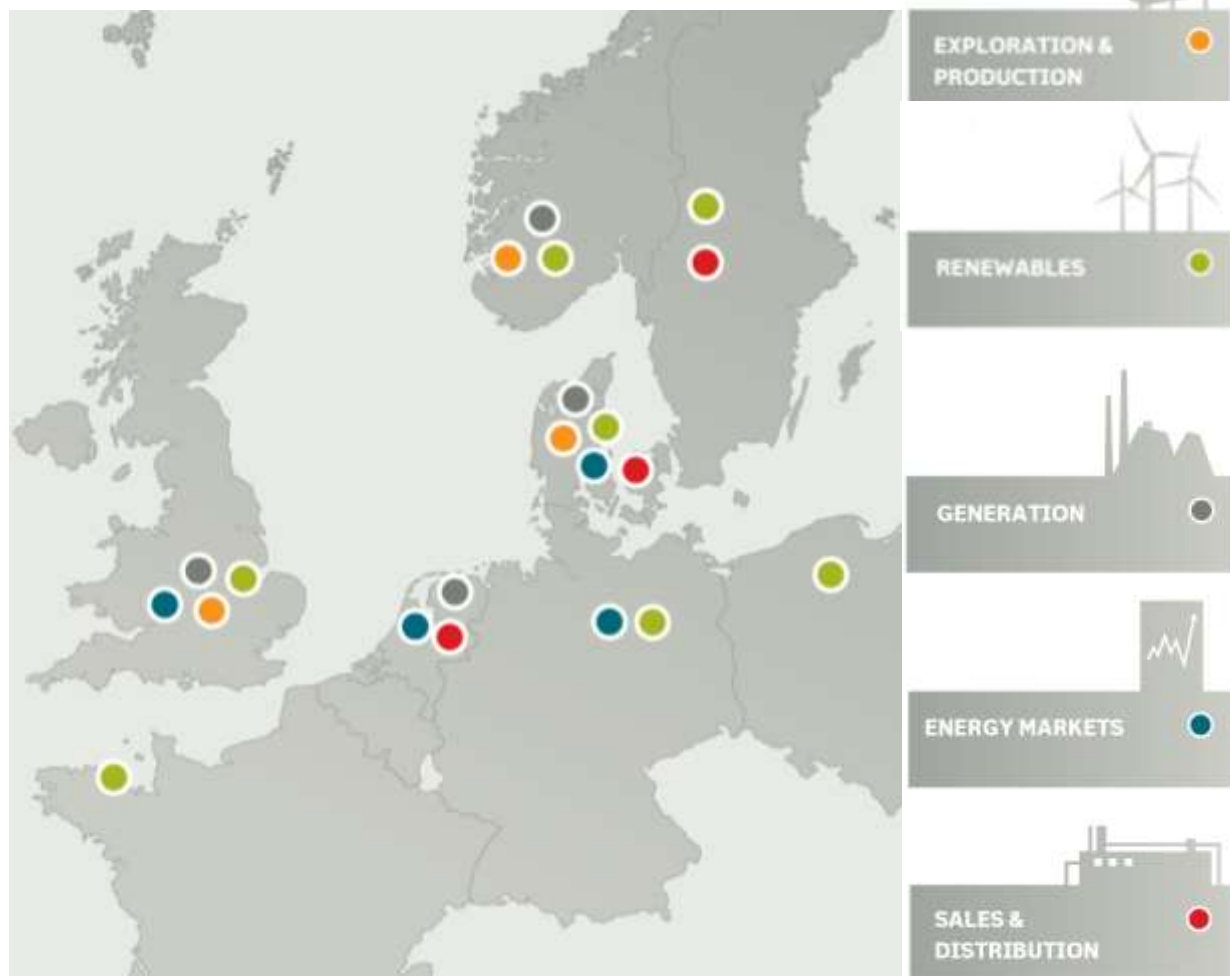


Standardization of production reporting on the Norwegian Continental Shelf - benefits and challenges

