is a sample from a pricked finger. The capsule containing the sample is then inserted into the device and the answer will appear in a matter of minutes. Initially, the company is focusing on an analysis method that provides more rapid answers in the case of a heart attack, which is a condition with diffuse symptoms but where rapid treatment can be decisive.

## Health, Safety and the Environment

At SINTEF, HSE issues are assigned the highest priority and the safety

of our employees takes precedence over all other considerations. Our responsibility for our employees' safety and working environment is taken very seriously. Effective collaboration between employees and management is essential for promoting a sound and health-promoting working environment.

HSE issues have a prominent place in SINTEF's principal strategy, and we operate with four main aims in connection with our HSE-related work:

- *SINTEF shall have a sound and health-promoting working environment.*
- *SINTEF shall achieve zero occupational sickness absence*
- *SINTEF shall incur zero levels of accident, injury, damage and loss*
- *SINTEF shall operate with a clear environmental profile*

Work carried out to achieve improvements within the institutes is documented in SINTEF's annual HSE report and in local action plans.

The safety campaign "Bry deg" (Show Your Care), which has been a major area of focus during 2015 and 2016, was completed during the first quarter of 2016. A total of 1600 employees took part together with more than 95 per cent of managers in a total of 69 meetings. The safety campaign contributed towards excellent progress in the field of safety, as revealed in SINTEF's working environment survey. The organisation has worked to follow up those areas for improvement and initiatives that emerged from the campaign meetings. The key lessons learned from the campaign have been summarised and presented to SINTEF's management and employees.

In 2016, a total of 32 incidents were recorded resulting in personal injury. Five of these involved subsequent sickness absence. During the autumn, a project was launched to obtain a better assessment of the causes of accidents and near misses that had been recorded during the year. The analysis revealed fewer personal injuries compared with 2015, but a much higher number than in 2014. There was a small increase in injuries requiring medical treatment, while injuries resulting in sickness absence and those requiring first aid showed a small decline. There are still too many injuries in the context of our zero-injury target.

In 2016, in the light of our goal to direct greater focus on serious incidents, SINTEF drew up a new procedure for experience sharing, called the "HSE one-pager". The idea is to provide a one-page presentation containing a brief description of the incident in question, focusing on the causes of, and lessons learned from, the incident. An "HSE one-pager" can be used at Group management meetings, institute management meetings and in other fora. During 2016, a total of 11 "HSE one-pagers" were presented to Group Management, all of which were made available to SINTEF's employees.

SINTEF's reporting and non-conformance system (Synergi) makes it possible for line managers and other relevant personnel to follow up incident reports. In order to enhance our safety culture, we rely on incidents being reported and followed up locally. Group Management is monitoring developments closely, and positive trends are emerging in the handling and subsequent closing of specific cases. In 2016 Synergi was expanded with a new function in the form of a root cause module enabling the analysis of causal factors. The Synergi app was introduced in April with the aim of encouraging higher levels of notification during fieldwork projects and business travel. To date however, no assessment has been made as to

whether this has resulted in a higher number of notifications from fieldwork sites and business travel.

In 2016, 510 HSE-related notifications were entered in the Synergi system, of which 40 were via the Synergi app. Of these, 418 were notifications of hazardous situations or observations, 50 involved near-misses, and 42 were actual accidents. Thirty-two of the incidents and observations were judged to constitute potential risks in critical areas. Approximately 60 per cent of the notifications came from laboratories and workshops, with 20 per cent from office and communal areas.

The incidents demonstrate that we must continue to assign high priority to work towards reducing occupational injuries. In 2016, the indices H1 (injuries resulting in sick leave) and H2 (personal injury frequency) were 1.4 and 4.8 respectively, compared with 1.9 and 4.3 in 2015.

The responsibility for ensuring that employees complete their HSE training rests with line managers, with support from HSE and HR personnel. In 2015 we introduced in-house mandatory training requirements, and during 2016 we have been working to close any training gaps. Some institutes have progressed further than others and have achieved high levels of implementation in relation to the HSE platform, combined with effective HSE risk assessment methods.

In 2016 an audit of a mandatory HSE-related e-learning course in laboratories and workshops was completed, and the course will be made available during the first quarter of 2017. Classroom training is arranged by the SINTEF School in collaboration with NTNU and the student welfare organisation in Trondheim. Mandatory training is also carried out locally within the institutes.

The use of chemicals is an important aspect of SINTEF's research activities, and effective procedures are essential to prevent personal injury and unwanted health consequences. In 2016, work has been carried out to develop a risk-based method for the selection of employees for health examinations, and this has helped towards developing a system that will meet the requirements for the establishment of an exposure register. The Norwegian Labour Inspection Authority has given SINTEF a positive assessment of the proposed system.

SINTEF's sickness absence rate stands at 3.7, which is still a little higher than our 3.5 per cent target. Occupational sickness absence was recorded at 0.3 per cent. SINTEF is an "Inclusive Working Life" (IA) enterprise and sickness-related absences are systematically followed up by the relevant institutes. Line managers, supported by HR personnel, are jointly responsible for the follow-up of sickness absences.

