RAPPORT 7/2005

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Evaluation of the DEMO 2000 program

NIFU STEP

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Rapport 7/2005
ISBN 82–7218–503–2
ISSN 1504–1824

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Preface

This report presents an evaluation of the DEMO 2000 program. DEMO 2000 is a large Norwegian technology development program for the oil and gas industry. Responding to initiatives from the Norwegian supplier industry, DEMO 2000 was initiated in 1999 by the Norwegian Ministry of Petroleum and Energy (MPE). In June 2005, NIFU STEP was given a contract by the MPE to evaluate DEMO 2000. The main topics in this evaluation were:

- Analysis of economic and socioeconomic effects related to the allocation of financial funds and the intention of DEMO 2000;
- Assessment of technology development, piloting and commercialization resulting from the awards of DEMO 2000»s financial support;
- Analysis of the program's additionality effects; how much technology development, piloting and commercialization would not have been achieved without DEMO 2000;
- Assessment of the organization and work processes of the program, including the relationship to the Research Council of Norway as well as other relevant parties;
- Proposals for program changes

The evaluation began in June 2005 and a final draft of the evaluation report was completed 13th December 2005. The evaluation was organized as a project under the leadership of Dr. Helge Godø of NIFU STEP in Oslo, who also has been responsible for the overall design and quality assurance of the evaluation. However, the main bulk of the work has been done by:

- Dr. Tor Borgar Hansen of NIFU STEP
- Mr. Tore Karlsson (MSc) of MemeTree Ltd, an independent consultant and expert of oil and gas industry.

In addition, the evaluation has benefited from:

- Mr. Nils Henrik Solum of NIFU STEP, who made major contributions in designing both web based surveys and in addition ran the first survey
- Mr. Aris Kaloudis, research director of NIFU STEP, who has given valuable advice to the evaluation.

Needless to say, an evaluation of this type is not possible without considerable contributions of facts, opinions and data from a large number of sources. Whenever possible and appropriate, this report will give credit to these sources in the text, however, we would like to thank all those who have contributed to questionnaires and interviews during the evaluation – and all others who used their valuable time to provide the evaluation with data and information.

Petter Aasen
Director

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Executive summary

DEMO 2000 is a technology development program organized in a large number of collaborative projects with participants from supplier industry, international and Norwegian oil companies and – to a lesser extent – Norwegian research institutions. Responding to initiatives from the Norwegian supplier industry, DEMO 2000 was initiated in 1999 by the Norwegian Ministry of Petroleum and Energy (MPE). In June 2005, NIFU STEP was given a contract by the MPE to evaluate DEMO 2000. In sum, the evaluation suggests that DEMO 2000 may be considered successful because – in spite of its relatively short lifetime – it has achieved its main objectives.

By 2005, MPE's funding of DEMO 2000 reached 342 million Norwegian kroner (MNOK). In DEMO 2000, participants contributed their own funds in the projects, in a co-financing arrangement together with MPE's funds. This resulted in projects with a total cost of approximately 1.5 billion Norwegian kroner (BNOK). Although many projects have not yet created any economic benefits (and some will probably never), a few DEMO 2000 projects have already obtained benefits in the magnitude of a factor between 2 and 3 times the total DEMO 2000 budget.

The evaluation found that DEMO 2000 obtained high additionality. The majority of the deliverables from the projects would not have materialized without the support and funding from the DEMO 2000 program, or at best been available at a later stage and at a smaller scale.

Approximately 1/3 of the DEMO 2000 projects were primarily concerned with measurement technologies, data analysis and modeling and/or interpretation technologies. The use of products and services resulting from these projects contribute to better risk management and decision making. However, the lion's share of the projects in the DEMO 2000 portfolio are concerned with technologies that will contribute to cost saving for the operators and/or increased hydrocarbon production/recovery. DEMO 2000 has contributed far more to later phases in the exploration and production (E&P) process than to the early exploration phase.

As yet, the value obtained from DEMO 2000 projects on the Norwegian Continental Shelf (NCS) is estimated to be in the order of 3 to 4.5 BNOK.

Based on information from the oil companies supporting the projects in the DEMO 2000 portfolio, an indicator for the total expected future value from these products and services – calculated by adding the potential value as reported for the individual projects – is estimated to be between 75 and 135 BNOK for the NCS.

The service companies/contractors expect future increase of revenues in the range of 3 to 6.5 BNOK within two years, between 6.5 and 11.5 BNOK in the 2

to 5 year timeframe and between 9.5 and 15 BNOK within 5 and 10 years as a result of their participation in DEMO 2000. Compared with the oil companies, this increase in revenues is expected to be obtained earlier, among other reasons, simply because the oil companies in most cases will need to invest in the new products and services before they can start to see the financial benefit. As an indication, the service companies/contractors have already in total seen between 1.25 and 2.3 BNOK of additional revenue realized. For the service companies/contractors it is also possible to observe that the projects being started early in the program, at this stage, have realized more value than the later ones.

The majority of the parties involved considered the DEMO 2000 organization and work processes of the program as «good» to «extremely good». The DEMO 2000 program has had an informal organization and non-bureaucratic work processes, in particular compared to EU programs. The program administration is highly respected by the participants. In addition to the financial support obtained through the DEMO 2000 program, many of the participants emphasized the value of obtaining support to and prioritizing new technology from the point of view of the end user.

DEMO 2000 has contributed, in particular, to activity in the following areas:

- Planning and execution of field development
- Production and production optimization
- To some extent in development and production drilling
- Some technologies will also have value in the field abandonment phase
- Sub sea solutions for deep water – specifically sub sea processing has been a priority area

Many projects are contributing to all the original goals defined for the DEMO 2000 program:

- Reduced cost on NCS
- Improved attractiveness of and activity on NCS
- Improved competitiveness of Norwegian industry

There has been a shift of emphasis from the first two to the last goal during the program.

Conclusion and recommendation

Based on the results of our evaluation, NIFU STEP recommends the continuation of the DEMO 2000 program.

Sammendrag

DEMO 2000 er et teknologiutviklingsprogram som er basert på et bredt anlagt samarbeid i form av en rekke samarbeidsprosjekter mellom leverandørindustrien, internasjonale og norske oljeselskaper og – i noe mindre utstrekning – norske forskningsinstitusjoner. DEMO 2000 ble igangsatt av Olje- og energidepartementet i 1999 etter initiativ fra især norsk oljeleverandørindustri. I juni 2005 fikk NIFU STEP i oppdrag å evaluere DEMO 2000. Ut fra evalueringens vurderinger kan man si at DEMO 2000 har vært vellykket fordi det på relativt kort tid har oppnådd sine viktigste målsetninger.

På evalueringstidspunktet hadde OED bidratt med 342 millioner kroner (MNOK) i støtte til DEMO 2000 siden oppstarten i 1999. Dette, sammen med deltakernes medfinansiering, ga et totalbudsjett for alle DEMO 2000 prosjektene på om lag 1,5 milliarder kroner (NOK). Selv om mange prosjekter ikke ennå har skapt økonomisk virkninger (noen vil sannsynligvis aldri oppnå økonomiske resultater), så fant evalueringen noen prosjekter som i sum allerede har gitt gevinster i størrelsesorden to til tre ganger DEMO 2000s totalbudsjett.

Etter evaluerings oppfatning oppnådde DEMO 2000 høy addisjonalitet. Brorparten av resultatene i DEMO 2000 prosjektene ville ikke ha blitt oppnådd uten støtten og finansieringen fra programmet, i hvert fall ikke på et så tidlig stadium som de faktisk har og sannsynligvis i mindre skala.

Om lag 1/3 av prosjektene i DEMO 2000 porteføljen var primært fokusert mot måleteknologier, data analyse, modellerering og/eller tolkningsteknologier. Bruk av produkter og tjenester som resulterer fra denne type prosjekter bidrar til forbedret risikohåndtering og beslutninger. Hovedandelen av DEMO 2000 prosjektene omfatter imidlertid teknologier som vil ha en direkte innvirkning på kostnadsreduksjon for operatører og/eller økt utvinning av hydrokarboner. DEMO 2000 har bidratt mest til de senere fasene i lete- og utvinningsprosessen og i mindre grad til letefasen.

Per i dag er den realiserte verdien fra DEMO 2000 prosjektene på den norske kontinentalsokkelen estimert til å være i størrelsesordenen 3 til 4,5 milliarder NOK.

Informasjon fra oljeselskapene som har støttet prosjektene i DEMO 2000 programmet tyder på at den totale fremtidige forventede verdien av produktene og tjenestene – representert ved en indikator som summerer fremtidig forventet verdi for de enkelte prosjektene – kan beregnes til å være i størrelsesordenen 75 til 135 milliarder NOK for den norske kontinentalsokkelen.

Den fremtidige verdien av DEMO 2000 prosjektene representerer muligheter for økt fremtidig omsetning for leverandørselskapene og indikatoren er estimert til å være i størrelsesområdet 3 til 6,5 milliarder NOK innen to år, mellom 6,5 og 11,5 milliarder NOK på to til fem års sikt og mellom 9,5 og 15 milliarder

NOK på fem til ti års sikt. De fremtidige verdiene forventes å bli raskere realisert for leverandørbedriftene enn for oljeselskapene, blant annet fordi oljeselskapene i de fleste tilfeller vil måtte foreta investeringer i produkter og tjenester før de kan høste gevinstene. Verdiindikatoren for serviceselskapene viser at disse allerede har realisert mellom 1,25 og 2,3 milliarder NOK i økt omsetning som en følge av resultatene fra deres DEMO 2000 prosjekter. For serviceselskapene sin del har prosjektene som fikk støtte i den tidlige fasen av DEMO 2000 programmet utløst mer verdi enn prosjektene som ble støttet i senere faser.

Flertallet av de involverte partene i DEMO 2000 programmet vurderer organiseringen og arbeidsprosessene i programmet som «god(e)» eller «svært god(e)». Mange deltagere fremhever også at programmet har stor verdi utover den finansielle støtten og da spesielt i forhold til å få innsikt i kundenes behov som igjen bidrar til å prioritere i utviklingen av ny teknologi. DEMO 2000 har hatt en uformell organisasjon og ubyråkratiske arbeidsprosesser, spesielt sammenlignet med EU-programmer. Programmets administrasjon nyter stor respekt blant deltakerne.

DEMO 2000 har spesielt bidratt til aktivitet på følgende områder:

- Planlegging og gjennomføring av feltutbygginger
- Produksjon og produksjonsoptimalisering
- I noen grad i utviklings- og produksjonsboring
- Noen av de utviklede teknologiene vil også ha verdi i avslutningsfasen
- Undervannsløsninger for store vanndyp, spesielt undervannsprosessering, har vært er prioritert område

Mange av prosjektene bidrar til å oppnå alle de opprinnelige målsetningene med DEMO 2000 programmet:

- Reduserte kostnader på norsk sokkel
- Økt aktivitet og attraktivitet på norsk sokkel
- Økt konkurransekraft i olje- og gassindustrien

I løpet av programmets levetid kan det synes som at det har vært en økende vektlegging av den sistnevnte målsetningen.

Konklusjon/anbefaling

Basert på resultatene av vår evaluering av DEMO 2000 programmet, vil NIFU STEP anbefale at programmet videreføres.

Summary – Main findings

DEMO 2000 is a technology development program organized in a large number of collaborative projects with participants from supplier industry, international and Norwegian oil companies and – to a lesser extent – Norwegian research institutions. Responding to initiatives from the Norwegian supplier industry, DEMO 2000 was initiated in 1999 by the Norwegian Ministry of Petroleum and Energy (MPE). In June 2005, NIFU STEP was given a contract by the MPE to evaluate DEMO 2000. In sum, the evaluation suggests that DEMO 2000 may be considered successful because – in spite of its relatively short lifetime – it has achieved its main objectives.

By 2005, MPE's funding of DEMO 2000 reached 342 million Norwegian kroner (MNOK). In DEMO 2000, participants contributed their own funds in the projects, in a co-financing arrangement together with MPE's funds. This resulted in projects with a total cost of approximately 1.5 billion Norwegian kroner (BNOK). Although many projects have not yet created any economic benefits (and some will probably never), a few DEMO 2000 projects have already obtained benefits in the magnitude of a factor between 2 and 3 times the total DEMO 2000 budget.

Approximately 1/3 of the DEMO 2000 projects were primarily concerned with measurement technologies, data analysis and modeling and/or interpretation technologies. The use of products and services resulting from these projects contribute to better risk management and decision making. However, the lion's share of the projects in the DEMO 2000 portfolio are concerned with technologies that will contribute to cost saving for the operators and/or increased hydrocarbon production/recovery. DEMO 2000 has contributed far more to later phases in the exploration and production (E&P) process than to the early exploration phase.

As a major financial contributor and stakeholder in DEMO 2000, the MPE established and appointed representatives to an Executive Steering Group for DEMO 2000. Most of these members are from the Norwegian oil and gas industry, i.e. Norwegian and international oil companies, the supplier industry, research institutions as well as observers from MPE, the Research Council of Norway (RCN) and the Norwegian Petroleum Directorate. In addition, a Technical Committee consisting of members from the participating oil companies has been instrumental in handling project applications. RCN has given DEMO 2000 administrative and managerial support.

Additionality

The total expenditure of the Norwegian government in the DEMO 2000 project portfolio from 1999 to mid-2005 (the period covered by this report) was 342 MNOK. This resulted in projects with a total cost of 1.5 BNOK. In addition, the companies involved have invested, and will continue to invest in the resulting products and services for another estimated 300 to 500 MNOK.

The majority of the deliverables from the projects would not have materialized without the support and funding from the DEMO 2000 program, or at best been available at a later stage and at a smaller scale.

Realized value

As yet, the value obtained from DEMO 2000 projects on the Norwegian Continental Shelf (NCS) is estimated to be in the order of 3 to 4.5 BNOK.

Future value – oil companies

Based on information from the oil companies supporting the projects in the DEMO 2000 portfolio, an indicator for the total expected future value from these products and services – calculated by adding the potential value as reported for the individual projects – is estimated to be between 75 and 135 BNOK for the NCS. Because many of the technologies will be interlinked when deployed in specific fields, the real value may be somewhat lower, however, it is still high.[1]

Within the next 2 years, between 10 and 15 % of the value as estimated by the indicator of 75 to 135 BNOK is expected to be realized, whereas some 35 % is expected to be realized in the 2 to 5 year timeframe and some further 45 % within 5 to 10 years. This future value resulting from projects funded by the DEMO 2000 program is expected to come from the use of new technology contributing to a combination of increased hydrocarbon production and recovery as well as from reduced total cost in E&P projects.

Future value – service companies

The service companies/contractors expect future increase of revenues in the range of 3 to 6.5 BNOK within two years, between 6.5 and 11.5 BNOK in the 2 to 5 year timeframe and between 9.5 and 15 BNOK within 5 and 10 years as a result of their participation in DEMO 2000. Compared with the oil companies,

1 An example may illustrate this: If the IMPREDO technology from SeaBed AS makes it possible to develop a field worth 10 BNOK with an acceptable risk due to improved seismic imaging and the same field can be developed since it is possible to install subsea equipment with the fibre rope deployment system from Odim Alitech, it will obviously not be correct to estimate the total value for the two projects for Norway to be 20 BNOK. This constructed example is taken from detailed descriptions of DEMO 2000 projects which can be found in appendix 2.

this increase in revenues is expected to be obtained earlier, among other reasons, simply because the oil companies in most cases will need to invest in the new products and services before they can start to see the financial benefit. As an indication, the service companies/contractors have already in total seen between 1.25 and 2.3 BNOK of additional revenue realized. For the service companies/contractors it is also possible to observe that the projects being started early in the program, at this stage, have realized more value than the later ones.

An even shorter term impact is the financial value for the supplier to the service companies/contractors involved. Many Norwegian (and other) companies have already delivered components and services to the companies involved in the project. As the activity is increasing in line with the above described expectations, this impact will also increase.

Approximately 1/3 of the financial support by DEMO 2000 has been provided for the two largest service companies/contractors involved.

Key factors for the realization of future values – all participants

- *Offshore demonstrations:* Although many of the projects include an offshore pilot (15 % of all DEMO 2000 projects, 39 % of all DEMO 2000 projects which have conducted a pilot), the technology for the rest of the portfolio is documented through onshore / lab test pilots that are in many cases not considered a full qualification of the technology. For many of the resulting products/services the operators will require offshore demonstrations or at least testing under realistic conditions in order to reduce technology risk before buying the solution
- *Positive field trials:* Even for the projects with completed offshore pilots, the growth of sales will develop only after the technology as a system has been used in a real commercial/operational mode – at least in several positive field trials, but often over long time to prove financial value, technical reliability and to be widely accepted. For many of the projects it is important to qualify a complete system – not only the specific components
- *The second valley of death:* Successful solutions to the above challenges often require creative business models in order to pass the «second valley of death»:
  - Finding the right partner for the service company / contractor involved
  - Overcoming delays or change of plans in the field projects targeted for piloting / first commercial use
  - Convincing partners and obtaining agreement in a license
  - Dependency on breakthroughs for complementary technologies

- *Deep and ultra deep water focus:* Many of the DEMO 2000 projects have developed technology for deep and ultra deep water. So far no ultra deep water fields have been found on the NCS and a limited, but growing market exist worldwide. Identification of such fields where the DEMO 2000 technology is enabling field development and optimization both on the NCS and globally is important
- *Time window of differentiation:* Technology is continuously being developed world wide and the value of the uniqueness of the technology resulting from the DEMO 2000 program needs to be leveraged within the «time window of differentiation»
- *Personnel and learning:* Lack of, or limited availability of qualified personnel resources and the ability to adapt to new ways of working are also barriers of commercialization for some projects

Socioeconomic impact

Although one may reasonably expect a high socioeconomic impact from DEMO 2000, an assessment of these has been beyond the scope of this study.

Assessing the organizational structure of DEMO 2000

DEMO 2000 has established itself as a «trade mark» internationally and is recognized as a valuable model for similar initiatives in other countries. This has facilitated collaborative efforts between DEMO 2000 and comparable international initiatives, such as e.g. DeepStar and PROCAP 3000.

In DEMO 2000, the research institutes had peripheral roles. Still, some research institutes have participated as subcontractors in DEMO 2000 projects, providing services related to testing and laboratory piloting. For a few projects the program has contribute to improving the competitiveness of institutes because this has enabled them to demonstrate strengths within certain technical/scientific disciplines and provided opportunities for new areas of technology development.

The majority of the parties involved considered the organization and work processes of the program as «good» to «extremely good». The DEMO 2000 program has had an informal organization and non-bureaucratic work processes, in particular compared to EU programs. The program administration is highly respected by the participants. In addition to the financial support obtained through the DEMO 2000 program, many of the participants emphasized the value of obtaining support to and prioritizing new technology from the point of view of the end user.

Overall contribution – main goals

DEMO 2000 has contributed, in particular, to activity in the following areas:

- Planning and execution of field development
- Production and production optimization
- To some extent in development and production drilling
- Some technologies will also have value in the field abandonment phase
- Sub sea solutions for deep water – specifically sub sea processing has been a priority area

Many projects are contributing to all the original goals defined for the DEMO 2000 program:

- Reduced cost on NCS
- Improved attractiveness of and activity on NCS
- Improved competitiveness of Norwegian industry

There has been a shift of emphasis from the first two to the last goal during the program.

Conclusion and recommendation

DEMO 2000 may be considered successful because – in spite of its relatively short lifetime – it has achieved its main objectives. As shown in the evaluation, a few DEMO 2000 projects have already obtained benefits in the magnitude of a factor between 2 and 3 times the total DEMO 2000 budget of approximately 1.5 BNOK.

DEMO 2000 has had a high degree of additionality and has had a positive influence on the results of the projects, either by making them possible at all or by accelerating and scaling up this type of technology development.

The Norwegian society has an opportunity for considerable benefit from DEMO 2000 projects if the factors that represent barriers are overcome within the «time window of differentiation».

Based on the results of our evaluation, NIFU STEP recommends the continuation of the DEMO 2000 program.

Sammendrag – hovedfunn

DEMO 2000 er et teknologiutviklingsprogram som er basert på et bredt anlagt samarbeid i form av en rekke samarbeidsprosjekter mellom leverandørindustrien, internasjonale og norske oljeselskaper og – i noe mindre utstrekning – norske forskningsinstitusjoner. DEMO 2000 ble igangsatt av Olje- og energidepartementet i 1999 etter initiativ fra især norsk oljeleverandørindustri. I juni 2005 fikk NIFU STEP i oppdrag å evaluere DEMO 2000. Ut fra evalueringens vurderinger kan man si at DEMO 2000 har vært vellykket fordi det på relativt kort tid har oppnådd sine viktigste målsetninger.

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Om lag 1/3 av prosjektene i DEMO 2000 porteføljen var primært fokusert mot måleteknologier, data analyse, modellerering og/eller tolkningsteknologier. Bruk av produkter og tjenester som resulterer fra denne type prosjekter bidrar til forbedret risikohåndtering og beslutninger. Hovedandelen av DEMO 2000 prosjektene omfatter imidlertid teknologier som vil ha en direkte innvirkning på kostnadsreduksjon for operatører og/eller økt utvinning av hydrokarboner. DEMO 2000 har bidratt mest til de senere fasene i lete- og utvinningsprosessen og i mindre grad til letefasen.

Som viktigste økonomiske bidragsyter har OED etablert og utnevnt medlemmer til en styringsgruppe for DEMO 2000. De fleste av medlemmene i denne gruppen kommer fra norsk olje- og gassindustri, dvs. fra norske oljeselskap eller internasjonale oljeselskap med virksomhet i Norge, norsk leverandørindustri og institutter, samt representanter fra OED, Norges forskningsråd og Oljedirektoratet. I tillegg ble det etablert en teknisk komité sammensatt av representanter fra de deltakende oljeselskapene. Denne komiteen har hatt en viktig rolle i utvelgelse av prosjekter til DEMO 2000. Administrasjonen av DEMO 2000 har vært lagt til Norges forskningsråd.

Programmets utløsende effekt – addisjonalitet

Myndighetenes samlede utgifter til DEMO 2000 prosjekt porteføljen var 342 MNOK i perioden 1999 til midten av 2005 (det tidsrommet denne evalueringen

omfatter). Dette har resultert i prosjekter med et totalbudsjett på kr. 1,5 milliarder NOK. I tillegg har leverandørbedriftene som er involvert i programmet planer om å investere ytterligere 300 til 500 MNOK i sine DEMO 2000 prosjekter.

Brorparten av resultatene i DEMO 2000 prosjektene ville ikke ha blitt oppnådd uten støtten og finansieringen fra programmet, i hvert fall ikke på et så tidlig stadium som de faktisk har og sannsynligvis i mindre skala.

Realisert verdi

Per i dag er den realiserte verdien fra DEMO 2000 prosjektene på den norske kontinentalsokkelen estimert til å være i størrelsesordenen 3 til 4,5 milliarder NOK.

Fremtidig verdi for oljeselskapene

Informasjon fra oljeselskapene som har støttet prosjektene i DEMO 2000 programmet tyder på at den totale fremtidige forventede verdien av produktene og tjenestene – representert ved en indikator som summerer fremtidig forventet verdi for de enkelte prosjektene – kan beregnes til å være i størrelsesordenen 75 til 135 milliarder NOK for den norske kontinentalsokkelen. Men fordi mange teknologier vil bli integrert i større teknologiske løsninger og –systemer når de kommer til anvendelse på spesifikke felt, vil den reelle verdien sannsynligvis være noe lavere, men den vil uansett være av et anselig volum.[2]

Innen to år forventes det at om lag 10 til 15 % av den indikerte verdien vil bli realisert, mens 35 % og 45 % av dette kan forventes å bli realisert på henholdsvis 2 til 5 og 5 til 10 års sikt. Den fremtidige gevinsten fra DEMO 2000 prosjektene forventes å komme fra nyutviklet teknologi som bidrar til økt utvinning av hydrokarboner, samt reduserte kostnader i lete- og utvinningsprosjekter.

Fremtidig verdi for leverandørselskapene

Den fremtidige verdien av DEMO 2000 prosjektene representerer muligheter for økt fremtidig omsetning for leverandørselskapene og indikatoren er estimert til å være i størrelsesområdet 3 til 6,5 milliarder NOK innen to år, mellom 6,5 og 11,5 milliarder NOK på to til fem års sikt og mellom 9,5 og 15 milliarder NOK på fem til ti års sikt. De fremtidige verdiene forventes å bli raskere realisert for leverandørbedriftene enn for oljeselskapene, blant annet fordi oljeselskape-

2 Et eksempel kan klargjøre dette: Hvis IMPREDO teknologien fra SeaBed AS muliggjør utviklingen av et felt til en verdi av 10 milliarder NOK med en askeptabel risiko grunnet forbedret seismisk imaging og det samme feltet kan utvikles fordi undervannssystemer kan installers ved hjelp av fibertau vinsjsystemet utviklet av Odim Alitech, er det åpenbart ikke riktig å estimere verdien av de to prosjektene til 20 milliarder NOK. Dette konstuerte eksemplet baserer seg på detaljert informasjon om DEMO 2000 prosjekter som finnes i appendix 2.

ne i de fleste tilfeller vil måtte foreta investeringer i produkter og tjenester før de kan høste gevinstene. Verdiindikatoren for serviceselskapene viser at disse allerede har realisert mellom 1,25 og 2,3 milliarder NOK i økt omsetning som en følge av resultatene fra deres DEMO 2000 prosjekter. For serviceselskapene sin del har prosjektene som fikk støtte i den tidlige fasen av DEMO 2000 programmet utløst mer verdi enn prosjektene som ble støttet i senere faser.

Underleverandørene til serviceselskapene har hatt en enda kortere horisont for sine gevinster av DEMO 2000 prosjektene. Mange norske (og andre) selskaper har allerede levert komponenter og tjenester til serviceselskapene som er direkte involvert i DEMO 2000 prosjektene. Ettersom aktiviteten øker i tråd med forventningene som beskrevet ovenfor, vil effektene for underleverandørene også øke.

Omtrent 1/3 av den finansielle støtten fra DEMO 2000 programmet har vært tildelt (tidligere og nåværende, til dels fusjonerte) selskaper i de to største aktørene målt etter mottatt støtte fra DEMO 2000.

Kritiske faktorer for utløsning av fremtidig verdi – alle aktører

- *Offshore demonstrasjoner:* Selv om mange DEMO 2000 prosjekter har hatt en offshore pilot (15 % av alle DEMO 2000 prosjekter, 39 % av alle DEMO 2000 prosjekter som har gjennomført en pilot), er teknologien i mange av prosjektene i resten av porteføljen dokumentert ved hjelp av onshore piloter og laboratorieforsøk. I mange tilfeller vil dette ikke kunne betraktes som en fullverdig utprøving av teknologien. Derfor vil operatørene kreve ytterligere, offshore pilotering eller i det minste testing under realistiske forhold av mange av produktene og tjenestene i DEMO 2000 prosjektene for å minske den tekniske risikoen før de vil vurdere et kjøp.
- *Positive feltforsøk:* Selv for prosjekter som har gjennomført en offshore pilot vil en økning i salget først kunne finne sted etter at teknologien har blitt utprøvd i et system i en reell kommersiell eller driftsmessig setting. I det minste vil det kreves flere positive feltforsøk, ofte over lang tid for å bevise finansiell verdi og teknisk pålitelighet for å bli anerkjent. For mange prosjekter vil det være avgjørende å utprøve et system, ikke bare spesifikke komponenter.
- *Dødens dal nr. 2:* Vellykkede løsninger på utfordringene nevnt ovenfor vil ofte kreve kreative forretningsmodeller for å komme gjennom dødens dal nr. 2, som for eksempel:
  - Finne den rette partneren for den involverte serviceselskapet
  - Overkomme forsinkelse eller endring i planer på felt som er utpekt som pilotkandidat/første kommersielle bruker

  - Overbevise partnere og oppnå enighet innad i en lisens
  - Unngå ulempene når man venter på gjennombrudd for relaterte, komplementære teknologier
- *Fokus på dypt og ultra dypt vann:* Mange av prosjektene har frembrakt teknologi for anvendelse på felt i dypt og ultra dypt vann. Så langt er det ikke påvist felt på ultra dypt vann på den norske kontinentalsokkelen, men det finnes et begrenset, men voksende marked for slike felt internasjonalt. Det er derfor viktig å identifisere felt, både på den norske kontinentalsokkelen og internasjonalt, der DEMO 2000 teknologi kan bidra til feltutvikling- og optimalisering.
- *Tidsvindu for differensiering:* Teknologi blir utviklet kontinuerlig på verdensbasis og verdien av den unike teknologien som DEMO 2000 har skapt må realiseres innenfor et tidsvindu for differensiering.
- *Personell og læring:* Mangel på eller begrenset tilgang til kvalifisert personell samt evnen til å tilegne seg nye arbeidsmetoder er også identifisert som kommersialiseringsbarrierer for enkelte DEMO 2000 prosjekter.

Samfunnsøkonomisk verdi

Selv om det er grunn til å anta en høy samfunnsøkonomisk verdi som et resultat fra DEMO 2000 programmet, har det ikke vært mulig innenfor rammen av denne evalueringen å foreta nøyaktige beregninger av slike resultater.

Vurdering av organisasjonsstrukturen for DEMO 2000

DEMO 2000 har etablert seg som et «varemerke» internasjonalt og blir fra utlandet betraktet som en foregangsmodell for lignende initiativer. Dette har bidratt positivt til samarbeid mellom DEMO 2000 og sammenlignbare utenlandske programmer som DeepStar og PROCAP 3000.