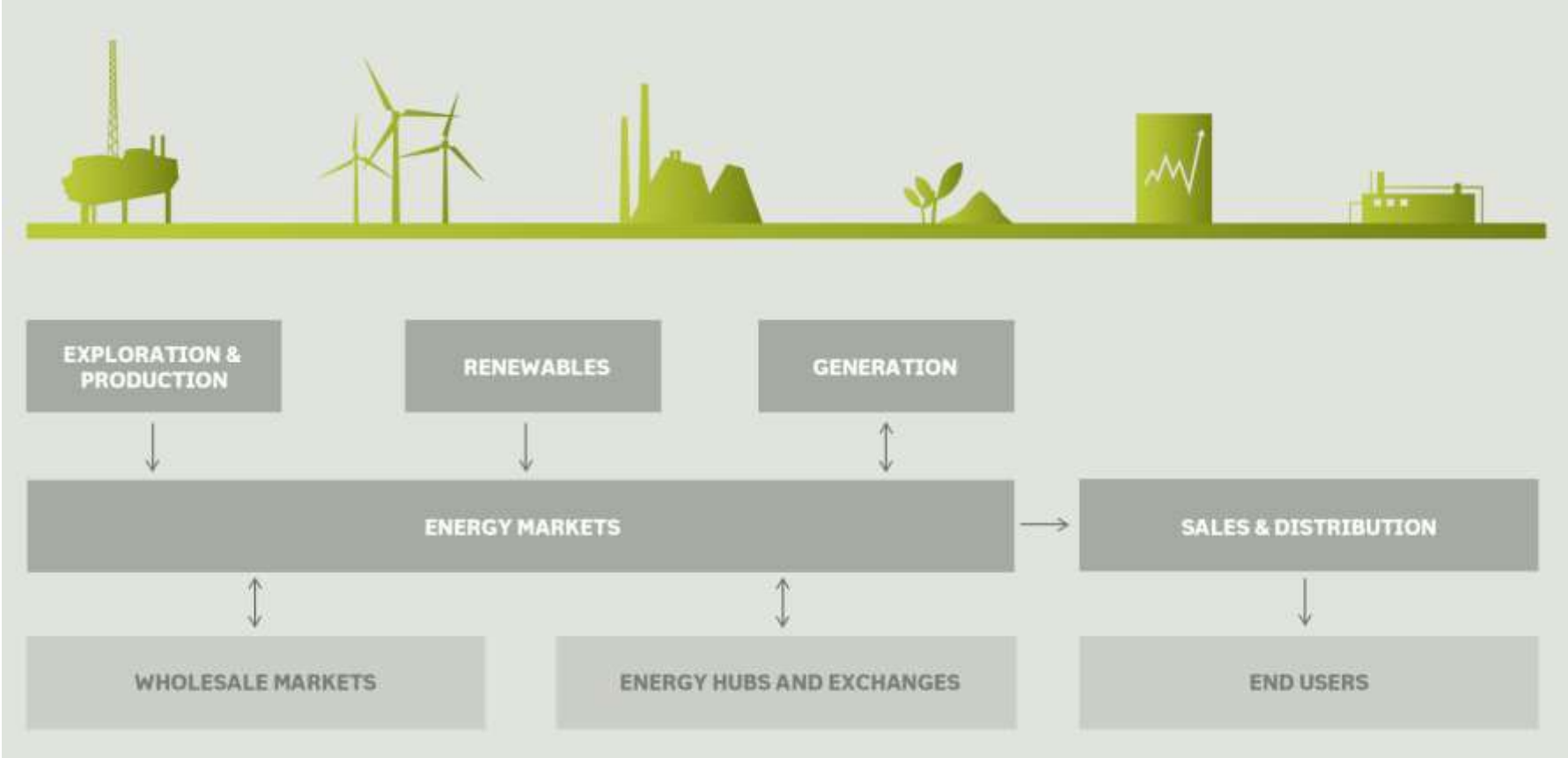
Magnus Svensson

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

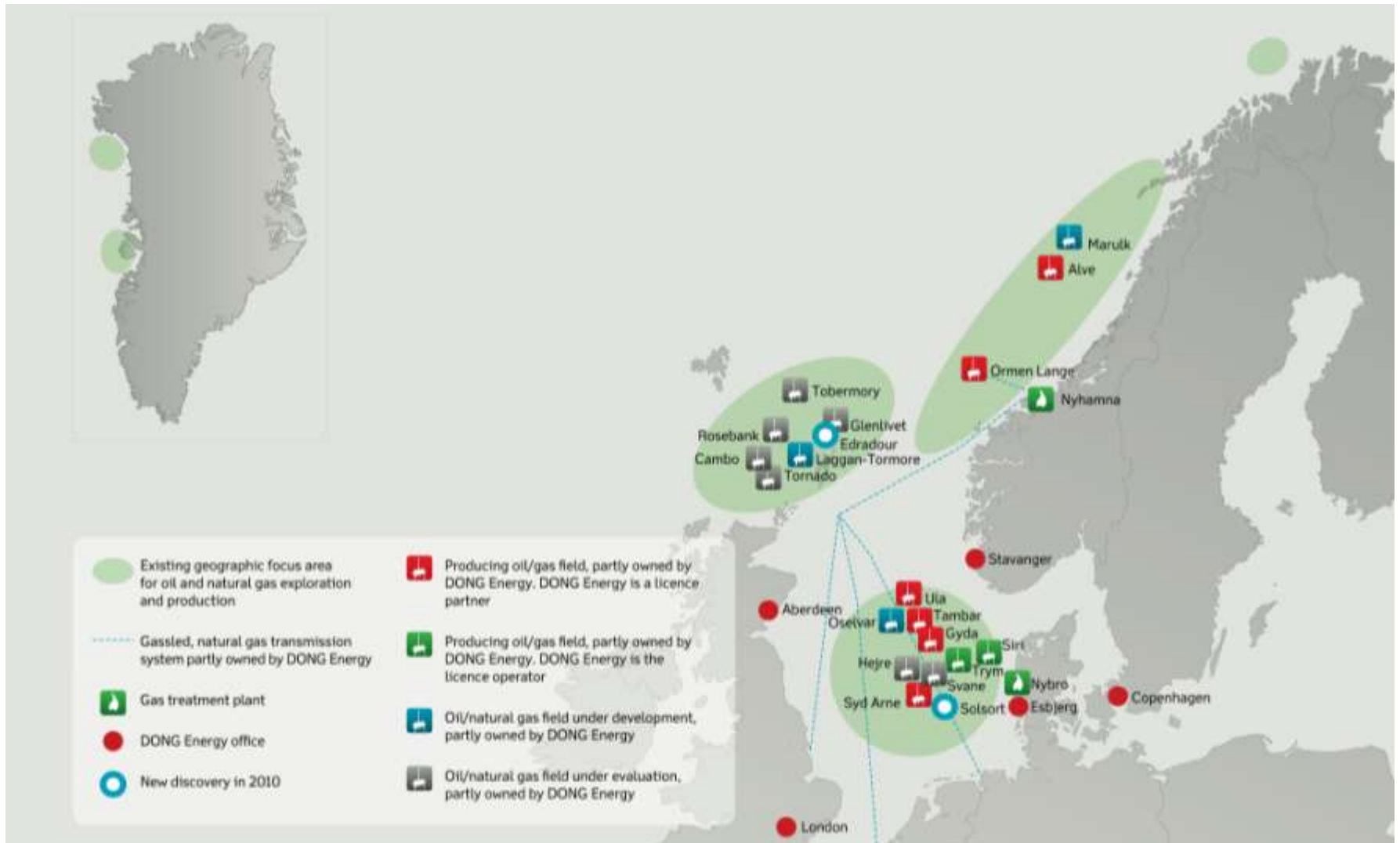


- We are headquartered in Denmark
- Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe
- Approximately 6000 employees

