

ID. TG5 PRIORITIZED AREA	PROBLEM STATEMENT / CHALLENGE	SUPPORTING TECHNOLOGIES & KNOWLEDGE WITH INNOVATION POTENTIAL ²
<p>#26 Consequences and opportunities from adoption of new technologies New technology and the accelerating pace of changes introduces new hazards and risks that will have to be managed in the spirit of the zero accidents philosophy and the continual improvement principle.</p> <p>A continual improvement of HSE performance requires management attention and prioritization, as well as improved understanding of HSE risks, hazards, and under-lying causes.</p>	<p>It is urgent to reduce GHG emissions. Introduction of new technology is a key element to reduce emissions. However, many of these technologies have not been in used in NCS operations. Hence, safety issues must be explored before implementation.</p> <p>A faster pace for adoption of digital solutions to improve the competitiveness of the NCS is needed. Associated safety and risks will have to be recognized and managed. Increased automation and complexity of systems and business processes leads to increased demands for knowledge and understanding of how to secure data models that is transparent, understandable / human conceivable through all phases of technology life cycle.</p> <p>Reduced manning and autonomy offshore mean that more safety system must be operated and maintained remotely. To make this efficient and maintain safe operation and maintenance, designers, operators and leaders competence and expertise should be strengthened on how to design and implement technology that supports human cognition.</p>	<ul style="list-style-type: none"> Improved understanding and management of potential safety and working environment impacts resulting from adoption of low-carbon technologies in the NCS operations, e.g. hydrogen, ammonia, electric boilers, batteries. Knowledge transfer from other industries that have substantial experience with low/zero carbon technologies. <ul style="list-style-type: none"> Use of digital technologies for efficient risk reduction in design, fabrication and operations, e.g. digital twins, augmented reality. Improved understanding and management of potential HSE implications related to the digital transformation of the Norwegian petroleum industry. Development of holistic approach to include human and operational elements when introducing automation and other digital technologies. Better detection and management of human – automation risks in digital solutions such as remote control and automation. New safety philosophies for technologies such as fully electric solutions, completely unmanned installations, and solution such as no standby vessels, no fixed helicopter transport, normally unmanned platforms etc. Improved understanding and knowledge on how to apply human centered approaches in digital technology. A more systematic use of human factors in system engineering.
<p>#27 Consequences and opportunities of new business models Since 2000, there has been a considerable increase in the diversity of companies operating on the Norwegian shelf. More recently, several strategic alliances and new incentive-based contract models have emerged. It is important that the changes in interfaces between different organizational units and systems, come to benefit safety.</p>	<p>A continued drive for improved efficiency and reduced GHG emissions is required to keep the NCS competitive. Introduction of new business models to leverage the potential of new technology is part of this. It introduces new hazards and risks that will have to be recognized, understood, and managed.</p>	<ul style="list-style-type: none"> Improved understanding and management of potential safety implications of changes to business models, the operator landscape, and rules&regulations. Improved understanding and management of potential working environment implications of changes to business models, the operator landscape, and rules & regulations. Effects of downsizing / low staffing.

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<p>#28 Major accidents: Improved understanding of risks and uncertainty</p> <p>The safety risk level on the NCS is low and the overall risk indicator is trending downwards. Nevertheless, some observations cause concern as discussed in Section 3.2</p> <p>All major accidents are preventable provided we identify and understand the root causes. It is therefore imperative for the Norwegian petroleum industry that risk management tools are continuously improved.</p>	<p>The industry must work constantly to prevent incidents, reduce risk and improve safety and learn from experiences and incidents, and particularly in relation to major accident risk. Situational awareness, risk understanding, understanding of barrier principles and uncertainty, are crucial for the industry's work in preventing major accidents, while improving involvement, knowledge, and engagement of humans.</p>	<ul style="list-style-type: none"> • Improved management of safety barriers, including an improved understanding of safety barrier integrity and of how an increased use of sensor technology and data analysis can support operational barrier management. • Better integration of human factors in risk management tools used during planning and execution of operations. • Improved tools for safety risk analysis that also include a better understanding and description of uncertainties and of the knowledge (i.e., assumptions and evidence) that support the risk analyses. • Holistic approach to learning from experiences and incidents and implementation of this learning into risk management tools and practices. • Safe life extension of facilities far beyond design life enabled by extensive monitoring or compensatory measures to ensure safety. • Improved tools for simultaneous operations to aid in risk understanding and awareness of each operation and their inter dependencies. Monitor and display continuous change in risk level for each ongoing and planned operation and the impact this have on the total risk picture. Provide support for safe and informed decision making and activity planning.
<p>#29 Improved working environment</p> <p>The management of the working environment in the petroleum industry aims at minimizing exposure to hazards and risks that could cause short-term or longer-term health issues.</p>	<p>Following the no harm principle, all working environment hazards and risks (including psycho-social factors) will have to be recognized and fully understood, and exposure prevented or limited to safe levels. A continual drive to understand and manage working environment hazards will bring the industry towards the vision.</p>	<ul style="list-style-type: none"> • Better understanding of working environment risks and uncertainties to eliminate potential short-term and long-term health problems. • Increased knowledge on health outcomes in relation to exposure assessments. • Improved monitoring of the working environment, including the physical, chemical, social and psychological work environment.

² These are examples. Other solutions addressing the prioritized technology areas should also be sought and developed.

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<p>#30 Cyber security as an enabler for digitalization A faster pace for adoption of digital solutions to improve the competitiveness of the NCS, is needed. Associated cyber security and risks will have to be recognized and managed.</p>	<p>The increased pace of digitalization requires sharing of data between multiple users. This increases the vulnerability for cyber security attacks in IT and OT systems. Many OT systems today are not ready for this, as they provide a hierarchical data access structure, preventing customers to access data in a secure manner.</p> <p>To build high quality data lakes that can be used in data analytics applications, such as AI and ML, require data models of the system that describe data transformations performed. Furthermore, the data models need to be made available to the end user in a machine-readable format.</p> <p>In addition to the cyber security threats related to technology and system integration, the industry needs to address the increasing demand of cyber security competence. This includes competence at the subject matter expert level, as well as a general understanding at all organization levels. This is needed to improve the awareness of cyber security threats and the vulnerabilities in data and applications.</p>	<ul style="list-style-type: none"> • Use of AI and ML for threat hunting. • Develop cyber security management tools. • Better understanding of complexity and interdependency of systems and data flow, e.g. design differences between IT and OT. • Improved understanding of cyber security risks and management for the NCS digital transformation. • Competence building of across disciplines, value chains and operators. • Reusable and transformable data models with open, secure and interoperable solutions enabled by technology capable of modeling data quality and user access at variable levels .