

Competence needs in the energy industries

Rev.: Final

Date: 8 June, 2023



Summary



Summary

- This report is part of an OG21 deep-dive study on energy supply security from the Norwegian continental shelf (NCS). Competence gaps is one of several potential threats identified to maintain long-term energy supply from the NCS. A draft of this report was presented and discussed in an OG21 workshop on competence 1 June 2023. The report has been updated with input and results from the workshop.
- Norway is an important energy provider to global markets, and especially to Europe. Norway's role as a reliable energy partner to Europe has increased as a result of the Ukraine war and EU's desire to become independent of Russian energy supplies. Even though EU and the UK have ambitious plans to phase out fossil fuels altogether, the call on Norwegian petroleum, and especially natural gas, is expected to remain high at least for the next decade. To maintain its role as an important energy partner also longer term, Norway would need to prepare for delivering also low-carbon energy and energy solutions.
- The energy related sectors need skilled employees to thrive. The petroleum sector, which has an aging workforce, need to hire new people to maintain production. But also new industry opportunities such as offshore wind, CCS, hydrogen and seabed mining would potentially need a lot of competence to be realized.
- The energy sectors employ people with a variety of skills ranging from vocational trained candidates, to academic professionals within subjects such as law, economics, geology and engineering to name a few. This report focuses on competence within the STEM subjects (science, technology, engineering and mathematics).
- There is an increased need for STEM professionals in all sectors of the society, driven by factors such as demographics, the digital transformation and the high pace of technology development, and the transition to a low-emission society. Norway has a well-educated population with a general education level above the OECD average. The proportion of people with higher STEM-education is however lower in Norway than the OECD average. This leads to a high competition for STEM professionals between the various sectors.
- The energy related sectors face three main challenges:
 1. Recruitment to STEM-studies at the universities. The challenge is both related to the qualifications of the young where too few select natural science and mathematics in high school, and the number of STEM study places offered at the universities.
 2. Recruitment of STEM professionals (both graduates and experienced) to the energy related industries in competition with other sectors. The challenge include but is not limited to factors such as job security, job purpose and industry reputation.
 3. Development of the workforce during the twin digital and green transition. The challenge include elements such as change capability, and training and further education to align with new competence needs.

Content

0

Summary

1

Project background,
purpose and scope

2

The energy landscape and
NCS resources

3

Recruitment to studies

4

Recruitment to the energy
industries

5

Developing existing
workforce

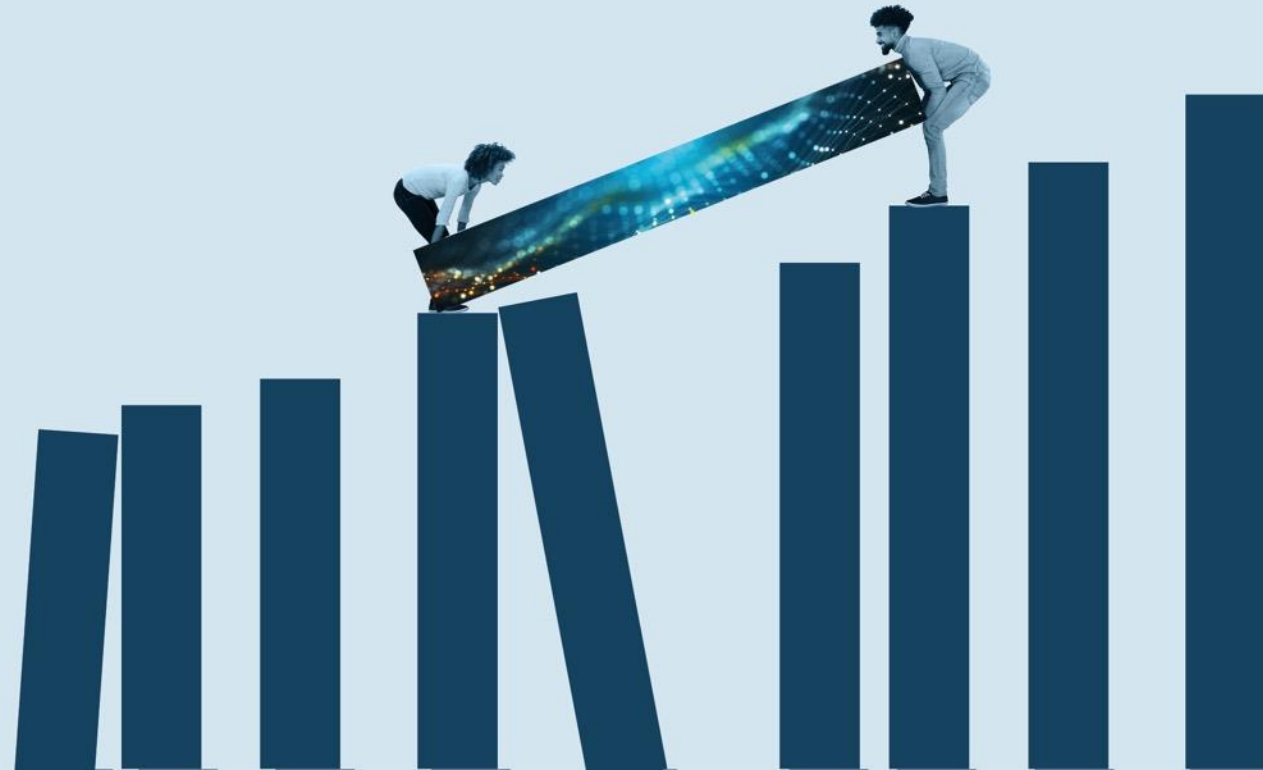
6

Abbreviations and
references

A

Appendix – Key take-aways
from competence workshop

1. Background, purpose and scope



Purpose and scope

On OG21:

OG21 has its mandate from the Norwegian Ministry of Petroleum and Energy (MPE). The purpose of OG21 is to “contribute to efficient and environmentally friendly value creation from the Norwegian oil and gas resources through a coordinated engagement of the Norwegian petroleum cluster within education, research, development, demonstration and commercialization. OG21 will inspire the development and use of better skills and technology”.

OG21 brings together oil companies, universities, research institutes, suppliers, regulators and public bodies to develop a national petroleum technology strategy for Norway.

Based on its mandate from the Norwegian Ministry of Petroleum and Energy, OG21 develops and maintains the technology strategy for the Norwegian petroleum industry.

The OG21 strategy was last updated in November 2021.

On the project:

The war in Ukraine has put energy security even more clearly on the agenda. Europe wants to phase out Russian energy supplies by accelerating renewable energy and import natural gas from reliable producers.

The UN Climate Panel's 6th report is clearer than ever on the urgency of reducing greenhouse gas emissions. It may appear as a paradox that more petroleum is needed from Norway, while Europe is reducing the use of fossil fuels.

The Norwegian goal is to reduce greenhouse gas emissions by at least 55% up to 2030. Measures in the petroleum industry, and especially electrification, are important both for reaching Norway's and the petroleum industry's climate goals. But with an increased need for electrification also in other industries and sectors and with the prospect of a possible power deficit before 2030, electrification projects in the petroleum industry are being challenged.

New technologies such as floating offshore wind and CCS can help solve challenges through the energy transition. But even such solutions spur discussions, for example relating to the exchange of electrical power with foreign countries.

Over the past year, Norway has become an even more important energy partner for Europe. Given that we are able to address the challenges we face on the Norwegian Continental Shelf (NCS), we can continue to be an important contributor to energy security in Europe. Technology and knowledge are key elements of that.

This is the background for this year's deep dive study from OG21. The project goal is: Identify threats to the supply of energy from the NCS to Europe and describe how the Norwegian oil and gas sector can contribute with technology and knowledge to remove, mitigate or otherwise manage such threats.

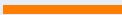
On this report:

The further development of existing and new energy industries in the Norwegian ocean space will require highly skilled people. Being able to attract, retain and develop talent with the right competence is one of the challenges identified for maintaining energy supplies from Norway to Europe.

This report focuses mainly on competence within science, technology, engineering and mathematics (STEM). The purpose was to provide input to a OG21 workshop on competence, 1 June 2023. It has been updated after the workshop with results and conclusions from the workshop.

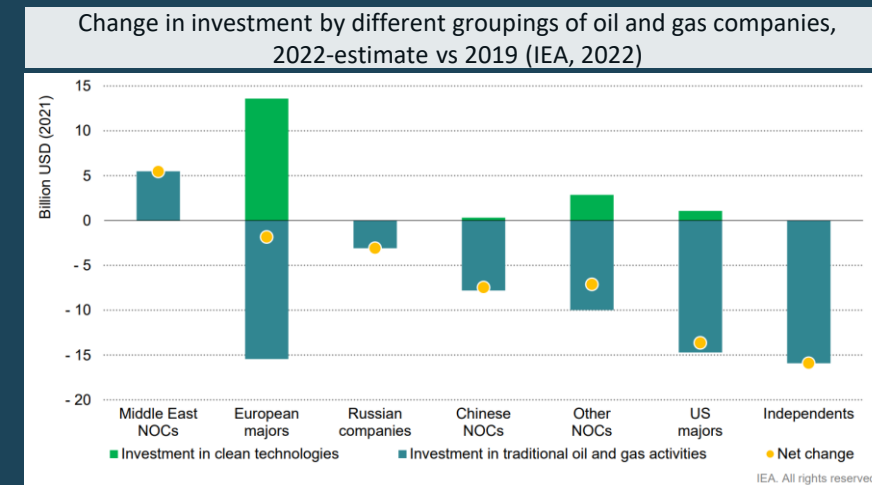
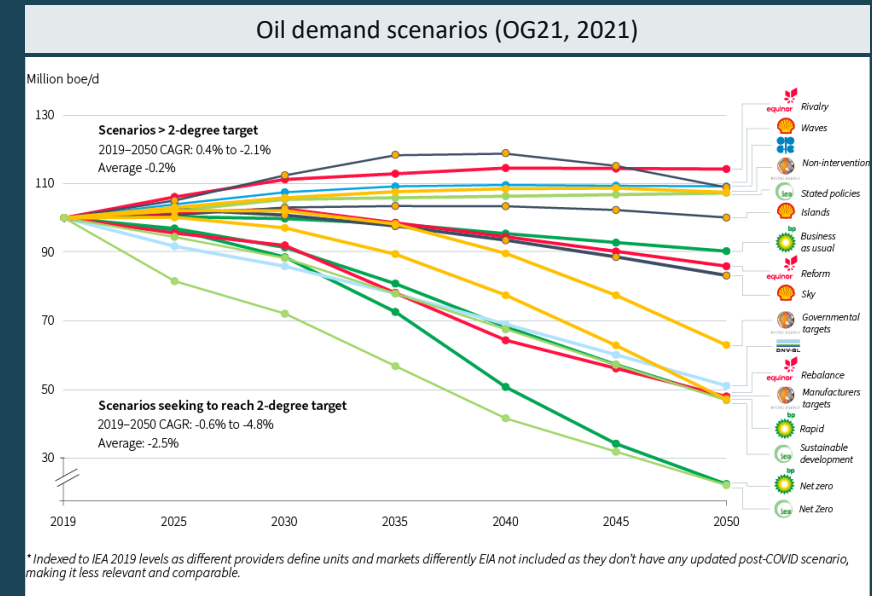
The updated report will be used as input to the further discussions over the course of the OG21 deep-dive study on energy security.