The integrated business model



Geographical overview



New assets in operation 2010-2014



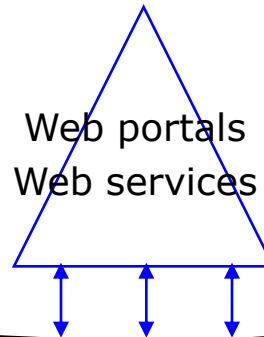
Daily Production reporting on the NCS - history

- 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

Smarter solutions



Vendor



Operator



Vendor

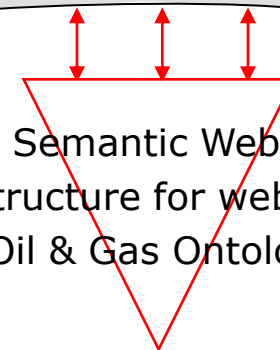


Field data

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



Common XML schemas



- Infrastructure for web services
- Oil & Gas Ontology

Smarter data

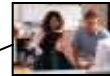
*Ontology = A hierarchical data structure containing concepts, relationships, properties and rules for a specific domain

Requirements for semantics for OLF's G1 & G2

IO Generation 2

- Integrated operation centers of operators and vendors
- Heavily instrumented facilities
- Heavy domain

Automatic optimization



Generation 2

- Complete ontologies supporting automated reasoning or inference of data rules for multiple

Oil – net, “The oil volume as defined by our revenue interest”

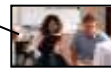
Oil – net, “A crude oil that includes all petroleum liquids excluding sediments and water as well as free water”.

ontology

IO Generation 1

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

Real-time collaboration rooms

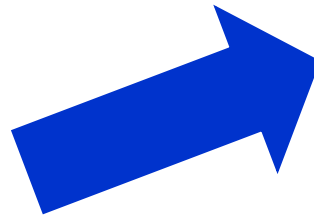
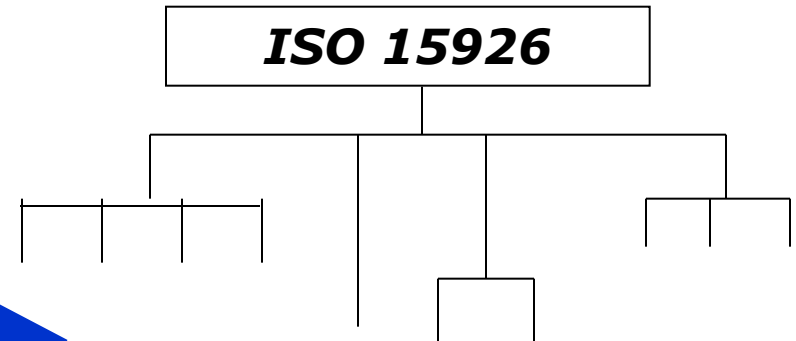
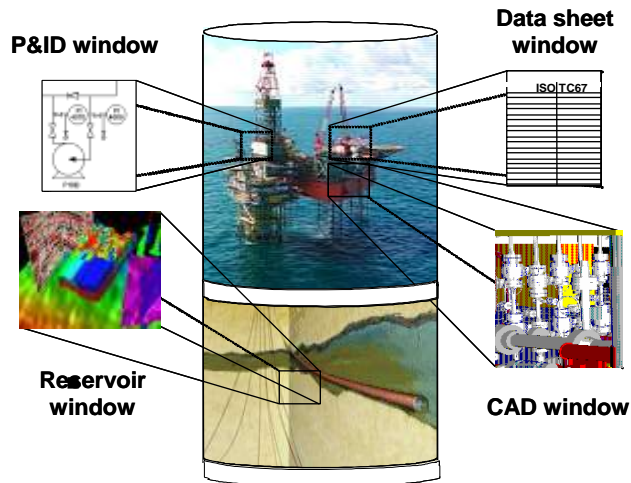


