Havtil / Norwegian Ocean Industry Authority

Temporary Plugged and Abandoned Wells on the Norwegian Continental Shelf 2024

Report Public

Havtil
Havindustritilsynet

THRE360 ENERGY

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Abstract:
Havindustritilsynet (HAVTIL) oversees the safety and compliance of temporary plugging and abandonment operations, ensuring they meet industry standards and regulations. Since 2011, HAVTIL has carried out biannual surveys to evaluate the integrity of temporarily plugged and abandoned wells. These surveys review factors such as well integrity classification, time elapsed since abandonment, future plans, and other details. The findings are made publicly available through anonymized data. THREE60 Energy AS was contracted to evaluate the 2024 data and present the results. In 2024, 488 wells have been reported. This is approximately twice as many wells compared to 2022, where 227 wells were reported. The increase in wells reported is mainly due to HAVTILs request for the operators to also include inactive wells that have not been in operation for 1 years. Focus remain with wells with degraded well integrity and without continuous monitoring.

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Abbreviations

Table 1 Abbreviations

HAVTIL	Havindustritilsynet (Norwegian Ocean Industry Authority)
DHSV	Down Hole Safety Valve
XT	Production Christmas Tree
NCS	Norwegian Continental Shelf
EEA	European Economic Area (Norsk: Det europeiske økonomiske samarbeidsområde, EØS)

1 Summary

Every other year Havindustritilsynet (HAVTIL) is collecting data from the Operators to obtain an overview of the well integrity of the temporarily plugged and abandoned wells on the Norwegian Continental Shelf (NCS). For the 2024 survey, a total of 488 wells were reported. This is approximately twice as many wells compared to the previous survey in 2022 (227 wells reported). The reason for the increase in this year's reporting is due to the inclusion of all inactive wells that have not been in operation for the last 1 year.

Key Findings:

- **Well Inventory:**
  - 488 wells were reported as temporarily abandoned or temporarily plugged and abandoned, representing 22% of the total well stock on the NCS.
    - The inactive wells (long term shut-in production or injection wells) represent 241 wells.
  - 71 wells reported in the 2022 survey are no longer reported in 2024. It is assumed that the reported 2022 remedial actions and future plans have been executed for these wells.
  - 156 of the wells reported in 2022 are transferred into the 2024 survey.
  - 332 wells are wells not previously reported
- **Well Integrity:**
  - The integrity status of the wells was categorised as follows:
    - 3 wells were classified as "red" (outside the Norwegian regulatory philosophy of dual barriers, requiring immediate attention).
    - 30 wells were classified as "orange" (outside the Norwegian regulatory philosophy of dual barriers, requiring immediate attention).
    - 192 wells were classified as "yellow".
    - 263 wells were classified as "green".
  - Two of the three "red" wells are the same as the "red" wells reported in 2022. One "red" platform well is new in the 2024 reporting. All red wells have future plans reported for 2024/2025.
- **Monitoring of Wells:**
  - 102 wells (21%) are currently not continuously monitored. These wells present a regulatory compliance challenge, as continuous monitoring of both primary and secondary well barriers is critical for ensuring long-term well integrity.
  - In contrast, 80% of the wells are continuously monitored, an improvement from the 72% reported in 2022.
- **Inactive Wells:**
  - A total of 241 inactive wells were included in the survey, which have been temporarily abandoned by using the DHSV as the primary barrier and the XT as the secondary barrier.
  - 64% of the inactive wells are subsea wells (154 wells), with 36% being platform wells (87 wells).
  - While most inactive wells are continuously monitored, a few subsea wells (7) and platform wells (4) are not continuously monitored.

- **Duration of Temporary Abandonment:**
  - > 25 platform wells are not in compliance with section 88 in the Activity Regulation as they have been temporarily abandoned after 1st January 2014 for more than 3 years. 7 of these wells have a "yellow" integrity status, and 2 are "orange".
  - > 22 subsea wells are not in compliance with section 88 in the Activity Regulation as then have been left without continuos monitoring of both well barriers for more than 1 year. 4 wells have a "yellow" and one has "red" integrity status
  - > Of the inactive wells, 34 wells have been shut in for more than 10 years, including 7 wells that have been inactive for over 20 years and 1 well for more than 30 years.
  - > Wells with "red" or "orange" integrity status are not in compliance with section 85 of the Activity Regulation.
- **Methane Observations:**
  - > Methane observations were reported for 19 subsea wells, and an additional 12 wells have unknown methane status.
  - > Of the wells where methane has been observed, 2 wells are classified as "orange" and will either be repaired or permanently abandoned. One well will be repaired and re-used within 2024. The other is planned for permanent plug and abandonment but with an undefined timeline.
  - > If the new EU Regulation on Methane emission become relevant for the NCS through the EEA, it will likely require further monitoring and reporting of methane observations, as well as mitigation plans.
- **Future Plans:**
  - > The future of temporarily abandoned wells falls into three main categories:
    - ♦ 30% of the wells have plans in place for permanent abandonment.
    - ♦ 40% are planned for re-use as producers or injectors.
    - ♦ 30% have undecided plans.
  - > For the "red" and "orange" wells, all three "red" wells have plans in place for permanent abandonment within 2025. Of the 30 "orange" wells, 50% are planned for re-use, while the other half are either to be permanently abandoned or have undefined plans.

Conclusion:

The 2024 survey shows positive trends in maintaining well integrity despite the significant increase in the number of reported wells. The proportion of wells in each integrity category remains consistent with 2022 which is a positive outcome in terms of overall well safety. However, focus remain with wells with degraded well integrity and without continuous monitoring. The new EU Regulation on Methane emission is likely to require higher focus monitoring for methane emissions and more frequent reporting.

2 Introduction

The biannual survey on all temporarily abandoned wells is part of HAVTIL's knowledge gathering related to “plugging and abandonment of wells” and contributes to an updated overview of the well stock and the integrity status. This is also part of HAVTIL's role to ensure that well activities are in compliance with governing standards and regulations. The Activity Regulation section 81, 85 and 88 is applicable. The operators were requested to report temporarily abandoned wells with and without monitoring of both well barriers according to NORSOK D-010, revision 05/2021.

From NORSOK D-010 chapter 3, Terms and definitions:

- Temporary abandonment - with monitoring: well status, where the well is abandoned, and the primary and secondary well barriers are continuously monitored and routinely tested. Note: If the criteria cannot be fulfilled, the well shall be categorized as a temporary abandoned well without monitoring.
- Temporary abandonment - without monitoring: well status, where the well is abandoned, and the primary and secondary well barriers are not continuously monitored and not routinely tested

The wellbore integrity status is reported according to "117 – Offshore Norge Recommended Guidelines for Well Integrity".

Category	Principle
Red	One barrier failure and the other is degraded/not verified, or leak to surface
Orange	One barrier failure and the other is intact, or a single failure may lead to leak to surface
Yello	One barrier degraded, the other is intact
Green	Healthy well - no or minor issue

Fig. 2.1 Principles from 117 – Offshore Norge Recommended Guidelines for Well Integrity

For the 2024 reporting, HAVTIL has also requested the status on all “inactive wells” where no operation has taken place the last 1 year, as these wells are also covered in the EU regulation related to reduction of methane emissions in the energy sector.

Note: Definition of "inactive-, temporarily- and permanently abandoned wells" according to REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942:

- "Inactive well" means an exploration or production oil or gas well or well site, onshore or offshore, in which, for at least 1 year, no operations for exploration or production have taken place, with the exception of temporarily plugged wells and permanently plugged and abandoned wells.
- "Temporarily plugged well" means an exploration or production oil or gas well or well site, onshore or offshore, where well barriers have been installed to temporarily isolate the producing reservoir and where access to the well is still provided for.

3 Statistics

3.1 Overview of the 2024 data

A total of 488 wells are reported as temporarily abandoned or temporarily plugged and abandoned (including the inactive wells) on the NCS. This represents 22% of the total well stock on the NCS (total 2245 wells from the Jan 2024 RNNP Report).

