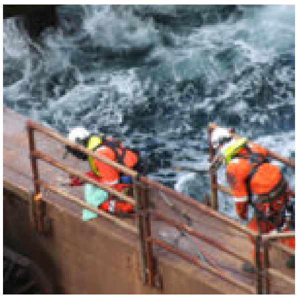
RESOURCE REPORT 2017

Turn every stone

Oljedirektoratet 14.06.2017

Shutting down fields and facilities forms a natural part of petroleum activities. Before production ceases, it is important that all measures which could provide profitable production have been assessed.

Continuous technological progress, field development and tie-back of new discoveries may help to extend producing life. But the point will eventually be reached when the cost of continued production from a field is higher than the revenues generated by its own output and from any possible tied-back fields. The decision will then be taken to shut down and begin the work of removing the facilities. Estimating precise cessation dates for the various fields and installations is difficult, since they will depend on several factors. These could include oil and gas prices, expected developments in production, improved production techniques, operating and maintenance costs, and the technical condition and producing life of the installations. In addition to uncertainty over shutdown, the launch date and duration of the actual cessation project may be uncertain.



Fields which are or could shut down within five years

Up to 25 per cent of fields currently on stream could cease to produce over the coming five-year period. That might sound dramatic, but output from the relevant fields has only a minor impact on total production from the Norwegian continental shelf (NCS). At 31 December 2016, 23 fields had shut down on the NCS. Their output contributed six per cent of total Production.

Production forecast and status for shut-down fields

Changed assumptions affect producing life

When a plan for development and operation (PDO) is submitted to the government, the licensees will have planned how and for how long the field is to produce. This is based on knowledge and data at the submission date. While these early estimates have proved over-optimistic in some cases, fields usually stay on stream longer and produce more than originally expected.

Changes in producing life

Cessation costs

Shutdown and disposal costs over the past five years totalled NOK 32.5 billion and NOK 8.5 billion respectively in 2016 value. These amounts are large viewed in isolation, but small compared with expenditure on exploration, development and operation and with revenues from the Fields.

More on cessation costs

Plugging wells

All wells drilled on the NCS must be plugged once production or injection has ceased. Exploration wells also have to be plugged. The NPD has estimated that some 40-50 wells will need to be plugged annually over the next few years.

More on shutdown and plugging wells

Regulations for shutdown and disposal

Cessation of petroleum activities and disposal of facilities are regulated by chapter 5 of the Petroleum Act. This specifies requirements for a decommissioning plan as well as rules on notifying termination of use, the disposal decision, liability, encumbrances and takeover by the state.

Decommissioning plan and regulations

Go to next topic: The NPD’s role

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Status of fields no longer on stream

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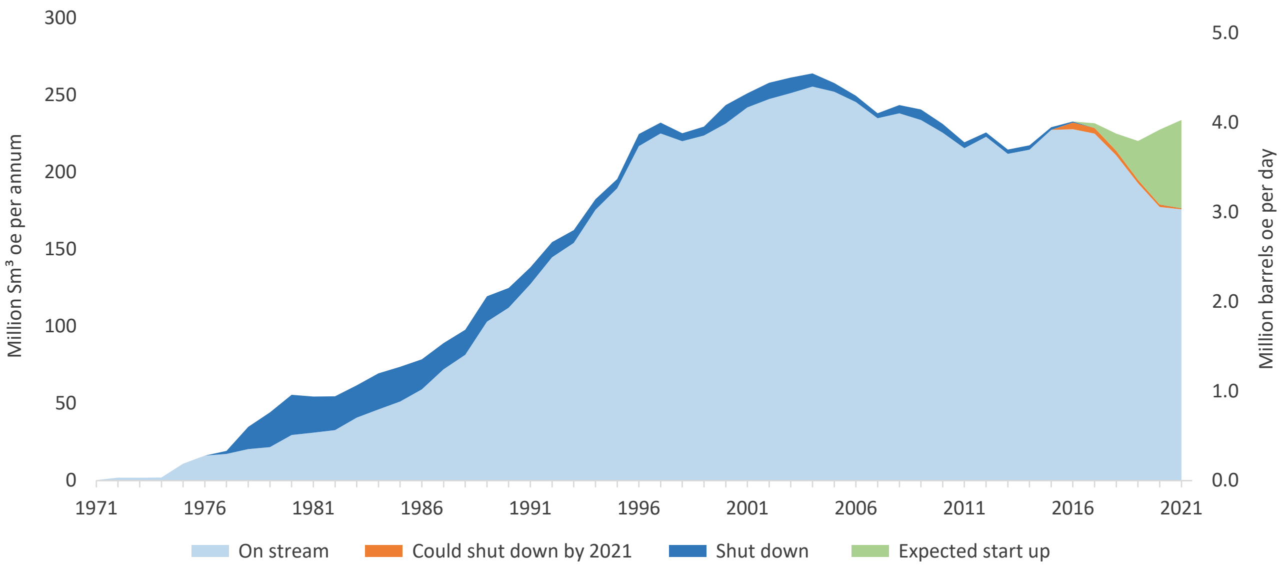
At 1 January 2017, the Norwegian continental shelf had 80 fields on stream and 23 no longer in production. The NPD expects a further 10-20 to shut down towards 2020. Fields approaching cessation are primarily small, with simple development solutions and relatively short producing lives. Some large fields which have long been on stream and now produce small volumes are also expected to shut down by 2021.