Traditional facilities

Generation 1

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

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**

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%



Field 1 Demo



Field 2 Demo

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



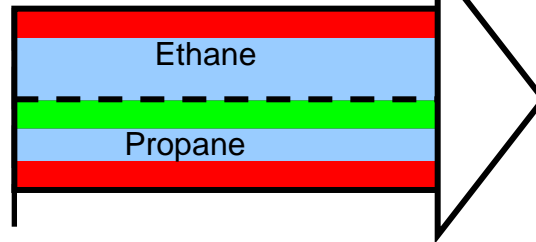
Field/Processing facility 3 Demo

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

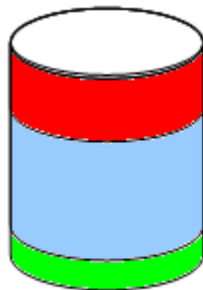
Pipeline A Demo



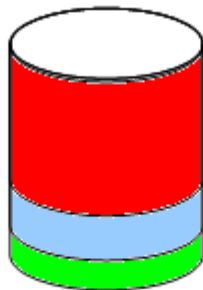
Sale Pipeline A



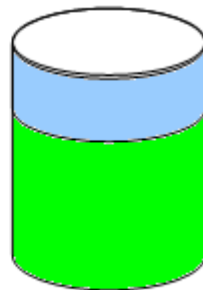
Terminal Demo



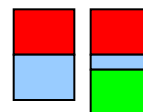
Propane



Ethane



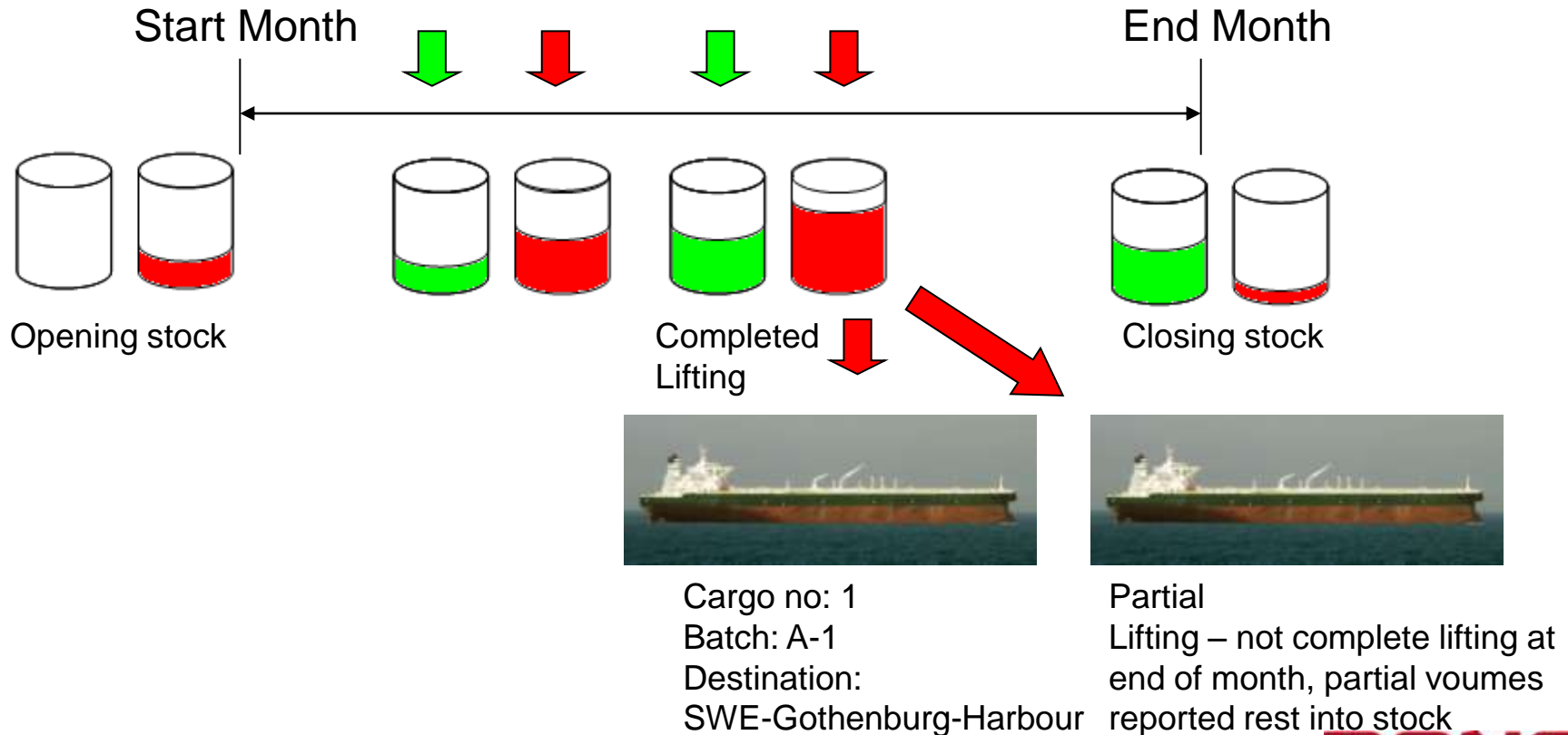
Normal butane



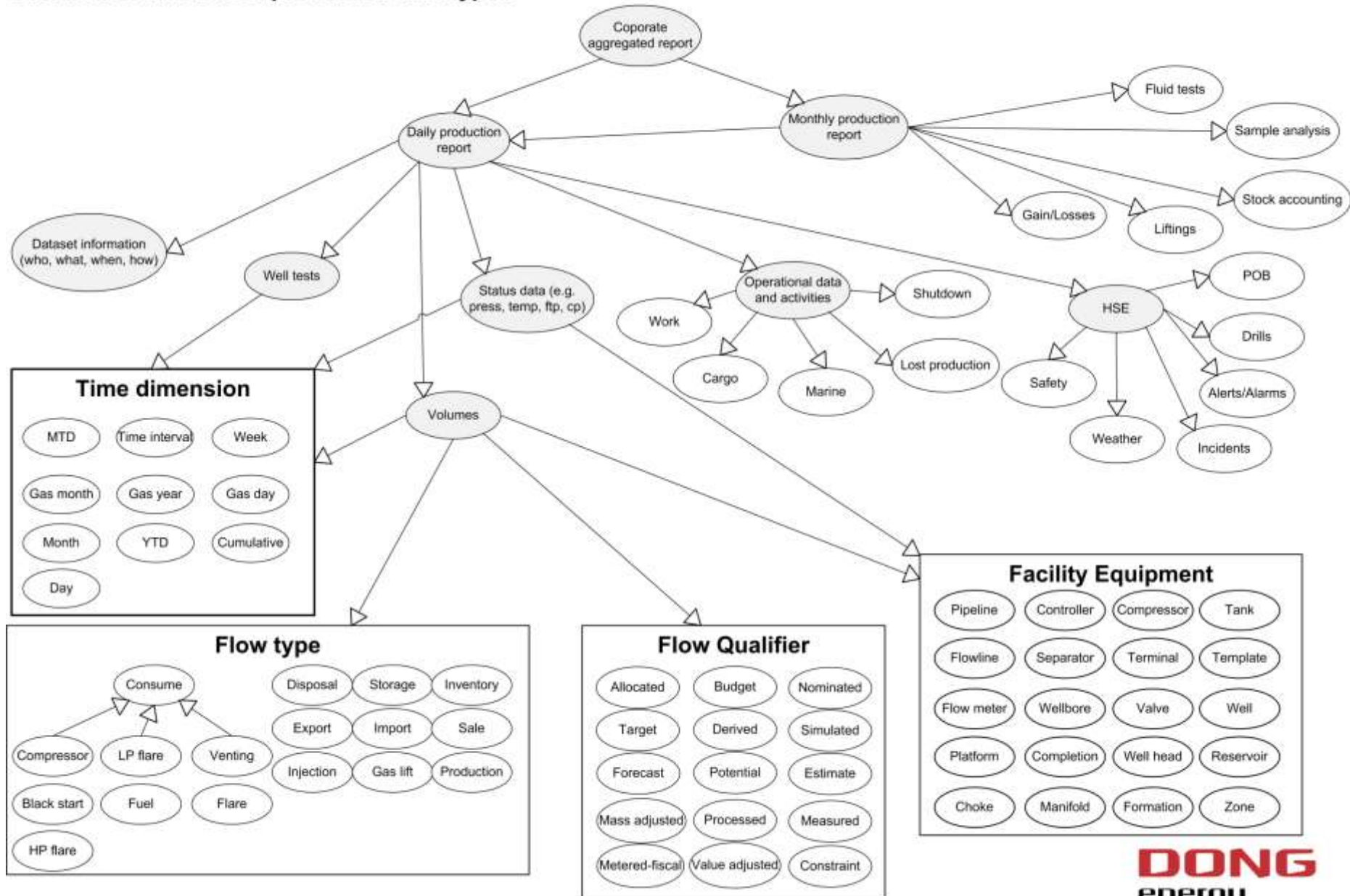
Cargo no: 1
 Batch: A-1
 Destination:
 SWE-Gothenburg-Harbour