Forskningsinstituttene betrakter ikke DEMO 2000 som et program tilrettelagt for dem i rollen som hovedkontraktspartner. Unntakene er de instituttene som i tillegg til sin forskningsaktivitet også har utviklingsaktiviteter. Instituttenes rolle i DEMO 2000 har vært mer knyttet til underleverandørrollen og da særlig i forbindelse med testaktiviteter. Enkelte DEMO 2000 prosjekter har bidratt til økt konkurranseevne for instituttene gjennom demonstrasjon av styrke innen visse teknologi- og fagområder og muliggjort innsats på nye områder.

Flertallet av de involverte partene i DEMO 2000 programmet vurderer organiseringen og arbeidsprosessene i programmet som «god(e)» eller «svært god(e)». Mange deltagere fremhever også at programmet har stor verdi utover den finansielle støtten og da spesielt i forhold til å få innsikt i kundenes behov som igjen bidrar til å prioritere i utviklingen av ny teknologi. DEMO 2000 har

hatt en uformell organisasjon og ubyråkratiske arbeidsprosesser, spesielt sammenlignet med EU-programmer. Programmets administrasjon nyter stor respekt blant deltakerne.

Programmets oppnåelse av overordnede målsetninger

DEMO 2000 har spesielt bidratt til aktivitet på følgende områder:

- Planlegging og gjennomføring av feltutbygginger
- Produksjon og produksjonsoptimalisering
- I noen grad i utviklings- og produksjonsboring
- Noen av de utviklede teknologiene vil også ha verdi i avslutningsfasen
- Undervannsløsninger for store vanndyp, spesielt undervannsprosessering, har vært er prioritert område

Mange av prosjektene bidrar til å oppnå alle de opprinnelige målsetningene med DEMO 2000 programmet:

- Reduserte kostnader på norsk sokkel
- Økt aktivitet og attraktivitet på norsk sokkel
- Økt konkurransekraft i olje- og gassindustrien

I løpet av programmets levetid kan det synes som at det har vært en økende vektlegging av den sistnevnte målsetningen.

Konklusjon/anbefaling

DEMO 2000 må betraktes som vellykket siden programmet på relativt kort tid må sies å ha oppnådd sine målsetninger. Som påvist i evalueringen har noen prosjekter allerede gitt gevinster i størrelsesordenen 2 til 3 ganger DEMO 2000s totalbudsjett på 1,5 milliarder NOK.

DEMO 2000 har hatt en stor utløsende effekt og har hatt en positiv innvirkning på prosjektenes resultater, enten ved at de har blitt muliggjort i det hele tatt eller at denne type teknologiutvikling har skjedd raskere og i større skala enn uten programmet.

Det norske samfunnet har en mulighet til å høste betydelige gevinster fra DEMO 2000 prosjektene dersom påviste barrierer overvinnes innenfor tidsvinduet for differensiering.

Basert på resultatene av vår evaluering av DEMO 2000 programmet vil NIFU STEP anbefale at programmet videreføres.

1 Introduction – background and terms of reference

NIFU STEP was awarded the task of evaluating the DEMO 2000 program by the Norwegian Ministry of Petroleum and Energy (MPE) 01.06.2005. DEMO 2000 is a project oriented technology development program based on a broad collaboration between the supplier industry, international and Norwegian oil companies, and – to a lesser degree – research institutions. The program was conceived in 1999 by the MPE after initiatives from the Norwegian supplier industry. The total budget for the program has been 342 MNOK as of 2005 and has had administrative support from the Research Council of Norway (RCN). The program is owned by the MPE, who appointed an Executive Steering Group mainly consisting of members of the industry (Norwegian and international oil companies, the supplier industry, research institutions as well as observers from MPE, RCN and the Norwegian Petroleum Directorate). In addition, a Technical Committee consisting of members from the participating oil companies has been instrumental in handling project applications.

The terms of reference for this evaluation were: [3]

1) Analysis of economic and socioeconomic effects related to the allocation of financial funds and the intention of DEMO 2000;
2) Assessment of technology development, piloting and commercialization resulting from the awards of DEMO 2000 financial support;
3) Analysis of the programs additionality effects; how much technology development, piloting and commercialization would not have been achieved without DEMO 2000;
4) Assessment of the organization and work processes of the program, including the relationship to the RCN as well as other relevant parties;
5) If applicable, proposals for program changes

3 Announcement in DOFFIN, reference number 2005-05733. See also appendix 1.

2 Evaluation framework

2.1 Evaluation topics

This evaluation report is organized in two parts:

- An introductory description of the evaluation framework (chapter 2) as well as background information for the evaluation (chapter 3)
- A second part – chapters 4 to 8 – which will present the results of the evaluation and the policy analysis

The structure of the report is shown in box 2.1

Issues	Chapter
Evaluation framework and background information	
Evaluation framework	2
The DEMO 2000 program and its context	3
Module 1: Evaluation of results and goal achievement	
Results	4.1
Additionality	4.2
Achievement of goals	4.3
Module 2: Evaluation of effects	
Expected economic benefits	5.1
Achieved economic benefits	5.2
Other company-specific benefits	5.3
Effects for the participating research institutions	5.4
Socioeconomic benefits	5.5
Module 3: Evaluation of the organization of DEMO 2000	
Evaluation of the structure of goals	6.1
Evaluation of the organizational structure and the management	6.2
Evaluation of the mechanisms of financing and distribution of funds	6.3
Summary of the evaluation of the organization of DEMO 2000	6.4
Module 4: Policy analysis and recommendations	
Research challenges in the petroleum industry and structural aspects	7.1
Coordination with other R&D and innovation promoting measures	7.2
The international character of DEMO 2000	7.3
Policy recommendations	8

Box 2.1 Overview of the evaluation report

2.2 Sources of information

In this evaluation, several sources of information were used. The most important were:

1. DEMO 2000 documents and archives
2. Web-based surveys
3. Peer-review
4. Interviews

2.2.1 DEMO 2000 archives and documents

The DEMO 2000 archives provided information on:

- Project names
- Project numbers
- Project status (completed, ongoing, cancelled, transferred to another project etc.)
- Project categorization in technology areas[4]
- Project leader, as well as her/his contact information
- Project leaders organization (name of organization, main contractor)
- Sponsoring oil companies (name of organization)
- Co-operating companies and research institutions (name of organization)
- Level of funding from each project participant (in MNOK)

In June 2005, the archives had information on:

- 121 projects, of which
  - 9 were cancelled and thus left out of the evaluation
  - 6 were transferred to and continued in later projects
- Leaving 106 projects to be analyzed in this evaluation, i.e. projects awarded support later than 01.06.2005 (13 new projects as per 28.09.2005) were not included in the evaluation

Although extremely rich on information, this database has two shortcomings which influenced the evaluation project, namely the actuality of the contact information and the lack of names of contact persons except from project leaders in the organization carrying out (and receiving the public financial support for) the DEMO 2000 projects.

4 Currently, the projects in the DEMO 2000 program are divided into the following technology areas: Subsurface Technology, Drilling- and Well-technology, Process and Multiphase Transport, Deepwater Technology, Gas Utilization, System Integration, E-field and Arctic Technology.

The former obstacle was overcome by consulting representatives from the DEMO 2000 program administration as well as web searching. This resulted in a completely updated list of contact information on the DEMO 2000 project leaders.

2.2.2 Web based surveys

Initial web based survey – collection of contact information

The second challenge took considerably more time and effort to overcome. NIFU STEP decided to seek the contact information for the other project participants, i.e. representatives from sponsoring oil companies and co-operating service companies, research institutions as well as other institutions, from the presumably best informed source, namely the project leaders. Hence, a simple, web-based questionnaire in the form of a table was designed to gather the contact information from the DEMO 2000 project leaders.

All in all, we received contact information from 89 of the 106 project leaders, a response rate of 84 %.[5] We received contact information on:

- 217 oil company representatives
- 15 representatives from co-operating service companies
- 16 representatives from research institutions
- 3 representatives from other institutions

It should be noted that several of the representatives from sponsoring oil companies were identified as contact persons for more than one project. In the most extreme case, one oil company representative was identified as contact person for his company in 7 DEMO 2000 projects. In fact, 23 persons were identified as contact persons for 3 and more projects. Evidently, this may have affected the response rate of the main web survey.

The contact information gathered in this first web survey subsequently formed the basis and the input for the second and much larger main web based survey.

The main web based survey

The main web based survey was designed to fit all roles in a DEMO 2000 project, i.e. project leaders, representatives from sponsoring oil companies and other co-operating companies and research- as well as other institutions.

5 It should be noted that in 6 out of the 106 projects, we were not able to detect a project leader – mostly due to position or company changes - or her/his contact information. Hence, 100 projects were left for the evaluation.

The web based questionnaire was sent to all 351 identified DEMO 2000 project leaders and participants, based on the contact information obtained from the DEMO 2000 project leaders (see previous section).[6] Table 2.1 provides an overview of the sample and the response rates of the web based survey.

Table 2.1 The sample of the web based questionnaire and mail answers

Web based questionnaire Respondent type	**Sent**	**Completed**	**Mail answer**	**Response rate – web**	**Response rate – web and mail**	**Timed out %**	**Response rate – total**
Oil company representative	207	108	7	52,17%	55,56%	13,04%	65,22%
Project leaders	100	54	6	54,00%	60,00%	19,00%	73,00%
Service company representative	16	5	2	31,25%	43,75%	12,50%	43,75%
Other (R&D, etc.)	14	8	1	57,14%	64,29%	28,57%	85,71%
TOTAL	337	175	16	51,93%	56,68%	15,43%	67,36%

As can be seen in table 2.1, the response rate varies across the different DEMO 2000 role categories. The highest response rate was reached among the representatives from R&D and other co-operating institutions, whereas the two most populated categories – the DEMO 2000 project leaders and oil company representatives – had response rates just above 50%.

However, several DEMO 2000 entries are labeled as projects in the DEMO 2000 database, but often these are perceived by the participants to be different phases of one and the same project. Hence, several respondents stated via email that their replies related to one DEMO 2000 project entry cover all entries on that particular project (see column «Mail answer» in table 2.1. If we add these to the responses given by the respondents through the web based survey, we find the total response rate (see column «Response rate – web and mail» in table 2.1).

In addition to these response rates, several respondents partially completed the web based survey. These are labeled «Timed out» in table 2.1. Some of them have completed more than half of the questionnaire, and – dependent on the degree of completion – their answers are included in the various parts of the evaluation.

6 In 14 cases out of approximately 40 returned emails, we were not able to find the current email address of the reported participant. This is in most cases probably due to job changes.

If we look at the response rates per project, we obtained information on 95 of the 100 DEMO 2000 projects included in this evaluation through the web based questionnaire and mail answers. The number of informants per project varied from none to eight. The distribution of informants is shown in table 2.2.

Table 2.2 Distribution of informants (web based questionnaire and mail answers)

Respondent combination Number of responses to a project	No answers	Project leader	Oil company representative	Other participants	Project leader and oil company representative	Project leader and other participant	All roles	TOTAL
0	5							5
1		20	16	1				37
2			7		25	4		36
3		1	1		7		1	10
4					5		1	6
5					1			1
6					2		1	3
7							1	1
8							1	1
SUM	5	21	24	1	40	4	5	100

It is important to recall that all projects consist of at least one organization which carries out the project (project leader) as well as at least one sponsoring oil company. Only a few projects had further participants, such as co-operating service companies or research institutions.

2.2.3 Peer review – Top 2 projects

As will be elaborated in section 2.3.2, we have analyzed 8 DEMO 2000 projects in more detail than the others. These projects were nominated by the DEMO 2000 TMC, who selected 2 projects from each of the four most populated technology areas in the DEMO 2000 program. These projects were labeled Top 2 projects. To obtain more information on these projects than the web survey allowed for, all project leaders as well as representatives from sponsoring oil companies were interviewed. In total, 8 project leaders and 6 representatives from oil companies were interviewed as part of the peer review process. In addition,

11 responses from oil company representatives and 4 responses from representatives from co-operating service companies and research institutions were received through the web based survey.

2.2.4 Interviews

In addition to the participants in Top 2 projects, a number of individuals with close connections to and interests in the DEMO 2000 program were interviewed to obtain information.[7] Most members of the bodies governing DEMO 2000 were included in the interview to obtain information on the background and the work processes of the program. In addition, the web based questionnaire was tested in early interviews, mainly with DEMO 2000 ESG and TMC members as well as representatives for Top 2 projects.

2.3 Evaluation methods

In this evaluation, a number of different methods and analytical approaches were used. These will be explained below.

2.3.1 Analysis of data from surveys and interviews

The main web survey was carried out by application of the recently released software program SPSS Dimensions. This is a program especially developed for the design of web based questionnaires.

In addition to the web based questionnaire, information has been obtained through interviews with key informants in the DEMO 2000 program and its surroundings. A list of individuals who provided information through interviews can be found in appendix 4. Interviews were also used in the peer-review analysis in order to obtain more detailed information on the Top 2 projects. All interview results were recorded either in writing or electronically and have been selectively presented throughout this report.

A short note should be made on the unit of analysis. The main unit of analysis in this evaluation is the project. However, as we received information from up to 8 respondents on one individual project, the construction of a consensus variable was called for in many cases. This was done by application of the principle of plain majority, i.e. in cases where respondents disagreed on the response to a question, say as to whether a pilot has been conducted in the project or not, we computed

7 Please see appendix 4 for a list of interviewed persons

a positive answer for the project if the majority of the respondents provided a positive answer. In cases of parity, i.e. when half of the respondents answered positively and the other half negatively, we gave the project leader an extra vote. Application of these two rules solved almost all of the conflicting answers.[8]

It should also be mentioned that information on economic benefits of each project has been measured by application of value range variables. This was done in order to lower the threshold for the respondents to provide financial information on the projects. Experience has shown that many respondents are reluctant to provide exact, numeric information on measures of economic performance, simply because this may be a very time-consuming task and often respondents do not possess such exact information. Hence, we applied a value range in all questions regarding economic performance (see appendices 2 and 6).

2.3.2 Measuring effects at company level

The approach for analysis of the effects of the DEMO 2000 program at the company level is different for the suppliers and the oil & gas companies (operators) involved. To the extent that research institutes are involved the effect for them fall in a third category.

For the operators the value of technology resulting form the DEMO 2000 projects is related to the impact on increased production and ultimate recovery from their fields as well as for reduced cost in the exploration, development, production, production optimization and/or abandonment phases. From this point of view the DEMO 2000 project portfolio can be further split in two parts:

- Projects resulting in measurement related technology providing the operator with a better basis for decision making and risk management
- Projects delivering technology that will have a direct impact on the financial gains for the company assets as identified above

For projects in the measurement category we asked the interviewees to estimate the value of the improved basis for decision making through the different E&P phases from pre drilling exploration to field abandonment. For all projects we asked the interviewees to evaluate the impact of the resulting technology on increased production and ultimate recovery from their fields as well as from the impact on reduced cost in the exploration, development, production, production optimization and/or the abandonment phase. The focus of the value creation has

8 The necessity of computing consensus answers is an interesting result per se. Obviously, in some cases this may be due to various biases such as e.g. a hindsight bias in case of projects which have been completed some years ago.

been for the most relevant field for the oil company involved, for the NCS as a whole and for the global portfolio of assets for the oil company being asked.

To try to quantify the value of the projects as seen from the service company / contractors side, we asked the company representatives to evaluate the expected increase in revenue and profitability for their company in Norway and internationally.

8 projects in the portfolio were analyzed in more detail than the others. These projects were nominated by the DEMO 2000 TMC, who selected 2 projects from each of the four most populated technology program areas. They were labeled Top 2 projects. To obtain more information on this subset of the portfolio than the web survey allowed for, all 8 project leaders as well as 5 representatives from sponsoring oil companies were interviewed. In addition, 11 responses from oil company representatives and 4 responses from co-operating service companies and research institutions were received through the web based survey.

A description of each of the Top 2 projects is included in appendix 3 where these project characteristics are discussed:

Following a short description of the technology, product and service constituting each of the projects, the participating oil companies and possibly research institutes involved and the achievements versus the original goals are discussed. The additionality (to what extent the project would have happened without DEMO 2000 support) is also part of this discussion. It should be mentioned that in this evaluation, as a novelty, we have also tried to investigate additionality effects on the output side, i.e. the results of each project. This was done by asking the participants about the importance of the DEMO 2000 support in achieving the various results of the individual projects.

The next step is to summarize the contribution to financing of the project by the partners. For the service company/contractor involved this includes financing of relevant development both before the DEMO 2000 project started, during the project period and after the DEMO 2000 period was completed.

In the discussion, major focus is set on quantifying the financial value of the project for both the service company/contractor, the oil companies and, if relevant, the research institutes involved as well as the potential value on the NCS as a whole. The last part includes a discussion of the contribution of the project to the general goals for the DEMO 2000 program:

- Reduced cost on the NCS
- Improved attractiveness of/activity on the NCS
- Improved competitiveness of Norwegian industry

Finally possible contributions to improved health, safety and environment are addressed.

Analysis of the Top 2 projects gave input to both the design and analysis of the information in the database generated from the web survey.

2.3.3 Measuring socioeconomic effects

A useful framework for analyzing socioeconomic benefits or effects from RD&D (research, development and demonstration) has been developed for evaluation of the Department of Energy's (DoE) large-scale energy research programs.[9] This evaluation distinguishes between economic benefits and costs, environmental benefits and costs as well as security benefits and costs. Depending on the degree to which these effects can be commercially exploited as well as the state of the technology development, they are categorized as either realized benefits, options benefits or as knowledge benefits. These benefits are summarized in figure 2.1.

Technology Development / Economic/ policy conditions	Technology Developed	Technology Development in Progress	Technology Development Failed
Will be favorable for commercialization	Realized benefits	Knowledge benefits	Knowledge benefits
Might become favorable for commercialization	Options benefits	Knowledge benefits	Knowledge benefits
Will not become favorable for commercialization	Knowledge benefits	Knowledge benefits	Knowledge benefits

Figure 2.1 A methodical framework for measuring socioeconomic effects of RD&D programs

The applicability of this concept with respect to the DEMO 2000 program lies in the similarity of the different cases in the DoE-matrix with the DEMO 2000 projects. In line with the intentions of the program, most of the projects fall under either of the two first categories of technology development. Projects are supposed to have reached a high degree of completion with respect to technical development. In DEMO 2000 they are supposed to be demonstrated, tested and

9 Cf. National Research Council et.al. (2000).

piloted in order to assess the commercialization potential. In theory, some projects will be tested with positive results, and thus be a step closer to commercialization or even reach the commercial stage in immediate succession to the test/demonstration/pilot. In other cases the result may be that further testing is needed. Finally, some projects may prove to have no commercial potential due to failed tests and further development may thus be aborted. Hence, we propose to encompass the case in which a DEMO 2000 project has already proved its commercial potential. This results in the following framework:

Technology Development / Economic/ policy conditions	Technology Developed	Technology Development in Progress	Technology Development Failed
Already materialized	Realized benefits	N.A.	N.A.
Will be favorable for commercialization	Realized benefits	Knowledge benefits	Knowledge benefits
Might become favorable for commercialization	Options benefits	Knowledge benefits	Knowledge benefits
Will not become favorable for commercialization	Knowledge benefits	Knowledge benefits	Knowledge benefits

Figure 2.2 A tentative, modified application of the DoE methodical framework for estimating socioeconomic effects of DEMO 2000 projects

A complete analysis of socioeconomic benefits is well beyond the scope of this evaluation project. Nevertheless, we have attempted to compute indicators of value creation at a socioeconomic level, which, however, should be treated with caution, as we have made no attempt to measure e.g. employment effects or effects on tax income. In addition, these indicators may to some degree overlap as different technologies and projects are needed to exploit the full potential of an asset on, say, the NCS or in an oil company's international portfolio. Such effects are not accounted for in this study.

3 The DEMO 2000 program and its context

3.1 The background – the state of the Norwegian oil and gas industry at the end of the past millennium

At the time of the conception of DEMO 2000 in 1999, the overall situation in the oil and gas industry was characterized by:

1. Low oil prices (ref. figure 3.1 below)
2. Low R&D activity, due to a drop in publicly funded research programs over the past years (ref. figure 3.2 below)
3. Few or no new initiatives within the industry. Many of the large Norwegian service companies as Aker Kværner and Vetco (f.k.a. ABB) had put their technology development projects on hold (or even considered writing them off)

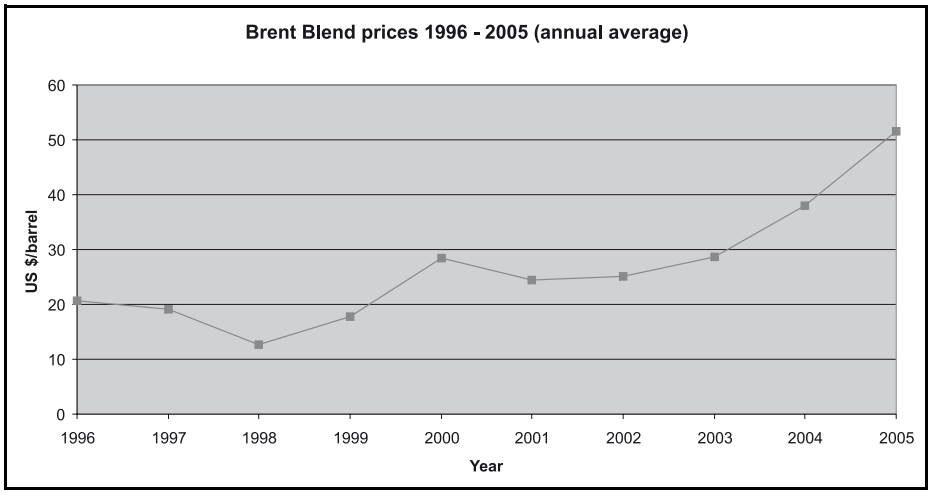

Figure 3.1 Brent Blend prices 1996 – 2005 (annual average)

The state of the industry was considered to be a threat to the future of the Norwegian oil and gas industry, which lead to an initiative by the so-called R&D Team Norway. This initiative developed into the DEMO 2000 program.

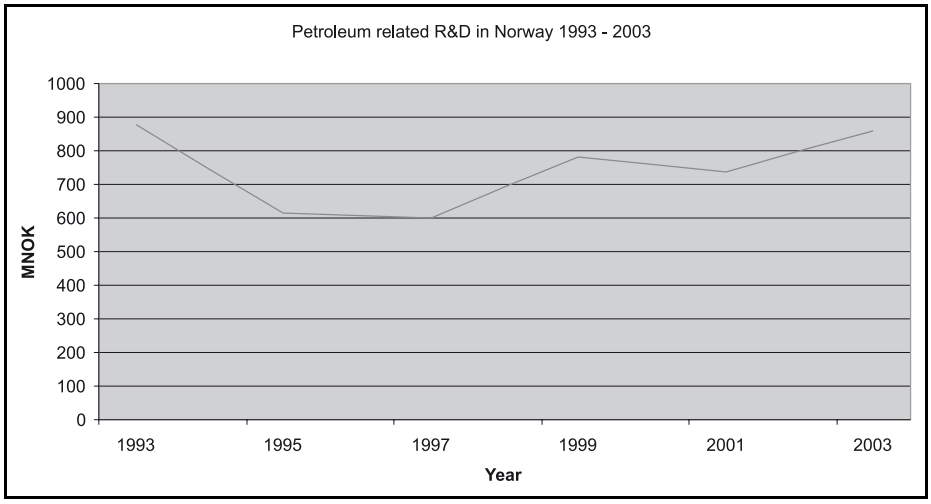

Figure 3.2 Petroleum related R&D in Norway 1993 – 2003

3.2 DEMO 2000 – description and key figures

In a White Paper from the MPE in May 1999, the DEMO 2000 program is mentioned for the first time in public documents.[10] In this, the government proposed that the Storting, the Norwegian parliament, approve an initial allocation of 100 MNOK to the DEMO 2000 program.

At the conception of the program, the following goals were stated for the program, the projects as well as activities and results:

"The programme will contribute to:

- long-term competitiveness in the oil sector
- continued profitable development of NCS resources

Projects will:

- demonstrate new technology which can lay the basis for new profitable NCS developments
- focus on specific fields where pilots can be run
- bring forward qualification of new technology

10 Cf. White Paper No. 37 (1998-1999), chapter 7 (Norwegian only) and Fact Sheet 2000 Norwegian Petroleum Activity, p. 32 (English)

Background, activities and results:
- demand for improved profitability
- need for new technology
- pilot demonstrations
- new developments
- fresh export opportunities«[11]

Initially, the Executive Steering Group of the DEMO 2000 program made the following estimates with respect to the export potential of the program: [12]
- Reservoir, drilling- and well technology: 7 – 10 BNOK
- Deep water technology/Floating production: 5 – 7 BNOK
- Subsea processing and multiphase transportation: 2 – 5 BNOK

These estimates are at the annual level, and are made under the condition that the program would be established on a permanent basis and that sufficient funds were provided for conduction of large-scale pilots.

3.2.1 The organization of DEMO 2000

The basic principles for the DEMO 2000 program were described in a guideline from the MPE and RCN in 1999.[13] This document regulates the governing bodies of the program, which tasks and responsibilities they have, the administration and management of the program and how projects are to be evaluated as well as an activity plan. In the following, we will focus more in detail on various aspects of the organization of DEMO 2000.

Internal organization

The internal organization of DEMO 2000 has since the conception of the program been made up by three parties, i.e. the program administration, the Executive Steering Group (ESG) and the TMC. However, the program is embedded in a larger system consisting of its owner, the MPE, the RCN and OG 21. Figure 3.3 provides an overview of the internal organization of DEMO 2000 but also the system in which it is embedded.

11 Fact Sheet 2000 Norwegian Petroleum Activity, p. 33
12 Cf. White Paper No. 39 (1999-2000), chapter 7
13 Ref. Ministry of Petroleum and Energy, Research Council of Norway (1999)

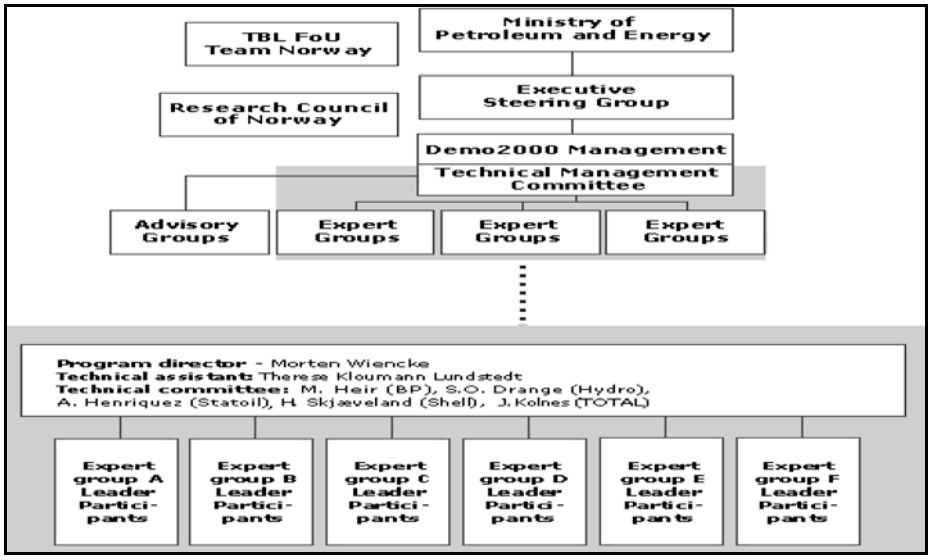

Figure 3.3 DEMO 2000 organization map

Source: http: //www.demo2000.no/om_oss/organisasjon/organisasjonskart/english.htm

As the reporting structure – as shown by lines in the figure – indicates, the program is not completely embedded within the RCN. On the contrary, the program's ESG was appointed directly by the MPE in 1999. The financial support has been provided by MPE which has earmarked financial funds to the program. These funds are administered by the RCN who has put its system for project support at the disposal of the program. Furthermore, the program manager is not a RCN employee, he is a hired consultant. He has secretarial and other RCN support functions at his disposal.

External organization

A broader view of the context in which DEMO 2000 is embedded is shown in figure 3.4.

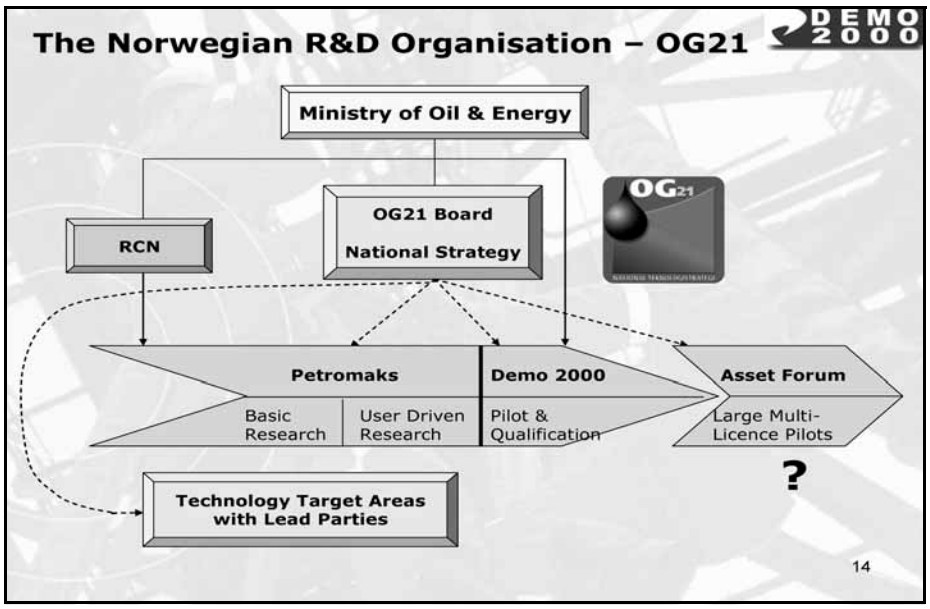

Figure 3.4 DEMO 2000 and its environment

Source: Slide no. 14 in a presentation by the chairman of the DEMO 2000 program held at the OG 21 workshop 09.03.2005

In this illustration, it becomes evident that DEMO 2000 is part of a much larger system. The most important observation is that DEMO 2000 is dependent on strategies developed by the national strategy task force, OG 21.[14] Another important observation is that DEMO 2000 – in a value chain perspective – is seen as an extension of the current petroleum research program, Petromaks. The Asset Forum depicted in the figure is an initiative created for the purpose of facilitating large, multi-licence pilots. Again, the direct relationship between the DEMO 2000 program and the MPE becomes evident. It should be noted, however, that the relationship between Petromaks and DEMO 2000 is not as close as the figure might suggest. The lion's share of applications to the DEMO 2000 program is not found among completed Petromaks projects, which of course is also due to the later conception of the latter.