2. The energy landscape and NCS resources



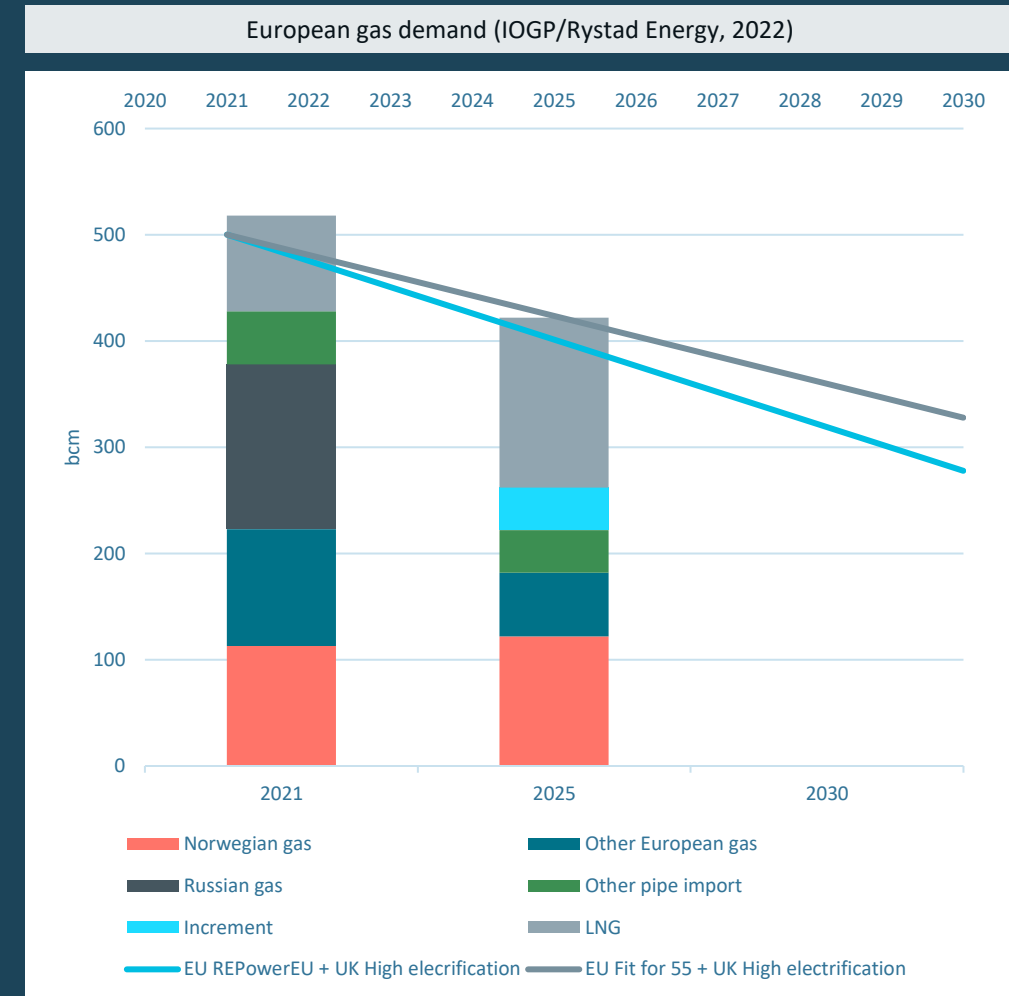
2.1 The world needs petroleum amidst a climate crisis

- The Ukraine war has added uncertainty to an already very uncertain energy future. OG21 presented a compilation of demand scenarios in the OG21 Strategy (2021) which showed that future oil and gas demand depends heavily on whether the global community succeeds in curbing Greenhouse Gas (GHG) emissions by scaling up low-emission energy sources.
- Recent publications from working groups contributing to IPCC's Sixth Assessment Report, show that curbing GHG emissions is more urgent than ever (IPCC, 2023).
- As described in the OG21 Strategy, OG21 believes that an orderly energy transition needs to be realized through demand destruction caused by new energy sources outcompeting fossil fuels, and not by fossil fuels supply cuts. The supply shock resulting from the Ukraine war illustrates challenges with supply disruptions.
- The post-pandemic recovery since the summer of 2021 revealed an under-investment globally in all sorts of energy, including oil and gas. According to IEA, only Middle East National Oil Companies (NOCs) plan to spend more on traditional oil and gas in 2022 as compared to 2019 - all other types of oil and gas companies plan to spend less (IEA, 2022). A report from the International Energy Forum and IHS Markit shows that Oil and Gas investments would need to increase significantly towards 2030 in order to balance the markets, even in a scenario with a plateaued demand (IEF, 2021).
- This illustrates the possibly counter-intuitive notion that oil and gas (O&G) investments are needed in the energy transition to zero-emission societies. The transition will have to take time, meanwhile production from existing oil and gas production will not be able to meet demand unless new investments are made.
- Attracting new oil and gas investments is however becoming more difficult, especially for International Oil Companies (IOCs) and independents. Investors are increasingly considering climate risk in their decisions. Low GHG emissions is therefore becoming a core competitive advantage.



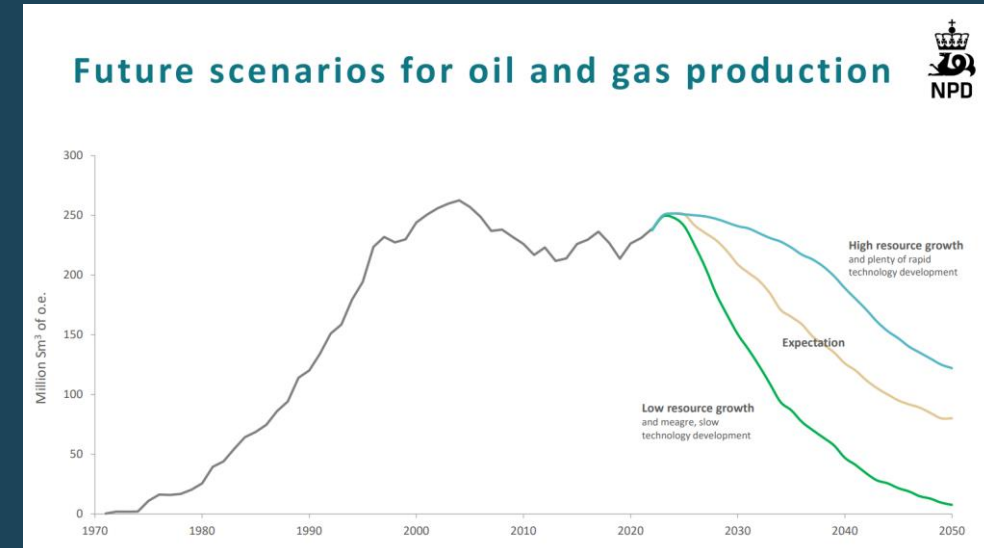
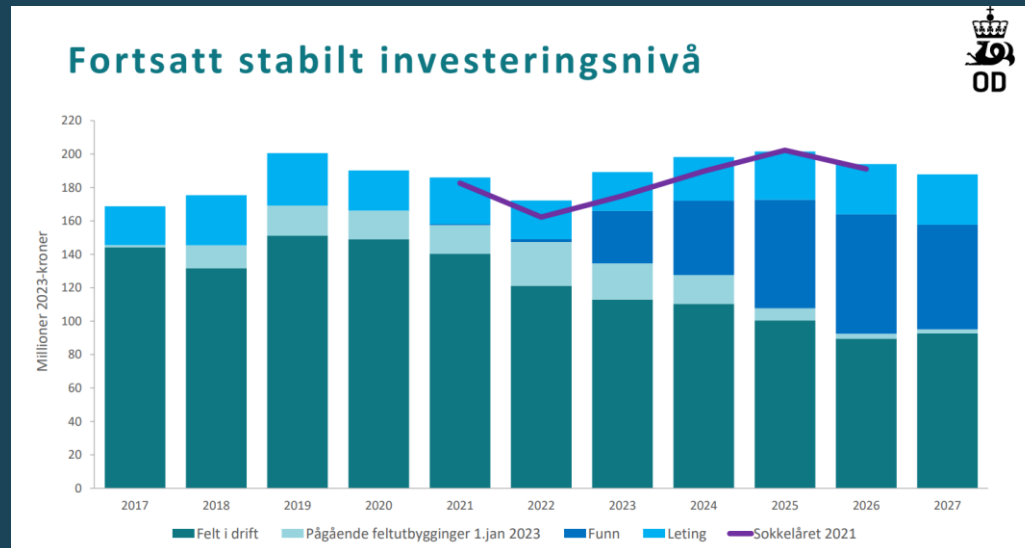
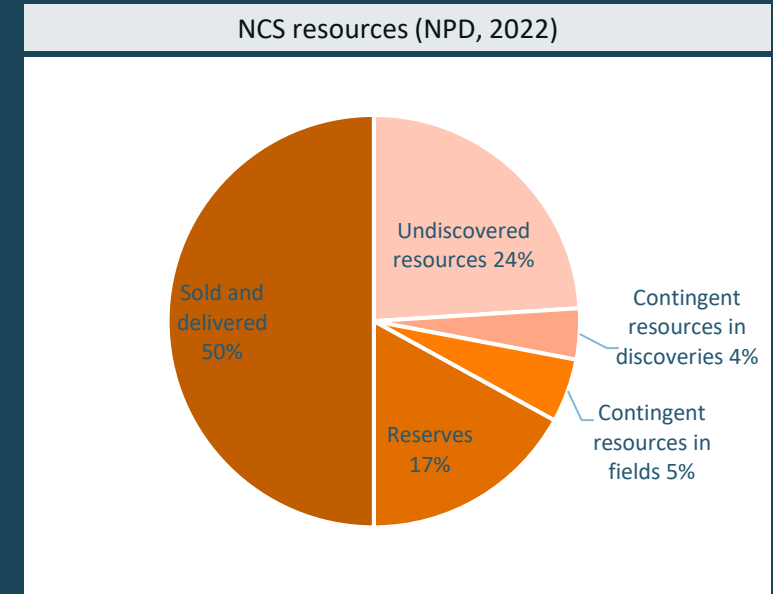
2.2 Norwegian gas is contributing to solving an energy crisis in Europe

