



System Sustainability & Obsolescence Management

The foundation for optimised life of field partnership

SUT – Controls Down Under
19th October 2016

Safety Moment



The Morning after....

Most of us enjoy a few glasses of wine to accompany our evening meal, especially during industry events where we often meet up with old colleagues and friends.

However, we mustn't forget that it takes time for alcohol to work its way out of our systems.

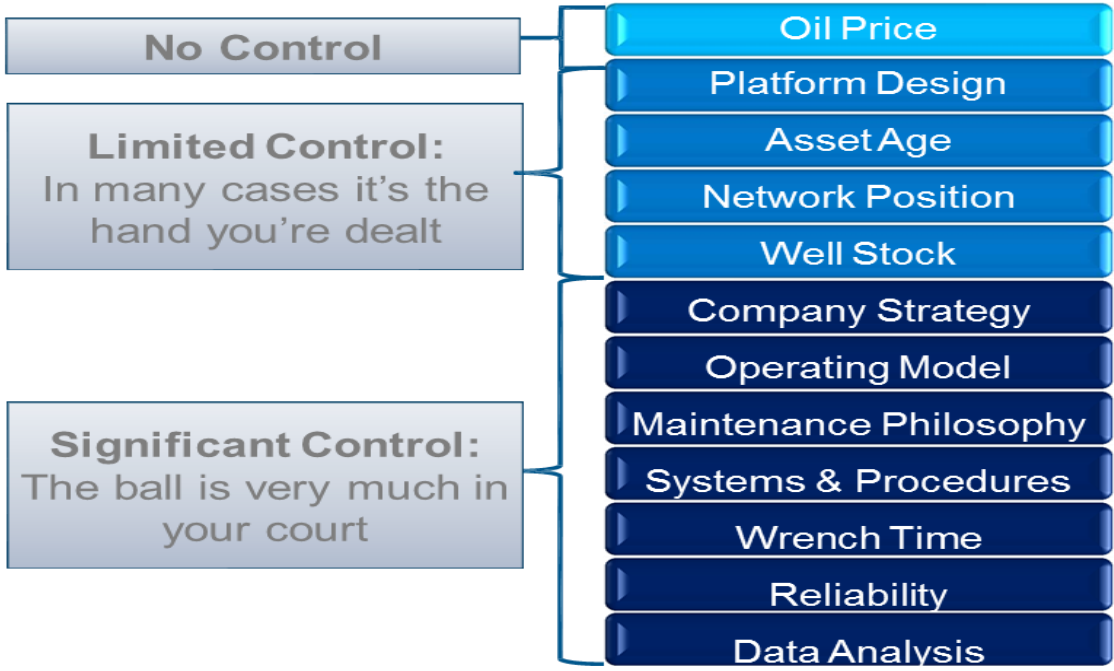
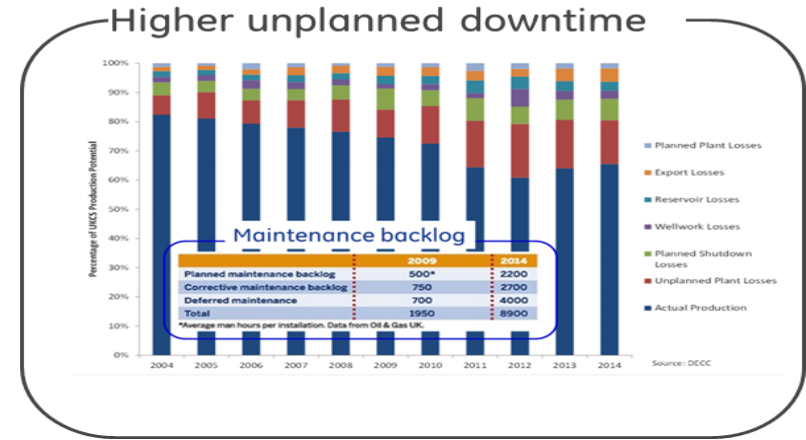
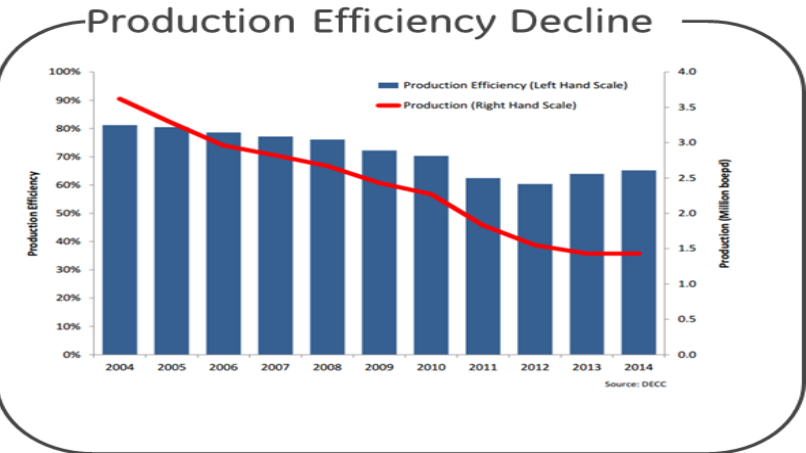
As a rough guide, drivers should allow at least one hour to absorb alcohol, plus at least one hour for each unit consumed.