As shown in Fig. 3.1, 3 wells have "red" well integrity status, 30 are "orange", 192 "yellow" and 263 wells are "green".

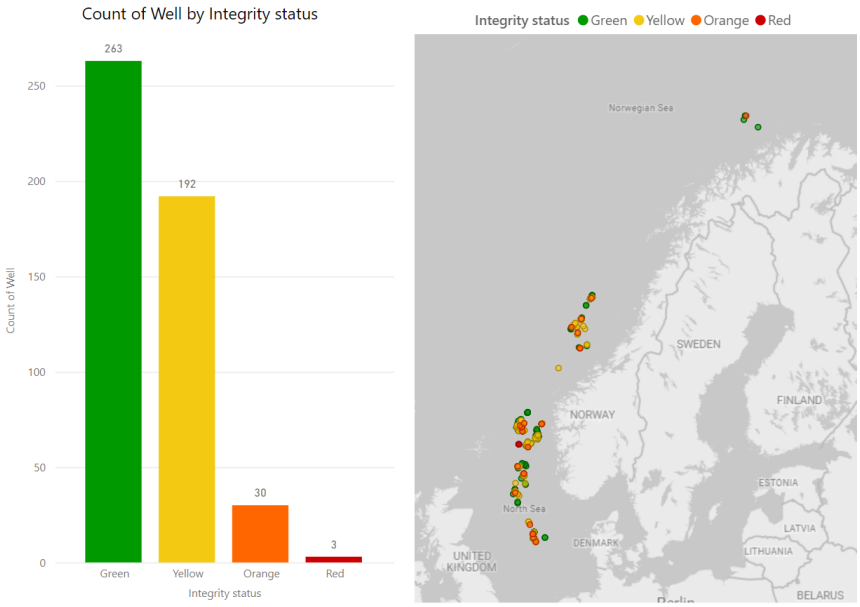

Fig. 3.1 Overview of the temporarily abandoned wells on the NCS

The number of wells reported for 2024 is approximately twice as many compared to the previous survey in 2022 where 227 wells were reported. The main reason for the increase in this year's reporting is due to the inclusion of all inactive wells that have not been in operation for the last 1 year. This includes production or injection wells that have been shut in with the DHSV as the primary well barrier and the XT as the secondary barrier. The reason for HAVTIL's request to include the inactive wells in the 2024 reporting is to be in line with the EU regulations related to reduction of methane emissions in the energy sector, where both the "temporarily plugged" and "inactive" well types are addressed.

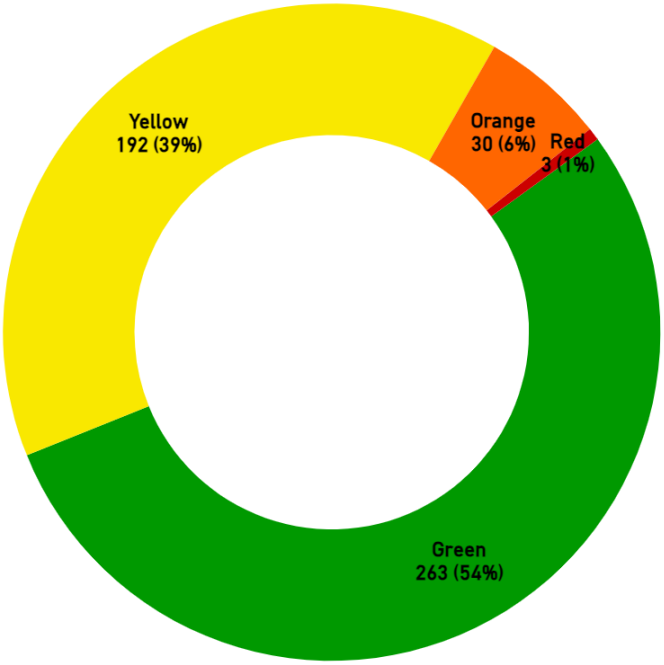

Fig. 3.2 Well integrity overview

The proportion in terms of well integrity status remains similar as previous reporting year despite the significant increase in overall number of wells reported in 2024.

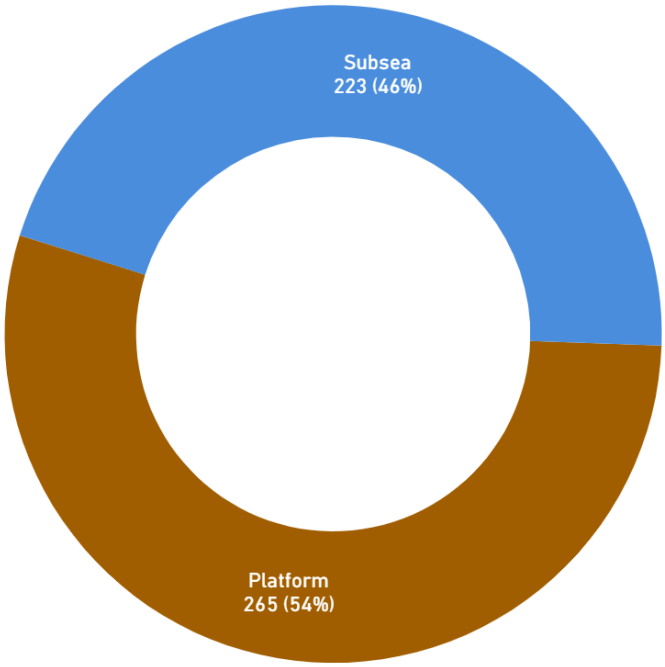

Fig. 3.3 Platform vs subsea wells

More subsea wells are reported this year, nearly 46% compared to 37% in 2022. This is due to more of the long term inactive wells are subsea types.

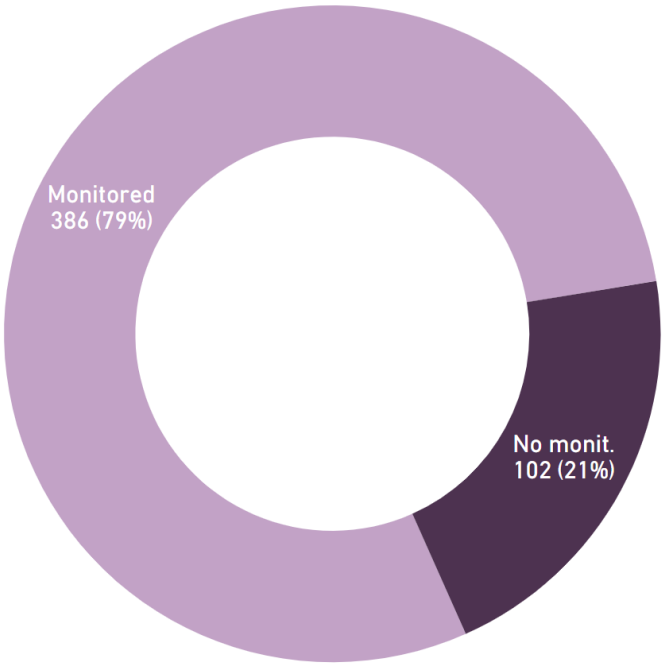

Fig. 3.4 Monitored vs not monitored wells

Nearly 80% of the wells reported are continuously monitored. This score is slightly better than the previous survey in 2022 where 72% of the wells were continuously monitored.

3.2 Breakdown of the 2024 data

Fig. 3.5 below shows the distribution between well types with respect to continuously monitoring and their respective well integrity status. The inventory of temporarily abandoned wells are close to an equal split between platform and subsea wells. Of the total 488 wells, 102 wells (21%) are without continuously monitoring.