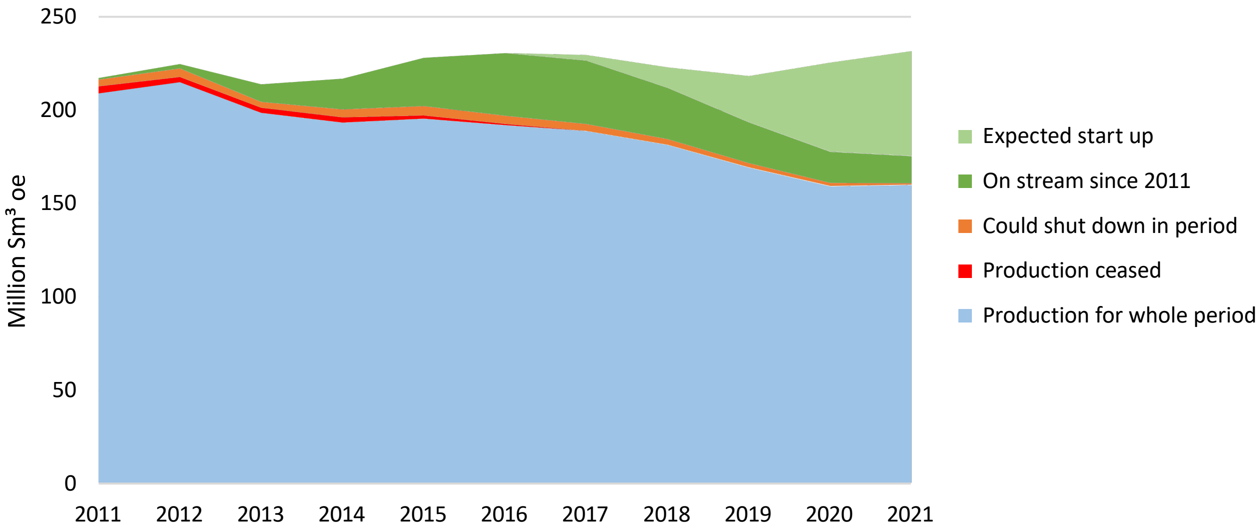


The 23 fields which have shut down accounted for six per cent of total production up to 2016.

Production 2011-21

Viewed in isolation, it might seem dramatic that up to 25 per cent of the fields currently on stream could cease production over the coming five years. But their collective output is so small that it adds only marginally to the total.

The overall contribution from fields which have or will probably shut down in 2011-21 comes to only two per cent of total output in this period. By comparison, fields which have or will come on stream in the same decade are expected to account for 14 per cent of total production.

