# Electric Actuation
# An Enabler for Brownfield Asset Integrity And Sustainability

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GE Oil & Gas

GE imagination at work

# EHS Moment

## Slings and Rigging

Rigging is a fundamental part of any lift. As we all know lifting is a High Risk Operation which is an integral part of both service and manufacturing operations. Only trained individuals should carry out this activity.

### The Seven Rules of Rigging

1. Know the load weight or perform your best estimate.
2. Locate or estimate the location of the load's Center of Gravity (CG).
3. Determine the load-share on each side of the CG.
4. Calculate the tension in each sling-leg.
5. As a minimum, select slings with capacity to match the sling-leg tension and hardware to match the vertical capacity of the slings.
6. Inspect the rigging.
7. Ensure Great Load Control. Make sure the hitch or hitches you have selected, and their edge protection, provide good to excellent control so slipping does not occur.

### Caring for Slings

- Always inspect slings before use
- Damaged or defective slings shall not be used
- Do not shorten slings with knots, bolts, etc.
- Do not pull sling from under a load.
- Use sleeve packing to protect web sling from sharp edges
- Avoid dragging slings on the floor
- Keep synthetic web slings away from chemicals or hot surfaces

Don't knot

Don't twist

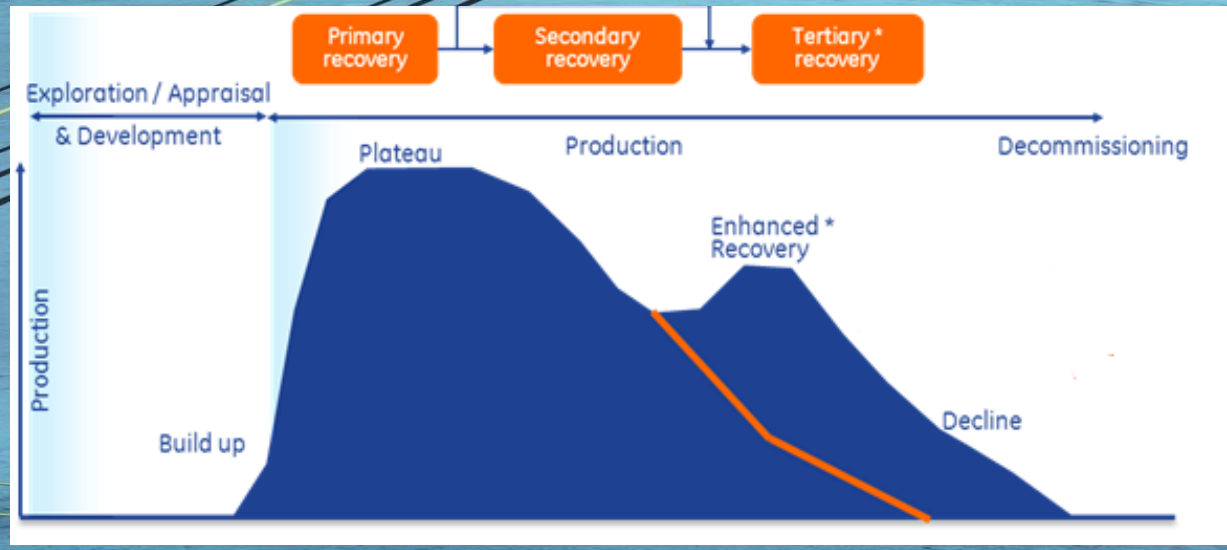
Ensure that all rigging equipment has been engineered and is inspected prior to use.

# Brownfield - opportunities for subsea electric actuation?

- Typical Greenfield attraction
  - Simplified subsea umbilical & topsides equipment
  - Flexible and more frequent control operations
  - Enhanced remote monitoring and diagnostics
  - EHS & environmental impact?

## Brownfield asset integrity

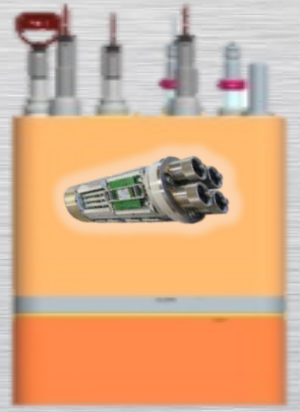
- Extended field life
- Reduced operational intervention



