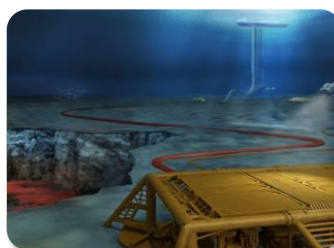GOLIAT

eni

norge

# Goliat Barrier Status Panel

Operational Barrier Management
HFC Forum, 27-28th April 2016
Live Fornes
**www.eninorge.com**

## Eni Norge - on the NCS for more than 50 years

- Present on the Norwegian Continental Shelf since 1965

- Interests in 60 licenses (North sea, Norwegian sea and the Barents sea)

- Operator of the Marulk field (gas field in the Norwegian Sea)

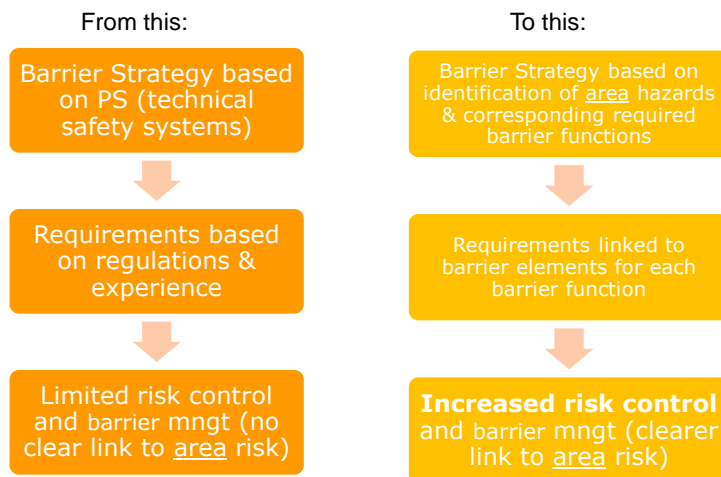- Operator of the Goliat field (oil field in the Barents Sea)
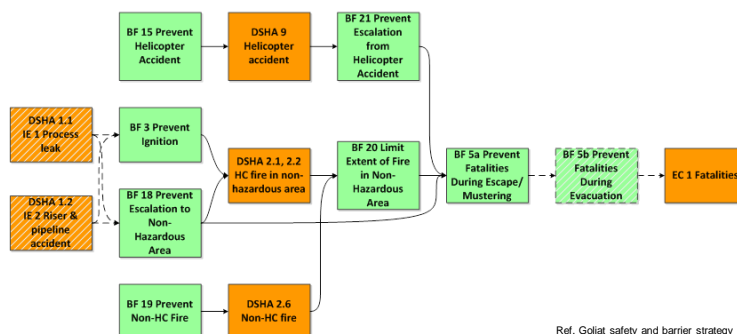
Goliat FPSO

Marulk gas field

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## Goliat field

- Discovered in year 2000

- On stream March 2016

- Located 88 km northwest of Hammerfest

- Eni Norge is operator (65%), Statoil is partner (35 %)

- First oil field in the Barents Sea

- Estimated recoverable oil reserves: 179 million barrels

- Production lifetime of 15 years

- The world's largest and most advanced cylindrical oil platform

- Tailored for Arctic weather conditions

- Supplied with electricity from shore

Link to video

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## Integrated Barrier Management Project (2013-2016)

**Purpose**

- The purpose of the project was to establish the safety and barrier strategy and performance requirements for all barriers based on the specific risk picture on the Goliat FPSO;  in order to be able to control risk through barrier management in daily operations.

**Participants**

- Eni Norge:
  - Goliat Project
  - Operations
  - HSEQ Dept.
  - D&T Dept.