The arrangement with each SINTEF Foundation institute's WEC was established in 2015 and evaluated in 2016. The aim of this arrangement is to ensure that the WEC's statutory activities are carried out at local level, close to the personnel that are directly affected. The evaluation revealed that the arrangement was off to a good start and that the formalities are in place. The idea behind areas for improvement is to stimulate more discussion during meetings and consolidate role awareness and expertise linked to the tasks of the WEC. In 2017 work will be carried out to implement training for WEC members.

In 2016 it was decided that SINTEF should seek certification in compliance with the following three standards; Environmental Management Systems (ISO 14001:2015), Quality Management Systems (ISO 9001:2015) and Working Environment Management Systems (OHSAS 18001:2007). The preparations for certification have been ongoing during the second half of 2016. The first certification audit was completed in December 2016, and the certificates received in February 2017. Certification provides an important boost to the organisation in an increasingly demanding and competitive market. Certification of the entire organisation consolidates SINTEF's status as an integrated enterprise with a joint management system, providing high quality services to its clients.

### **Financial independence**

In 2016 SINTEF reported an ordinary operating profit of NOK 80 million, compared with NOK 52 million in 2015 (prior to phasing out the pension scheme). The pre-tax profit was NOK 97 million, compared with NOK 60 million in 2015.

There was a decline in net operating revenues in 2016 of 2.8 per cent, compared with growth of 4.3 per cent in 2015. In 2015, sales of assets in the companies GasSecure and Resman generated one-off revenues of NOK 93 million.

The market has been challenging throughout the year, especially in the oil and gas sector. We continue to focus strongly on sales efforts, cost reductions and other measures designed to secure profitability in the markets where we operate. Cost reduction measures implemented in 2015 resulted in a total annual effect of NOK 230 million for the year from 2016, and a further NOK 70 million in 2016 for the year from 2017. At the start of 2017 all institutes have healthy project order books. This is the result of proactive sales efforts combined with many significant resource adaptations carried out in recent years.

At the close of 2016, our liquidity situation continues to be sound, but was observed to weaken in the latter half of the year, and is now the subject of close monitoring. SINTEF has established a joint arrangement within the Group for the investment of its liquidity reserves. The portfolio is invested in accordance with SINTEF's "Rules governing internal financial management", dated October 2016. In 2016, on average, NOK 292 million has been expended on administration, compared with NOK 313 million in 2015. Our low-risk profile contributed to a positive yield of 0.22 per cent in 2016, compared with 8.4 and 6.6 per cent in 2015 and 2014, respectively.

SINTEF is exposed to currency exchange fluctuations in that some of its project revenues are in foreign currencies, although project costs are entirely or largely in Norwegian kroner. Futures contracts are employed to reduce this risk. We have specifically evaluated the potential risk and our freedom of action in the event of serious collapse of the Eurozone.

During both 2014 and 2015 we experienced a significant weakening of the Norwegian kroner in the foreign exchange markets. This has made both 2015 and 2016 challenging years in relation to EU revenues based on contracts entered into in 2012 and 2013. The value of revenues from completed work is prepared based on exchange rates projected at the projects' reporting milestones.

It is essential that SINTEF succeeds in creating a financial surplus which can be invested in new research and skills development. In 2016, SINTEF invested NOK 100.2 million in laboratories, scientific equipment and other business assets. The corresponding amount in 2015 was 156.5 million.

SINTEF currently enjoys a robust financial position. As of 31 December 2016 SINTEF holds an equity of NOK 2,178 million (2,126 million), which represents 60 per cent (58) of its total equity. The corresponding figures for the SINTEF Foundation are NOK 1,929 million (NOK 1,875), which constitutes 66 per cent (65) of its total equity.

The annual profit for the SINTEF Foundation in 2016 was NOK 57 million, compared with a loss of NOK 207 million in 2015. This is allocated in its entirety to "other equity".

Our equity and operational status, combined with our cost-saving initiatives and a satisfactory order book, provide us with a good basis for declaring the organisation a going concern. The Boards of the subsidiary companies have made similar assessments, and all have concluded that we have the basis of a going concern. The Board is not aware of any circumstances that have arisen since the close of the accounting year which affect its opinion regarding the financial position of either the Foundation or the Group. On this basis the Annual Accounts have been prepared under the going concern assumption.

## Clients

SINTEF creates opportunities for our private and public sector clients and contributes to their wealth generation. We also promote the healthy development of society as a whole. This is one of our most important contributions to the community at large.

In 2016, SINTEF completed 5,722 projects for a total of 3,954 clients of all sizes. Projects were carried out for both private and public sector clients in fields including renewable energy, oil and gas, the marine and industrial sectors, building and infrastructure, as well as enabling technologies, health and welfare and social science research.