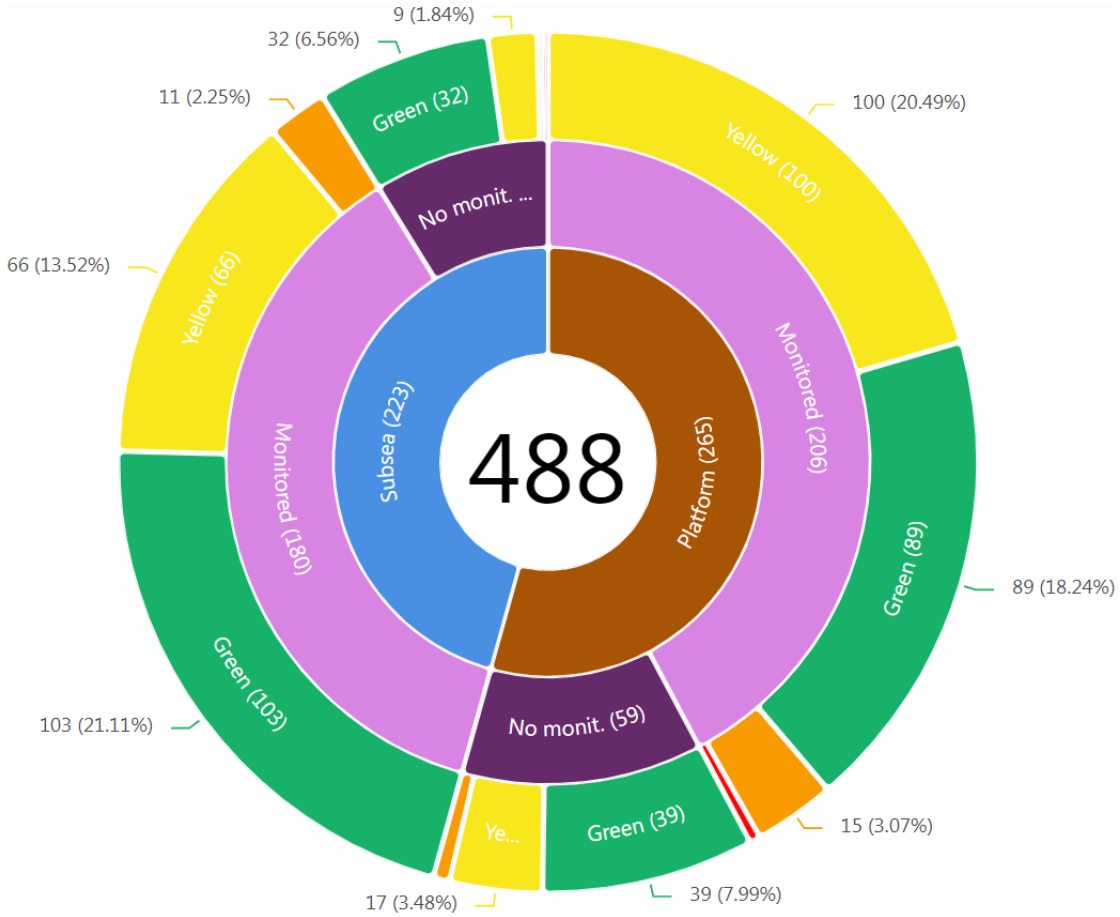

Fig. 3.5 Overview of temporarily abandoned wells

Fig. 3.6 below shows an overview of platform and subsea wells. Of the 265 platform wells, 59 wells are not continuously monitored. Of these wells, 17 have "yellow" integrity status, whereas 3 are classified as "orange". 2 of the platform wells have "red" integrity status and are continuously monitored. For the 223 subsea wells, 43 are not continuously monitored. Of these, 9 are "yellow", 1 is "orange" and 1 is "red".

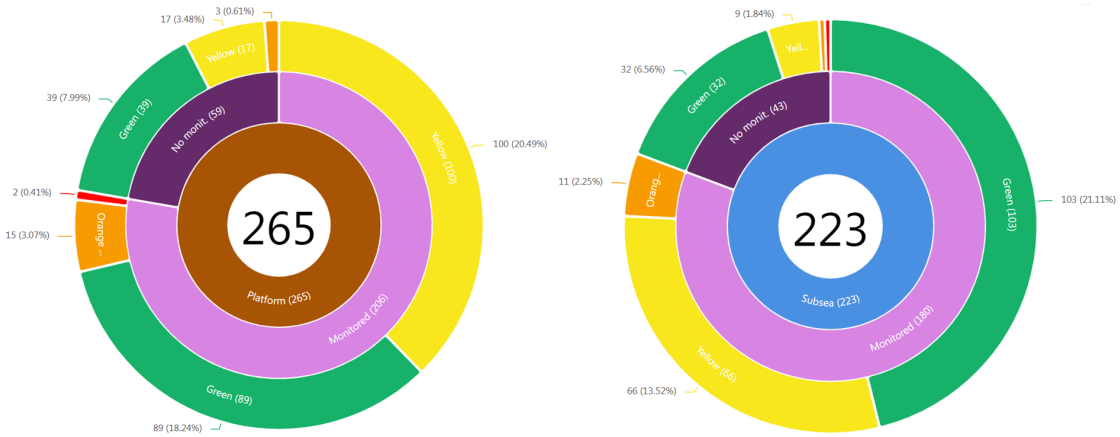

Fig. 3.6 Overview of subsea and platform wells

Comparing the last three reporting years, 2020, 2022 and 2024, the well integrity status proportion has remained stable. As already mentioned, the number of wells reported in 2024 are twice as many an in 2022 by the inclusion of inactive wells. However, the amount of "red" wells has not increased, which is considered positive. One "red" well is new for the 2024 reporting, whereas the other two were also reported in 2022.

Fig. 3.7 Comparison per reporting year

When further comparing the reported wells in 2024 to the wells reported in 2022, the data shows that 71 wells reported in 2022 are not part of the 2024 reporting, assuming that the wells have been re-used according to reported plan in 2022 and are back in operation or permanently plugged and abandoned. 156 wells out of the total 488 are wells also reported in 2022. A total of 332 wells are new to the 2024 reporting, which is as mentioned due to the amount of inactive wells and new temporarily plugged and abandoned wells.

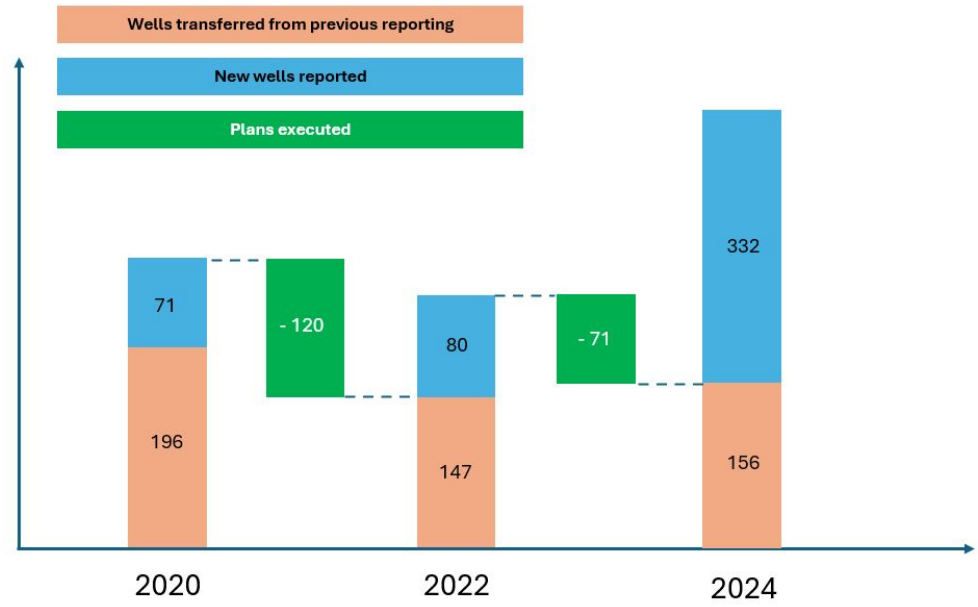

Fig. 3.8 Overview last three reporting years

3.3 Inactive wells

A total of 241 wells is placed in the category "inactive" where they have been temporarily abandoned by using the DHSV as the primary well barrier and the XT as the secondary barrier. 154 wells are subsea and 87 wells are platform. Most of these wells are reported to be under continuous monitoring. 147 of the subsea wells are continuously monitored and 7 are without continuous monitoring. These are wells not currently hooked up to the production facility and cannot be monitored. These wells are required to be under a yearly monitoring regime by ROV survey after a verification of the barriers. 4 of the platform wells are not contentiously monitored, 1 having "yellow" and 3 having "green" integrity status.

