



**Re-use &
Decommissioning report**
Stepping up the pace

2023

Index

Preface	<u>3</u>	2.4 Offshore pipelines	<u>23</u>
Factsheet	<u>5</u>	2.5 Onshore wells	<u>25</u>
1 Decommissioning & Re-use	<u>6</u>	+ Interview NAM	<u>26</u>
+ Interview Ministry of Economic Affairs & Climate	<u>8</u>	2.6 Onshore locations	<u>29</u>
2 Expected decommissioning in the Netherlands 2023–2032	<u>11</u>	2.7 Onshore pipelines	<u>30</u>
2.1 Total overview offshore & onshore	<u>12</u>	3 Expected offshore decommissioning costs 2023–2032	<u>31</u>
2.2 Offshore wells	<u>13</u>		
2.3 Offshore installations	<u>15</u>		
+ Nature-enhancing decommissioning	<u>17</u>		
+ Interview Natuur & Milieu/Stichting De Noordzee	<u>19</u>		

Preface

Thijs Starink

General Manager Nexstep

It is a privilege to write the preface to this year's Re-use and Decommissioning Report of Nexstep as its General Manager. Allow me to explain why. Some 40 years ago as a student in Delft, I was fortunate enough to enrol in a 5-week diving course at the Royal Navy arranged by the university. In return, I was expected to regularly collect and replace test samples at the bottom of the North Sea, next to the so-called REM-island. Initially this platform was installed offshore for commercial TV broadcasting. Later it was used for scientific studies by Rijkswaterstaat and the Technical University in Delft. Finally, the platform was decommissioned. It only just escaped scrapping and is now a landmark event location and restaurant in the harbour of Amsterdam. The history of the REM-island symbolises what Nexstep stands for: re-use, re-purpose and/or decommission. After enjoying a long period of growth in the E&P business with EBN and before that with Allseas, I consider it fitting to contribute to the decommissioning task that faces us. It is a challenge to lead Nexstep the coming years and I will give it my best.

“We have momentum, let's keep going and step up the pace”

This is the sixth report in a row and Nexstep has matured to an established organisation. Nexstep was, after all, founded to optimise and accelerate decommissioning activities by intense co-operation between all operators, the Ministry of Economic Affairs and Climate, the service industry and other stakeholders. Over the next few decades, we face the huge challenge of decommissioning around 1700 wells and up to 150 offshore platforms. In past years, various parties have questioned if decommissioning of the Dutch E&P infrastructure was really going to happen and if so, when? The joint campaign for the decommissioning of old exploration wells, led by Nexstep on behalf of six different operators, demonstrates what we can achieve. This unique joint campaign was launched in April 2022 and will be completed by the end of this summer, leaving 35 offshore wells safely plugged and cut off 6 meters below the seabed. The collaboration has resulted in substantial cost savings, a lower environmental burden and valuable insights in how to improve efficiency and effectiveness. In addition, the five largest E&P operators in the Netherlands are running their own campaigns for plugging & abandoning production wells, as well as removing and dismantling platforms. Hence we landed quickly on the title of the Nexstep report this year: “Stepping up the pace”.

Other work streams run by Nexstep together with the oil companies are also beginning to bear results. The qualification of Through Tubing Cementation (TTC) as an acceptable technique for decommissioning wells to the satisfaction of State Supervision of Mines is reaching its conclusion. TTC is more efficient, more sustainable and less costly than the technique currently employed in the Netherlands.

Nexstep also monitors new developments and insights. Take for example our efforts regarding nature-enhancing decommissioning. Inspired by the North Sea Agreement and research by Wageningen University, Nexstep joined forces with Energie Beheer Nederland (EBN) to address this issue. Subsequently Natuur & Milieu, Stichting De Noordzee, Netherlands Wind Energy Association and Element NL were invited to form a joint project headed by EBN. Scientific studies have shown the significant increase in biodiversity around man-made structures on a sandy seabed. Hence the idea that in some cases leaving in place (parts of) infrastructure may conserve and sometimes even enhance the existing biodiversity. The project is ongoing and together we aim to draft a well-founded and broadly supported assessment framework to determine when, and under what circumstances, such nature-enhancing decommissioning is a viable option.

Alongside the positive results that we see emerging from all the campaigns, there are also concerns and challenges. Strict policies and a stringent regulatory regime are not a problem, but uncertainty and inconsistency are an issue. A level playing field is important, also across national and North Sea borders. Uncertainty about the application of Industry Standard 45, the guideline for the decommissioning of wells, has caused delays in the awarding of permits applied for by the operators. Nexstep will therefore step up its efforts to stimulate an open, constructive dialogue between operators, the Ministry of Economic Affairs and Climate and State Supervision of Mines.

Nexstep will continue to hold steady on the course that has brought us where we are this year. We have momentum, let's keep going and step up the pace where we can.



Nexstep Factsheet

Decommissioning in the Netherlands

status December 31, 2022

Operational infrastructure offshore

Gas platforms	Oil platforms	Subsea installations	Wells	Pipeline (km)
104	7	13	350	2848

Suspended infrastructure offshore

Gas platforms	Oil platforms	Subsea installations	Wells	Pipeline (km)
32	8	6	286	932

Decommissioned infrastructure offshore

Gas platforms	Oil platforms	Subsea installations	Wells	Pipeline (km)
28	6	12	821	754

Decommissioned infrastructure offshore 2022

Gas platforms	Oil platforms	Subsea installations	Wells	Pipeline (km)
2	0	0	39	30

Offshore infrastructure forecasted to be decommissioned 2023-2032

Gas platforms	Oil platforms	Subsea installations	Wells	Pipeline (km)
69	10	15	403	1829

Operational infrastructure onshore

Well locations	Processing locations	Other locations	Wells	Pipeline (km)
161	31	98	531	1156

Suspended infrastructure onshore

Well locations	Processing locations	Other locations	Wells	Pipeline (km)
164	5	10	494	984

Decommissioned infrastructure onshore

Well locations	Processing locations	Other locations	Wells	Pipeline (km)
37	11	30	1415	141

Decommissioned infrastructure onshore 2022

Well locations	Processing locations	Other locations	Wells	Pipeline (km)
0	0	0	4	0

Onshore infrastructure forecasted to be decommissioned 2023-2032

Well locations	Processing locations	Other locations	Wells	Pipeline (km)
161	14	75	664	1007

1 Decommissioning & re-use

The Russian invasion in Ukraine in February 2021 has had an enormous impact on oil and gas prices and has resulted in security of supply to be high on the agenda of all European countries. New sources of supply are found through the import of LNG, underground gas storages are now required to have minimum filling levels and a call is made to accelerate national gas developments. In parallel, the decision is made to cease production from the Groningen field in 2023, or in 2024 at the latest in case we will be faced with a severe winter.

A much-heard comment is that decommissioning in the Netherlands is yet to start and that it is shifting year after year. This may be partly true for the decommissioning of installations both onshore and offshore, but certainly not for wells. Of all oil and gas wells that have been drilled both onshore and offshore, the majority (58% and 55%, respectively) have already been permanently decommissioned. And, with regard to offshore installations, several operators have recently awarded larger decommissioning contracts. As a result of this, some 30 platforms are expected to be removed over the next two to three years.

Inspection and cleaning of MLS wells offshore

In 2022, Nexstep's first joint campaign of six operators started with the inspection and cleaning of some 30 mudline suspended (MLS) wells offshore. This summer, the wells will be permanently decommissioned using a vessel instead of a jack-up rig. Because of the clear advantages of combining similar work into one campaign, a second campaign for 50 more MLS wells is being evaluated. Due to the heavier work scope, probably a jack-up rig will be required.

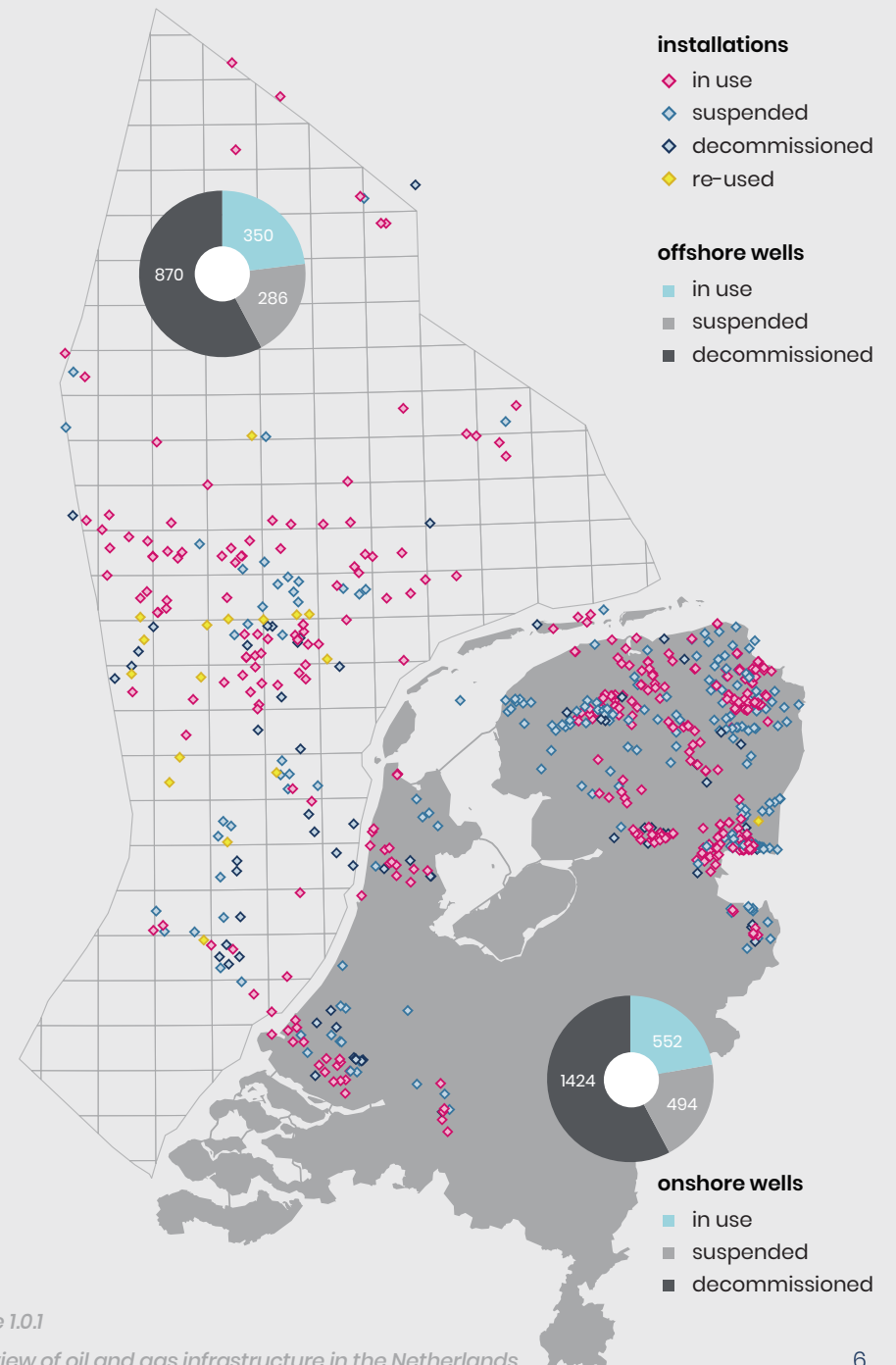


Figure 1.0.1

Overview of oil and gas infrastructure in the Netherlands

Decommissioning onshore installations

With respect to onshore installations, about half of all locations are expected to be decommissioned and restored over the next decade, starting predominantly with the well sites. Over the last three years, NAM has carried out an extensive decommissioning campaign for 76 onshore wells in the northeast of the country, including 44 wells of the Groningen field. These locations are possibly suited for repurposing for green/bio gas production because these already have a connection to the national gas grid.