Norwegian Monthly production reporting – sample stock accounting and balance data stream

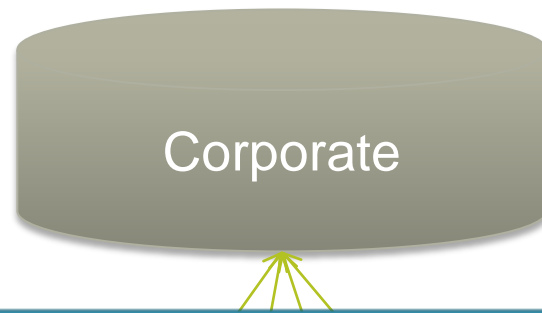


Overview of time based production data types



Field and corporate level production reporting

Multiplied



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

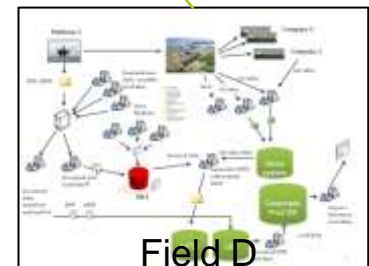
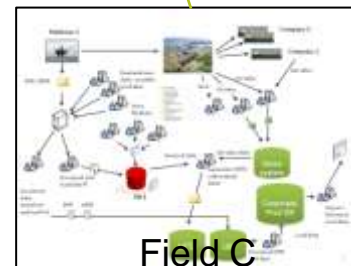
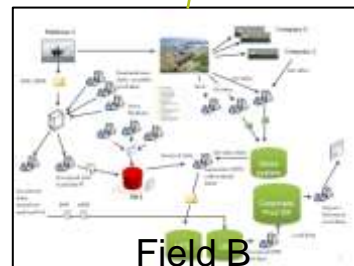
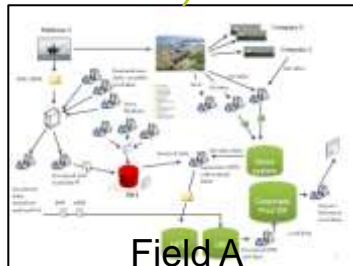
How do we link data and systems?

Where is the latest version and what did we distribute

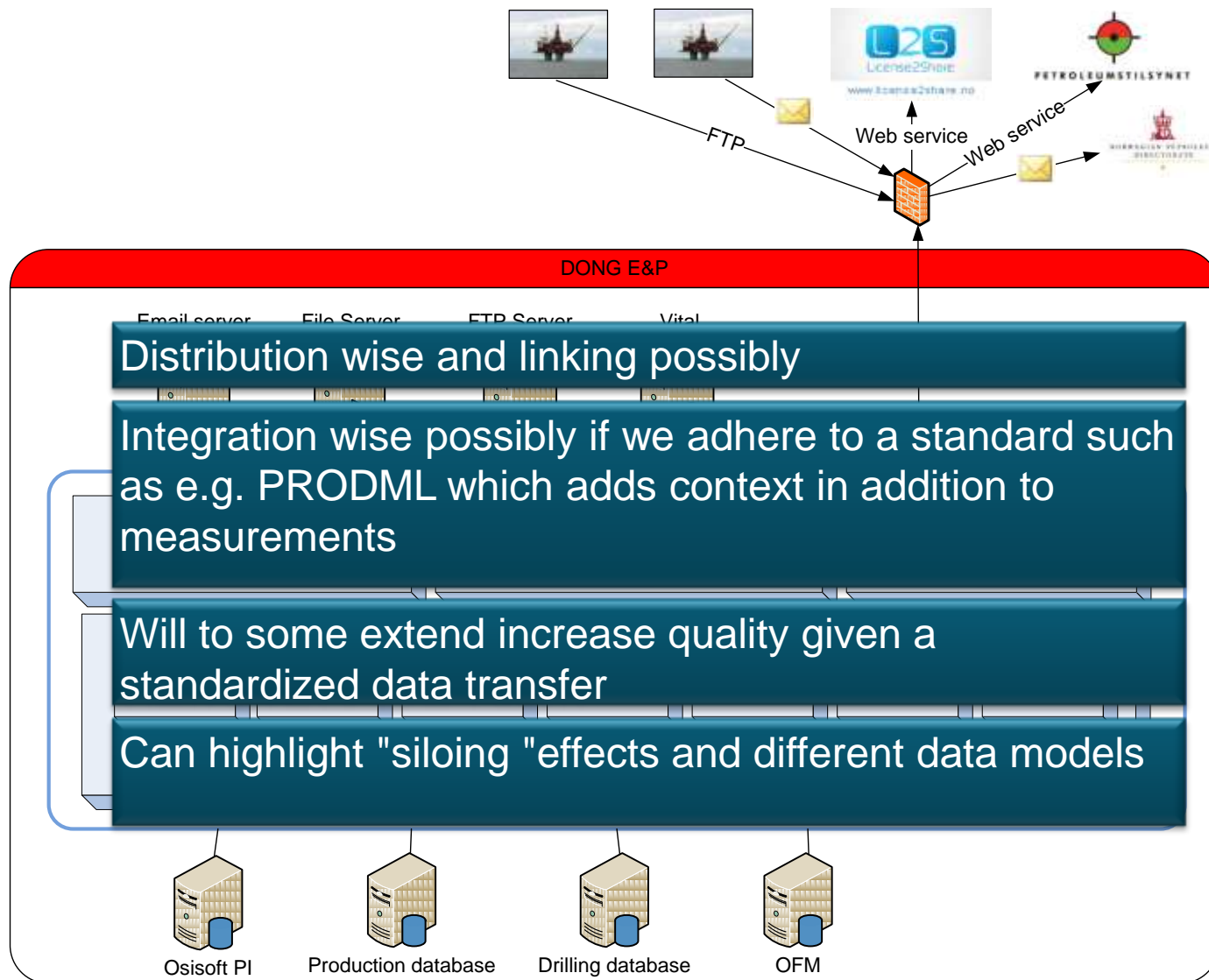
What about the manual "massaging" of data

