Global Flow Measurement Workshop
24-26 October 2023

Technical Paper

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New Measurement Regulation in Norway - Regulators view

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1 INTRODUCTION

Norway's petroleum industry has recently undergone regulatory changes with the introduction of the Measurement Regulations that came into effect on May 1, 2023. This paper deals with the most important aspects of these changes and elaborates on the consequences it will have for the industry.

The Measurement Regulations elaborate on relevant requirements in the Petroleum Act and the CO_2 Tax Act and apply to licensees and others participating in the petroleum activities. The licensee is the subject of duty to the Measurement Regulations and is responsible for ensuring that anyone who performs work for them, either themselves, through employees, contractors, or subcontractors, complies with the Measurement Regulations and individual decisions pursuant to the regulations.

The Norwegian Petroleum Directorate (NPD) plays a pivotal role in developing and maintaining the Measurement Regulations. It is entrusted with overseeing compliance with the Measurement Regulations and providing technical advice to the Ministry of Petroleum and Energy.

2 BACKGROUND FOR NEW MEASUREMENT REGULATIONS

The Norwegian Petroleum Directorate (NPD) was established in 1972, and the following year, in 1973, supervision of the fiscal measurement of the quantity of petroleum produced was assigned to the NPD. The first measurement regulations came into force in 1984, one for gas measurement with orifice plates and one for oil measurement with turbine meters. The measurement regulations were later, in 1991, merged into one regulation, while at the same time being expanded to include several types of measurements and measuring technologies. A separate regulation on CO_2 tax measurement came into force in 1993. Around 1996, NORSOK standards (industry standards) were established for fiscal gas and oil measurement (I-104 and I-105). They were partly based on comments to the 1991 measurement regulations. In 2001, a new revision of the measurement regulation came into force, in which the 1991 measurement regulation and the regulation on CO_2 tax measurement were merged. Simplifications were made due to the NORSOK standards.

The first measurement regulations set requirements for the maximum permissible measurement error. These error limits were eventually reformulated as the

maximum permissible measurement uncertainty. This has led to some inconsistency and lack of uniformity in how uncertainty has been expressed, interpreted, and implemented. Measurement error and measurement uncertainty are two complementary, but distinct, aspects of the characterisation of measurements. Measurement error describes the difference between a measurement result and the value of the measurand (quantity to be measured), while measurement uncertainty describes the reliability of the claim that the stated measurement result represents the value of the measurand.

The 2001 regulations were maintained and remained in force until the new measurement regulations came into force. It had however, become somewhat fragmentary, with requirements that in some cases were inconsistent, technology-dependent and did not meet relevant requirements in MID (Directive 2014/32/EU) (which Norway are obliged to comply with through the EEA Agreement). This, in addition to the goal of increased flexibility, cost-effectiveness and predictability in case processing, led to the decision to develop a new measurement regulation instead of continuing to work on revising the 2001 edition of the Measurement Regulations.

3 THE DEVELOPMENT OF THE NEW MEASUREMENT REGULATIONS

NPD believes that stakeholder involvement is important to achieve a measurement regulation that both safeguards the authority's objectives with the regulations and that is reasonable for the industry to comply with. As a part of that strategy, an expert group with representatives from the petroleum industry, the service industry and academia were therefore established. The group consisted of Dag Fløtlo from Equinor, Bjarne Syre from DNO, Ole Øiestad from Intertek Westlab and Kjell-Eivind Frøysa from HVL/NORCE. This group met regularly throughout the process of developing the new measurement regulation.

The new regulations were sent out for national and EEA (European Economic Area) consultation in July 2022, with a consultation deadline in October 2022. At the request of the industry, the consultation deadline was extended by one month. By the end of the consultation period, 12 consultation responses had been received. Some of the consultation bodies had objections to parts of the proposed regulation. The most extensive consultation response came from Offshore Norge[1]. Offshore Norge established a working group with the purpose of working with the NPD to ensure a common understanding of the submissions and expedient adjustment of requirements.

The changes resulting from the consultation input led to the regulation being sent out for a new consultation, but with a shorter consultation period this time. The consultation responses were few and the adjustments were minor and of such a nature that it was decided that the new regulation could be implemented without further consultation.

