Skisser med relevans innenfor

Petroleum

Tabell: Oversikt over skisser med relevans for området **Petroleum**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
316431	Hydrogen Links Research Infrastructure	SINTEF ENERGI AS (NTNU)	Petter Nekså	48 400 000
316445	Norwegian Rheology Laboratory	UiS (NTNU, NMBU, SINTEF Industru, NORCE, IFE, UiO)	Mahmoud Khalifeh	120 000 000
316449	National Infrastructure for Multiphase Flows - 2020	IFE (SINTEF, UiO, NTNU)	Karin Hald	23 000 000
316507	IOR and Subsurface Field Lab at Risavika	UiS (NORCE, IFE)	Ying Guo	100 000 000
316513	Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC)	NGI (NTNU)	Kristoffer Skjolden Skau	40 000 000
316515	National Test Centre for Large Industrial Sprays	USN	Joachim Lundberg	5 000 000
316553	Norwegian Digital Subsurface Lab	SINTEF AS	Ane Elisabet Lothe	75 000 000
316572	Hydrogen Safety Laboratory	UiB (USN, UiS)	Trygve Skjold	27 263 000
316590	Fault and fracture characterisation and testing laboratory	NGI (NORCE, NORSAR, UiO)	Luke Griffiths	39 970 000
316612	PreMechatronics Lab	UiA	Kjell G. Robbersmyr	38 300 000

Prosjektnummer: 316431
Tittel: Hydrogen Links Research Infrastructure
Søkerinstitusjon (partnere): SINTEF ENERGI AS (NTNU)
Prosjektleder: Petter Nekså

Sammendrag:
The Hydrogen Linksresearch infrastructure (RI) will enable research on topics that are necessary for efficient use of hydrogen as an energy carrier, and thereby accelerate the transition towards a low carbon society. The elements of the research infrastructure will cover gaps in the national and international R&D environment, especially related to storage, transport and use of liquefied hydrogen (LH2); as well as large-scale end-use of hydrogen for power generation in gas turbines. The knowledge Hydrogen Links will bring forward is essential for utilisation of hydrogen, especially in energy intensive areas, such as utilising hydrogen as fuel for the maritime sector and in order to decarbonise offshore power production. Hydrogen Linkswill contribute to maintaining value creation in important sectors for Norway as well as supporting value creation through new product developments and industries supplying national and global markets.

Prosjektnummer: 316445
Tittel: Norwegian Rheology Laboratory
Søkerinstitusjon (partnere): UiS (NTNU, NMBU, SINTEF Industry, NORCE, IFE, UiO)
Prosjektleder: Mahmoud Khalifeh

Sammendrag:
Rheology is the science of deformation and flow of materials, ranging from liquid to solid materials such as food, drilling fluids, paints, polymers, blood, medicine, concrete, rocks, ceramic-based materials, gas hydrates, etc. Rheology is a fundamental subject for understanding fluid systems and the dynamic behaviour of solids.

The main objectives of the proposed infrastructure are: a) to develop cutting-edge techniques for rheological analysis and characterization combined with advanced data processing and image processing methods; b) modelling rheological behaviour for processing and design; c) facilitate the discovery and development of new functional materials and fluids for use in industries and in society; d) improve process control in advanced production by generating in-depth understanding of the rheological properties of materials (from feedstock to intermediate and final products).

This infrastructure project will bring together leading Norwegian academic and research environments within the field of rheology. The partners in Norwegian Rheology Laboratory (NRL) have a wide range of active research activities related to rheology, such as Pumps & Pipes (UiS, NORCE), research on movement of cancer cells (UiS), sustainable technologies such as carbon capture and storage, hydrogen-based technologies, multiphase flow systems, oil-water dispersions (IFE, SINTEF Industry, NTNU) and processrelated technologies (SINTEF Industry, NTNU, IFE) including oil & gas and energy, background on food and biotechnology (NMBU) and development of new advanced carrier systems for pharmaceuticals based on nanoparticles and complex gels (UiO). The infrastructure project will strengthen multi-disciplinary collaboration related to rheology in Norway and with leading international environments, and result in common project applications, exchange of fellows, students, and experience, and sharing equipment. The collaboration will also help

strengthen smaller research environments within rheology in Norway. The NRL will also support industrial research and collaboration, helping SMEs and industries in developing/ optimizing their services.

We plan the infrastructure to be fully operational within 3 years. NRL will provide services and leading research infrastructure to academia, research organizations and industries, and will make Norway a leading country within rheological innovation, science and technology.