- Professional support:

  ○ SINTEF

  SAFETEC
  AN ABB GROUP COMPANY

  ABB

Goliat Barrier Status Panel (test version)

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## Barrier Management Project - Methodology

From this:

To this:

Barrier Strategy based on PS (technical safety systems)

Barrier Strategy based on identification of <u>area</u> hazards & corresponding required barrier functions

Requirements based on regulations & experience

Requirements linked to barrier elements for each barrier function

Limited risk control and barrier mngt (no clear link to <u>area</u> risk)

**Increased risk control** and barrier mngt (clearer link to <u>area</u> risk)

## Identify barrier functions by «barrier grid» technique



Ref. Goliat safety and barrier strategy (Figure by Safetec)

Barrier grids developed for all main areas:
• Shows the relationship between the hazards in a specific area (i.e. the area-specific risk picture ) and the Barrier Functions (BF) needed to prevent or/and mitigate these risks

## Barrier elements

- The barrier elements represent the **solutions or "materialization"** of the sub-functions necessary to realize a barrier function

- Technical barriers need to be made **operational** (e.g. <u>how</u> to operate the barrier systems) and **organisational responsibility** needs to be assigned (e.g. <u>who</u> is going to operate the barrier systems; <u>who</u> is authorized to realise a barrier function)
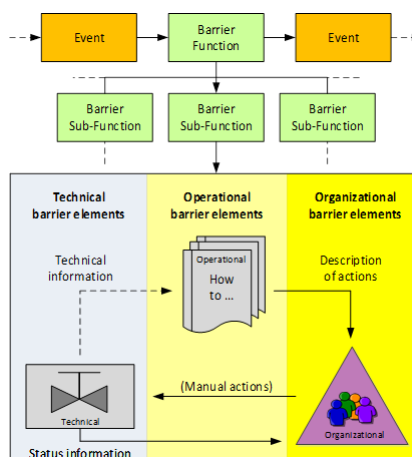
Ref. S.Hauge & K.Øien, SINTEF

## Barrier Status Panel – Decision support & visualisation tool

- The Barrier Status Panel is developed by ABB (use of ACE):
  - Using <u>real-time</u> data from SAS (Safety & Automation System)
    - Condition Monitoring, Dangerous Undetected fault signals, Faults, Blockings
  - Using daily data from SAP (Preventive Maintenance & Corrective Maintenance)

- The Barrier Status Panel show the <u>**current status**</u> of the barrier functions (and hence, the barrier elements):
  - Provides offshore & onshore users with up-to-date information regarding the barriers' health status - both for main areas and for the FPSO as a whole
    - Use of Barrier grids; showing where in the 'sequence of events' that barriers are not functioning or degraded

- The Barrier Status Panel is a planning & decision support tool to be use during activity planning:
  - It is <u>not</u> a system for handling of hazardous situations (e.g. during a high-high alarm or a gas leakage)

- Only the **technical** barrier elements are included so far

## Barrier Status Panel - offshore & onshore collaboration

▪ Use of the Barrier Status Panel leads to improved risk management and a joint risk awareness/understanding between the offshore and the onshore organisations:

  ▪ Used offshore in daily activity planning
  ▪ Used by the OSG (Onshore Support Group) in Hammerfest to prepare work packages and to monitor risk and barrier status
  ▪ Used by TSG (Technical Support Group) in Hammerfest and Development & Technology at Forus to monitor and follow-up technical systems and performance standards
  ▪ Used by onshore HSEQ to monitor and trend risk and barrier status
  ▪ Used by onshore management to monitor high level risk and barrier status

## Aggregation rule set

Below, a rule set for allocating traffic lights on a barrier element/tag level is presented:

*On a barrier element/tag level at least one of these observations will give a red light:*   🔴

  • IF PM overdue > 90 days, then red light [1]
  • IF CM notification open OR overdue, AND priority in SAP = high, then red light
  • IF condition monitoring alarm = Failure (> 750), then red light
  • IF safety fault alarm = failure, then red light
  • IF tag manually blocked (i.e. inhibited) or suppressed[2], then red light

*On a barrier element/tag level at least one of these observations will give a yellow light:*   🟡