# Upgrading Brownfields – example of Control Systems Solutions

Existing MCS

3 Full Controls System



TVCM Pompano

2 Controls Upgrade Subsea

Baler

Old SEM


Legacy SCM

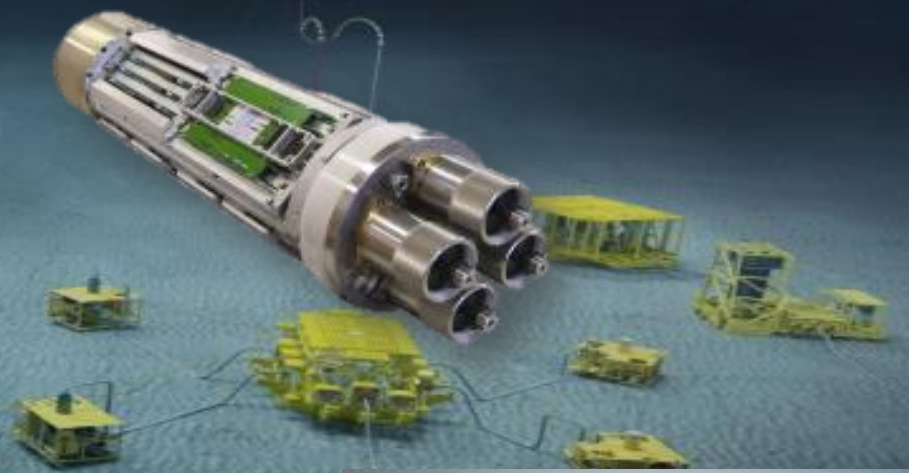
1 Controls Refurb Subsea


Troll B Snorre B

# A journey of brownfield upgrade success

## Obsolescence Mitigated
## + Enhanced Functionality & A World of Analytics

- Statoil **TVCM**
- Statoil **Snorre B**
- Statoil **Troll B**
- Snepco **Bonga**
- BP **Foinaven**
- ExxonMobil **Balder**
- Stone **Pompano**
- Anadarko **K2**



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# Project – TVCM (Norway)



## Key operator challenges

- Obsolescence – 27 wells to support
- Multiple pod / DHPT configurations
- Different pod vendors
- Need for improved instrumentation
- Upgrade without recovering trees

## Initial FEED results

- Single pod solution achievable
- Multiple adaptor plates
- SemStar5R solves DHPTs
- Additional functionality deliverable
- Enhanced comms – subsea router
- Open architecture

## Current status

- 27 pods deployed and working
- Multi vendor upgrade success
- Improved bandwidth (~1Mb/s)
- All interfaces proven

# Projects Troll B (Norway)



**Troll B Key operator challenges**

- Supportability on field life extensions
- Must fully integrate with existing systems and equipment
- Retain existing pod reliability
- No topside changes (including software)
- Only pre-qualified products to be used

**Troll B Initial FEED results**

- SemStar5 based SEM3 emulation package to be used
- Existing SCM can be used with SemStar5 SEM
- SMU redesign recommended due to component obsolescence

**Troll B Current status**

- SCMs deployed and operating
- New SMUs installed
- Successful integration with existing topside system


# Project Pompano–(GoM)

**Key operator challenges**

- Obsolescence / supportability
- Field life extended to 2025
- MCS upgrade
- SCM backwards compatibility

**Initial FEED results**

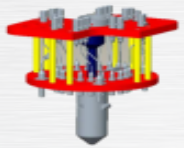
- ModPod / SemStar5
- SCM Hydro-mechanical Modification

**Current status**

- ModPod/SemStar5 confirmed
- Generic ModPod for future fields
- Deliveries Scheduled 2016

# A market validated brownfield toolbox









| Project | SemStar5 | Refurb Pod | ModPod | Adaptor Plate | Sensor Upgrade | Dual Band Comms | New MCS | New Topside I/F (SMU) | SemStar 5R | Comms Router (Fibre) | Smart Center Link | Install. Strategy | Electric Actuation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVCM | ■ | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | |
| Balder | ■ | ■ | ■ | ■ | | | | | | | ■ | | |
| Pompano | ■ | | ■ | ■ | ■ | | | | | | ■ | | |
| Snorre B Troll B & C | ■ | ■ | | | ■ | | | ■ | | | ■ | ■ | ■ |
| Non GE | ■ | | ■ | ■ | | ■ | ■ | | ■ | | ■ | ■ | |
| Ormen Lange | | | | | | | | | | | | | ■ |
| Åsgard | | | | | | | | | | | | | ■ |

Validated approach - flexible capability – common qualified products – applicable to non GE systems

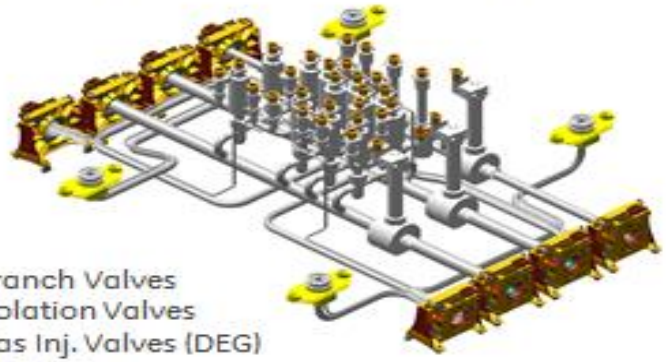
# An extension to the brownfield toolbox
# GE Ifokus Compact Low Power Rotary Electric Actuator