Prosjektnummer: 316449
Tittel: National Infrastructure for Multiphase Flows - 2020
Søkerinstitusjon (partnere): IFE (SINTEF, UiO, NTNU)
Prosjektleder: Karin Hald

Sammendrag:
Currently, IFE, SINTEF, NTNU and UiO have ten different laboratories for research in multiphase flow. The laboratories perform experiments for both industrial and academic partners and are among the best in the world in their focus areas, with a capacity for multiple different measurement methods.

To ensure that the laboratories can continue to deliver up-to-date experimental data to national and international research environments, the partners will apply together for infrastructure funding for upgrade, maintenance, operation and expansion of existing process equipment and instrumentation.

The application will also include funding to establish an extensive searchable database for large amounts of multiphase data which have been collected over decades. Such a database will be an important tool for improving simulator tools and models and will have great commercial value. It may also contribute to increased understanding of central challenges in fluid mechanics.

Prosjektnummer: 316507
Tittel: IOR and Subsurface Field Lab at Risavika
Søkerinstitusjon (partnere): UiS (NORCE, IFE)
Prosjektleder: Ying Guo

Sammendrag:
The planned infrastructure will be owned by the University of Stavanger who is the host of The National IOR Center of Norway in the period 2013-2021, in collaboration with its research partners Norwegian Research Center AS (NORCE) and the Institute of Energy Technology (IFE). The location of such a large-scale infrastructure is currently planned at Risavika test center near Stavanger.

Norway has large oil and gas resources that remain in the reservoirs when production is shut down. Increasing the recovery rate of reservoirs in operation is therefore of great importance. This can be done, for example, by injecting water with compositions other than seawater used in Norwegian oil fields today. Current focus on CCS opens for another possibility to include CO2 in the injection water for IOR in combination with permanent storage for CO2.

Experimental studies in the laboratory show that different additions (salts, chemicals or CO2) to the injection water can have positive effect on the recovery rate. The question is whether the IOR potential measured at core scale of a few centimeters in the current practice will work equally well in

a reservoir that can be kilometers in extent. The investments for IOR projects are large, and it is therefore important to reduce uncertainties by validating results in relevant scale and realistic conditions such as temperature and pressure in the reservoir. In addition, adequate and well-calibrated modeling tools are needed to estimate improved recovery rate for different injection strategies. Such estimate and model validation from offshore pilot are costly and often inconvenient, therefore raise the need for a field-scale laboratory where test samples of several meters could be used to better represent flow from well into reservoir. Advanced instruments are included for data acquisition and analyzing the mineral rock surface, mineralogy, fluid composition and properties before, during and after experiments. The measurements from such a field lab can substitute costly field pilots for IOR and also for safe geological storage of CO2. We believe that this infrastructure will bridge the pore, core and field scales, which today is a challenge both in industry and academia, to explore new ideas and open to interdisciplinary, multinational and cross-sectoral research

Prosjektnummer: 316513
Tittel: Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC)
Søkerinstitusjon (partnere): NGI (NTNU)
Prosjektleder: Kristoffer Skjolden Skau

Sammendrag:
Future research and technology development in Norway and in Europe will have a strong focus on safely utilizing ocean and coastal space. Oceans and coasts will be an arena to produce food, harvest energy, support transport infrastructure, and to address housing and other industry needs.

Sustainable development and the green shift require different structure types, which must be safe for people and the environment, and economically viable. To achieve this requires a transformation of the seabed engineering technology that underpins this infrastructure. The proposed Coastal and Offshore Geotechnical Structures Testing Centre (COGSTEC, Figure 1) will unlock the necessary innovation, through new insights, technology development and rapid prototyping. COGSTEC will allow researchers and designers to simulate and verify whole life soil, ice and infrastructure behaviour, and inspire innovation.

COGSTEC is timely, since engineering testing is being transformed by new advances in sensing, control, imaging and robotics, as well as hybrid physical-numerical simulations. COGSTEC will form a national platform that will harness these technologies, across facilities from the scale of a soil and ice element in the laboratory to a large-scale structure in the field. This will achieve a major advancement in the accuracy and realism of physical testing in civil and offshore engineering.

COGSTEC complements the Ocean Space Centre and in combination they will provide a complete infrastructure for determination of loads, structural response and soil reactions. COGSTEC will be available for use by the industry and academia, accelerating industry-driven innovation and research (and complements EnergiX and MAROFF) and will boost the collaboration across Norwegian academia and industry.