14 http://www.og21.org

3.2.2 DEMO 2000 work processes

Among the most important work processes in the DEMO 2000 program is the task of application assessment which is undertaken according to the following steps:

1. Call for applications
2. DEMO 2000 program administration receives, registers and distributes the applications
3. TMC assesses the applications by use of expert groups
4. Expert groups assesses the applications individually
5. TMC meets with each expert group to reach consensus for application ranking
6. TMC applies the final criterion, piloting probability
7. TMC reaches agreement on ranking of all applications
8. TMC proposes unified list of applications to ESG
9. ESG votes over the proposed projects
10. Projects receive funds in the order of proposed list approved by ESG
11. Successive allocation of funds to projects until budget is consumed

In the DEMO 2000 program, there have been seven calls for applications, the first one in 1999 and the latest one in 2005. Hence, the program has gone through the process described above seven times.

Table 3.1 Overview of evaluation criteria applied in assessment of DEMO 2000 project applications used in the first six rounds

Evaluation criterion	**Applied in round**
1. Economic potential (NCS)	1, 2, 3, 5, 6
2. Will quickly bring forward new field developments	1, 2, 3, 5, 6
3. Innovation	2, 3, 5, 6
4. Will build competence for the future	2, 3, 5, 6
5. Can trigger new industrial activity and export	1, 2, 3, 5, 6
6. Can be demonstrated as a pilot under realistic conditions	1, 2, 3, 5, 6
7. Green technology/environmental effects	2, 3, 5, 6
8. Total solutions	2, 3, 5, 6
9. Improves long term industrial development	2, 3, 6
10. Improves cooperation and alignment of forces in the industry vs. the export market	1, 2, 3, 5, 6

As table 3.1 shows, the criteria for evaluating DEMO 2000 project applications have remained relatively stable over the six year period of the program. In the project selection process, the proposals are reviewed and assessed by the members of the expert groups of each technology area, which are headed by a TMC member. The piloting criterion (cf. criterion no. 6 in table 3.1) has not been evaluated by each member of the expert group, but by the TMC members after they have received the ratings from and achieved consensus on the project ranking within their expert groups.

3.2.3 Key figures of the DEMO 2000 program

As of round six of DEMO 2000, 111 projects had been awarded contracts, as shown in table 3.2.

Table 3.2 Overview of the DEMO 2000 project portfolio per round of awards

Round	Number of project		Distribution of funding in MNOK (%)			
	applica-tions	awards	DEMO 2000	Contractors	Oil companies	Sum
1	211	32	76.53 (22.62%)	98.10 (28.99%)	163.78 (48.40%)	338.42
2	158	23	68.03 (27.13%)	63.48 (25.32%)	119.23 (47.55%)	250.74
3	56	20	47.60 (24.19%)	73.13 (37.17%)	76.00 (38.63%)	196.73
4	11	5	11.43 (12.02%)	9.72 (10.22%)	73.96 (77.77%)	95.11
5	50	16	43.40 (26.59%)	47.98 (29.39%)	71.88 (44.03%)	163.25
6	42	15	29.73 (24.02%)	29.69 (23.99%)	64.34 (51.99%)	123.75
SUM	528	111	276.72 (23.69%)	322.09 (27.58%)	569.19 48.73%)	1168.00

As can be seen from table 3.2, the DEMO 2000 funding was at the highest level in the first round and has been decreasing since then. The most important observation, however, is that the DEMO 2000 share of 23,69% of funding (276 MNOK) has triggered 76,51% (871 MNOK) of the programs total funds from the contractors themselves (322 MNOK, 27,58%) and the sponsoring oil companies (569 MNOK, 48,73%).

The distribution of funds among the service companies/contractorsis shown in table 3.3: [15]

Table 3.3 Overview of DEMO 2000 contractors and received DEMO 2000 funding

Contractor	No. of projects	Total project cost	DEMO 2000 funding (kNOK)	Ratio
Aker Kværner	22	373 996	55 885	14.94%
Vetco	14	187 295	53 643	28.64%
FMC Kongsberg Subsea	8	131 840	24 285	18.42%
READ	6	57 199	17 208	30.08%
FRAMO Engineering	6	69 820	16 500	23.63%
Weatherford – Optoplan	7	50 500	14 280	28.28%
Roxar	5	47 728	13 313	27.89%
Atlantis Deepwater Technology	1	48 000	10 000	20.83%
Petrotech	3	34 690	9 238	26.63%
RF	2	29 615	7 959	26.87%
Odim Alitec	2	25 110	7 800	31.06%
Western Geco AS	1	21 156	6 000	28.36%
Aker/IFE/Markland/Hitec	1	14 300	5 500	38.46%
Triangle	3	26 815	5 420	20.21%
Geco/UiB	1	21 800	5 400	24.77%
Scandpower	2	17 000	5 300	31.18%
AGR Services AS	1	25 000	5 000	20.00%
VisiWorld	1	19 700	5 000	25.38%
PGS	2	14 280	4 760	33.33%
Offshore Resource Group AS	1	18 124	4 531	25.00%
Roxar/RF	1	31 700	4 500	14.20%
Aker, Reinertsen, Framo, Kværner and DSND	1	12 000	4 000	33.33%
NCC Construction AS	1	20 000	4 000	20.00%
ChemTAG	2	8 300	3 650	43.98%
CorrOcean ASA	1	14 460	3 615	25.00%
Systems in Motion	3	12 200	3 300	27.05%
Baker Hughes Intec	1	8 800	3 000	34.09%
Baker Oil Tools	1	11 800	3 000	25.42%

15 In this overview, we have applied the current names of the organizations which are named contractors in the DEMO 2000 awards. For some of the larger organizations the figures are aggregated at a corporate level in cases where subsidiaries are named contractors. This is especially true for the largest contractors in this overview in terms of received funding. Among these, there have been several mergers and acquisitions over the past years. It should also be noted that this overview shows a slightly lower DEMO 2000 share of funding than table 3.2 due to the inclusion of the latest DEMO 2000 projects in this table (round 7).

Table 3.3 contd.

Contractor	No. of projects	Total project cost	DEMO 2000 funding (kNOK)	Ratio
DNV/KværnerOil&Gas/CorrOcean	1	10 000	3 000	30.00%
SeaBed Geophysical AS	1	17 500	3 000	17.14%
IFE	1	9 000	2 700	30.00%
NGI	1	8 990	2 560	28.48%
Multiphase Meter AS	1	16 888	2 500	14.80%
Ocean Riser System AS	1	9 000	2 250	25.00%
Technip	2	10 240	2 163	21.12%
SINTEF Petroleum Research	2	8 000	2 000	25.00%
Ocean Development Corp. (ODC)	1	5 600	1 850	33.04%
Clamp-On AS	1	6 421	1 548	24.11%
High Pressure Innovation	1	5 078	1 532	30.17%
FMC/MWS/DNV/V&S/Triangle	1	3 000	1 500	50.00%
Fantoft Process Technologies AS	1	4 200	1 400	33.33%
Deep Water Composites	1	3 750	1 250	33.33%
National Oilwell	1	7 550	1 250	16.56%
NTS	1	2 400	1 000	41.67%
Naxys	1	3 250	952	29.29%
Aker, DSND, Reinertsen	1	2 988	920	30.79%
Well Technology	1	6 010	600	9.98%
First Interactive	1	1 660	560	33.73%
Christian Michelsen Research	1	1 500	500	33.33%
DNV – Det Norske Veritas AS	1	1 420	485	34.15%
Proffshore/RF	1	1 000	400	40.00%
DEEP Community	1	1 200	300	25.00%
SUM	126	1 499 873	342 307	22.82%

One observation is the low presence of research institutions as DEMO 2000 contractors. However, in the interviews it became evident that these institutions have been involved as subcontractors, mainly related to test activities. There has been a concentration of funding among a few contractors, e.g. the top two contractors have received 32% of the public DEMO 2000 funds. In total, as of round 7 of DEMO 2000, the public funding of 342 MNOK has attracted more than 1,15 BNOK of private funding, which can be regarded a high ratio (77%).

3.2.4 Characteristics of the DEMO 2000 project portfolio

As discussed briefly in section 2.2.1, the projects in the DEMO 2000 portfolio are divided into technology areas, much in accordance with the Technology Target Areas of OG21. However, before we turn to the results of the DEMO 2000 projects in the next chapter, we will show the distribution of the projects according to phases in the petroleum E&P process. Figure 3.5 provides an overview of the distribution of DEMO 2000 projects according to the phases in the E&P process.

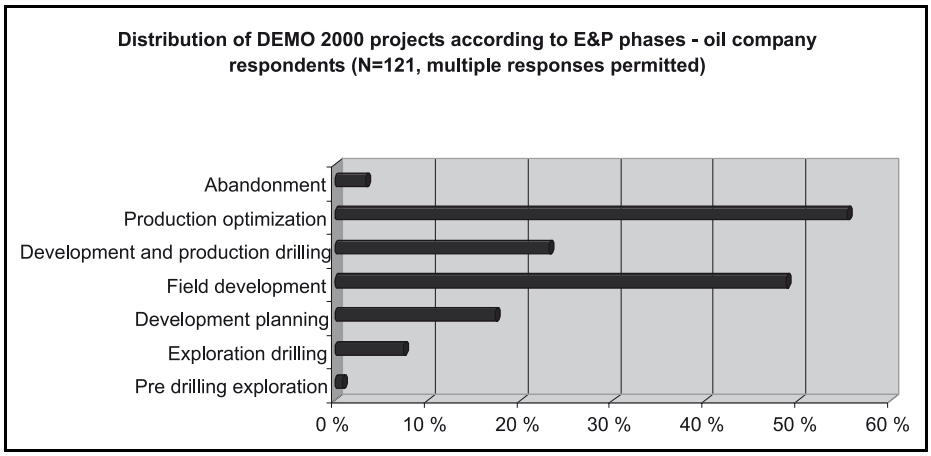

Figure 3.5 Distribution of DEMO 2000 projects according to E&P phases – oil company respondents

As shown in figure 3.5, the lion's share of DEMO 2000 projects has been in the production optimization[16] and field development phases of the E&P process. Accordingly, another important finding is the low presence of projects in the early phases, i.e. pre drilling exploration and exploration drilling.

16 Please note that this phase of the petroleum E&P process also includes e.g. enhanced recovery/improved oil recovery activities.

4 Results of the evaluation of goals and results

4.1 The results of the DEMO 2000 projects

Information on the results of the DEMO 2000 projects was obtained ex post, by way of interviews and the web-survey. At the project level, little is known about the initial expectations of each project (ex ante) as this type of data was not recorded in the application process.

In this evaluation, a number of possible project results were pre-defined by the evaluation team and tested in early interviews. This resulted in an inventory of results, and the participants were first asked to indicate which results were expected at the outset of the project and subsequently, which results were actually obtained. All participants in the evaluation answered these questions. In the following we will distinguish between completed and ongoing DEMO 2000 projects.[17]

4.1.1 Results from completed DEMO 2000 projects

By comparing the expectations of each project participant with the results actually obtained, we found the results shown in figure 4.1:

17 The notion of a completed project is applied in a strict DEMO 2000 sense of the term, i.e. the projects are not receiving funds from the DEMO 2000 program anymore. This does not imply that the project is completed from the contractor's side, which may also benefit from further oil company support.

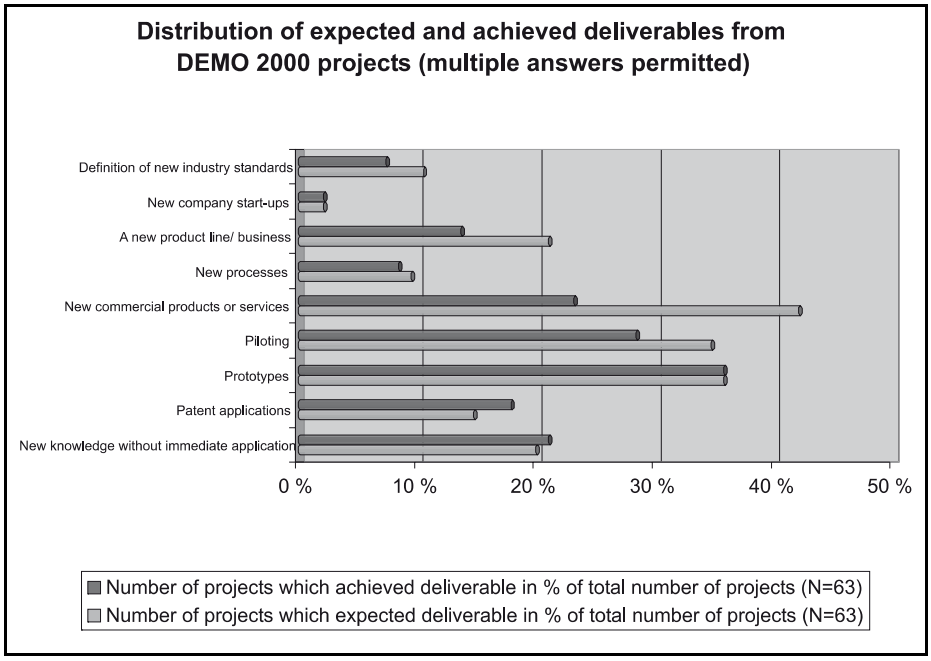

Figure 4.1 Distribution of expected and achieved deliverables from completed DEMO 2000 project

As shown, not surprisingly, the expectations were in most cases higher than what was achieved in terms of deliverables. However, it should be noted that for some deliverables, the number of actually achieved results exceed that of the expected results. This may in some instances be due to a serendipity effect, but it is also possible that some respondents suffer from some kind of hindsight bias, as some projects are completed several years ago. A hindsight effect may of course influence the respondents' perception of both their expectations to deliverables as well as the actually obtained deliverables.

As can be seen from figure 4.1, there are differences between expectations and actually achieved deliverables when comparing each deliverable category. There seems to be a tendency for a declining ratio of fulfilled expectations as closer to the market the deliverables are, which is not surprising. The largest failure rate is found for the deliverable new commercial products and services.

With respect to piloting activity, which is at the heart of the DEMO 2000 program, we see that so far, 27 pilots have been carried out in completed DEMO 2000 projects. Seen against the total number of projects, this corresponds to a pilot rate of nearly 30%. With reference to the goals of the program, where pi-

loting is highlighted as one of the most important activities (ref. section 3.2), this may seem as a low number.

When compared with the expectations at the start of the project, we find a pilot fulfillment rate of slightly above 80%.

According to the respondents, the reasons for failing to conduct pilots were the following:

- Project delays
- Operator opted for alternative, often conventional solution
- Change of operator at pilot installation
- Technical problems
- Slow identification of suitable pilot installations (wells, fields etc.)
- Pilot is still to be conducted (applies mostly to ongoing DEMO 2000 projects)

A closer view on the piloting activity reveals the following distribution of types of piloting locations as shown in figure 4.2:

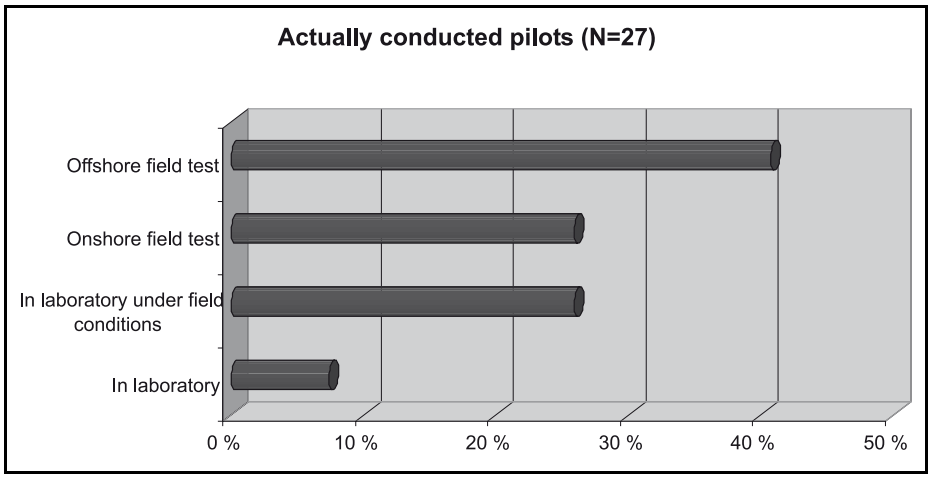

Figure 4.2 Distribution of location of conducted pilots in DEMO 2000 projects

According to figure 4.2 demonstrates, the dominant location of doing pilots has been offshore field tests. In addition, some pilots were done onshore, either in a laboratory or on onshore field, however, mainly under realistic circumstances.

4.1.2 Results from ongoing DEMO 2000 projects

We received answers from participants in 32 DEMO 2000 projects which still received DEMO 2000 support as per 1 June 2005. Figure 4.3 shows the distribution of deliverables in terms of:

- Expectations at the outset of the project
- Deliverables that have already been made
- Deliverables that are expected to be made before project completion

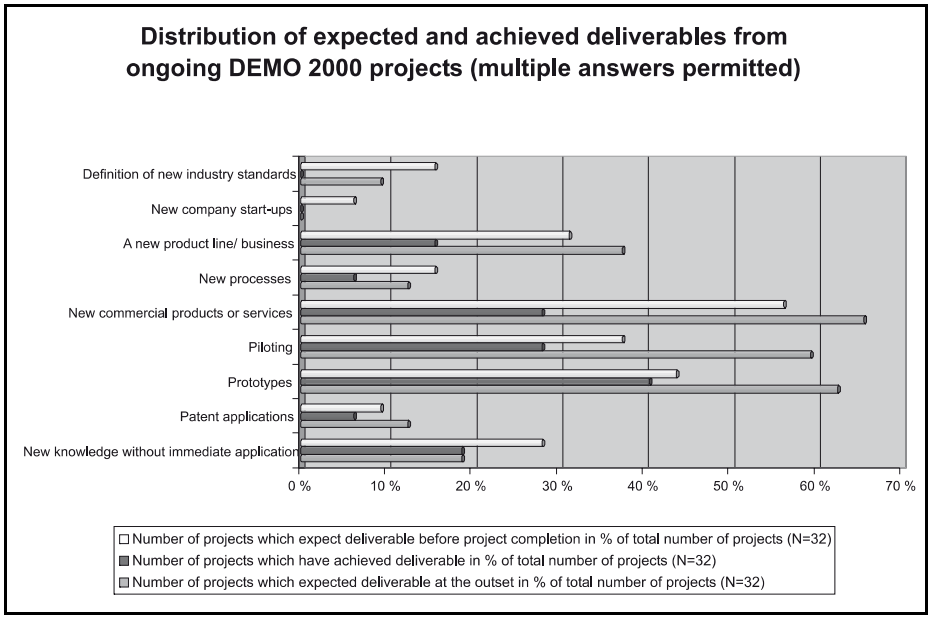

Figure 4.3 Distribution of expected and achieved deliverables from ongoing DEMO 2000 project

In comparison to the projects that have already been finished, the fulfillment rate of deliverables in ongoing DEMO 2000 projects is – as can be expected – lower. In order to get a clearer picture of the anticipated results that are still to be expected from these projects, we asked the participants to indicate their expectations. Inspection of figure 4.3 indicates an optimistic attitude towards achieving deliverables in the projects to an extent that – if this becomes true – expectations at the outset of the projects will be surpassed for all deliverable categories. As the analysis of the results of the completed DEMO 2000 projects has shown, there is not much evidence to support such optimistic estimates.

With respect to pilots, the results from the 32 ongoing DEMO 2000 projects

are – as can be expected – somewhat lower, as shown in figure 4.3. In 28 % of the ongoing projects, a pilot has been carried out. However, 38 % of these projects still expect to carry out a pilot. If the same completion rate applies to these projects as to the completed projects, we would reach a pilot rate of 56 %, which would be higher than for the completed DEMO 2000 projects.

The figures presented in this section should be considered as an indicator of DEMO 2000 initial goal achievement. These may be subject to different interpretation in terms of success.

4.2 Additionality

In the evaluation, we have attempted to extend the question of additionality to also encompass the influence of the program on the individual projects' results. Informants were asked to judge the project in terms of the following outcomes:

a) No influence on achieving the deliverable (deliverable would have been obtained anyway)
b) Influence on the scale of the deliverable
c) Influence on the time horizon for the achievement of the deliverable and
d) Influence on making the deliverable possible at all

The responses are given in figure 4.4.

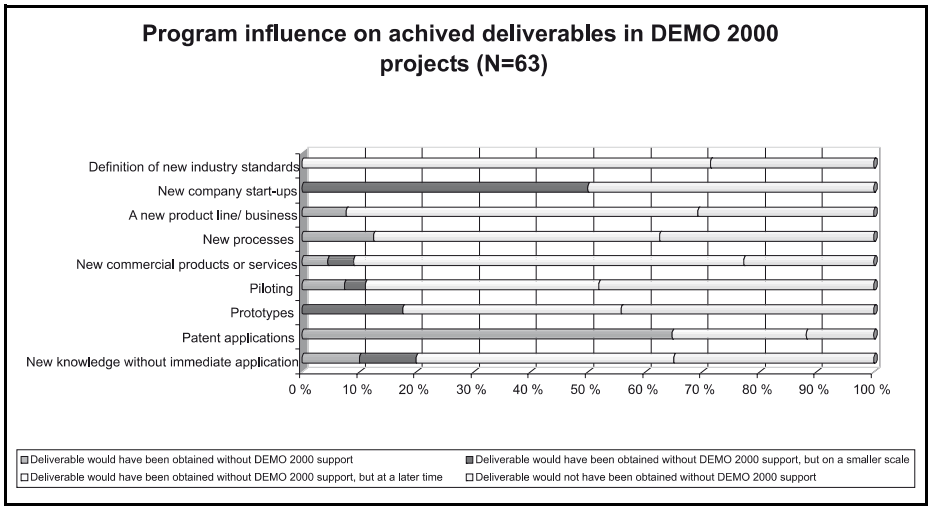

Figure 4.4 DEMO 2000 influence on achieved deliverables in completed DEMO 2000 projects (N=63)

An overwhelming fraction of the respondents share the opinion that a majority of the projects' results would either not have been achieved at all or at a later time without the DEMO 2000 support. This is an indication of the accelerating and catalyst character of the program. It may be observed that especially the closer-to-market results of the projects, as e.g. new commercial products, services and processes but also piloting, seem to have been influenced positively by the DEMO 2000 program although this observation is statistically weak. Still, this may be interpreted as a certain efficiency of the program.

In addition to the funds already allocated to DEMO 2000 projects, as will be shown in section 5.2.2, the service companies have already invested and plan to invest an additional 300 – 500 MNOK after the DEMO 2000 support has ceased.

In sum, this seems to indicate a relative satisfactory degree of additionality in the DEMO 2000 program.[18]

4.3 Achievement of the goals of the DEMO 2000 program

The DEMO 2000 program has since it was conceived in 1999 been accompanied with the stable set of objectives, i.e.:

- Reducing cost on the NCS
- Increasing the attractiveness of, and activity on the NCS
- Increasing the competitiveness of Norwegian oil and gas industry

When asking the participants of the web survey their opinion of how their projects contribute to the achievement of these objectives, the following result was obtained:

18 It should be noted, however, that in order to investigate additionality effects in more depth and in a methodologically more satisfactory manner, a wider population should be included in the survey, not least unsuccessful applicants to the DEMO 2000 program. This, however, was beyond the scope of this evaluation project.

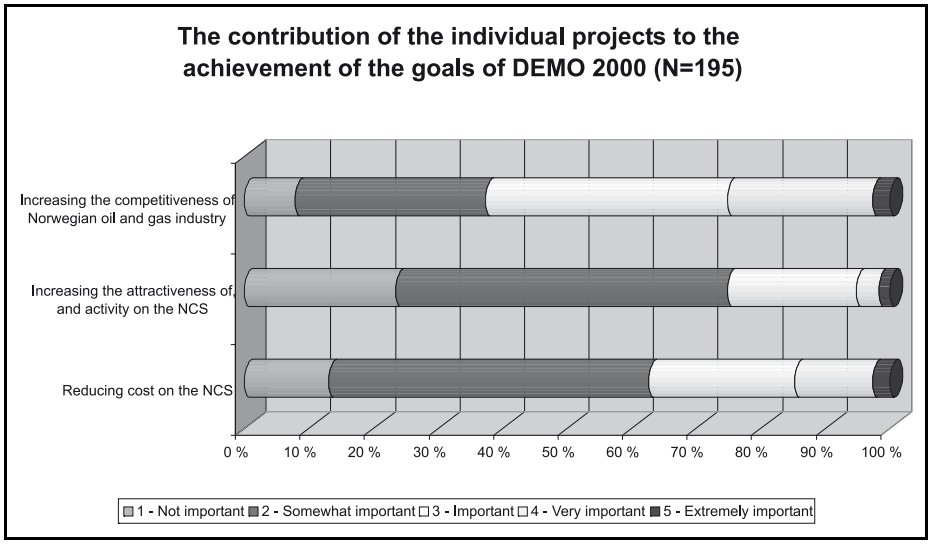

Figure 4.5 The contribution of the individual projects to the achievement of the goals of DEMO 2000

Figure 4.5 shows that primarily the goal of increasing the competitiveness of the Norwegian oil and gas industry is perceived to have been accomplished to a higher extent than the other goals. This is confirmed by data obtained in the interviews undertaken in the evaluation.

5 Results from the evaluation of effects

In line with the general goals for the DEMO 2000 program of reducing cost on the NCS, improving the attractiveness of and the activity on the NCS and improving the competitiveness of Norwegian industry, the information gathered through this evaluation will be used to focus on realized and potential financial gain of the program along two axes:

- The value of the technology, products and services developed in terms of reduced cost and increased production/recovery for the NCS as seen from an oil company point of view
- The value of the resulting products and services in terms of increased revenue for the Norwegian supplier industry world wide

It is important to stress that the total numbers presented below represents the sum of the financial value as seen by individual companies and is therefore referred to as value indicators. This study has not attempted to calculate realistic socioeconomic numbers by taking into account the complex interrelationship between the values as seen by individual companies.

5.1 Expected overall economic benefits

At the outset of the evaluation, NIFU STEP had expected to find ex ante estimates of economic benefits of each DEMO 2000 project, e.g. materialized as business cases handed in along with the project applications. This proved not to be the case; hence no analysis of economic benefits based on ex ante expectations can be carried out.

As an alternative approach, NIFU STEP asked the participants to evaluate the economic benefits ex post.

5.2 Achieved overall economic benefits

In this evaluation, we make a strict distinction between the economic benefits of the organizations carrying out DEMO 2000 projects (contractors, virtually service companies only) as well as other service companies and research institutions co-operating in the projects on the one hand and organizations sponso-

ring the projects (oil companies) on the other hand. Whereas organizations in the first category are likely to harvest the economic benefits in terms of increased revenue, profitability and market shares, the oil companies tend to view the potential economic benefits of their participation in DEMO 2000 projects in terms of increased production of hydrocarbons or reduced costs in development and production – or both. In the following, we will present the results of our survey according to this distinction.

5.2.1 Achieved overall economic benefits – oil companies

The approach for analysing the effects of the DEMO 2000 program at the company level is described in section 2.3.1. In this section, we present the values of an indicator for the total expected future financial potential from the DEMO 2000 portfolio which is computed by addition of the individual values as reported for individual DEMO 2000 projects.

Based on the estimates reported in this section, the value of the indicator for total potential reduced cost at the NCS is estimated to be between 35 and 60 BNOK. Between 3 and 4,5 BNOK has been realized so far and within the next 2 years some 10% of the potential is expected to materialize. Some 35% is expected to be realized in the 2 to 5 year timeframe and some further 55% within 5 to 10 years.

By combining the indicator values for both increased production and ultimate recovery as well as for reduced cost, the value of the indicator for total the expected realization from the DEMO 2000 program is between 75 and 135 BNOK. So far, however, only between 3 and 4,5 BNOK has been realized, whereas between 10 and 15% of this potential is expected to be realized within the next 2 years. Some 35% is expected to be realized in the 2 to 5 year timeframe and some further 45% within 5 to 10 years.

