Planned Obsolescence and “Mid Life” Updates -

Life of field is more than just ‘existence’

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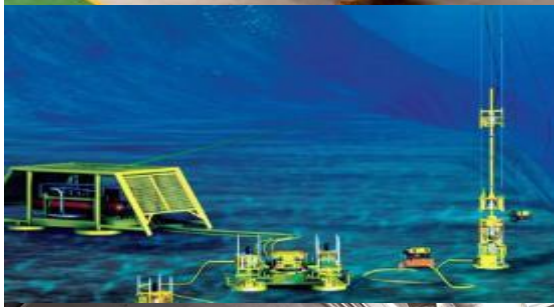
Why Upgrade Existing Brownfield Systems?

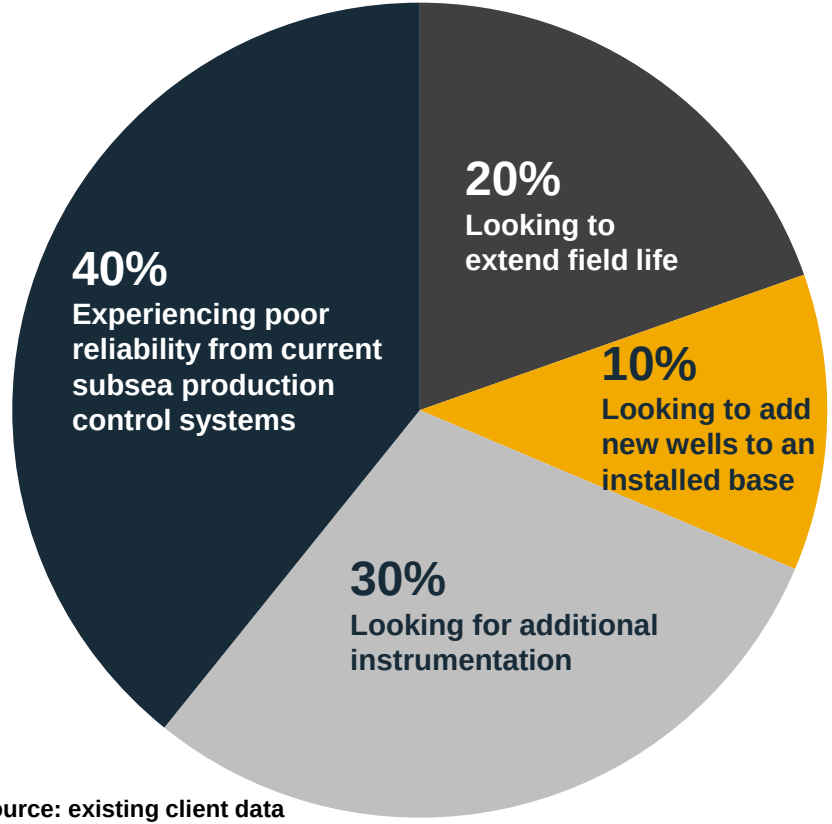
Brownfield subsea fields are an important segment of global offshore oil and gas production.

With over **80%** of the world energy use reliant on fossil fuel the maintenance and optimisation of these often aging subsea assets is an economic and moral necessity for the industry.



Rationale for Brownfield Upgrades

Development motivation for brownfields



Source: existing client data

High reliability of hydrocarbon production and reliable revenue return on investment is a fundamental of Operator Business Planning.

