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LEAK DETECTION SYSTEM NOVA DEVELOPMENT

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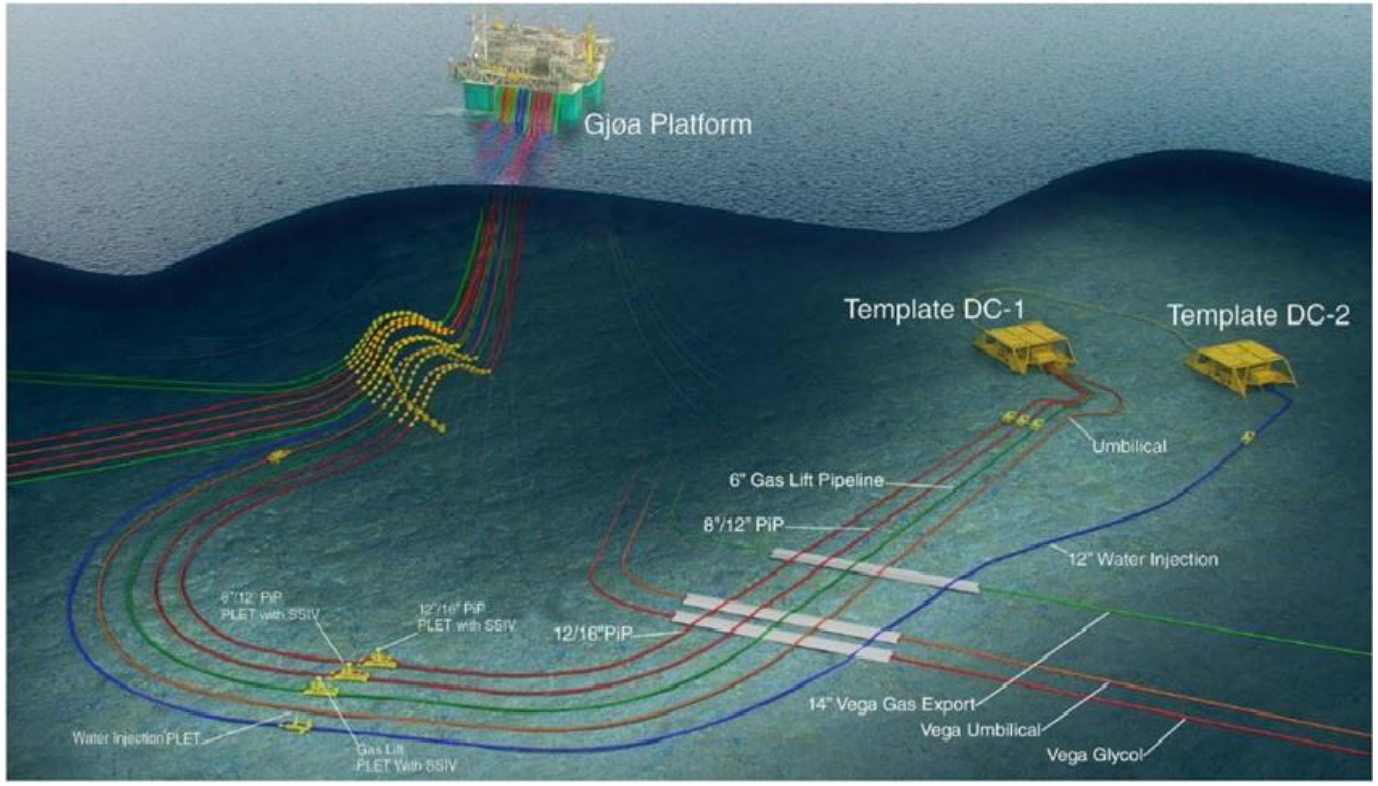
INTRODUCTION