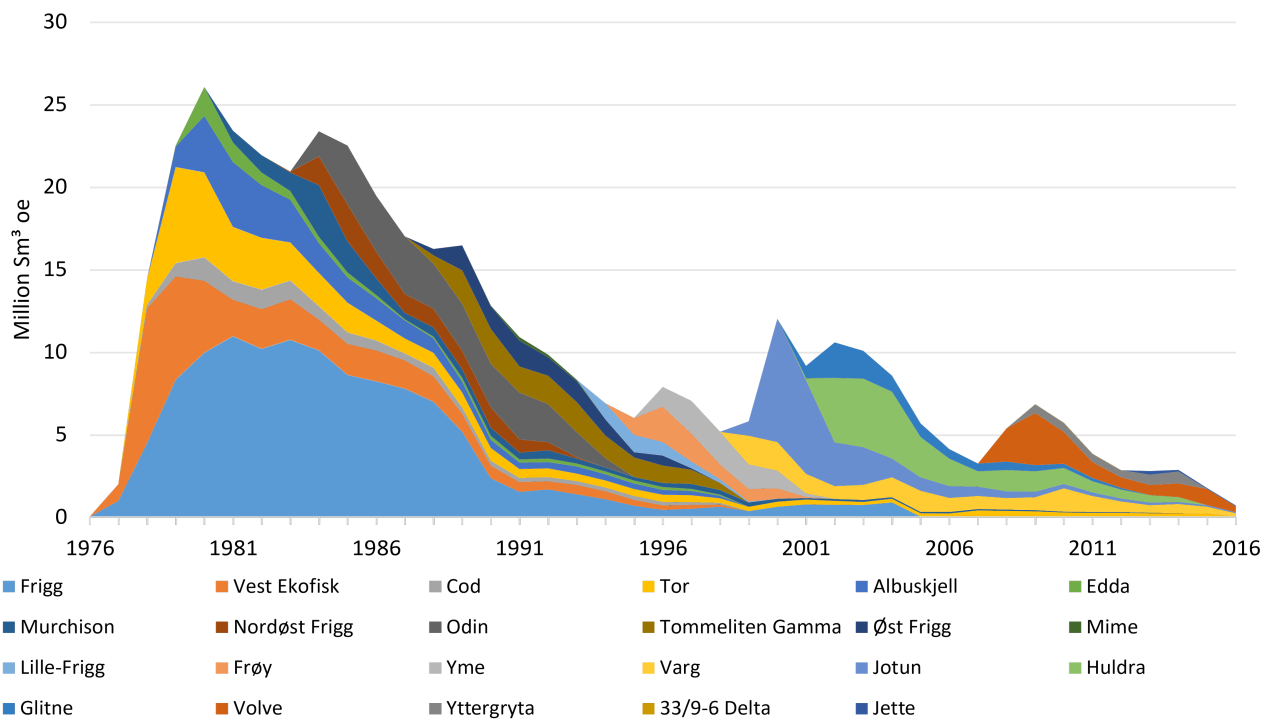


Only two per cent of production derives from fields which have shut down or are likely to do so by 2021.

Download data

Historical production from shut-down fields

The figure below shows petroleum production from fields which have ceased production. Frigg, the biggest of them, ranks as the 20th largest field on the NCS.



Production from fields is at its highest in their first few years on stream (Frigg and Murchison straddle the Norwegian-UK boundary – resources shown here are only Norway’s share).

Historical data clearly show that most of a field's production occurs during its first few years on stream. Many fields then continue to produce at a substantially lower and declining rate until such output is no longer profitable.

The commercial life of facilities which are no longer producing themselves may be extended if they can function as host installations for other discoveries in the area. That makes it important to explore all opportunities for utilising such facilities before a final disposal decision.

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Next chapter: Producing life of fields

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Changes to producing life

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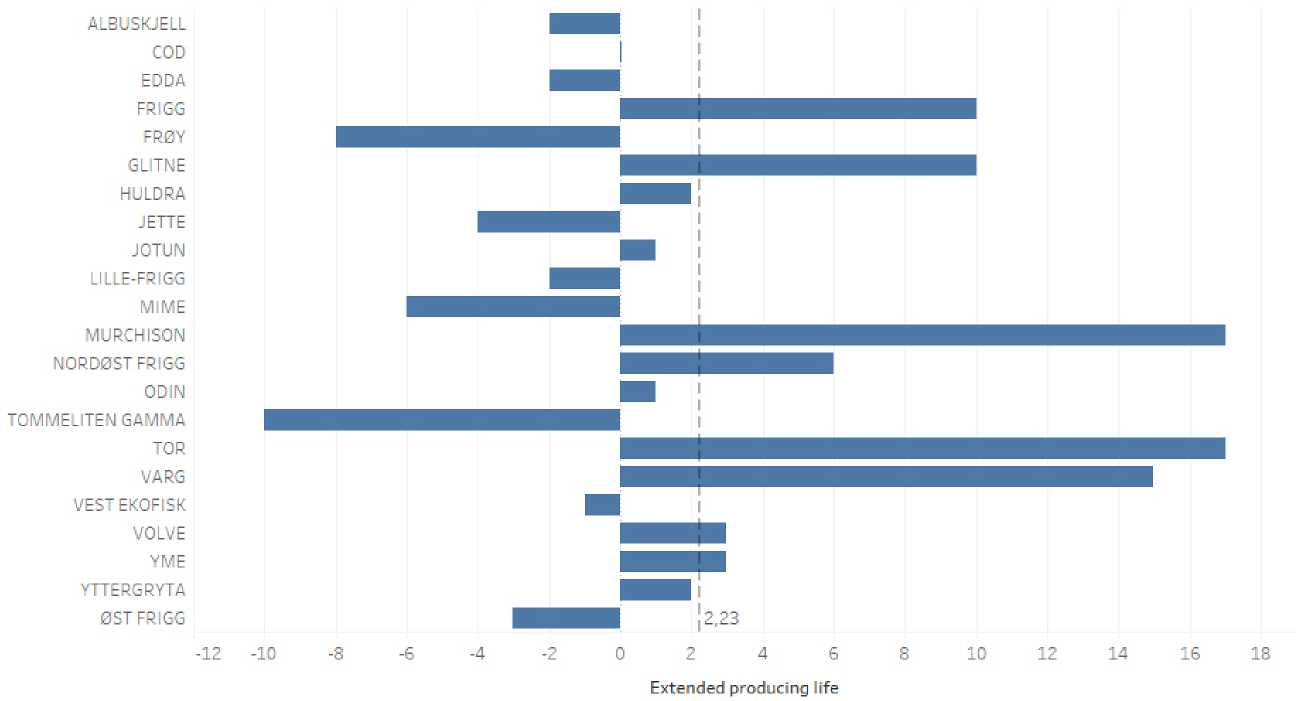
Most fields remain on stream for considerably longer than originally planned, and fields and infrastructure capacity must be utilised efficiently. The median extension to producing life beyond the period anticipated in the plan for development and operation (PDO) for all fields on stream is nine years, with an average of almost 12.