Prosjektnummer: 316515
Tittel: National Test Centre for Large Industrial Sprays
Søkerinstitusjon (partnere): USN
Prosjektleder: Joachim Lundberg

Sammendrag:
Numerous of industrial processes involve sprays. One of the most common types of spray is the water sprinkler spray used to extinguish fires. Even though theses sprays have been used for several decades, the working principles are not fully explained. This is due to the complexity of the spray phenomena. Some parameters are determined routinely, including shape of the spray and total mass but detailed droplet size- and velocity distribution demand scientific equipment with aligned optical arrangements. Droplet size affects extinguishing/spray properties, make this a crucial element. Other usage areas include spray (diesel) combustion, pressure washing, dust removal (washing towers), spray drying and artificial snow. Especially, in the case of industrial sprays factors such as dust, high humidity or high temperatures create challenging environments for measurement setup. Instead of measuring in-situ the measurements can be replicated in a lab. Currently there is no permanent and established research infrastructure that is able to recreate and analyse the complex behavior of the industrial sprays. Until now, test rigs involving advanced optical equipment combined with lasers for illumination have been reconfigured for each test requiring weeks of reworking to reach perfect alignment.

Driving factors behind the National Test Centre for Large Industrial Sprays include both challenges faced by industry and advancement in basic research, for example, in the areas of spray behavior, complex model development, quantitative risk assessments and validation of numerical simulations. Innovation in technology often base the design on numerical predictions like computational fluid dynamics (CFD). To predict spray behavior without proper measurements can affect the accuracy of the output. The Test Centre is designed to give physically correct description of the flow behavior of spray phenomena, which can be used for input to numerical simulations.

The process safety and combustion research group in the University of South-Eastern Norway have developed experience and carry out spray research in a controlled environment. The group aims through the National Test Centre for Large Industrial Sprays, to create a national research infrastructure, building on a preliminary design developed for projects with Equinor ASA, Wärtilä Moss AS and MSG Production AS. The expanded design and capabilities will enable various spray and liquid types (including combustible fluids) to be handle and investigated opening up research and innovation, for example, in the oil and gas, land-based industry and maritime sector (e.g. LNG shipment).

Prosjektnummer: 316553
Tittel: Norwegian Digital Subsurface Lab
Søkerinstitusjon (partnere): SINTEF AS (NORCE, SINTEF Digital, Norsk Regnesentral, NGU, UiS, NTNU, UiO)
Prosjektleder: Ane Elisabet Lothe

Sammendrag:
Norway's O&G technology strategy for the 21st century calls for “Technologies and Innovation for a Competitive Norwegian Petroleum Sector”, and the “Roadmap for Research Infrastructure” mentions digitalization of all petroleum industry disciplines and a need for infrastructure for improved subsurface understanding as priorities. The Rystad Energy Report quantifies the huge potential in value creation related to improved subsurface understanding. At the same time, the Norwegian government and European Commission underline the importance of a transition to a greener economy and sustainability, and we are at a point where a digital transformation and transfer of know-how and technology from oil and gas to more environmental-friendly, sustainable geoscience applications (e.g., geothermal energy, hydrogen/CO2/gas/heat storage, and water resource mapping) could help combat climate change and support UN sustainability goals. The Norwegian Digital Subsurface Lab (NorDigS Lab) targets all the above-mentioned challenges and opportunities by providing eInfrastructure for quality-assured subsurface data and interoperable open-source software. With NorDigS Lab, we want to establish a national arena for building expertise, sharing crossdisciplinary knowledge and data, and stimulating innovation related to digitalization in a range of subsurface applications. The goals of the infrastructure will be achieved by offering Norwegian scientists and students a unified platform for rapid/remote access to subsurface data and software, and tools for machine learning and big data. In this way, the platform will support digitalization of the petroleum industry, transfer of knowledge from oil and gas to more sustainable and environmental-friendly subsurface disciplines, and it will be an asset for researchers/students in everything from small to major research efforts within a range of application areas. The initiative consists of: 1) establishing a new Digital Subsurface Data Platform following the Open Subsurface Data Universe standard and providing unified access to key data sets from, e.g., industry, NPD's Diskos database, and partners' proprietary databases; 2) establishing a new Digital Subsurface Software Platform, communicating with the Data Platform and offering a range of open(-source) interoperable subsurface software and standard libraries for big data handling and machine learning; 3) upgrading NORCE' web-enabled software infrastructure OpenLab and integrating this with the Data and Software Platforms.

Prosjektnummer: 316572
Tittel: Hydrogen Safety Laboratory
Søkerinstitusjon (partnere): UiB (USN, UiS)
Prosjektleder: Trygve Skjold

Sammendrag:
The vision for the Hydrogen Safety Laboratory (HySALA) project is to establish state-of-the-art laboratory facilities that will allow researchers to investigate safety-critical properties and phenomena involving hydrogen and hydrogen-based fuels, as well as to test and verify the

performance of equipment, solutions and models for fire and explosion protection under conditions, and at spatial scales, that resemble actual industrial applications. The foreseen research activities will be highly relevant for a wide range of practical applications, ranging from energy production to safety and security in industry and society. The infrastructure will support internationally cutting-edge research in areas that are of critical importance to Norway as an energy nation: efficient, sustainable and safe conversion, transport, storage and use of hydrogen and hydrogen-based fuels.