- EU has called upon Norway to provide more gas to replace natural gas from Russia. And we have delivered on that call. Gas production increased by 10% in 2022, and it is expected that the volumes will be at 2022 level in the years to come.
- The added volumes of Norwegian gas in 2022 represent 100 TWh. To put this in context, it equals more than 70% of the total Norwegian hydropower production in a normal year (140 TWh).
- The most optimistic EU transition trajectory away from gas is expressed by the REPowerEU scenario. UK has also ambitious plans to decarbonize. If you add the most optimistic UK transition scenario, the high electrification scenario, to the REPowerEU scenario, the estimated gas demand in 2030 would be close to 300 bcm (IOGP, 2022).
- LNG plays the most important part in rebalancing Europe's gas supply. LNG is more expensive than piped gas from Norway, and as Europe weans itself further off natural gas, sometime into the 30'ies, LNG supplies will probably be reduced before piped gas supplies.
- It is hence probably significant room for Norwegian natural gas during the coming decade even within the most ambitious decarbonizing scenarios of the European energy transition. But at some point in time, natural gas from Norway will likely also be phased out of the European energy mix. We should prepare for that by developing de-carbonized ways to market our gas.



2.3 Lots of resources on the NCS, high activity in the years to come

- The NCS still holds large resources of oil and gas. NPD estimates that only half of it has been produced (NPD, 2022).
- NPD expects the investment level on the NCS to remain high in the years to come (NPD, 2023)
- How much of the remaining resources that will be produced after 2030 depends on many factors such as politics, stakeholder support, attracting investments, and technology. NPD describes a “high resource growth” and a “low resource growth” scenario in addition to the expectation scenario. The high resource growth scenario requires successful exploration and field development, which again would need to be supported by efficient technology adoption.
- Maintaining a high safety level and providing attractive frame conditions are also fundamental for continued development of the NCS. Key competitive factors are low break-even prices and low CO₂-emissions.

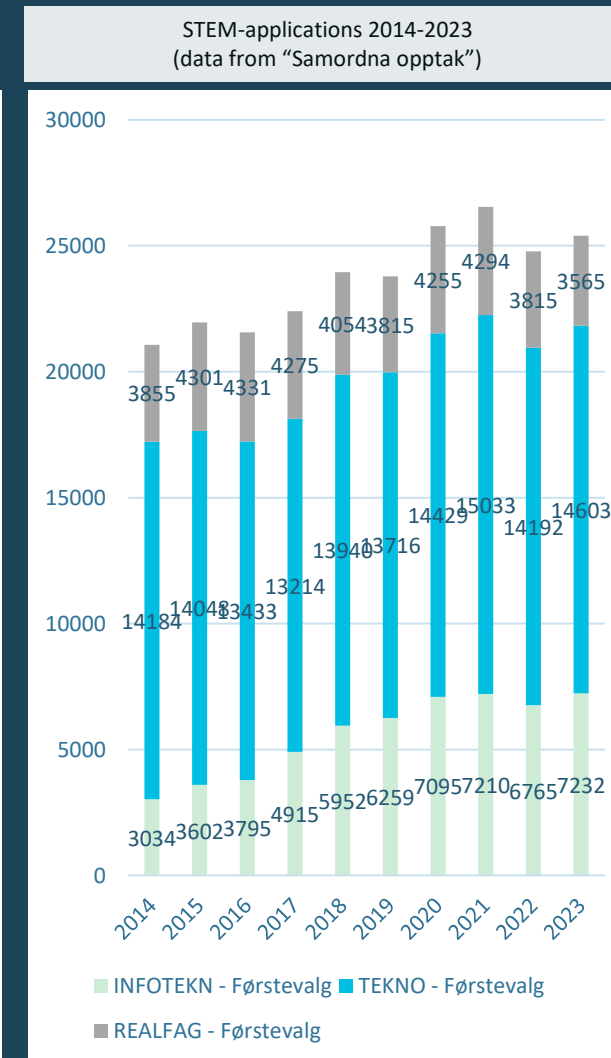
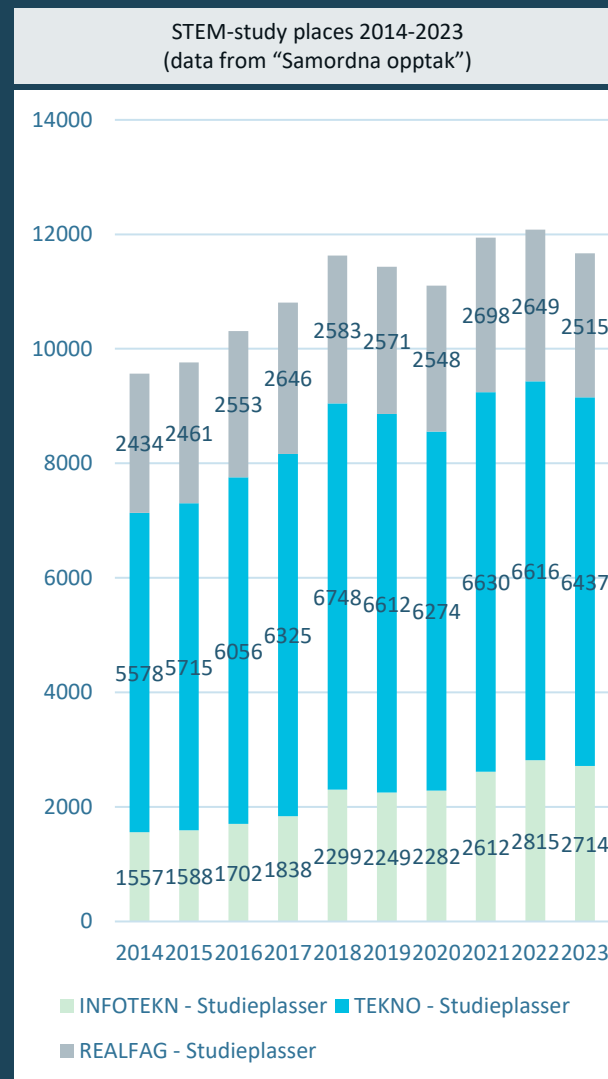


3. Recruitment to studies



3.1 A continued high interest in STEM studies, but a too low capacity could lead to a high competition for talent

- There is a current and future high need for science, technology, engineering and mathematics (STEM) graduates in Norwegian industries, including the energy industries (see Section 4.1). The energy industries stand out as the ones with the highest needs.
- The education level in Norway is slightly higher than the OECD average, but with a relatively lower proportion of people with higher STEM-education (Meld.St.14 (2022-2023)).
- There has been an increase in STEM-graduates over the last decade, mainly driven by higher number of ICT study places.
- STEM-educations are relatively popular with Norwegians who apply for higher education:
 - Applications to Information technology studies have risen sharply over the last decade in concert with the number of new study places within such subjects.
 - Applications to M.Sc. in engineering show a slightly increasing trend over the same time period.
 - Applications to science and mathematics have however decreased two years in a row and are now at the lowest over the last 10 years.
- The application trends suggest that Norwegian universities will continue to deliver high-qualified graduates in the years to come. However, too few students graduate in STEM subjects to meet society's demand. The current capacity compared with the needs expressed by the industry, indicate that there could be fierce competition for STEM talent between industries in the years to come.
- To address the shortage of STEM graduates it is not only necessary to increase the number of STEM study places. It would also require efforts earlier in people's life to spur interest for STEM subjects.
- An open question is how the digital transformation will affect universities and higher education, e.g. on how students are admitted, how courses are delivered, and how credentials are awarded.