A significant number of projects are carried out involving cross-disciplinary collaboration among the various SINTEF institutes. Broad, cross-disciplinary approaches provide unique opportunities for the development of effective solutions. A multidisciplinary focus is essential as a basis for delivering solutions to meet the great and complex challenges currently facing society, especially in connection with digitisation, health and welfare issues, and the so-called "green transition".

SINTEF's participation in the major, long-term, research centres also entails extensive involvement among our Norwegian and overseas clients. SINTEF is currently participating in nine Centres for Research-Based Innovation (SFIs) and 14 Centres for Environmentally-Friendly Energy Research (CEERs). Taken together, these activities involve the participation of just over 200 industrial enterprises. Participation in these centres provides these companies with long-term knowledge development at the forefront of international research, and contributes towards consolidating their networks and boosting their competitiveness.

Our relationships with our clients and understanding of their needs are of crucial importance. The process of enabling effective dialogue with clients in an atmosphere of trust at all organisational levels is high on Group Management's list of priorities. This also involves increased levels of dialogue with the public authorities, primarily in Norway, but also in the EU and other countries. In 2016, SINTEF attended a series of high-level meetings with many international companies, public authorities and institutions.

Under the banner "Technologies that change working life", SINTEF's CEO was one of the keynote speakers at the Annual Conference of the Federation of Norwegian Enterprise (NHO) on 7 January 2016. The presentation was based on a report that SINTEF had prepared for the conference containing scientific contributions from many of the SINTEF institutes. Since this conference, representatives from SINTEF's Group Management have attended most of the NHO's regional annual conferences with the dual aim of meeting the Norwegian business community and presenting the importance of new key technologies to Norwegian working life and commercial competitiveness. These fora have provided excellent opportunities for active dialogue on these issues throughout the country.

Contact between research scientists and their clients is important for the development and implementation of high-quality projects. Project management, effective implementation competence and teamwork are essential for effective project work. SINTEF's Group Management focuses strongly on project quality, and will boost its efforts in this area during 2017.

The company SINTEF TTO commercialises research results by facilitating the launch and development of new companies, patenting processes and the licensing of technology. In 2016 seven commercialisations were implemented in the form of three licensing agreements and start-up of the following companies:

- ChemFree has developed a new system for the chemical-free and environmentally sound dispersal of marine oil spills.
- Array-on-a-dime produces a microphone that dramatically improves speech recognition technology installed in devices such as mobile phones.
- BrainImage enables the more sensitive removal of brain tumours during surgery leading to better results by using a new and improved contrast fluid that is injected into the body prior to the operation.
- Zivid Labs has developed a new 3D camera that improves robotic vision in industries varying from furniture to car manufacture.

At the close of 2016, SINTEF TTO had 15 companies in its portfolio, and during the course of the year invested a total of NOK 28 million via the SINTEF Venture fund. In total in 2016, SINTEF TTO has contributed to the purchase of R&D services at SINTEF to the value of NOK 95 million. This has enabled the start-up companies to be supplied with the specialised technological skills and expertise that are essential for their success in global markets.

## Research

The work to promote SINTEF's profile as a research centre continued during 2016. It is essential that SINTEF maintains an effective balance between academic publication and contract research projects. The most important demonstration of our research results occurs when new technologies and systems are finally made use of by our clients

and society at large. However, publication in the international arena is also assigned high priority, and the Board underlines the importance of SINTEF being actively involved in and contributing to its own skills development and the global advance of new knowledge by means of publication. Publication promotes the profile and enhancement of scientific quality. Our aim is to publish at least one peer-reviewed scientific publication per research scientist per year. In 2016 the figure was 0.71 publications per research scientist per year, compared with 0.69 in 2015.

SINTEF's size and international standing is significant for the effective exploitation of research funding in Norway. This is clearly expressed in connection with the EU's research programmes, where SINTEF is by far the largest Norwegian player. Participation in the EU's Framework Programmes is key to enhancing the quality of SINTEF's scientific output, enabling it to remain in the forefront of international research in fields such as ICT, biotechnology, energy, nanotechnology and materials science.

Investment in laboratory facilities is crucial if Norway is to continue to develop as a country where know-how is produced, boost its global competitiveness and attract the best students and research scientists. Since 2007 SINTEF has invested more than NOK 1 billion in laboratories, scientific equipment and buildings.

In December 2016 the Norwegian Ministry of Trade, Industry and Fisheries announced a concept selection study (KVU) linked to alternative models for a future knowledge centre for ocean space technologies – the Ocean Space Centre. The comprehensive report prepared by external experts concluded that the creation of such a centre would be beneficial in a socio-economic context, and endorsed the concept recommended by SINTEF and NTNU. This is an important step towards realisation of the concept, and it is also very positive to see that the government supports completion of the Ocean Space Centre as part of its new ocean strategy.

Strategic collaboration with universities and other research institutes is vital if we are to maintain a robust national research arena. The strategic collaboration between NTNU and SINTEF is of considerable importance. It contributes towards keeping SINTEF's applied research in the international academic forefront, while enabling NTNU to carry on extensive research directed at finding specific solutions to issues facing businesses and society.