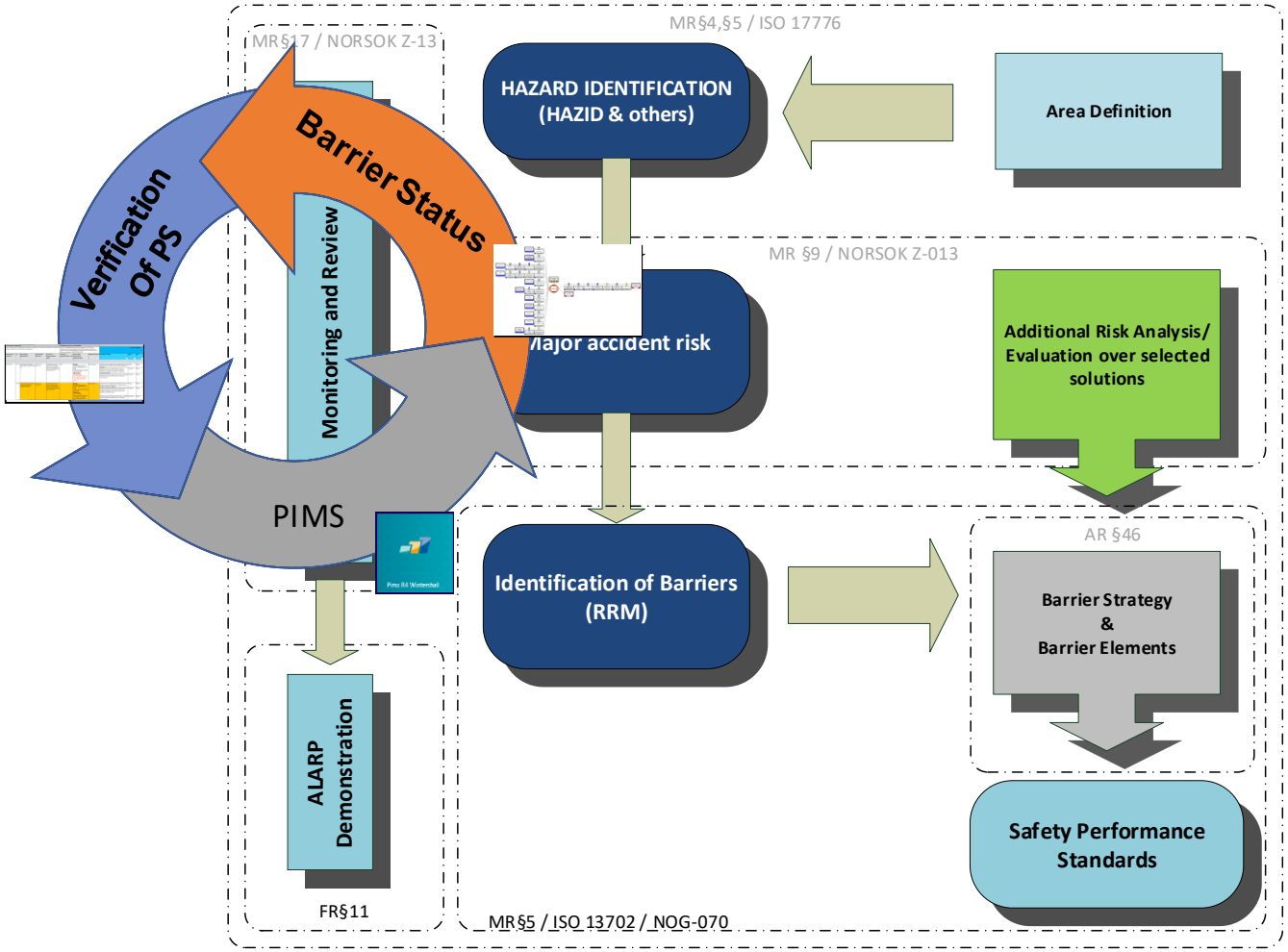
THE NOVA FIELD OVERVIEW

Location



Field development concept

NOVA BARRIER MANAGEMENT



