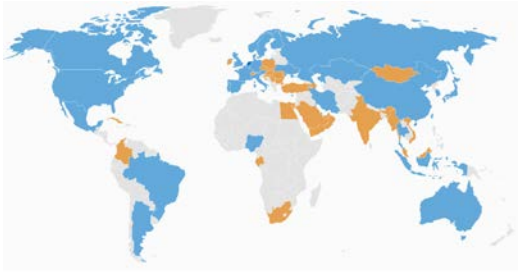


Updated and latest news from international standardization

4th ISO seminar on international standardization

in the reliability technology and cost area

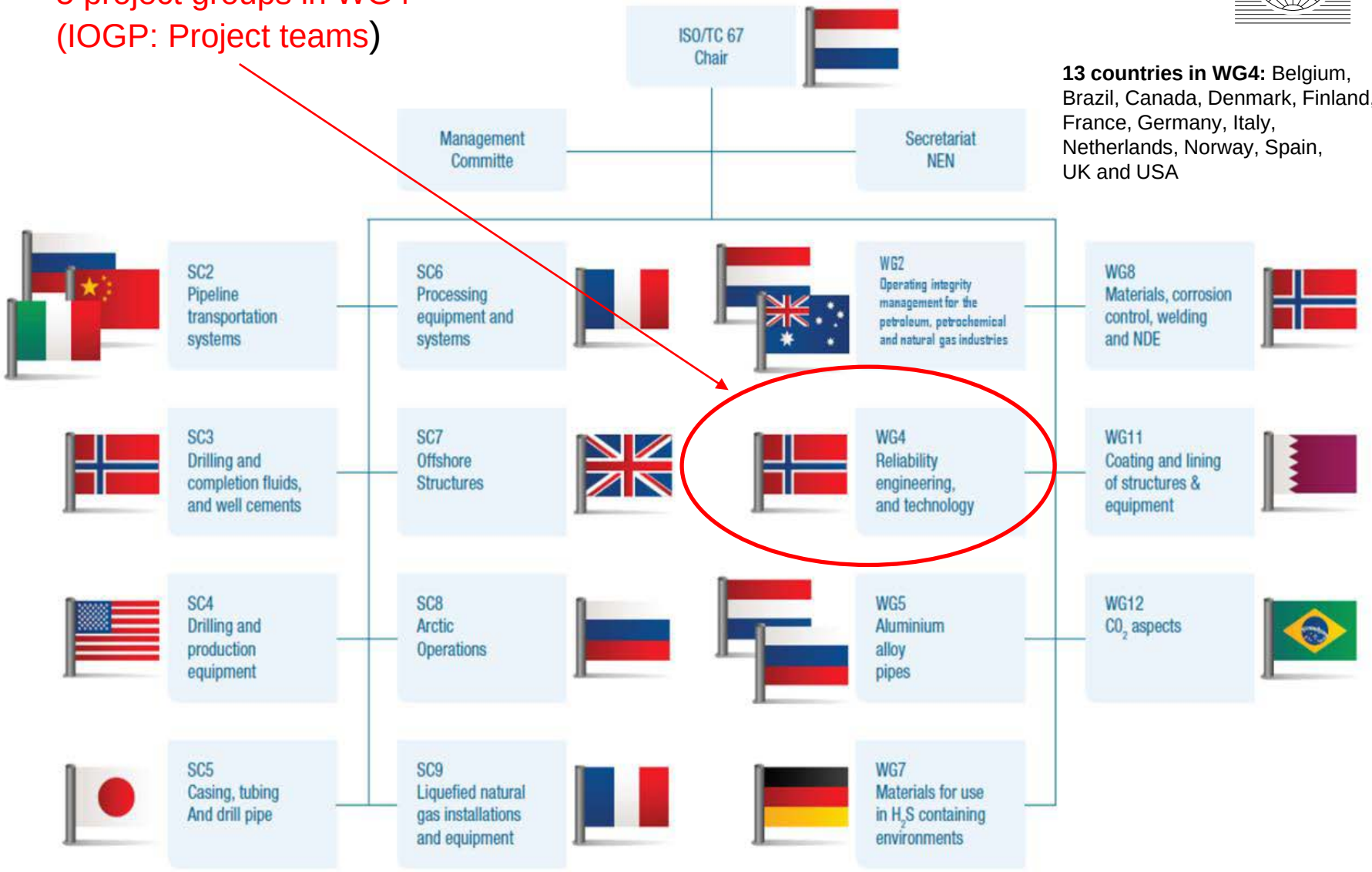
Statoil, Houston, USA, 4 May 2018

Runar Østebø, Advisor, Statoil
ISO/TC 67/WG4 Convenor

Content

- ISO/TC67 framework and WG4 portfolio
- Current main activities
- Concluding remarks