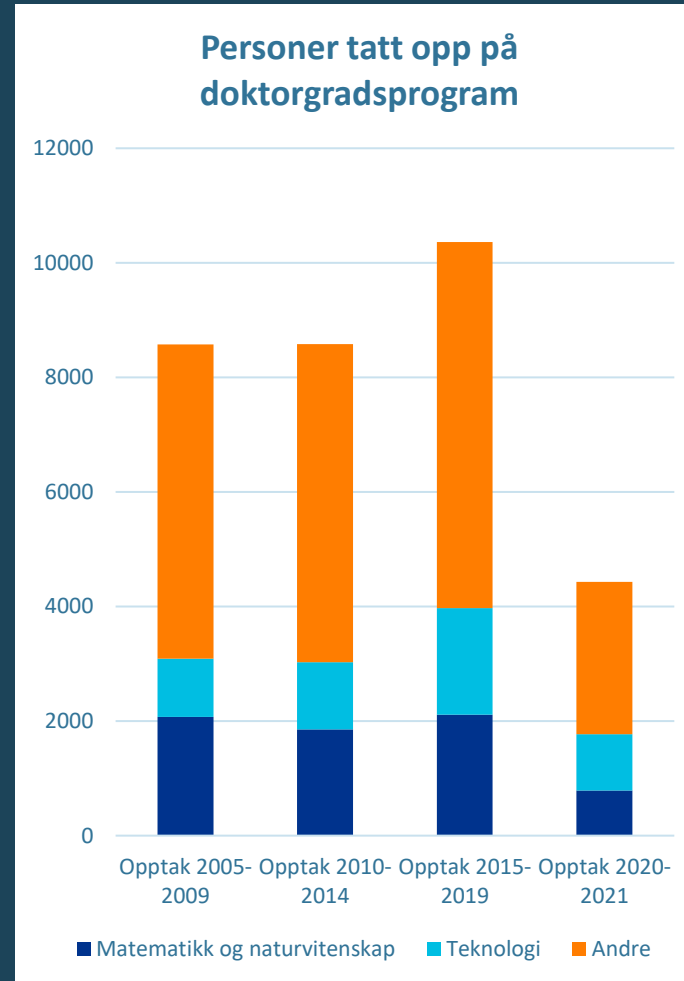
3.2 Recruitment to core petroleum studies – do we have a problem?

- The petroleum industry recruits graduates from a variety of studies, including STEM, law, economy and humanities. We focus on STEM graduates in this report. As described in Section 3.1. Norway has fewer STEM graduates than the OECD average.
- The energy industries, including petroleum, recruit graduates from all types of STEM studies. Most studies are industry generic, and the energy/petroleum industry compete for talent on an equal footing with other industries.
- A few subjects are considered “core” to the petroleum industry, especially those related to subsurface understanding such as geology, geophysics and reservoir modelling.
- The number of study places offered within geology at Norwegian universities has been constant at around 250 over the last decade. The interest for the studies has increased considerably the last 4 years (see figure far right). The number of study places offered and the interest in geology studies should therefore not be a concern to the Norwegian petroleum industry.
- The number of applicants to specific petroleum technology engineering studies at Norwegian universities and study places offered, including B.Sc. And M.Sc. Studies, are shown in the first figure to the right. It illustrates a sharp decline in students’ interest in such subjects over the years, but with a surprising recovery in interest in 2023 explained by renewed interest in petroleum B.Sc. at the UiS and the M.Sc. in georesources and geotechnology at NTNU. (UiS and NTNU stopped offering their M.Sc. in petroleum engineering studies in 2022 and 2023, respectively, due to the low interest over the years before). The NTNU case illustrates the importance of branding studies to the broader scope that they are covering.
- The total number of graduates from petroleum engineering studies is less than 60 per year. This corresponds to around 0,1% of the total offered engineering study places in 2023. Other STEM graduates would be, with some on-the-job training, able to fill most if not all petroleum technology positions. Reservoir modelling for instance, has a high content of applied mathematics, fluid mechanics and thermodynamics.
- From a pure industry recruitment point of view, the low number of petroleum engineering graduates is probably not a big concern short-term. The concern is more related to the further development of Norway’s world class subsurface environments at the universities. Without students these environments would erode, which in turn would hurt innovation capability in a domain where Norway today has a competitive advantage.



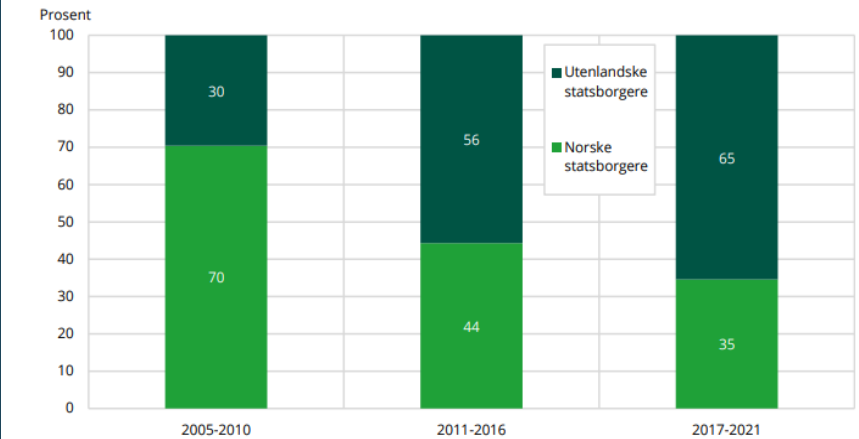
3.3 Energy and petroleum related Ph.D.-studies provide high-competence talent to academia as well as to the industry

- More than 2000 people start a Ph.D.-education in Norway each year. Almost 40% of these are within STEM subjects (SSB, 2023).
- Energy and petroleum programs and research centers organized by the RCN are important for funding energy and petroleum related Ph.Ds. 1381 Ph.D. candidates have been funded through energy and petroleum programs at the RCN in the 2005-2022 period (595 within petroleum, and the rest within renewables).
- Almost 50% of the energy and petroleum Ph.D. candidates over the period examined have been foreigners. The largest countries of origin are (in descending order): China, Germany, Iran, Russia, India, Italy, France and 49 other countries.
- 39% of the Ph.D. candidates end up in academia, 41% in the industry, and 20% are not employed in Norway 5 years after dissertation.
- More than half of the foreign Ph.D. students remain in Norway for at least 5 years after their dissertation.
- The consistent strong job market for energy related STEM graduates may explain the relatively low portion of Norwegians among energy Ph.D. students. The low portion should be a concern for the Government and the Norwegian energy industries. An increase in Ph.D. salaries should be considered.



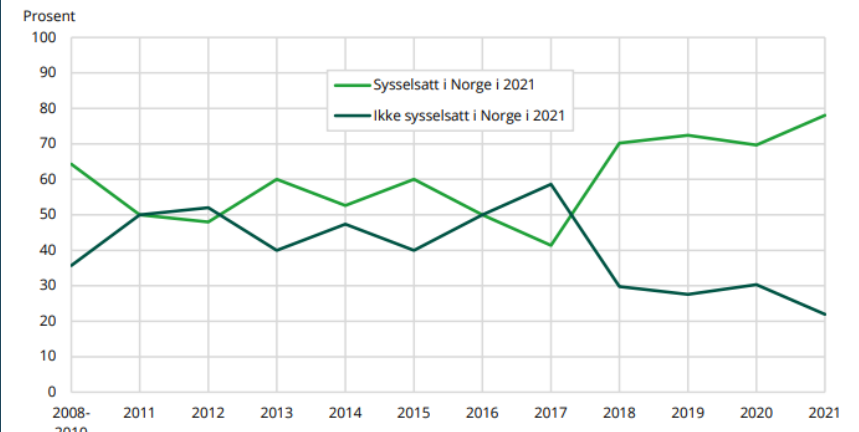
N=595 over period 2005-2021

Figur 2.4 Stipendiater innenfor petroleum etter år for start på doktorgradsprogram og statsborgerskap. Prosent



Kilde: Statistisk sentralbyrå

Figur 4.1 Stipendiater innenfor energi og petroleum med utenlandsk statsborgerskap etter år for doktorgrad og om de var sysselsatt i Norge i 2021. Prosent



Kilde: Statistisk sentralbyrå

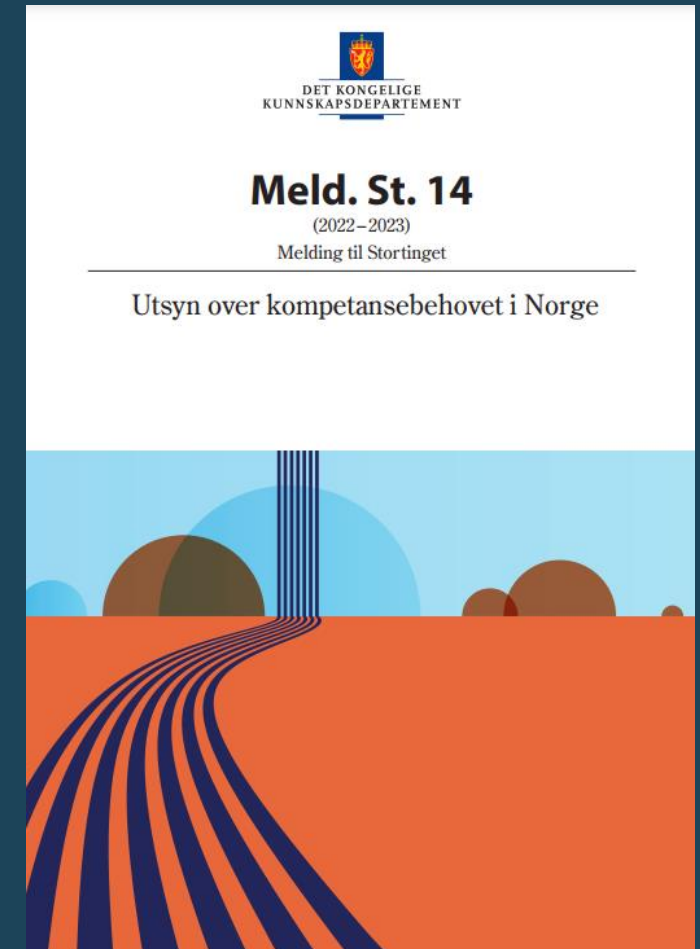
3.4 New tuitions fees lead to a decrease in students from outside EEA. The Norwegian energy sectors could lose an important pool of talents

- Last autumn, the Norwegian Parliament adopted tuition fees for all new students from countries outside the European Economic Area (EEA) and Switzerland from and including the autumn semester 2022. The out-of-pocket payment must at least cover the institution's costs for the education.
- The application deadlines for this group of applicants were during the autumn, and at several universities this year's admissions are ready. The figures show that fewer students from countries outside the EEA and Switzerland have accepted a place this year as compared to previous years (Klassekampen, 2023):
 - At NTNU, the number of students who have accepted a place has dropped from 370 students in 2022 to 222 in 2023. In several studies at the Faculty of Engineering, there has been more than a halving, according to Universitetsavisa.
 - At UiO, just under 300 were offered a place last year. 192 of these accepted. This year, just over 400 applicants were offered a place, but only 150 accepted. The proportion of positive replies is therefore considerably smaller this year than last year.
- Several reports point to the lack of qualified employees in Norway:
 - NHO (2023) describes a high need for people with engineering, natural sciences and IKT in the petroleum and renewables industries,
 - NIFU/Oslo Economics (2023) describes a lack of qualified R&D&I-relevant people if the Government is to succeed with its ambition to increase R&D&I to 3% of the GDP.
- A recent report on Ph.D. students within Energy and Petroleum says that more than half of the foreign students remain in Norway for at least 5 years after their dissertation (SSB, 2023).
- The Government's introduction of tuition fees for students outside EEA therefore appears counter-productive during a time with a lack of highly qualified people.