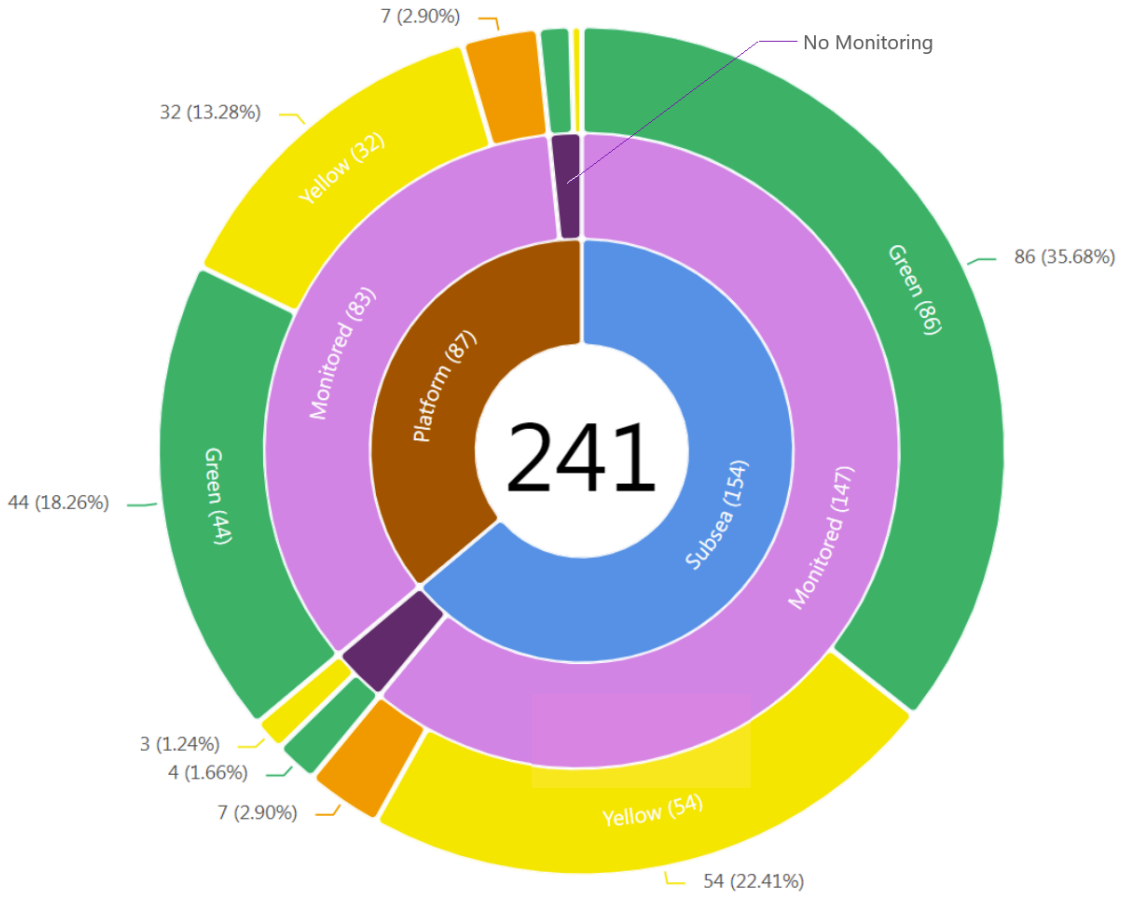

Fig. 3.9 Overview of inactive wells

From figure Fig. 3.9 above, there are 11 wells without continuously monitoring and not easily displayed as most of the inactive wells are continuously monitored. Fig. 3.10 below show these 11 inactive wells, where 4 are platform wells and 7 subsea wells. All have "green" or "Yellow" integrity status.

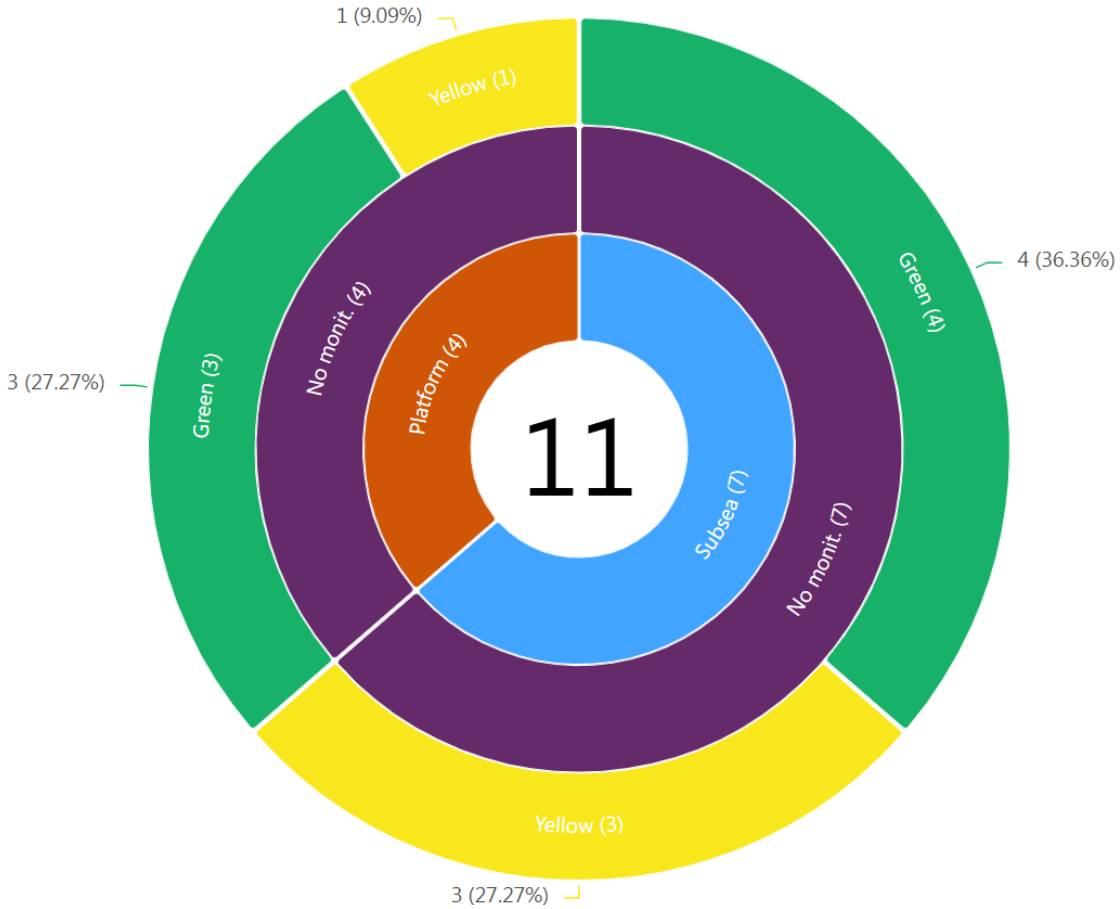

Fig. 3.10 Inactive wells not continuously monitored

As can be seen from the Fig. 3.11 below, most of the inactive wells have been shut in for less than 5 years. However, 34 wells have been shut in for more than 10 years, where 7 wells have been shut in for more than 20 years, and 1 for 30 years.