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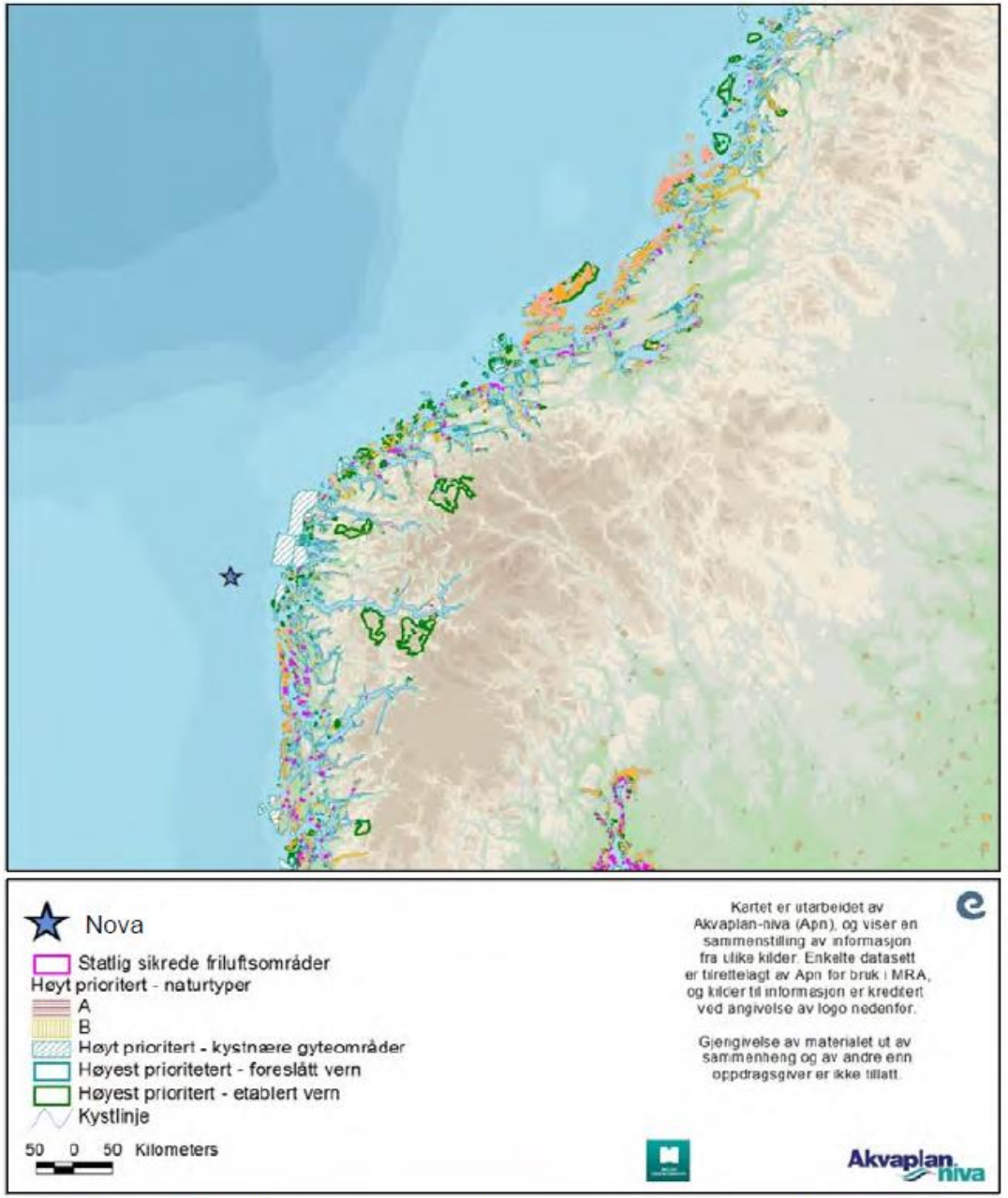
SELECTION OF LEAK DETECTION SYSTEM– METHODOLOGY