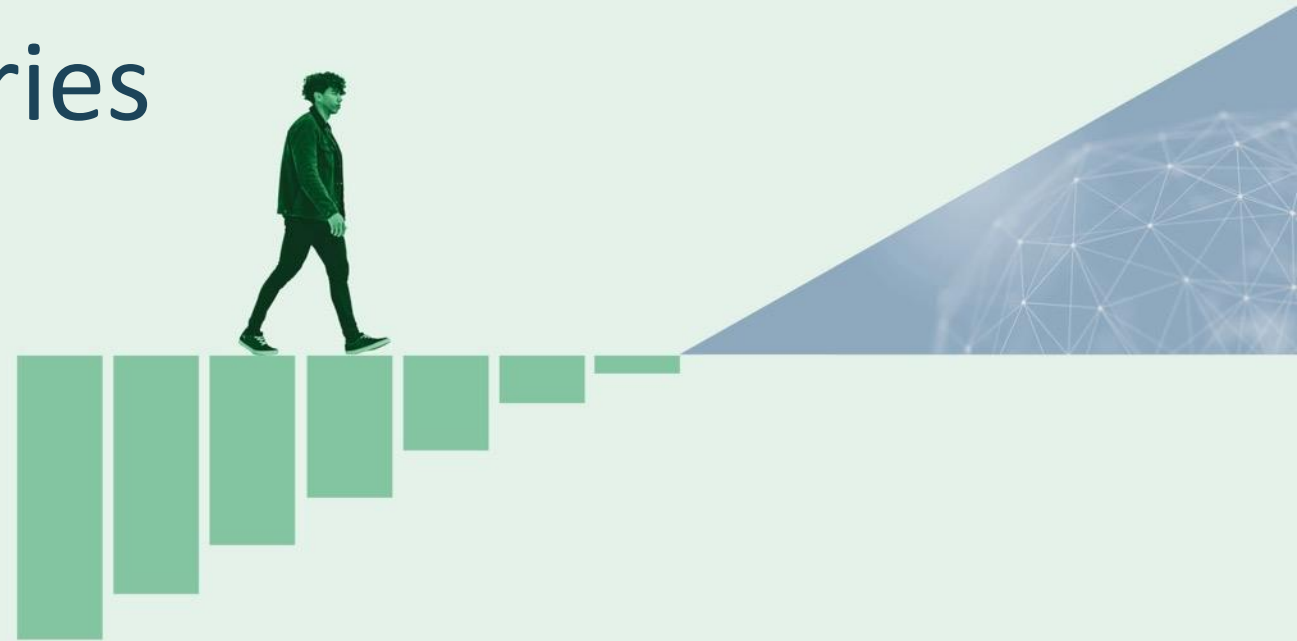


3.5 The Government wants to prioritize competence for the green transition. The competence needs of the O&G sector during the transition are not addressed.

- The current Government’s education policy, including expectations for future competence needs, is described in the White Paper “Utsyn over kompetansebehovet i Norge” (Meld.St.14 (2022-2023). It is informed by reports from Kompetansebehovsutvalget, as well as reports from industry organizations, SSB and Consultancy firms.
- The White Paper describes a current tight job market with a deficit of ICT-developers and engineers.
- The Government wants to prioritize:
 - Competence for productive and competitive industries
 - Competence for the green transition
 - Competence for high quality welfare services
 - Qualify and mobilize people currently outside the workforce
- The broad introduction of new digital technology increases the need for ICT competence, especially in combination with other skills such as domain knowledge, collaboration skills, social skills, and critical thinking skills. Universities need to align their study programs with the society’s need for talent with such diverse sets of skills.
- The White Paper describes a high uncertainty related to the long-term development of the O&G sector and the corresponding need for people. A new report from Kompetanseutvalget on the green transition, expected early June 2023, will be addressing the need for competence during the energy transition from fossil fuels to low-emission energies.
- The Government has identified several important industries for the green transition, including offshore wind, batteries, hydrogen and CCS. The White Paper refers to NHO and LO, who are worried about a competence shortage during the green transition. It also refers to a report by Oslo Economics that describes the importance of a holistic view of the energy sector where there is an internal mobility of people to optimize capacity utilization.
- The Government is clear on the expectations to the universities on prioritizing areas of high importance for the green transition. The need for highly qualified talent needed to compete successfully for O&G market shares during the decades to come through the energy transition, is not discussed in the White Paper.
- From an NCS energy supply and security perspective, OG21 is of the opinion that it would be a concern if the expectations from the Government are that the priorities would be at the expense of petroleum studies.



4. Recruitment to offshore energy industries

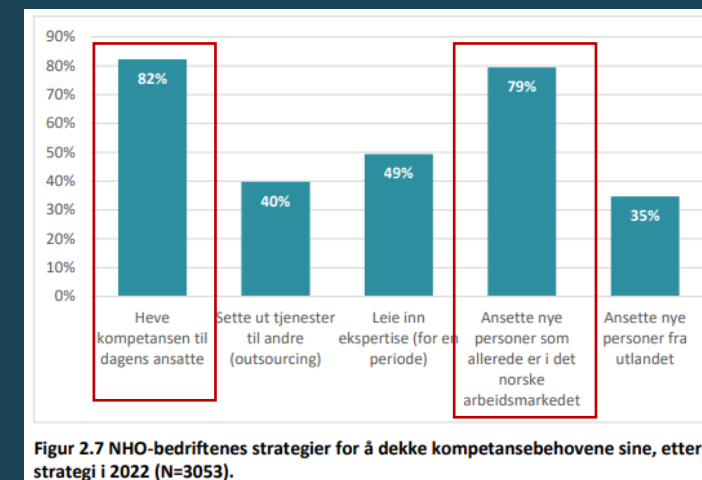


4.1 Access to talent is a bottle neck for the Norwegian offshore energy industries short-term

- NIFU (2023) describes in their annual assessment for NHO, the Confederation of Norwegian Employers, a situation where Norwegian industry enterprises experience a continued lack of competence. 65% of the industry enterprises report an uncovered competence need.
- For the energy industries (Energi Norge representing renewables companies, Offshore Norge representing energy companies mainly engaged in O&G, and Norsk Industri representing suppliers to the energy companies), engineering competence is the biggest gap, followed by ICT, natural sciences/mathematics and social sciences/law. Supplier companies have in addition a high need for people with vocational competence.
- The companies in the NIFU study report two main strategies to fill competence gaps:
 - Increase the competence of the workforce
 - New hires

Tabell 3.1 Andel NHO-bedrifter som i stor eller noen grad har behov for følgende fagkompetanse, etter landsforeninger i 2022. (N=4686)