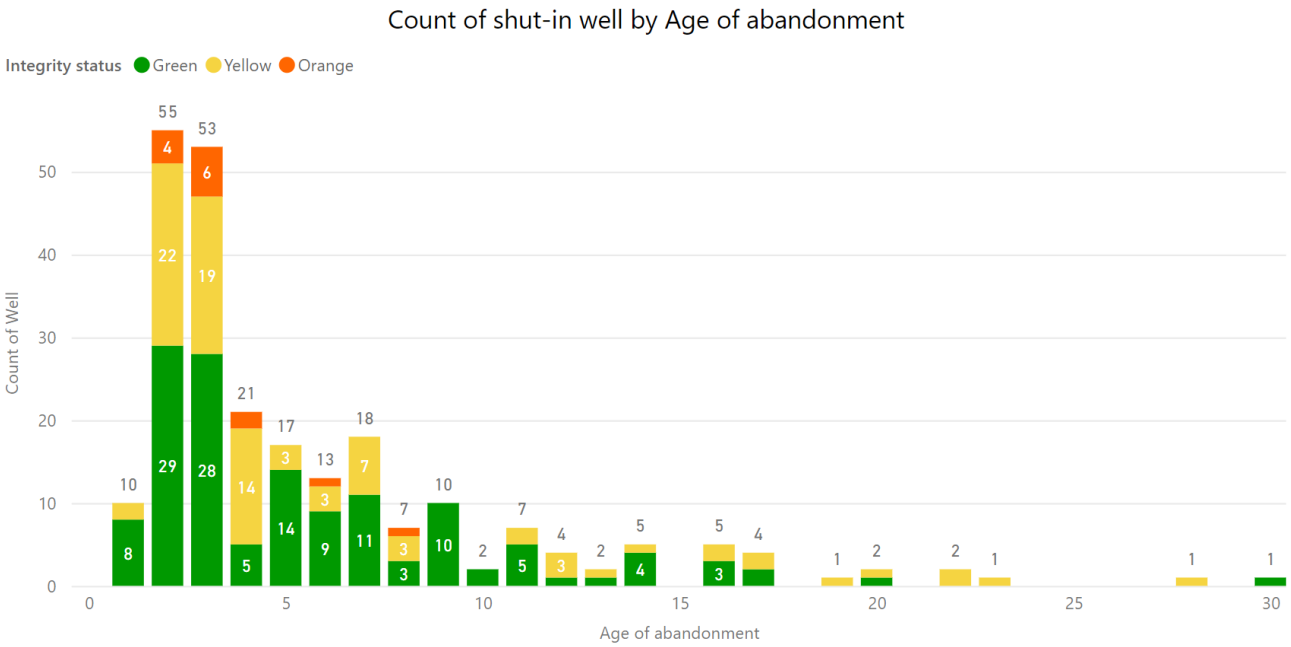

Fig. 3.11 Inactive wells vs well integrity and shut in duration

None of the long term shut in wells have a "red" integrity status. 7 wells are "orange, 91 wells are "yellow" and the rest are green.

4 Temporarily abandonment period

As there is no regulatory upper limit to how long a development well can be temporarily abandoned as long as there is continuous monitoring and frequent or routine testing of the barriers in place, the main focus for this type of wells has been to obtain an overview of the wells without continuos monitoring.

As per Activity Regulation section 88, the well integrity status of all subsea completed wells shall be monitored if the well is planned to be left for more than 1 year. For development wells abandoned after 1st January 2014, the Operator shall permanently abandon the reservoir section within 3 years if the well is not continuously monitored. The same section states that exploration wells commenced after this date shall not be temporarily abandoned for more than 2 years.

Fig. 4.1 below shows the platform development wells without continuous monitoring. The 26 wells to the right of the 2014 cutoff line are not in compliance with section 88 in the Activity Regulation as they have been temporarily abandoned after 1st January 2014 for more than 3 years. 7 of these wells have a "yellow" integrity status, and 2 are "orange".

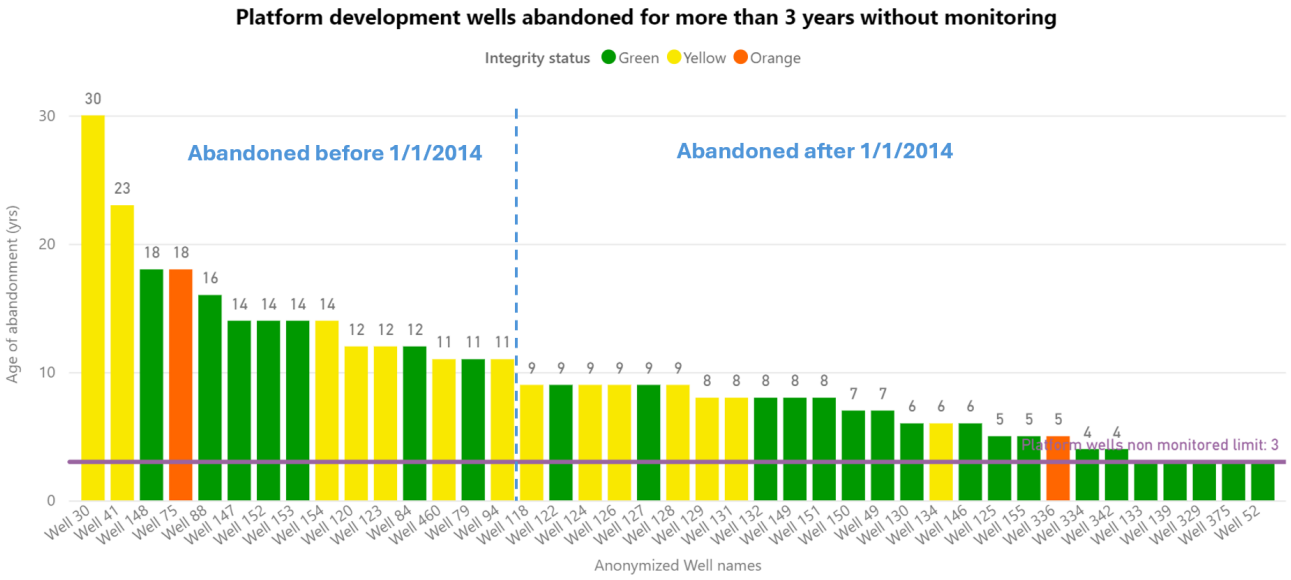

Fig. 4.1 Platform development wells without continuous monitoring

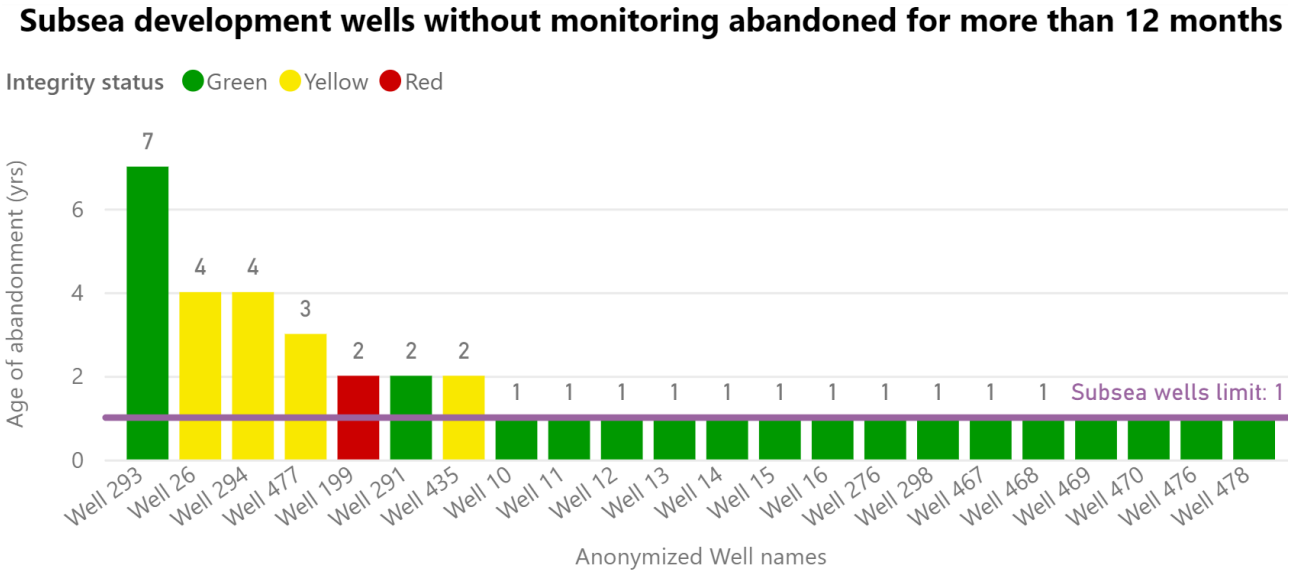

Fig. 4.2 Subsea development wells without continuous monitoring

Fig. 4.2 above shows subsea development wells without continuos monitoring of both well barriers for more than 1 year, and as such not in compliance with regulations. 22 wells fall into this category. 4 wells have a "yellow" and one has "red" integrity status. The plan is to permanently abandon the "red" well in 2025.