## Efficient valve actuation for multiple applications

**A retro-fit solution offering utmost flexibility**

- Sensor suite monitors all critical parameters -

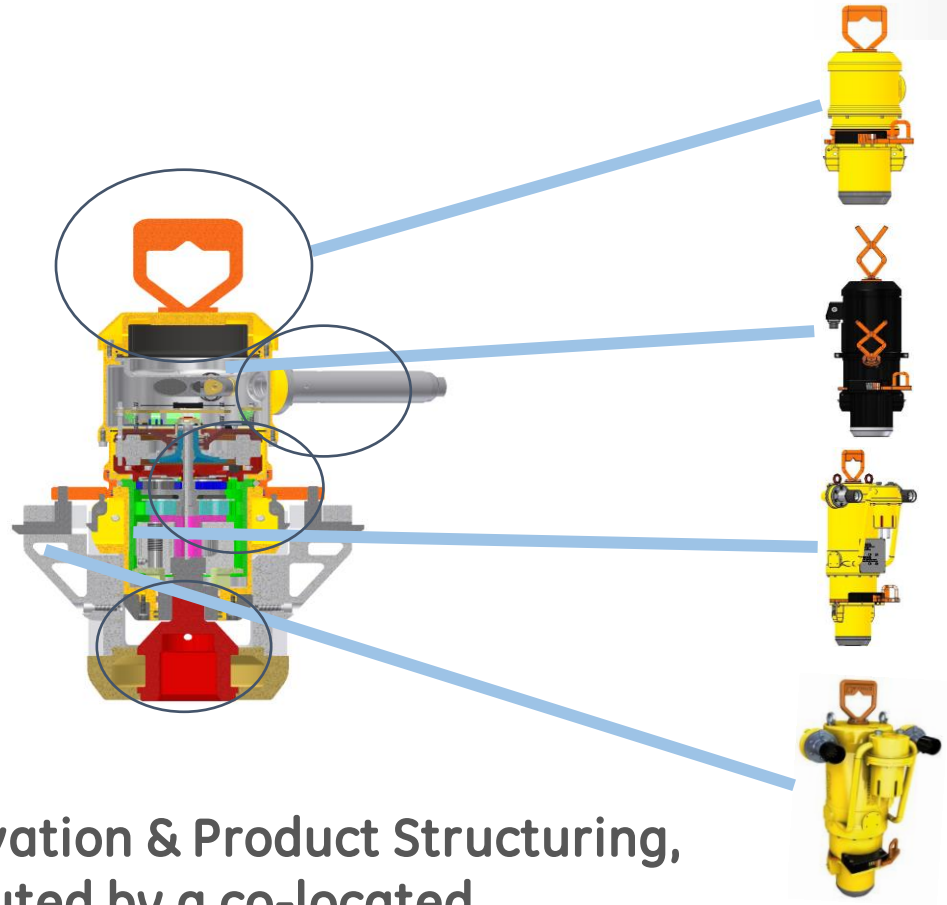
  torque, position, power, operations, temperature and more.
- Flexible power and communication protocol....
- Local Energy Storage...trickle charge
- Simple Installation through standard interfaces...ROV bucket



- Branch Valves
- Isolation Valves
- Gas Inj. Valves (DEG)
- MEG Valves

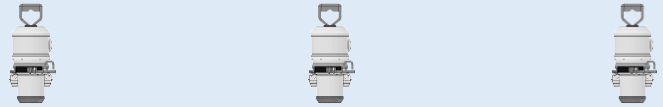
Electrical Choke with GE IFOKUS actuator