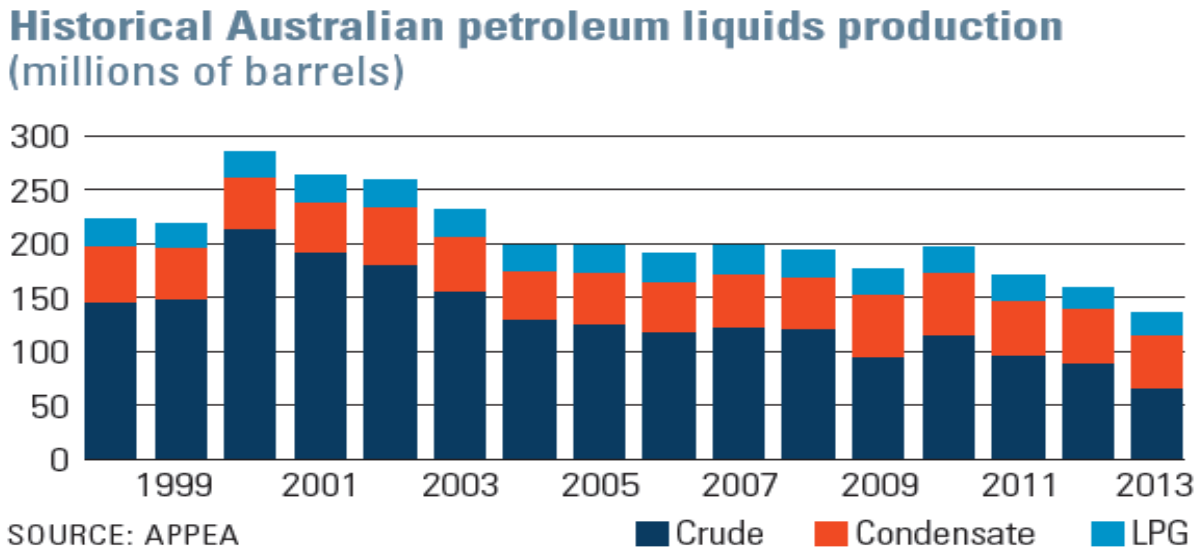
Many Operators are experiencing multiple challenges in maintaining or extending existing field life or functionality to meet business opportunities.

Availability and commercial viability of OEM solutions often exacerbate the risk of production reliability or not commercially feasible making the Business Plan unachievable i.e.

A Lost Production Opportunity.

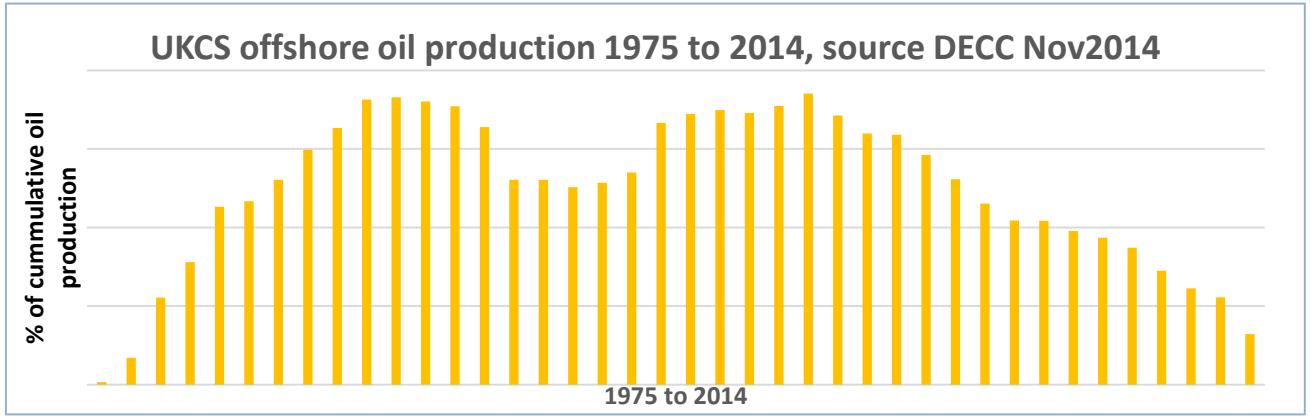
Australian liquids Production

Australia's production of oil, condensate and LPG has been in decline since it peaked in 2000



UKCS Production

Since the initial licensing issued in 1964 approximately 42 billion barrels of oil equivalent [boe] have been produced within the UKCS; upwards of 12 to 24 billion boe could be produced;