4 exploration wells are reported as having been drilled and temporarily abandoned before the new regulations came into effect (Jan 2014); these 4 wells have all been temporarily abandoned for more than 30 years.

5 Observation of methane

Since 2022 operators have been requested to report any wells where methane has been observed around subsea wells and if possible report the leak rate. Of the 223 subsea wells temporarily abandoned, 19 wells have observed methane and 12 have been reported with an "unknown" status.

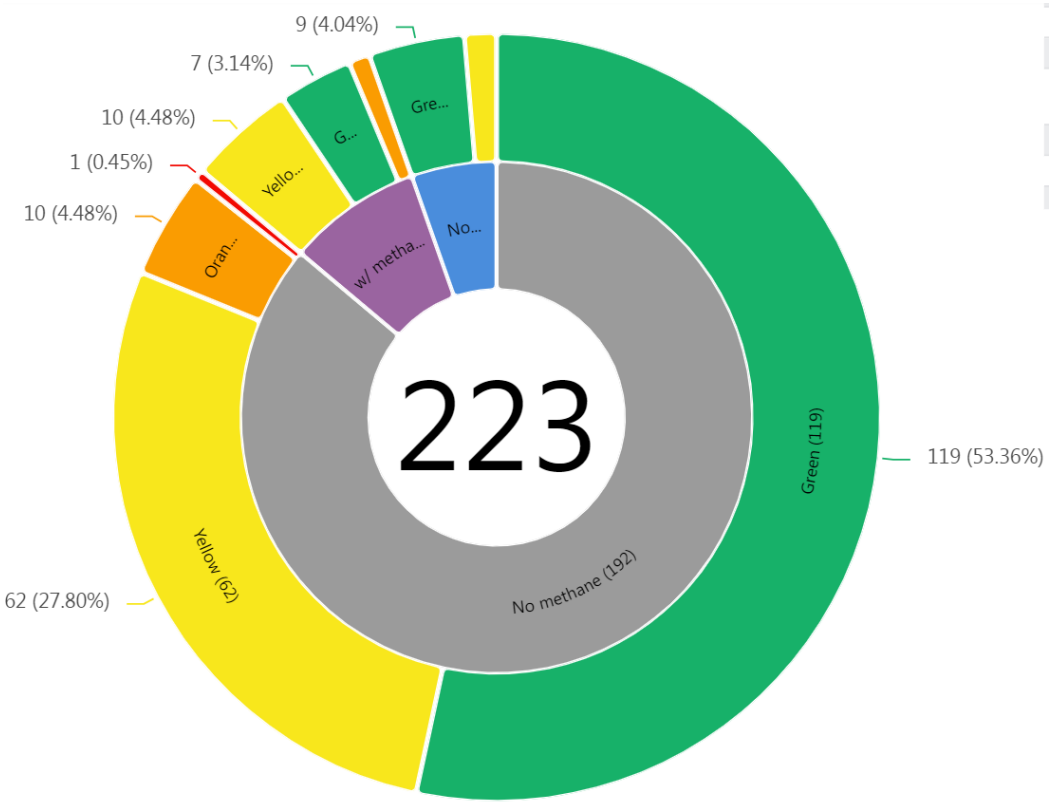

Fig. 5.1 Subsea wells with methane observations

Where methane has been detected, it is typically associated with intermittent bubbles to a varying degree. For several of the wells, it has been concluded to be biogenic shallow gas. In the 19 wells where methane has been detected, 7 wells have a "green" integrity status, 10 wells are "yellow", and 2 wells are "orange".

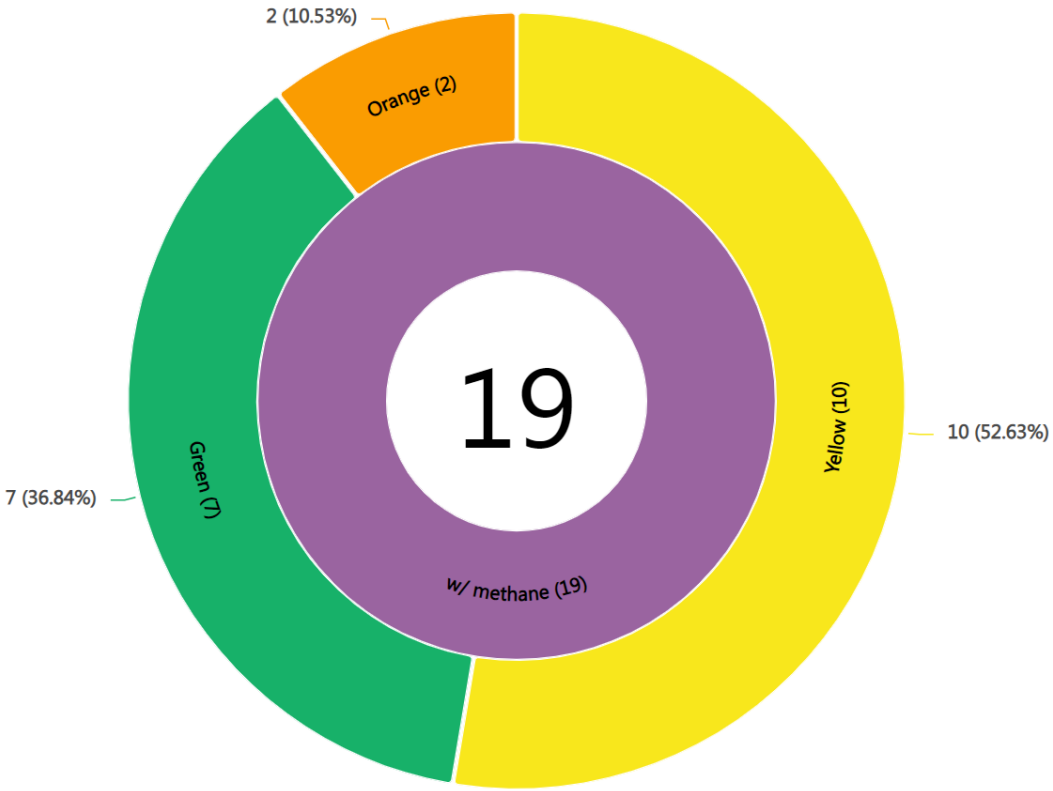

Fig. 5.2 Subsea wells with observed methane

For the two "orange" wells where methane has been observed, one well will be repaired and re-used within 2024. The other is planned for permanent plug and abandonment but with an undefined timeline.