A number of factors can contribute to extend producing life for a field:

- producing the resources takes longer than expected
- changes to the resource base
- measures for improving recovery
- Tie-in oil and gas from other Fields.

When the licensees submit a PDO for a field, they also estimate how long it is likely to stay on stream. However, the cessation date can be brought forward or pushed back as assumptions change over a field's producing life. Some shut down earlier than planned, primarily because production has failed to develop as well as expected.



The average producing life for fields now shut down was just over two years longer than expected when the PDO was submitted.

Mapping and exploring for resources is a matter of urgency in the vicinity of infrastructure set to shut down in the near future. It may be possible to utilise these facilities for phasing-in new discoveries in the area, and thereby contribute to increased value creation.

Most discoveries are developed with subsea installations tied back to existing infrastructure. This reduces overall development costs in an area and makes a number of small discoveries commercial. In addition, it may improve recovery from the host Field.

READ MORE: Projects on producing fields og development of discoveries

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Next chapter: Costs related to cessation

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Decommissioning costs

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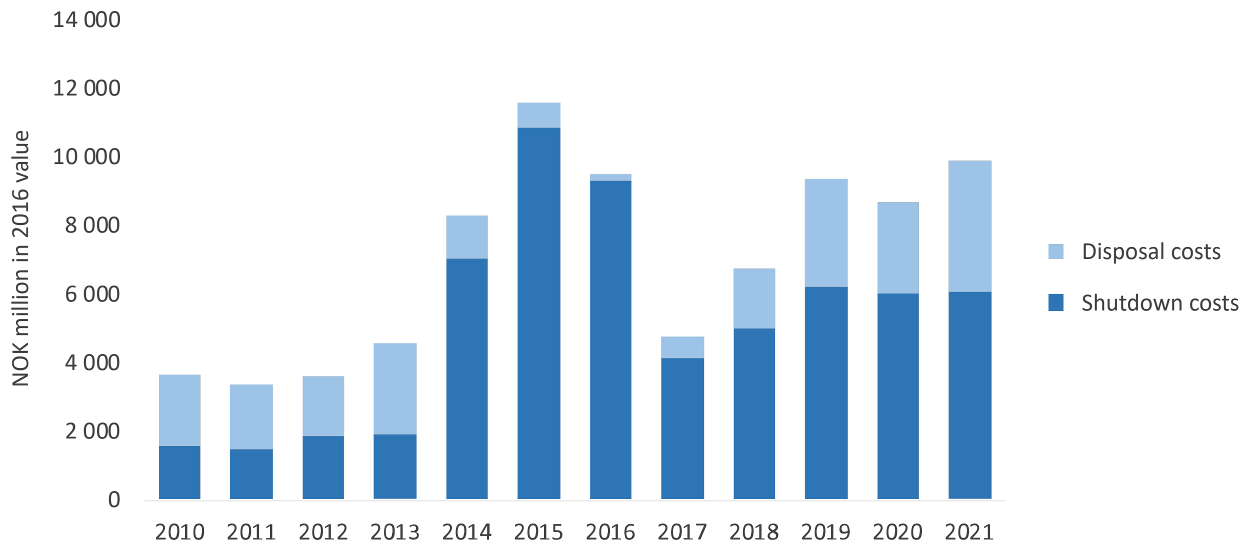
The costs relating to shut down and disposal are relatively small compared with expenditures on exploration, development and operation and with the revenues it generates. Shutdown and disposal costs over the past five years totalled NOK 32.5 billion and NOK 8.5 billion respectively in 2016 value. The NPD expects the corresponding figures for the next five years, again in 2016 value, to be NOK 23.4 billion and NOK 12 billion.