Re-use of offshore facilities

The re-use of satellite topsides for new offshore gas developments is being realised quite regularly, although this is typically limited to the same operator who operated the facilities initially. Repurposing of offshore facilities for new activities is currently being considered mainly for CO₂-storage. At first the identification and selection of the best suitable reservoirs for offshore CO₂-storage is required. Whether the facilities and/or the production wells are ready for re-use will depend on many factors and it should be avoided that the facilities and/or wells are decommissioned prior to that assessment. In case a period is required to be bridged between the cessation of production and the moment for repurposing, clarity is needed which party will be responsible for the maintenance and insurance of the infrastructure during this intermittent period.

Porthos project

This year is key for the Porthos project to store CO₂ offshore in the depleted P18-A gas field. The Council of State will rule on whether the ecological assessment sufficiently demonstrates that the nitrogen deposition of Porthos does not have a significant detrimental effect on protected natural areas, and whether this will render the necessary permits for the project irrevocable. Pending the final ruling, the Dutch government has published a financial guarantee scheme ahead of obtaining the irrevocable permits.

Hydrogen transport network

Also, attention for hydrogen production is picking up. The Ministry of Economic Affairs & Climate has appointed Gasunie to develop an onshore transportation network for hydrogen since 85% of their existing gas network can be safely converted. Gasunie is also evaluating the options for a new network offshore, collecting hydrogen production from several energy hubs and receiving stations. Alternatively, existing gas pipelines offshore may be used. Both NGT and NOGAT have received certification from Bureau Veritas that these major trunklines are suitable for the transportation of hydrogen.



Some views from MEAC on decommissioning

Kees Hansma

(Director Transition Deep Underground
Ministry of Economic Affairs & Climate)

This year, the subtitle for the Nexstep Report 2023 is 'Stepping up the pace'. Do you support this choice of subtitle?

"Absolutely! I fully support and recognise this subtitle. Nexstep brings together all relevant parties within the oil and gas sector and facilitates smooth cooperation between them. That cooperation should result in the more efficient deployment of resources and eventually considerable cost reductions. The acceleration Nexstep has demonstrated in the decommissioning of infrastructure will remain crucial, over the coming years, too. Gas production in the Netherlands is a mature and declining market. The challenges which Nexstep together with the sector faces, offer opportunities for re-use as well as chances to give new substance to the use of available space for the energy transition. If you want to accelerate those activities, you must also accelerate the removal activities that must first be carried out. And it looks very much as if that acceleration is now taking place."

“Acceleration in decommissioning will remain crucial”

The Decommissioning Security Agreements (DSA) have been in place since 2019. What results of these agreements have you seen, in practice?

"Thanks to these agreements, operators, licensees and the State now enjoy increased certainties and indeed guarantees. The DSA was drafted by operators and other licensees, as a means of organising the timing and the form of financial security. Thanks to the DSA, all parties with a financial interest are secure in the knowledge that the decommissioning costs of the other licensees are covered. On top of this, the Decommissioning Security Monitoring Agreement (DSMA) is an agreement between Energie Beheer Nederland (EBN) and all licensees, as a means to monitor the financial securities and, when deemed appropriate, to advise the Ministry to request additional warranties. The guidelines and procedures offer clarity and prevent other parties from being presented with a higher than expected bill for the decommissioning costs in case one or more licensees would go bankrupt. Ultimately this protection extends to the State, and as such the Dutch tax payer is also protected."

There are concerns within the oil and gas industry about the implementation of the policy that allows pipelines to remain in place unless... [red.: there are special/ good reasons to remove them]. Do you recognise those concerns?

“Yes, I certainly do. Two years ago, when we were working together on this policy, we had to define what we qualified as safe and unsafe. Based on guidance from various advisors, the Ministry of Economic Affairs and Climate decided this spring that two requests for leaving pipelines in place had to be rejected. That rejection was based on, amongst others, uncertainties in the long term. If say in twenty years’ time, the pipelines turn out to be problematic, who is responsible for solving these problems? At present there is still some uncertainty on these issues. We are currently engaged in dialogue with State Supervision of Mines about how to provide greater clarity for all stakeholders on this question and justify what has been established in the regulations.”

The question whether, and if so subject to what conditions, partial dismantling could in fact prove valuable in increasing biodiversity in the North Sea is receiving a great deal of attention. What is the position of the Ministry of Economic Affairs and Climate when it comes to temporarily or perhaps permanently amending the regulations in question, to allow ecological pilot studies to be conducted, following the initial assessment?

“With a view to ecology it may be appropriate, under strict conditions, to leave parts of constructions such as platform foundations behind at some locations. I understand that because of the hard structure of platforms, some platforms house special species of corals, sea-anemones and mussels. Also, that around such constructions marine life is more abundant as fishing is not permitted there. Any amendment to the relevant regulations is a matter for interdepartmental consultation since this does not only affect regulations for mining. In my judgement, partial dismantling will also require a wider public debate. Nevertheless, more scientific research will first have to be conducted into the question whether partial dismantling would generate added value, and if so under what conditions.



And of course the legal aspects will also have to be considered. Natuur & Milieu and the North Sea Foundation are currently carrying out a legal screening procedure; the results of which are due to be announced this summer. Once all the relevant aspects have been examined in that framework, I can imagine that, for instance, the North Sea Consultation may be able to issue recommendations on the basis of which the relevant legislation and regulations could be amended.”

In the opinion of the Ministry of Economic Affairs and Climate, where are the greatest opportunities for the re-use of offshore and onshore infrastructure?

“The Ministry of Economic Affairs and Climate recognises the re-use of oil and gas infrastructure as a promising development; both for the transition itself and for making the industries concerned more sustainable. Onshore, for example, a number of the infrastructure may be re-used for geothermal energy, the storage of hydrogen or realisation of energy hubs like GZI Next. The onshore pipeline network can be used to transport hydrogen, but any such change in use will require higher gas specifications. We will first have to investigate which regulations need to be amended and how the various stakeholders should interact. Offshore, installations and pipelines could be re-used for example for transport and storage of CO₂ or hydrogen. We will also continue to need input from the sector because of its knowledge and experience of systems and processes. In that sense, the term re-use can be applied to more than just the infrastructure.”



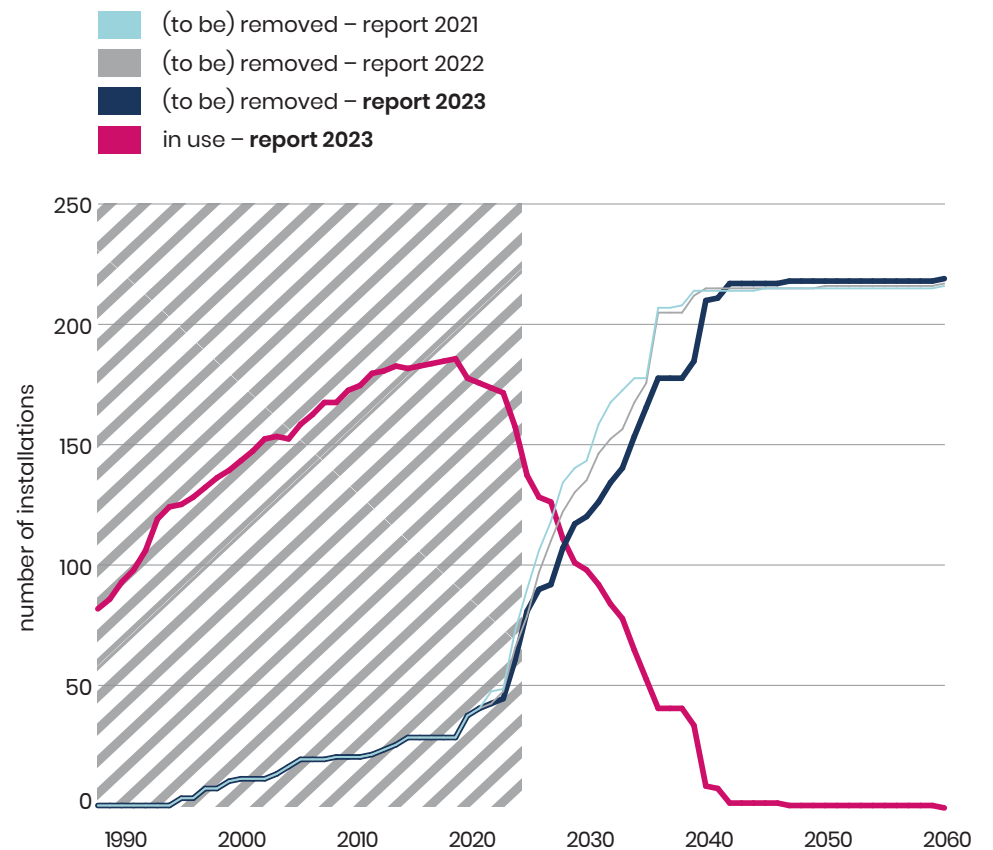
2 Expected decommissioning in the Netherlands

Despite the delays in the forecasted decommissioning activity we have seen in the past years, the years to come promise to be very active. Petrogas has awarded a contract for removal of the P09 oil installation and seven of their Q01 oil installations. For the L07 assets, TotalEnergies is carrying out well plug and abandonment (P&A) and has awarded a contract for removal of ten topsides and nine jackets. Furthermore, Wintershall has extended their contract using the Swift-10 jack-up unit for well P&A and will remove at least six platforms and will be tendering another four platforms, and Neptune Energy has awarded contracts for a well P&A program last spring, which will be followed by the removal of the associated platforms.

The revised Mining Law requires operators to notify the authorities on installations, pipelines or wells being permanently put out of use, and submit a decommissioning plan within one year.

Last but not least, the first joint mud line suspended well campaign is currently on its way. A second campaign to decommission another 50 mud line suspended wells will be reviewed although a campaign of this size will most likely require the continuous utilisation of a jack-up rig for some three years. Then, the immense task remains to decommission some 600 wells offshore and 1,000 wells onshore. This calls for large campaigns of comparable scope and innovative new technologies to further optimise decommissioning.