# Modular Design Concepts



## Low Complexity Applications (Rotary)

**i1 family**



## Tree Valve Applications (FSC & FAI)

**i2 family**

## Fast Acting Valve Applications

**i3 family**

## Safety Systems (SIL certified)

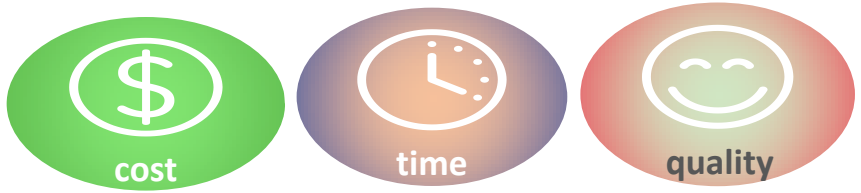
**i4 family**


Anti-Surge

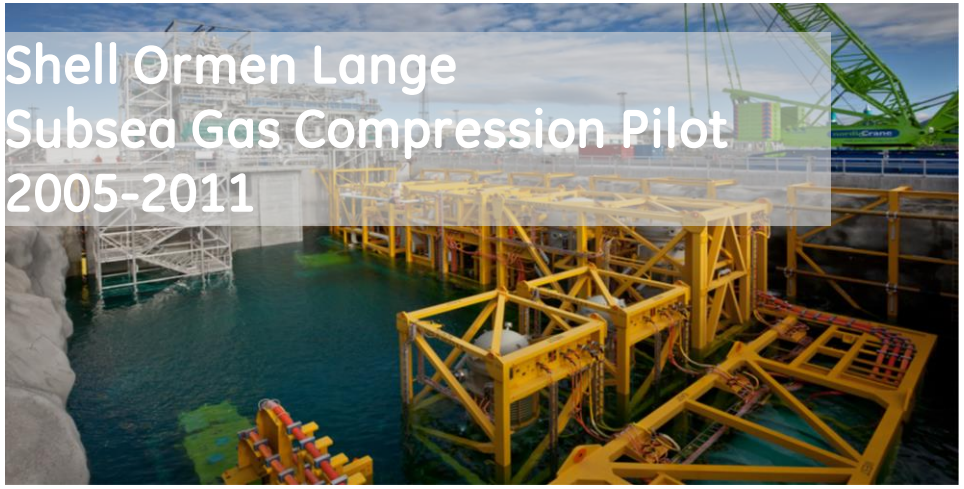

SIL rated

**Innovation & Product Structuring, executed by a co-located, integrated, product team**

**Structured Ifokus Products deliver on:-**



# Ifokus in the field – a leading position in electric actuation of gas compression systems




**Full scale test in Nyhamna, Norway**

3000+ hours of operation during testing
100Nm fail safe rotating
600/2700Nm fail as is rotating
Anti Surge Actuator. Fail safe open linear
400VAC dual redundant control system


linear fail open Anti Surge Actuators
Two are so far installed subsea and operational
400VAC dual redundant control system
electrical running tool developed
2012- 2014

# Ifokus in the field– focus on brownfield upgrades

**Statoil Troll C – Remote Control Methanol Isolation Valve**

Brownfield Installation

2700Nm low voltage rotating compact actuator

Direct powered

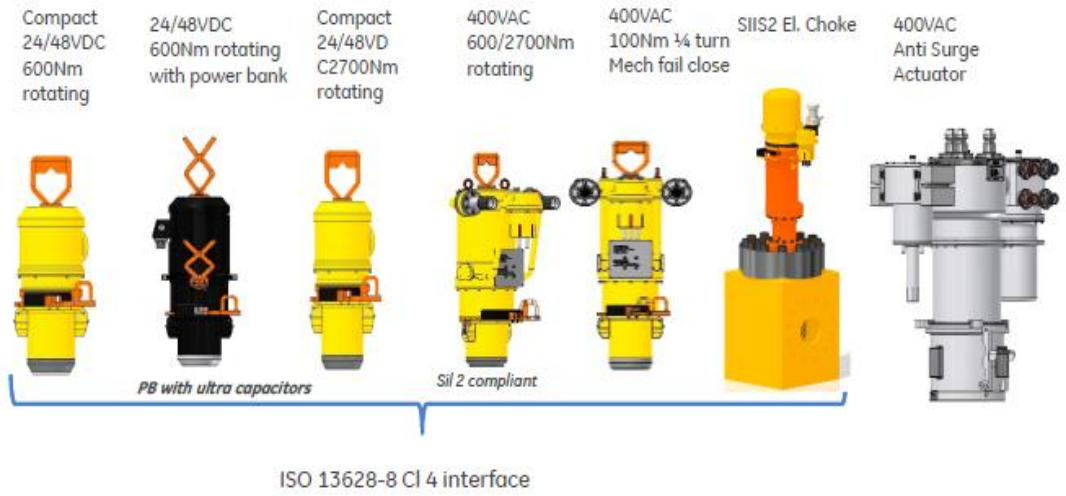
Co-existing power and communications by Proserv

Operating since August 2014

ROV intervention replaced – twice monthly operation

brownfield installation – flexible approach – improved operational efficiency

# In summary




## Success on brownfield solutions

- Broad range of upgrades successfully executed
- Qualified & proven Compact Rotary Electric Actuator
- Subsystem co-existence & co-dependence
- Brownfield toolbox is growing

success on brownfield solutions – extended toolbox to face new challenges