ACCORDING TO NOROG GUIDLEINE 100 – REFERRED TO IN ACTIVITY REGULATIONS §57

Define context	Dimensioning scenarios	Performance requirements	Selection of techniques	Assess performance	Evaluate GAPs
• Field and activity • Near shore location (50 km) • Env. risk • Regulatory basis	• Area/system definition • Leak points • Leak freq/ leak size	• Based on location/ env. risk • Area/system specific • Leak rate specific	• Based on location/ env. risk • BAT • Cost - benefit	• Area/system specific • Leak rate specific • Visualize limitations • Uncertainties	• Inability to detect? • Weather limitations? • Assess (Frequency, performance of system, envi. consequences) • Cost of closing GAP



Figur 8.3 Høyt miljøprioriterte lokaliteter (Akvaplan-niva, 2015). Datakilde: Miljødirektoratet (2015).

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LEAK DETECTION SYSTEM

ENVIRONMENTAL RISK CONSIDERATIONS

- **Environmental risk below Wintershall Dea acceptance criteria for all defined leak rates/duration**

- **Vulnerable shoreline resources**
  - Near shore is the most sensitive area – Seabirds habitats
  - Runde is the southernmost bird cliff in Norway
  - **<u>Nova approx. 50 Km from shore</u>**

NOVA LEAK DETECTION SYSTEM

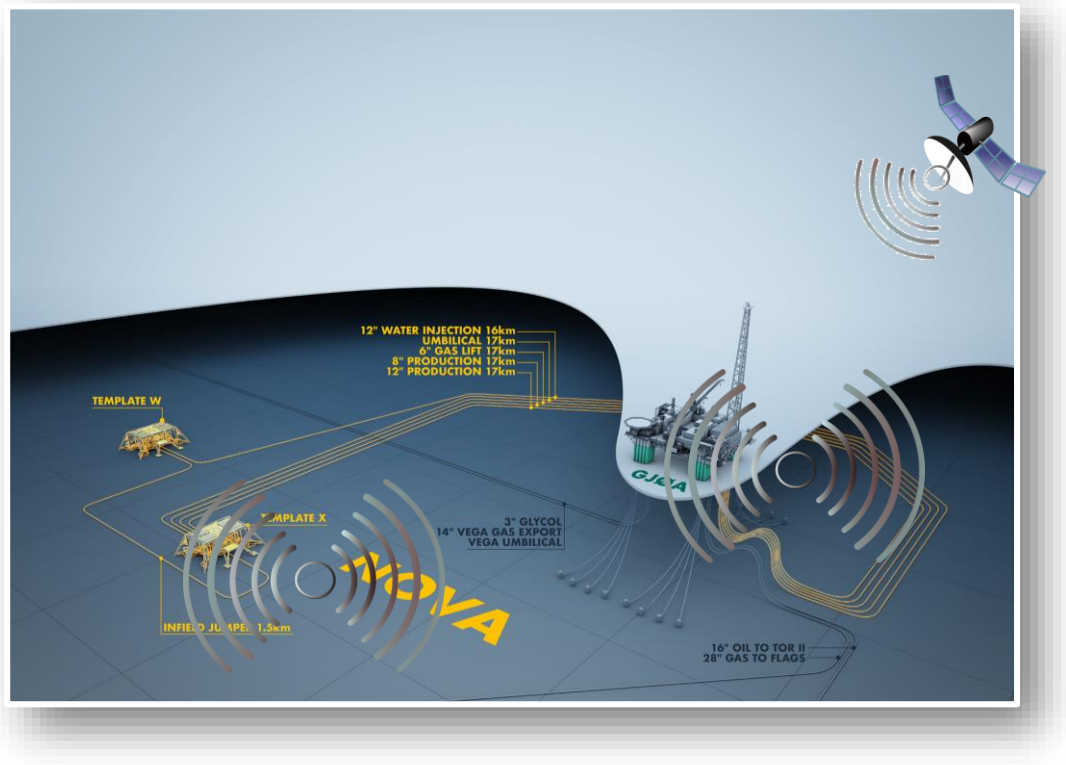
RESULTS FOR INDIVIDUAL LEAK SCENARIOS

- Conservative value of production during year 2022.