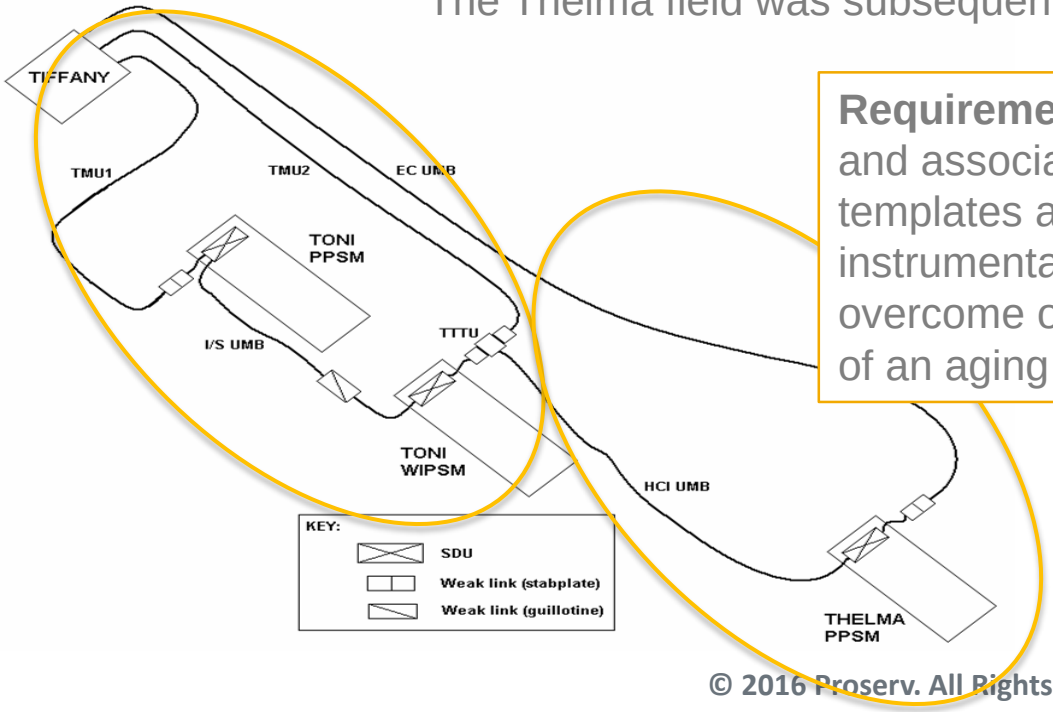
Production in the UKCS has fallen 38% between 2010 and 2013 with 72% of this attributed to a drop in production efficiency;

Source: UKCS Maximizing Recovery Review: Final Report published by Sir Ian Wood 24th February 2014

Project Overview

Toni field: operated by CNR International, installed in 1993 with first production achieved during December 1993.

The Thelma field was subsequently installed in 1996.



Requirement: provide two new or re-furbished XTs and associated controls tied into the existing templates and provide support for future tie-in / instrumentation – whilst minimising CAPEX and overcome obsolescence and reliability challenges of an aging field

Toni key system challenges

Increasing Risk to Production

Failed wells without security of support from the OEM required an alternative control solution to reinstate well production without full system replacement

Extending Toni Field for Additional Wells and field tie-in

OEM system was unable to provide support for additional wells with compliant legacy control and interfaces, additionally no support / functionality for future tie-in to new or existing assets was possible

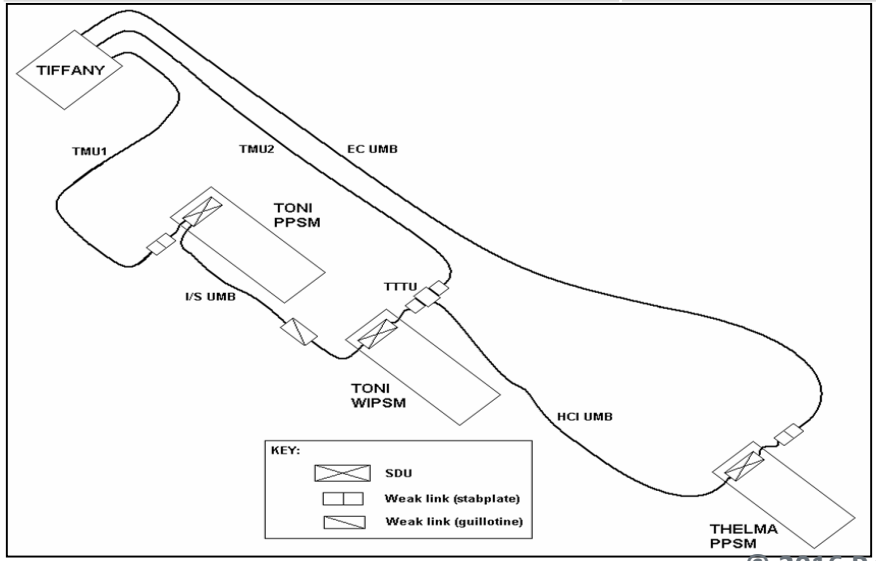
Additional Instrumentation for Production Optimisation

Instrumentation to provide essential information to maximise remaining production was not incorporated into the existing control system. In addition to provide support for the inevitable de-commissioning activities.