The key factors that are important for the realization of this value in the years to come are:

- Although many of the projects include an offshore pilot (15% of all DEMO 2000 projects, 39% of all DEMO 2000 projects which have conducted a pilot), many of the onshore/lab test pilots are not considered a full qualification of the technology. For many of the resulting products/services the operators will require offshore demonstrations or at least testing under realistic conditions to reduce technology risk before buying the solution
- Even for the projects with completed offshore pilots, the growth of sales will develop only after the technology as a system has been used in a real com-

mercial/operational mode – at least in several positive field trials, but often over long time, to prove financial value, technical reliability and be widely accepted. For many projects it is important to qualify a complete system – not only the specific components
- Although the DEMO 2000 program has helped to demonstrate the technology and by that process has moved the technology further towards commercialization, there are often remaining hurdles to pass before the products and services will be in full commercial usage
- Successful solutions to the above challenges often require creative business models in order get passed the «second valley of death':
  - Finding the right partner for the service company/contractor involved is often part of this
  - Delays or change of plans in the field projects targeted for piloting / first commercial use is often part of the problem
  - Convincing partners and obtaining agreement in a license is often a hurdle
  - Individuals or companies having the courage to take the risk to use the technology are often required
  - In some cases breakthrough is need in related technologies
- The products and services from individual DEMO 2000 projects will in most cases contribute to solutions for categories of oil and gas fields with specific challenges and opportunities. Identification of such fields where the DEMO 2000 technology is enabling field development and optimization both on the NCS and globally is important. Many of the projects are resulting in technology for deep and ultra deep water. So far no ultra deep water fields have been found on the NCS and a limited, but growing market exist worldwide.
- Technology is continuously being developed world wide and the value of the uniqueness of the technology resulting from the DEMO 2000 program need to be captured within the «time window of differentiation».
- Lack of, or limited availability of qualified personnel resources and the ability to adapt to new ways of working are also barriers for some projects.

As will be shown in the following, detailed analysis, the oil company representatives stated that the main financial benefits of their DEMO 2000 projects are related to the direct impact on cost reduction or enhanced recovery (as opposed to measurement technologies). This is shown in table 5.1.

Table 5.1 DEMO 2000 projects with effects on improving recovery or cost reduction (N=102, multiple answers permitted)

	N	1 No impact	2 Little impact	3 Some impact	4 High impact	5 Extremely high impact
Increasing hydrocarbon production	102	27%	15%	37%	19%	2%
Increasing ultimate recovery	102	33%	13%	38%	15%	1%
Reducing cost in exploration	102	69%	18%	5%	9%	– –
Reducing cost in development	102	28%	14%	37%	21%	– –
Reducing cost in production	102	25%	24%	28%	20%	3%
Reducing cost in abandonment	102	67%	16%	11%	7%	– –

As can be seen from table 5.1, a total of 97 representatives categorized their DEMO 2000 projects having a high or extremely high direct impact on cost reduction or enhanced recovery. The results from the subsequent evaluation of these projects will be reported in the following and we will use this information to discuss the indicator values for the NCS in total. [19]

Increasing hydrocarbon production

Table A.2.10 in appendix 2 shows the distribution of answers by respondents to the question of the value for increased hydrocarbon production.

Based on the feedback on the question about increasing production from the NCS as a whole, the value of the total indicator is estimated to be between 25 and 45 BNOK.

So far less than 100 MNOK has been realized. Approximately 15% of the potential is expected to be realized within the next 2 years, more than 40% in the 2 to 5 year timeframe and some 30 to 35% within 5 to 10 years.

Increasing ultimate hydrocarbon recovery

Table A.2.11 in appendix 2 shows the distribution of answers by respondents to the question about the value for increased ultimate recovery. In the questionnaire, to avoid double counting, we have asked the respondents not to include

19 Statistics derived from the resulting database is shown in appendix 2. The value intervals used in the questionnaire are: < 100 MNOK, 100 to 500 MNOK, 500 to 1,000 MNOK, 1 to 5 BNOK and above 5 BNOK, cf. appendix 6.

value which they consider already included in previous answers. This may mean that the potential for increased hydrocarbon production gets a higher score relative to the score for ultimate hydrocarbon recovery and the later questions than is real. However, when the value of the indicator for the total financial potential is calculated, this effect is cancelled out.

From the responses to the question of increasing ultimate recovery at the NCS as a whole, it is estimated that the value of the total indicator is between 15 and 30 BNOK.

No value has been realized so far. According to the oil companies involved, however, between 15 and 20% of the potential is expected to be realized. Some 30% is expected to be realized in the 2 to 5 year timeframe and some further 50% within 5 to 10 years.

Based on the above numbers the value of the indicator for the increase hydrocarbon production and ultimate recovery combined is estimated to between 40 and 75 BNOK. Less than 100 MNOK has been realized so far and 15% of the potential is expected to be realized within the next 2 years. Some 35% is expected to be realized in the 2 to 5 year timeframe and some further 40% within 5 to 10 years.

Reducing cost in exploration, development, production and abandonment

The statistics derived from the database are shown in tables A.2.12 through A.2.15. In the view of DEMO 2000 oil company participants, it is obvious that the main cost reduction from the DEMO 2000 projects is expected to come in the development and production phases.

Reducing cost in exploration

Table A.2.12 in appendix 2 shows the distribution of answers by respondents to the value of reduced cost in exploration. From the responses to the question of reduced cost of exploration at the NCS as a whole, the value of the total indicator is estimated to be between 3 and 8 BNOK.

Between 100 and 600 MNOK has been realized so far and the oil company representatives expect approximately 10% of the potential to be realized within the next 2 years. Some 45% is expected to be realized between 2 to 5 years and another 45% within 5 to 10 years.

Reducing cost in development

Table A.2.13 in appendix 2 shows the distribution of answers by respondents to the value of reduced cost in the field development phase. From the responses to

the question of reduced cost of field development at the NCS as a whole, the value of the total indicator is estimated to be between 15 and 20 BNOK.

Between 100 and 500 MNOK has been realized so far and the oil company representatives expect approximately 10 % of the potential to be realized within the next 2 years. Some 40 % is expected to be realized in the 2 to 5 year timeframe and some further 50 % within 5 to 10 years.

Reducing cost of production

Table A.2.14 in appendix 2 shows the distribution of answers by respondents to the value of reduced cost in the production phase. From the responses to the question of reduced cost in production at the NCS as a whole, the value of the total indicator is between 17 and 25 BNOK.

Between 2.8 and 3.3 BNOK has been realized so far. Some 10 % is expected to be realized within 2 years, 30 to 35 % in the 2 to 5 year timeframe and some further 55 % within 5 to 10 years.

5.2.2 Achieved overall economic benefits – service companies

In order to keep the task of evaluation at an acceptable level with respect to the participants' perception of complexity of the task, we used two simple measurement approaches. First, we asked the project leaders to evaluate the impact of the technology in their project on various measures of economic performance. The results from this initial question can be found in table 5.2.

Table 5.2 Distribution of answers regarding resulting economic performance from DEMO 2000 projects for service companies

Measures of economic performance	N	No impact	Low impact	Some impact	High impact	Extremely high impact	Provided numeric information on value
Improved productivity for your company	74	24%	23%	36%	15%	1%	**16%**
Increased revenue in Norway	74	9%	14%	46%	30%	1%	**31%**
Increased revenue internationally	74	8%	26%	24%	41%	1%	**42%**
Profitability in Norway	74	9%	23%	38%	28%	1%	**29%**
Profitability internationally	74	11%	30%	23%	31%	5%	**36%**
Market share in Norway	74	14%	20%	32%	32%	1%	**33%**
Market share internationally	74	11%	27%	23%	35%	4%	**39%**
Competitiveness in Norway	74	5%	18%	34%	41%	3%	**44%**
Competitiveness internationally	74	5%	23%	30%	36%	5%	**41%**
Growth potential in Norway	74	9%	15%	39%	32%	4%	**36%**
Growth potential internationally	74	9%	23%	23%	35%	9%	**44%**

As the second step in the process, participants who had evaluated the measures of economic performance to have either high or extremely high impact were directed to a section in the questionnaire where they were asked to quantify these measures on predefined scales. Also, the participants were asked to distinguish between economic benefits from the projects which have already been obtained and those which are expected to accrue in the future. In the following, we report findings on revenue effects.

The reported estimates represent minimum and maximum values as stated by the respondents. An overview is presented in figure 5.1.

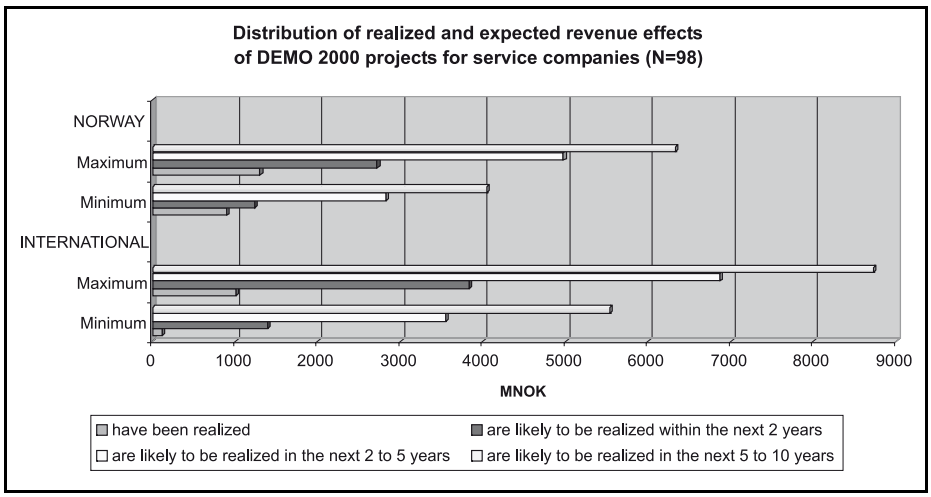

Figure 5.1 Realized and expected revenue effects of DEMO 2000 projects for service companies

We first turn to the revenue that has already been generated from DEMO 2000 projects. Between 900 MNOK and 1,3 BNOK of sales is reported as already realized in Norway from results from projects supported by the DEMO 2000 program. Internationally, somewhere between 120 MNOK and 1 BNOK has been generated. In addition, international sales from other products and services based on technology developed and tested in the DEMO 2000 program amount to at least 800 MNOK.

Within 2 years between 1.2 and 2.7 BNOK of sales is expected to be realized in Norway, whereas between 1.4 and 3.8 BNOK of sales is expected to be realized internationally from results from projects supported by the DEMO 2000 program.

In 2 to 5 years, between 2.8 and 5 BNOK of sales is expected to be realized in Norway, whereas between 3.5 and 6,9 BNOK of sales is expected to be realized internationally from results from projects supported by the DEMO 2000 program.

Finally, in the long run, i.e. in 5 to 10 years, data from respondents suggest that between 4 and 6.3 BNOK of sales is expected to be realized in Norway whereas between 5.4 and 8.7 BNOK of sales is expected to be realized internationally from results from projects supported by the DEMO 2000 program.

In sum, the DEMO 2000 projects are estimated to generate between 18.5 and 33.5BNOK in revenue effects for the service companies over the next 2 to 10 ye-

ars in both the Norwegian and international market. Revenue effects amounting to 5–6% of this potential have already been obtained. The larger part of the potential is likely to be realized in the international market.

Comparing these figures with the actual export figures for the Norwegian oil and gas industry, which were estimated to 34 BNOK for 2003, it becomes evident that the DEMO 2000 projects currently make only small contributions to the overall export.[20] However, their contribution to reaching the objective of 80 BNOK export value by 2010 may be considerable.[21] Finally, if the estimates in this evaluation are compared with the export targets as expressed for DEMO 2000 at the outset of the program (cf. section 3.2.), the conclusion would be that these objectives have not been met. It could be argued, however, that these targets were based on conditions that have not been met, i.e. scaling DEMO 2000 up to an extent where large-scale pilots could be conducted as planned in the Asset Forum initiative.

In order to harvest the benefits of the DEMO 2000 projects, investments still are to be made. Figure 5.2 provides an overview of the investments made in DEMO 2000 projects so far and how much is planned in the future.

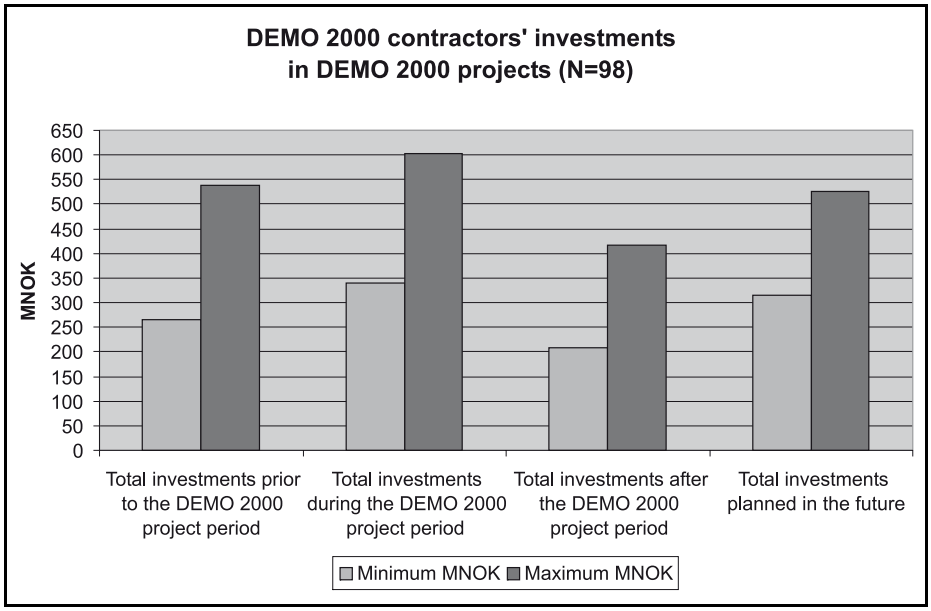

Figure 5.2 Service companies' investments in DEMO 2000 projects

20 Cf. F. Kristiansen et. al. (2003).

21 Cf. INTSOK (2004).

As can be seen in figure 5.2, the contractors' investments in their DEMO 2000 projects have been raised from approximately 270–540 MNOK prior to the DEMO 2000 contract period to 340– 610 MNOK during the contract period. Furthermore, for the future the projects are expected to invest a further 320–530 MNOK (all projects). The completed projects have invested some 210– 420 MNOK after the DEMO 2000 contract expired. This shows that the contractors in total will allocate approximately 1130– 2050 MNOK to the DEMO 2000 project portfolio. Hence, one may suggest that DEMO 2000 has stimulated these companies to increase their funding of technology development activities.

5.2.3 Achieved overall economic benefits – summary

We find that the expected economic benefits in the future outweigh the already accrued benefits by a high factor. This is especially true with respect to the oil companies.

This result is not surprising, taking into account that most DEMO 2000 projects are only recently completed. We must also bear in mind that approximately 1/3 of the projects are still ongoing.

We have chosen to highlight a few examples of DEMO 2000 projects which have succeeded in the sense that most of them have reached the stage of first commercial sales. These projects, which we label Top 2 projects, are extensively described in appendix 3.

5.3 Other company-specific benefits

In addition to the more readily quantifiable economic benefits, respondents were asked to report on other company-specific effects, such as competitiveness and also HSE-effects. In addition, effects on suppliers were measured.

In the survey, the respondents gave answers that they expect an improvement for their competitive capacity, both in the domestic as well as in the international market. The distribution of these responses is shown in tables 5.3 and 5.4.

Table 5.3 Increased competitiveness in Norway as a result of the DEMO 2000 projects

Competitiveness in Norway	N	no improvement	some improvement	important improvement	significant improvement	extreme improvement
has already occurred?	32	19%	44%	25%	9%	3%
is likely to occur within the next 2 years?	32	9%	22%	44%	25%	– –
is likely to occur in the next 2 to 5 years?	32	6%	19%	38%	34%	3%
is likely to occur in the next 5 to 10 years?	32	9%	19%	34%	34%	3%

Table 5.4 Increased competitiveness internationally as a result of the DEMO 2000 projects

Competitiveness internationally	N	no improvement	some improvement	important improvement	significant improvement	extreme improvement
has already occurred?	31	26%	32%	32%	6%	3%
is likely to occur within the next 2 years?	31	10%	16%	58%	13%	3%
is likely to occur in the next 2 to 5 years?	31	3%	19%	42%	29%	6%
is likely to occur in the next 5 to 10 years?	31	6%	13%	42%	26%	13%

The respondents report that they expect the results from their DEMO 2000 projects to improve their competitive capabilities. However, there are no clear tendencies as to where these improvements will have the largest impact, i.e. in the domestic or in the international marketplace.

With respect to possible HSE effects from the DEMO 2000 projects, the respondents gave answers which are displayed in figure 5.3.

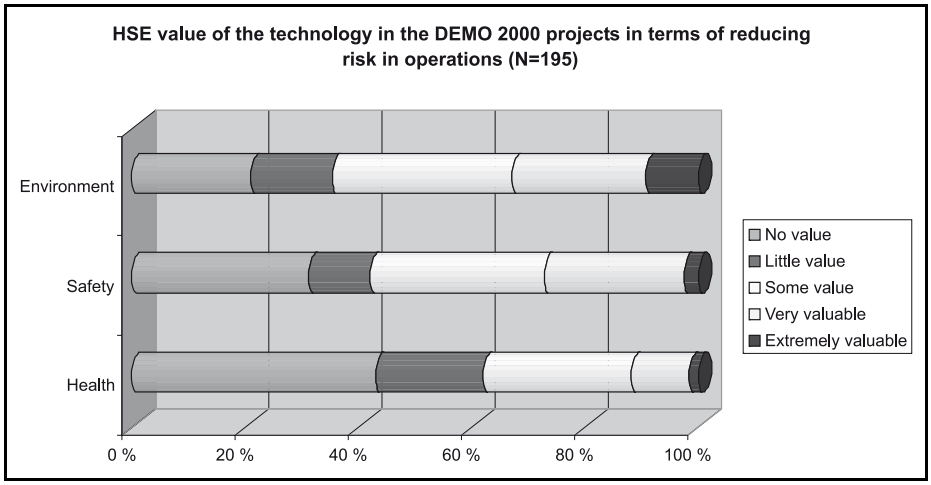

Figure 5.3 HSE effects of the DEMO 2000 project

The largest HSE value of the DEMO 2000 projects seems to be for the environment. When asked whether the effects had already occurred, 13% of the respondents gave a positive answer, indicating that approximately 15 of the DEMO 2000 projects have already shown positive HSE benefits.

The DEMO 2000 project leaders were also asked to indicate possible effects on behalf of their subcontractors. Figure 5.4 summarizes these findings.

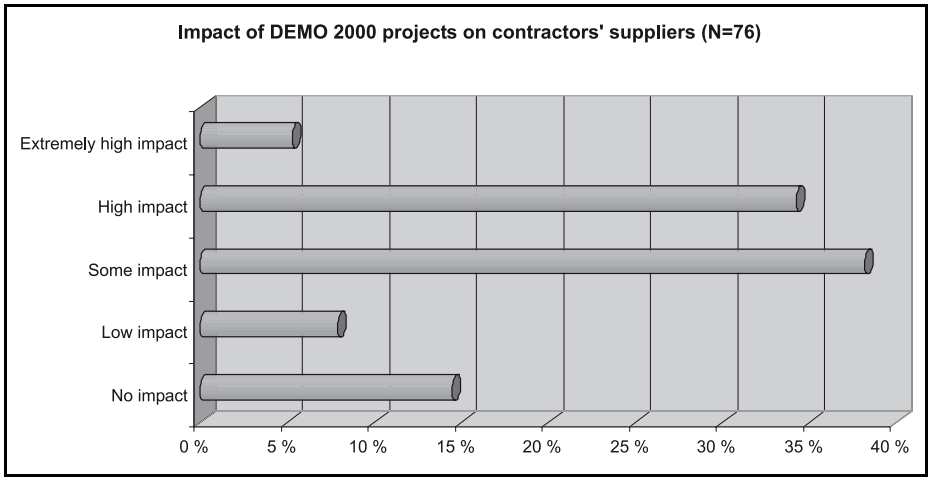

Figure 5.4 Impact of DEMO 2000 projects on contractors' suppliers

As shown in figure 5.4, the DEMO 2000 projects have an impact on the contractors' suppliers. This is confirmed by data obtained in the interviews undertaken in the evaluation.

5.4 Effects for the participating research institutions

As reported in section 3.3, relatively few research institutions participated in the DEMO 2000 program as contractors in the projects. Nonetheless, we asked these participants about the benefits they received from participating in the projects. Figure 5.5 summarizes these findings.

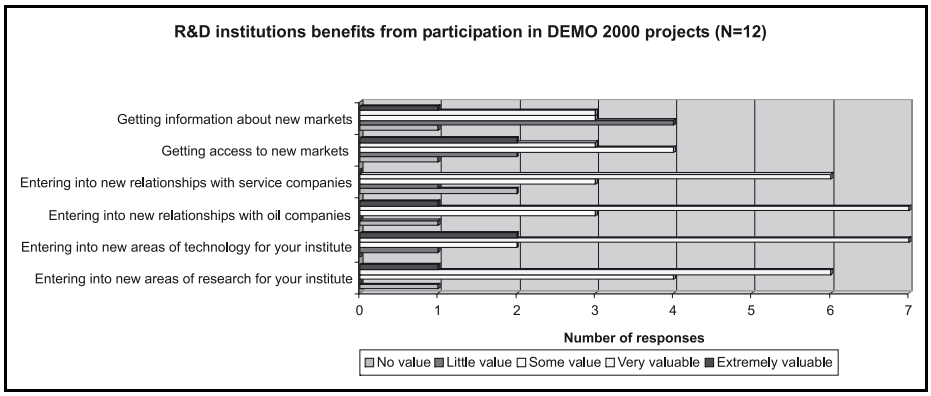

Figure 5.5 Benefits for research institutions from DEMO 2000 participation

5.5 Socioeconomic effects

Based on the tentative, modified application of the DoE methodical framework discussed in section 2.3.3, we attempt to give a tentative estimate of some aspects of socioeconomic effects of DEMO 2000 projects. It must again be stressed that these estimates by no means can be interpreted as exact indicators nor must this be interpreted as a complete analysis of socioeconomic benefits. Rather, we attempt to systematize information from the respondents on the already realized as well as the potential value of the results of the DEMO 2000 projects. Figure 5.6 represents this overview.

<table>
<tr><th>Technology Development
Economic/ policy conditions</th><th>Technology Developed</th><th>Technology Development in Progress</th><th>Technology Development Failed</th></tr>
<tr><td>Already materialized</td><td>3 – 4.5 BNOK</td><td>N.A.</td><td>N.A.</td></tr>
<tr><td>Will be favorable for commercialization</td><td colspan="2" rowspan="2">75 – 135 BNOK</td><td>Knowledge benefits</td></tr>
<tr><td>Might become favorable for commercialization</td><td>Knowledge benefits</td></tr>
<tr><td>Will not become favorable for commercialization</td><td>Knowledge benefits</td><td>Knowledge benefits</td><td>Knowledge benefits</td></tr>
</table>

Figure 5.6 A tentative estimate of socioeconomic effects of DEMO 2000 projects based on information from participants

The numbers used in figure 5.6 are the indicator values as described in section 5.2.1 and represent the value potential on the NCS for the oil companies involved in the DEMO 2000 projects.

As has been shown, the DEMO 2000 projects also have effects on e.g. the suppliers of the service companies. Although no attempt has been made to quantify such effects in this evaluation, information obtained through interviews point to the fact that such effects may be substantial. Other socioeconomic effects, such as employment effects, income to the Norwegian authorities through e.g. taxes etc., have not been investigated in this evaluation, but may be of a substantial magnitude.

6 Results from the evaluation of the organization

6.1 Evaluation of the structure of goals of DEMO 2000

The goals of DEMO 2000 have been virtually unchanged since the conception of the program in 1999. The following goals are still associated with the program:

- Reducing cost on the NCS
- Increasing the attractiveness of, and activity on the NCS
- Increasing the competitiveness of Norwegian oil and gas industry

However, during the lifetime of the program, there seems to have been a shift of emphasis on increasing the competitiveness of Norwegian oil and gas industry.

6.2 Evaluation of the organizational structure and management of DEMO 2000

There has been some discussion over the work processes used in the DEMO 2000 program, especially the processes for application assessment and awarding of financial support. This has raised issues such as conflict of interest. In this context, DEMO 2000 was explicitly mentioned in the so-called Smith report as an example of questionable practices.[22] First, the simplified procedure of application assessment in DEMO 2000 as compared to other RCN programs is pointed out. Secondly, the MPE is accused of «departmental over steering» because the DEMO 2000 ESG has been appointed by the MPE and not the RCN.

In interviews, most members of the ESG complained about the strict interpretation of the rules regulating conflict of interest issues. They argue that no reasonable decisions can be reached when the competent decision makers are to leave the room. However, as from the autumn of 2005, the rules of conflict of interest handling have been relaxed for DEMO 2000 and the ESG, which now makes decisions as it did before.

22 Ref. Research Council of Norway (2004)

In order to get an additional view of the organization and work processes of DEMO 2000, we asked the project leaders to evaluate these aspects. Figure 6.1 provides an overview of the results.

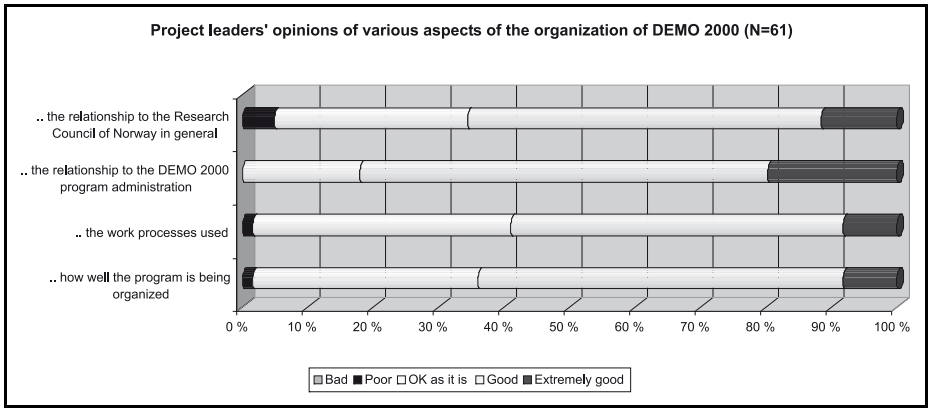

Figure 6.1 Project leaders' opinions of various aspects of DEMO 2000 organization

As may be observed in figure 6.1, the DEMO 2000 project leaders seem to be satisfied with the way the DEMO 2000 program is organized and they claim to have a good relationship to the program administration. This is also supported by findings in the interviews. As one of the non-Norwegian participants put it: «I would like to add a comment about the first rate support we received from DEMO 2000. I strongly believe that we could not have achieved this project in the time and manner we did in any other country. I found the Norwegian funding system both efficient and speedy and I strongly believe this is one of the key drivers leading to the undoubted success of Norway's technology.»[23]

As an extension of this analysis, we asked the project leaders to benchmark DEMO 2000 against other, in their view comparable domestic or international programs.

The findings are summarized in figure 6.2.

23 Information obtained through the web based questionnaire

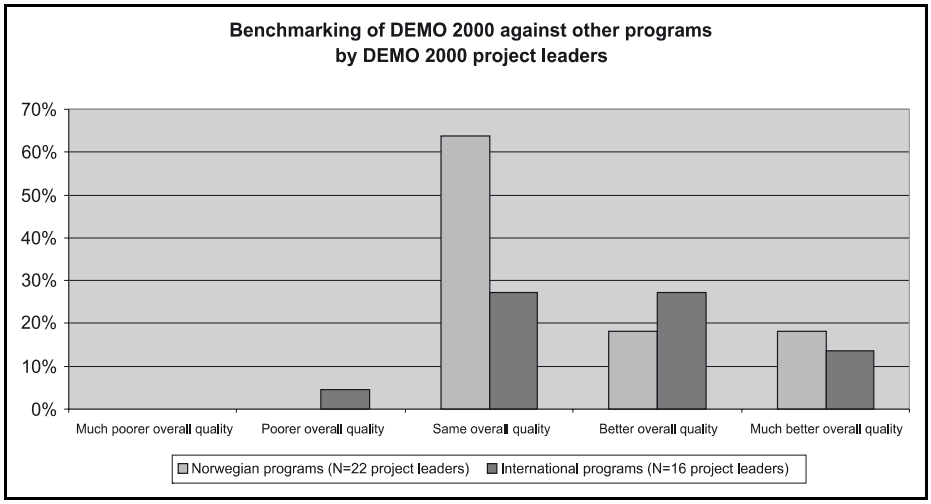

Figure 6.2 DEMO 2000 project leaders benchmarking of DEMO 2000 against other programs

Of all the 38 participants who had experience with either Norwegian or international programs comparable to DEMO 2000 (in their view), only one of them rated DEMO 2000 as poorer as these programs in terms of overall quality. In fact, 17 respondents evaluated the overall quality of DEMO 2000 to be better or much better than that of comparable Norwegian or international programs.

The results of the interviews were unanimous in praising the program administration for excellent overall performance. However, some respondents feel that there could be a larger degree of involvement in the individual projects from the program administration's side. This desire must be viewed against the resources available to the management and the workload. From our point of view, more involvement from the DEMO 2000 program administration can only be accomplished if more resources are made available. It is however questionable whether this should be a top prioritized task.

6.3 On access to resources – financing and distribution of funds

There is a constantly ongoing discussion it the DEMO 2000 official fora regarding the distribution of funds. As the overview of the DEMO 2000 project portfolio shows (see table 3.1), more than 125 projects have received financial sup-

port since 1999. The question at hand is thus whether the program should continue to support a large number of projects with relatively limited funds, or whether one should concentrate on fewer and larger projects. The idea would be that the success rate of the projects in terms of piloting and commercial sales would increase by such a concentration of financial support.

Obviously, one major obstacle to increasing the financial support per are the ESA regulations. One way of handling this, would be to issue financial support not to a single contractor, but to consortia of contractors. This could also imply to move away from supporting stand-alone projects, with mainly single hardware components to be developed, towards supporting concepts provided by consortia of contractors. These could in turn consist of participants not only from the service companies, but could also include research institutions and institutions of higher education.