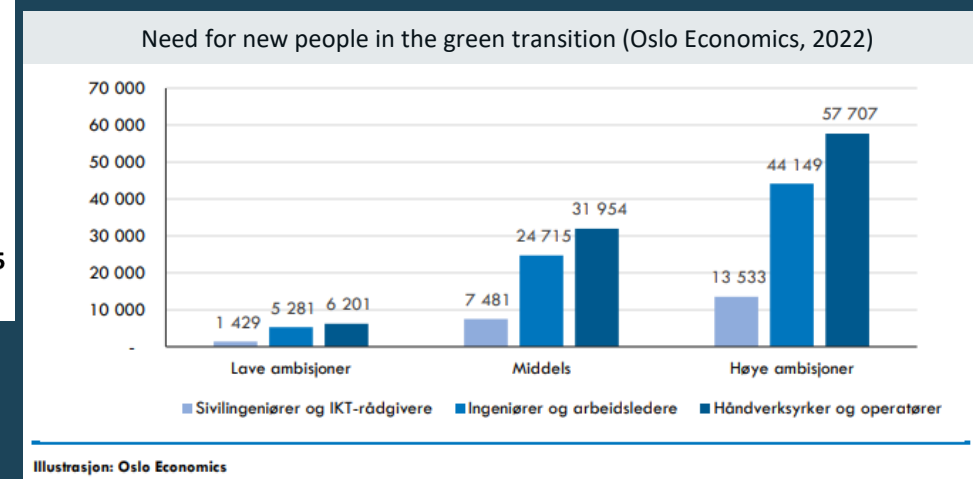
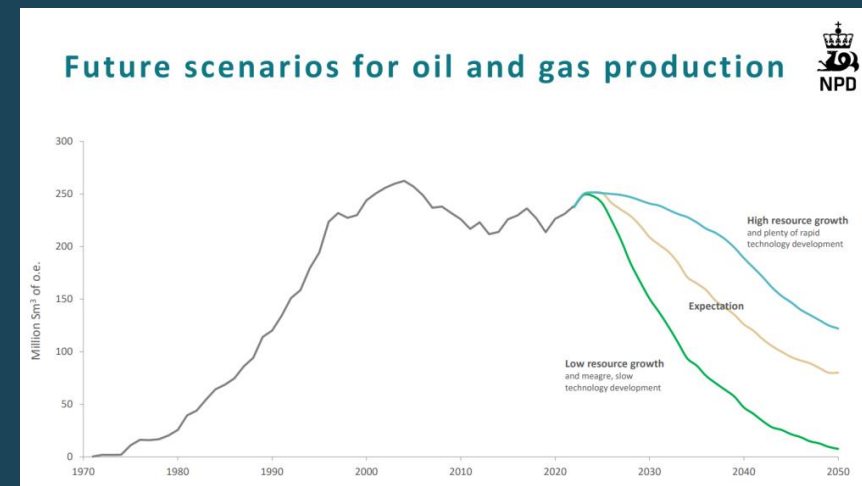
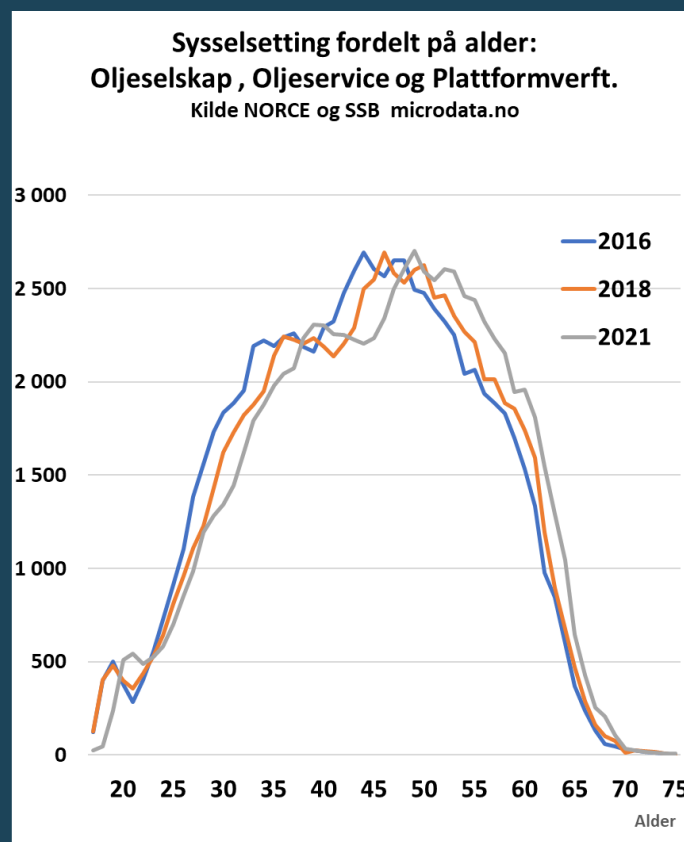
Landsforening	Forsvars- og sikkerhetsfag	Helse-, sosial- og idrettsfag	Humanistiske og estetiske fag	Læring og pedagogiske	Matematikk/naturvitenskapelige fag	Ingeniør og tekniske fag	Håndverksfag	Primærnæringsfag	Samferdselsfag	Samfunnsfag, juridiske fag.
Abelia	15%	15%	15%	16%	31%	53%	10%	6%	6%	55%
Byggenæringens Landsforening	2%	1%	2%	1%	9%	60%	75%	3%	7%	24%
Energi Norge	19%		2%	1%	39%	82%	47%	3%	8%	45%
Mediebedriftenes Landsforening	8%	5%	26%	11%	15%	21%	8%	6%	8%	44%
NHO Geneo	1%	78%	7%	28%	12%	14%	6%	3%	1%	32%
Byggmesterforbundet	1%				3%	55%	79%			18%
NHO Logistikk og Transport	11%	1%	1%	3%	4%	18%	15%	15%	54%	40%
NHO Luftfart	25%	8%			8%	58%	17%		33%	17%
NHO Mat og Drikke	4%	8%	3%	1%	16%	27%	43%	35%	8%	30%
NHO Reiseliv	4%	6%	4%	6%	4%	8%	40%	12%	5%	27%
NHO Service og Handel	3%	15%	9%	15%	6%	18%	52%	9%	6%	28%
NHO Sjøfart	8%				42%	75%	33%		42%	50%
NHO Transport	6%	3%		6%	6%	24%	12%	3%	76%	35%
Nelfo	6%	1%	1%	2%	5%	67%	81%	3%	4%	17%
Norges Bilbransjeforbund (NBF)	1%	1%	2%	1%	2%	42%	66%	5%	9%	20%
Norsk Industri	8%	1%	3%	2%	24%	72%	57%	5%	7%	30%
Offshore Norge	18%	2%	2%		44%	80%	20%	4%	6%	38%
Sjømat Norge	5%	1%	5%	4%	35%	66%	47%	57%	8%	49%
Total	6%	7%	5%	6%	13%	44%	51%	9%	8%	30%



Figur 2.7 NHO-bedriftenes strategier for å dekke kompetansebehovene sine, etter strategi i 2022 (N=3053).

4.2 Offshore energy industries will likely need new talent also long-term, driven by an aging O&G workforce and development of new offshore industries

- Blomgren and Fjellidal (2022) describe an aging workforce in the petroleum industry (see figure right). 35% of the workforce is above 50 years old (it is even worse in oil companies, pipe transport and process plants where 46% are above 50 years old). In addition, there are two age gaps in the demography curve: age group 20-24 and 35-42 years respectively.
- The activity level in the petroleum industry is going to be high at least until 2026, driven by the high number of PDOs in 2021-2022. NPD (2023) describe different scenarios after that depending on resource growth and technology implementation. NPD expects the NCS production to slowly decline during the 2030'ies, but the difference between the high and low scenarios is very large as we approach 2040.
- Some of the long-term decline in the petroleum industry could be off-set by activities in new, offshore energy-related industries on the NCS such as CCS, offshore wind and seabed minerals. Oslo Economics (2022) have estimated that the green transition could result in a need for more than 30 000 engineers and IKT professionals already in 2030 in the middle scenario, however with a large uncertainty span btw. the low and high scenarios depending on how the transition goes.
- The pool of talent needs to be increased to address the demand for STEM professionals. This includes more STEM study places and graduates as discussed in Section 3, but also to attract talent from abroad.



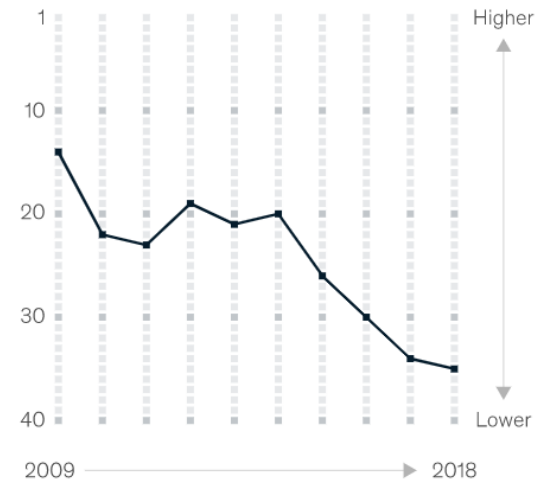
4.3 Energy related companies are popular among STEM graduates in Norway

- Universum (2023) find many energy related companies to be among the most popular with new STEM graduates in Norway. It might be in contrast with the popular belief in Norway that even oil companies and suppliers to the petroleum sector are on top of the list of preferred employers.
- New STEM graduates internationally are less positive to the petroleum industry (see figure far right). The popularity of petroleum companies has shown a decreasing trend over the last decade (McKinsey, 2019). The low attractiveness globally is confirmed by Universum's global index over most popular companies with engineering graduates in 2022, with only two oil companies among top 50 and the highest at rank 27 (Universum, 2023).

	universum Most attractive employers Norway Engineering / Natural sciences		
	2020	2021	2022
1	Equinor	Equinor	Equinor
2	Norconsult	Norconsult	Norconsult
3	Sintef	Multiconsult	Multiconsult
4	Multiconsult	Sintef	Aker Solutions
5	Sweco	Kongsberg Gruppen	Kongsberg Gruppen
6	Kongsberg Gruppen	Aker Solutions	Aker BP
7	Google	Sweco	Sweco
8	Asplan Viak	Innovasjon Norge	Skanska
9	Rambøll	Skanska	AF Gruppen
10	Forsvarets forskningsinstitutt	AF Gruppen	Google
11	AF Gruppen	Rambøll	COWI
12	Innovasjon Norge	Aker BP	Sintef
13	Statens vegvesen	COWI	Statkraft
14	Aker Solutions	Forsvaret	Veidekke
15	COWI	Statkraft	Rambøll
16	Veidekke	Veidekke	Statsbygg
17	DNV GL	Asplan Viak	Forsvaret
18	Skanska	Statens vegvesen	Hydro
19	Forsvaret	Google	DNV
20	Statkraft	DNV GL	Asplan Viak

The oil and gas industry is losing its appeal to the next generation of talent.