  • IF 28 days ≤ PM overdue ≤ 90 days , then yellow light [1]
  • IF CM notification overdue AND priority in SAP = medium, then yellow light
  • IF fault alarm = degraded, then yellow light

*IF none of the above conditions are present, then barrier element/tag has a green light:*   🟢

Note 1): PM also includes functional testing (FT) of the barrier elements/tags
Note 2): Automatic suppression (e.g. of standby equipment) not to be included in barrier panel

The above rule set is sufficient to set a traffic light on element level. Red takes preference to yellow which again takes preference to green. In this way all the individual barrier elements can be given a traffic light.
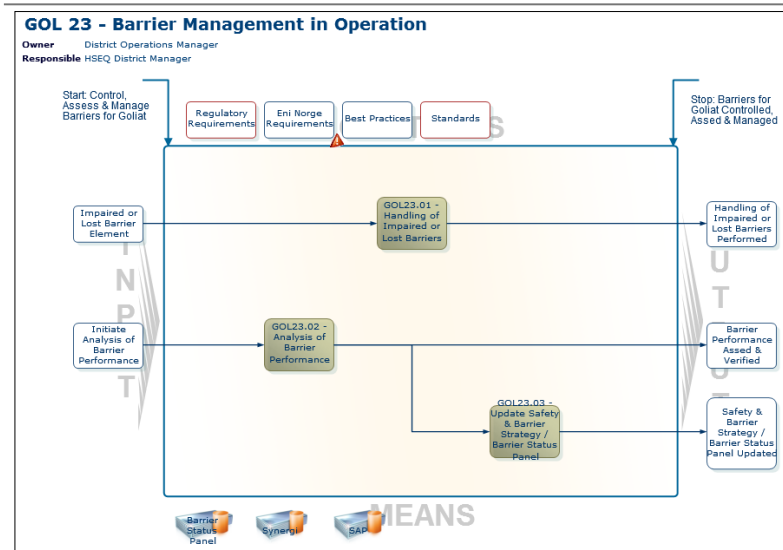
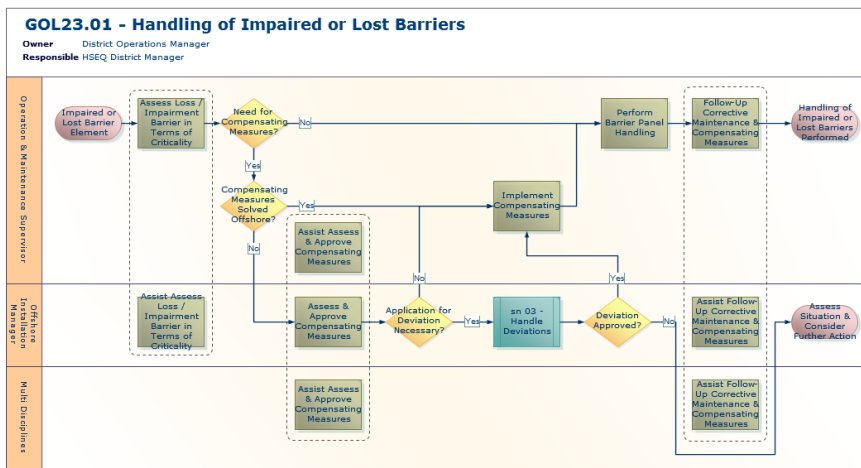## Barrier Status Panel – front page - Video
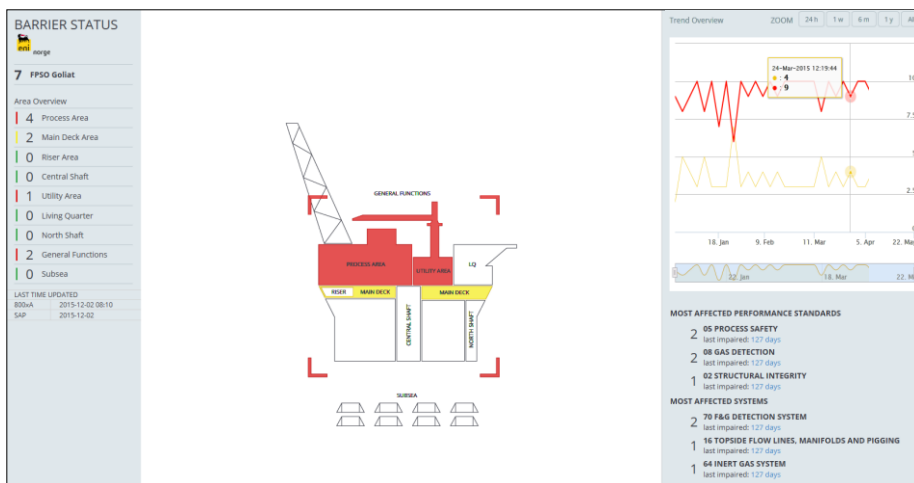