5 project groups in WG4
(IOGP: Project teams)

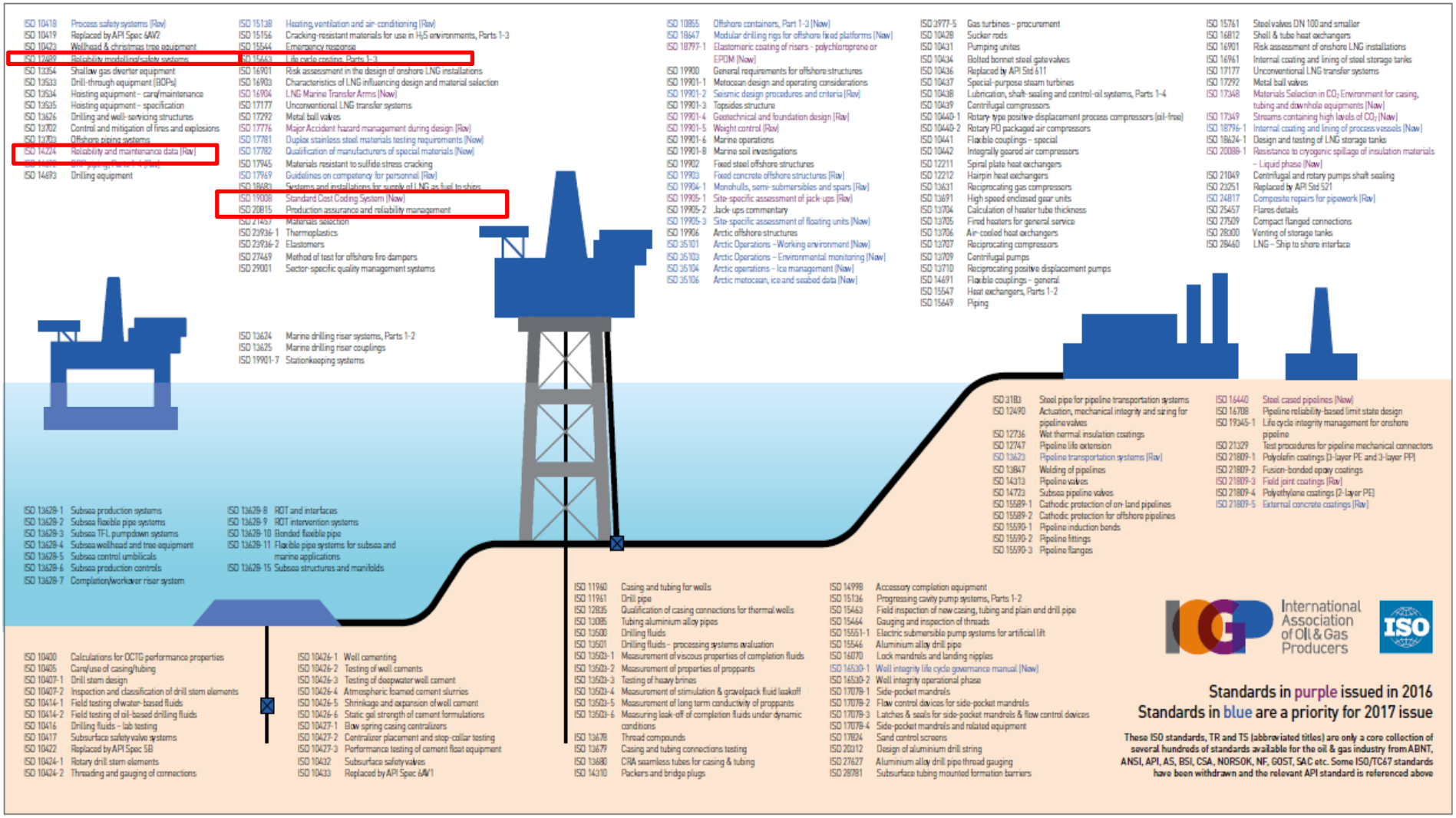


13 countries in WG4: Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, UK and USA