6.4 Summary of the evaluation of the organization of DEMO 2000

Based on the findings of this part of the evaluation, we must conclude that the program seems to have been successful, not least in the eyes of the participants. Obviously, there will always be room for improvement in all programs, and in the case of DEMO 2000, this seems to be the case with respect to the issues of application assessment and possible issues of conflict of interest.

NIFU STEP would recommend that in its continuation, DEMO 2000 should seek to employ the current rules of the RCN which regulate conflict of interest issues, however in such a manner, that the decision processes in the program are not compromised.

7 Results of the policy analysis

7.1 Research challenges in the petroleum industry and structural aspects

According to OG21, the NCS challenges and opportunities can be summarized as:

- Sustainable development and zero harm to people and environment
- Increased reserve replacement rate through exploration
- Increased hydrocarbon recovery
- Cost effective technology for Arctic developments
- Development of marginal fields
- Increased value creation from gas
- Future competence development and increased recruitment to the industry
- Increased export of technology

For a successful development within these fields, all elements in the complete process of research, development and demonstration of the use of the technology developed are critical. As important as successful projects within each of these three major phases, is a smooth flow of development from one phase to the next. Since this evaluation is focusing on the part of the process which is to demonstrate the use of new technology, the details for the research and development phases will not be discussed in any detail. However, some comments about the R&D part of the overall process are needed in order to have the right perspective on the need for technology demonstration.

In the following, a few observations are included about recent changes of the R,D&D processes in the global oil & gas industry:

Historically many of the oil & gas companies used to have their own R&D departments. Through the 1990's there was a strong focus within the companies on prioritizing «core business» in parallel with a significant consolidation and merger process in the industry. As a result an important segment of the global market consists of a few major and «super major» companies.

In terms of R&D activity they appear to have followed different strategies. Some have continued a solid internal R&D activity through the change processes in the industry. Others have gone through internal debates and have typically changed the way they structure and organize R&D based on an evalu-

ation of core competence/business. They are, however, continuing with significant R&D efforts.

In the mid 1990's several of the companies decided to move to «asset based» organizations, sometimes in parallel to reductions of internal R&D resources. For a while many previous R&D staff ended up as specialists in the asset organizations and had the opportunity to implement the best of their ideas directly on projects in operations. Over the last few years, however, there has been a shift back to more centralized technical and R&D departments. Some companies have, however, reduced their internal efforts and partly replaced it with cooperation with service companies and research institutes.

All the major and super majors are key players on the NCS and most of them are active in the DEMO 2000 process and have members in the committees.

In addition to the majors and super majors several of the independents and smaller oil & gas companies are operators and partners on the NCS and others are evaluating opportunities in Norway or are in the process of being pre-qualified. This group of companies typically do not do much R&D themselves, but may be involved in specific projects with the suppliers and research institutes.

A last category consists of the national oil companies. Most of them have kept a strong R&D activity over the years. From an international perspective, Statoil and Hydro fit into this category even though they are both partly privately owned. Typically both Statoil and Hydro have major research centers and have over the years had several successes with the application of resulting new technology. As national oil and gas companies they are naturally both important players on the DEMO 2000 arena.

In the global market the service industry has been through a similar consolidation process as the oil companies with the result that a few major companies dominate. These companies are today key players for R&D in the upstream industry. Some of them have major operations as well as R&D activities in Norway and several of them are active in the DEMO program.

In addition there is a large number of medium sized to small service and technology providers globally including a number of Norwegian ones with offices or only operations in Norway. Many of the Norwegian companies have developed and commercialized internationally recognized technology and the DEMO program is one of the facilitators in this process. Over the years many Norwegian start-up companies have been acquired by the major service companies.

7.2 Coordination with other R&D and innovation promoting measures

OG 21 is the strategic body overseeing the Norwegian oil and gas related R&D policy. One of its roles is to identify technology gaps. This body has a direct impact on the DEMO 2000 program as its strategy is adopted by this program as well as other programs such as Petromaks. OG 21 is thus coordinating the technology development in the petroleum cluster in Norway, however, without financial funds at its disposal.

We recommend that the strong strategic link between OG21 and DEMO 2000 should be upheld and maintained along the same lines as we observe today. This ensures that DEMO 2000 is operating in line with the overall technology development strategy for the Norwegian oil and gas industry as well as the NCS.

The most obvious measure, with which DEMO 2000 should seek a co-ordination, is Petromaks. A goal for this research program is ensuring another 50 years of oil production and 100 years of gas production at the NCS.

We recommend applying mechanisms which in a dynamic way can allocate financial funds to the various programs under the OG21 strategy depending on the needs.

7.3 The international character of DEMO 2000

Recently, the program management of DEMO 2000 has turned its attention towards international collaboration. More specifically, the management and the ESG have entered into discussions with international initiatives like DeepStar and PROCAP 3000.

One of the results of this evaluation suggests that much of the developed technology for (ultra-) deep water has no immediate application on the NCS due to lack of prospects. Hence, the internationalization of the DEMO 2000 program appears to be a logical strategy to implement. Both DeepStar and PROCAP 3000 consists of operators of (ultra-) deep water prospects and the portfolio of development projects is considerable. Based on this, it seems evident that the commercial future of many of the results from the DEMO 2000 program lies in international petroleum markets.

We recommend the strengthening of the trademark and the international profile of DEMO 2000. It seems desirable to engage in and further strengthen the links to comparable international initiatives.

8 Policy recommendations

At the time of the launch of the DEMO 2000 program, there was a crisis in the industry: The oil price was at a record low and many ongoing technology programs at the time were simply stopped and new ones were not started. For almost all projects in the DEMO 2000 portfolio the partners involved believe that the projects would not have happened without the DEMO 2000 support or at least that they would have been significantly delayed or happened at a much smaller scale.

The situation in the industry today is completely different from the one in 1999 with the oil price at a record high and with limited personnel and other resources available. In today's market, scarce resources need to be used in an optimal manner. One could therefore argue that the measures necessary in 1999 are not relevant today when the «patient is in good health».

It is important to note, however, that many of the participants in the program emphasize the value, not only of the financial support, but also of the DEMO 2000 work processes for prioritization of technology. An alternative model is to continue with the structure of the program, but without the financing involved. It is, however, a fact that the financial contribution is important to make the process real.

Another argument is that the current market climate should be used to invest more in longer term high risk projects. Petromaks is the program for R&D projects. A closer cooperation and coordination between Petromaks and DEMO 2000 will make it easier to prioritize between efforts in R&D versus piloting of technology. It is, however, important to do this in way that keeps the efficiency of the system experienced by all participants in the DEMO 2000 program.

So far a limited amount of funding has been channeled to new technology for the exploration phase. Intensified exploration has now been identified as one of the priorities by the oil industry in Norway. In many cases R&D in this area is done by the oil companies and the relevant service companies themselves as tools and knowledge for exploration is considered to be in the area of core competence and business for the operators. It is, however, recommended that some of the DEMO 2000 budget is used for demonstration of technology in the exploration phase for which similar hurdles are identified as for many of the major projects in the development and production phase.

DEMO 2000 is not seen as a program for the research institutes. In terms of contribution to the DEMO 2000 process, the participating institutes represent a perspective which is different from the oil companies on one hand and the

supplier industry on the other hand. By working on projects which often combines evaluation of new technology from an operator perspective with a view of a science and technology provider, the research institutes can contribute to the process of optimizing the selection process of projects for funding and encourage prioritization of projects that will pull together in terms of creating value.

Although many of the projects in the DEMO 2000 portfolio are contributing to improved HSE performance, this has not been a goal in itself for the DEMO 2000 program. It is not recommended to change this as other initiatives in Norway are focusing on improved HSE. However, HSE and in particular environmental aspects are important for projects focusing on technology for the Arctic areas.

With the capital already invested in the completed projects in the DEMO 2000 portfolio and the ongoing investment in further projects, the Norwegian society has an opportunity for considerable financial gain by addressing the factors that represent barriers to reward within the «time window of differentiation».

The piloting process stimulated by the DEMO 2000 program is moving a number of technologies towards commercialization. For many of the resulting products and services, however, there are still remaining hurdles for successful commercialization. A common challenge is to demonstrate the use of the technology in an operational and commercial setting over time. It is difficult to find asset organizations that are willing to take the risk of installing new technology for the first time in a real life setting. The concept of «Asset Forum» has been introduced as a possible solution to this challenge, but has so far not been able to establish a working model. A number of projects have already received funding for multiple phases. If an additional phase of financing for an already funded and successful project will result in documentation of a commercial product or service, this should be encouraged. If piloting is more beneficial and possible in other areas than on the NCS, such options should be explored.

When technologies from several projects in the existing portfolio or in combination with technology in new projects constitute an integrated system and it is important to demonstrate the value of the system to make the inherent technology commercially proven, such combined technology solutions should be given priority. This is also an opportunity to bring in new partners into a project who will help facilitate the process of product or service commercialization.

In essence, a shift towards projects in an earlier phase on one hand and funding of additional phases for commercial/operational demonstrations on the other hand is recommended.

A debate about conflict of interest has been on the agenda in the DEMO 2000 committees. For a while representatives for an oil company sponsoring a project had to leave the room during voting on that particular project in the steering committee. Recently the steering committee has gone back to the practice from earlier years when only the companies with ownership in a given project technology would have to leave the room during voting on that project. This is in line with the general philosophy of the DEMO 2000 program which is to get the end users to help prioritizing technology for piloting. With this model it is important to be constantly aware of the risks involved and continue to manage the process in an as transparent manner as possible.

Currently the institutes are represented in the steering committee. It should be evaluated how they can participate in the preparation for selection of projects earlier in the process. At the same time the industrial partners should be encouraged to involve the research institutes as partners in individual projects. In most cases the research institutes are closely linked to the universities. In general such a move will also contribute to one of the priorities highlighted by OG21 of strengthening the cluster collaboration with the universities/institutes.

Although most of the expected value creation from the DEMO 2000 projects has yet to be realized, the program has demonstrated a unique approach for accelerated qualification of critical new technology for the NCS and should be continued. In parallel to the contribution for the NCS, many of the products and services demonstrated through the DEMO 2000 program represent a substantial potential for world wide growth for the service companies/contractors involved, not only in markets with ultra deep water operations. The current initiatives by the DEMO 2000 program administration to use the program for active marketing of Norwegian technology and companies in areas like the Gulf of Mexico, Brazil and West Africa should be continued and strengthened.

In terms of thematic focus areas, challenges related to Arctic areas are already on the agenda for DEMO 2000. So far two projects focusing on data collaboration and sub-ice solutions have been identified. In line with the traditional strength of the DEMO 2000 program, it is recommended that the main focus is on projects involving piloting of new technology in the field. In addition to new project ideas that are expected to focus on challenges in the Arctic, the historic and current DEMO 2000 project portfolio ought to include technologies that can be further developed or combined to address this theme. In future invitations for applications for funding, it is recommended to specifically invite such redefined or combined project definitions. This will also contribute to an increased return on investment in the DEMO 2000 program as discussed above.

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APPENDIX

Appendix 1 Terms of reference

Oppdragsbeskrivelse/Konkurransegrunnlag for evaluering av DEMO 2000

DEMO 2000

Oppdragsgiver
Olje og energidepartementet
Petroleumsavdelingen
Industri- og forskningsseksjonen
Postboks 8148 Dep
0033 OSLO

Telefon : 22 24 90 90
Telefaks : 22 24 95 65

Alle henvendelser vedrørende tilbudet rettes til:
Avdelingsdirektør Odd Sverre Haraldsen
Telefon direkte : 22 24 62 66
Telefaks direkte : 22 24 95 66
e-post : osh@oed.dep.no

eller,

Rådgiver Cecilie Ravn Munkvold
Telefon direkte : 22 24 62 38
Telefaks direkte : 22 24 95 66
e-post : crm@oed.dep.no

Dato
Evalueringen er kunngjort i Norsk Lysingsblad DOFFIN-database og konkurransegrunnlaget er gjort tilgjengelig på Olje- og energidepartementets nettsider fra 1. april 2005.

Anskaffelsesprosedyre
Konkurranse med forhandlinger etter forutgående kunngjøring.

Beskrivelse av oppdraget
Det skal utføres en evaluering av teknologiutviklingsprogrammet Demo 2000. Programmet har eksistert siden 1999 og har mottatt støtte fra Olje- og energidepartementet i perioden 1999 - 2004. Hensikten med evalueringen er å vurdere grad av måloppnåelse, suksess og programmets fremtid. Evalueringen vil inngå som en oppfølging av St.meld. nr. 38 (2003-2004). I denne er økt satsning på forskning og teknologi lansert som et av Regjeringens tiltak for å nå den langsiktige utviklingsbanen for petroleumsvirksomheten. Demo 2000 er ment som et viktig verktøy i så måte. Det vises til vedlegg for en nærmere beskrivelse av bakgrunn og hensikt med etableringen av Demo 2000.

Evalueringen skal omfatte:

- Vurdere den bedrifts- og samfunnsøkonomiske effekten av Demo 2000. Hva Demo 2000 faktisk har oppnådd i forhold til pengebruk og intensjonen da det første gang ble bevilget midler i 1999.
- Vurdere teknologiutvikling, pilotering og kommersialisering som har kommet som en følge av Demo 2000s bevilgninger.
- Vurdering av programmets utløsende effekt; hvor mye teknologiutvikling, pilotering og kommersialisering ville ikke ha kommet uten DEMO 2000.
- Vurdering av programmets organisering og arbeidsmetoder, herunder forholdet til NFR og andre relevante aktører.
- Eventuelle forslag til endringer i programmet.

Det stilles krav om at tilbyder og evalueringsteamet ikke mottar eller har mottatt økonomisk støtte fra eller på annen måte er eller har vært engasjert i Demo 2000 eller i prosjekter tilknyttet Demo 2000.

Oppdraget skal være ferdig utført innen fire måneder fra kontraktsinngåelse.

Demo 2000
I 1999 ble Demo 2000 startet opp som et samarbeidsprogram innen prosjektrettet teknologiutvikling i petroleumssektoren. Programmet gjennomføres som et samarbeid mellom oljeselskaper, leverandørindustri og forskningsinstitusjoner. Det ble over statsbudsjettet bevilget 100 mill. kroner til programmet for 1999 og 80 mill. kr for år 2000. For 2004 ble det bevilget 30 mill. kroner til programmet. Det har vært en forutsetning at den statlige bevilgningen til Demo 2000 utløser ytterligere midler fra leverandørbedrifter og oljeindustrien.

En styringsgruppe bestående av representanter fra leverandørindustrien, forskningsmiljøer og oljeselskapene er oppnevnt av OED for å gjennomføre programmet. Programmidlene kanaliseres gjennom Norges forskningsråd.

Hensikten med Demo 2000 er å bidra til:

.

- Reduserte kostnader på norsk sokkel
- Økt aktivitet
- Økt konkurransekraft i næringen

Demo 2000 skal omsette prioriteringene til OG21 (Olje og gass i det 21. århundre – Nasjonal strategi for teknologi og forskning i olje- og gassnæringen) til konkrete prosjekter for utvikling, demonstrasjon og testing av nye løsninger. Formålet er å fremme utvikling og bruk av ny teknologi for norsk kontinentalsokkel og for eksport. Demo 2000 skal spille en sentral rolle i å fremme forslag til større pilotprosjekter som er velegnet for samarbeid mellom flere utvinningstillatelser på norsk kontinentalsokkel. Demo 2000 skal være et viktig verktøy for å løse de fremtidige teknologiutfordringene på norsk kontinentalsokkel og internasjonalt.

De ovennevnte momentene skal vurderes i evalueringen.

Nøkkelpersoner/involverte parter
Det er ønskelig at evalueringen inkluderer intervjuer med bl.a. følgende nøkkelpersoner/ involverte parter:

.

- Programdirektør Morten Wiencke. ·
- Medlemmer av styringsgruppen og deres overordnede. ·
- Medlemmer av teknisk komité og deres overordnede. ·

- TBL, INTSOK, OLF, OG21, NFR. ·
- Norske selskap/organisasjoner: Statoil, Hydro og ulike forskningsinstitusjoner / leverandørbedrifter. ·
- Internasjonale selskap/organisasjoner: Shell, BP, Chevron; Total, Petrobras, ENI, DeepStar, Society of Petroleum Engineers (SPE).
- Eventuelt andre nøkkelpersoner/involverte parter.

Datagrunnlaget
Evalueringsteamet skal i sin evaluering av Demo 2000 også basere seg på eksisterende informasjon slik som søknader, prosjektrapporter m.m.. Evalueringsteamet vil få tilgang til arkivert informasjon.

Rapportering
Det skal utarbeides en samlet evalueringsrapport på engelsk med en helhetlig framstilling av evalueringens teorigrunnlag, metode og datagrunnlag, samt redegjørelse for gjennomførte analyser. Rapporten skal ha et eget avsnitt med sammenstilling av hovedfunn, konklusjoner og tilrådninger. Rapporten skal ha et kortfattet sammendrag på 2 sider på norsk/engelsk og et helhetlig sammendrag på engelsk på inntil 10 sider. Rapporten skal foreligge både i papir- og elektronisk versjon.

Oppfølgingstjenester
Oppdraget omfatter forpliktelse til deltakelse på inntil tre møter for presentasjon og drøfting av evalueringens konsekvenser i en periode på inntil seks måneder etter levering av rapport.

Kvalifikasjonskrav/ Krav til tilbudet

Leverandør kvalifikasjoner
Vedlagt tilbudet skal det vedlegges:

- Skatteattest for innbetalt skatt og merverdiavgift, ikke eldre enn seks måneder
- HMS erklæring ·
- Tilbyders evalueringsfaglige kvalifikasjoner (med referanse til tidligere utført arbeide). ·
- Tilbyders kompetanseområder og interesser med relevans for den foreslåtte evalueringen. ·
- Tilbyders kapasitet og evne til å levere til avtalt tid og i henhold til avtalte spesifikasjoner.
- Oversikt over prosjektteam og -leder (Cv-er vedlegges).

Krav til tilbudet
Tilbudet på evalueringen skal leveres på norsk eller engelsk. Det skal kun leveres tilbud på hele oppdraget samlet. Tilbudet skal leveres i form av en kort skisse. Det blir ikke ytt økonomisk kompensasjon for skissen eller kostnader i forbundet med eventuelle forhandlinger.

Tilbudet skal eksplisitt gjøre rede for hvordan problemstillingene i oppdraget vil bli analysert. Det skal gjøres rede for metodevalg og de forutsetninger som ligger til grunn for dette. I den forbindelse skal det bl.a. gjøres rede for hva slags datainnsamlingsmetoder som vil bli benyttet. Hvordan resultatene tenkes å bli presentert og formidlet skal også fremgå av tilbudet.

Dersom oppdraget skal gjennomføres av mer enn ett evaluerings/forskningsmiljø, skal det gjøres rede for fordelingen mellom disse.

- Tilbudet skal inneholde et pristilbud med spesifisering av timepriser.
- Tilbud som ikke er i samsvar med vilkårene i konkurransegrunnlaget vil kunne bli forkastet.
- Tilbud som leveres for sent blir forkastet.
- Olje- og energidepartementet forbeholder seg retten til å forkaste samtlige tilbud.

Utvelgelsesprosess
Olje- og energidepartementet tar sikte på å gå i forhandlinger med to til fire tilbydere. I løpet av forhandlingene vil det kunne bli stilt krav om å utarbeide mer detaljerte tilbudsdokumenter.

Oppdragsgiver vil på bakgrunn av foreliggende dokumentasjon velge det tilbudet som totalt sett anses som mest fordelaktig. Kriterier som legges til grunn vil være:

Det økonomisk mest fordelaktige tilbud vurdert på grunnlag av:·

- Tilbyders og evalueringsteamets faglige kvalifikasjoner og erfaring. ·
- Det faglige opplegget i tilbudet mht. kvalitet og relevans.
- Pris.

Olje- og energidepartementet vil tegne kontrakt med én evaluerer som har det totale ansvaret for gjennomføringen av hele oppdraget. Eventuell delegering av deler av oppdraget til andre fagmiljøer fritar ikke kontraktspartner for dette ansvaret.

Konfidensialitet
I forbindelse med oppdraget vil oppdragstaker kunne få tilgang til konfidensiell informasjon. Det vil således i den endelige avtalen med oppdragstaker bli stilt krav om konfidensialitet og om undertegning av en konfidensialitetserklæring.

Innlevering av tilbud
Tilbudet må være Olje- og energidepartementet i hende senest 1. mai 2005. Tilbyder er forpliktet til å opprettholde tilbudet inntil 1. juli.2005.

Tilbudet sendes eller leveres i papirform i lukket konvolutt og som vedlegg til e-post til følgende adresse:

Olje og energidepartementet
Att: Cecilie Ravn Munkvold
Petroleumsavdelingen
Industri- og forskningsseksjonen
Postboks 8148 Dep
0033 OSLO

e-post: crm@oed.dep.no

Tilbudet merkes "Tilbud på Evaluering av Demo 2000"

Relevante internettadresser:

Demo 2000

OG21

Appendix 2 Achieved overall economic benefits – detailed results

A.2.1 Service companies

Table A.2.1: Improved productivity as a result of the DEMO 2000 projects

Improved productivity for your company	N	0%	0 - 5%	5 - 20%	20 - 50%	50 - 100%
has already occurred?	12 100%	6 50%	4 33%	1 8%	1 8%	- -
is likely to occur within the next 2 years?	12 100%	- -	1 8%	8 67%	2 17%	1 8%
is likely to occur in the next 2 to 5 years?	12 100%	- -	- -	7 58%	4 33%	1 8%
is likely to occur in the next 5 to 10 years?	12 100%	- -	3 25%	4 33%	4 33%	1 8%

Table A.2.2: Increased revenue in Norway as a result of the DEMO 2000 projects

Increased revenue in Norway	N	less than 20 MNOK	between 20 and 99 MNOK	between 100 and 249 MNOK	between 250 and 499 MNOK	more than 500 MNOK
has already occurred?	23 100%	21 91%	- -	1 4%	- -	1 4%
is likely to occur within the next 2 years?	23 100%	14 61%	5 22%	1 4%	2 9%	1 4%
is likely to occur in the next 2 to 5 years?	23 100%	7 30%	6 26%	5 22%	2 9%	3 13%
is likely to occur in the next 5 to 10 years?	23 100%	5 22%	5 22%	7 30%	1 4%	5 22%

Table A.2.3: Increased revenue internationally as a result of the DEMO 2000 projects

Increased revenue internationally	N	less than 20 MNOK	between 20 and 99 MNOK	between 100 and 249 MNOK	between 250 and 499 MNOK	more than 500 MNOK
has already occurred?	31 100%	29 94%	1 3%	1 3%	- -	- -
is likely to occur within the next 2 years?	31 100%	20 65%	5 16%	3 10%	3 10%	- -
is likely to occur in the next 2 to 5 years?	31 100%	7 23%	12 39%	6 19%	3 10%	3 10%
is likely to occur in the next 5 to 10 years?	31 100%	5 16%	9 29%	9 29%	2 6%	6 19%

Table A.2.4: Improved profitability in Norway as a result of the DEMO 2000 projects

Profitability in Norway	N	less than 5 MNOK	between 5 and 24 MNOK	between 25 and 49 MNOK	between 50 and 99 MNOK	more than 100 MNOK
has already occurred?	22 100%	19 86%	2 9%	1 5%	- -	- -
is likely to occur within the next 2 years?	22 100%	10 45%	10 45%	1 5%	1 5%	- -
is likely to occur in the next 2 to 5 years?	22 100%	5 23%	9 41%	6 27%	2 9%	- -
is likely to occur in the next 5 to 10 years?	22 100%	3 14%	10 45%	4 18%	4 18%	1 5%

Table A.2.5: Improved Profitability internationally as a result of the DEMO 2000 projects

Profitability internationally	N	less than 5 MNOK	between 5 and 24 MNOK	between 25 and 49 MNOK	between 50 and 99 MNOK	more than 100 MNOK
has already occurred?	27 100%	24 89%	3 11%	- -	- -	- -
is likely to occur within the next 2 years?	27 100%	13 48%	9 33%	4 15%	1 4%	- -
is likely to occur in the next 2 to 5 years?	27 100%	4 15%	11 41%	8 30%	3 11%	1 4%
is likely to occur in the next 5 to 10 years?	27 100%	3 11%	8 30%	7 26%	5 19%	4 15%

Table A.2.6: Increased market share in Norway as a result of the DEMO 2000 projects

Market share in Norway	N	between 0 and 9%	between 10 and 24%	between 25 and 49%	between 50 and 74%	more than 75%
has already occurred?	25 100%	14 56%	3 12%	5 20%	1 4%	2 8%
is likely to occur within the next 2 years?	25 100%	8 32%	9 36%	5 20%	3 12%	- -
is likely to occur in the next 2 to 5 years?	25 100%	4 16%	9 36%	8 32%	4 16%	- -
is likely to occur in the next 5 to 10 years?	25 100%	6 24%	5 20%	9 36%	4 16%	1 4%

Table A.2.7: Increased market share internationally as a result of the DEMO 2000 projects

Market share internationally	N	between 0 and 9%	between 10 and 24%	between 25 and 49%	between 50 and 74%	more than 75%
has already occurred?	29 100%	20 69%	1 3%	3 10%	2 7%	3 10%
is likely to occur within the next 2 years?	29 100%	13 45%	8 28%	4 14%	2 7%	2 7%
is likely to occur in the next 2 to 5 years?	29 100%	6 21%	14 48%	5 17%	3 10%	1 3%
is likely to occur in the next 5 to 10 years?	29 100%	6 21%	11 38%	6 21%	4 14%	2 7%

Table A.2.8: Growth potential in Norway as a result of the DEMO 2000 projects

Growth potential in Norway	N	0%	0 - 9%	10 - 24%	25 - 49%	more than 50%
has already occurred?	27 100%	12 44%	11 41%	3 11%	1 4%	- -
is likely to occur within the next 2 years?	27 100%	3 11%	10 37%	9 33%	5 19%	- -
is likely to occur in the next 2 to 5 years?	27 100%	1 4%	5 19%	11 41%	8 30%	2 7%
is likely to occur in the next 5 to 10 years?	27 100%	1 4%	5 19%	10 37%	6 22%	5 19%

Table A.2.9: Growth potential internationally as a result of the DEMO 2000 projects

Growth potential internationally	N	0%	0 - 9%	10 - 24%	25 - 49%	more than 50%
has already occurred?	33 100%	13 39%	18 55%	1 3%	- -	1 3%
is likely to occur within the next 2 years?	33 100%	2 6%	14 42%	15 45%	1 3%	1 3%
is likely to occur in the next 2 to 5 years?	33 100%	1 3%	6 18%	14 42%	8 24%	4 12%
is likely to occur in the next 5 to 10 years?	33 100%	1 3%	4 12%	13 39%	6 18%	9 27%

A.2.2 Oil companies

Table A.2.10: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Increasing hydrocarbon production

Increasing hydrocarbon production	N	not relevant	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	21 100%	7 33%	4 19%	4 19%	4 19%	2 10%	- -
the Norwegian Continental Shelf as a whole?	21 100%	3 14%	2 10%	3 14%	5 24%	6 29%	2 10%
your company's operations worldwide?	21 100%	2 10%	2 10%	2 10%	5 24%	8 38%	2 10%

How much has been realized as of today?	N	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	21 100%	19 90%	1 5%	1 5%	- -	- -	- -
the Norwegian Continental Shelf as a whole?	21 100%	19 90%	1 5%	- -	1 5%	- -	- -
your company's operations worldwide?	21 100%	18 86%	2 10%	- -	1 5%	- -	- -

When do you expect the full potential of the results of this project to be realized (N=21)?

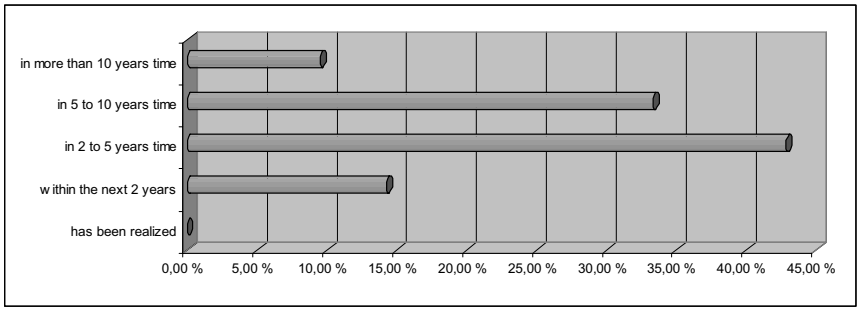


Table A.2.11: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Increasing ultimate recovery

Increasing ultimate recovery	N	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	16 100%	9 56%	1 6%	1 6%	4 25%	- -	1 6%
the Norwegian Continental Shelf as a whole?	16 100%	7 44%	1 6%	2 13%	1 6%	3 19%	2 13%
your company's operations worldwide?	16 100%	6 38%	1 6%	2 13%	2 13%	3 19%	2 13%

How much has been realized as of today?	N	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	16 100%	15 94%	- -	1 6%	- -	- -	- -
the Norwegian Continental Shelf as a whole?	16 100%	16 100%	- -	- -	- -	- -	- -
your company's operations worldwide?	16 100%	15 94%	- -	- -	1 6%	- -	- -

When do you expect the full potential of the results of this project to be realized (N=16)?