In the figure above, cessation costs for 2010-15 represent actual figures while those for 2016-21 are forecasts from the revised national budget (RNB) for 2017. A rise in these costs is expected from 2018-19, which also accords with an increase in the level of activity in disposal of facilities.

Cessation costs is a broad term, and incorporates preparatory expenditures on fields due to come off stream as well as spending on shutting them down and plugging their wells. In addition, it includes costs for necessary clearing up on fields which are not scheduled to come off stream during the period. Disposal costs relate to implementing the physical removal or abandonment of facilities.

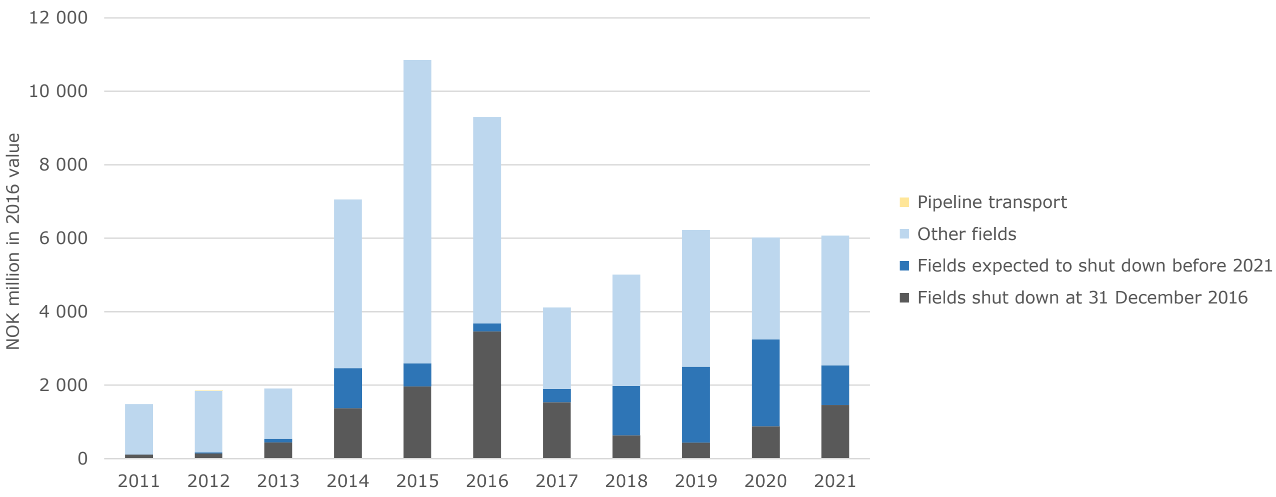
During 2011-21, cessation costs will account for three per cent of the NOK 2 733 billion actually used or due to be spent on petroleum activities. This overall amount breaks down as:

- 58 per cent Investment
- 24 per cent operating costs
- 12 per cent exploration costs
- **three per cent cessation costs**
- three per cent other costs.

This proportion will probably rise when the big fields come to shut down

Shutdown costs

Shutdown costs in 2015 were up by 54 per cent from the year before. But that was not because more fields came off stream as a result of low oil prices. Most of the 2015 figure is costs related to plugging of wells and removing equipment no longer in use from fields on stream. The biggest contributors included Ekofisk, Eldfisk and Statfjord.

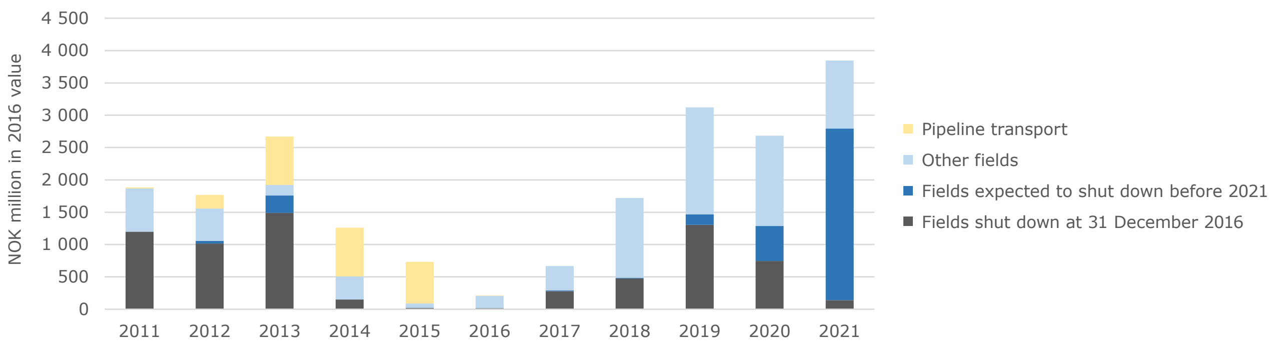


A large part of shutdown costs relate to fields which will remain on stream for many years to come (light blue).