RØ – 4.5.18

WG4 responsibilities

ISO Standards for use in the oil & gas industry



IOGP Poster-Standards – April 2017

Sep 2016: ISO/TC67 portfolio contains approx 200 standards; 60+/- quoted in ISO 14224:2016

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ISO/TC67/WG4 - Reliability Engineering & Technology Portfolio Status and Highlights

- **ISO 14224:2016** *"Collection and exchange of reliability and maintenance data for equipment"*
  - French version NF EN ISO 14224 has been officially issued 10 October 2017
    Portuguese translation of 3rd edition is delayed and expected in 2019
  - Interim phase focusing on deployment and marketing

- **ISO 20815** *"Production assurance and reliability management*"
  - **DIS version for 2nd ed. was approved** in Oct 2017 based P-members voting (100% voting positively).
  - **FDIS version expected to come in June/July 2018**
  - Active phase focusing on new version to come

- **ISO/TR 12489:2013** *"Reliability modelling and calculation of safety systems"*
  - Interim phase focusing on deployment and marketing.

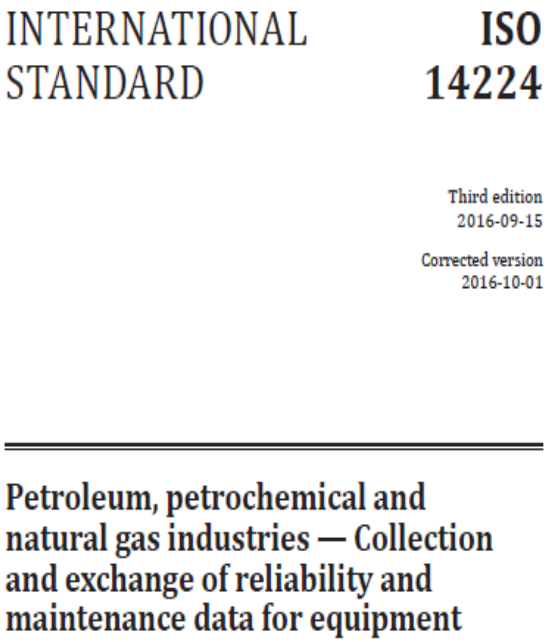
- **ISO 15663-1/2/3:2001:** "*Life cycle costing"*
  - New active phase with revision in progress, via IOGP Standards Solution. 10 countries

- **ISO 19008:2016** *"Standard Cost Coding System for oil and gas production and processing facilities"*
  - **EN ISO 19008 approved by CEN** in 26 Dec 2017, and issued 28 March 2018 by CEN
  - Interim phase focus with particular focus on applications to ensure cost control

ISO 14224:2016

”Collection and exchange of reliability and maintenance data for equipment”

- *Scope*
  - Standardized data format to facilitate exchange reliability and maintenance (RM) data between operator and owner, etc.
  - Provide key definitions
  - Basis for communicating equipment experience **«reliability esperanto»**
  - Normative terminology e.g.
    - **Failure modes (per equipment class)**
    - **Failure mechanism and failure cause (generic across all equipment classes)**
  - **Key Performance Indicators (KPI)**
  - Applicable for all type of oil & gas facilities and operation, and all phases.
  - Guidance for analysis of reliability and maintenance data