Ranking of most-attractive employers among engineering/IT students

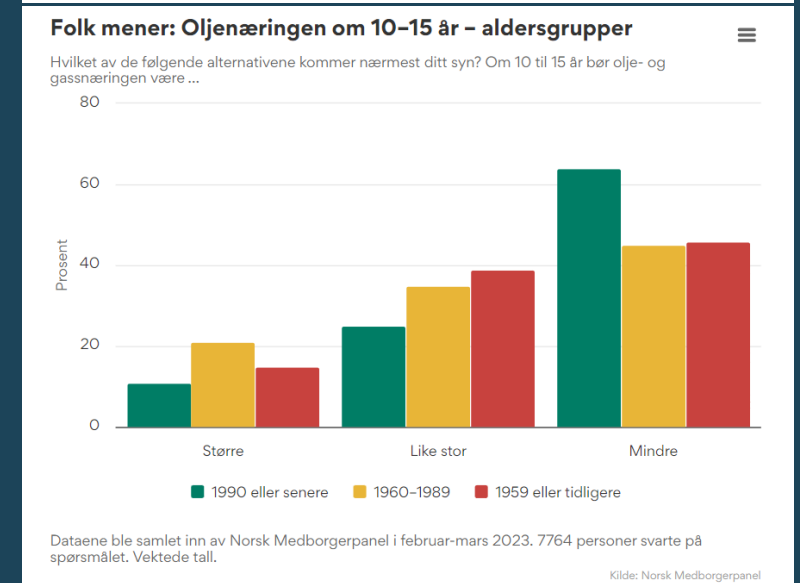
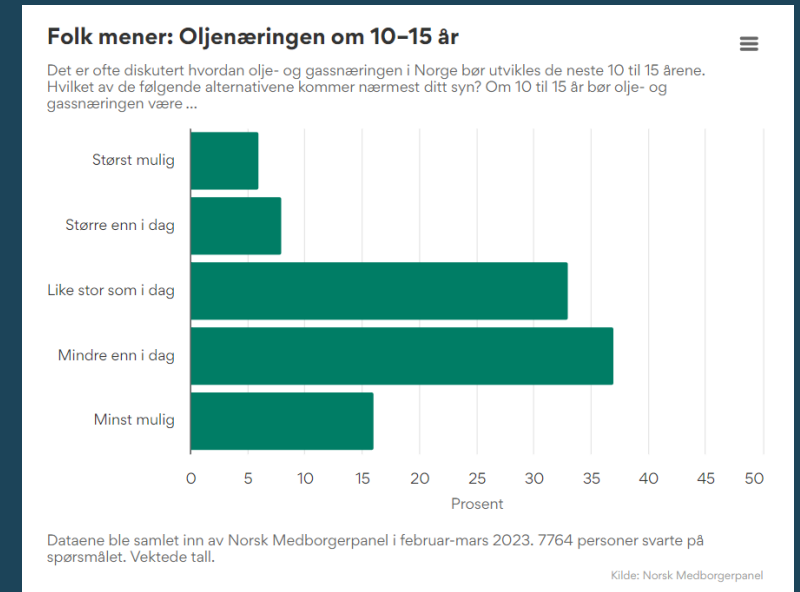


Source: 2018 gender diversity study, Petroleum Equipment & Services Association, April 2018; Independent Petroleum Association of America; Preparing for an aging workforce: Oil, gas and mining industry report, SHRM, December 2015; World's most attractive employers 2018, Universum, September 2018

McKinsey
& Company

4.4 What does it take to be attractive in the competition for talent?

- Universum (2023) list the following attributes as the most important when Norwegian graduates rank employers:
 1. A friendly work environment
 2. Competitive base salary
 3. Variety of assignments
 4. Flexible working conditions
 5. Leaders that support my development
- At a higher level, industries are also dependent on social support and a positive reputation to stay attractive. Gregersen (2023) has in a poll revealed that among the general population in Norway, approximately 50% are of the opinion that in 10-15 years the petroleum industry should be at the same size or bigger than today. Among those born after 1990 more than 60% believe the petroleum industry should be smaller in 10-15 years than today.
- OG21 is of the opinion that public support, especially by the young, is dependent on whether the petroleum industry is recognized for contributing to the energy transition and curb greenhouse gas emissions. The industry needs to be part of the solution, not the problem. It remains to the industry to convince the public through tangible activities and results that it is. That means:
 - The petroleum industry needs to deliver year-on-year greenhouse gas emission cuts from the production as well as along the petroleum value chain.
 - To demonstrate that petroleum production is part of the energy equation during an orderly energy transition to a low-emission society.



5. Developing the workforce



5.1 Life-long learning to succeed in the twin transition

- Competence development and life-long learning is becoming ever more important to motivate and retain people. Enterprises want their employees to have deep domain knowledge as well as a broader overview of the areas where the knowledge is applied.
- Management support and ownership is important to build knowledge culture and provide strategies and tools for people to meet new challenges.
- New digital technologies as well as the advent of new energy and maritime industries such as battery technology, CCUS, offshore wind and seabed mining require a workforce with the ability to acquire new competence and adapt to changing job requirements.
- NIFU (2023) describes in their annual assessment for NHO, the Confederation of Norwegian Employers, a situation where Norwegian industry enterprises experience a continued lack of competence. 65% of the industry enterprises report an uncovered competence need. Developing the competence of the workforce is described as a key strategy to address the need.
- The Governmental White Paper on competence (Meld.St.14 (2022-2023)) does however suggest that private enterprises do not appear to be investing more in competence development of their workforce, although larger enterprises in general invest more per employee than small and medium sized businesses. Continued education and workforce competence development is the responsibility of individuals and companies, but upskilled employees could go to competitors. This market imperfection leads to under-investments as compared to the optimum level from a societal perspective. Public co-pay could mitigate the problem.
- The Government therefore has announced that a competence reform is forthcoming, which will incentivize continued education and professional development.
- The universities are responding to the needs of the industry, and several courses related to digital transformation and the green shift are now being offered to professionals. Providing high quality courses require time and effort both from the universities and industry partners.



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NETTSTUDIER

CCUS-kurs: CO2 fangst, bruk og lagring

Vil du lære meir om CO2 fangst, -bruk og -lagring? Nettbasert kurs over 10 veker, primært for deg som jobbar innan olje-, gass- eller leverandøriustrien.




Length Scales

Imaging techniques

10⁻⁶-10⁻⁴m MICROSCALE
10⁻⁴-10⁻²m CORESCALE
10⁻²-10⁰m BLOCKSCALE
10⁰-10²m GRIDBLOCK SCALE
10²-10⁴m FIELD SCALE

Microscopy MRI and CT Nuclear Tracer Numerical Simulations

Nettbasert emne om CO2 fangst og lagring for deg som jobbar innan olje- og gassindustrien. Foto: UIB



NTNU Studier Studentliv Forskning og innovasjon Om NTNU

Videreutdanning og deltidsstudier Enkelkurs



Foto: Colourbox/Sergey Nivens

Muliggjørende teknologier for digitalisering

Start: 27.09.2023
Søknadsfrist: 01.06.2023

Sted for samlinger: Trondheim

Pris: 24000 Kr
Studiepoeng: 7,5
Emnekode: IT6205

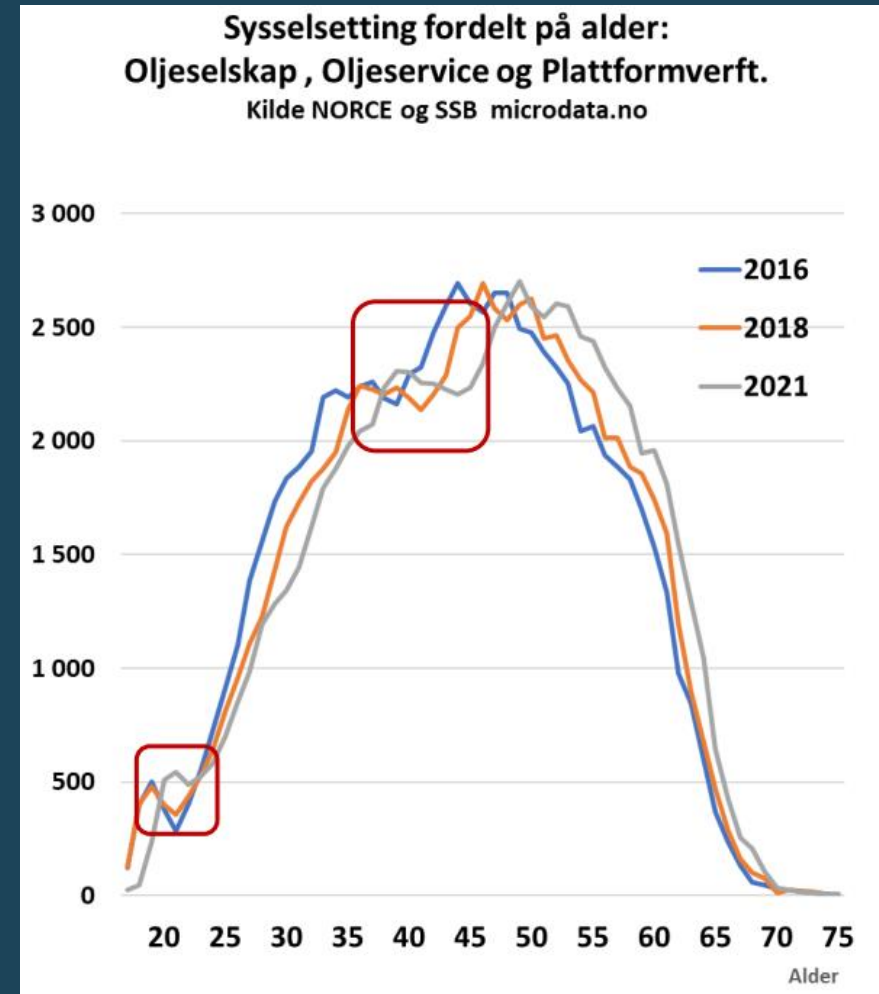
Søk dette kurset nå

Emnet gir innføring i og oversikt over ny digital teknologi, som for eksempel maskinlæring, kunstig intelligens, tingenes internett, virtuell virkelighet og stordata. Du vil få tilstrekkelig innsikt til at du skal kunne forstå, planlegge og gjennomføre omstillings- og utviklingsprosesser i egen organisasjon basert på digitale løsninger.

