Standardization of production reporting on the Norwegian Continental Shelf - benefits and challenges

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DONG Energy is one of the leading energy groups in Northern Europe

• We are headquartered in Denmark

• Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe

• Approximately 6000 employees
The integrated business model
Geographical overview
New assets in operation 2010-2014

- **2010**
  - **RENEWABLES**
    - KARCINO (PL)
    - GUNFLEET SANDS (UK)
  - **EXPLORATION & PRODUCTION**
    - NINI ØST (DK)
  - **GENERATION**
    - SEVERN (UK)
    - MONGSTAD (NO)

- **2011**
  - **RENEWABLES**
    - WALNEY (UK)
  - **EXPLORATION & PRODUCTION**
    - TRYM (NO)

- **2012**
  - **RENEWABLES**
    - LONDON ARRAY (UK)
    - LINCS (UK)
  - **EXPLORATION & PRODUCTION**
    - OSELVAR (NO)
    - MARULK (NO)

- **2013**
  - **RENEWABLES**
    - ANHOLT (DK)
  - **EXPLORATION & PRODUCTION**
    - SYDARNE (DK) PHASE 3
  - **GENERATION**
    - ENECOGEN (NL)

- **2014**
  - **RENEWABLES**
    - BORKUM RIFFGRUND 1 (DE)
  - **EXPLORATION & PRODUCTION**
    - LAGGAN-TORMORE (UK)
  - **GENERATION**
    - INBICON (DK)

*The grey figures illustrate technology undergoing commercial viability testing.*
Daily Production reporting on the NCS - history

- Part of Integrated operations program
- Started by Norwegian Oil Industry Association (OLF) with Shell, BP, Chevron, Exxon, Statoil, ConocoPhillips, Total, etc.
- Started in 2000
- Focus on exchange of daily production data, e.g. volumes, HSE, well tests, operational data, quality data
- Defines standard xml reports for exchange of daily production data and a standardized viewable report
- XML format defined together with Energistics and formed the basis for PRODML
- Reference data and definitions part of ISO15926
- Been running in production since 2006
- Infrastructure built for automatic delivery of data to partners (through solution LicenseWeb)
- First phase defined approximately 1500 different production terms
Data Integration
An efficient pipeline for real-time transferal and analysis of data

Field data
- Health, safety, environment
- Seismic
- Drilling
- Completion
- Reservoir & production
- Operation & maintenance

Vendor

Operator

Vendor

Smarter solutions

Web portals
Web services

Common XML schemas

Semantic Web
- Infrastructure for web services
- Oil & Gas Ontology

Smarter data

*Ontology =  A hierarchical data structure containing concepts, relationships, properties and rules for a specific domain
Requirements for semantics for OLF’s G1 & G2

IO Generation 2
- Integrated operation centers of operators and vendors
- Heavily instrumented facilities
- Heavy automation and multi-domain optimization

Generation 2
- Complete ontologies supporting automated reasoning or inference of data using logical rules
- Taxonomies for multiple domains

IO Generation 1
- Integrated onshore and offshore centers
- Intra-domain optimization of work processes

Generation 1
- Terminologies for single domains
- The basis for XML schemas for automatic transferal of data between applications in same domain

Oil – net, “The oil volume as defined by our revenue interest”
Oil – net, “A crude oil that includes all petroleum liquids excluding sediments and water as well as free water”.

Automatic optimization
Integrated Information Platform (IIP) Project (PETROMAKS funded Project)

- Drilling and completion
  - Daily drilling report
  - WITSML (partly)
- Reservoir and production
  - Daily production report
  - Well and well zone tables
- Operation and maintenance
  - ISO 13374 + software (Mimosa)
  - SAS + IEC 61508
- Sub sea production systems
  - ISO 13628 and Tyrihans specifications
- Infrastructure for web services

ISO 15926

Include optimal set of information from reservoirs, wells, and subsea production facilities. Semantic database with new terms included:

- Production (1500 terms)
- Subsea equipment (1000+ terms)
- Drilling (1000 terms)
- Safety and automation (200+ terms)
- Environment (200+ terms)
Monthly Production reporting on the NCS