INTERNATIONAL STANDARD

ISO 14224

Third edition
2016-09-15

Corrected version
2016-10-01

Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment

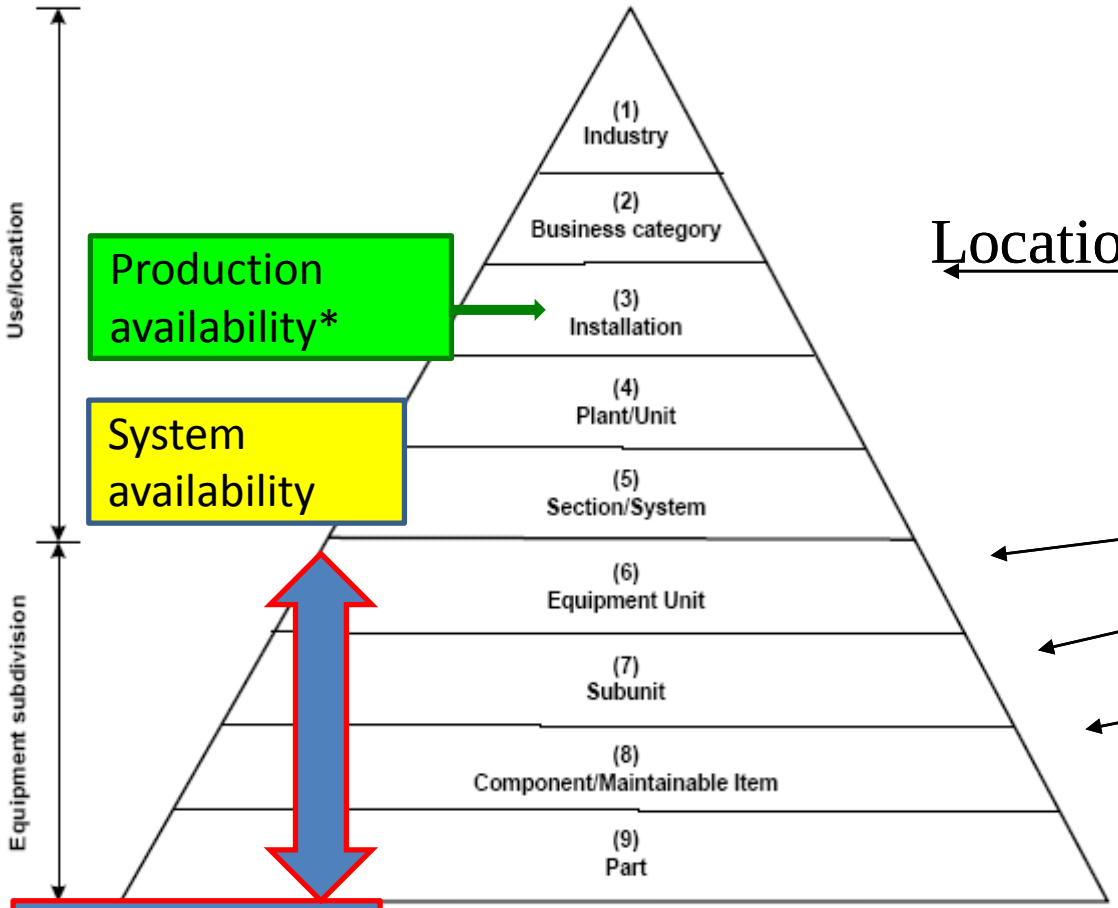
Important standard also with respect to digitalization and LCI.

CEN version approved July 2016: EN ISO 14224
(Per April 2018: Adopted by 37 CEN-member countries)
e.g. adopted in Norway as Norwegian standard 1 Jan 2017: NS-EN ISO 14224:2016
Edition 2 was adopted in USA as ANSI/API Std 689 in July 2007. Ed. 3 pending?

Regulatory example: NS-EN ISO 14224:2016 quoted also in PSA (see e.g. failure and maintenance data in Activity Regulations - § 49).

ISO 14224 - Taxonomy classification

Taxonomic level for performance measurement



Production availability*

System availability

Reliability data

Location & Consequence(s)

Focus area at equipment level:

- Inventory
- Failure
- Maintenance

Source: ISO 14224 (Dec 2006) – Figure 4

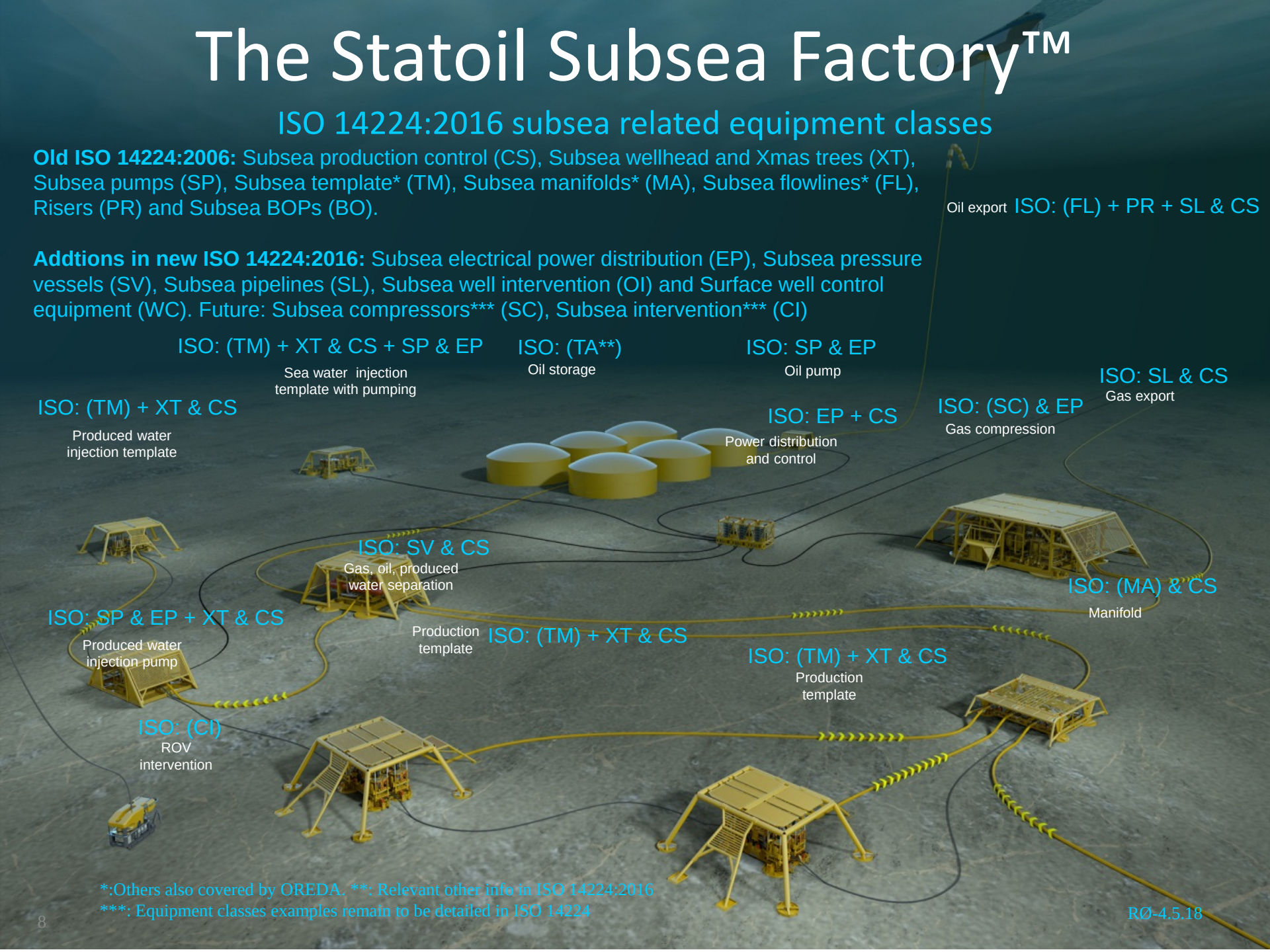
*In operation often called Production efficiency (PE)

The Statoil Subsea Factory™

ISO 14224:2016 subsea related equipment classes

Old ISO 14224:2006: Subsea production control (CS), Subsea wellhead and Xmas trees (XT), Subsea pumps (SP), Subsea template* (TM), Subsea manifolds* (MA), Subsea flowlines* (FL), Risers (PR) and Subsea BOPs (BO).

Addtions in new ISO 14224:2016: Subsea electrical power distribution (EP), Subsea pressure vessels (SV), Subsea pipelines (SL), Subsea well intervention (OI) and Surface well control equipment (WC). Future: Subsea compressors*** (SC), Subsea intervention*** (CI)



*:Others also covered by OREDA. **: Relevant other info in ISO 14224:2016
***: Equipment classes examples remain to be detailed in ISO 14224