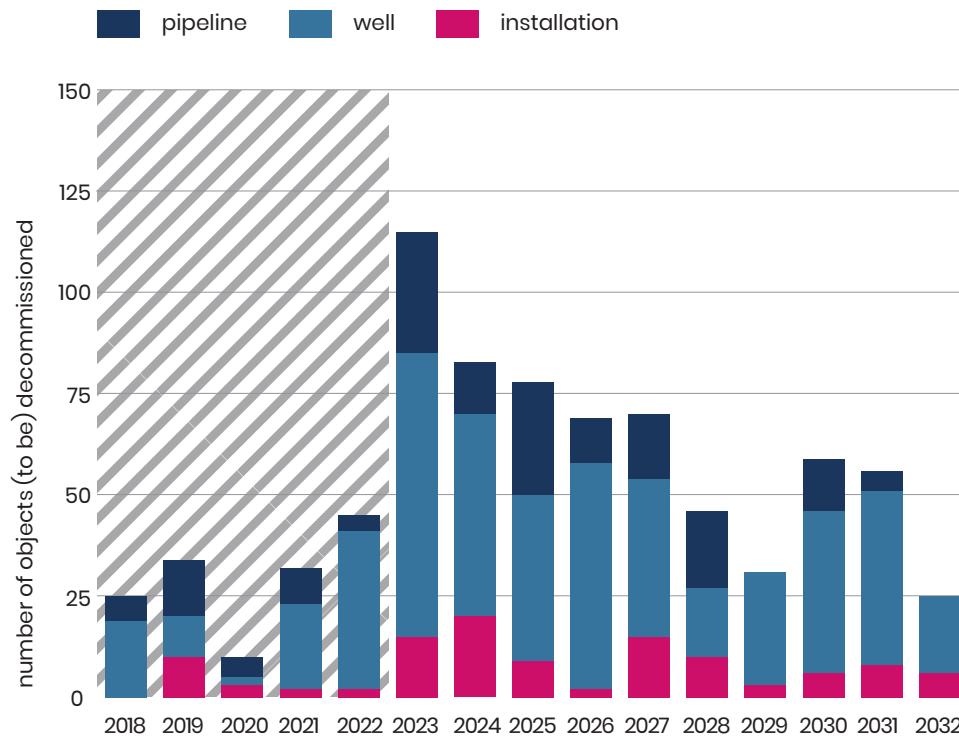
Figure 2.0.1. Number of installed and removed offshore installations



2.1 Total overview offshore & onshore

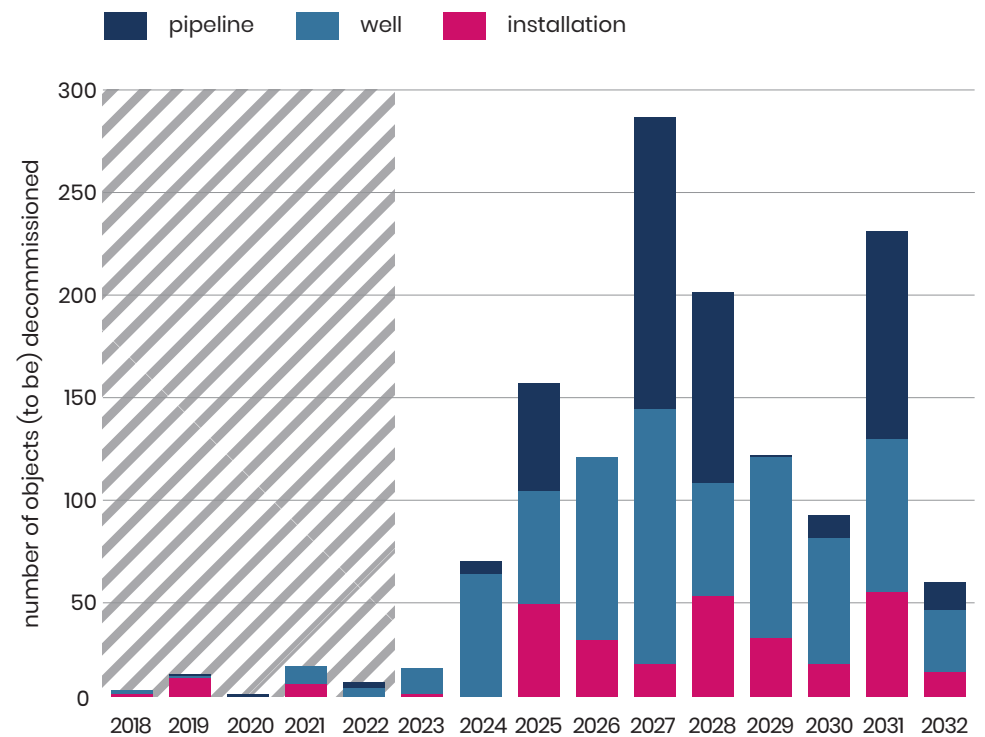
Offshore, we notice that platform removal activity will be fairly high until 2028, except for a dip in 2026. Overall, we do see a delay occurring in later years. Decommissioning of offshore platform wells is forecasted to be rather stable around 35 to 40 wells each year; with a three weeks execution time per well this means that two rigs will be working all year round.

Figure 2.1.1. Realised and forecasted decommissioning - offshore infrastructure



Onshore, the completion of site decommissioning the next two years is forecasted to be very low, with peaks in activity occurring every three years. Well decommissioning, however, shows levels between 55 and 90 wells per year. While offshore decommissioning activities typically do not draw much attention of the general public, the onshore activities understandably do as they are taking place in - so to speak - people's backyards. A dedicated interview regarding the recently concluded onshore decommissioning and restoration campaign by NAM is included on page 26.

Figure 2.1.2. Realised and forecasted decommissioning - onshore infrastructure



2.2 Offshore wells

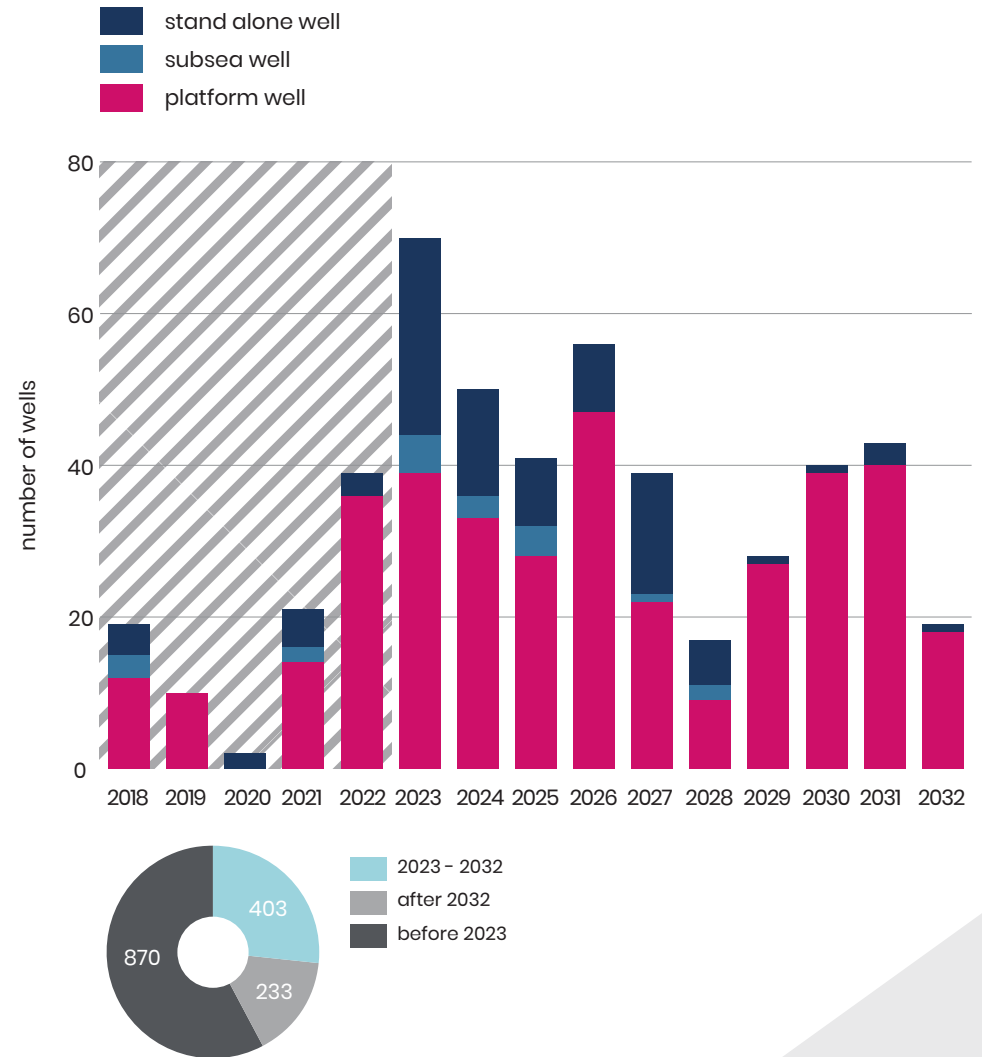
Following a low in 2020, activity on offshore wells is rising to an average of some 40 wells each year. Wintershall, TotalEnergies and Neptune are the main operators that will be active in well P&A work offshore during the coming years.

Nexstep's joint vessel-based campaign

Clearly marked in 2023 is Nexstep's joint vessel-based campaign with six operators to decommission 30 stand-alone wells following the execution in 2022 of the cleaning and inspection of the wells. The mobilisation started in May and the campaign is expected to be completed in September. By executing this work using a vessel, the costs are expected to be reduced by some 30% compared to earlier estimates based on the use of a jack-up rig.

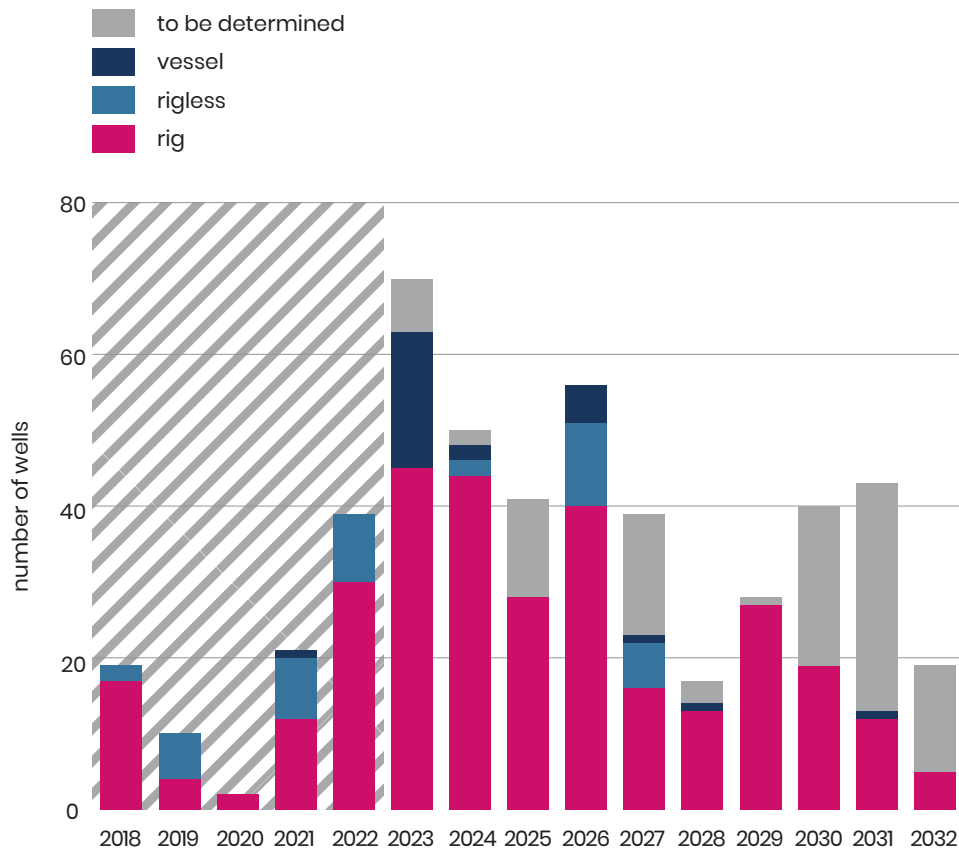
This campaign may be followed by a next campaign to P&A some further 50 stand-alone wells. The scope of work on these wells is likely such that the actual P&A work cannot be executed using a vessel and will require a jack-up rig. The first joint campaign, however, has proved that surveying and inspecting the wells in an early stage is definitely useful to carry out the detailed engineering. This will prevent unpleasant surprises on the status of the wells to a large extent such that the use of back-up plans and delays during execution can be avoided.