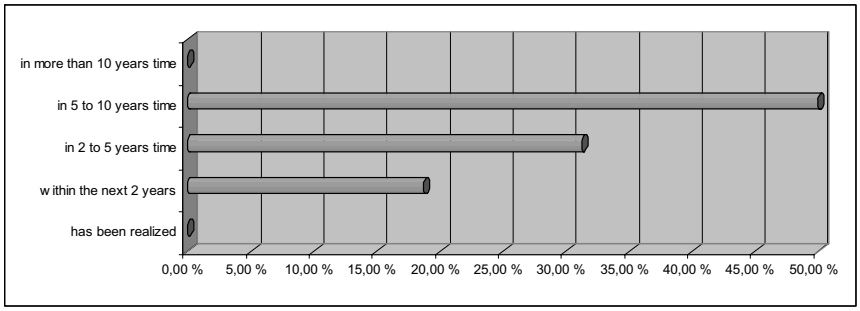


Table A.2.12: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Reducing cost in exploration

Reducing cost in exploration	N	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	9 100%	3 33%	4 44%	2 22%	- -	- -	- -
the Norwegian Continental Shelf as a whole?	9 100%	3 33%	3 33%	- -	2 22%	1 11%	- -
your company's operations worldwide?	9 100%	3 33%	2 22%	1 11%	2 22%	1 11%	- -
How much has been realized as of today?	**N**	**nothing yet**	**between 0 and 99 MNOK**	**between 100 and 499 MNOK**	**between 500 and 999 MNOK**	**between 1000 and 4999 MNOK**	**above 5000 MNOK**
your company's most relevant field on the Norwegian Continental Shelf?	9 100%	8 89%	1 11%	- -	- -	- -	- -
the Norwegian Continental Shelf as a whole?	9 100%	7 78%	1 11%	1 11%	- -	- -	- -
your company's operations worldwide?	9 100%	7 78%	2 22%	- -	- -	- -	- -

When do you expect the full potential of the results of this project to be realized (N=9)?

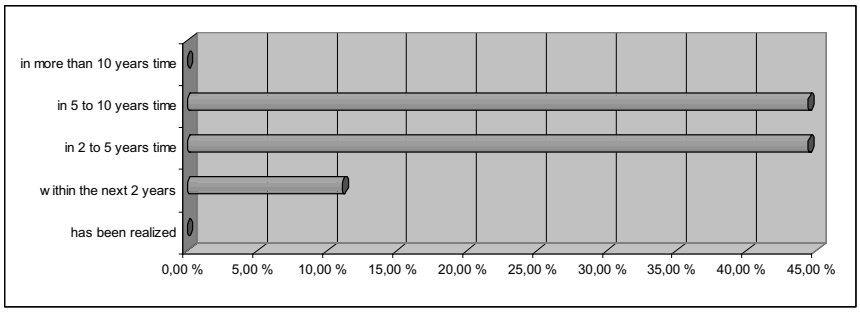


Table A.2.13: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Reducing cost in development

Reducing cost in development	N	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	21 100%	8 38%	7 33%	4 19%	1 5%	- -	1 5%
the Norwegian Continental Shelf as a whole?	21 100%	7 33%	3 14%	6 29%	2 10%	1 5%	2 10%
your company's operations worldwide?	21 100%	7 33%	3 14%	5 24%	2 10%	3 14%	1 5%

How much has been realized as of today?	N	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	21 100%	19 90%	2 10%	- -	- -	- -	- -
the Norwegian Continental Shelf as a whole?	21 100%	18 86%	2 10%	1 5%	- -	- -	- -
your company's operations worldwide?	21 100%	18 86%	1 5%	- -	2 10%	- -	- -

When do you expect the full potential of the results of this project to be realized (N=21)?

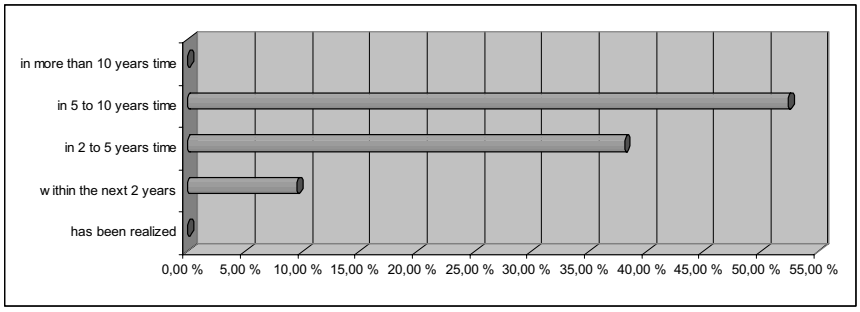


Table A.2.14: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Reducing cost in production

Reducing cost in production	N	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	23 100%	13 57%	4 17%	3 13%	2 9%	- -	1 4%
the Norwegian Continental Shelf as a whole?	23 100%	11 48%	3 13%	2 9%	3 13%	2 9%	2 9%
your company's operations worldwide?	23 100%	11 48%	2 9%	4 17%	2 9%	3 13%	1 4%
How much has been realized as of today?	**N**	**nothing yet**	**between 0 and 99 MNOK**	**between 100 and 499 MNOK**	**between 500 and 999 MNOK**	**between 1000 and 4999 MNOK**	**above 5000 MNOK**
your company's most relevant field on the Norwegian Continental Shelf?	23 100%	20 87%	2 9%	1 4%	- -	- -	- -
the Norwegian Continental Shelf as a whole?	23 100%	19 83%	2 9%	1 4%	- -	1 4%	- -
your company's operations worldwide?	23 100%	20 87%	1 4%	1 4%	- -	1 4%	- -

When do you expect the full potential of the results of this project to be realized (N=23)?

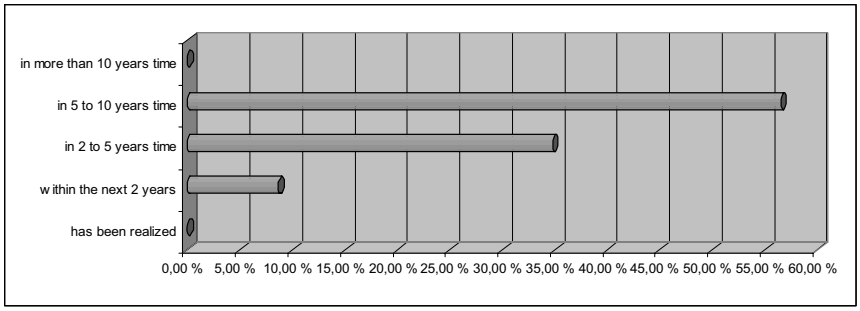
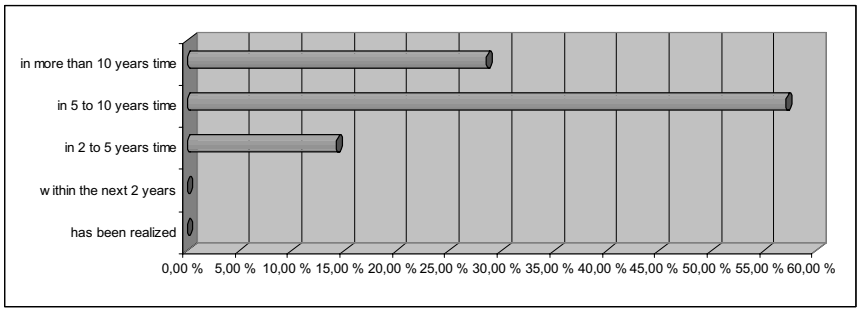


Table A.2.15: Direct impact of the DEMO 2000 projects' results on the oil companies' assets – Reducing cost in abandonment

Reducing cost in abandonment	N	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	7 100%	3 43%	3 43%	- -	- -	- -	1 14%
the Norwegian Continental Shelf as a whole?	7 100%	4 57%	1 14%	1 14%	- -	- -	1 14%
your company's operations worldwide?	7 100%	3 43%	2 29%	- -	1 14%	- -	1 14%
How much has been realized as of today?	**N**	**nothing yet**	**between 0 and 99 MNOK**	**between 100 and 499 MNOK**	**between 500 and 999 MNOK**	**between 1000 and 4999 MNOK**	**above 5000 MNOK**
your company's most relevant field on the Norwegian Continental Shelf?	7 100%	6 86%	1 14%	- -	- -	- -	- -
the Norwegian Continental Shelf as a whole?	7 100%	6 86%	1 14%	- -	- -	- -	- -
your company's operations worldwide?	7 100%	6 86%	1 14%	- -	- -	- -	- -

When do you expect the full potential of the results of this project to be realized (N=7)?



Appendix 3 Detailed descriptions of DEMO 2000 Top 2 projects

For each of the 8 DEMO 2000 'Top 2' projects described below the following characteristics are discussed:

1) Following a short description of the technology, product and service constituting each of the projects, the participating oil companies and possibly research institutes involved and the achievements versus the original goals are discussed. The additionality (to what extent the project would have delivered its results without DEMO 2000 support) is also part of this discussion. It should be mentioned that in this evaluation, as a novelty, we have also tried to investigate additionality effects on the output side, i.e. the results of each project. This has been done by asking the participants about the importance of the DEMO 2000 support in achieving the various results of the individual projects
2) The next step is to summarize the contribution to financing of the project by the partners. For the service company/contractor involved this includes financing of relevant development both before the DEMO 2000 project started, during the project period and after the DEMO 2000 period was completed
3) In the discussion, major focus is set on quantifying the financial value of the project for both the service company/contractor, the oil companies and, if relevant, the research institutes involved as well as the potential value on the Norwegian Continental Shelf as a whole
4) The last part includes a discussion of the contribution of the project to the general goals for the DEMO 2000 program:
    - Reduced cost on NCS
    - Improved attractiveness of / activity on NCS
    - Improved competitiveness of Norwegian industry
5) Finally possible contributions to improved health, safety and environment are mentioned

A.3.1 Atlantis

Description of product/service/project

Atlantis Deepwater Technology Holding (ADTH) is an offshore technology company located in Grimstad. The company was established in 2000 specifically for the purpose of commercializing the Atlantis technology.

Atlantis represents a novel method for exploration drilling and field development in deep and ultra deep waters. By building an artificial buoyant seabed (ABS) placed at 2-400 meter below the sea surface, it becomes possible to use equipment designed for relatively shallow water in a deep water environment, for example light drilling rigs. The objective with the DEMO 2000 project (149593 – Full scale inshore test of the Atlantis Deepwater Concept, phase 1 & 2) was to verify the applicability of the technology as a safe and cost effective method for drilling and field development in deep waters.

Participating oil companies and research institutes

BP and Shell were participating in the Atlantis project.

Achievements versus original goals for the project – additionality

The project started late 2001 and was successfully completed in 2003. The Atlantis unit was fabricated at Nymo yard in Grimstad and was moved to Aker Marine Contractors in Jåttavågen in Stavanger. The purpose with the project was to demonstrate the marine handling of the unit when towed and when submerged. The towing took place in the fjords near Stavanger and a demonstration was performed in Gandsfjorden by submerging the construction at 200 meter below sea surface.

The original goals for the Atlantis project were to develop and build a unit, to complete a pilot project and develop a new commercial product, service, process and product line / business. The full use of the unit in an actual drilling operation is pending. Such use is for the moment under discussion in the Asian market.

It is unlikely that the Atlantis project would have happened without DEMO 2000 funding the first unit, piloting and new commercial products and services. Significant funding was needed and the oil companies do not have high enough R&D budgets these days. The major drilling contractors see the Atlantis project to some extent as a competing solution to their expensive deep water rigs. It has taken time to find a drilling contractor who is keen to pick up the idea. It is more likely that the drilling contractors focusing on shallow water operations may be interested as they see Atlantis as an enabler for the use of their assets in deep water operations.

Financing by service company / contractor, oil companies and DEMO 2000

Atlantis has been developed over the last 8 years and so far close to 120 MNOK has been used for development work. Prior to the start of the DEMO 2000 project ADTH had already invested about 30 MNOK in the development. The total cost of the DEMO 2000 project was 48 MNOK. The DEMO 2000 program financed 10 MNOK, ADTH 26 MNOK and BP and Shell contributed each 6 MNOK. Following the completion of the DEMO 2000 project ADTH has invested another 20 MNOK and expects to continue to invest more than 20 MNOK in the years to come.

Economic value for participating companies

From an oil company perspective

- The Atlantis technology will make it possible to save cost in exploration and development by using simpler solutions designed for relatively shallow water. Sub-sea technology for drilling and field development in shallow water can be applied for any water depths.
- The Atlantis solution is relevant both for exploration and production drilling and field development. There may be different Atlantis versions for exploration and production. The cost of drilling operations can be reduced by 20-40% due to the fact that low cost 2^{nd}-3^{rd} generation rigs can be used. A typical saving of 5-15 MUSD per well is expected.

- Atlantis may make it possible to explore for and develop fields in ultra deep water that may otherwise not become commercial. That means that Atlantis may contribute to increase the world's ultimate recovery of hydrocarbons.
- So far, however, no direct financial value has been obtained by the oil companies. Most of the value is expected to be realized in 5 to 10 years time. Critical factors for the realization of this value will be the availability and cost of deepwater rigs.
- Deep water areas for Atlantis are where the water depth is 800 meter and deeper.

From a service company / contractor perspective

- The Atlantis solution can be used on all deep water continental shelves. So far, no water depth limitation has been defined.
- The DEMO 2000 project is also expected to increase the revenue for the company in Norway and internationally. In particular, the project is expected to have a positive impact on the ADTH profitability in the international market. This will also lead to a significant increase in market share, company growth and competitiveness globally. Within 2 years this is expected to increase to 50 to 100 MNOK and after 2 years more than 100 MNOK as long as the first application is in service.
- Following the completion of the DEMO 2000 project, ADTH and China Oilfield Services Limited (COSL) have agreed to the use of Atlantis in upcoming deepwater exploration activities in China and other South East Asia and Pacific countries, including Australia. COSL will invest 9 MUSD to prepare the first fully operational Atlantis unit and for exclusive rights to use the technology in the area.
- The Atlantis business will also have a high impact for the ADTH suppliers.

Value of the project from a 'Norway AS' point of view

The Atlantis project is important in terms of reducing cost on the NCS. It is in particular important for the competitiveness of Norwegian industry in deep and ultra deep water markets.

Contribution to improved health, safety and environment

With the use of Atlantis the safety will be improved in deep water drilling. This is mainly because much less time is needed to shut in a well with the blow out preventer at the Atlantis unit instead of at the sea bottom. Therefore it is much easer to disconnect from the well in an emergency situation. Because of the much shorter drilling riser, spill of mud will also be much less with an immediate disconnect. The Atlantis also has other values from a health and safety point of view. As Atlantis is not yet in operation, the identified HSE value has not yet been realized.

A.3.2 CompTether (Analysis and verification of manufacturing, transportation and installation of CompTether) – DeepWater Composites (Aker Kværner)

Description of product/service/project

The idea with the CompTether project is to use carbon fibre in tethers for tension leg platforms (TLPs) to reduce the weight in deep water installations. Advantages with the CompTether technology in addition to low weight are high strength/stiffness, high fatigue resistance, high corrosion resistance and that the system is spoolable. The starting point for the DEMO 2000 project was cooperation between Kværner and Conoco (today ConocoPhillips) originally in 1995. This interest was partly triggered by DuPont (owner of Conoco at the time) who saw a potential new market for their carbon fibre production.

The first DEMO 2000 project (139763 – Manufacturing and verification of CompTether prototype) consisted of the development of a prototype at the Kværner facility in Moss and verification of the CompTether properties through testing at DNV. The second project was focusing on analysis and verification of manufacturing, transportation and installation of CompTether (149599).

Participating oil companies and research institutes

Norske Conoco AS, DnV, SINTEF and NTNU

Achievements versus original goals for the project – additionality

The DEMO 2000 projects were ongoing from 2000 through 2004. The objective of the projects was to verify technical and commercial aspects related to manufacturing, transportation and installation of CompTether and to get the composite tether technology accepted by US authorities for use in the GOM. All of the following deliverables were both expected at the time of applying for DEMO 2000 funding and has actually been achieved: Prototype, new commercial products, new industry

processes, new product lines and new industry standards. A new company was started for this business (Deep Water Composites), but has later been acquired 100% by Aker Kværner.

Aker Kværner and partners believe that the CompTether pilot would not have been realized without the DEMO 2000 support and that the product and product line would have become available only at a much later stage. Aker Kværner also concludes that the subsequent carbon fibre umbilical development would not have happened without the DEMO 2000 support. The financial funding has been important, but the value of the DEMO 2000 process was equally important as it demonstrated the industry interest in the technology.

Financing by service company / contractor, oil company and DEMO 2000

Prior to filing the DEMO 2000 application Kværner had already invested a few MNOK in the project. The total cost for the two DEMO 2000 projects is 21.5 MNOK. Financing by the DEMO 2000 program has been a total of 4.3 + 1.6 MNOK. Aker Kværner has contributed with 6.3 + 1.5 MNOK and other private financing is 6 + 1.7 MNOK. For the future Aker Kværner has shifted its investment to the umbilical project which is seen as a direct result of the DEMO 2000 tether projects.

Economic value for participating companies

From an oil company perspective

- The value of the carbon fibre technology will primarily come in the field development and production phase by reducing the project cost, both Capex savings due to reduced payload and Opex savings due to reduced maintenance. In ultra deep water the technology will be extremely relevant. Analysis has shown that the weight of tension leg platforms can be reduced by 50% with use of carbon fibre technology as much less capacity is needed to carry the weight of the tethers. This means a saving of several BNOK.
- One can also argue that CompTether will contribute to increased hydrocarbon production and recovery if it represents the enabling technology for field

development. Since the time of the DEMO 2000 CompTether project, there has, however, been less focus on very deep water projects.

- Currently the operator involved does not have fields in the portfolio requiring the CompTether solution and no value has yet been realized from this technology. It is unlikely that a significant part of the financial return from the investment in this technology will materialize earlier than 2010. The important general point is that technology is available and qualified when the need suddenly is there. The Aker Kværner umbilicals using the same technology is likely to be used much earlier (less than 2 years).
- A key point is that the carbon fibre based system is spoolable. For some deep water assets CompTether could be the enabling technology to make field development possible by using existing floaters. Based on this argument the technology has the potential to help increase the volume of world wide production and ultimate recoverable hydrocarbons.

From a service company / contractor perspective

- The CompTether marked includes anchoring of old and new TLP platforms, but also submerged pipelines, tunnels and other floating structures. The main market is deep and ultra deep waters in benign and harsh environments world wide. If the Aker Kværner umbilical technology is taken into account, the effect of the DEMO 2000 projects is expected to have a substantial financial impact on the company. Aker Kværner has announced the award of a MUSD 110 contract in the GOM.
- In addition to Aker Kværner, DnV was a service company partner on this project. The CompTether project is expected to have some direct impact on the revenue for DNV both in Norway and internationally. The most important contribution from this project will, however, be on improved competitiveness. DNV has a dominating position in the worldwide market in this area and the CompTether technology has already been an important factor the DnV competitiveness. This position is expected to strengthen further in the years to come as deep water projects become more important.
- The CompTether project will have a high impact for Aker Kværner and DnV suppliers.

From a research institute perspective

- The introduction of composite materials offshore has already been important for the competitiveness of the academic partner involved in the project, primarily in Norway. The DEMO 2000 project has been valuable in terms of entering into new areas of research, new areas of technology and for new relationships with oil companies.

Value of the project from a 'Norway AS' point of view

The primary value of the project has been to improve the competitiveness of Norwegian industry.

Contribution to improved health, safety and environment

CompTether will allow the use of smaller and lighter platforms which means safer operations and less environmental impact in terms of less usage of energy etc.

A.3.3 NESCOS – Hydraulic control system for rotation sleeves – NESCOS AS (formerly Triangle Equipment AS)

Description of product/service/project

NESCOS, based at Ålgård, is a provider of advanced downhole well completion equipment to the international oil and gas industry. One of two key NESCOS products is also called NESCOS (Non Electric Surface Controlled System). It is an all-hydraulic smart well completion system for flow control in hydrocarbon producing and water injecting wells. The NESCOS smart well valve is operated hydraulically from the surface and has several innovative features such as rotation sleeve, metal-to-metal sealing and multi-position choke.

The objective of the project (139502) was to manufacture and test a technical prototype of the NESCOS smart well system both in the Saab Avionics facilities and in simulated well conditions at the Rogaland Research (RF) DIACS test facility, before demonstrating it later in a field well.

Participating oil companies and research institutes

Statoil, BP, Total, Agip and ChevronTexaco and SND

Achievements versus original goals for the project – additionality

The DEMO 2000 project started in 2000 and was planned to be completed the same year. Due to unexpected technical challenges, the completion of the project was delayed and was concluded early in 2002.

Expected deliverables from the DEMO 2000 project at the time of application included patent application, prototyping, piloting, a new commercial product and a new business line. The testing within the DEMO 2000 project period failed. However, following the DEMO 2000 project NESCOS has completed the testing successfully. The final piloting was done in the laboratory under field conditions. The test was

carried out according to industry wide accepted criteria at RF - Rogaland Research. The test simulated 15 years of North Sea conditions and consisted of 200 open and close cycles at 120 degrees C and a pressure of 345 bar and with up to 200 bar differential pressure over the valve.

The patent application would probably have been filed independent of the DEMO 2000 support. It is likely that the other deliverables also would have been realized, but at a later time.

Financing by service company / contractor, oil company and DEMO 2000

Prior to the start of the DEMO 2000 project, NESCOS (Triangle) had already invested between 5 and 10 MNOK in the technology. The total budget for the DEMO 2000 project was 17.5 MNOK. Due to the delay in the project the total cost was approximately 27 MNOK. During the project NESCOS invested more than 13 MNOK. The DEMO 2000 contribution was 2.6 MNOK. Following completion of the project the company has further invested between 10 and 25 MNOK and expect to continue to invest a few more MNOK in the coming years. The development of NESCOS has also been supported by the EU 5th framework program.

Economic value for participating companies

From an oil company perspective

- Major smart well technology benefits are to increase by several percentage points the oil recovery through the ability to manage production from several zones and minimize water production as well as having to do less well intervention. As such NESCOS has primarily value for production optimization and indirectly for the field development phase. The largest benefits are expected for offshore wells, both sub-sea and platform wells, but also high flow land wells are expected to gain from this technology. Cost reduction in the production phase for a typical field on the NCS may be above 100 MNOK. The total cost reduction for the NCS is probably limited to 500 MNOK.

- No value has been realized on the NCS so far, but is expected to develop in 2 to 5 years. Oil companies have started to benefit from similar technology available on the market.

From a service company / contractor perspective

- The main market for NESCOS is expected to be the North Sea, the Gulf of Mexico, West Africa and South America. Secondary markets are Western Europe and the Far East. NESCOS estimate the total future market for smart well technology to be MNOK 1,000 per year.
- NESCOS has sold the system to Petrobras for approximately 10 MNOK and has announced the conclusion of a frame agreement with an oil company operating in West Africa. Within 2 years, revenue from the international market is assume to be between 20 and 100 MNOK, within 5 years 100 to 250 MNOK and after 5 years more than 500 MNOK. A solid development of profitability, market share and competitiveness in the international market is expected to develop in parallel to the revenue growth. Critical for this development is a successful marketing strategy.
- The surface equipment is produced by Proserv AS in Tananger. The valves are produced by Aarbakke AS at Bryne.
- A challenge for a small company like NESCOS is to be able to sell an individual technology component in an integrated solution. Establishing agreements with the right alliance partners is a critical factor for commercial success. The company is cooperating with Houston based Precision Completion Systems under which the NESCOS technology has become part of a multi year completion contract with a major oil company.

Contribution to improved health, safety and environment

Smart well technology will be important for improved safety and for the environment.

Value of the project from a 'Norway AS' point of view

The NESCOS project seems to have most impact for Norwegian industry internationally as the sale of the resulting products so far has been to Petrobras and the interest by Norwegian operators has been limited.

A.3.4 Fibre Rope Deployment System (FRDS) for Installation of Subsea Modules – ODIM Alitec AS

Description of product/service/project

ODIM Alitec AS, a 100% subsidiary of ODIM ASA, is based at Hjørungavaag in Hareid and is a supplier of automated handling solutions for the mooring and deepwater installation market.

In ultra deep water the weight of steel prohibits the use of traditional wires for installation and lifting of subsea modules. Due to their competence in submarine cable handling, Hydro contacted ODIM to try to find a solution. With lower weight, smaller vessels can also be used in the field operations. This led to a pre-study (3200 KNOK) which resulted in a design basis.

The next phase, and the first DEMO 2000 project, consisted of building a prototype for the deployment system (158042 – Fibre Rope Deployment System for Installation of Subsea Modules) which also included a Pilot 1 on a barge inshore. The decision was to develop a hydraulic solution with 50 ton capacity which was considered sufficient for a feasibility test. The system referred to in the DEMO 2000 project as FRDS is using the CTCU™ technology.

The second DEMO 2000 project (163797 – Field Piloting Project; DWI 3000 - Demonstration of a Fibre Rope Deployment System for Ultra Deep Water Installation of subsea hardware) consisted of a Pilot 2 (field trial) on the Ormen Lange field in April 2005, installation of three anchors used as attachment points for the two 1,150 tons templates installed September 2005. The last pilot was a Hydro initiative due to a current need that could have been solved with wires, but where a live test of fibre rope was considered low-risk.

Main value for the oil companies: To prove the technology for future applications at extreme water depths (Brazil, West Africa, GOM) as there is no actual need on the

NCS today. ODIM has sold two units of the solution for seabed research at 5-6000 meters depth.

Participating oil companies and research institutes

The pre-study involved Norsk Hydro Produksjon AS, Petrobras as oil companies in addition to Subsea 7, Technip, Honeywell Performance Fibres and The Cortland Companies. In both DEMO 2000 projects, Shell Technology Norway AS, Statoil and the Ormen Lange Gas-field Development joined the group. DnV was part of the project, monitoring and reporting the actual results

Achievements versus original goals for the project – additionality

The first DEMO 2000 project took place in 2003/2004 and the second one in 2005. Through analysis and calculations, field piloting and data logging, the project documented the applicability of the handling system for the fibre rope deployment system at the Ormen Lange field in connection with three 35 ton gravitational anchors.

At the time of applying for DEMO 2000 funding the expected deliverables from the project was a prototype, piloting of the system as well as introduction of a new product/service and business line. All deliverables have been achieved. In addition the project has led to a new company start-up. In the future new product lines may even be the result of the DEMO 2000 projects in terms of new applications based on the same technology, e.g. Mooring Winch System for drilling rigs. The pilot was planned and completed as an offshore field test.

Results have exceeded expectations. The prototype would probably have been made without DEMO 2000 support, but in a smaller scale. It is unlikely that the piloting and the new products would have been realized without DEMO 2000.
The FRDS system was recently presented at the Deep Offshore Technology Conference in Vitoria, Brazil November 8 to 10, 2005.

Financing by service company / contractor, oil company and DEMO 2000

Prior to the DEMO 2000 project, ODIM had already invested more than 20 MNOK. The total project cost for both projects was 36.4 MNOK with a DEMO 2000 financing of 11 MNOK. After the completion of the DEMO 2000 project, ODIM has continued to invest several MNOK and expect to continue to do so in the coming years.

Economic value for participating companies

From an oil company perspective

- The ODIM technology is enabling installations in deep water. As such it is relevant for planning and execution of field development. It could also be relevant for production optimization and field abandonment. The technology will help to reduce the project cost in these phases although opportunities in the abandonment phase have a long time horizon. For a typical field on the NCS the saving for the operator may be up to 100 MNOK. Savings for the NCS in general could be up to 500 MNOK. For one of the major deep water operators the global savings may be up to 1 BNOK. One can also argue that it will increase hydrocarbon production and ultimate recovery as it can be the critical technology making field development possible. This can easily be at a multi BNOK level. This technology has not yet resulted in financial savings for the oil companies involved, but value should start to be realized in a 2 to 5 year time frame. The main critical factor for success is availability of new field developments in ultra deep water. For deep water field abandonment a 5 to 10 year timeframe is more likely.

From a service company / contractor perspective

- ODIM Alitec expects this technology to be extremely valuable for them in terms of increased revenue and improved profitability, primarily in Norway, but also internationally. So far the resulting revenue is less that 20 MNOK, but within 2 years it is expected to increase to somewhere between 20 and 100

MNOK both in Norway and internationally. In 2 to 5 years it is expected to be between 250 and 500 MNOK and after 5 years more than 500 MNOK. The critical factor for this revenue increase for Odim is availability of qualified engineers and labour resources.

- The corresponding development of improved profitability both in Norway and internationally is less than 5 MNOK so far, between 5 and 25 MNOK within 2 year, 25 and 50 MNOK between 2 and 5 years and 50 to 100 MNOK between 5 and 10 years as long as deepwater development is not put on hold.
- This development will have a similar significant impact on market share, competitiveness and growth as long as the industry does not find other methods for deep water installations and mooring.
- This business development will also be very positive for the suppliers of ODIM.
- Customers in between ODIM and the operators are contractors for module and anchor installation, deepwater mooring, abandonment and recovery systems for pipe laying. The recent extreme weather in the GOM has increased the demand for such services lately. A barrier to the use of the new technology is less knowledge about the lifetime of fibre relative to steel wires. With the move towards deeper water, however, operators are being forced to find alternative solutions. The market for subsea installations is expected to be strong in the GOM next year.

Value of the project from a 'Norway AS' point of view

The ODIM DEMO 2000 project will be an important contributor for reduced cost on the NCS, improved attractiveness of, and activity on the shelf as well as for improved competitiveness of Norwegian industry.

Contribution to improved health, safety and environment

This technology will have an important impact on HSE. The fibre rope is easier to control than a wire and makes less damage if it breaks.

A.3.5 Design and qualification of in-well fiber-optic network and surface instrumentation unit for high channel count permanent in-well seismic systems – Optoplan AS

Description of product/service/project

Optoplan AS, based in Trondheim, is specializing in optical fibre sensor instrumentation and optical fibre Bragg grating technology. The company was founded in 1985 as a spin-off from the Technical University in Trondheim. In November 2002 Weatherford International Ltd. acquired Optoplan. Optoplan is today a Product Center within the Weatherford business unit "Intelligent Completion Technology".