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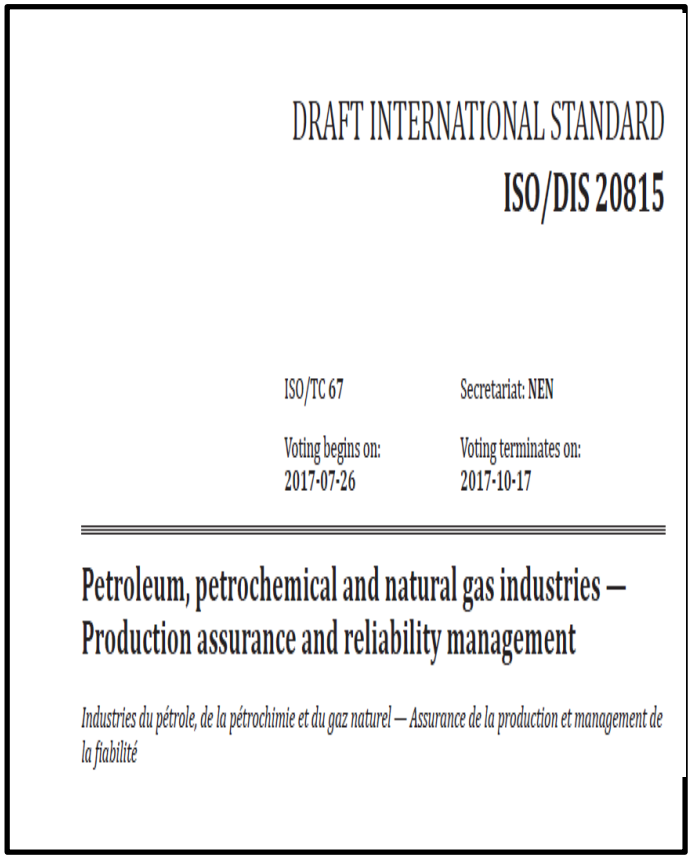
ISO 20815

"Production assurance and reliability management"

- **Scope**
  - Production assurance and reliability management
    - **Production Assurance Programme (PAP)**
  - Definitions including
    - Technology Readiness Level (TRL)
    - Production and Time loss categorization
      - interacting with ISO 14224
  - Contractual reliability framing (targeting)
  - Analysis techniques



DRAFT INTERNATIONAL STANDARD

ISO/DIS 20815

ISO/TC 67 Secretariat: NEN

Voting begins on: 2017-07-26 Voting terminates on: 2017-10-17

Petroleum, petrochemical and natural gas industries – Production assurance and reliability management

Industries du pétrole, de la pétrochimie et du gaz naturel – Assurance de la production et management de la fiabilité

Status ed.1: CEN version approved February 2010: EN ISO 20815
(Per April 2018: Adopted by 39 CEN-countries)
e.g. adopted as Norwegian standard June 2010: NS-EN ISO 20815:2010

NEW Ed.2 to come in 2018
(FDIS planned June 2018)

Regulatory example: NS-EN ISO 20815:2010 quoted also in PSA (see e.g. Maintenance programme in Activity Regulations - § 47).

Production assurance terms

Other definitions, e.g.

3.1.7 design life (see ISO/DIS 20815)
planned usage time for the total system

NOTE: It is important not to confuse design life with the 'mean time to failure' (MTTF), which is comprised of several items that might be allowed to fail within the design life of the system as long as repair or replacement is feasible.