Figure 2.2.1. Realised and forecasted decommissioning - offshore wells by well type



In 2021-2022 in total some seventeen wells were decommissioned in a more cost-effective way using a hydraulic unit that was erected over the wells of Petrogas' oil installations Helm and Helder. In general, however, this will not be possible on the smaller platforms because of the limited deck space available.

Figure 2.2.2. Realised and forecasted decommissioning - offshore wells by decommissioning method



courtesy Petrogas

2.3 Offshore installations

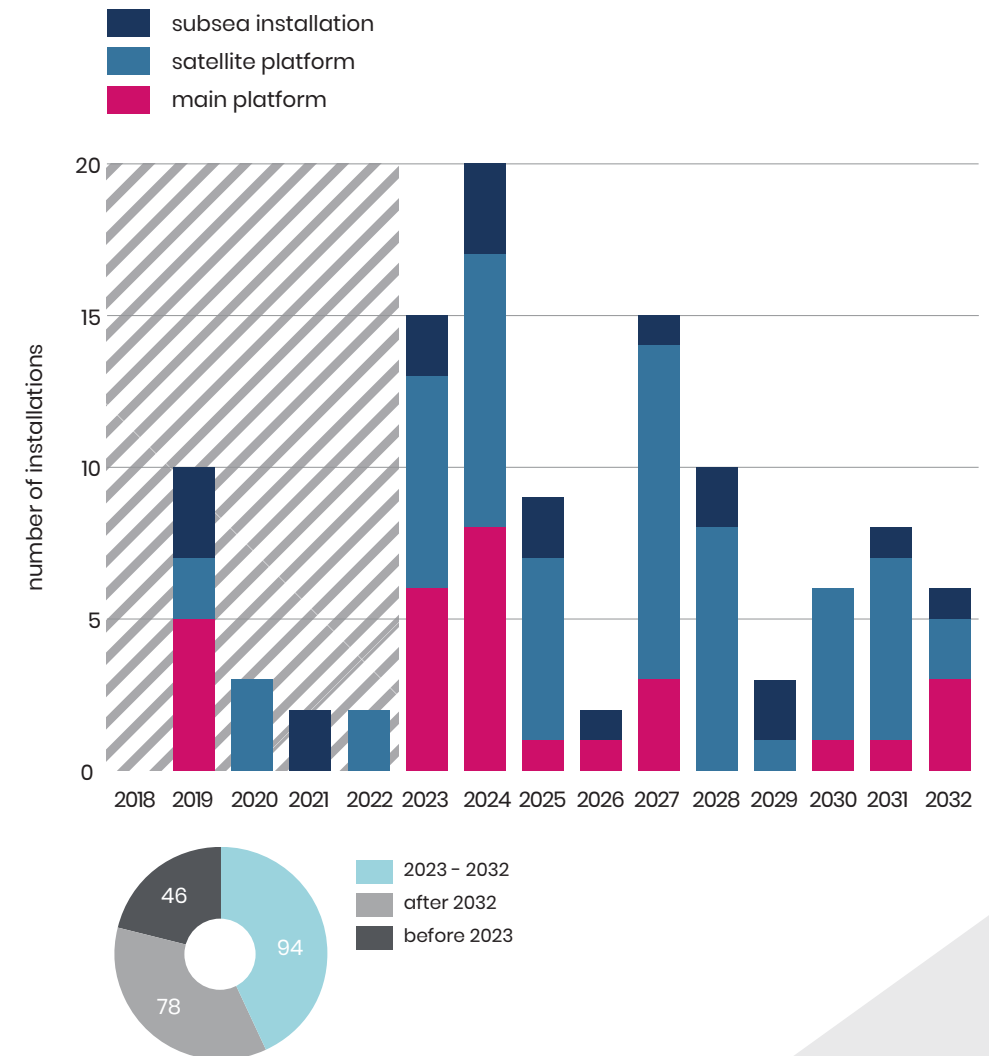
As reported, last year the Q04-A and Q04-B platforms were removed to make room for the windfarm Hollandse Kust Noord. The two platforms are currently being dismantled onshore in Flushing.

The forecasted removal activity for 2023 and 2024 is high with a total of 30 platforms; contracts have been awarded for 23 of these platforms. TotalEnergies has contracted AF Decom to remove ten topsides and nine jackets, dismantling of which will take place in Norway. Wintershall contracted Scaldis to remove six platforms and another three are yet to be awarded. Petrogas has awarded the removal and dismantling of eight of their oil platforms to Heerema. Neptune Energy is expecting to award the removal of two platforms this year. The P11-E satellite of ONE-Dyas is foreseen to be removed and reserved for re-use, as the platform was designed for this already when it was installed in 2016.

Development

Besides removal also some new platforms are being developed. Petrogas' minimum facilities satellites A15-A and B10-A have been installed in May this year and ONE-Dyas is planning on developing the N05-A field with a platform which will be powered by a nearby German windfarm to limit the carbon footprint.

Figure 2.3.1. Realised and forecasted decommissioning - offshore installations by type



The forecasted activity shows highs and lows. In the Netherlands, currently two major yards and two new entries are now active in the dismantling of offshore installations and disposal of waste materials. Typically, around 98% of the materials, mainly consisting of steel, can be recycled. To identify any potential capacity issues, insight is required into the storage and handling capacities of the onshore dismantling yards versus the expected supply.

A study is being carried out into possible alternative decommissioning techniques. This is especially of interest for the larger topsides, as they may require the use of larger crane vessels, which are heavily drawn upon by the very active offshore wind sector. A detailed assessment is required on the question which of the platforms are installed as single lift and which, probably older platforms, have a modular design due to the limited lifting capacity of the earlier versions crane vessels.

Figure 2.3.2. Realised and forecasted decommissioning - offshore platforms weights

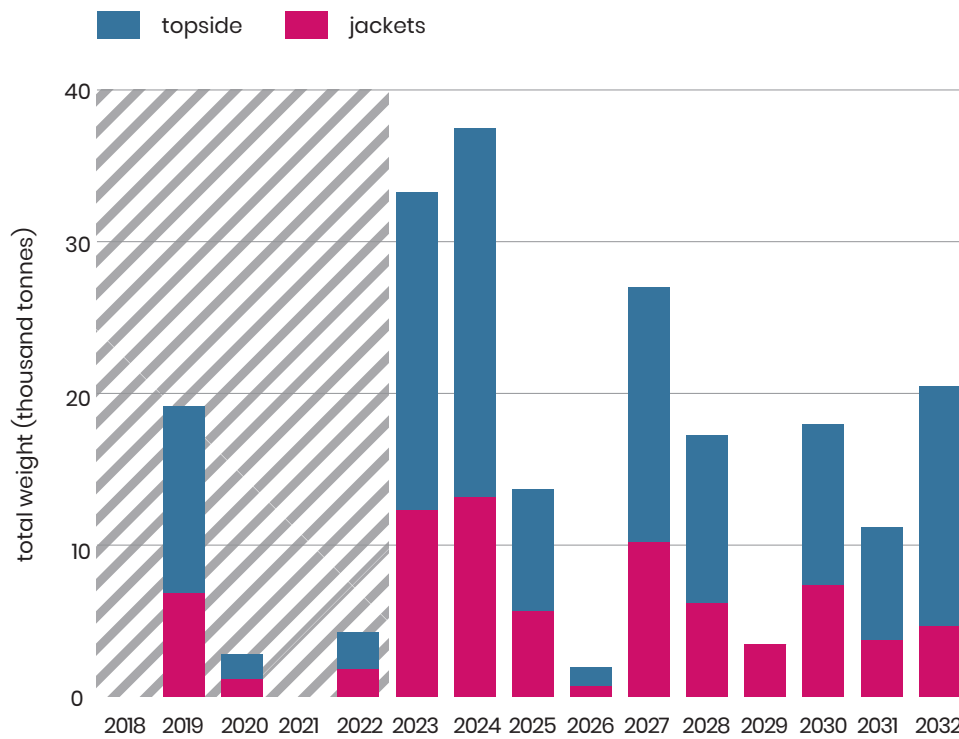
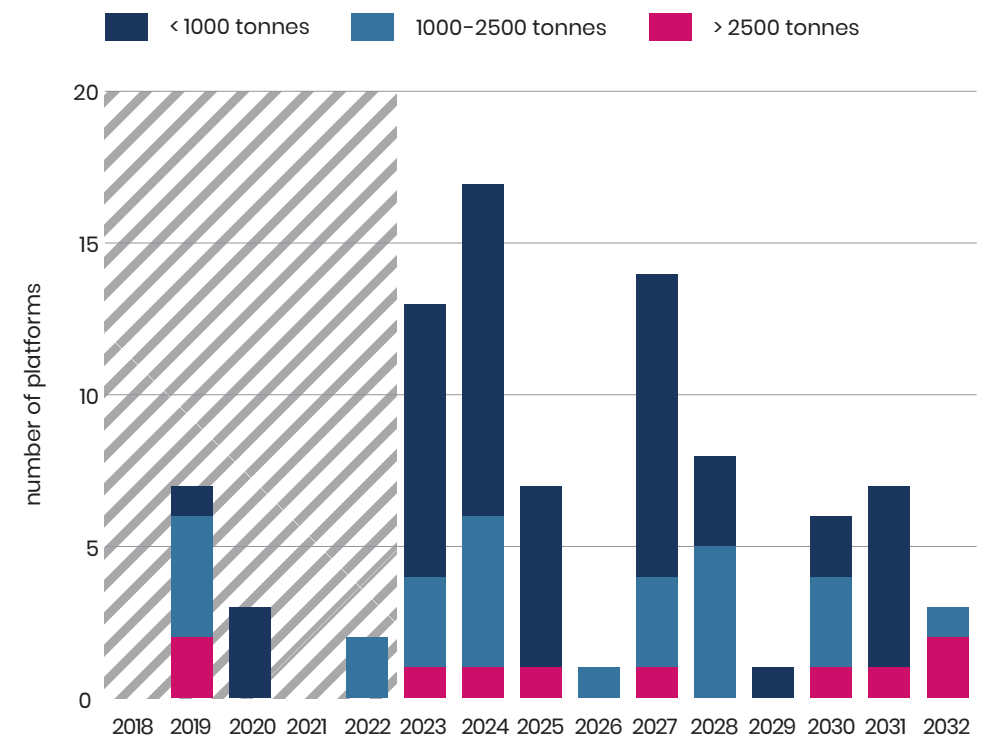


Figure 2.3.3. Realised and forecasted decommissioning - offshore platforms by heaviest module weight



Nature-enhancing decommissioning

When jackets are removed and taken to shore for dismantling, marine organisms that have attached themselves to the jacket during the production phase are destroyed. Various scientists, like Joop Coolen from Wageningen University & Research, are studying the biodiversity on and around such man-made structures. Biodiversity within the proximity of oil and gas installations is further protected by the 500-metre safety zone around the installations, which is established to restrict (fishing) vessels entering the area.