'Brownfield Upgrade' uses techniques and technology developed specifically by Proserv for this application……

Potential Toni field support options

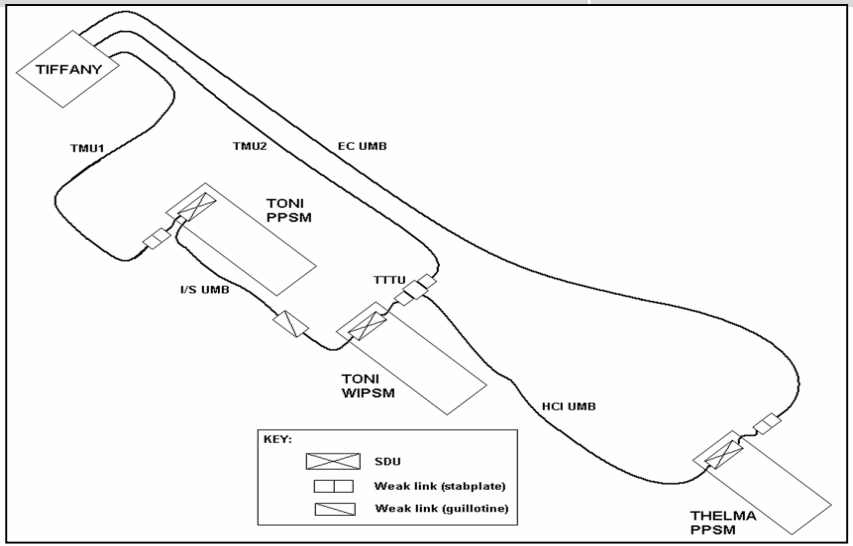
Option#1	Benefit	Risk
Continue to refurbish existing SCMs and cables etc. as required. Rationalising sensor and JB interfaces where possible.	Minimal CAPEX cost. Continued use of existing SDUs as appropriate.	Increasing OPEX risk. Obsolescence / reliability and availability of SEM/SCM components. Lost opportunity for increased production; extension of field life or ability to support tied-in Thelma field.



Do nothing different and attempt to maximise extraction and system availability overcoming issues / events as they arise;

Potential Toni field support options

Option#2	Benefit	Risk
Full infrastructure replacement – Replace umbilical, SDUs, SCMs and in-field jumpers with new. Adequate system spares available	**System reliability increase and obsolescence issues addressed in full.**	**High CAPEX and installation costs.** **Full shutdown required to replace equipment with uncertainty on installation time and loss of production.**



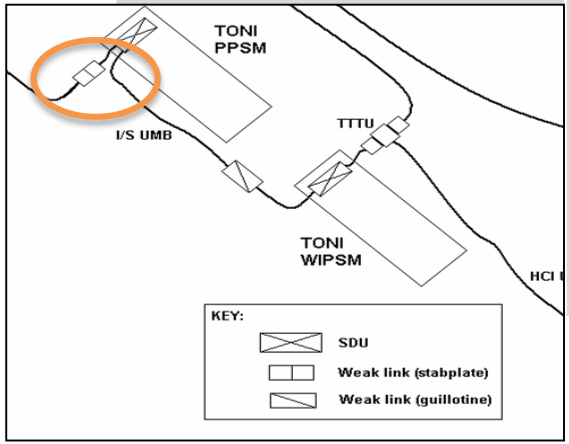
Traditional industry approach; often difficult to justify high CAPEX vs production field life potential. A range of tie-in options considered.

1. New SDU/Umbilical to Toni;
2. New SDU/Umbilical to Thelma;

Excluding controls tie-in costs x2 anticipated costs for controls alone.

Potential Toni field support options

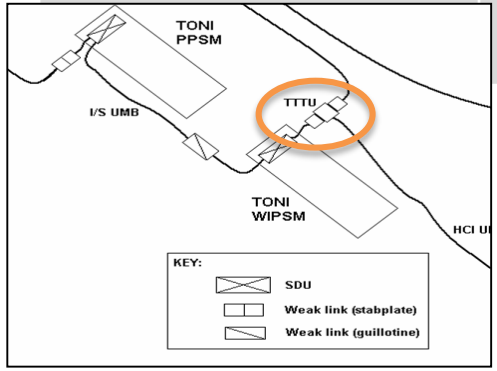
Option#3	Benefit	Risk
Split weak link at Toni production manifold and Install new SDU. Install new SCMs on any new trees being installed and integrate to new SDU.	CAPEX reduced utilising existing hydraulics. Existing field can still produce while work is being carried out. Once installed existing and new SCMs can operate concurrently. Phased replacement of existing controls infrastructure. Additional interfaces on new SDU allow future SCMs to be connected as required. Obsolescence issues partially addressed – existing parts of the system are subject to phased replacement. Some system spares available on existing. Adequate spares on new equipment.	Uncertainty on installation time, but quantifiable as scope limited. Requires full co-operation of umbilical and weak-link and umbilical OEM, as interface to weak-link stab plates is critical. Engineered solution required for Obsolete bulkhead connectors at existing SDUs, requires engineering and testing. Limit of future expansion and interfaces to meet field development opportunities.