Leak rate % (m^3/h)	Duration of leak (hours)			Maximum amount of oil emulsion on shoreline (tons)			Minimum drift time to shore (hours)		
0.30% (1)	24	72	168	1	2	3	28	28	28
3% (10.0)	12	24	72	29	240	601	29	32	37
10% (33.3)	1	3	12	37	144	300	26	26	26
25% (83.33)	1	1	6	308	308	730	23	23	25
50% (166.7)	1	1	6	200	200	1188	23	23	23

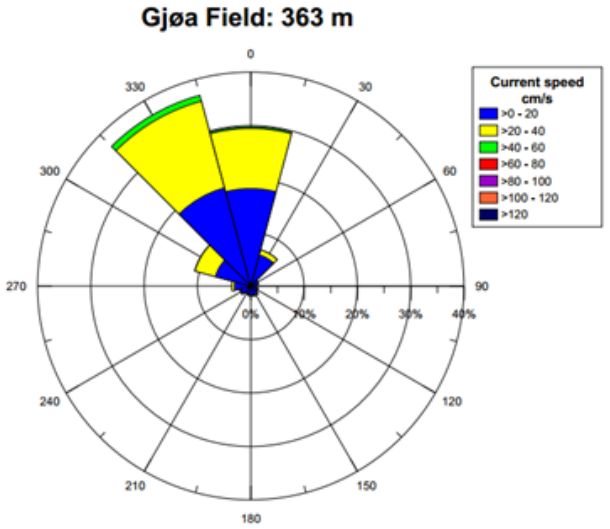
SELECTION OF REMOTE LEAK DETECTION TECHNIQUES

- Environmental conditions
- Environmental risk
- Best available technology (BAT);
- Technical feasibility and maturity;
- Cost-benefit.