The EU regulation related to the ambition to reduce methane emission in the energy sector may influence requirements related to monitoring of wells on the NCS and mitigations for the wells which has observed methane. "Regulation (EU) 2024/1787 of the European Parliament and of the Council, Article 18" addresses requirements related to inactive, temporarily plugged wells and permanently plugged and abandoned wells with some key takeaways:

1. **Inventory requirement by 2025**: By August 5, 2025, Member States must establish a public inventory of all inactive, temporarily plugged, and permanently plugged and abandoned wells. This inventory should be regularly updated using scientific data and best available techniques.
2. **Methane emissions reporting**: Annual reports on methane emissions from inactive and temporarily plugged wells must be submitted by May 2026, and thereafter, by May 31 each year. Monitoring and reports must follow the best available technology (BAT) until formal standards are implemented.
3. **Exemptions based on no methane emissions**: If pressure monitoring shows no methane emissions for a certain period (5 years onshore, 3 years offshore), the monitoring obligations for those wells cease.
4. **Remediation for emission detection**: If methane emissions are detected, authorities must act to remediate and permanently plug wells, considering environmental impacts before plans are executed.
5. **Mitigation plans**: By August 2026, Member States or responsible parties must develop and implement mitigation plans to address methane emissions, with priority given to high-risk wells.
6. **Offshore well exemptions for wells with a water depth deeper than 700 meters:**
    1. The competent authorities may exempt offshore wells from the methane emission monitoring and mitigation requirements if robust evidence is provided showing that the potential methane emissions have a negligible climate impact.
7. **Offshore well exemptions for wells with a water depth between 200 and 700 meters**:
    1. Offshore wells at a water depth between 200 and 700 meters can also be exempted from these requirements, provided the operator can demonstrate, via an environmental impact assessment, that methane emissions from those wells would likely have a negligible climate impact.

Fig. 5.3 below shows the well integrity status where methane has been observed or where the status is not known versus the water depth categories mentioned above.

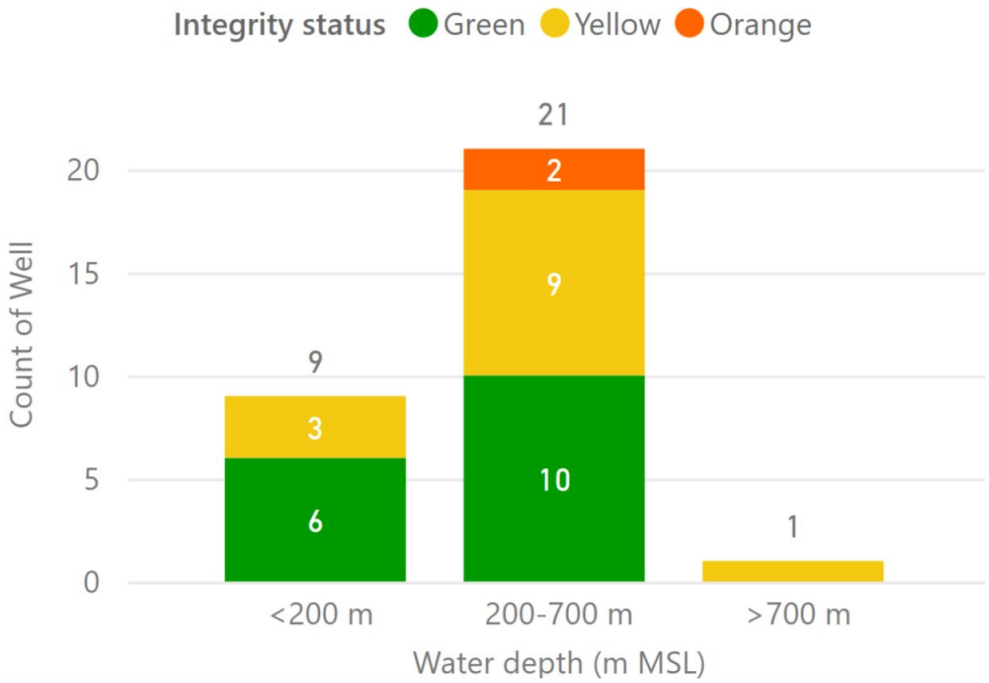

Fig. 5.3 Subsea wells with observed methane or unknown status

For all the 488 temporarily abandoned wells, the split by the same water depth categories are shown in Fig. 5.4 below.

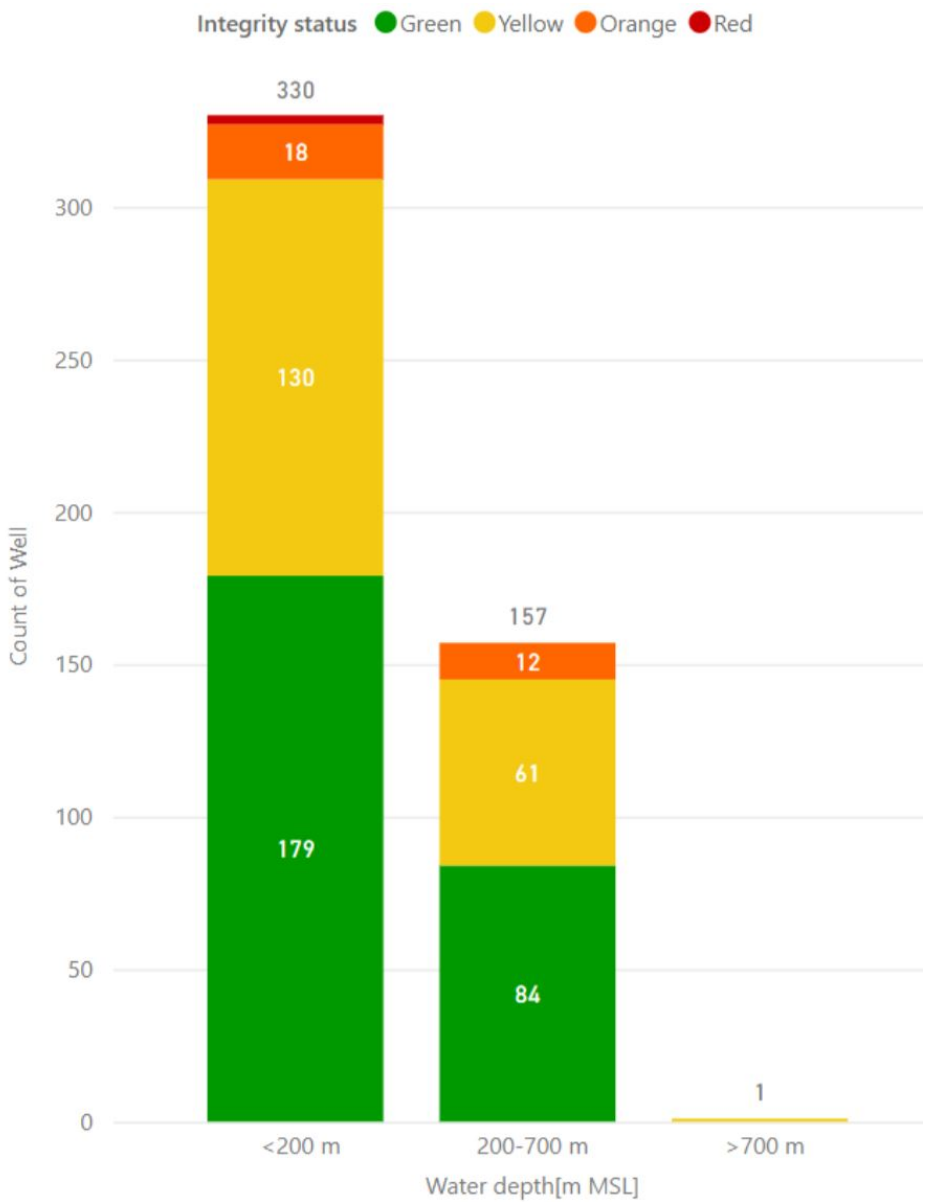

Fig. 5.4 Temporarily abandoned wells vs water depth

6 Future plans

The future plans for the temporarily abandoned or temporarily plugged and abandoned wells (including inactive wells) fall into three main categories:

1. Permanent abandonment (~30%),
2. Re-use the slot for future production or injection (~40%)
3. To be defined (~30%).

Note: The "re-use" category is merged by the operators input of: slot recovery, bring back to production, repair and re-completion. For the wells planned to be permanent abandonment, most of the wells will be executed before 2030.