Approach was not seen to address production threats due to obsolescence.

Potential Toni field support options

Option#4	Benefit	Risk
Replace electrical jumpers on TTTU at Toni water injector manifold. Install new EDB to allow electrical breakout to SDU and new SCMs	• CAPEX reduced as existing hydraulics are still utilised in addition to reduced impact on integration requirements. • Field can still produce while work is being carried out. • Minimal installation time and cost, as does not require deployment and interfacing of heavy structures. • No OEM involvement required as solution provider will tie into Tronic jumpers to their own EDB. • Existing SCMs and new SCMs can operate concurrently. Facilitates phased replacement of existing controls infrastructure. • Obsolescence issues partially addressed –existing parts of the system can be subject to phased replacement or upgrade. [e.g SEM upgrade potential] • Full field extension and functionality capability realised.	Uncertainty on installation time, but less than full SDU option (option 3); Engineered solution for obsolete connectors for existing wells on SDU requires engineering and testing [Future]



Based upon the evaluation CNR International determined Option#4 to be the optimum solution to be further evaluated

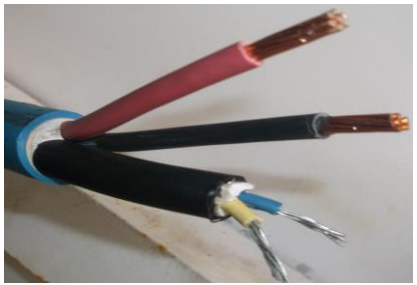
Communication & power options

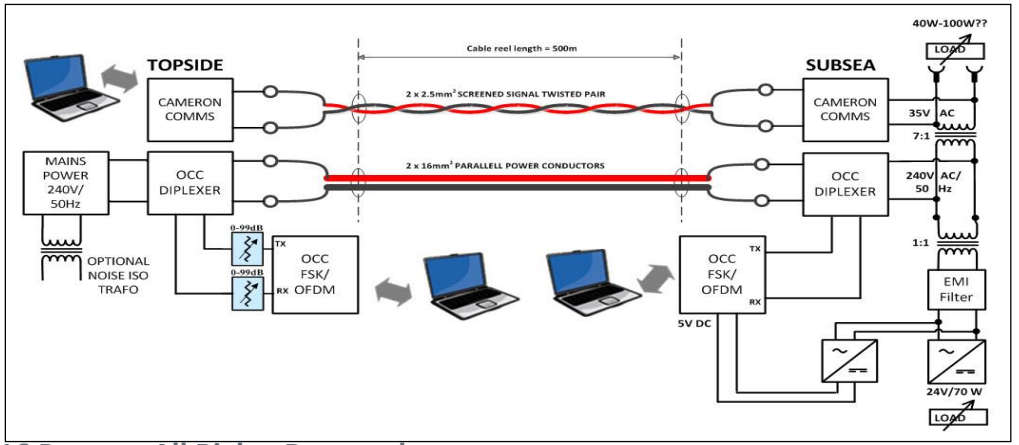
The current Toni system utilises separate and redundant communication and power solution over a 2,5 and 16mm conductors respectively.

Testing using Proserv Open Communication Controller [OCC] in conjunction with project test equipment it was established 16mm conductors would provide optimum powerline performance;

Crosstalk from OEM communications would did not impact Proserv performance; >38kbps multi-drop achievable with concurrent communications.