In 2016 the respective Boards at NTNU and SINTEF adopted a plan for the intensification of this collaboration by means of the "Better together" project. Third party analyses of the project demonstrate that our 66-year collaboration has been highly significant for Norwegian research and innovation. It has also highlighted the need to define and be aware of the differences in roles and terms of reference between the universities and research institutes, and to boost incentives that promote collaboration and effective work demarcation.

SINTEF is an active participant in international research projects. There has been much focus on our involvement in the European Energy Research Alliance (EERA), which has an important strategic role in the field of European energy research. Together with NTNU, we are engaged in a strategic collaboration with leading research centres in Japan and the USA in the fields of energy and materials science.

Priority is assigned to the SINTEF Group's main areas of focus –

typically involving three-year cross-disciplinary research projects in fields that are of special importance to SINTEF. The following areas of Group focus were initiated in 2013 and will be completed at the start of 2017: bio-based products from sustainable resources, ManageIT, SEATONOMY and Welfare technologies. In total, SINTEF has invested NOK 180 million in twelve Group areas of focus since 2006.

In 2015, the Research Council of Norway established a number of new centres for research-based innovation (SFIs), all of which became operative during 2016. The SFIs support innovation in the form of significant investments in long-term research projects involving close collaboration between industrial enterprises with active R&D programmes and the leading research centres. SINTEF is involved in nine of the new centres, and has been assigned the role of coordinator for four of them. The centres in which SINTEF is participating involve the fields of exposed aquaculture operations, climate change adaptation, smart maritime technologies, fabrication, advanced materials, advanced ultrasound, the process industry and maritime operations.

In May 2016 the Norwegian Ministry of Petroleum and Energy granted approximately NOK 1.3 billion in support of eight new Centres for Environmentally-Friendly Energy (CEERs). Both SINTEF and NTNU are participating in all of the eight new centres, and SINTEF is acting as coordinator for three of them. Support payments will be made for up to eight years and will trigger equally large amounts from the business and industrial sector, as well as R&D partners.

In total, SINTEF is currently participating in 14 CEERs, and is coordinator for six of them. A summary report completed in August 2015 revealed that six of the CEERs that NTNU and SINTEF were then participating in had triggered as much as NOK 950 million in investment in research from business sources. This investment resulted in more than 200 registered innovations, including technology licences and start-ups derived from CEERs in which NTNU and SINTEF are currently participating.

It is positive that national research strategies such as the Energi21, Hav21 and OG21 programmes linked to a series of industrial sectors are being put in place. Joint research strategy platforms involving both industry and the public authorities are of great importance to both technical quality and innovative competence. SINTEF has assigned high priority to its participation in these processes. It is pleasing to see that the government has also indicated that it will be launching work to develop a similar strategy (Digital21) for digitisation.

In February 2016 an international panel of experts published an assessment of Norway's techno-industrial research institutes. The assessment concluded that the institutes play an essential role in the Norwegian innovation system and that direct and indirect economic spin-offs are of key importance to Norway, as well as Norwegian businesses and public sector organisations. SINTEF is highlighted as a well-run organisation with a strong management team and highly skilled employees, enjoying a particularly strong status in the EU's research programmes.

The social science research institutes were also assessed by an international panel of experts in 2016. SINTEF Technology and Society received a positive assessment, and is described as an institute that can demonstrate a significant impact on the shaping of domestic policy initiatives, health services and business development. The

assessment recommends that SINTEF should place strong emphasis on exploiting the full potential of the “One SINTEF” concept, and combine this in an effective collaboration between itself and NTNU.

## People

SINTEF's aim is to be an attractive workplace offering unique development opportunities for people with knowledge and enthusiasm. Whether or not SINTEF is viewed as such is monitored by means of our working environment survey conducted every second year.

The survey was carried out in January 2016, with a response rate of 93 per cent. The results of the survey confirm that overall, SINTEF is a good place at which to work, although some need for improvement was also identified. These challenges are being looked into, and work is being carried out to utilise the results as a basis for future improvements. Follow-up measures were implemented during 2016 according to plan.

The role of management is vital in this context. SINTEF is working systematically to develop its management resources, with a focus on individual managers and team spirit. It is important to boost the quality of our middle management. We are placing increasing emphasis on the development of managers responsible for major, complex projects and on enhancing their aptitude for efficient teamwork across the scientific and organisational disciplines. This is essential if we are to address the major challenges of our times.

SINTEF continues to be successful in competition for skilled employees in the global market. We place great emphasis on taking care of and fostering the development of our current staff, while at the same time working to safeguard future recruitment by means of brand development and promotional activities in the domestic and global markets. SINTEF's ranking has improved in the list of attractive workplaces compiled on the basis of student surveys. Results from the major Universum survey reveals that we are currently third on the list of Norway's most attractive places to work among technology students.