Biodiversity research programmes

Several studies have mapped biodiversity on and around man-made structures. Since 2014, the independent scientific programme INSITE studies the effect of such infrastructure on the ecology of the North Sea.

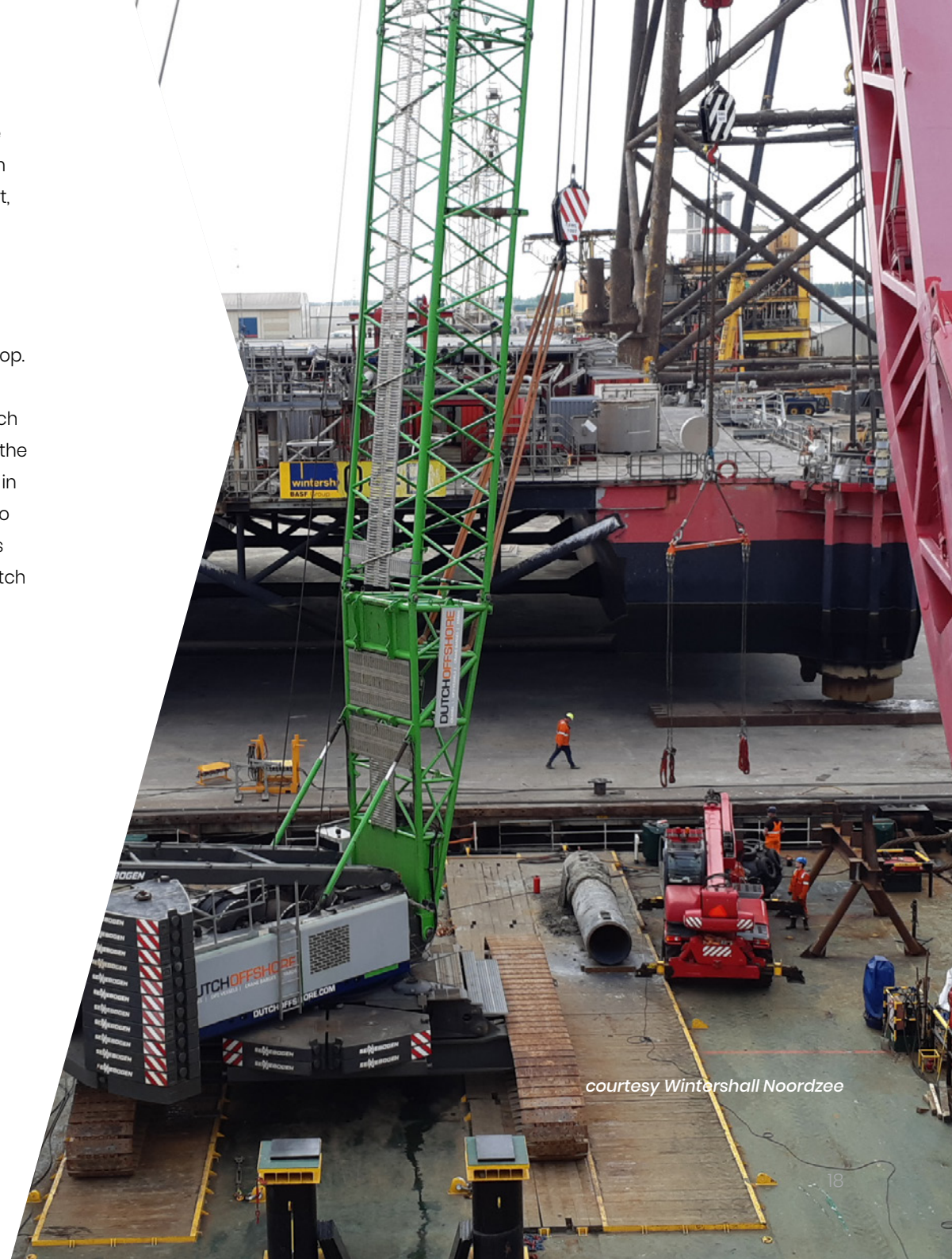
Some 98% of the Southern North Sea currently consists of a sandy and muddy seabed. In the past, a greater proportion of hard substrate such as oyster beds is known to have supported greater biodiversity in the marine ecosystem. Similarly, man-made structures such as offshore platforms, pipelines and renewable energy installations like wind turbines are known to have a role in increasing biodiversity locally, but further research on the wider effects on the North Sea has, until now, been limited. From 2010 to 2015 the science-based programme Living North Sea Initiative (LINSI) explored alternative approaches of decommissioning, in order to restore a healthy and rich North Sea ecosystem. One target was to create solid social support from NGO's, government bodies and oil and gas operators.



courtesy Wintershall Noordzee

In 2018 a follow-up pilot project was launched by Neptune Energy and EBN to study the development of biodiversity on two disused offshore jackets for a period of at least ten years. Unfortunately, the project was ultimately cancelled due to a lack of solid support, liability issues and challenging financial conditions. The jackets were removed in 2019 together with the topsides.

Areas with oyster grounds have disappeared due the extensive fishing with beam trawlers. Nowadays, offshore installations provide a safe haven for marine life to develop. The question is whether the industry should remove the installations when they are no longer in use or leave them in place to preserve the ecosystem. In a common approach in the US part of the Gulf of Mexico, obsolete oil and gas structures can be donated to the so-called Reef Programs. The main Reef Programs of Louisiana and Texas, established in 1986 and 1991 respectively, have created over one hundred artificial reefs from over two hundred decommissioned platforms. Scientist and professional diver Joop Coolen has been able to study and shoot footage of the abundant biodiversity on and around Dutch offshore installations.



courtesy Wintershall Noordzee



Ewout van Galen



Rob van Tilburg

Nature-enhancing decommissioning

as a boost for biodiversity

On the map of the European Marine Strategy Framework Directive (MSFD) the Dutch North Sea is turning dark red. As a consequence of industrial activities, biodiversity is declining and habitat types are being lost. At the same time there are indications that artificial, hard substrates can serve as breeding grounds for the redevelopment of biodiversity. Rob van Tilburg, Programme Director at Natuur & Milieu and Ewout van Galen, Head of Programmes at Stichting De Noordzee have come together to talk about the relationship between biodiversity and infrastructure. In other words, 'nature-enhancing decommissioning' and the value of creating knowledge, frameworks and commitment.

'Nature-enhancing decommissioning' is a relatively new term that refers to the partial dismantling of the infrastructure for offshore wind, oil and gas. Over the years, new biodiversity has been created around parts of this infrastructure. At the end of the lifecycle of these elements, removing not the entire infrastructure, but only part of it, may be a way of preserving the newly established biodiversity. According to this concept, the jacket of a gas or oil platform or the foundations of a wind turbine can be left in situ. It is then up to the owner to

remove all the other parts. However, OSPAR, the convention entered into by the North Sea countries to protect the marine environment in the northeastern section of the Atlantic Ocean, specifies that all unused infrastructure on the North Sea must be fully dismantled.

Importance of biodiversity

The intensive use of the North Sea for wind turbines, fisheries, sand, oil and gas extraction, shipping, underground CO₂-storage and plastic pollution is increasingly weakening the ecological quality and reducing the resilience of the North Sea. Van Tilburg explained, "The impoverishment makes both onshore and offshore populations vulnerable to diseases and disruptive external influences. Conversely, diversity of species results in a resilient system. Over the past few years, we have noticed that our oil and gas platforms and wind turbines provide valuable starting points for the establishment of diverse nature. That in turn has led to the assumption that the conditions around these platforms could be favourable for creating and preserving biodiversity. This effect is reinforced by the fact that the no seabed disruptive activities are permitted in a radius of 500 metres around such platforms. That lack of disruption is crucial for the recovery and development of underwater nature."

“It is essential that all stakeholders on the North Sea recognise nature enhancement as a fundamental value”

Broadly supported framework

The development of biodiversity around infrastructure elements raises the question whether it is worthwhile to protect the nature created in those environments, in specific cases. Van Galen continued, “Our first hope is that in line with the undertakings in the North Sea Agreement and the Paris Climate Agreement, as few new platforms as possible will be added, and as much of the infrastructure as possible will be decommissioned. However, wherever artificial surfaces can make a positive contribution to the establishment of biodiversity, we wish to conduct further research into the type of natural value around platforms and what potential that value offers. Current research into these aspects is still in the early stages. For that reason, together with Nexstep, Element NL, Natuur & Milieu and the Netherlands Wind Energy Association, we signed up to the ‘Nature-enhancing Decommissioning of Assets in the North Sea’ project, initiated by Energie Beheer Nederland (EBN). The aim of this project is to develop a joint framework which determines whether, and if so when, the partial dismantling of platforms is an option and according to precisely which conditions. For example the ecological, legal, financial conditions and the technical risks as well as the issue of governance – in other words, who acquires ownership of the remainder of a platform, who is responsible for maintaining the remains and who will take charge of the safety aspects?”

One step beyond tailor-made

There is no simple answer to the question which areas are eligible for partial dismantling. Van Tilburg explained, “Nature may have taken hold around every platform, and that could give grounds for partial dismantling. The first step therefore is to determine for every platform whether from the point of view of nature, it is desirable or necessary to consider and to implement partial dismantling. In other words, every case is a tailor-made situation that must not be permitted to create a precedent.” In Van Galen’s words, “If in the future specific cases are actually selected for partial dismantling, it would be useful if the cost savings achieved by the oil and gas companies as compared with complete dismantling and removal were to be made available for nature conservation and

enhancement. That would then be one of the ways in which the oil and gas industry could contribute to the transition process in which this sector also has a role to play. It is crucial that the sectors involved recognise and indeed be accorded the overall responsibility to give something back to the nature they have used. After all, the North Sea Agreement calls upon the initiators, starting now, to not only develop the infrastructure in line with legislation, but in fact to go one step further. In other words, given the already recognised situation of ecological decline, everything that happens on the North Sea must on balance have a positive impact on nature.”

Race to the top

It could be argued that the biodiversity surrounding the platforms has emerged by accident; after all, when the structures were designed, nature conservation or enhancement were certainly not considered as a criterion. Today’s knowledge and the expected outcomes of scientific research reveal opportunities for the future. Van Tilburg explained, “In certain areas you could truly give nature a kickstart by designing the infrastructure to be optimally nature enhancing, over and above the regulatory requirements imposed on the design. It is essential that all parties recognise nature enhancement as a basic value, and that it be taken as an operating principle in all licencing regulations and governance initiatives we undertake. In that way, the initiators understand exactly what is expected of them, and you can encourage innovation within the companies involved. The most innovative parties will outperform their colleagues and competitors and hence enjoy the commercial benefits. The result will be a race to the top, with ever improved forms of nature conservation and nature-enhancing construction. What would really help is a commonly shared commitment to re-establish the healthy status of the North Sea.”