Just three 250ml glasses of wine and you can't drive for 13 hours!

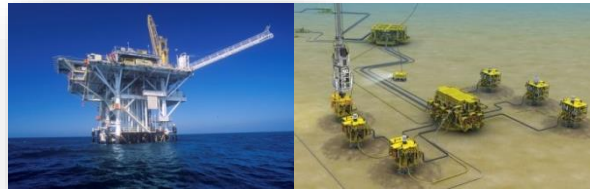
Being banned from driving would change your life in so many ways...

The only way you know you'll be safe to drive is if your blood alcohol is at 0.

Current Production Efficiency Challenges of Aging Infrastructure

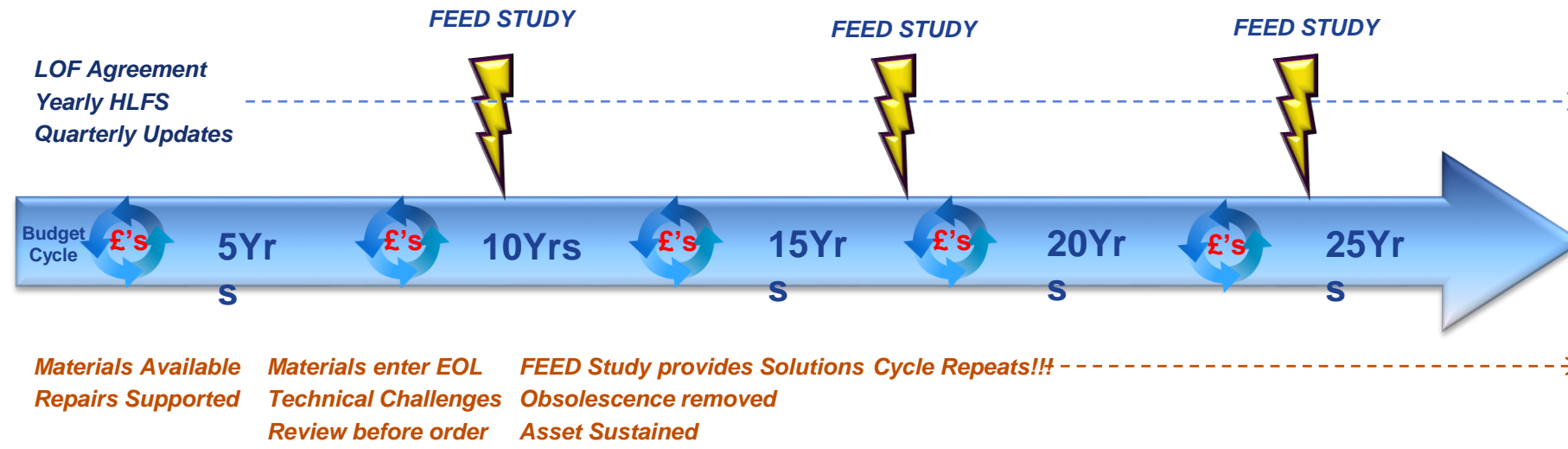


Sustainability Cycle



Sustain Operations ??
Enhance Operations ??