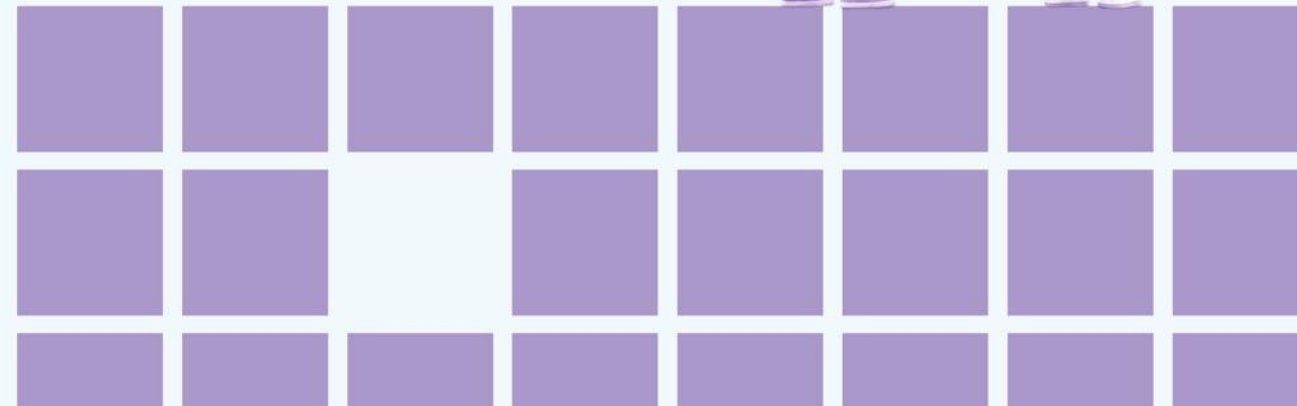
Emnet kan inngå i basismodulen NTNUs Masterprogram i teknologiledelse og digital omstilling, eller som del av et annet studium ved NTNU hvor det passer inn.

5.2 Retain employees in a tight job market

- Retaining employees is a key challenge when there is scarcity of qualified professional and competition for talent in the job market.
- Delivering on employees' criteria for a good working environment could be critical to retain people. Universum (2023) list the following attributes as the most important when Norwegian graduates rank employers:
 - A friendly work environment
 - Competitive base salary
 - Variety of assignments
 - Flexible working conditions
 - Leaders that support my development
- Life-long learning important to motivate and retain people. Organizations need to recognize that people are motivated in different ways - some have a very strong inner drive, others must be nudged. Many are however motivated by new challenges throughout their career.
- The petroleum industry is cyclical and has over the last two decades gone through several down-turns with lay-offs. The low-cycle periods right after year 2000 and in 2014 corresponds to distinct "gaps" in the demography, suggesting that lay-offs during such periods cause lasting impact.
- To avoid such demography gaps and loss of reputation, it is important for the industry to offer job security also during down-cycle periods.



6. References & abbreviations



References

- A. Blomgren and Ø. M. Fjelldal. (2022). *Utvikling i sysselsetting relatert til petroleum, sokkel-elektrifisering og nye havnæringer, 2018-2026*. Rapport 12/2022 NORCE Helse & Samfunn. <https://norceresearch.brage.unit.no/norceresearch-xmlui/bitstream/handle/11250/3002711/NORCE%2BRapport%2B12-2022%252C%2BHelse%2Bog%2Bsamfunn.pdf?sequence=1&isAllowed=y>
- IEA. (2022). *IEA World Energy Investment 2022*. IEA. Hentet fra <https://iea.blob.core.windows.net/assets/b0beda65-8a1d-46ae-87a2-f95947ec2714/WorldEnergyInvestment2022.pdf>
- IOPG (2022). *Rebalancing Europe's gas supply*. <https://iogpeurope.org/project/rebalancing-europes-gas-supply-opportunities-in-a-new-era>
- IPCC (2023). *Sixth Assessment Report*. <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>
- IEF. (2021). Deepening Underinvestment in Hydrocarbons Raises Spectre of Continued Price Shocks and Volatility. International Energy Forum. <https://www.ief.org/investment-report-2021>
- Klassekampen (2023). *Antallet studenter fra utenfor EQS stuper, 26 April 2023*. <https://klassekampen.no/utgave/2023-04-26/antallet-studenter-fra-utenfor-eos-stuper>
- Meld.St.36 (2020-2021). *Energi til arbeid – langsiktig verdiskaping fra norske energiresurser*. <https://www.regjeringen.no/contentassets/3d9930739f9b42f2a3e65adadb53c1f4/no/pdfs/stm202020210036000dddpdfs.pdf>
- McKinsey (2019). How women can help fill the oil and gas industry's talent gap. <https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-women-can-help-fill-the-oil-and-gas-industrys-talent-gap>
- Meld.St.14(2022-2023). *Utsyn over kompetansebehovet i Norge*. <https://www.regjeringen.no/contentassets/d4a1053c98614420a71de98352902464/no/pdfs/stm202220230014000dddpdfs.pdf>
- NILU. Arbeidsmarkedet for IKT-kandidater med høyere utdanning. <https://nifu.brage.unit.no/nifu-xmlui/bitstream/handle/11250/2675765/NIFU-rapport2020-15.pdf?sequence=6&isAllowed=y>
- NIFU. Kompetanse for grønn omstilling. <https://nifu.brage.unit.no/nifu-xmlui/bitstream/handle/11250/3063455/NIFUrapport2023-5.pdf?sequence=1&isAllowed=y>
- NIFU. NHOs kompetansebarometer 2022. <https://nifu.brage.unit.no/nifu-xmlui/bitstream/handle/11250/3050853/NIFU-rapport2023-1.pdf?sequence=1&isAllowed=y>
- NIFU/Oslo Economics (2023). Privat finansiering av forskning, utvikling og forskningsbasert innovasjon i Norge. <https://www.forskningsradet.no/siteassets/publikasjoner/2023/privat-finansiering-av-forskning-utvikling-og-forskningsdrevet-innovasjon-i-norge.pdf>
- NPD (2022). *Resource report 2022*. <https://www.npd.no/globalassets/1-npd/publikasjoner/rapporter/ressursrapporter/2022/en/resource-report-2022.pdf>
- NPD (2023). *Sokkelåret 2022*. <https://www.npd.no/fakta/publikasjoner/rapporter/sokkelaret/sokkelaret-2022/>
- OG21. *A new Chapter*. 2021. https://www.og21.no/siteassets/figurer-og21-strategi-2021/og21-strategi_eng.pdf
- Oslo Economics (2022). *Kompetanse- og kunnskapsbehov for det grønne skiftet*. <https://www.nho.no/contentassets/cae76a06ce6a4db9a6d5dec6cc73c5e3/221111-rapport--rapport-gronn-kompetanse-og-kunnskap.pdf>
- Samordna opptak (2023). <https://www.samordnaopptak.no/info/om/sokertall/index.html>
- SSB (2023). *Rekruttering til forskning innenfor energi og petroleum*. <https://www.ssb.no/teknologi-og-innovasjon/forskning-og-innovasjon-i-naeringslivet/artikler/rekruttering-til-forskning-innenfor-energi-og-petroleum>
- T. Gregersen (2023). *Oljenæringen om 10 til 15 år: Mindre, som I dag, eller større?* Energi og klima, 2 May 2023. <https://energiogklima.no/nyhet/oljenaeringen-om-10-til-15-ar-mindre-som-i-dag-eller-storre/>
- Universum (2023). *World's most attractive employers*. <https://universumglobal.com/wmae2022/>

Abbreviations

bcm	Billion cubic meter	RCN	The Research Council of Norway
CAPEX	Capital expenditures	R&D&I	Research, development and innovation
CCS	Carbon capture and storage	STEM	Science, technology, engineering and mathematics
EEA	European Economic Area	UIS	University of Stavanger
EOR	Enhanced oil recovery	UK	United Kingdom
GHG	Greenhouse gas		
ICT	Information and communication technology		
IOC	International oil company		
IPCC	International Panel on Climate Change		
LO	Landsorganisasjonen – Norwegian confederation of trade unions		
LNG	Liquified natural gas		
MPE	Ministry of Petroleum and Energy		
NCS	Norwegian continental shelf		
NIFU	Nordic institute for studies of innovation, research and education		
NHO	The confederation of Norwegian enterprise		
NOC	National oil companies		
NPD	Norwegian Petroleum Directorate		
NTNU	Norwegian University of Science and Technology		
O&G	Oil and gas		

Appendix A – Key take-aways from OG21 workshop on competence



Key take-aways from June 1 Workshop on Competence (see Appendix for details)

A

Energy studies – recruitment and content

- Need more STEM student places – could vary between disciplines
- Start early – generate interest in STEM subjects early – engaged teachers/role models, guest teachers.
- Broad energy studies with a strong foundation – need to keep the motivation high through studies.
- Rename studies to better reflect the broad scope of the energy transition and future roles of candidates.
- Ph.D.-salaries too low to attract Norwegian graduates in a tight work market.
- Be attractive to foreign students, especially for higher level studies.

B

Recruitment to the energy industries

- Avoid competence “cannibalism” -> Increase pool of resources: (i) More STEM study places in Norway, and (ii) be attractive to foreign graduates and professionals.
- Industry needs to be part of the solution, not the problem. Bring more balance to what is the actual problem and what is the actual solution. Be better at communicating the industry’s role in the energy transition and the ongoing work on decarbonization.
- Challenging to get supply industry involved in R&D projects. NCS is mature and hence the time for return of investment is uncertain. The Government through the Research Council, has an increased role to stimulate innovation, which again leads to people development.
- Is the diversity within the operators too narrow (in background and perspectives)? Is a more strategic diversification a vehicle to improve performance (including recruitment and retainment)?

C

Life-long learning

- Need people with deep domain knowledge as well as wide scope understanding.
- Life-long learning important to match the pace of technology development, build change capability, and participate in new industry opportunities.
- Life-long learning important to motivate and retain people. Recognize that people are motivated in different ways - some have an inner drive, others must be nudged. Many are motivated by new challenges throughout their career.
- Management support and ownership important to build knowledge culture and provide strategies and tools for people to meet new challenges.
- High competition for talent, and trained employees could be lost to competitors. Public co-pay could reduce such market imperfections.
- Need better collaboration btw. universities and industry. Takes time and effort to develop high quality courses that align with industry needs.

The logo consists of the letters 'OG21' in a white, stylized, sans-serif font. The 'O' and 'G' are connected at the top, and the '2' and '1' are also connected. The background is a blue-tinted photograph of ocean waves with white foam.

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