Download data

Disposal costs

Although total shutdown spending rose in 2015, disposal costs declined. The pipeline transport category includes the removal of the B11 compression platform. This formed part of the Norpipe system from Ekofisk to Emden in Germany, and was removed because the need for gas compression in this pipeline had declined since the platform became operational in 1977.



Disposal costs.

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Uncertain forcasts

Considerable uncertainty prevails over the forecasts for future shutdown and disposal costs. The material condition of facilities, market volatility, industry experience, expertise and knowledge, capacity of the service and supply industry, and technology development are among the factors which will affect the cost Picture.

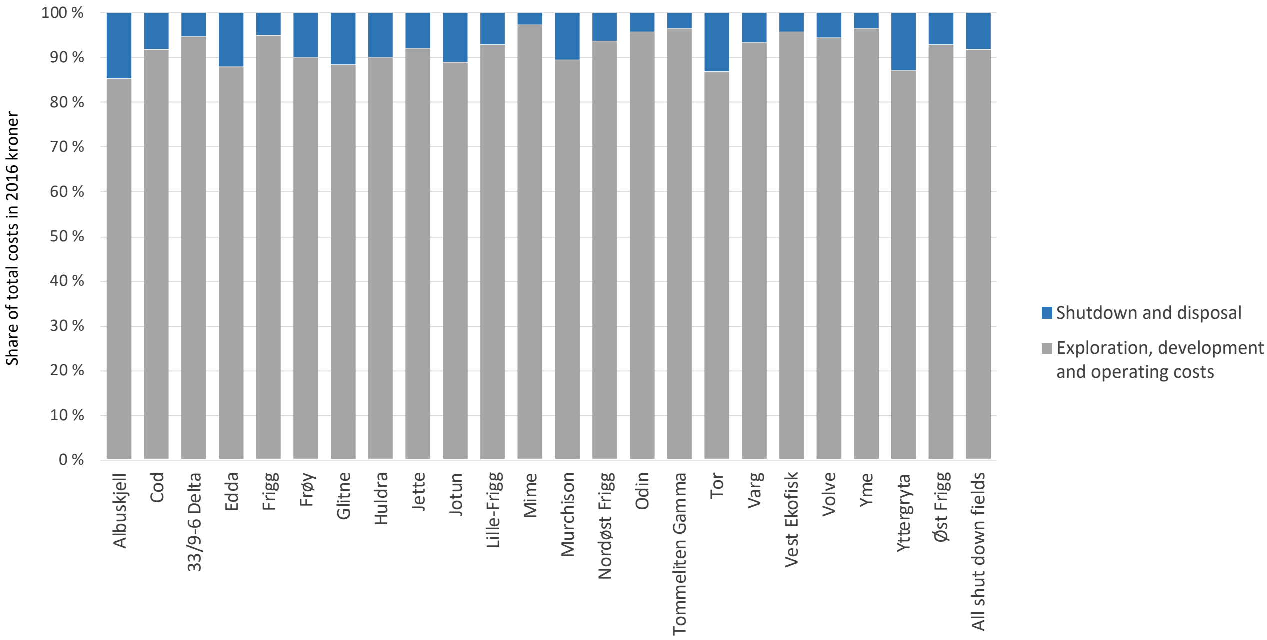
As more disposal projects are executed, the government and the industry will acquire further information which can help to provide a more precise picture of the future costs.

Although the cost of removing facilities and plugging wells is likely to decline through learning and technology development, overall disposal expenditure will probably be somewhat higher in the long term. Good collaboration between licensees, service and supply industry, government and relevant interest organisations will be important for the best possible disposal solution, and thereby for reduced costs.

Historical breakdown of costs

Total expenditure on fields where production had ceased at 31 December 2016 was NOK 428 billion in 2016 value. Field developments vary considerably in terms of size, complexity and number of installations. Big differences in disposal costs will therefore exist between a field with a single subsea template and a development with one or more large facilities. Costs for big disposal projects will be spread over a longer period than for a field with small and simple development solutions

Shutdown and disposal costs on fields which have now ceased production range between three and 15 per cent of total expenditure.



On average, eight per cent of total costs relate to shutdown and disposal on fields which have ceased production.

Download data

Costs of well plugging

All wells on the Norwegian continental shelf (NCS) must be permanently plugged and abandoned (P&A) in an acceptable manner. Plugging costs per well can vary from just under NOK 50 million to several hundred million kroner. This depends on the complexity of the field and the wells. Based on figures reported by the companies, the NPD has estimated that 40-50 wells are due to be plugged annually over the next few years.