Asset Life ???

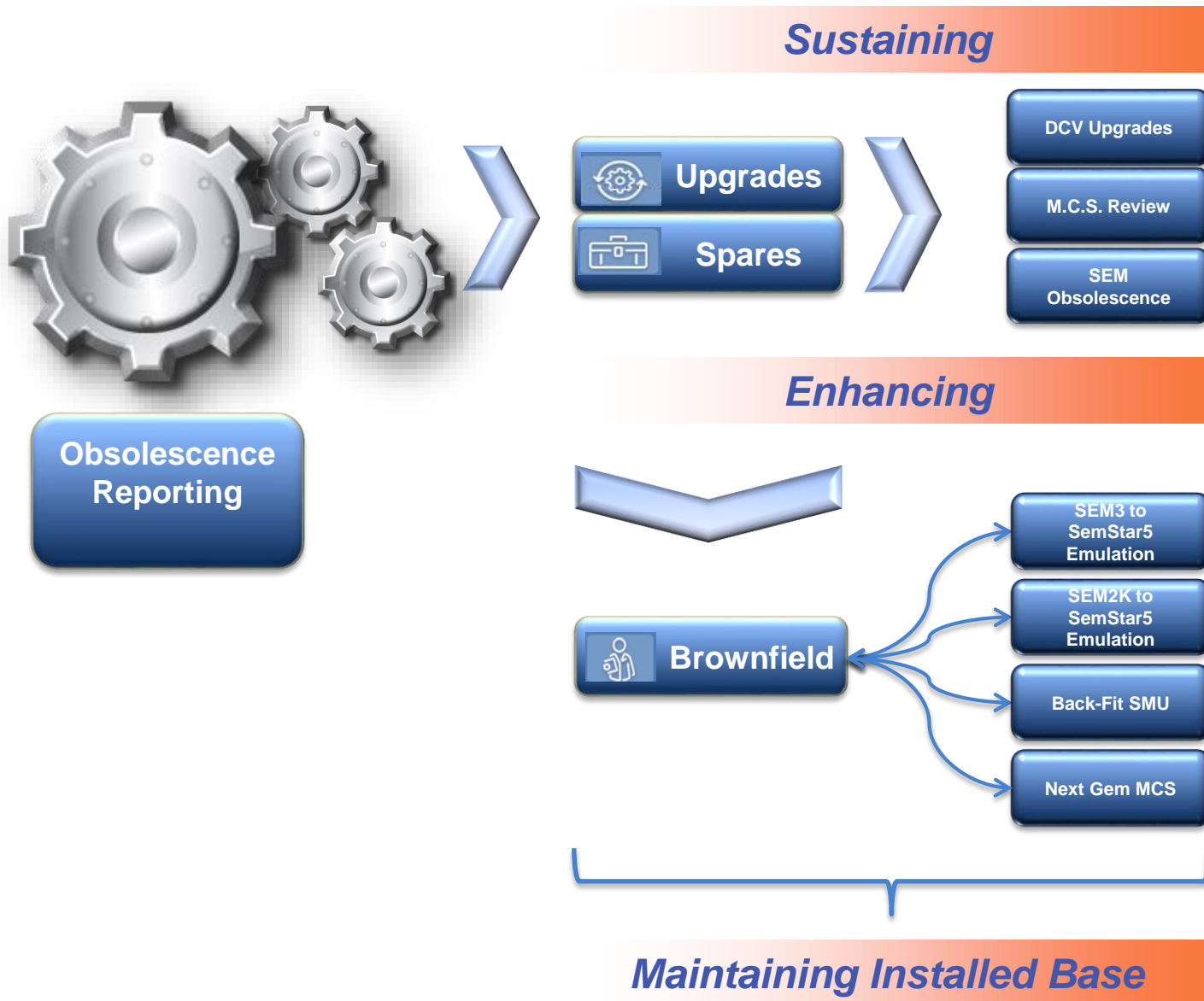


Technology Insertion

Multi-generational Product Plans

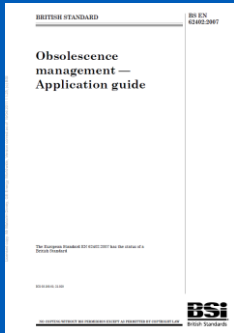


System Sustainability



Obsolescence Services – Engagement Map

Obsolescence Management Guide



Joint Operator Specification

3428A

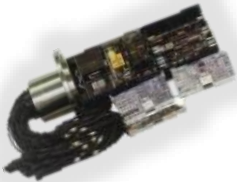


Upgrading Brownfields – Systems Solutions

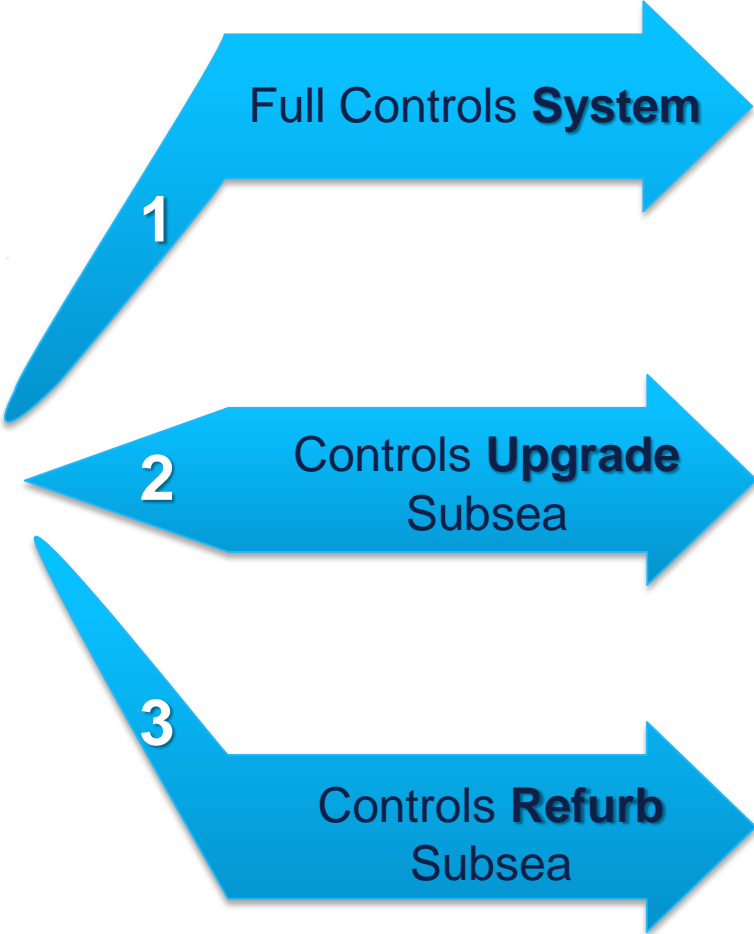


Existing
MCS

Old SEM



Legacy SCM



Statoil 'TVCM'

Esso Norge
'Balder'
Stone Energy

Statoil 'Troll B'
Statoil 'Snorre B'

Case study: *SmartCenter* delivers savings for Canadian Natural Gas Company

SmartCenter delivers considerable value and savings for a Canadian natural gas company:

- **Remotely located** platform
- logistics for field service engineers **complex and considerable**.
- *SmartCenter* deployed during the commissioning phase of the project to enable **maximum impact and savings**.
- Majority of engineering support conducted remotely through *SmartCenter* by **expert engineers** in the subsea controls **Centre of Excellence**, Bristol UK.



Value Driver #1 – Remote ad-hoc fault diagnosis

- Commissioning and fault diagnosis conducted remotely by onshore experts for the commissioning period of 6 months.
- Removed the need and cost of a full-time offshore commissioning support engineer.
- Conducted over 2 man weeks of fault finding which saved at least 4 mobilisation charges.