The NPD is of the opinion that the stakeholder involvement has been constructive and beneficial for both the authorities and the industry. It has been an important

[1] Offshore Norge is an employer and industry organization for companies with activities related with the Norwegian continental shelf.

factor in achieving the goals set for the regulatory work, and it has given stakeholders the opportunity to influence requirements, design and familiarise themselves with the structure and content of the regulations.

4 THE DESIGN AND CONTENT OF THE NEW MEASUREMENT REGULATIONS

The primary objective of these regulations is to ensure accurate and reliable measurements for tax calculation and revenue generation in Norway's petroleum activities. These regulations encompass requirements on measurements, management systems, measuring systems, and documentation.

The Measurement Regulations consist of functional requirements, performance requirements, and technical requirements, occasionally including exceptions to ensure cost-effective measurements. Documentation requirements accompany exemption provisions.

The regulations draw upon international standards and metrological principles, with reference to organizations such as BIPM (International Bureau of Weights and Measures), ISO, API and others. The International System of Units (SI), International Vocabulary of Metrology (VIM), and Guide to the Expression of Uncertainty in Measurement (GUM) are integral to these regulations.

The regulations elaborate the Petroleum Act's mandate for prudent resource management, safety, and environmental protection. These overarching principles are taken into account in the Measurement Regulations.

A model-based approach to measurement is incorporated in the regulations, emphasizing a dual-level process involving concrete interactions between object of interest, measuring instruments, the environment and theoretical or statistical models. This approach broadens the common understanding of measurement, accommodating experimental, theoretical, and calculated values.

In the design of the measurement requirement, it is assumed that the result of a measurement is only complete when it is accompanied by a quantitative indication of the measurement uncertainty. This measurement uncertainty reflects the incomplete knowledge of the measurand and makes it possible to assess the reliability, comparability or risk associated with the measurement result. Specifying measurement uncertainty is also a prerequisite for achieving traceability to underlying SI units.

Measurands for petroleum production and CO_2 tax calculations are defined in accordance with the petroleum legislation (Petroleum Act Section 4-10 and Petroleum Regulations § 26) and the Act relating to tax on CO_2 emission. Uncertainty limits are set to ensure practical and appropriate measurements.

5 CONSEQUENCES OF NEW MEASUREMENT REGULATIONS FOR THE INDUSTRY

In the consultation notes after the first and second consultation, in-depth information is given about NPD’s assessments of the changes made in relation to

the 2001 edition of the measurement regulations. Below is a discussion of the conditions that are believed to have the greatest impact on the industry.

The introduction of the new measurement regulations necessitates a review and update of management systems to ensure compliance. Increased flexibility is expected, due to the reduced specificity of organizational requirements, including the requirement to appoint a person responsible for the measurement system and for procedures for operation, maintenance, calibration, and control to be followed. A risk approach allows for more cost-effective solutions.

More specific requirements for operation and maintenance, including calibration and monitoring, will require a review of routines and procedures. The review may reveal the need to develop computer programmes, etc. Improved monitoring of measuring instruments and systems is anticipated, enhancing measurement accuracy and efficiency.

The requirement for an extended uncertainty budgets will require additional industry efforts. However, these budgets provide a formal record of measurement uncertainty analysis, improving reliability and resource allocation.

Existing measuring equipment's accuracy levels largely align with the new regulations, potentially reducing the need for new purchases.

Routine reporting of measurement-related information in the Annual Status Report from fields in production will introduce additional work. Nevertheless, it will increase awareness of measurement and could enhance transparency and secure licensees' revenues.

6 CONCLUSIONS

In conclusion, the new Measurement Regulations signify a shift in the petroleum industry. While they introduce some challenges, they also hold the promise of improved measurement accuracy, greater flexibility, and enhanced resource management.

7 REFERENCES

[1] Forskrift om fiskal måling i petroleumsvirksomheten (måleforskriften)

[2] Veileder til forskrift om fiskal måling i petroleumsvirksomheten (Måleforskriften)

[3] Måleteknisk ordliste. Vedlegg 1 til veileder til måleforskriften

[4] Standarder og andre anerkjente dokumenter. Vedlegg 2 til veileder til måleforskriften

[5] Evaluering av måledata ved måling av fluidstrøm. Vedlegg 3 til veileder til måleforskriften.

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