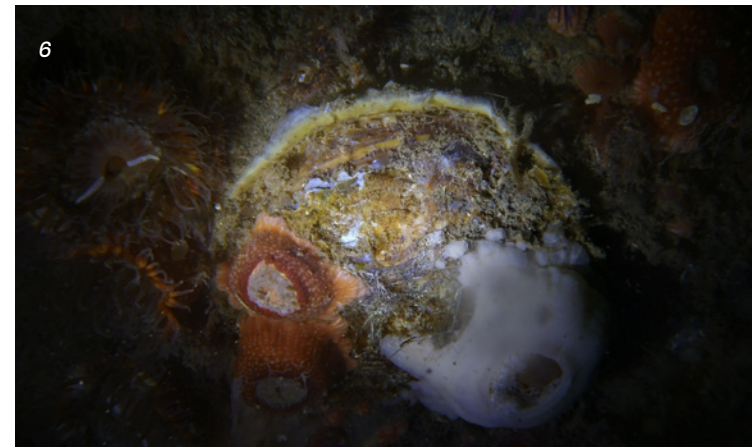
Broader cooperation

If it were up to Van Tilburg and Van Galen, as well as commitment, scientific research and cooperation between all stakeholders involved would form the basis for activities on the North Sea. Van Galen, "To start with, we all need to be clear about what we are talking about. Scientific research and a North Sea wide approach are essential. Only then can you start with governance, the standardisation of criteria, the drafting of monitoring guidelines, the establishment of control locations and the distribution of space on the North Sea, all within the existing ecological boundaries. Once we recognise the value of partial dismantling, we can start a broader cooperation with all parties active on the North Sea, including stakeholders from the wind industry, fisheries and shipping. In that phase, we will actively seek cooperation with the Ministry of Economic Affairs and Climate. The initial studies we are currently conducting are the starting point for placing the elements of the North Sea Agreement on the agenda, before finally arriving at real decisions."

Looking forward

The EBN project 'Nature-enhancing Decommissioning' is a key element in setting the contours of the overall development, in which major steps have already been taken in cooperation with all parties. Van Tilburg explained, "For me it is positive to see so much willingness among the users of the North Sea to search for areas in which our interests converge, and how those interests can be tackled together. It is my hope that on the basis of the outcomes of this project, in five years' time, we will have developed a joint framework that has already been ecologically tested in a pilot form. That framework could be valuable in making the right choices and providing an insight into which legislation needs amending, and identifying the appropriate governance." Van Galen concluded, "The most important aspect of the whole story is perhaps that all the stakeholders involved must feel a love for the natural aspects of the story, and recognise their shared responsibility for a healthy North Sea, by accepting that a healthy North Sea is the only real basis for the proposed operations."





Pictured: Breakwater anemone (1, 4)
Velvet swimming crab (2), Flat oyster (3, 6),
Gargoyle polyp (5), Mussel (7)

Mentioned species need hard substrate. Photos were taken at wrecks and a granite stone field in the Dutch North Sea.

2.4 Offshore pipelines

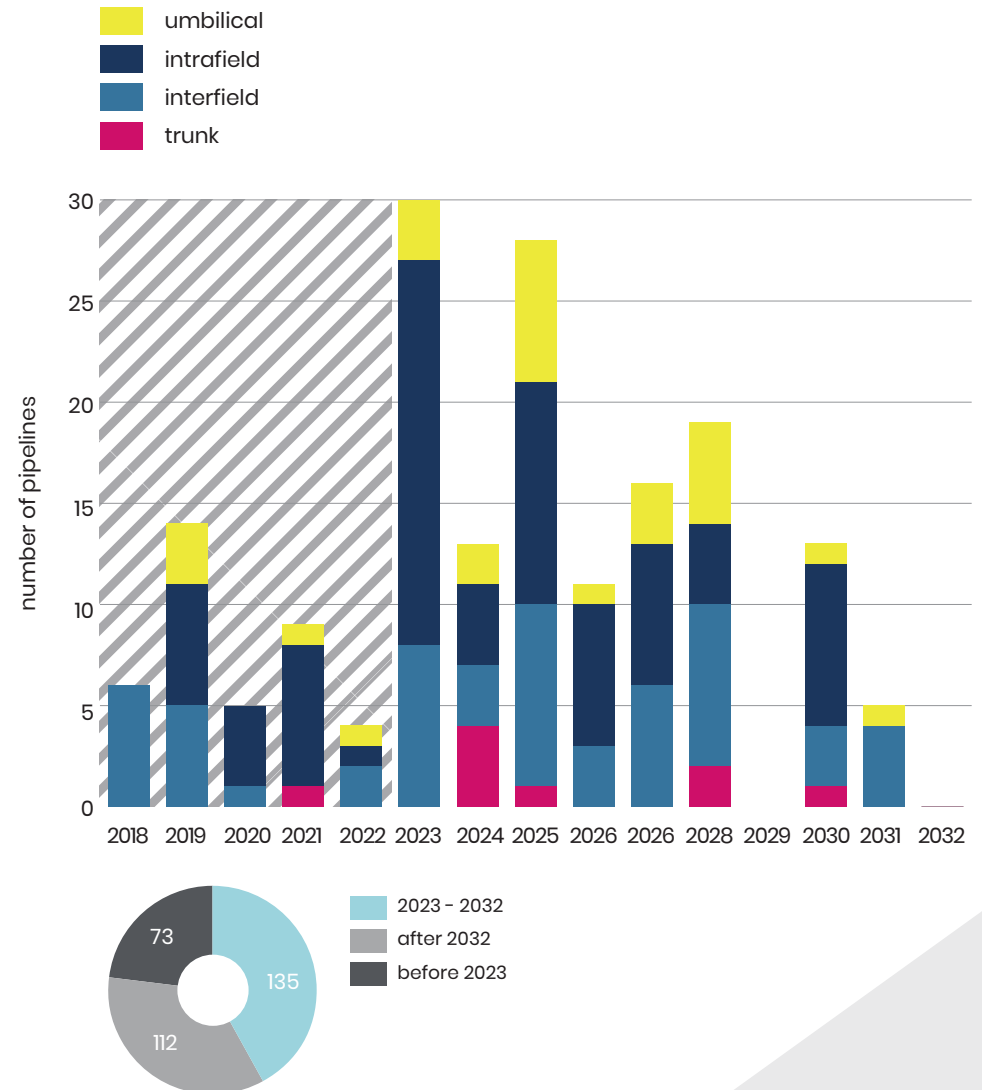
In total, the Dutch Continental Shelf contains some 3,800 kilometres of pipelines, which are used for the transportation of (mainly) natural gas and oil. Diameters up to 6 inches are typically used for chemicals and controls. Diameters for gas and oil pipelines typically vary from 6 inches for small interfield pipelines to 36 inches for the main trunklines, which transport natural gas to shore. Pipelines up to 16 inches in diameter are typically buried in the sea floor while pipelines larger than 16 inches in diameter are left on the seabed.

Procedures

When pipelines are taken out of service permanently, a notification is sent to the authorities together with a proposal on the recommended method for decommissioning. For this a comparative assessment has been introduced to compare the options to remove (parts of) a pipeline or to leave a pipeline in place, addressing all aspects from safety, environmental impact, emissions, interference with other parties active at sea and costs.

The formal policy is to decommission pipelines in-situ, that is leaving the pipelines behind in a safe and cleaned state in such a way that they cause no restrictions or risks to other users of the sea. Therefore, any contamination needs to be below the legal limits. For instance, the hydrocarbon content of the collected flush water should not be above 30 parts per million. The pipelines will be disconnected to enable removal of the connected installation(s). In case pipelines are causing restrictions or risks to other users of the sea the Minister of Economic Affairs & Climate can decide that the pipelines, or sections thereof, need to be removed.

Figure 2.4.1. Realised and forecasted decommissioning - offshore pipelines by pipeline type



Continuous monitoring

During the oil or gas production phase, pipelines are monitored on a regular basis to ensure the physical integrity and for their location, burial state and damages to avoid possible harm to other users of the sea. If required, corrective measures are taken. When pipelines are left behind after the production phase they still require to be monitored for safety on a regular basis. The frequency, annually or every so many years, will be determined on a risk basis, depending on the stability of the seabed and historic surveys during the production phase.

Operating companies are often working internationally and will, at some point cease to exist or no longer be active in a specific region. Therefore, the monitoring obligation and possible corrective measures require to be secured for the long term. This could, for instance, be arranged via an existing or newly formed organisation funded by the operating companies. This organisation could take-over and assume the monitoring obligations and corrective actions from those companies ceasing to exist or leaving the Netherlands, for instance against a predetermined lump sum.

Re-use for hydrogen and CO₂

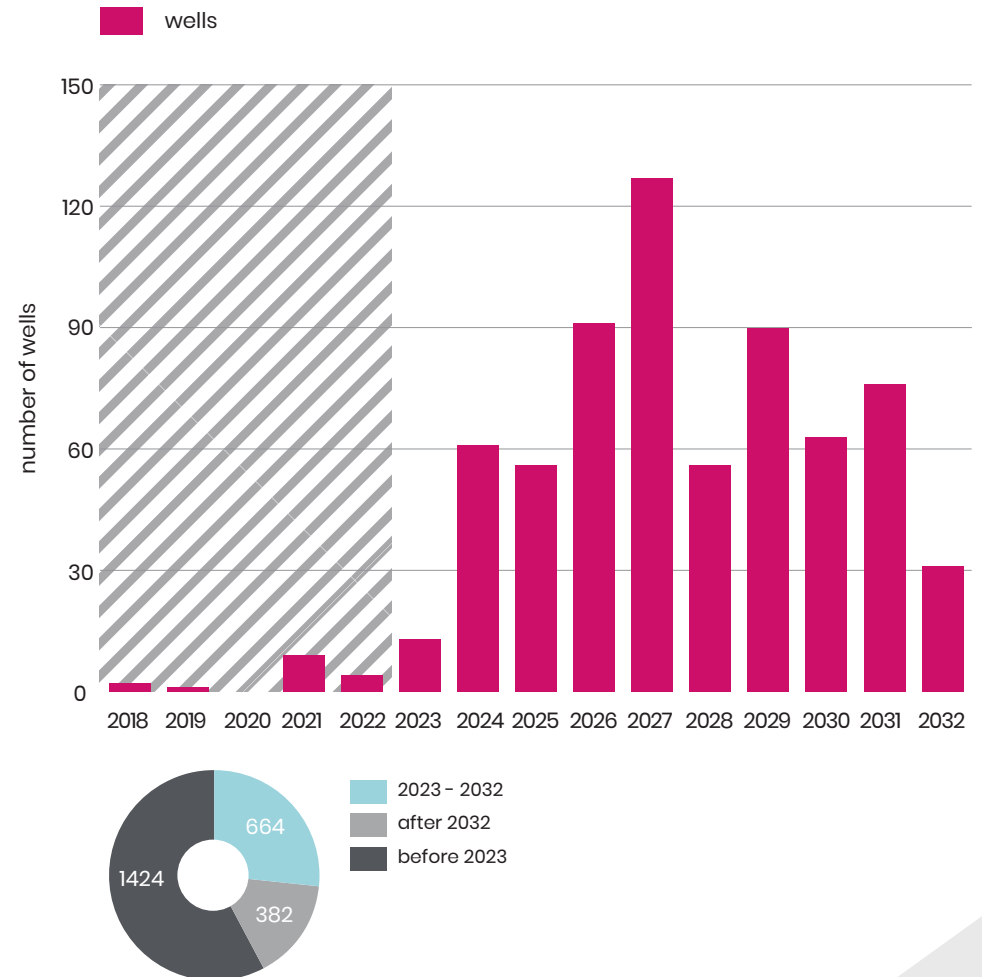
In some cases, re-use of the pipelines is possible. With the expanding development of offshore wind and the growing interest in (green) hydrogen as alternative sustainable energy source, pipeline operating companies like NGT and NOGAT have already received certification from Bureau Veritas to use their trunklines for the transportation of hydrogen. During the transition to transport pure hydrogen, the comingled transport with natural gas would be possible. However, for the transport of hydrogen via the onshore pipeline grid the gas specifications will need to be adjusted to cater for the increased hydrogen content.