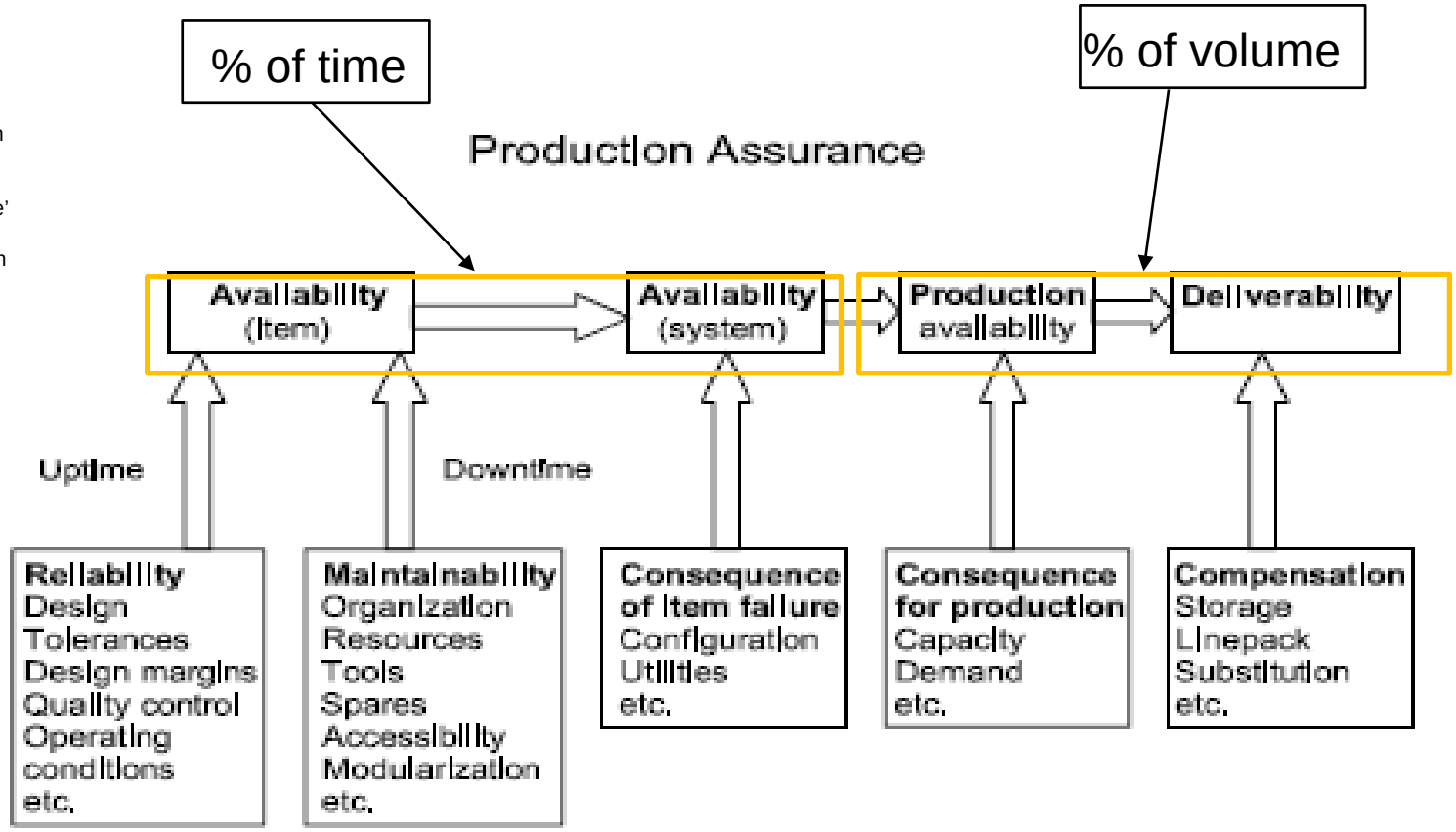


Figure G.1 — Illustration of the relationship between some production-assurance terms

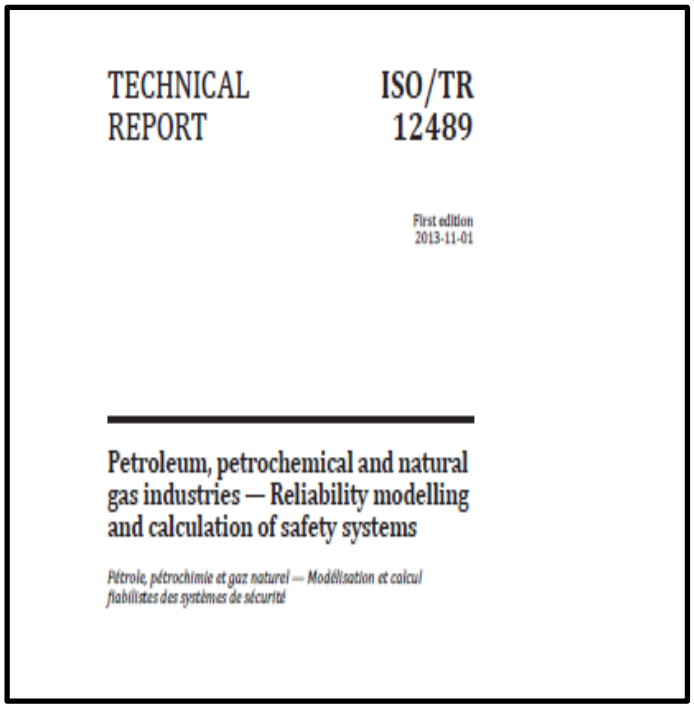
Source: ISO 20815

ISO Technical Report 12489
”Reliability modelling and calculation of safety systems”