The key components in the Optoplan in-well seismic systems for high resolution imaging of reservoir features and fluids are:

- 3 component accelerometers using optical fibre as the sensing element
- A device for mechanical coupling of the 3-C accelerometer to the formation
- Multi-channel optical fibre sensing networks using passive components
- An instrumentation unit for sensor interrogation with all active components

Optoplan has received DEMO 2000 funding for three in well seismic projects in sequence:

1. 139497 – Design and qualification of permanently installed in-well multi-component multi-station seismic system
2. 149622 – Design and qualification of in-well fibre-optic network and surface instrumentation unit for high channel count permanent in-well seismic systems
3. 158005 – Increased reservoir imaging capability and monitoring efficiency using permanent 4-C/4-D in-well fibre optic seismic. Prior to the DEMO 2000 projects, Optoplan had developed and field tested a proof of concept 3-component fibre optic accelerometer with a simplified instrumentation system in cooperation with the CiDRA Corporation

The main purpose of the first DEMO 2000 project (13497) was construction and qualification of a permanent multi-level (16 channels) in-well seismic system for 4-D applications. At the time of the application the intention was to exploit fibre optic technology. A predefined goal halfway through the project was to confirm the advantages of fibre optic technology versus conventional electric technology. Following development of both the fibre-optic and the electronic system, the project steering committee decided to continue with fibre-optic technology. The project was completed and the qualification objectives defined early in the project were achieved.

In phase 1 of the second project (149622) a five level (16 channels) fibre-optic 3-C accelerometer system was installed in an on-shore gas storage field in the south west of France (the Total Izaute well). Two vertical seismic profile (VSP) walk away surveys were acquired with 6 months interval. Total processed the data and very high resolution images showed seasonal maximum and minimum levels of the gas-water-contact. In phase 2 of the second project a design study and laboratory verifications were conducted to optimize the electro-optic components and fibre-optic network for a > 60 channels / optical fibre system. Work was also done to prepare and qualify components needed for offshore installations of a similar system.

In the third project a special tool was built and successfully tested at the Vetco Gray flow test facility in the UK for capability of doing both active walk away VSP surveys and micro seismic monitoring during well production. The accelerometers were reinstalled with improved completion components in the Total Izaute well to reduce unwanted complex waves associated with tubing conveyed installations.

Participating oil companies and research institutes

The in-well seismic projects are being supported by Statoil, Total, BP and Hydro. Both BP Norway and BP in the GOM are supporting the project. Read Well Services was also a partner in the first project. Hydro is not a sponsor of the third project.

Achievements versus original goals for the project – additionality

The two first DEMO 2000 projects were ongoing in 2000/2001 and 2001/2003. The third project started in 2003 and is scheduled to be completed H1 2006.

At the time of the DEMO 2000 application for the first two projects, the following deliverables were expected: Prototypes, piloting and new product applications. At this stage prototypes have been developed, piloting has been completed and a new product line is established. In the future it is expected that the project will result in new commercial products and services and new product lines / businesses.

Expected deliveries from the third project include prototyping and new commercial products in addition to new application knowledge.

The Optoplan projects are considered successful by the partner companies as the goals were reached and the project was executed in an "impressive and professional manner". The access to a major organization like Weatherford is an advantage for the purpose of getting this technology into the market.

Financing by service company / contractor, oil company and DEMO 2000

The total budget for the three DEMO 2000 projects is some 46 MNOK. The total cost of the three projects is close to plan. The total DEMO 2000 financing for the three projects is 10.7 MNOK. The remaining cost has been shared approximately equally between Optoplan on one hand and the participating companies on the other.

Economic value for participating companies

From an oil company perspective

- Advantages with in-well seismic versus surface seismic is
    - The ability to undershoot overburden obstacles (easier access to the reservoir image)
    - Better data resolution
    - Better receiver repeatability for 4D monitoring
    - No effect of difficult surface and shallow subsurface conditions
    - The opportunity to calibrate surface seismic systems
    - Integration with other types of in-well measurements (temperature, pressure and flow)
- The permanent in-well seismic system has most value in the field development and production optimization phase. It is also relevant for development and production/injection drilling and reservoir management and may have value related to field abandonment. The system will help to increase hydrocarbon production and ultimate recovery as well as to some extent to reduce cost of field development and production.
- For a typical field in Norway, this technology may have a value of up to 100 MNOK. It is not difficult to defend a business case with an investment cost of a couple of M$. For the NCS in total, the value may be up to 1 BNOK. For an international operator the value may be in the 100 to 500 MNOK bracket for their global portfolio. In addition to the North Sea, the Gulf of Mexico is an important market. There is also great interest in the system in the Middle East. Fracture monitoring is an interesting application area.
- So far, however, no value has been realized. If several positive field trials take place, the main financial impact from this technology ought to come in the 2 to 5 year future time window.

From a service company / contractor perspective

- Permanent in-well seismic systems have markets worldwide, in particular for wells with high or prohibitive intervention cost. Applications include micro seismic monitoring and 4D time lapse seismic.
- It is expected that the in-well seismic system will contribute with a couple of hundred MNOK increased revenue in Norway and more than 500 MNOK internationally with a corresponding increase from some 20 to 50% market share in Norway and from some 5 to 20% internationally.

Contribution to improved health, safety and environment

An optical system is safer than an electrical system. From an environmental point of view, one application of the system is to monitor micro seismic activity. This can be used to detect fracture development which may be critical for leakage of gas from the reservoir. A specific potential application of this technology is to use it for analysis of subsidence. As such, it may have positive effect on safety and the environment.

Value of the project from a 'Norway AS' point of view

In general the Optoplan project will have some impact on all of the general goals for the DEMO 2000 program; reducing cost on NCS, improving the attractiveness of, and activity on NCS as well as improving the competitiveness of Norwegian industry.

A.3.6 IMPREDO (Improved prediction and delineation of hydrocarbon filled reservoir zones using high quality 4 component seismic data acquired in 3 dimensions at the seabed) – SeaBed Geophysical AS

Description of product/service/project

SeaBed Geophysical is a service company with headquarters in Trondheim that specializes in seabed seismic. Their concept is to deploy geophone sensor nodes into the seabed and acquire high quality multi component pressure and shear wave data. The SeaBed system can be used for 2D, 3D and 4D seismic surveys. Advantages with the SeaBed system are repeatability for 4D surveys due to accurate and flexible positioning and that 'holes' can be avoided in the 3D data, for example around platforms (in contrast to cable based systems).

The purpose with the DEMO 2000 project (149643) was to demonstrate that the acquisition system works and that the desired reservoir imaging is feasible. The project included

- Specification and planning of offshore 4C-3D acquisition
- 4C-3D acquisition at the Volve field
- Time efficient 4C processing based on existing methodology
- Pre-stack imaging
- Data analysis and interpretation

The project was initiated in May 2002 and the data were acquired in June/July 2002. For the data acquisition part of the project SeaBed installed their equipment on the seabed prior to the start-up of a WesternGeco seismic project in the area. While WesternGeco was shooting and acquiring data with their equipment, the SeaBed system was also activated. The processing results could therefore be compared with cable data. A disadvantage for SeaBed as seen from their point of view was that WesternGeco got access to the SeaBed data, but not the other way around. The French contractor CGG processed the data.

Participating oil companies and research institutes

Statoil, Hydro and Total were partners in the project.

Achievements versus original goals for the project – additionality

At the time of application, piloting and new commercial services were expected results from the DEMO 2000 project. Both deliverables were achieved. The survey over the Volve field represented a successful pilot for the SeaBed system in terms of acquiring quality data and the Cantarell project in Mexico has demonstrated that the company is offering a new commercial service. IMPREDO would not have happened without DEMO 2000 support. It is also considered unlikely that SeaBed would have secured the Mexico job without the DEMO 2000 project as a reference.

IMPREDO is a technical success. Although there are still some challenges related to the processing of the node data, the acquired raw data is considered to be of high quality in terms of vector fidelity and azimuth coverage.

Unfortunately SeaBed has not secured further contracts following the Mexico project. However, the company is actively using results from the Cantarell project for further marketing and sales activities. It is possible that the DEMO 2000 project will result in new product lines / businesses as well as new industry standards in the future.

Financing by service company / contractor, oil company and DEMO 2000

SeaBed had invested some 50 – 60 MNOK in the technology before the DEMO 2000 project started. During the project they invested another 5 to 10 MNOK. The total budget was 17.5 MNOK with 3 MNOK of DEMO 2000 funding. Towards the end of the project there was a lack of budget for data processing and the total project cost was close to 21 MNOK. An additional 40 MNOK has been invested after the project was completed and SeaBed expects to continue to invest more than 25 MNOK in the future (the number could be as high as 200 MNOK for deepwater operations when 500 nodes are needed).

Economic value for participating companies

From an oil company perspective

- The objective with seabed seismic is to provide data to the oil companies in order to reduce the economic risks and reduce uncertainties related to reservoir description, fluid flow and reservoir management. The main impact will be in the field development and production optimization phases. The technology is also important for development and production drilling. It could also be used in the evaluation of the timing for field abandonment.
- Successful use of seabed seismic will contribute to increase production and ultimate hydrocarbon recovery. Applied in a 4D mode, multi component data will increase recovery. They will also help to reduce cost in the production phase. The SeaBed system is seen as an alternative to permanently installed seismic arrays (semi permanent) as it is possible to replace a sensor at the same position as in previous time laps surveys.
- If the information from a 4C/4D survey is used in decision making for increased production of a few hundred million barrels of oil, it means more than 5 BNOK of increased revenue. Cost reduction during production can be in the order of 500 MNOK. One can also argue that the SeaBed data will make it possible to understand and therefore develop fields that would otherwise involve too high risk. If this argument is accepted it can be concluded that the financial value of the technology is higher than 1,000 MNOK for a single field and multi BNOK for the NCS in total. Thin carbonate reservoirs can be used as a relevant example as it is difficult to map the reservoir with conventional seismic data. Monitoring of production of thin oil columns below gas is another example.
- So far no value has been realized from the SeaBed technology by operators on the NCS. Since the cost of acquiring the data with sufficient coverage is high relative to alternative seismic techniques, operators are struggling to commit to projects even if it can be argued that the value of the data is high.

From a service company / contractor perspective

- The 2003/2004 Cantarell project in Mexico, the world's largest 4C-3D survey, had a value of 110 MNOK and was a successful operation. The DEMO 2000 project (at Volve) took place prior to the Cantarell project. It is unlikely that SeaBed would have won the Mexico job without the DEMO 2000 project as a reference. The DEMO 2000 project therefore had a direct impact on increased revenue of 110 MNOK for SeaBed as well as the same growth and the corresponding increased market share internationally. So far the DEMO 2000 project has not resulted in financial benefits for SeaBed in Norway.
- Through the project, SeaBed learned how to improve the productivity (some 20%) for its own benefit. The project was also important in terms of identifying and correcting weaknesses in the system. The direct involvement with the oil companies was, in particular, important.
- Finally the DEMO 2000 project has had a positive effect for other Norwegian companies, for example for local mechanical workshops in mid Norway.

Contribution to improved health, safety and environment

Although not the main focus of the project, it can be argued that the node system is safer than cable systems as it is exposing less people to back deck offshore work. There are also some disadvantages with the system from an HSE point of view so it can also be argued that the HSE effect is neutral in a complete evaluation.

Value of the project from a 'Norway AS' point of view

With the Mexico project in mind the DEMO 2000 project has contributed to improved competitiveness of Norwegian industry. There are, however, mixed opinions about the future of the node system as a high number of sensors are needed in order to obtain sufficient data coverage.

A.3.7 VIEC (Vessel internal electrostatic coalescer) – Vetco Aibel AS (ABB at the time of the project)

Description of product/service/project

Vetco Aibel is developing new products to make oil-water separation more efficient and cost effective. Separators often experience problems with emulsions and capacity limits.

The objective with the VIEC (DEMO 2000 project number 158054) is to improve water separation from oil. An electrostatic coalescer can enhance the speed and efficiency of the separation process. The high-voltage electrostatic field makes water droplets bump into each other and coalesce into bigger drops, which separate more easily. This technology has so far, however, been unavailable for the turbulent conditions in the inlet separator. The VIEC moves coalescer performance upstream to the inlet separator with new electric and mechanical developments. The efficiency of the first stage separator is thereby increased and the emulsion layer is removed. This enhanced performance can be used to expand capacity and reduce chemical consumption. The side benefits include a better quality of produced water and an improved level of control.

Participating oil companies and research institutes

Norsk Hydro was the participating oil company in the VIEC project. The Troll West oil field was the reference production case for the VIEC project from Hydro's point of view.

Achievements versus original goals for the project – additionality

The project was ongoing in 2003 and 2004.

At the time of the DEMO 2000 application the expected deliverables from the project was piloting and the resulting new product. This was also achieved through the

DEMO 2000 period. The equipment was installed in the 1st stage separator on Troll C platform in June 2003. It has been operational since then with only minor electrical adjustments. The project covered mechanical and electrical verification, pilot testing of 1 module in real oil, full size construction and offshore installation and operation and monitoring.

VIEC as a new product would probably not have been available without the DEMO 2000 funding and support.

Financing by service company / contractor, oil company and DEMO 2000

Vetco's (ABB's) own financing prior to the start of the DEMO 2000 project was between 5 and 10 MNOK. The total DEMO 2000 project cost was 9.2 MNOK with 2 MNOK DEMO 2000 financing. The rest was covered approximately 50% by ABB. Following the completion of the project, between 5 and 10 MNOK have been invested and it is expected that another 1 to 5 MNOK will be invested in the future.

Economic value for participating companies

From an oil company perspective

- VIEC is a tool for production optimization by providing the operator with increased production capacity, reduced demulsifier consumption and improved process control. First of all this technology will have a high impact on cost reduction in the production phase. However, it will also contribute to increased production.
- The VIEC technology makes it cheaper to develop small fields, in particular with heavy oil. The use of chemicals will be reduced. Production will increase.
- Typical cost reduction for a single field on NCS may be up to 100 MNOK. For the Troll field this order of magnitude of saving has already been achieved. World wide it could be up to 500 MNOK for an operator on the NCS.
- The financial impact of the VIEC product from an oil company point of view is expected to be in the 2010 to 2015 time interval. An important point is that the VIEC technology must be reviewed and adjusted to each individual plant.

From a service company / contractor perspective

- The market for VIEC includes existing separators with operating problems as well as new installations where heavy, viscous oil calls for an extra effort to separate the water from the oil. The targets for subsea use are field developments were efficient separation of water from the oil can result in substantial savings on installation or operating expenses, e.g. by reducing the requirements for pipeline size, insulation and or the consumption of chemicals.
- Vetco has already had a couple of sales both in Norway and in the international market. This is a unique technology which means that the market share is 100%. It makes it possible to achieve good margins. A revenue increase of above 500 MNOK is expected. Growth is taking place in Norway as well as in Brazil.

Value of the project from a 'Norway AS' point of view

VIEC is a very important component for improved competitiveness of Norwegian industry. It is also an important contributor to reduced cost of projects on the NCS and will have some impact on the activity and attractiveness of NCS.

Contribution to improved health, safety and environment

VIEC has important environmental benefits which are already being achieved. There is less use of chemicals than with traditional solutions. Water consumption and discharge to sea are being reduced. A spin off effect is that produced water is also cleaner.

A.3.8 Wet Gas Compressor – Framo Engineering AS

Description of product/service/project

Framo Engineering, headquartered in Bergen, develops and markets products and systems primarily related to multi phase flow. The wet gas compressor (WGC) is a compact and rugged sub sea unit that enables long distance transportation of unprocessed well fluid. As well pressure decreases, gas expands and compressor inlet flow increases. WGC can be used to increase life of selected wells if well pressure drops below flow-line inlet pressure. WGC can also be used to push gas directly to shore without separation/boosting.

There are three WGC DEMO 2000 projects; 136 622 – Development and Engineering of the WGC system, which is completed, 149 651 – WGC testing at K-Lab providing the opportunity to use 'real' fluids, which has also been completed and 163 287 – Endurance testing of the compressor for the Tune Pilot project, which is ongoing. The latter was nominated as a top 2 project, although the two other ones are clear predecessors to 163 287.

Projects 136622 and 149651 were active in 2000 to 2003. The current DEMO 2000 project comprises a long-time test at the Flatøy facilities i.e. not at Tune.

Participating oil companies and research institutes

Projects 136 622 and 149 651 were sponsored by Shell, Statoil, Norsk Hydro and the Ormen Lange license. Project 163 287 is sponsored by Hydro. Although only Hydro sponsors the current project, Shell and Statoil are still interested.

Achievements versus original goals for the project – additionality

In the two first projects WGC was full scale tested at Framo's multi-phase flow facility at Flatøy and then with real gas and condensate at the Statoil test facility at Kårstø, K-Lab.

All of prototype, piloting, a new commercial product and a new product line / business were expected deliverables from the project. All expected deliverables as defined at the time of filing the application have actually been delivered. Patents had been filed prior to obtaining DEMO 2000 funding. From an operator point of view the main expectations in terms of project deliverables were the prototype, piloting and a new product line / business. All are considered achieved. The availability of the product would have been delayed without the help of DEMO 2000.

Piloting was expected to take place in a laboratory setting under field conditions which is also what actually happened. Piloting of WGC would probably not have happened without DEMO 2000 funding. The prototype and the new product line would have materialized, but at a smaller scale and at a later time. DEMO 2000 is seen as an important vehicle for reduction of the elapsed time from development to commercialization.

Financing by service company / contractor, oil company and DEMO 2000

Between 10 and 20 MNOK had been were invested by Framo prior to the start of the WGC DEMO 2000 project. The total budget and cost for the first two DEMO 2000 projects were close to 38 MNOK with a total DEMO 2000 funding of 7.5 MNOK. In addition to Framo's own contribution, more than 22 MNOK of other private funding was available. The total budget for the ongoing project is 8 MNOK with 2 MNOK financing by DEMO 2000. The development of the next generation WGCs will require the same amount of time, effort and $ as the process for WGC. Between 10 and 20 MNOK is also expected to be invested by Framo on the WGC project in the years to come. For the size of a company like Framo, these are significant numbers.

Economic value for participating companies

From an oil company perspective

- Use of WGC is relevant in the field development and production optimization phases. It may also be relevant for the evaluation of postponement of abandonment. The general idea with WGC is to make it easier to produce the hydrocarbons in the reservoir. De-bottlenecking of the topside system is key. It is more complex to evaluate the potential impact of WGC on ultimate recovery.
- WGC will have high impact in terms of increasing production and ultimate recovery in fields where the pressure is not sufficient for continued production without pressure support. WGC is also expected to have some impact in terms of contributing to reducing cost in the development phase by avoiding expensive platforms.
- The WGC can have more than 1 BNOK value for an asset owner of a relevant field on the NCS and more than 5 BNOK on the total Norwegian shelf. This technology is also expected to have more than 1 BNOK value globally for an international player on the NCS. The investment in the system is in the order of 300 – 350 MNOK. Some companies have identified as many as 30 candidates on the NCS.
- So far no value has been realized for the oil companies involved. Critical factors for success are completion of ongoing tests and identification of the first field installation opportunity where the operator is willing to install a prototype. The planned Tune pilot did not materialize. Based on drilling results it was concluded that revamping of the existing compressor gave sufficient capacity. A niche opportunity is boosting of small satellite fields.
- The main financial impact of the WGC technology is expected to be realized between 2010 and 2015.

From a service company / contractor perspective

- All the value points we have defined for service companies are relevant for WGC and Framo has enormous expectations to this product. The compressor business is new to Framo so the WGC provides an opportunity to enter a new market. The company background is in pumps. They expect revenues increasing from MNOK 50 to 400 per year from WGC and this business can contribute to close to a doubling of the Framo turnover (more than 1 BNOK expected in 2006). The first priority is, however, a successful pilot.
- As a niche product this will not be a low profit volume business and good profitability is expected. The market share starts at zero. Initially the market will be in Norway. Internationally Framo is staying in contact with the super majors, but the first customer may very well be a small company. Australia is a possibility. The GOM market, on the other hand, is very conservative.

Research institutions should enter the field in early project phases to verify the technology. This would strengthen the credibility of the technology vis-à-vis the oil companies.

Value of the project from a 'Norway AS' point of view

The main overall value of the project is to improve the competitiveness of Norwegian industry based on technology and a product developed, constructed, built and tested in Norway. WGC will also contribute to increase activity/attractiveness of the NCS by increasing production and ultimate recovery and reduce cost.

Contribution to improved health, safety and environment

The WGC technology is expected to have some limited positive effect on HSE. The installation of WGC means less usage of chemicals. Hydrates can be avoided.

Appendix 4 List of interviewed persons

Name	Role	Organization
Erik Skaug	Key person	RCN, Petromaks
Rolf Hestenes	Federations	TBL Offshore
Ole Lindefjell	International companies/ organizations, Top 2 project	ConocoPhillips
Kjetil M. Stuland	Norwegian companies/ organizations	RF
Morten Wiencke	DEMO 2000 program manager	DEMO 2000
Rolf Utseth	DEMO 2000 ESG	Statoil
Sigmund Stokka	DEMO 2000 ESG	RF
Erik Nakken	DEMO 2000 ESG	SINTEF
Alan P. Burns	DEMO 2000 ESG	Total
Siri Helle Friedemann	DEMO 2000 ESG	RCN
Liv Lunde	DEMO 2000 ESG	IFE
Jens Hagen	DEMO 2000 ESG	Hydro
Cato Bjelland	DEMO 2000 ESG	CMR
Simon Davies	DEMO 2000 ESG	Aker Kværner
Alfred Nordgård	DEMO 2000 ESG, OG 21 Chairman	Norske Shell
Torbjørn Darre	DEMO 2000 ESG	BP
Anna Inger Eide	DEMO 2000 ESG	OD
Rune Strømquist	DEMO 2000 ESG, Chairman	Vetco
Adolfo Henriquez	DEMO 2000 TMC	Statoil
Morten Heir	DEMO 2000 TMC	BP
Helge Skjæveland	DEMO 2000 TMC	Shell
Stein Olav Drange	DEMO 2000 TMC	Hydro
Eivind Berg	Top 2 project	SeaBed Geophysical
Sverre Knudsen	Top 2 project	Weatherford (Optoplan)
Karl Kravik	Top 2 project	Total
Olav Inge Barkved	Top 2 project	BP
Lars Raunholt	Top 2 project	NESCOS (formerly Triangle Equipment AS)
Jan Petter Fjellanger	Top 2 project	Hydro
Arnfinn Bærheim	Top 2 project	BP
Jørgen Eide	Top 2 project	FRAMO Engineering
Hans Kristian Sundt	Top 2 project	Vetco
Per Ingeberg	Top 2 project	Odim Alitec
Turid Storhaug	Top 2 project	Aker Kværner
Arne Johansen	Top 2 project	Atlantis Deepwater Technology Holding
Henning Haugland	Top 2 project	Hydro
Arne Ulrik Bindingsbø	Top 2 project	Hydro

Appendix 5 Interview guides

A.5.1 – Interview guide – Top 2 project representatives

DEMO 2000 – Introduction to interview

The **purpose** with this interview is to gather **information** which will be used to evaluate **how successful** the **Demo 2000 program** has been **relative to the original goals.**

We will be going through a **number of questions**, but the **most important** point is to make sure we document **your strongest viewpoints** on the Demo 2000 program.

Top 2 All project representatives

Q1: Name? Company? Function? What is your involvement in the DEMO 2000 program?	

Top 2 All project representatives

Q2: Let's spend some time on your specific project. We have read some of the material available in the DEMO project files, but please give a short description of the following to make sure we understand it correctly; What is the essence of the technology/product/service? A few words about the history of the product/service. What is the main value for the oil companies? What is the current status?	

Top 2 All project representatives

Q3: This is a list of possible deliverables from your DEMO project. Which of them were expected at the time of applying for DEMO support (A), have been deliverables from the project (B) or are expected to be (C)? *(For the relevant ones, how do the following criteria fit: 1 - Obtained, but far behind expectations, 2 - Obtained, but behind expectations, 3 - Obtained according to expectations, 4 - Obtained above expectations, 5 - Obtained far above expectations, Obtained although initially not planned)* For the relevant ones, how do the following statements fit: Would have been obtained anyway, would have been obtained, but at a smaller scale, would have been obtained, but at a later time, would not have been obtained

	A – Expected at time of DEMO 2000 application	B – Actually delivered	C – Expected to be delivered
New knowledge without immediate applications			
Patent applications			
Prototypes			
Piloting			
New commercial products or services			
New processes			
A new product line/ business			
New company start-ups			
Definition of new industry standards			
Other (please specify)			

	.. would have been obtained anyway	.. would have been obtained, but at a smaller scale	.. would have been obtained, but at a later time	.. would not have been obtained
New knowledge without immediate applications				
Patent applications				
Prototypes				
Piloting				
New commercial products or services				
New processes				
A new product line/ business				
New company start-ups				
Definition of new industry standards				
Other (please specify)				

Top 2 Service company representatives

Q4: At the total level, how much has your organisation invested in the DEMO 2000 project, prior to DEMO funding, during DEMO phase, after, planned in the future (less than 1 MNOK, between 1 and 5, between 5 and 10, between 10 and 25, more than 25 MNOK)?	

	less than 1 MNOK	between 1 and 5 MNOK	between 5 and 10 MNOK	between 10 and 25 MNOK	more than 25 MNOK
Investments prior to the DEMO 2000 project period					
Investments during the DEMO 2000 project period					
Investments after the DEMO 2000 project period					
Investments planned in the future					

Top 2 All project representatives

Q5: Please indicate which of the following phases are encompassed by this project (1 Not relevant, 2 Somewhat relevant, 3 Relevant, 4 Very relevant, 5 Extremely relevant): Pre drilling exploration, Exploration drilling, Development planning, Development and production drilling, Production optimization, Abandonment, Other?	

	1 Not relevant	2 Somewhat relevant	3 Relevant	4 Very relevant	5 Extremely relevant
Pre drilling exploration					
Exploration drilling					
Development planning					
Development and production drilling					
Production optimization					
Abandonment					
Other (specify)					

Top 2 Oil company representatives

Q6: We will be distinguishing between two types of technologies: On one hand we will look at technologies for *new or improved measurements, data analysis, modelling and interpretation used for decision making and risk management.* On the other hand we will look at technologies that have a *direct impact on project cost saving for the operator or increased hydrocarbon production/recovery*. Let's start with the second category. Here is a list of value points for such technologies; *Increasing hydrocarbon production, increasing ultimate recovery, reducing cost in exploration, reducing cost in development, reducing cost in the production phase, reducing cost of abandonment*. Is it possible for you quantify the value for the most important categories for a typical field on the NCS in MNOK? What about the value for NCS in general? Has your company already experienced the benefits identified above from this project?

Please apply *x* for most typical field and *y* for NCS in the appropriate boxes

(*x* = ……)

	not relevant	less than 100 MNOK	Between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
Increasing hydrocarbon production						
Increasing ultimate recovery						
Reducing cost in exploration						
Reducing cost in development						
Reducing cost in production						
Reducing cost in abandonment						

Top 2 Oil company representatives

Q7: We will be distinguishing between two types of technologies: On one hand we will look at technologies for *new or improved measurements, data analysis, modelling and interpretation used for decision making and risk management.* On the other hand we will look at technologies that have a *direct impact on project cost saving for the operator or increased hydrocarbon production/recovery*. Let's look at the first category of technologies. If we go back to the phases in the E&P process (*Pre drilling exploration, exploration drilling, development planning, development and production drilling, production optimization, abandonment, other*.) Is it possible for you quantify the value for the most important categories for a typical field on the NCS in MNOK? What about the value for NCS in general? Has your company already experienced the benefits identified above from this project?

Please apply *x* for most typical field and *y* for NCS in the appropriate boxes

(*x* = ……)

	not relevant	less than 100 MNOK	Between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
Pre drilling exploration						
Exploration drilling						
Development planning						
Field development						
Development and production drilling						
Production optimization						
Abandonment						
Other (specify)						

Top 2 Service company representatives

Q8: Here is a list of the possible value points from the technology resulting from the DEMO project; *Improved productivity for the company itself, increased revenue in Norway and internationally, profitability in Norway and internationally, market share in Norway and internationally, competitiveness in Norway and internationally, growth potential in Norway and internationally*. Is it possible for you to quantify the value for the most important categories (MNOK and %'s)? In addition to your own company, will this project have value for other players (other service companies, suppliers, operators, research institutes etc.)? Has your company already experienced the benefits identified above from this project?	

	1 Less than 20 MNOK (0% - no)	2 Between 20 and 99 MNOK (<5 %/ - some)	3 Between 100 and 249 MNOK (5–20% - important)	4 Between 250 and 499 MNOK (20–50% - significant)	5 More than 500 MNOK (50–100% - extreme)
Improved productivity for your company					
Increased revenue in Norway					
Increased revenue internationally					
Profitability in Norway					
Profitability internationally					
Market share in Norway					
Market share internationally					
Competitiveness in Norway					
Competitiveness internationally					
Growth potential in Norway					
Growth potential internationally					

Top 2 All project representatives

Q9: In addition to the financial value you have described, will the project contribute to improve health, safety and/or the environment (1 to 5 with 5 as highest)? Has your company already experienced the benefits identified above from this project? Could you also comment on the development of technical risk throughout this project?	

	1 No impact	2 Little value	3 Some value	4 Very valuable	5 Extremely valuable
Health					
Safety					
Environment					
Other (please specify)					

Top 2 All project representatives

Q10: On a scale from 1 to 5 with 5 as best, how would you give scores on: How well the program is being organized? The work processes used? The relationship to the DEMO 2000 program administration? The relationship to the Research Council of Norway in general? The relationship to other relevant players (please specify)?	

