

## OG21 Strategy - A New Chapter

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### Overview of technology priorities for all disciplines

The overarching goal of technology development and implementation is to realize value from the NCS safely and with minimal environmental impact.

The OG21's technology groups (TGs) have identified new technology and competence that could improve the NCS competitiveness in light of the future demand for oil and gas described in Section 2 and the challenges and opportunities described in Section 3.

A total of 30 technology and knowledge areas have been prioritized. In addition, the TGs have discussed and identified opportunities for new industry development based on the competence and solutions in the petroleum industry as well as opportunities for improved life-cycle management and circular economy.

An overview of the technology priorities per discipline (TG) and interconnections between disciplines, is shown in Figure 41. Estimates on potential value for technology opportunities is presented in Figure 42. A detailed description of the prioritized technology areas for each TG is provided in the following sub-sections.

As Figure 41 indicates, a broad range of technologies is needed to improve the NCS competitiveness. Each prioritized technology area offers significant improvements on at least one of the competition metrics. Combined, the prioritized technology areas hold a promise of improving the NCS competitiveness along all metrics, including volumes, costs, and CO<sub>2</sub>-emissions.

The prioritized safety and environment technology areas are fundamental for the "license-to-operate". Addressing the technology and knowledge needs within these areas is therefore of vital importance for the further development of the NCS.

Stakeholders in the petroleum sector have a shared responsibility for addressing the technology priorities through R&D&I, and OG21 therefore encourage industry enterprises, universities, research institutes as well as public funding bodies, to reflect OG21 priorities in their R&D&I plans and programs.

We have not indicated current TRL-level for the prioritized areas. The reason is that even for prioritized areas where mature technologies exist in the market, there is still scope for radical new innovations, new components or new knowledge that could replace or improve existing solutions.

**Figure 41. Overview of technology opportunities per discipline (TG) and cross-discipline dependencies**

TG	Opportunity name	TG1	TG2	TG3	TG4	TG5
TG1 Climate change and environment	#1 Energy efficiency in offshore operations	●	○	○	○	○
	#2 Reduced cost of electrification	●			○	
	#3 Offshore carbon capture and storage	●	○		○	○
	#4 Lifecycle assessments	●	○	○	○	○
	#5 Leak detection and mitigation	●			○	○
	#6 Environmental risk assessment and management	●				○
	#7 Oil spill contingency	●			○	○
	#8 Environmental performance data	●			○	
TG2 Subsurface understanding	#9 Offshore CO <sub>2</sub> storage and late-life deposits	○	●	○	○	
	#10 Data acquisition for subsurface understanding and models		●	○		
	#11 Data management for subsurface understanding and models		●		○	
	#12 Subsurface understanding and models	○	●	○	○	○
TG3 Drilling, completions, intervention and P&A	#13 Water management	○	●	○	○	
	#14 Data gathering and optimization of drilling operations		○	●	○	○
	#15 Improved drilling equipment	○		●		
	#16 Advancements in well construction and methodologies			●		○
	#17 Subsea well intervention technologies	○		●	○	○
	#18 Recompletion and multilateral technologies		○	●		○
TG4 Production, processing and P&A	#19 Challenging reservoirs	○		●	○	
	#20 More efficient P&A		○	●		○
	#21 Facility integrity and lifetime extension of fields				●	○
	#22 Data collection for facilities				●	
	#23 Data management for facilities		○	○	●	○
TG5 Safety and working environment	#24 Digital tools for improved monitoring, better understanding and more efficient operations		○	○	●	○
	#25 Unmanned facilities and subsea tie-backs		○	○	●	○
	#26 Consequences and opportunities from adoption of new technologies	○	○	○	○	●
	#27 Consequences and opportunities of new business models	○	○	○	○	●
	#28 Major accidents – improved understanding of risks and uncertainty	○	○	○	○	●
	#29 Improved working environment	○	○	○	○	●
	#30 Cyber security as an enabler for digitalization	○	○	○	○	●

Figure 42 Overview of prioritized technology opportunities and estimated, potential effects on competition metrics for prioritized technologies\* (Rystad Energy, 2021)

TG	Opportunity name	Volume additions potential (mmboe 2020–2050)	Cost reduction potential (BUSD 2020–2050)	Upstream emissions reduction potential (mt CO2 2020–2050)
TG1 Climate change and environment	Energy efficiency in offshore operations	Neutral	5.2	29.0
	Offshore carbon capture and storage	Neutral	-9.0	35.0
	Leak detection and mitigation			
	Environmental risk assessment and management	Prerequisite for continued operations and future technology adoption		
	Oil spill contingency			
TG2 Subsurface understanding	Offshore CO2 Storage and late-life deposits	495	-13.0	Very large, but scope 2 & 3
	Data gathering for subsurface understanding and models			
	Data management for subsurface understanding and models	Enabler for technology opportunity #9		
	Subsurface understanding and models	2560	10.0	1.5
	Water management	1090	0.0	7.0
TG3 Drilling, completions, intervention and P&A	Data gathering and optimization of drilling operations	1550	5.8	1.3
	Improved drilling equipment	0	6.0	2.5
	Advanced well construction and methodologies	840	4.4	0.9
	Subsea well intervention technologies	1520	4.2	0.9
	Recompletion & multilateral technologies	1350	7.0	0.6
	Tight and inhomogenous reservoirs	970	-7.8	-1.9
	More efficient P&A and road to rigless	Neutral	5.9	0.6
TG4 Production, processing and P&A	Material condition detection and degradation mechanisms			
	Data gathering for facilities	Enabler for technology opportunity #21		
	Data management for facilities			
	Digital tools for improved maintenance and more efficient operations	970	20.0	16.5
	Unmanned facilities and subsea tie-backs	800	11.0	1.5
TG5 Safety and working environment	Standardized subsea templates	710	14.6	Neutral
	Consequences and opportunities from adoption of new technologies			
	Consequences and opportunities from new business models	Prerequisite for continued operations and future technology adoption		
	Major accidents: Improved understanding of risk and uncertainty			
	Improved work environment			
	Cyber security as enabler of other digitalization technologies	Prerequisite for digitalization technologies		

\* There is a small discrepancy in the naming of technology opportunities in Figure 41 and Figure 42. The reason is that the opportunities have been further matured by OG21 after the final report from Rystad Energy was delivered.

Source: Rystad Energy research and analysis

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