- Builds further on daily production reporting standard, adds additional elements to the xml schema and reference database ISO15926
- Includes both monthly official government reporting and partner reporting
- Adds new definitions to ISO 15926 in the area of transport, sale, cargo, stock accounting and stream ownership information tracking
- Adds in addition semantic annotations to the schema
- Includes requirements and definitions for handling business rule validation as an overlay to normal schema validation
- Includes more advanced validation with respect to e.g. naming of wells, fixed installations based on NPD fact pages.
- Accepted in 2008 but still, highlights a lot of challenges as associated with monthly reporting both on the government and company side
- Currently in the last phase of pilot testing together with the government
- Extensions feed into PRODML and work done with Energistics
Norwegian Monthly Production Reporting – sample data stream

BP 35%
StatoilHydro 20%
ExxonMobil 5%
ConocoPhillips 20%
Total 5%
Chevron 5%
Shell 10%

StatoilHydro 40%
BP 20%
ExxonMobil 10%
ConocoPhillips 20%
Total 5%
Chevron 5%

ConocoPhillips 45%
ExxonMobil 20%
Chevron 10%
Shell 25%

BP 35%
StatoilHydro 20%
ExxonMobil 5%
ConocoPhillips 20%
Total 5%
Chevron 5%
Shell 10%

ConocoPhillips 45%
ExxonMobil 20%
Chevron 10%
Shell 25%
Norwegian Monthly production reporting – sample stock accounting and balance data stream

Start Month

Opening stock

Completed Lifting

End Month

Closing stock

Cargo no: 1
Batch: A-1
Destination:
SWE-Gothenburg-Harbour

Partial Lifting – not complete lifting at end of month, partial volumes reported rest into stock
Overview of time based production data types
Field and corporate level production reporting
How do we ensure that we are talking about the same data?
How do we ensure knowledge transfer and common processes?
Where is my data and the latest version?
How do we find relationships and key parameters used for data mining/KPI’s?
How do we link data and systems?
Where is the latest version and what did we distribute?
What about the manual “massaging” of data?
How do we avoid “siloing” and field specific data models and systems?
How do we ensure quality and propagation of the same between systems?
The solution?

Distribution wise and linking possibly
Integration wise possibly if we adhere to a standard such as e.g. PRODML which adds context in addition to measurements
Will to some extend increase quality given a standardized data transfer
Can highlight "siloing "effects and different data models
Moving forward
Introducing Semantic technology - triples

Well 1 is a Production well
Well 2 is an Injection well

Well 1
- Produces Oil
- Has name 31/10-1A
- Has operator DONG
- Is situated in Field A

Field A is situated in North Sea

Statoil and BP are partners of DONG

DONG, BP, and Statoil are partners with the production well 31/10-1A.

Oil is produced by Well 1.
Well 1 and Well 2 are both wells.

DONG operates Field A, which is situated in the North Sea.
Definition of internal and external data

Sample nomenclature classification scheme

Measurement constraint e.g. allocated, fiscal, metered, calculated
Sample field setup linking real time data to higher ordered data

This is what people should relate to
Moving forward within the production reporting domain on NCS

- Looking into establishment of a triplestore aka knowledgebase handling both daily drilling and daily and monthly production reports
- Further enchantments to the current standard
NCS Epim ReportHub
## Challenges

1. XML does not solve all of our problems – still it is possible to have different definitions of a given data element.
3. Extraction of data.
4. Selling the idea – convincing people using the data that it is beneficial to have a standardized format for it.
5. The Excel problem.
6. Standardization vs I want the same data as always even if I do not use it.
7. Standardization vs new requirements and data elements.
8. Time and propagation of standard across a large number of fields – typically coincides with software upgrades.
9. Propagation of idea that this is a machine to machine communication.
10. Complexity of production data.
11. That is Norway we cannot do business like that hence we cannot use it.
12. History of the field and decisions made back in time.
Benefits seen

- Quality has gone up
- Automatic and standardized reporting raises awareness
- Follow up is done on a more detailed and timely level
- Has eased how we do integration internally between group functions and applications
- Timely distribution
- One source of the data generate once -> distribute many -> load in standardized manner
- Decrease costs and free up resources to be used for more qualified work
- Combining data elements e.g. production and drilling
- Standards not bound to NCS only -> tried and tested on other continents
- Standards can be used for other purposes w.g. weekly reporting, P/I plan, KPI reporting, forecasting
Questions?