2016 was the year in which SINTEF focused on safeguarding its operations in challenging economic times, while simultaneously exploiting its growth potential. Staff reductions were carried out in some of the research groups in order to adapt capacity to reduced activity in certain markets, most notably in the oil and gas sector.

As of 31 December 2016, SINTEF had a total of 1,960 employees. Of these, 1,154 were employed by the SINTEF Foundation. In 2016 SINTEF had a staff turnover of 6.8 per cent, and exhibited a turnover of 6 per cent within the group defined as “scientific personnel”. Employees leaving SINTEF represent an important contribution to skills development in industry and the public sector.

Fifty-five per cent of our researchers have doctorate degrees, compared with 44 per cent in 2009. In 2016, 432 of our employees (22 per cent) hailed from a total of 74 countries outside Norway. This shows that SINTEF is attractive to international research scientists and that we are successful in bringing highly qualified researchers to Norway. SINTEF's overseas employees provide a valuable source of scientific and cultural expertise. The majority of employees from outside Norway are from Germany and France.

## Equal opportunity and family policy

The Board and Group Management are fully committed to promoting equal opportunity at SINTEF. One of SINTEF's objectives is to increase the proportion of women among both its research scientists and managers. The President of the SINTEF Group is a woman. When vacancies arise, SINTEF aims actively both to recruit women and to develop female managers from its own ranks. Structural imbalances in recruitment practices applied in the educational establishments are nevertheless reflected in SINTEF's staff.

Gender distribution within SINTEF is shown in the table below.

	Men	Women
The Board	44	56
Group Management	71	29
Research managers and middle managers	63	37
Research scientists	71	29
SINTEF	65	35

In 2013, the Research Council of Norway awarded SINTEF a three-year project (the so-called Balance Project) to promote a better gender balance among its high-level technical positions and research managers. The project is now in its final phase and has contributed towards increasing the proportion of female managers at SINTEF. It has provided valuable know-how that can be applied both at SINTEF and other Norwegian research centres.

SINTEF subscribes to the following agreements: NHO/Tekna, NHO/NITO, NHO/Forskerforbundet, NHO-Abelia/LO-NL and NHO-Abelia/Parat. We conduct annual salary negotiations with employee representatives. Salaries and conditions of employment are determined by negotiation and discussion with representatives in the respective employee organisations. Women are considered on an equal footing with men. We carry out systematic monitoring to ensure that undesirable salary differentials do not arise.

81 per cent of our work force are full-time employees. 24 per cent of our female employees and 17 per cent of males work part-time. One reason for the part-time employment statistics is that employees are taking advantage of the opportunity to reduce their working hours while receiving an early negotiated pension. SINTEF makes very little use of temporary employment arrangements. At the end of the year, 47 employees (2.4 per cent) were in temporary positions, 20 of them women and 27 men.

SINTEF's working environment survey for 2016 revealed no significant differences in terms of how men and women felt about their work situation. We will continue to develop focused initiatives to ensure that SINTEF remains an attractive workplace for both sexes.

It is one of SINTEF's aims to be successful in the global recruitment market. Many vacant research positions are advertised in English, and applicants worldwide have access to all job advertisements.

To ensure that foreign employees are well taken care of, SINTEF has established an integration programme for employees from other nations and their families. The programme offers expat services, free Norwegian lessons and teaching in English at the SINTEF School. Diversity management is one of the themes of the SINTEF School's manager development programme. Findings from the working environment study indicate that overseas employees enjoy working at SINTEF.

SINTEF goes to great lengths to meet the needs of employees with special adaptation requirements. As part of our IA objectives we are committed to adapting workplaces to those of our employees who either have, or develop, disabilities. This work takes place in close co-operation with the Norwegian Labour and Welfare Administration (NAV), and we make full use of available public support arrangements to facilitate this activity. It is also a defined IA objective that we pursue the current practice of focusing on skills and qualifications during the recruitment process, rather than on any limitations resulting from a disability.

SINTEF shall be an organisation that welcomes rounded individuals with a life outside the workplace. We therefore allow flexible arrangements to meet the individual's needs, such as flexible working hours for all employees and special arrangements for parents with young children.

### **Internationalisation**

It is SINTEF's objective to be a world-leading research institute. Internationalisation is an integral part of SINTEF's business operations. We have been successful in the following fields of our globalisation strategy: The strengthening of our academic network, participation in the EU's research programmes, international sales of R&D services and international recruitment. At the same time, we must acknowledge that we have yet to find workable solutions to the problem of establishing a profitable presence outside Norway.

SINTEF was by far the best-represented Norwegian participant in the EU's 7th Framework Programme for Research and Development, which was concluded at the close of 2013. As part of this programme, SINTEF was granted participation in 254 projects, and the role of coordinator in 55. The EU has awarded SINTEF a total of EUR 149 million in support funding. Research linked to some of these projects will continue up until 2018. We are currently focusing strongly on achieving new projects linked to the Horizon 2020 programme, which was launched in 2014. As of February 2017, SINTEF has been granted participation in 104 projects in this programme, including 25 as coordinator. The EU has awarded SINTEF a total of EUR 60 million in support funding.