~\$200k saved

Value Driver #2 – Remote software updates

- Delivered 3 remote software updates to the system during commissioning.
- Removed the need for 3 x 1 week offshore trips and associated mobilisation costs.

~\$120k saved

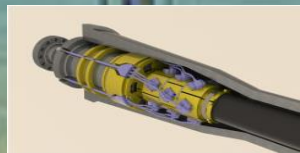
Value Driver #3 – Remote implementation of Modbus links

- Implemented a Modbus transparent link to DHPT cards and enabled the periodic gathering of data remotely.
- Removed the need for a 1 week offshore trip and associated mobilisation costs to install the link.
- Data gathered remotely every week for 5 weeks, which would have otherwise required an offshore mobilisation each week.

~\$70k saved

~\$390k saved over a 6 month period

Brownfield Asset Integrity



Subsea Processing
Condition Monitoring

Corrosion/Erosion Monitoring



Choke Health Modelling

Hydraulic Fluid Loss Advisor

Fluid Consumption
Actuator performance
Choke performance

Umbilical Electrical Integrity

Leak Detection
& Condition
Monitoring

Production &
System
Performance

VFM
Hydrate Formation
Wax Formation
Chemical Injection
Optimization

SmartCenter™
24/7 Support
& Smart Apps



Acoustic
Leak Detection
Condition Monitoring

Sensor Health

Valve Actuator
Performance

Production System
Health Monitoring

Enhanced System Performance

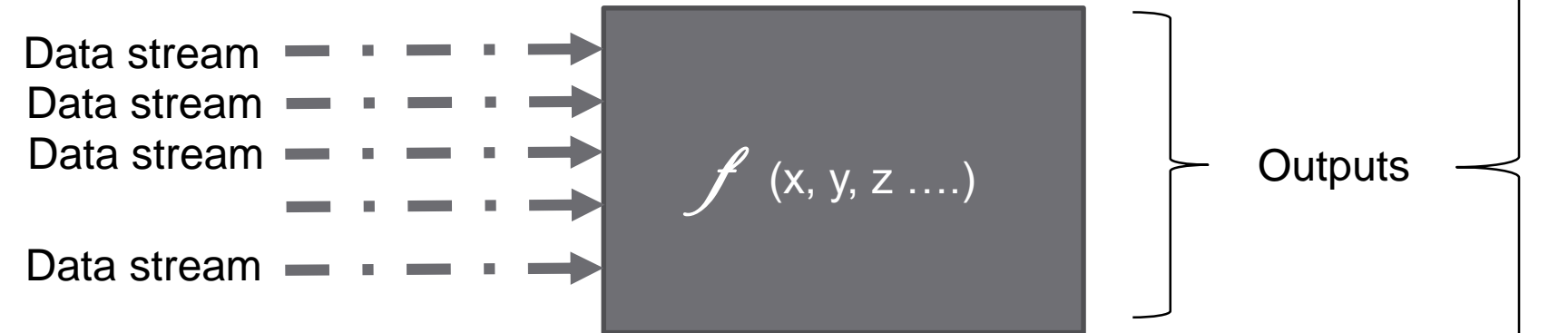


System Sustainability Management





- ### Analysis
- Value trend
 - Rolling Average 1
 - Rolling Average 2
 - Rolling Average 3
 - Value Limits (+ve & -ve)
 - Rate of Change of Trend
 - Plot of rate of change



- ### Diagnosis
- Hydraulic Fluid Usage
 - Actuator Profiling
 - Choke Performance
- ### Monitor
- Flowline Integrity
 - Electrical Integrity
 - Sensor (P/T) Integrity
 - Data Communication Int'ty

Analysis = *what's happening*
 Diagnosis = *why this is happening*
 Prognosis = *if this continues to happen then the outcome is*



- ### Prognosis
- Virtual Flow Metering
 - Hydrate Formation Analysis
 - Wax Formation Analysis
 - Chemical Injection Optⁿ