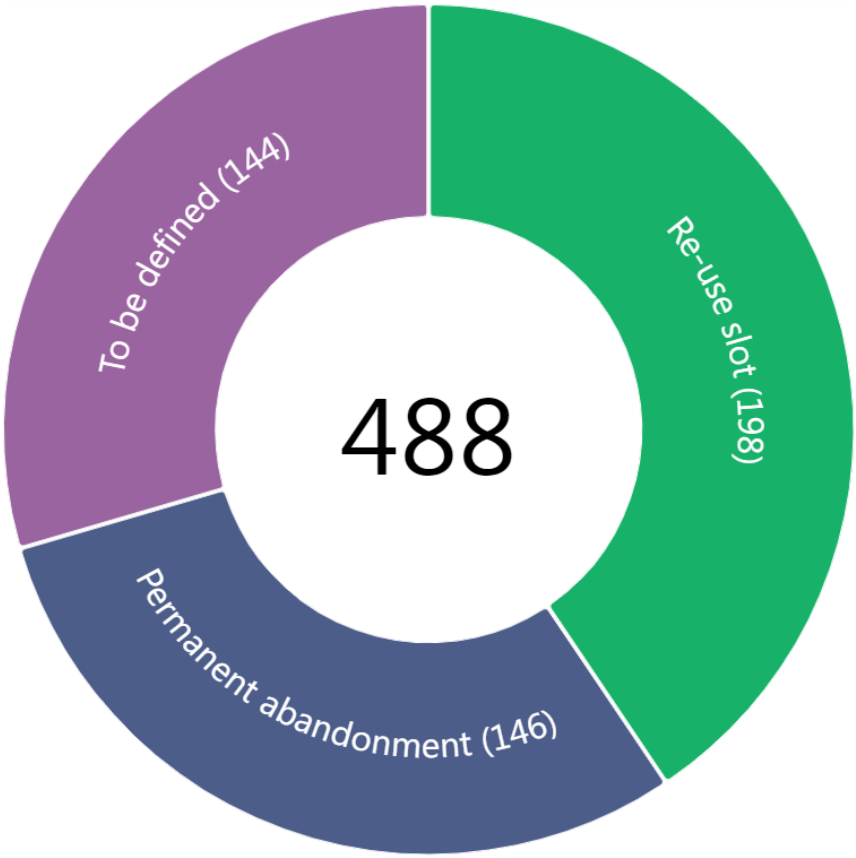

Fig. 6.1 Future plans of the temporarily abandoned wells

For the 241 inactive wells which are new for the 2024 reporting, the future plans are shown in the figure below and split between subsea and platform wells. Overall 15% of the wells are confirmed for permanent abandonment. 41% of the wells will be re-used and for 43% of the inactive wells the Operator have not yet defined the future plans.

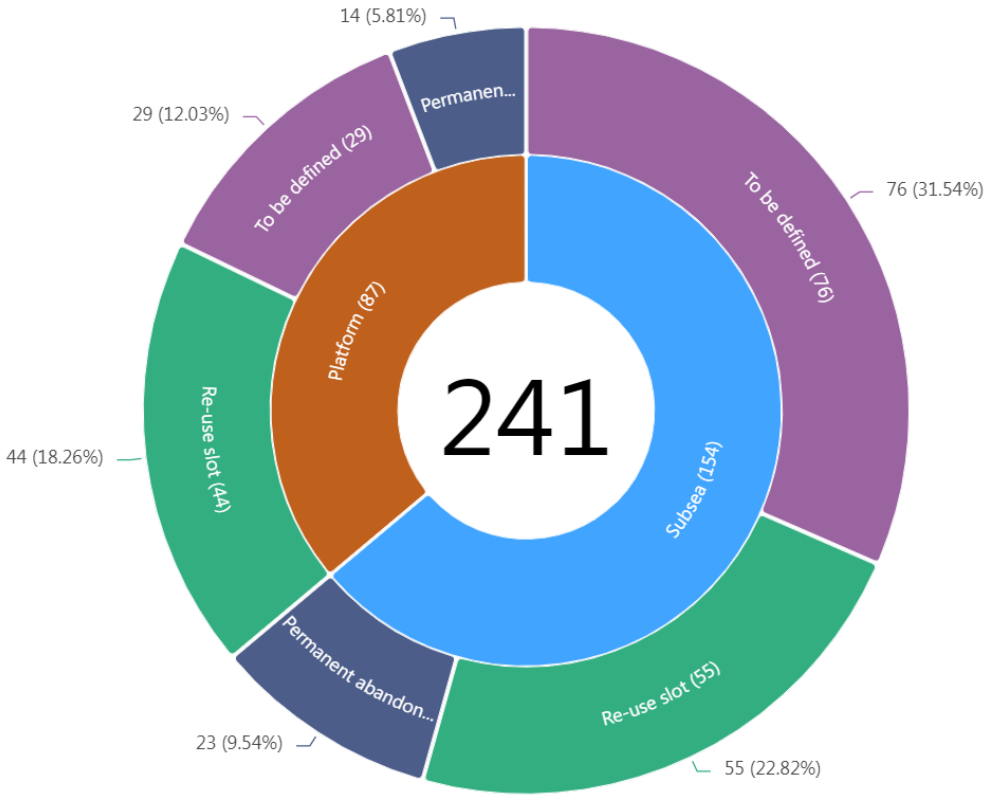

Fig. 6.2 Future plans for inactive wells

Regarding the future plans for the "orange" and "red" category wells, the 3 "red" wells are planned for permanent abandonment within 2025, ref figure below. For the 30 "orange wells, half of the wells are planned to be re-used (17 wells), 7 wells are planned to be permanently abandoned and 6 are yet to be decided (unclear).

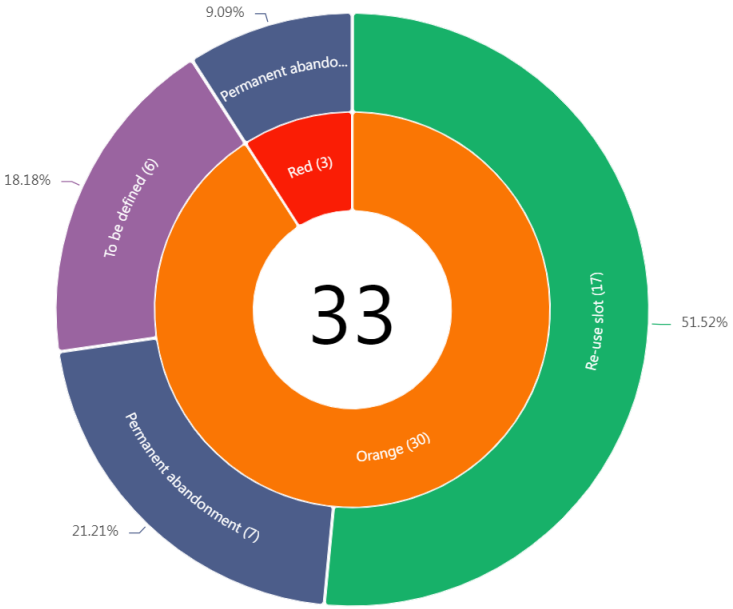

Fig. 6.3 Future plans for the orange and red wells

For the 2 "red" platform wells, the future plan is for them to be permanently abandoned within 2024. As for the "red" subsea well, the plan is to permanently abandon the well in 2025.

The number of temporarily abandoned wells has remained relatively stable over the past several years. From 2020 to 2022, 120 wells were removed from the temporarily abandoned list, either by being put back into operation or through permanent abandonment. In the following reporting period, from 2022 to 2024, 71 wells were removed. The projected number of wells to be removed by 2026 is 231 (171 to be re-used, 51 to be permanently plugged and abandoned, 9 to be decided). HAVTIL will be following up that Operators are fulfilling their current plans, particularly in terms of permanently abandonment of the "red" wells and reducing the number of "orange" wells.

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