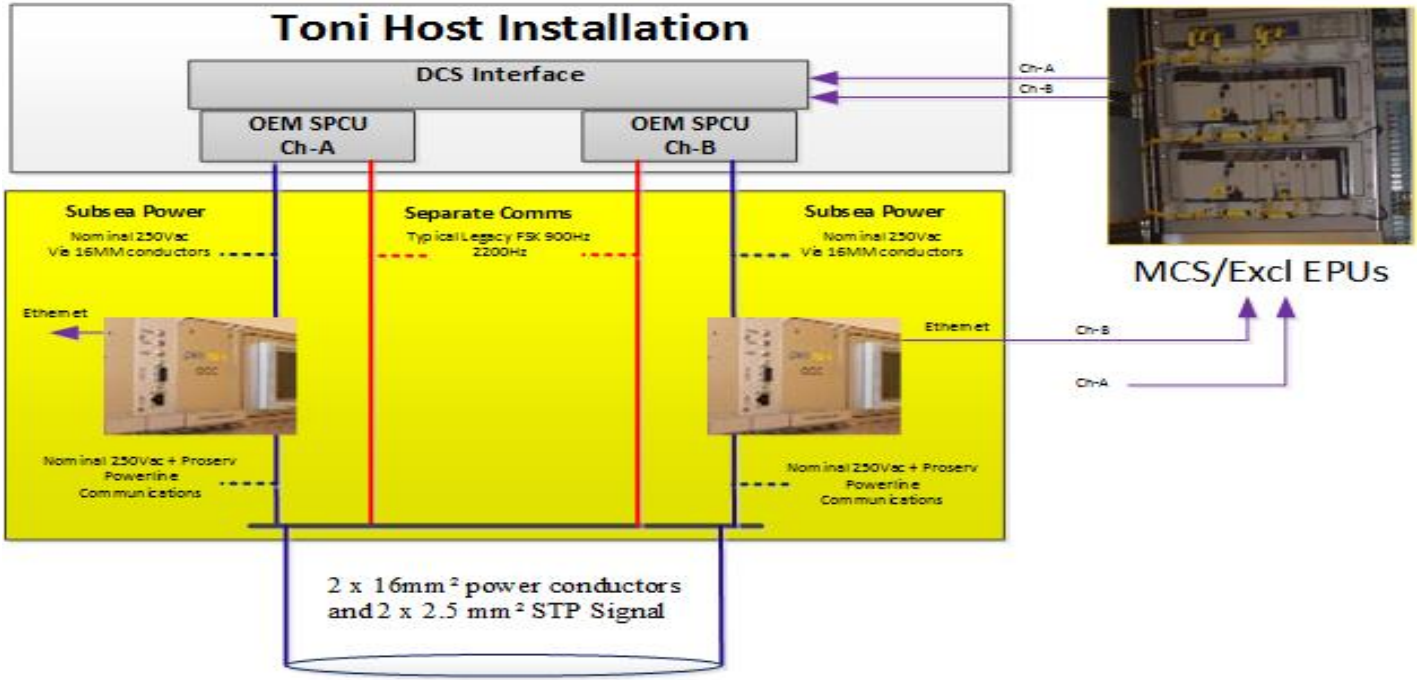
Power system capacity and specification verified.