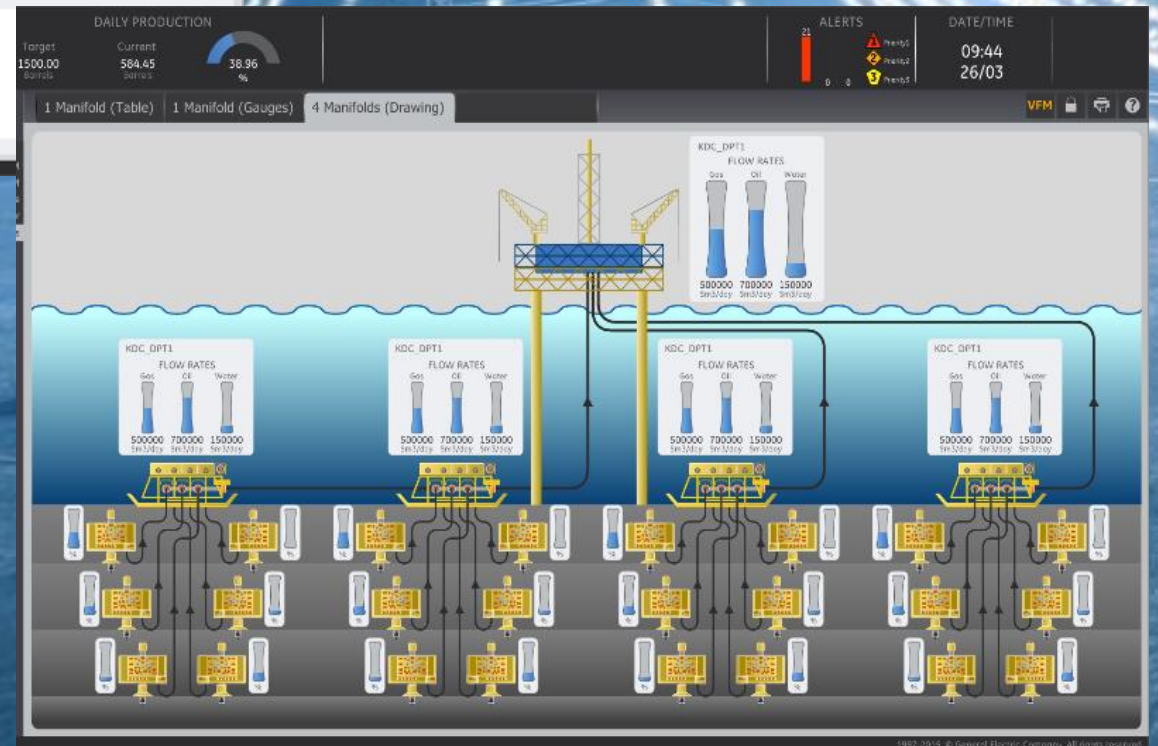


Hosting a Subsea Digital Service –the ‘Predix’ Platform



Why Predix?