SINTEF's competitive success in the EU's research market demonstrates that our expertise has achieved international recognition. In order for SINTEF to fulfil its role in society at large, it is essential for us to be able to develop globally competitive solutions and to bring state-of-the-art know-how and networks to our clients.

The biggest challenge we face in connection with EU research projects has been that on occasion we have experienced a lack of clarity regarding the terms of reference set out for our participation. Moreover, the EU's compensation arrangements are tailored to research practices in other countries, by which the host nations cover the greater part of the costs. SINTEF is pleased that 2015 saw the establishment by the authorities of the "STIM-EU" support scheme, which provides funds to protect research institutes' resources from over-depletion during EU research projects. Nevertheless, we still fail to achieve full costs coverage in connection with our EU research projects, and the Board emphasises that SINTEF relies on this investment in knowledge being rewarded with greater activity linked to industrial clients so that our overall research portfolio can deliver acceptable financial returns.

In 2015 SINTEF established an office in Brussels at the same premises as NTNU and the University of Bergen. The aim of establishing a presence here is to further consolidate our networks and participation in EU-funded research programmes. Our experience from 2016 shows that our presence in Brussels is important.

The authorities have set out an ambitious EU-related research strategy, and this was followed up in the Norwegian budget with a considerable consolidation of the STIM-EU scheme. Further increases in support, in step with the extended scope of the EU programme, are crucial if the stated research strategy aims are to be met and stable terms of reference established. It is essential that SINTEF's costs for participation in EU projects are covered in the same way as for those funded by the Research Council of Norway.

International sales in 2016 amounted to NOK 448 million, compared with NOK 499 million in 2015. This corresponds to 14 per cent (17 per cent in 2015) of SINTEF's total sales. We have completed projects for clients in 63 countries, and EU projects represent about 50 per cent of our international activity (38 per cent in 2015).

### **The external environment**

*Based on our vision of "Technology for a better society", SINTEF aims to give due consideration to the external environment in all aspects of its business activities.*

*The aim of SINTEF's environmental policy is to ensure that both our research and the management of our own business activities are carried out with due consideration for the external environment. It shall also ensure the continuous improvement of our own environmental performance.*

*(Extract from SINTEF's external environment policy)*

The certification process carried out in 2016 has demonstrated that SINTEF has potential for improvement in its approach to assessing and prioritising environmental issues linked to its own activities. At the same time, the certification body highlighted some good examples of environmental assessment procedures that should provide the basis for a best practice model.

Environmental issues shall be assigned priority not only in connection with our own activities, but also during projects and in the application of the results of our projects. The last of these entails that we wish by means of our research projects to contribute towards environmental benefits for our clients and society at large.

By working systematically to reduce pressure on the environment, SINTEF is assuming environmental responsibility and meeting the expectations of its clients. In 2016, a single incident of pollution of the external environment was recorded, involving a spill of 100 litres of oil from an outdoor storage tank. The incident was controlled in an effective manner and the damage was limited.

SINTEF aims to reduce both the amounts of waste it generates, and its energy consumption. Measurement parameters were established in 2016 that will form the basis of goal management initiatives for the period leading up to 2018.

Our most important contributions to the environment are our world-leading research and development activities focused on renewable



energy, climate-related and environmental technologies. These fields constitute significant areas of focus in SINTEF's principal strategy document. Our environmental work is communicated actively to the outside world by means of the dissemination of our research and expertise in the field of environmental science.

## Ethics

SINTEF operates on the basis of a clear ethical platform. "Ethics, values and leadership" are key aspects of SINTEF's principal strategy. Our ethical guidelines can be found assembled in SINTEF's "Ethical Compass", document, which is accessible in the public domain via the SINTEF website.

Ethics-related work at SINTEF encompasses the fields of research, business and relational ethics. SINTEF's research ethics are based on regulations determined by the Norwegian ethics committees, on the principles promoted by the European Group on Ethics in Science and New Technologies, and by international agreements such as the Vancouver Convention.

SINTEF has made a commitment to the EU Charter and Code, or the "European Statement on Researchers" and "Code of conduct for the recruitment of research scientists". From an EU perspective, this is both an obligation and an aid to creating an attractive European research environment that enables research scientists to enjoy sound employment terms and conditions.

SINTEF expects and requires its suppliers and business partners to share our ethical values. Suppliers and business partners involved in our activities are obliged to submit written acceptance of our code of ethics. Ethical matters are discussed in management team and departmental meetings, and it has been the practice for many years that HSE and ethical matters constitute the first item on the agenda of all internal meetings.