How do we avoid "siloeing" and field specific data models and systems?

How do we ensure quality and propagation of the same between systems?

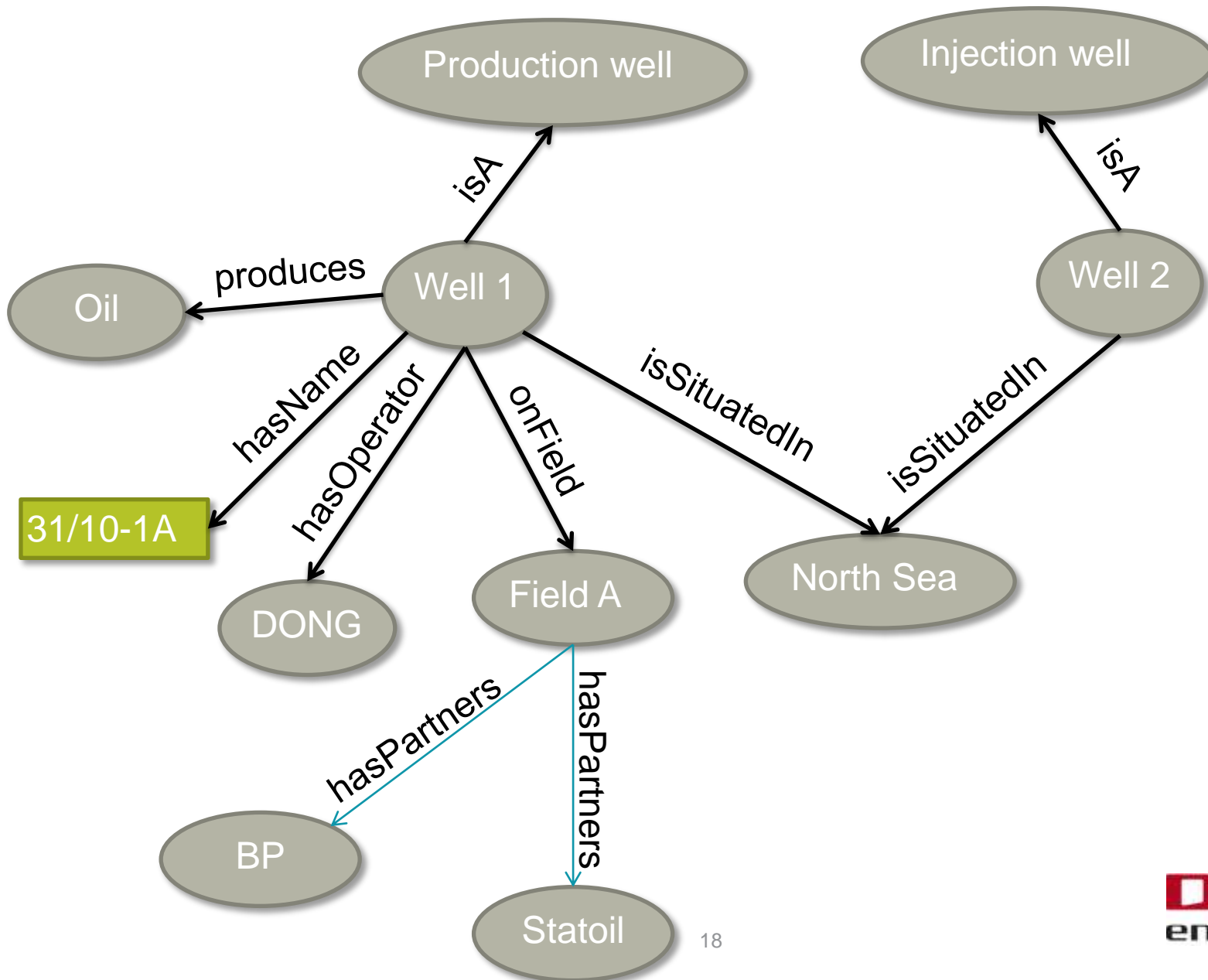


The solution?