- Common Historian
- Data exchange between Apps
- Open Source Host



Enablers – Benefits – Outcomes

Enablers

Data-driven **asset performance** and **Failure mode** management

Life of Field Monitoring

Subsea-focussed **analytics** for **flow** and **assets**

Subsea System operations **scenario planning** toolkits

Informed, risk-based strategies for **maintenance planning & spares holding**

Benefits

Improve MTTR/MTBR

Enhance field and system knowledge

Support Fast, accurate decisions

Reduce Vessel Costs & utilisation

Optimise spares holding

Outcomes

Avoid Unplanned Downtime

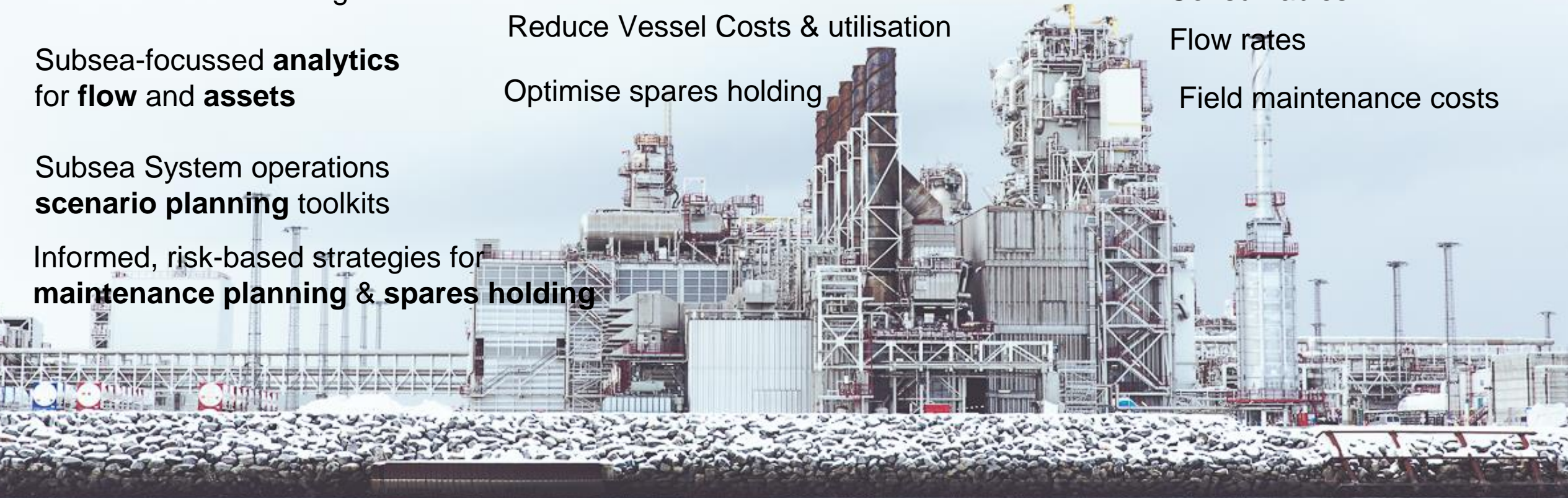
Optimise:

Maintenance

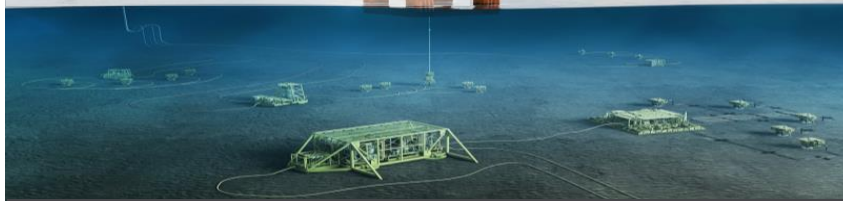
Consumables

Flow rates

Field maintenance costs



Customer Challenge



Increasing volumes of Hydraulic control fluid being lost Sub-Sea, but no understanding where loss was occurring

Eliminate Sub-Sea Hydraulic fluid loss, by using supplied System Data to support targeted intervention

Action



Operator contacted GE to report they had excessive hydraulic fluid loss Sub-Sea, but no idea where it was occurring.



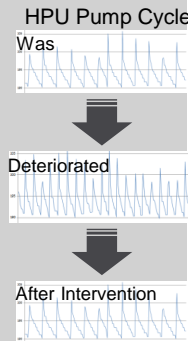
Operator shared operational data. G.E. remotely analysed SCM logs and isolated failure using flow meter data.



Operator recovered effected SCM. Excessive hydraulic fluid loss eliminated

Solution Delivery

- 1 **Collaboration** with client on scale and history of problem
- 2 **Remote System analysis** takes place with zero production impact
- 3 **System Data** identified failure event. Targeted Intervention with minimal recovery scope.



SMARTCENTER: A remote connection allowing domain expert access to off-shore systems, allowing faster analysis / solution deployment

Results



Environmental impacts avoided.



\$0.75M of OPEX Costs avoided per year.



Reduction in HPU cycle & Valve events. Early life failures avoided

Commercial Opportunities Overview

The move to continuous & consistent monitoring i.e. Data Stream promotes the introduction of innovative commercial arrangements.

Typically these involve :-

- Cash flow optimization
- Production performance
- Equipment availability and performance
- GE operational performance