Scope

- Provide guidelines with <u>focus on modelling & calculations</u>
- ISO/TR 12489 is an important supplement of IEC 61508-part 6 (functional safety), but for all safety systems
- Priority 2 issue on ISO/TC 67 ”Action plan industry events” (Montara/Macondo)

CEN version approved March 2015 and issued Jan 2016: CEN ISO/TR 12489
(Per April 2018: Adopted by 22 CEN-member countries)


TECHNICAL REPORT

ISO/TR 12489

First edition
2013-11-01

Petroleum, petrochemical and natural gas industries — Reliability modelling and calculation of safety systems

Pétrole, pétrochimie et gaz naturel — Modélisation et calcul fiabilistes des systèmes de sécurité

ISO 15663 – Life Cycle Costing (Part 1,2 and 3)

- **Scope**
  - Provide guidelines for Life Cycle Costing of competing options

- **Status**
  - 1st edition was issued in 2000 (Part 1) and 2001 (Part 2 + 3).
  - Expert members from 9 countries takes part (via IOGP) in re-established TC67/WG4/PT4
    - Brazil, Denmark, Finland, France, Germany, Italy, Norway, Spain, and UK.

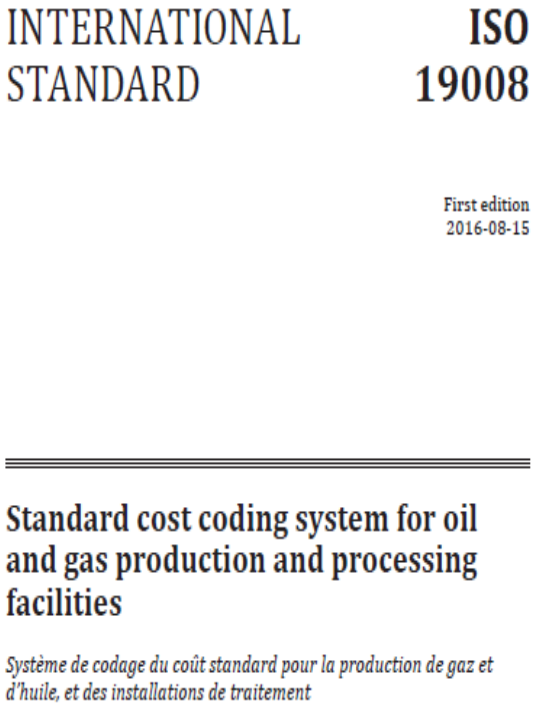
- **New draft ed. 2 planned to come as DIS in 2019**

National adopted versions:
- ***CEN version of Part 1*** *(adopted by 38 countries)*
- *CEN version of Part 2&3 will coe when new ISO 15663, ed.2*

ISO 19008

Standard Cost Coding System for oil and gas production and processing facilities

- **Scope** – Provide standard cost coding system
- New 1st edition was issued in August 2016.
- Main parts and 3 normative Annexes containing each of the coding structures PBS, SAB and COR with code, code name and definition
  - Excel files can be found in the http://standards.iso.org/iso/19008
- One informative Annex containing examples of use


INTERNATIONAL STANDARD

ISO 19008

First edition
2016-08-15

Standard cost coding system for oil and gas production and processing facilities

Système de codage du coût standard pour la production de gaz et d'huile, et des installations de traitement

CEN version approved December 2017: EN ISO 19008
(Per April 2018: Adopted by 7 CEN-countries)
e.g. adopted as British standard in 2018: BSI-EN ISO 19008:2018

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Concluding remarks

- Governance: Management and selective use of the ISO standards amongst industry companies as defined in regulations and governance systems

- Use of these developed oil & gas ISO-standards is an industrial responsibility – for equipment and work processes
  - To reduce risk (safety and environment) and optimize production assurance
  - To save cost by controlling variety
  - To minimizes company own specifications
  - Capture standardized learnings

- Compliant use of ISO standards – and also supporting current digitalization - can unlock business value and is a means to achieve cost-efficiency, profitability, HSE objectives, and also minimize climate impact