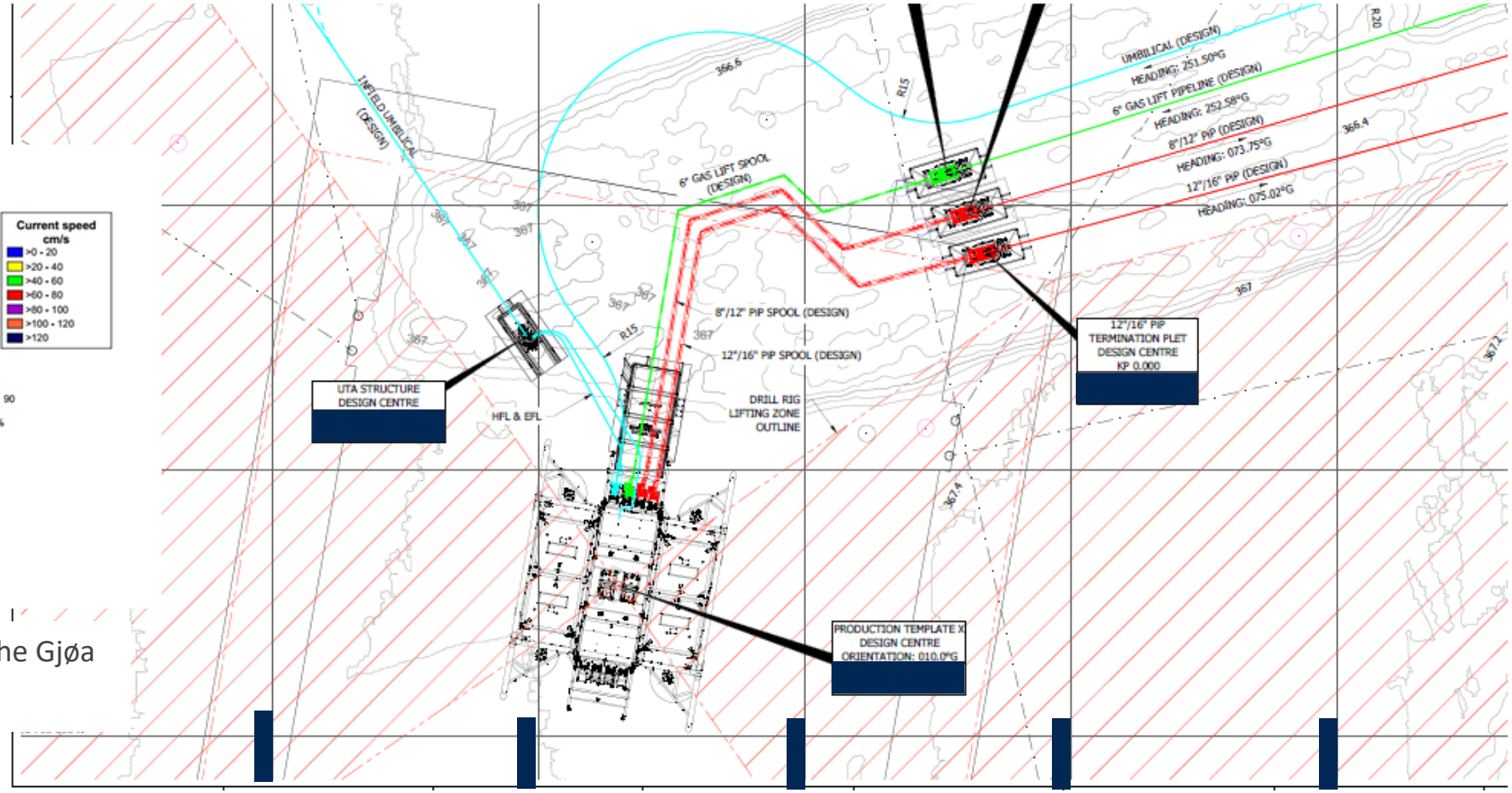


NOVA LEAK DETECTION SYSTEM

TEMPLATE X PLACEMENT AND DOMINANT CURRENT ROSE

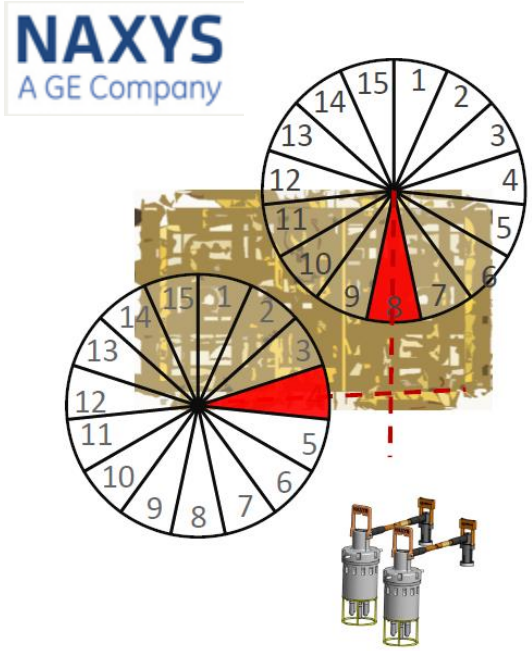


Current rose at 363m depth at the Gjøa field



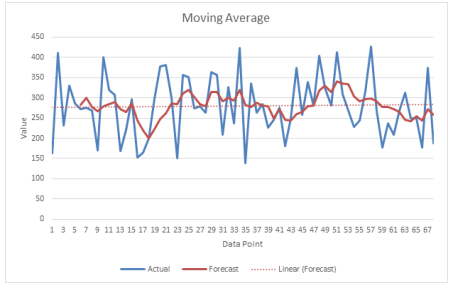
SELECTED LEAK DETECTION TECHNIQUES AT SPS

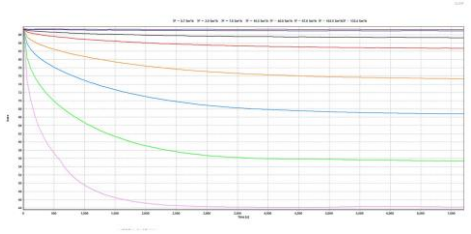
Franatech Methane Sniffers



2 x Naxys A5 Acoustic Leak and Vibration Detectors

Source Naxys Subsea Leak Detectors Product Presentation for Nova project.