A dedicated forum for P&A of wells was created in 2009 by the Norwegian Oil and Gas Association to exchange experience between a number of companies and fields. Examples include operational P&A experience from Ekofisk/Valhall and work on the barrier philosophy for Ekofisk and Huldra. Efforts are being made to develop simpler and more cost-effective well-plugging solutions.

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Next chapter: Plugging wells

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Plugging wells

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The Norwegian continental shelf (NCS) has a large and growing number of wells. Exploiting the big investment which a well represents for as long as commercially justified is important. The companies must accordingly assess reusing existing wells to maintain profitable production on a Field.

Calls have been made over the past three-four years for spare rig capacity to be used for plugging all idle wells. The NPD believes this would represent poor resource management. See the article of 23 November 2015 on plugging of wells can prevent value creation.

The NPD understands why questions are raised about why many apparently idle wells are not plugged. All wells shall be permanently plugged and abandoned (P&A*) in an acceptable manner. It is therefore important that the industry continues to identify new technology and solutions which can help to reduce the time and cost of P&A.

** P&A refers in the case of exploration wells to straightforward permanent P&A. Where production/injection wells are concerned, it involves ceasing to produce/inject and then permanently plugged.*

Well statistics

All well paths have a fixed starting point known as the wellhead. This can stand on a production platform or in a subsea template, and defines the top of the well. Several well paths can be drilled from each wellhead. So far, an average of two well paths have been drilled per wellhead on the NCS. “Well” is used here a collective term for all well paths leading back to a single wellhead.

The NPD’s well statistics show that more than 2 000 well paths are neither in use nor permanently P&A. This could encourage the view that an extensive P&A market now exists. However, the number of wellheads and the status for using them paints a different Picture

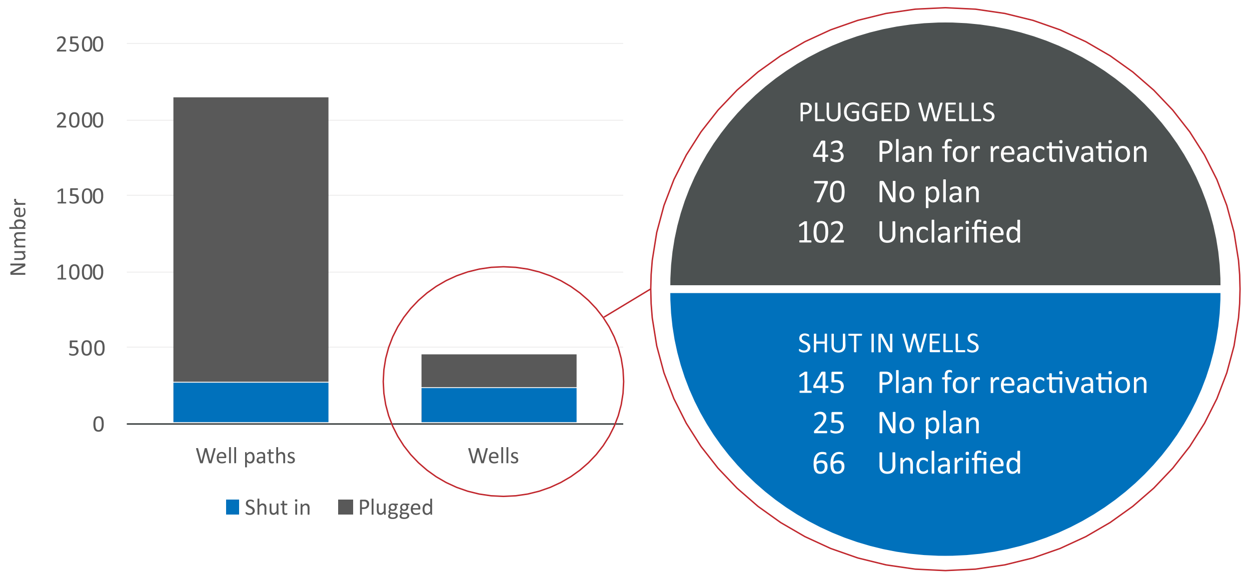
Three main reasons explain why several well paths are drilled from each wellhead

1. **An initial well path** is drilled in some cases to determine exactly where the resources lie and thereby identify the optimum positioning of a well path in the reservoir. This first well path is then plugged, and a new one drilled for production use.

2. **Sidetracks**. After a well path has been producing for a few years, the area it is draining could be fully depleted. Rather than drill a completely new well, the lowest section is plugged and a new path drilled out from the existing well to an area of the reservoir with remaining resources. This could be repeated several times in a well's lifetime.
3. **Multilaterals**. Two or more well paths are drilled in the same well to produce or inject simultaneously. In the event of problems with one lateral, it can be shut off while the others remain operational..

Well paths which have been shut in and plugged are designated inactive.