Test version; not 'real' data

## Barrier management work processes

## Barrier management work processes



**GOL23.01 - Handling of Impaired or Lost Barriers**
Owner    District Operations Manager
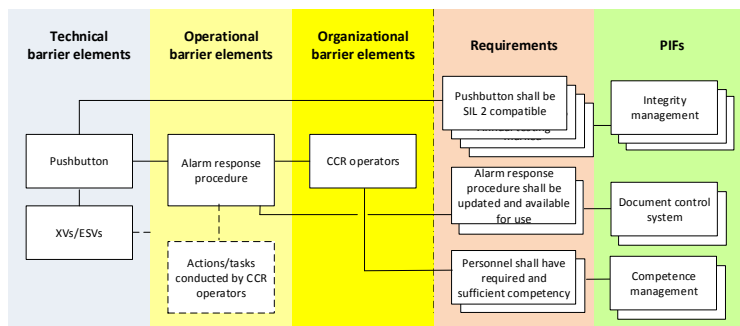Responsible HSEQ District Manager

## Experiences so far

- High number of 'red' barriers (due to start-up phase)

- Handling of barriers in the panel are being conducted:
  - Used daily – offshore/onshore collaboration; increased collaboration & common understanding
  - Focus on blockings and corrective maintenance on barrier elements
  - Some handling has to be transferred to onshore (system responsible)

- Feedback from users:
  - Positive focus; organisation has increased understanding and focus on barrier management
  - Workload due to the high number of red barriers
  - Would like more information from related systems (SAP, SAS, maintenance workplace etc ) – want more text/info
  - Requests aggregation rules based on criticality assessments (note: ongoing)
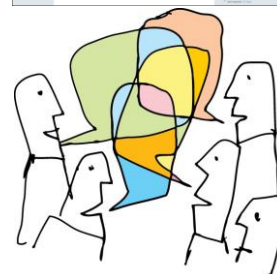
## Barrier management project – phase II; include O&O

- Establish system for monitoring the **status** of the **operational** and **organisational (O&O)** barriers for Goliat (i.e. use of Barrier Status Panel)
- Identifying **indicators** for degradation of the operational and organisational barriers
- **Performance requirements** and **verification** activities (*performance indicators* and audits)

| Technical barrier elements | Operational barrier elements | Organizational barrier elements | Requirements | PIFs |
|---|---|---|---|---|
| Pushbutton | Alarm response procedure | CCR operators | Pushbutton shall be SIL 2 compatible | Integrity management |
| XVs/ESVs | Actions/tasks conducted by CCR operators | | Alarm response procedure shall be updated and available for use | Document control system |
| | | | Personnel shall have required and sufficient competency | Competence management |

Ref. S.Hauge & K.Øien, SINTEF

## Summary

- The Barrier Management Project has focus on linking barriers to the risk picture on Goliat FPSO in order to have more control with majors accident risk

- Barrier Status Panel: Planning & decision-making tool, but also a risk management tool; via monitoring the barrier status over time, we get an *indication* on how well protected we are against major accidents

- Barrier Status Panel to include indicators on operational and organisational barrier elements (Phase II) – 2016/2017