	1 - Bad	2 - Poor	3 - OK as it is	4 - Good	5 - Extremely good
.. how well the program is being organized?					
.. the work processes used?					
.. the relationship to the DEMO 2000 program administration?					
.. the relationship to the Research Council of Norway in general?					
.. the relationship to other relevant players (please specify)?					

Top 2 All project representatives

Q11: Do you have experience with similar programs in Norway or internationally? Please specify. How do they compare with DEMO 2000 (+ and -)? Do you have any recommendations for changes/improvements for DEMO 2000?	

	1 - Much poorer overall quality	2 - Poorer overall quality	3 - Same overall quality	4 - Better overall quality	5 - Much better overall quality
A -					
B –					
C -					
D -					
E -					

Top 2 All project representatives

Q22: In general, on a scale from 1 to 5 with 5 as best, how important do you think your project is in terms - Reducing cost on the NCS - Increasing the attractiveness of, and activity on the NCS - Increasing the competitiveness of Norwegian oil and gas industry	

	1 - Not important	2 - Somewhat important	3 - Important	4 - Very important	5 - Extremely important
Reducing cost on the NCS					
Increasing the attractiveness of, and activity on the NCS					
Increasing the competitiveness of Norwegian oil and gas industry					

A.5.2 – Interview guide – other interview candidates

DEMO 2000 – Introduction to interview

The **purpose** with this interview is to gather **information** which will be used to evaluate **how successful** the **Demo 2000 program** has been **relative to the original goals.**

We will be going through a **number of questions**, but the **most important** point is to make sure we document **your strongest viewpoints** on the Demo 2000 program.

All candidates

Q1: Name? Company? Function? What is your involvement in the DEMO 2000 program?	

Steering and technical committee members

Q2: How do you see the original background and the drivers for the DEMO program? (From a Norway point view, from your position in the industry?) How have the drivers changed over time (if they have)?
In general, we have research, technology development & engineering. Where do you see DEMO 2000 fit into this cycle? Do you think that DEMO 2000 is important to increase oil&gas related R&D in Norway? The overall purpose with the DEMO 2000 program was originally defined to be to contribute to

- Reducing cost on the NCS
- Increasing the attractiveness of, and activity on the NCS
- Increasing the competitiveness of Norwegian oil and gas industry

What do you think has so far been the main value of the program with respect to these goals? Why?

Steering and technical committee members

Q3: From the DEMO 2000 database we will be extracting the number of different types of deliverables from all the projects; *Technology without immediate application, patent applications, prototypes, piloting, new commercial products or services, new industry processes, new product lines/business, new company start ups, new industry standards*. How do you see the importance of the different types of deliverables relative to the overall goals for the program and how do you observe the distribution of the actual deliverables from the projects? Are you familiar with projects that would not have been carried through without DEMO 2000 support? Or at a smaller scale?

	Expected distribution at the outset	Actual distribution	Expected distribution in the future
New knowledge without immediate applications			
Patent applications			
Prototypes			
Piloting			
New commercial products or services			
New processes			
A new product line/ business			
New company start-ups			
Definition of new industry standards			

	.. would have been/will be obtained anyway	.. would have been/will be obtained, but on a smaller scale	.. would have been/will be obtained, but at a later time	.. would not have been/will not be obtained
New knowledge without immediate applications				
Patent applications				
Prototypes				
Piloting				
New commercial products or services				
New processes				
A new product line/ business				
New company start-ups				
Definition of new industry standards				

Steering and technical committee members

Q4: One way to categorize the DEMO 2000 projects from a value point of view (as opposed to the DEMO 2000 technology areas (A – G)) is to see where they fit into the E&P life cycle: *Pre drilling exploration, exploration drilling, development planning, field development, development and production drilling, production optimization, abandonment, other*. In which of these phases do you think the DEMO 2000 program has the main impact? Where has the main impact been for the company/organization you are representing?	

	1 Not relevant	2 Somewhat relevant	3 Relevant	4 Very relevant	5 Extremely relevant
Pre drilling exploration					
Exploration drilling					
Development planning					
Development and production drilling					
Production optimization					
Abandonment					
Other (specify)					

Steering and technical committee members – oil companies

Q5: By face to face and online interviews with representatives for companies involved in the various DEMO projects, we are gathering information to try to quantify the financial value of program both a micro and macro level.
Another way to categorize the projects is on one hand to look at technologies for *new or improved measurements, data analysis, modelling and interpretation used for decision making and risk management* and on the other hand to look at technologies that have a *direct impact on project cost saving for the operator or increased hydrocarbon production/recovery*.
Let's start with the second category. Here is a list of value points for such technologies; *Increasing hydrocarbon production, increasing ultimate recovery, reducing cost in exploration, reducing cost in development, reducing cost in the production phase, reducing cost of abandonment*.
Please think of a DEMO 2000 project that you are familiar with contributing to improvement in one or more of these categories. Is it possible for you quantify the value for the most important categories for a typical field on the NCS in MNOK (*x*)? What about the value for NCS in general (*y*)?

Please apply *x* for most typical field and *y* for NCS in the appropriate boxes

(*x* = ……)

	not relevant	less than 100 MNOK	Between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
Increasing hydrocarbon production						
Increasing ultimate recovery						
Reducing cost in exploration						
Reducing cost in development						
Reducing cost in production						
Reducing cost in abandonment						

Steering and technical committee members – oil companies

Q6: Let's look at the other category of technologies (for *new or improved measurements and data analysis, modelling and interpretation used for decision making and risk management*). If we go back to the phases in the E&P process (*Pre drilling exploration, exploration drilling, development planning, development and production drilling, production optimization, abandonment, other*.) Can you think of DEMO project in this category that you are familiar with, contributing to improved decision making or risk management in one or more of these phases? Is it possible for you quantify the value for the most important categories for a typical field on the NCS in MNOK? What about the value for NCS in general?	

Please apply *x* for most typical field and *y* for NCS in the appropriate boxes

(*x* = ……)

	not relevant	less than 100 MNOK	Between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
Pre drilling exploration						
Exploration drilling						
Development planning						
Field development						
Development and production drilling						
Production optimization						
Abandonment						
Other (specify)						

Steering and technical committee members – service companies

Q7: By face to face and online interviews with representatives for companies involved in the various DEMO projects, we are gathering information to try to quantify the financial value of the program at both a micro and macro level. Here is a list of the possible value points for the service companies involved from the technology resulting from the DEMO project; *Improved productivity for the company itself, increased revenue in Norway and internationally, profitability in Norway and internationally, market share in Norway and internationally, competitiveness in Norway and internationally, growth potential in Norway and internationally*.
Please think of a DEMO 2000 project that you are familiar with, that contributes to improvement in one or more of these categories. Is it possible for you to quantify the value for the most important categories (MNOK and %'s)?
In addition to the service company itself, do you see that this project will have value for other players (other service companies, suppliers, operators, research institutes etc.)?

	1 Less than 20 MNOK (0% - no)	2 Between 20 and 99 MNOK (<5 %/ - some)	3 Between 100 and 249 MNOK (5–20% - important)	4 Between 250 and 499 MNOK (20–50% - significant)	5 More than 500 MNOK (50–100% - extreme)
Improved productivity for your company					
Increased revenue in Norway					
Increased revenue internationally					
Profitability in Norway					
Profitability internationally					
Market share in Norway					
Market share internationally					
Competitiveness in Norway					
Competitiveness internationally					
Growth potential in Norway					
Growth potential internationally					

Steering and technical committee members

Q8: In addition to the financial value you have described, will the project contribute to improve health, safety and/or the environment? Could you also comment on the development of technical risk throughout this project? What about the programme as a whole regarding technical risk?	

	1 No impact	2 Little value	3 Some value	4 Very valuable	5 Extremely valuable
Health					
Safety					
Environment					
Other (please specify)					

Steering and technical committee members

Q9: By interviewing the representatives involved in the individual projects, we are gathering information about the value of each project in isolation. Since you are a member of the steering/technical committee we would like to focus on the value of clusters of projects and the DEMO portfolio as a whole. Here is a list of possible 'integrated' value points; Along the value chain for specific projects (research, suppliers, service companies, operators), within a certain discipline (seismic, drilling, sub-sea technologies etc.), for specific challenges on the NCS (deep water, chalk reservoirs, Tampen Spur area, artic operations etc.), transfer of knowledge and skills not directly connected to goods and services (mobility of workforce, professional networks, market intelligence)	

Integrated value points

- Along the value chain for specific projects
    - research, suppliers, service companies, operators
- Within a certain discipline
    - seismic, drilling, sub-sea technologies etc.
- For specific challenges on the NCS
    - deep water, chalk reservoirs, Tampen Spur area, artic operations etc.
- Transfer of knowledge and skills not directly connected to goods and services
    - mobility of workforce, professional networks, market intelligence
- Other?

Steering and technical committee members

Q10: Could you please describe the mandate and the work processes in the committee you are a member of, the relationship between the committees and the expert groups, to the program 'owner', to other parties (specify, for example NRC). What do you consider strength and weaknesses in the way DEMO 2000 is organized? Are you familiar with similar programs in Norway or internationally? If so, please specify. Any comments on how DEMO is organized/functioning relative to these other programs? Do you have any recommendations for changes/improvements? Other comments?	

Technical committee members

Q11: Could you please describe in detail the process of project application assessment in the Technical Committee? How do the different actors interact? How a conclusion is made (consensus vs majority decisions)? Could you describe the project evaluation criteria [show list of evaluation criteria in round 1 and 7]? What caused the changes?	

Appendix 6 Web based questionnaire

GENERAL INFORMATION

What is your position within your organization?

What is your role in this DEMO 2000 project?

- ❍ Project leader in a service company
- ❍ Project leader in a research institution
- ❍ Contact person in an oil company sponsoring this project - with a direct connection to a production license
- ❍ Contact person in an oil company sponsoring this project - with NO direct connection to a production license
- ❍ Contact person in a service company co-operating in this project
- ❍ Contact person in a research institution co-operating in this project
- ❍ Contact person in other institution co-operating in this project

Please specify the number and/or the name of the production license (and if not on the Norwegian Continental Shelf, which country):

What was the number of employees in your organization as per 31.12.2004?

(0 - 999999)

What was the turnover of your organization for the fiscal year 2004 (MNOK)?

(0 - 999999)

Has your organization previously received support for the subject (or predecessors) of this DEMO 2000 project?

- ❍ Yes
- ❍ No

Which program provided the support (multiple responses permitted)?

- ❑ BRØNN
- ❑ GAVOT
- ❑ KAPOF
- ❑ LETE
- ❑ OFFSHORE 2010
- ❑ OLJE OG GASS
- ❑ PETROMAKS
- ❑ PETROPOL
- ❑ RESERVE
- ❑ RUTH
- ❑ SPOR
- ❑ SPUNG
- ❑ UTBYGG
- ❑ Goodwill Agreements
- ❑ Cash Agreements
- ❑ 50 % Agreements
- ❑ Other (please specify) :

DEMO 2000 PROJECT EXPECTATIONS

What deliverables were anticipated from the DEMO 2000 project at the time of application (multiple responses permitted)?

- ❑ New knowledge without immediate application
- ❑ Patent applications
- ❑ Prototypes
- ❑ Piloting
- ❑ New commercial products or services
- ❑ New processes
- ❑ A new product line/ business
- ❑ New company start-ups
- ❑ Definition of new industry standards

PLANNED PILOT

Please specify the type of piloting planned for this project:

- ❍ In laboratory
- ❍ In laboratory under field conditions
- ❍ Onshore field test
- ❍ Offshore field test

DEMO 2000 PROJECT INVESTMENTS [ONLY SERVICE COMPANY AND RESEARCH INSTITUTION RESPONDENTS]

In total, how much has your organization invested in the DEMO 2000 project so far and how much is planned to be invested in the future?

	not relevant	less than 1 MNOK	between 1 and 5 MNOK	between 5 and 10 MNOK	between 10 and 25 MNOK	more than 25 MNOK
Total investments prior to the DEMO 2000 project period	❍	❍	❍	❍	❍	❍
Total investments during the DEMO 2000 project period	❍	❍	❍	❍	❍	❍
Total investments after the DEMO 2000 project period	❍	❍	❍	❍	❍	❍
Total investments planned in the future	❍	❍	❍	❍	❍	❍

DEMO 2000 PROJECT RESULTS

As of today, which deliverables have actually been obtained in the project?

- ❑ Nothing yet, the project is still ongoing
- ❑ New knowledge without immediate application
- ❑ Patent applications
- ❑ Prototypes
- ❑ Piloting
- ❑ New commercial products or services
- ❑ New processes
- ❑ A new product line/ business
- ❑ New company start-ups
- ❑ Definition of new industry standards
- ❑ Unfortunately, no deliverables have been obtained

ACTUAL PILOT

Please specify the type of piloting actually carried out in this project:

- ❍ In laboratory
- ❍ In laboratory under field conditions
- ❍ Onshore field test
- ❍ Offshore field test

DEVIATION BETWEEN PLANNED AND ACTUAL PILOT [ONLY IF CONDUCTED PILOT WAS OF SMALLER SCOPE THAN PLANNED]

The pilot that was actually conducted was smaller in scope than originally planned. What caused this?

PLANNED PILOT NOT CONDUCTED [ONLY IF PILOT WAS EXPECTED, BUT NOT CONDUCTED]

The planned piloting activity appears to not have been conducted. What caused this?

How would you evaluate the influence of the DEMO 2000 programme on the deliverables of this project? [DEPENDENT ON RESPONSES TO ACTUALLY OBTAINED DELIVERABLES]

	.. would have been obtained anyway	.. would have been obtained, but on a smaller scale	.. would have been obtained, but at a later time	.. would not have been obtained
Nothing yet, the project is still ongoing	❍	❍	❍	❍
New knowledge without immediate application	❍	❍	❍	❍
Patent applications	❍	❍	❍	❍
Prototypes	❍	❍	❍	❍
Piloting	❍	❍	❍	❍
New commercial products or services	❍	❍	❍	❍
New processes	❍	❍	❍	❍
A new product line/ business	❍	❍	❍	❍
New company start-ups	❍	❍	❍	❍
Definition of new industry standards	❍	❍	❍	❍
Unfortunately, no deliverables have been obtained	❍	❍	❍	❍

As of today, which deliverables from the project are likely to be obtained in the future?

- ❑ Nothing further, every deliverable has already been obtained
- ❑ New knowledge without immediate application
- ❑ Patent applications
- ❑ Prototypes
- ❑ Piloting
- ❑ New commercial products or services
- ❑ New processes
- ❑ A new product line/ business
- ❑ New company start-ups
- ❑ Definition of new industry standards

How would you evaluate the influence of the DEMO 2000 programme on the expected deliverables of this project? [DEPENDENT ON RESPONSES TO DELIVERABLES LIKELY TO BE OBTAINED IN THE FUTURE]

	.. would be obtained anyway	.. would be obtained, but on a smaller scale	.. would be obtained, but at a later time	.. would not be obtained
Nothing further, every deliverable has already been obtained	❍	❍	❍	❍
New knowledge without immediate application	❍	❍	❍	❍
Patent applications	❍	❍	❍	❍
Prototypes	❍	❍	❍	❍
Piloting	❍	❍	❍	❍
New commercial products or services	❍	❍	❍	❍
New processes	❍	❍	❍	❍
A new product line/ business	❍	❍	❍	❍
New company start-ups	❍	❍	❍	❍
Definition of new industry standards	❍	❍	❍	❍

Please indicate which of the following phases in the exploration and production process are encompassed by this project:

- ❑ Pre drilling exploration
- ❑ Exploration drilling
- ❑ Development planning
- ❑ Field development
- ❑ Development and production drilling
- ❑ Production optimization
- ❑ Abandonment

Is this DEMO 2000 project primarily concerned with measurement technologies, data analysis, modelling and/or interpretation technologies?

- ❍ Yes
- ❍ No

FOR OIL COMPANY REPRESENTATIVES

In which of the E&P phases can risk management and/or decision making be improved by using the results from this project?

	1 Not relevant	2 Somewhat relevant	3 Relevant	4 Very relevant	5 Extremely relevant
Pre drilling exploration	❍	❍	❍	❍	❍
Exploration drilling	❍	❍	❍	❍	❍
Development planning	❍	❍	❍	❍	❍
Field development	❍	❍	❍	❍	❍
Development and production drilling	❍	❍	❍	❍	❍
Production optimization	❍	❍	❍	❍	❍
Abandonment	❍	❍	❍	❍	❍

If you have stated that the DEMO 2000 project will have a very important or extremely important impact on risk management and/or decision making in more than one of the E&P phases, please think carefully through whether the values you estimate in the following questions are already included in your response to earlier E&P phases. If this is the case, please tick the alternative "value included in previous answer" from the second question and onwards to avoid multiple counting.

[IN THE FOLLOWING SECTION, RESPONDENTS WILL BE ASKED TO EVALUATE TOTAL POTENTIAL FOR COST SAVING OR PRODUCTION/RECOVERY INCREASE ONLY FOR THOSE E&P PHASES FOR WHICH THEY CHOSE THE VALUES "VERY RELEVANT" OR "EXTREMELY RELEVANT" IN THE ABOVE QUESTION]

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the PRE DRILLING EXPLORATION phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	not relevant	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the EXPLORATION DRILLING phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the DEVELOPMENT PLANNING phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the FIELD DEVELOPMENT phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the DEVELOPMENT AND PRODUCTION DRILLING phase significantly. What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the PRODUCTION OPTIMIZATION phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You indicated that the results from this DEMO 2000 project can improve decision making and/or risk management in the ABANDONMENT phase significantly.
What is the total potential of project cost saving or production/recovery increase with such improved quality of decision making for:

	Value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

Please evaluate the degree to which the results of this DEMO 2000 project will have a direct impact on project cost saving or increased production/recovery in terms of:

	1 No impact	2 Little impact	3 Some impact	4 High impact	5 Extremely high impact
Increasing hydrocarbon production	❍	❍	❍	❍	❍
Increasing ultimate recovery	❍	❍	❍	❍	❍
Reducing cost in exploration	❍	❍	❍	❍	❍
Reducing cost in development	❍	❍	❍	❍	❍
Reducing cost in production	❍	❍	❍	❍	❍
Reducing cost in abandonment	❍	❍	❍	❍	❍

If you have stated that the DEMO 2000 project will have a very important or extremely important impact on more than one of the increased production/recovery or project cost saving value categories, please think carefully through whether the values you estimate in the following questions are already included in your response to earlier value categories. If this is the case, please tick the alternative "value included in previous answer" from the second question and onwards to avoid multiple counting.

[IN THE FOLLOWING SECTION, RESPONDENTS WILL BE ASKED TO EVALUATE TOTAL POTENTIAL FOR COST SAVING OR PRODUCTION/RECOVERY INCREASE ONLY FOR THOSE VALUE CATEGORIES FOR WHICH THEY CHOSE THE VALUES "HIGH IMPACT" OR "EXTREMELY HIGH IMPACT" IN THE ABOVE QUESTION]

You stated that the results from this DEMO 2000 project can/will have a significant impact on INCREASING HYDROCARBON PRODUCTION. Please quantify the value of this project for:

	not relevant	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You stated that the results from this DEMO 2000 project can/will have a significant impact on INCREASING ULTIMATE RECOVERY. Please quantify the value of this project for:

	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You stated that the results from this DEMO 2000 project can/will have a significant impact on REDUCING COST IN EXPLORATION. Please quantify the value of this project for:

	value included in	between 0 and 99 MNOK	between 100 and 499	between 500 and 999	between 1000 and	above 5000 MNOK

	previous answer		MNOK	MNOK	4999 MNOK	
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You stated that the results from this DEMO 2000 project can/will have a significant impact on REDUCING COST IN DEVELOPMENT. Please quantify the value of this project for:

	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You stated that the results from this DEMO 2000 project can/will have a significant impact on REDUCING COST IN PRODUCTION. Please quantify the value of this project for:

	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

You stated that the results from this DEMO 2000 project can/will have a significant impact on REDUCING COST IN ABANDONMENT. Please quantify the value of this project for:

	value included in previous answer	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

How much of this potential has been realized as per today for:

	nothing yet	between 0 and 99 MNOK	between 100 and 499 MNOK	between 500 and 999 MNOK	between 1000 and 4999 MNOK	above 5000 MNOK
your company's most relevant field on the Norwegian Continental Shelf?	❍	❍	❍	❍	❍	❍
the Norwegian Continental Shelf as a whole?	❍	❍	❍	❍	❍	❍
your company's operations worldwide?	❍	❍	❍	❍	❍	❍

When do you expect the full potential of the results of this project to be realized?

- ❍ has been realized
- ❍ within the next 2 years
- ❍ in 2 to 5 years time
- ❍ in 5 to 10 years time
- ❍ in more than 10 years time

What do you consider the main critical factor(s) for the realization of this potential?

HEALTH, SAFETY AND ENVIRONMENTAL EFFECTS [ALL RESPONDENTS]

How valuable is the technology in the project in terms of reducing risk in operations related to:

	No value	Little value	Some value	Very valuable	Extremely valuable
Health	❍	❍	❍	❍	❍
Safety	❍	❍	❍	❍	❍
Environment	❍	❍	❍	❍	❍

Have the HSE-benefits from this project already been realized?

- ❍ No
- ❍ Yes
- ❍ Comments (if needed):

DEMO 2000 PROJECT RESULTS - EVALUATION BY SERVICE COMPANY AND RESEARCH INSTITUTIONS

What is the expected impact of the technology in your project in terms of:

	No impact	Low impact	Some impact	High impact	Extremely high impact
Improved productivity for your company	❍	❍	❍	❍	❍
Increased revenue in Norway	❍	❍	❍	❍	❍
Increased revenue internationally	❍	❍	❍	❍	❍
Profitability in Norway	❍	❍	❍	❍	❍
Profitability internationally	❍	❍	❍	❍	❍
Market share in Norway	❍	❍	❍	❍	❍
Market share internationally	❍	❍	❍	❍	❍
Competitiveness in Norway	❍	❍	❍	❍	❍
Competitiveness internationally	❍	❍	❍	❍	❍
Growth potential in Norway	❍	❍	❍	❍	❍
Growth potential internationally	❍	❍	❍	❍	❍

You stated that the technology in this project will have a significant impact on IMPROVING THE PRODUCTIVITY of your organization. Please estimate the improved productivity resulting from the technology in this project which:

	0%	0 - 5%	5 - 20%	20 - 50%	50 - 100%
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the improved productivity?

You stated that the technology in this project will have a significant impact on INCREASING YOUR ORGANIZATION'S REVENUE IN NORWAY. Please estimate the increased revenue in Norway resulting from the technology in this project which:

	less than 20 MNOK	between 20 and 99 MNOK	between 100 and 249 MNOK	between 250 and 499 MNOK	more than 500 MNOK
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the increased revenue in Norway?

You stated that the technology in this project will have a significant impact on INCREASING YOUR ORGANIZATION'S REVENUE INTERNATIONALLY. Please estimate the increased revenue internationally resulting from the technology in this project which:

	less than 20 MNOK	between 20 and 99 MNOK	between 100 and 249 MNOK	between 250 and 499 MNOK	more than 500 MNOK
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the increased revenue internationally?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S PROFITABILITY IN NORWAY. Please estimate the profitability in Norway resulting from the technology in this project which:

	less than 5 MNOK	between 5 and 24 MNOK	between 25 and 49 MNOK	between 50 and 99 MNOK	more than 100 MNOK
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the profitability in Norway?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S PROFITABILITY INTERNATIONALLY. Please estimate the profitability internationally resulting from the technology in this project which:

	less than 5 MNOK	between 5 and 24 MNOK	between 25 and 49 MNOK	between 50 and 99 MNOK	more than 100 MNOK
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the profitability internationally?

Please quantify your organization's share of the market of relevance for this project, both

	0%	between 0 and 4%	between 5 and 9%	between 10 and 24%	between 25 and 49%	between 50 and 74%	more than 75%
the Norwegian market and	❍	❍	❍	❍	❍	❍	❍
the international market	❍	❍	❍	❍	❍	❍	❍

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S MARKET SHARE IN NORWAY. Please estimate the increase in market share in Norway resulting from the technology in this project which:

	between 0 and 9%	between 10 and 24%	between 25 and 49%	between 50 and 74%	more than 75%
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the market share in Norway?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S MARKET SHARE INTERNATIONALLY. Please estimate the increase in market share internationally resulting from the technology in this project which:

	between 0 and 9%	between 10 and 24%	between 25 and 49%	between 50 and 74%	more than 75%
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the market share internationally?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S COMPETITIVENESS IN NORWAY. Please estimate the improved competitiveness in Norway resulting from the technology in this project which:

	none	some improvement	important improvement	significant improvement	extreme improvement
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the improvement of competitiveness in Norway?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S COMPETITIVENESS INTERNATIONALLY. Please estimate the improved competitiveness internationally resulting from the technology in this project which:

	none	some improvement	important improvement	significant improvement	extreme improvement
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the improvement of competitiveness internationally?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S GROWTH POTENTIAL IN NORWAY. Please estimate the growth potential in Norway resulting from the technology in this project which:

	0%	0 - 9%	10 - 24%	25 - 49%	more than 50%
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the growth potential in Norway?

You stated that the technology in this project will have a significant impact on YOUR ORGANIZATION'S GROWTH POTENTIAL INTERNATIONALLY. Please estimate the growth potential internationally resulting from the technology in this project which:

	0%	0 - 9%	10 - 24%	25 - 49%	more than 50%
has already occurred?	❍	❍	❍	❍	❍
is likely to occur within the next 2 years?	❍	❍	❍	❍	❍
is likely to occur in the next 2 to 5 years?	❍	❍	❍	❍	❍
is likely to occur in the next 5 to 10 years?	❍	❍	❍	❍	❍

What do you consider the main critical factor(s) for the realization of the growth potential internationally?

Please provide supplementary comments (if necessary):

On a scale from 1 to 5 with 5 as highest, how significant will the results of your project be for your suppliers?

- ❍ 1 No impact
- ❍ 2 Low impact
- ❍ 3 Some impact
- ❍ 4 High impact
- ❍ 5 Extremely high impact

Please provide supplementary comments (if necessary):

FOR RESEARCH INSTITUTION REPRESENTATIVES

How valuable is the DEMO 2000 project in terms of:

	No value	**Little value**	**Some value**	**Very valuable**	**Extremely valuable**
Entering into new areas of research for your institute	❍	❍	❍	❍	❍
Entering into new areas of technology for your institute	❍	❍	❍	❍	❍
Entering into new relationships with oil companies	❍	❍	❍	❍	❍
Entering into new relationships with service companies	❍	❍	❍	❍	❍
Getting access to new markets	❍	❍	❍	❍	❍
Getting information about new markets	❍	❍	❍	❍	❍

Please provide supplementary comments (if necessary):

ORGANIZATION OF THE DEMO 2000 PROGRAM [NOT FOR OIL COMPANY REPRESENTATIVES]

On a scale from 1 to 5 with 5 as best, how would you rate:

	1 - Bad	2 - Poor	3 - OK as it is	4 - Good	5 - Extremely good
.. how well the program is being organized?	❍	❍	❍	❍	❍
.. the work processes used?	❍	❍	❍	❍	❍
.. the relationship to the DEMO 2000 program administration?	❍	❍	❍	❍	❍
.. the relationship to the Research Council of Norway in general?	❍	❍	❍	❍	❍

Do you have experience with similar programs in Norway or internationally?

- ❍ Experience with none of these
- ❍ Experience with Norwegian programs
- ❍ Experience with international programs
- ❍ Experience with both Norwegian and international programs

Please list one Norwegian program with which you have (had) experience

Please list one international program with which you have (had) experience

With 3 as the same overall quality and with 5 as best, how would you rate DEMO 2000 relative to:

	1 - Much poorer overall quality	2 - Poorer overall quality	3 - Same overall quality	4 - Better overall quality	5 - Much better overall quality
the Norwegian program you mentioned	❍	❍	❍	❍	❍

With 3 as the same overall quality and with 5 as best, how would you rate DEMO 2000 relative to:

	1 - Much poorer overall quality	2 - Poorer overall quality	3 - Same overall quality	4 - Better overall quality	5 - Much better overall quality
the international program you mentioned	❍	❍	❍	❍	❍

With 3 as the same overall quality and with 5 as best, how would you rate DEMO 2000 relative to:

	1 - Much poorer overall quality	2 - Poorer overall quality	3 - Same overall quality	4 - Better overall quality	5 - Much better overall quality
the Norwegian program you mentioned	❍	❍	❍	❍	❍
the international program you mentioned	❍	❍	❍	❍	❍

Please include any specific comments and/or recommendations for possible improvements

DEMO 2000 GOAL ACHIEVEMENT

In general, on a scale from 1 to 5 with 5 as best, how important do you think your project is in terms of:

	1 - Not important	2 - Somewhat important	3 - Important	4 - Very important	5 - Extremely important
Reducing cost on the NCS	❍	❍	❍	❍	❍
Increasing the attractiveness of, and activity on the NCS	❍	❍	❍	❍	❍
Increasing the competitiveness of Norwegian oil and gas industry	❍	❍	❍	❍	❍

To complete the survey and the registration of your answers, please click the "Send" button below.

To review or edit your answers, use the "Previous" button to navigate. Please note that each page is saved only when you click the "Next" button. If you wish to go back to previous questions, your answers will not be saved. For your answers to be saved, you must click the "Next" button again until you have reached this page and clicked the "Send" button.

Next time you click the link you received in the e-mail, you will be directed to the last saved question in the survey if you did not complete the questionnaire.