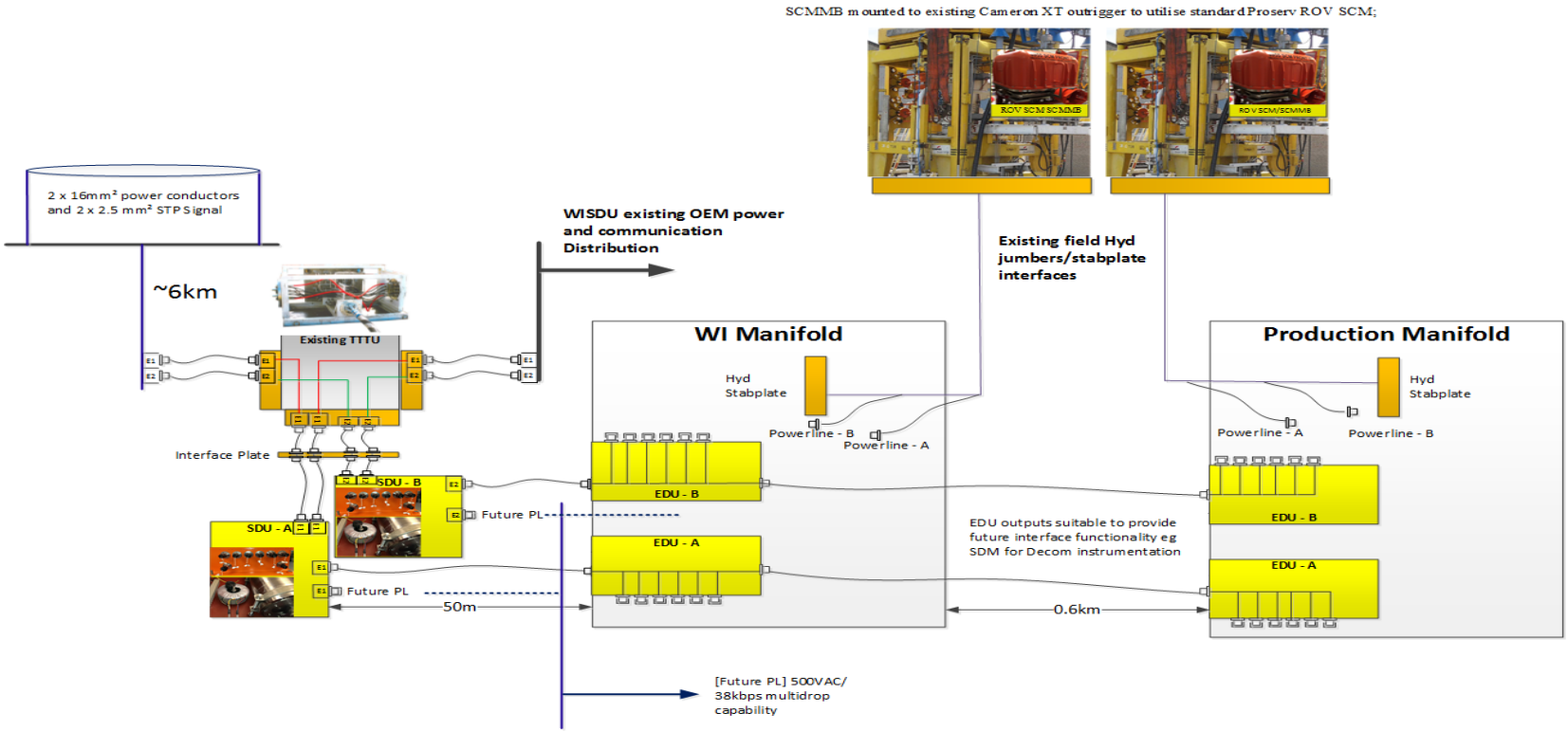
Solution scope - Topside

A Proserv Topside Communications on power system was implemented to run from the existing power system with integral option to update to meet future field developments; compliant control and monitoring interface provided between SCS and installation DCS system.



Solution scope - Subsea

2x new Proserv SCMs and SCMMB installed onto the OEM XTs including compliant 2 x PT and 1x TT on each tree, Interfaced via Proserv redundant Open Communication Hubs.



Toni applied Subsea System Solutions

Operator Challenges

- Extend field for additional wells
- Additional instrumentation for production optimisation
- Risk of failure and poor reliability
- Extended well life

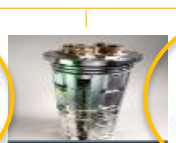
Proserv Solutions

- Co-exist
- SEM Retrofit
- SCM Refurbishment
- Topside Upgrade

Proserv Toolkit


OCC

OCH

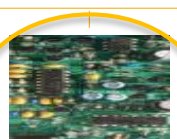

A2G


SCM


TIACS


Subsea Interfaces


Monitoring 'SeaHawk'