- *Shut in: production well closed for some length of time*
- *Plugged: production well plugged while the field is still on stream*
- *No plan: a production well which is shut in will be temporarily plugged, with permanent P&A when the facility has been removed*
- *Unclarified: wells still being assessed for reuse or plugging*.



Specific plans exist for reactivation of 145 shut-in wells on the NCS. The same applies to 45 of the plugged wells.

Download data

The bar chart above shows the number of inactive well paths and wells. A big difference exists between the number of plugged well paths and plugged wells. That reflects all the sidetracks. These wells will be permanently P&A when the field shuts down.

Status reports on well activities implemented and planned for fields on stream are obtained by the NPD on an annual basis. These cover such matters as why a well path is not in use and plans for the wells. The overview in the circle above shows that almost half the wells are covered by specific plans for reactivation, either through workovers or by drilling a new well path.

Some wells are also shut in because the production facilities lack capacity or to build up reservoir pressure. These can be reactivated when conditions change.

Back Next chapter: Regulations for shutdown and disposal

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Regulations for shutdown and disposal

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Cessation of petroleum activities and disposal of facilities are regulated by chapter 5 of the Petroleum Act. This specifies requirements for a decommissioning plan as well as rules on notifying termination of use, the disposal decision, liability, encumbrances and takeover by the state.

The decommissioning plan must describe future areas of application for a facility and provide the government with a basis for reaching a decision on disposal. It will not be subject to approval, and its proposals on a disposal solution are not binding on the government.

Disposal requirements are also determined by a decision under the Oslo-Paris convention (OSPAR) which came into force in 1999. This provides guidance and acceptable disposal options for various types of offshore facility. The following complete or partial installations must be shipped ashore for recycling or other forms of disposal:

- subsea installations – in other words, production facilities on the seabed
- floating steel installations
- small fixed installations (with a jacket weighing less than 10 000 tonnes)
- the uppermost part of large fixed steel structures (the topside and that part of the support structure above the piles in installations with a jacket weighing more than 10 000 tonnes)
- topsides on concrete platforms.

Exemptions can be issued for:

- the lower part of large fixed steel structures (jacket weighing more than 10 000 tonnes) installed before February 1999
- concrete gravity base structures (GBS) and anchor foundations
- any other installation when unusual or unforeseen circumstances caused by damage to the structure or deterioration, or other causes which involve corresponding difficulties, are identified.

The OSPAR decision does not cover pipelines, parts of the facility beneath the seabed or concrete anchor foundations which do not present an obstacle to fisheries. More details on the regulations for pipeline disposal are provided in Report no 49 (1999-2000) to the Storting (in Norwegian only).

In addition to the rules in the OSPAR convention, international guidelines have been issued by the International Maritime Organisation (IMO). Its MSC/Circ 490 guidelines of 4 May 1988 provide guidance and are primarily intended to meet shipping concerns.

Disposal duties and liability

The licensee and owner has an obligation to ensure that the disposal decision is implemented, unless the Ministry of Petroleum and Energy decides otherwise. Similarly, the licensee and owner is liable for damage or inconvenience caused wilfully or negligently in connection with disposal of the facility or other implementation of the decision. That also applies to future liability where the disposal decision means that the facility is to be abandoned on the field. Such liability applies regardless of whether the production licence or the permit for installation and operation has expired.

Section 10.8 of the Petroleum Act provides that the licensees are jointly and severally responsible to the state for financial obligations arising out of petroleum activities pursuant to the licence. This also applies to costs associated with implementing the disposal. Being jointly and severally responsible means that each licensee in the joint venture must meet its proportionate share of the disposal costs. It is also responsible to the Norwegian state for the total amount. Should any licensee default, the others are secondarily liable for meeting that licensee's proportionate share of the cost.

Should all or part of a licence be transferred, the party transferring its interest will have a secondary financial liability to both the other licensees and the state for the cost of implementing the disposal decision. Put briefly, this means the liability arises if the new licensee defaults on its share of the obligation to meet the cost of implementing the disposal decision.

The ministry has noted that no difference should exist on this point whether part or all of an interest is sold. It has warned that an assessment will be made when considering its consent concerning a change of licensee company for a field on stream in order to determine whether conditions should be set in relation to the parent company's secondary liability for disposal costs.

These responsibilities persist in the event of later transfers of the interest or parts of it. The claim will then be directed first to the company responsible for the most recent transfer. Liability is calculated on the size of the transferred interest, and limited to costs related to facilities which existed at the time of the transfer.

More details on responsibilities and liabilities can be found in sections 5-3, 5-4 and 10-8 of the Petroleum Act, as well as in section 45a of the petroleum regulations. The compensation rules in chapters 7 and 8 of the Act also apply.

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