Following up ethical guidelines is the responsibility of management. In addition, SINTEF has an Ethics Council and its own Ethics Ombudsman. The Ethics Council consists of six members, all of whom are either managers or elected SINTEF employee representatives. Four council meetings were held in 2016. The Ethics Ombudsman acts as an advisor and discussion partner for the entire SINTEF organisation and is also consulted in connection with external matters. The Ethics Ombudsman arrangement means that SINTEF satisfies the requirements of the Norwegian Working Environment Act regarding an in-house notification channel.

In autumn 2016, Tove Håpnes was appointed as the new Ethics Ombudsman at SINTEF, succeeding Svein Nordenson, who retired after ten years in the post.

SINTEF personnel currently have seats on three Norwegian research ethics committees; Medicine and Health, Social Science and the Humanities, and Natural Sciences and Technology.

## SINTEF's role in society

SINTEF's role in society is a key component of our principal strategy, which states that SINTEF contributes towards the development of society at large by means of research and innovation. We contribute towards wealth creation and develop solutions to meet the chal-

lenges facing society today. We also communicate know-how, solutions and our recommendations in a proactive and resolute manner.

A major part of SINTEF's research activities is linked to the development of solutions addressing some of the key issues currently facing society, such as climate change and environmental issues, energy, food, health, clean water and future job creation. This research means that social responsibility is a key part of our core activities and corresponds with our vision of "Technology for a better society".

Our social responsibilities also address the way in which we administer our business activities and their links to issues such as human rights, employee rights and social conditions, the external environment and the battle against corruption. SINTEF has developed policies and guidelines linked to all these fields, which have been incorporated into our management system and code of ethics. Employee rights are safeguarded by means of SINTEF's collective salary agreements and the monitoring of our responsibilities as an IA enterprise.

SINTEF is a member of the UN Global Compact, and actively applies its ten principles on human rights, work standards, the environment and anti-corruption. SINTEF submits annual reports on its status (Communication on progress) in relation to these principles in accordance with the requirements set out in the Compact. This status report is part of SINTEF's annual reporting process and is published on our website.

SINTEF is a member of Transparency International, an organisation dedicated to the elimination of domestic and global corruption. SINTEF adheres to the guidelines and advice provided by this organisation.

An active dialogue with wider society is a key aspect of SINTEF's role. This includes both our role as a provider of terms of reference and research-based facts as a basis for public debate and policy development, as well as our work to consolidate the regulatory framework governing both research and SINTEF as an enterprise. In 2016 we have intensified our efforts to promote public relations and dialogue with the authorities, and this will continue in 2017.

## Corporate governance at SINTEF

SINTEF wishes to be regarded as professional in terms of its leadership and management practices, exercising innovative competence within a non-bureaucratic decision-making structure.

SINTEF's central administrative bodies are the Board and the Council. The Board is the Foundation's principal administrative body, for which the Council acts in an advisory function, with authority as stipulated by the Norwegian Act relating to Foundations (stiftelsesloven) and SINTEF's Articles of Association.

SINTEF's Council carries on supervision to ensure that the Foundation's objectives are adhered to in accordance with the Articles of Association. It elects the Board, determines remuneration of board members and appoints an auditor. The Council is led by the Rector of NTNU and comprises 28 members including representatives from NTNU, the University of Oslo, the Research Council of Norway, the business sector, industry organisations and SINTEF's elected employee representatives.



The Board of the SINTEF Foundation acts as Board of the SINTEF Group. The activities of the three limited companies are governed by their Articles of Association, shareholders' agreements, inter-Group agreements and instructions issued to their respective Boards. Principles for the Group's administration and coordination with affiliated organisations have been established in accordance with SINTEF's overall goals and strategy.

The Board is made up of nine persons. Two are principally employed at NTNU, four are from industry or public sector administration, and three are permanent employees of the SINTEF Foundation. The Board has responsibility and authority in all matters which are not assigned to the Council. The Board acts in accordance with SINTEF's Articles of Association, the Act relating to Foundations, and those parts of the Norwegian Limited Liability Companies Act (*lov for aksjeselskaper*) that apply to foundations. The Board appoints the Group President and determines his or her salary and other employment terms, as well as determining the framework and principles for remuneration of the group management team. The Board held eight meetings in 2016, two of them via telephone conferencing.

SINTEF's Group management is responsible for the strategic administration of the entire scope of SINTEF's business activities. The Group President is responsible for day-to-day operations in accordance with the Articles of Association of the Foundation and Group agreements, and in all other respects in accordance with the Norwegian Act relating to Foundations and the Limited Liability Companies Act. The Group President is authorised to act on behalf of the Foundation, except in connection with the purchase, sale and mortgaging of property and the purchase and sale of companies. The Group President or Vice President acts as Board Chair of all the research companies which constitute the SINTEF Group.

SINTEF has established a system of tertial financial risk reporting. The risk environment is discussed by the management and Board of each of the research institutes, as well as at Group management and Board levels. Risk-reducing initiatives are identified and implemented on a continuous basis.

Following a certification process carried out by DNV GL in December 2016, SINTEF is now certified under the ISO 9001, ISO 14001 and OHAS 18001 standards.