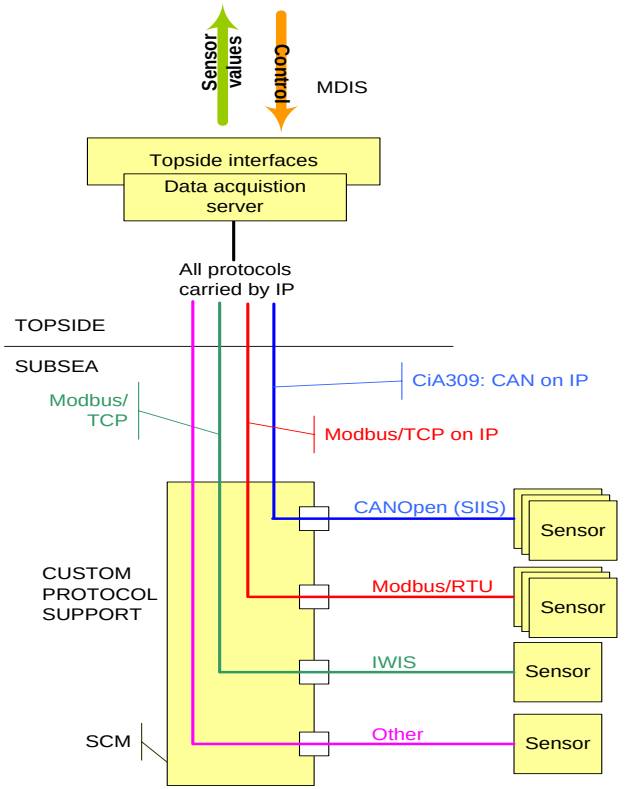

Topside Protocols


ROV Tooling


Hydraulics

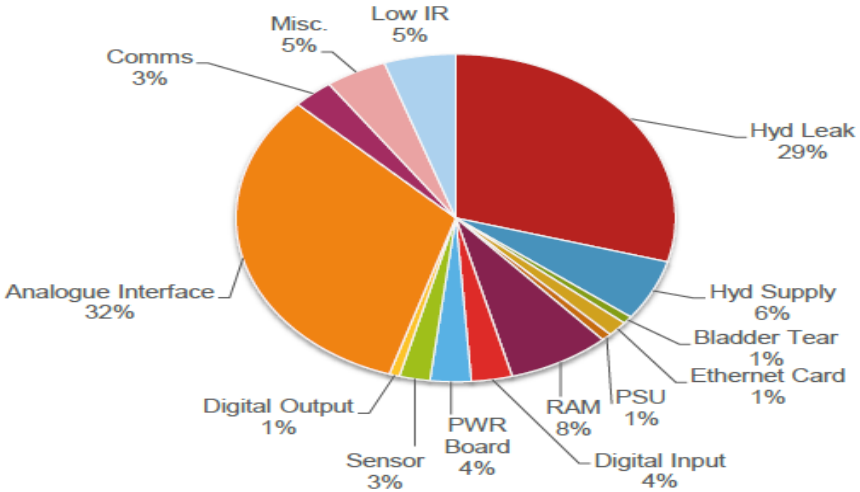
Subsea Standardisation

Subsea integration; system upgrades should address connectivity, performance and standardisation

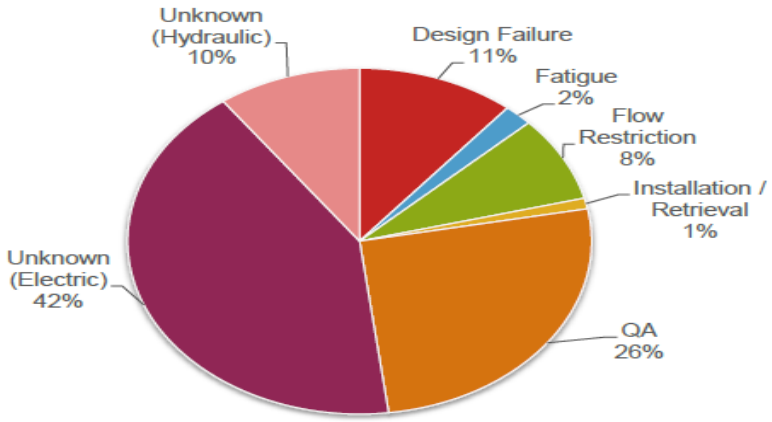


Reliability and Obsolescence

System or component failure and poor reliability result in unplanned, reduced or lost daily production volumes. Add the high OPEX cost of SCM recovery and the Operator's profitability has been significantly impacted this combined with obsolescence creates even greater challenges.



Results by Failure Type*



Results by Failure Cause*

Source – SURF IM JIP March 2015

Conclusion - Toni field upgrade

Bringing additional wells into the installed ‘brownfield’ infrastructure or expanding the aging asset to compensate for tailing production may be problematic if the OEM no longer supports the technology.

Full system upgrades can be cost prohibitive and even where extension options are available the OEM options benefits from a competitive alternative.

Proserv co-exist technology has enabled the Toni field extensions without affecting the existing installed subsea controls system or the need for spare umbilical conductors or the installation of a new umbilical.

It has provided an open-communication architecture with industry standard interfaces and the ability to extend and manage future tie-ins and functionality such as asset surveillance, monitoring and control.

“To maximise on the advantage of this technology, we need to start thinking a bit less conventionally and employ some of the practices which are common in other areas of the energy and manufacturing industry. “ Paul Hunter, CNR International.

Using co-exist and a proven open, modular approach with standardised interfaces the operational **Life of field will be more than just ‘existence’**

Thank You – Any Questions??

INGENIOUS SIMPLICITY