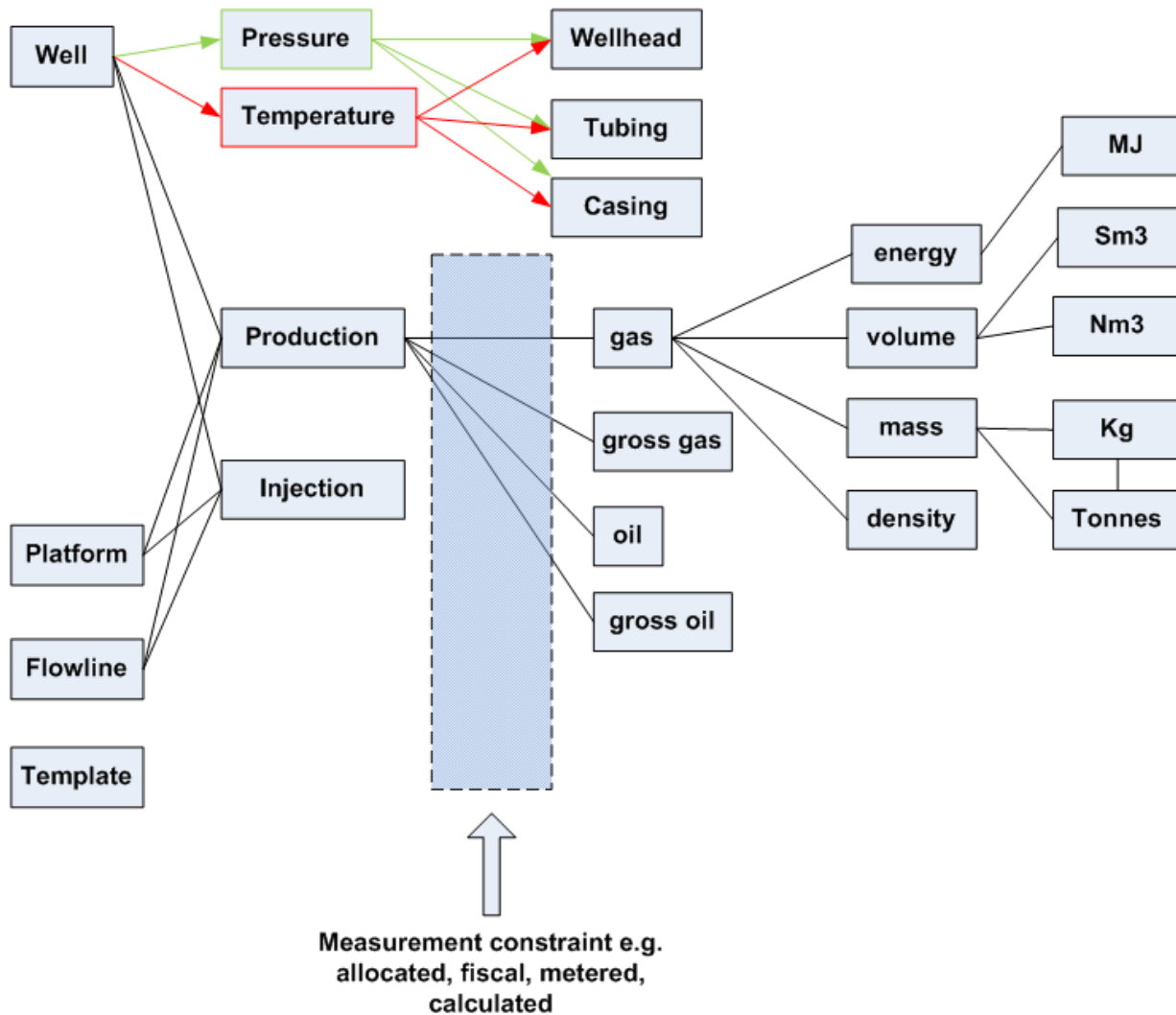
Moving forward

Introducing Semantic technology - triples

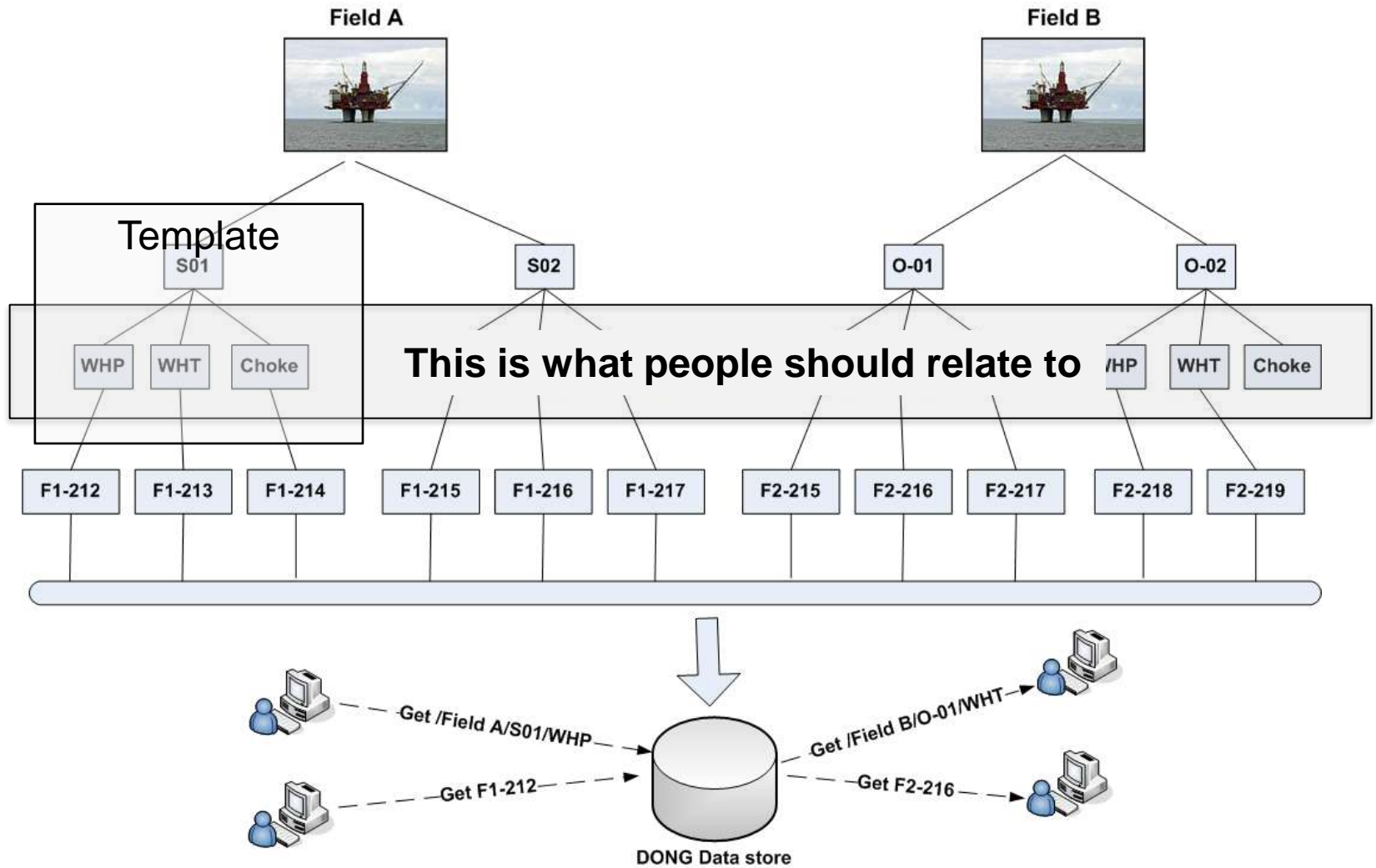


Definition of internal and external data

Sample nomenclature classification scheme



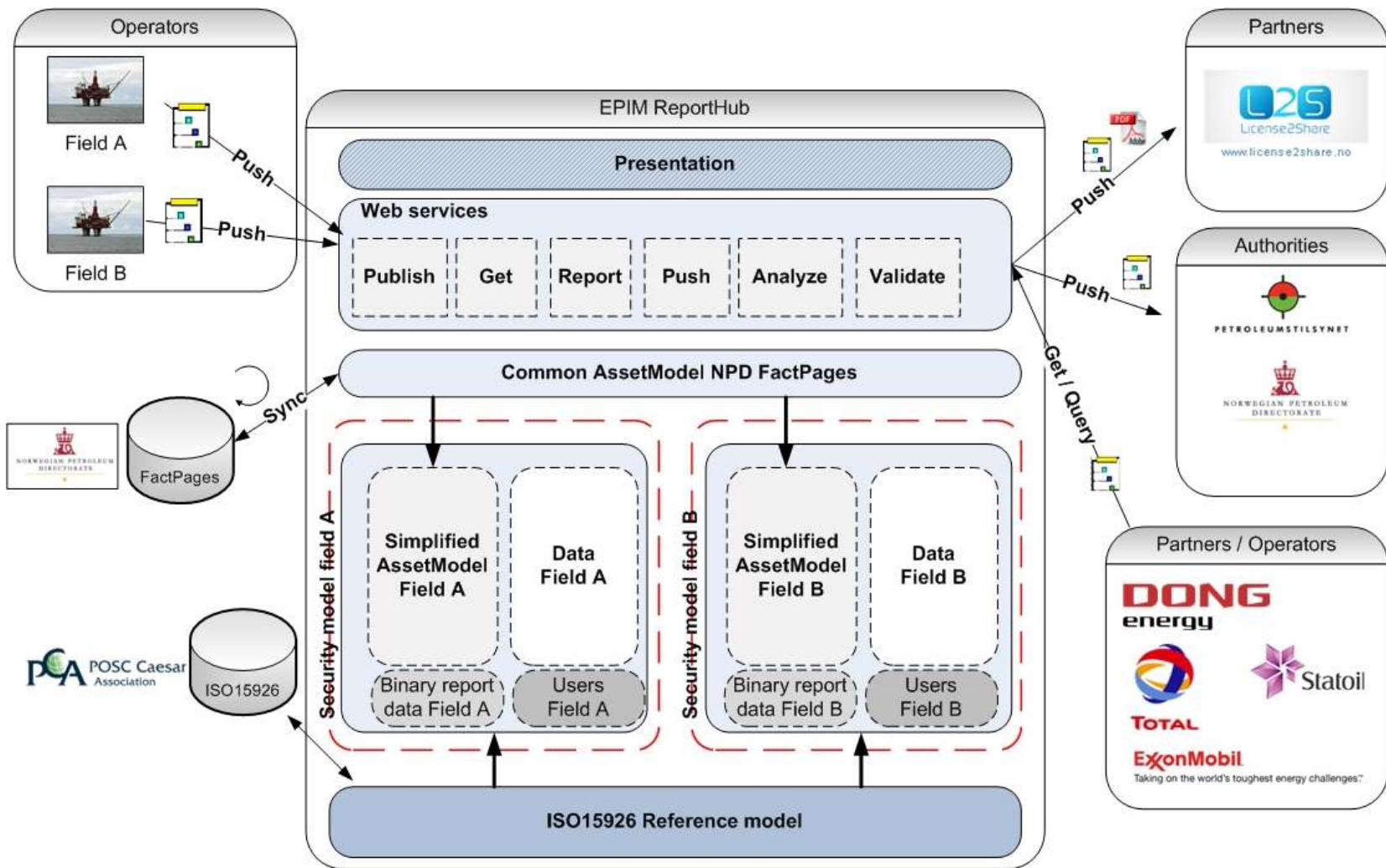
Sample field setup linking real time data to higher ordered data



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

XML does not solve all of our problems – still it is possible to have different definitions of a given data element

Manual massaging of data – automatization highlights issues related to manual processing steps

Extraction of data

Selling the idea – convincing people using the data that it is beneficial to have a standardized format for it

The Excel problem

Standardization vs I want the same data as always even if I do not use it

Standardization vs new requirements and data elements

Time and propagation of standard across a large number of fields – typically coincides with software upgrades

Propagation of idea that this is a machine to machine communication

Complexity of production data

That is Norway we cannot do business like that hence we cannot use it

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?