The management system includes a shared system (Synergi) designed to administer accident notifications, unwanted incidents, as well as other non-conformances and suggestions for improvement. SINTEF is registered in the Achilles Joint Qualification System for suppliers to the oil and gas industry.

### **Future prospects and challenges**

With the assistance of its leading expertise centres, SINTEF intends to make an active contribution to wealth generation and competitive competence, and to achieving the public authorities' goals within fields of key importance to society at large.

New technology is vital to wealth generation and the development of solutions to the key challenges facing society today. SINTEF regards it as an important task to assist its clients in boosting their profitability by the application of efficient processes and new technologies used to create new products and fuel growth in new markets. One of SINTEF's strengths is that we offer multidisciplinary expertise by

combining technical teams working together across organisational boundaries. This facilitates the development of effective solutions for our clients and society as a whole.

Digitisation, automation and advanced robotic technologies are fuelling change in all aspects of our working life and in society at large. This creates new opportunities, but also challenges. SINTEF possesses high levels of expertise in these fields, and aims to make an active contribution towards a successful restructuring of the business and public sectors.

In order to develop solutions that will contribute towards a better society, it is crucial to be fully aware of the interplay between technology, people and secure communities. Our aim is to achieve a close integration of research in the fields of technology and the natural and social sciences.

A successful restructuring of society requires acceleration in the application of cross-disciplinary approaches and technological know-how. Technology is blurring the traditional boundaries between established social and industrial sectors, for example, in the fields of smart grids, electric mobility and cyber risk. In order for SINTEF to be able to make a meaningful contribution during this restructuring, it is vital that we succeed in extracting the potential inherent in our cross-disciplinary skills and expertise.

The so-called "green transition" represents a key motivation for restructuring. SINTEF intends to concentrate its efforts on climate change technology and adaptation, renewable energy, energy efficiency and carbon capture and storage (CCS). We are assigning high priority to our future research activities in these fields. Petroleum research remains an important field because oil and gas continue to be key components in the global energy mix and will be important raw materials in other industrial processes for many decades to come. In the field of petroleum research we are placing a major focus on mitigating the negative environmental impacts of fossil fuel production and consumption.

The dramatic fall in oil and energy prices is having a major impact on the Norwegian economy, resulting in declining levels of activity and rising unemployment in many sectors and geographical regions. We note that our clients in the oil and gas and supply sectors have cancelled or postponed planned research projects. At the same time there is a growing need for projects in this sector that can contribute towards rapid and significant costs savings. This is a situation that offers considerable challenges for SINTEF. It is essential to intensify our focus on financial management, effective operations, and our ability to implement the rapid restructuring of our own activities.

This situation brings to the fore the need for a drastic restructuring of Norwegian business and community life, providing not only challenges, but also opportunities for SINTEF. It is vital that we maintain a targeted focus on our clients, not only to safeguard our own revenues, but also so that we can provide them with timely assistance in these challenging times. Major structural changes within society also generate a growing need for research and innovation. Here, SINTEF is ready and equipped with the skills and expertise required to play a major role.

A new country study carried out by the OECD addressing the Norwegian innovation system emphasises the key role that research institutes play in driving restructuring within the Norwegian economy.

However, the report also considers problems linked to the fact that the techno-industrial institutes suffer from very low levels of basic funding, and expresses the view that this will be a challenge during restructuring. Low levels of basic funding have drawn the research institutes very close to their clients. However, this also makes them very reliant on solvent clients linked primarily to the established industries. On their own, the institutes have only limited opportunity to support start-up companies and less solvent organisations in new sectors. The OECD points out that this may restrict business activity to the traditional sectors, and put the brakes on regeneration and skills development in new commercial areas. This is an important issue that both SINTEF and the public authorities should be taking more seriously.

It is crucial that Norway achieves a position from which it can regenerate its domestic stock of laboratories and scientific equipment, so that Norwegian contract research can remain competitive in the international market place. At the same time we recognise that the development and operation of large and advanced laboratory-facilities such as our MiNaLab, the multi-phase laboratory, and the marine engineering laboratories are demanding tasks.

SINTEF wishes to put itself in a position from which, in collaboration with its clients, it can extract more of the growth potential in the field of ocean space. Growth potential linked to the oceans has become considerable in recent years. SINTEF's ambition is to become an expert and visible supporter of the industrial sector, the public authorities and society as a whole. It aims to achieve this by combining leading scientific research with its position in the international forefront of analysis, concept development and influence on public policy. The establishment of SINTEF Ocean AS is a step in this direction.

We are working actively to consolidate our market penetration in the oil and gas sector. This may include the possibility of merging SINTEF Petroleum Research with the SINTEF Foundation.

The Board extends its thanks to all SINTEF employees and business partners for their collaborative efforts and contributions during 2016. We also wish to thank the co-owners of subsidiaries and representatives from the business and wider communities who participate in SINTEF's many boards and councils.

Trondheim, 29 March 2017

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