Another promising re-use option for the offshore pipelines is transportation of CO₂ for underground storage. The Aramis project in particular is developing an open access offshore CO₂ transport system with a capacity of 22 megaton per annum. The offshore trunkline will be connected to several offshore depleted gas fields operated by various Dutch E&P companies.

2.5 Onshore wells

NAM has started a large onshore campaign in 2020 to decommission 76 wells, but the number of wells actually reported decommissioned in 2020–2022 is very low. Although the wells are successfully plugged downhole, the final cut and removal of the steel casings, to a depth of at least three metres below ground level, is often done after a three-month monitoring period and executed as part of the site restoration works. The final completion of the decommissioning can thus take several years from the start; this is shown by the expected increase in numbers as of 2024. This campaign also included the first well clusters of the Groningen gas field, which will be permanently closed-in this year.

Figure 2.5.1. Realised and forecasted decommissioning – onshore wells





René Jansen



Johan Atema

Decommissioning & Restoration campaign NAM

pioneer in new industry

For a long time it was seen as a necessary evil, but slowly but surely it is becoming an honourable core activity; the safe, efficient and cost-effective decommissioning of wells. In response to the massive challenge facing the Netherlands over the next few decades – the decommissioning of in total some 2000 wells – NAM, in close consultation with local residents and municipalities – has been implementing a D&R campaign, over the past three years. Johan Atema (Director of NAM) and René Jansen (General Manager Decommissioning & Energy Hubs) talk about the technologies employed and the lessons learned as well as the sound of twittering birds on the worksite.

As operator for the vast majority of onshore wells in the Netherlands, NAM recognised the need and the responsibility to develop a strategy that makes it possible to rapidly, safely and cost-efficiently decommission both simple and complex wells, while generating the least possible nuisance. Many years of preparation culminated in the implementation of the Decommissioning and Restoration campaign (D&R) which started in February 2020 and concluded in March 2023. In the provinces of Overijssel, Drenthe and Groningen, using a series of

new technologies and strategies, NAM decommissioned 76 wells, of which 43 were simple and 33 complex. Throughout these decommissioning activities, NAM focused its attention on cooperation with business partners, concern for the surroundings, the deployment of innovative techniques and cost savings. The results are highly promising.

New technologies

For decades, the decommissioning of wells involved large drilling rigs and noisy and polluting diesel powered generators, all transported to the worksite on heavy trucks. As René Jansen explained, "The D&R campaign has shown that we are capable of decommissioning practically every type of well using a so-called hydraulic workover unit (HWU). The HWU comprises a series of modular elements – a sort of giant-sized Lego blocks – that can be assembled and relocated far more easily than a large drilling rig. Furthermore, the HWU can be simply plugged into the electricity supply. This meant that during this campaign, 71% of the wells could be decommissioned using electricity. The overall result is lower emissions and less noise production.

Moreover, thanks to the use of the HWU, far fewer transport movements were needed; relocating this system is four times faster than relocating a conventional drilling rig. As well as more flexibility, the overall outcome was considerable time savings. A reduction in the number of transport movements at the same time led to increased safety for the operators, and for the surrounding environment. Whereas we rely on the HWU for decommissioning large, complex wells, when it comes to sealing smaller, simpler wells, we use the P&A-on-a-wire technology. This technology, that is constantly being further improved, enables us to work even faster, more efficiently and more safely.”

Communication with local residents

Taking account of the wishes of the local residents and the surrounding environment was a clear spearhead for NAM within this campaign. Johan Atema explained, “23 days after we had started work at one location, a local resident asked one of the operators when they expected to start work. The question itself spoke volumes. Unavoidably, onshore wells are sometimes located close to inhabited areas. With that in mind, before we started, we mapped out the potential causes of nuisance and sought ways of limiting that nuisance, as far as possible. All our efforts were conducted in consultation with the municipal authorities and local residents; these consultations furthered our understanding of those aspects we needed to take into account. On top of this, NAM employees visited the local residential areas to hand out flyers and to engage in dialogue with local residents. We also invited residents to become members of a WhatsApp group, via which they were able to submit their questions. Senior staff on the worksite were always available and willing to answer any questions. The greatest benefit of this campaign is that the local residents experience little or no nuisance from the work. At the worksite itself, you can even hear the twittering of the birds, so to speak.”

Atema:

“**We face the huge challenge of decommissioning 900 onshore wells, over the next few decades**”

Global industry

The successful completion of the D&R campaign offers clear perspectives for further development. Atema continued, “The next step is to continue the process of professionalisation. In other words, introducing improvements and working increasingly rapidly and more cost-efficiently. The advantage of working at onshore locations is that you have the space and the opportunity to try out new strategies and to allow interested onlookers to observe. In the future, we also hope to work more alongside local contractors, and to investigate the possibilities of working with profit sharing principles. There are still many wells that have to be decommissioned, both onshore and offshore. We see opportunities for creating new specialist businesses, and turning the decommissioning process into an industry that can be deployed as an export product. Along similar lines to the dredging industry, which itself was also born out of necessity.” Jansen added, “It is always worthwhile, wherever possible, to work in partnerships. In other words, to develop and implement ideas, together, to jointly tackle any problems that arise and to share the lessons learned. Via Nexstep, for example, we were able to share our learnings about the Through Tubing Cementation campaign (TTC). In the same way, we are keen to share the knowledge we have acquired and the lessons we have learned in implementing the D&R campaign, with operators and other interested parties.”

Honourable activity

While the initial leg of the D&R campaign has been carried out onshore, NAM has the ambition of also deploying the technologies and strategies used offshore. As Jansen explained, “To start with, we will be continuing the campaign onshore in 2024, by introducing a series of improvements, in terms of both implementation and safety. In the new campaign, for example, we will be working with three instead of two different units, in order to further increase efficiency.” Another improvement point relates to safety. In Atema’s words, “During the initial campaign, one of the things we discovered was that the safety guidelines of the contractors differ from our own. To safeguard everyone’s safety, we plan to develop a ‘common safety framework’. It is also worth mentioning that in addition to the more or less expected theoretical and practical benefits, the campaign also generated an unforeseen moral victory. Both within our own echelons and at the other companies involved, we observed the emergence of a clear sense of pride; together, we were working on something that until recently was viewed as a project no one wanted to get involved in. However, thanks to the excellent cooperation and positive outcome, decommissioning today feels very much like an honourable activity. This new boost is a welcome twist in the massive challenge facing us, over the next twenty years.”

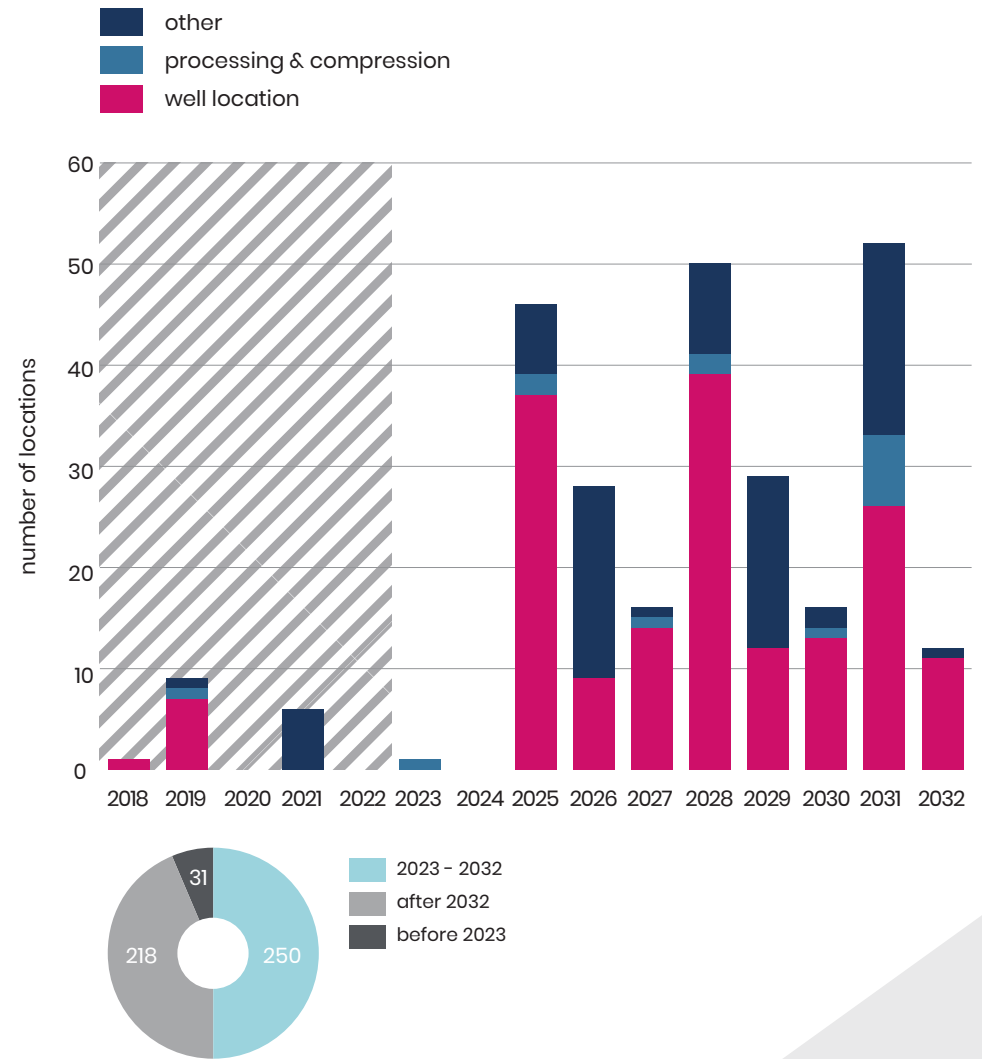


courtesy NAM

2.6 Onshore locations

As onshore well and processing locations are already connected to the national grid for natural gas and in use for energy production, they are potentially very well suited for development of biomethane. For biomethane development, an essential precondition is that sufficient feedstock is available within an acceptable radius. Next to that, the site must be large enough or be suitable for extension. For this alternative use, it might be required to change the zoning plan for the area and to obtain the required permits. This is a process in which all stakeholders, including residents and local government, should be involved. It requires continuous investment in mutual relations, and open and transparent communication to gain commitment and support.