The HySALA facility includes two installations that complement each other with respect to spatial scale and applications. The first installation is a state-of-the-art laboratory facility that will allow researchers to investigate physical and chemical phenomena related to ignition and combustion phenomena in hydrogen-airmixtures. This facility will include two small explosion chambers and a unique wind tunnel for investigating safety-critical phenomena related to ignition and flame propagation in established flow fields, with or without congestion. The second installation will be a large-scale explosion chamber, dimensioned to withstand detonations and constant volume deflagrations.

The infrastructure will be unique for Norway and Europe, and will allow researchers to develop, verify and validate strategies and solutions for explosion protection of industrial facilities, such as electrolysers, hydrogen refuelling stations, fuel preparation rooms and fuel cell rooms in ships, etc. The ambition is to establish unique installations that can be operational on short notice, be flexible and easy to operate, and produce state-of-theart results. The infrastructure will be available for researchers that complete mandatory (site-specific) safety training, with differentiated pricing for industry and academia, sponsors vs. regular users, etc. As such, the HySALA facility will facilitate high-quality research, including national and international cooperation.

Prosjektnummer: 316590
Tittel: Fault and fracture characterisation and testing laboratory
Søkerinstitusjon (partnere): NGI (NORCE, NORSAR, UiO)
Prosjektleder: Luke Griffiths

Sammendrag:
Understanding fracture processes within the subsurface, and their influence on geomechanical, geophysical, and fluid transport properties is vitally important for oil & gas production, geological carbon storage, geothermal energy storage and production, slope stability, groundwater resources and seabed installations. Laboratory testing of rock and soil under controlled and realistic stress and fluid pressure conditions allows us to understand the influence of fractures on such properties. However, it is difficult to observe local deformation mechanisms and structures as they occur, and instead we often rely on post-test analysis. Recent advances in CT scanning technology allow for rapid, ultra-high-resolution, multi-scale imaging—ideal for characterisation and time-lapse imaging of laboratory samples of rock and soil during advanced testing. At the same time, fluid flow within fractures and the associated chemical and thermal processes have strong—yet poorly understood—implications for the geomechanical properties and behaviour of fractured rock. There is a lack in dedicated national infrastructure to address this topic, and we envisage that simultaneous flow and mechanical experiments, combined with high-resolution CT imaging, can lead to unique datasets shining a spotlight on such complex processes. To extend this knowledge to the field requires upscaling, and borehole geophysics and measurement of the hydraulic properties of fractures has

been identified as a key tool to calibrate the detailed models developed in the laboratory and transfer knowledge across scales.
NGI has a long history of laboratory testing of geomaterials and has recently developed a strong expertise in 3D microCT-imaging and developing CT-transparent testing equipment, as well as monitoring laboratoryscale microseismicity to understand failure processes. NORCE has state-of-the-art laboratories dedicated to investigation of multiphase and multicomponent fluid flow in porous media. A combined infrastructure, integrating our complementary expertise in both laboratory and field investigations, would provide a unique opportunity for directly observing fracture and fault formation within rock and soil and linking complex mechanical, thermal, and chemical processes to geoengineering parameters of interest. As such, we propose a Fracture & Flow Lab. Infrastructure improvements across these two laboratories will include: a new micronano-CT scanner with moving source and imager; mechanical testing equipment (shear box and high temperature triaxial and tensile loading apparatus) and advanced geophysical instrumentation; and borehole logging equipment for measurement of field-scale hydraulic properties. Importantly, this infrastructure will require a dedicated data management system. This e-infrastructure will leverage competence and software solutions from NORCE to provide an interactive and robust access to the generated data, thus facilitating data reuse, visualization, analysis and promoting collaboration.

Prosjektnummer:316612
Tittel: PreMechatronics Lab
Søkerinstitusjon (partnere): UiA
Prosjektleder: Kjell G. Robbersmyr

Sammendrag:
Top Research Centre Mechatronics (TRCM) at University of Agder was established in 2019 and will develop the next generation mechatronics systems for selected fields to contribute to the competitiveness and sustainability of the industry. Today TRCM collaborates extensively with the world leading offshore oil drilling industry. The SFI offshore mechatronics is a leading research center in its field with close collaboration with the international offshore oil industry. Now we see a growing interest in other offshore industries like offshore wind energy, offshore mining, aquaculture, and marine harvesting. These industries meet challenges similar to what the oil industry has experienced regarding deploying, operating and maintaining offshore installations. We will use the expertise and experience from the oil industry to develop mechatronics concepts and technology for other offshore applications.