Mass Balance & Pressure Alarm Low Low (PALL)

NOVA LEAK DETECTION SYSTEM

METHANE SNIFFERS & PASSIVE ACOUSTIC – WHY?

- Ability for early mapping of leaks (position, extent, quantity)
- Confirmation of leaks between systems
- Increased performance, decreased uncertainty

→ decreased emergency response time

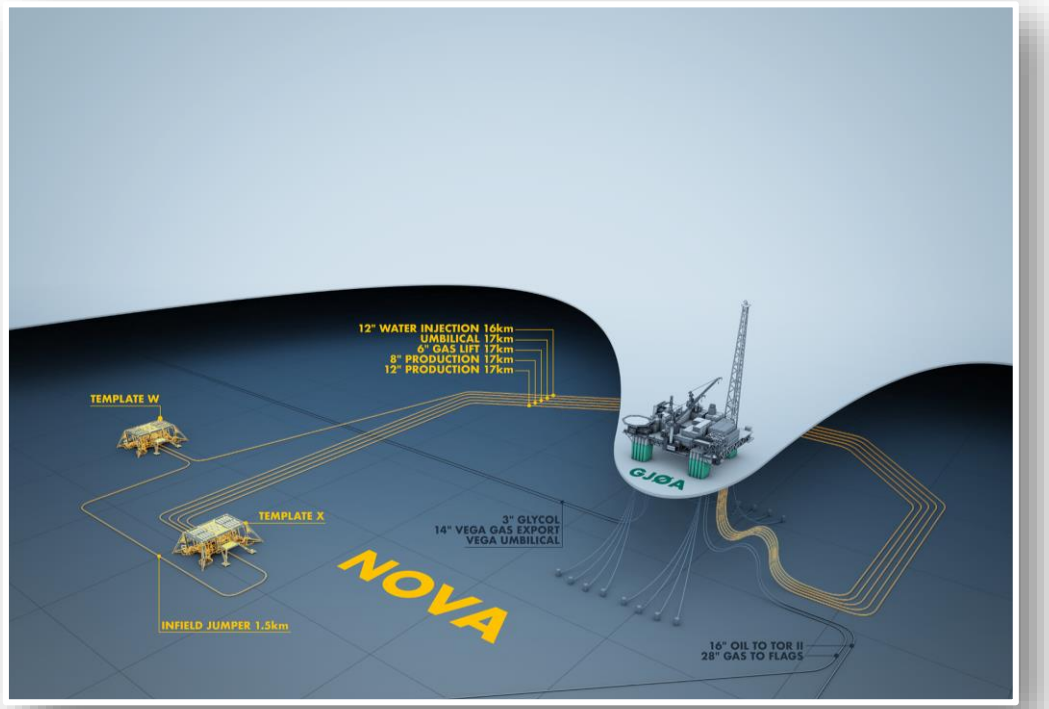
→ decreased operational cost (limiting need for vessel/ROV)

Leak rates (Sm3/h)	Requirement	Methane sniffers*	Passive acoustic	PSD - PALLs	Mass balance**	Satellite radar
0.01-1	72 hours	29,4 hours	<2 min	No	No	<56 hours
1-10	12 hours	1,5 hours	<2 min	No	No	<28 hours
10-19,5	3 hours	0,8 hours	<2 min	No	3 hours***	<28 hours
19,5-48,6	< 1 hour	0,5 hours	<2 min	1 hour****	3 hours	<28 hours
48,6-97,4	< 1 hour	< 0,5 hours	<2 min	1 hour	3 hours	<28 hours

NOVA LEAK DETECTION SYSTEM

LESSONS LEARNED

- Structured approach
- Start early



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THANK YOU !