Managing H&S in Innovative Projects

ENA SHE Conference
13th May 2016

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A Mutual Energy Company Working for Consumers

Scotland to Northern Ireland
High Pressure natural gas transmission pipeline providing all natural gas to NI

500MW HVDC Interconnector providing market link between Irish & GB Electrical wholesale markets
Our Story

• Small engineering team
• Strategically important assets
• H&S Management System for “normal” operation
• One of the asset starts suffering failures
• Pioneering, innovative and often “off-piste” standards
• Hundreds of thousands of man hours exposure to high risk environments
• Successful H&S Management to ensure everyone gets home safely
Structure & Content of Presentation

• Context and summary of the problem & where it took us
  – Onshore & remote civil engineering
  – Offshore cable fault finding
  – Conventional offshore submarine cable repair
  – Pioneering fault finding
  – HVDC control re-engineering
  – A world first in-situ submarine cable repair (short video)
  – A “brownfield” and “fast tracked” submarine cable replacement project (MRC Replacement Project)

• Using the MRC Project as example a H&S Case Study
  – Objectives
  – Challenges met & how they were overcome
  – Results
Three Key Elements of Moyle

ELEMENTS of the MOYLE INTERCONNECTOR

- Ayrshire
- Ayr
- Stranraer
- Overhead Line Route
- Underground Cable Route
- Coylton Substation
- Arran
- Larne
- Undersea Cable Routes
- Co.Antrim Portmuck
- Kintyre
- Ballycronan More Converter Station
- North Channel
- Currarie Port
- Auchencrosh Converter Station

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Dual Monopole HVDC 2 x 250MW

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Integrated Return Conductor

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2010: Land Fault

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2011: Two Simultaneous Submarine Faults

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Conventional “Cut & Splice” Repair Campaign

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2012: Further & Current Submarine Fault

- **Ayr Substation**
- **Coylton Substation**
- **Ayrshire**
- **Co.Antrim**
- **Larne**
- **Belfast**
- **Stranraer**
- **Ballycronan More Converter Station**
- **Currie Port**
- **Overhead Line**
- **Undersea Cable**

**Options:**
- **A** 500MW Single Circuit
- **B** 2 x 250MW Dual Monopole

Diagram showing energy flow from 0 MW to 250 MW.
Recovery Plan : April 2013

- Emergency Fall Back in event of two concurrent faults in IRC on both poles
Emergency Fall Back Option

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• Emergency Fall Back in event of two concurrent faults in IRC on both poles

• Specify, procure & gain consent to replace the fault prone integrated return conductors with new metallic return conductor (MRC) cables (estimated possible 2018)

• Develop two possible “Interim Solutions” to temporarily return the technical capacity of Moyle back to 500MW
  - Bipole Operation
  - In-Situ Seabed Repair – starting with pinpointing the fault!
Bipole Option: Compass Deviation Complications
Recovery Plan : April 2013

- **Emergency Fall Back** in event of two concurrent faults in IRC on both poles

- **Specify, procure & gain consent to replace the fault prone integrated return conductors with new metallic return conductor (MRC) cables** (estimated possible 2018)

- **Develop two possible “Interim Solutions” to temporarily return the technical capacity of Moyle back to 500MW**
  - Bipole Operation
  - In-Situ Seabed Repair – starting with pinpointing the fault!
Submarine Fault Pinpointing: Pioneering Use of DTS

Heat rise at 7772
Suspected Fault 7773
Engineering & Testing Dry Wrap Repair
IEC 60502, IEC 60230, IEC 60229, CIGRE 496

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Designing a Dry Environment to execute the wrap: Internationally Acclaimed Innovation

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Procuring and mobilising a marine campaign within three months
Employing a unique TUPE dive spread to maximise bottom time for divers
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Enduring Solution
New Low Voltage Return Cables
2 x 55km “MRC” Beach to Beach Cable Lay

Key:-
- Existing IRC cable
- New MRC cable

Existing IRC cable: ~5-10m apart

New MRC cable: ~5-10m apart

~52km

AA: Transition Joints

Section BB: Nearshore Section
- Alongside existing to within 4m
- New MRC cables laid alongside the Existing rockberm and rock dumped or New MRC cables laid in cast iron shells and rock dumped

Section CC: Offshore Section
- Conventional Marine installation
- New MRC cables laid in a virgin trench in a corridor offset to the south of the existing IRC cables by 5-100m
## Target Delivery Full Capacity by Q4 2018

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Cable Manufacture February to May
Load Out North Cable onto Skagerrak July 15
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“Cable Float-in” Portmuck NI
Capjet Burial Tool Deployed from Skagerrak
Post Burial Survey to assess Rock Placement
Offshore “Fallpipe” Rock Placement
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Nearshore “Split Barge” Rock Placement
Intertidal Area: Cast Iron Shells & Diver Burial

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Transition Joint
Transition Joint
22nd January: North Cable “Switch On”
Project Delivery Factors

• Procurement
  – Senior Management commitment & support
  – Short decision making timescales
  – Realistic risk sharing

• Innovative engineering design

• Flexibility on Scheduling
  – Winter 2015/16 concerns
  – Factory Slots and Availability of Skagerrak

• Stakeholder - Client – Contractor interface management
  – SONI, Siemens, Interconnector Users

• Collaborative & Parallel working

• Experienced teams – Client & Contractor
Key Project Objectives

1. No injuries, fatalities or occupational illness.

2. No prosecutions, improvement or prohibition notices.

3. No damage to existing assets.

4. No unresolved complaints from land-owners/residents etc.

5. Delivered on time and on budget.
Project Health & Safety Challenges

• Very accelerated timescale with an early project start
• Diverse European Contractors with limited recent knowledge of UK H&S legislation and multiple sub-contracting disciplines
• Two sets of CDM Regulations applied to the project at the same time!
  CDM 2015 came into force for GB in April 2015 whilst CDM 2007 still applied for NI operation. (Transition arrangements for GB operations until October 2015)
• Substantial off-shore operations including complex diving operations
• Managing ‘Safety from the System’ arrangements on-shore and off-shore
• Effective site control and Temporary Works Co-ordination
• Very remote site at Currarie Port in Scotland
• Communications to sites
• Understanding the geography
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Overcoming the challenges

- Created a H&S management team embracing Mutual Energy, the Principal Contractor and other key players (CDM-C, Site H&S Manager and Project Manager)
- H&S was agreed to be a vital integral part of the Project Management from concept, through design and build
- Up-front agreement that Health & Safety would never be a subject for commercial ‘disagreement’
- Dedicated resource on the ground (and at sea) to co-ordinate and advise on all hazardous operations including achieving and maintaining Safety from the System
- Integration of audit, inspection, training and coaching
- Continuous Communication and Involvement across the project
- Satellite technology for communications
- Managing environmental issues

‘WE CONCENTRATED ON FIXING THE PROBLEMS - NOT FIXING THE BLAME!’

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The ‘results’ so far....

- Over 240,000 exposure hours since July 2015 without illness or injury
- 5 near-miss reports, 2 good-catch reports on-shore
- No Road Traffic Collisions
- 308 ‘Good spots/hazard reports’ off-shore
- 1014 tool-box talks
- 3 ‘stand-down’ sessions pre-mobilisation
- 67 audits (announced and un-announced)
- 1 HSENI unannounced visit
- Audited by British Safety Council as part of 2015 ‘5-Star’ audit
- No damage to existing assets
- No unresolved complaints
- No unnecessary delays created by the Health and Safety regime
Summary

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