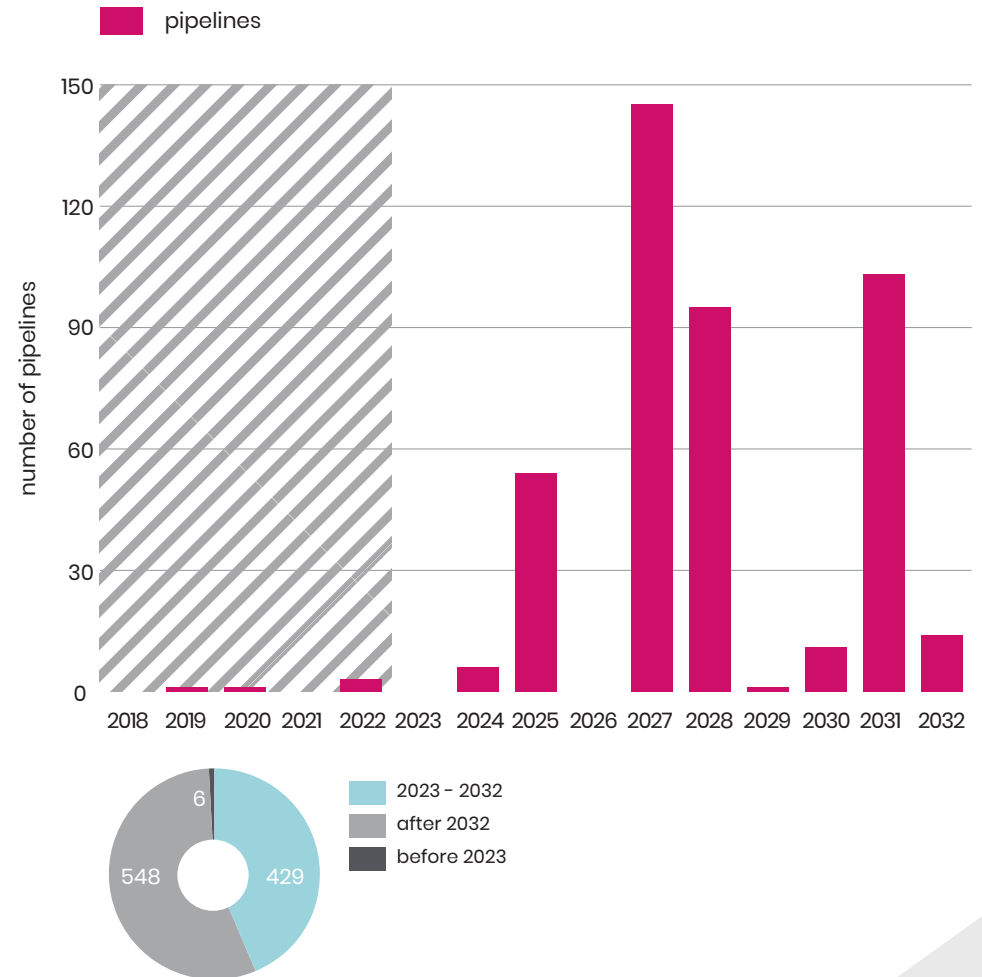
Figure 2.6.1. Realised and forecasted decommissioning - onshore locations by locations type



2.7 Onshore pipelines

The principal method for the decommissioning of onshore pipelines is to remove the pipeline and restore the trajectory to its original state, unless otherwise agreed upon with the respective land owner(s). Like onshore locations, the onshore pipelines are ideally suited to be re-used for the transportation of other fluids. Also, some pipelines may be suitable for energy storage using compressed air. Once a pipeline is re-used by another party, the liability for maintenance, monitoring, repair and ultimate decommissioning will need to be transferred to the new owner.

Figure 2.7.1. Realised and forecasted decommissioning - onshore pipelines



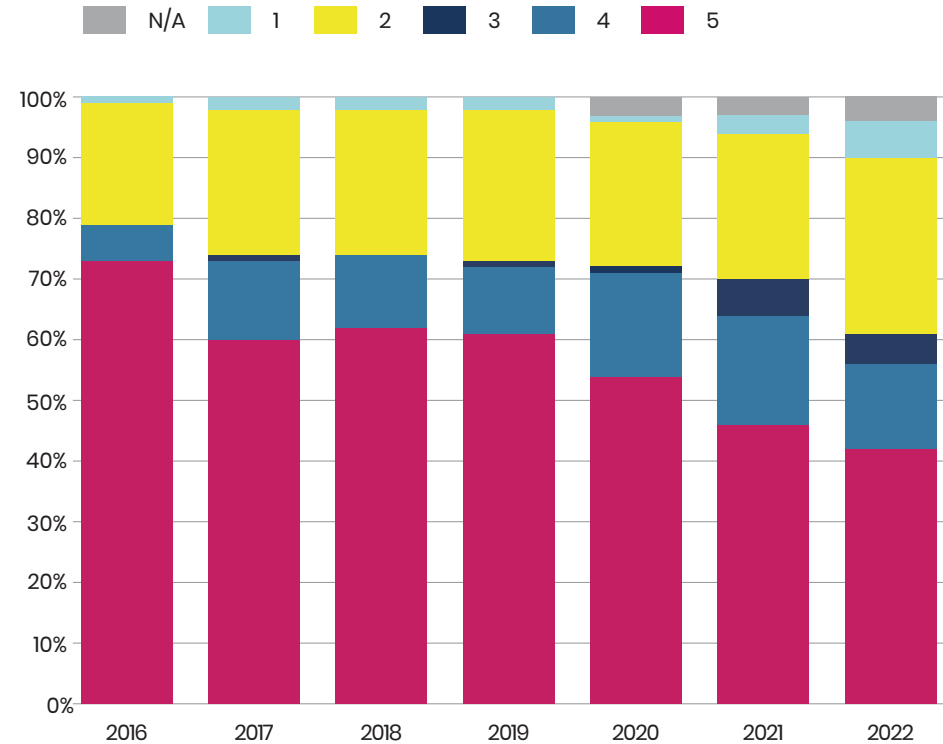
3 Expected offshore decommissioning cost

With the execution of decommissioning nearing, cost estimates are becoming more and more accurate. Like in the UK, there is a shift over time from predominantly a low certainty Class 5 (ASTM) estimate towards classes with higher certainty. A more detailed work scope typically also results in an increase of the cost estimates. As such, it would be misleading to compare current cost estimates with those from earlier days. It is more insightful to state a cost estimate in combination with its uncertainty. A Class 5 estimate for the feasibility phase typically has a confidence interval with a low estimate of -20 to -50% and with a high estimate of +30 to +100% around the deterministic cost estimate. For an approval of expenditure, typically a Class 1 estimate is required, with a typical low estimate confidence interval of -3 to -10% and a high estimate of +3 to +15% around the deterministic estimate.

Financial security

Since 2019 a new system for financial security has been introduced for offshore licences by the operators, in consultation with EBN and the Ministry of Economic Affairs & Climate. A Decommissioning Security Agreement (DSA) is set up between the operator and other licensees, in order to arrange the timing and form of financial security that is to be re-assessed annually. This DSA ensures that the operator can successfully charge the decommissioning costs to the other licensees. Besides the DSA, a Decommissioning Security Monitoring Agreement (DSMA) is arranged between EBN and all licensees to safeguard the financial securities. EBN monitors and advises the Ministry of Economic Affairs and Climate accordingly. Since the end of 2021 also DSAs and DSMAs are introduced for onshore licences.

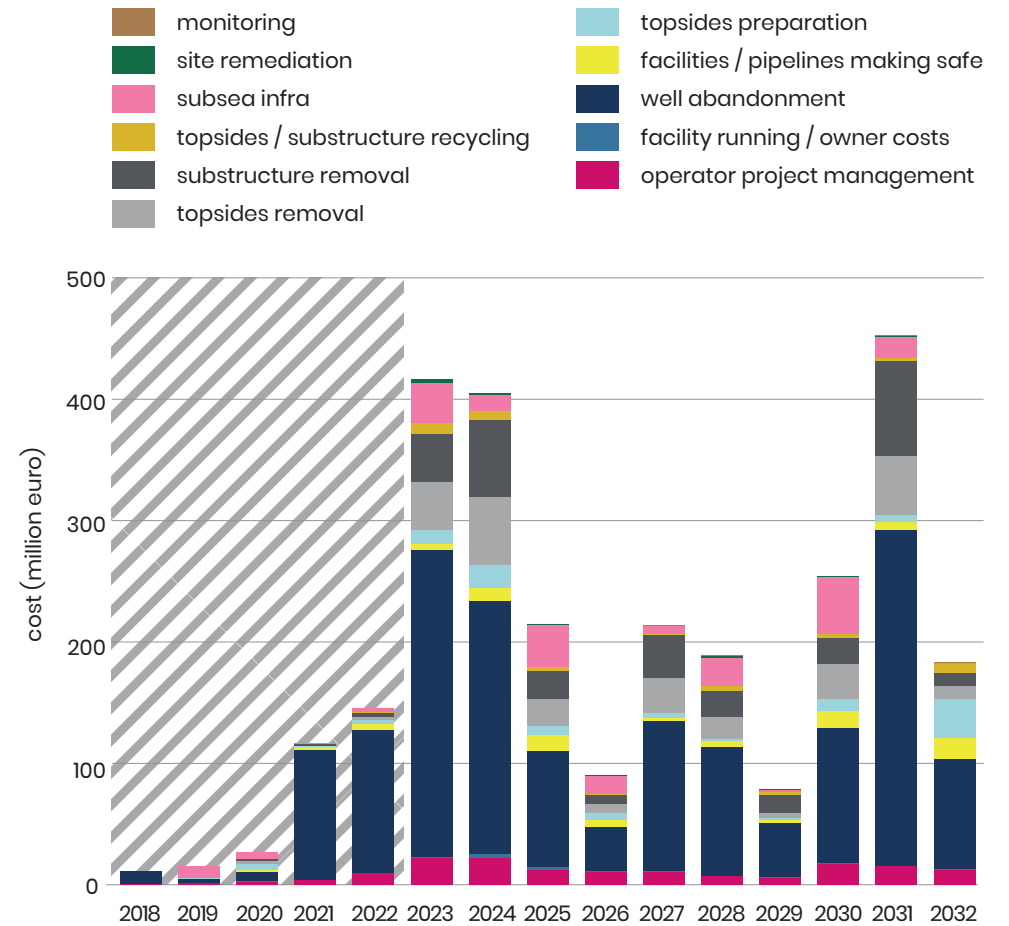
Figure 3.0.1. Cost estimates by ASTM class



Financial securities may be arranged in a variety of ways, for instance through guarantees from the parent company or bank, or through a secured deposit. The required financial guarantee is determined as the estimated decommissioning cost, multiplied with a risk factor, minus the remaining net present asset value.

The forecasted decommissioning cost for the next decade adds up to almost 2.4 billion euros. Clearly, the years 2023 and 2024 stand out with forecasted spendings of 400 million euros per year, related to the high activity in well P&A and platform removals.

Figure 3.0.2. Annual expected costs of offshore infrastructure by category



The re-used Welland Wellhead Protection Structure revealed in Rotterdam by artist Ruud Kuijer (21st June 2023)

