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Wytch Farm Oilfield: Pipe-in-pipe Remediation Project

Presentation to UKOPA Members
24th February 2015

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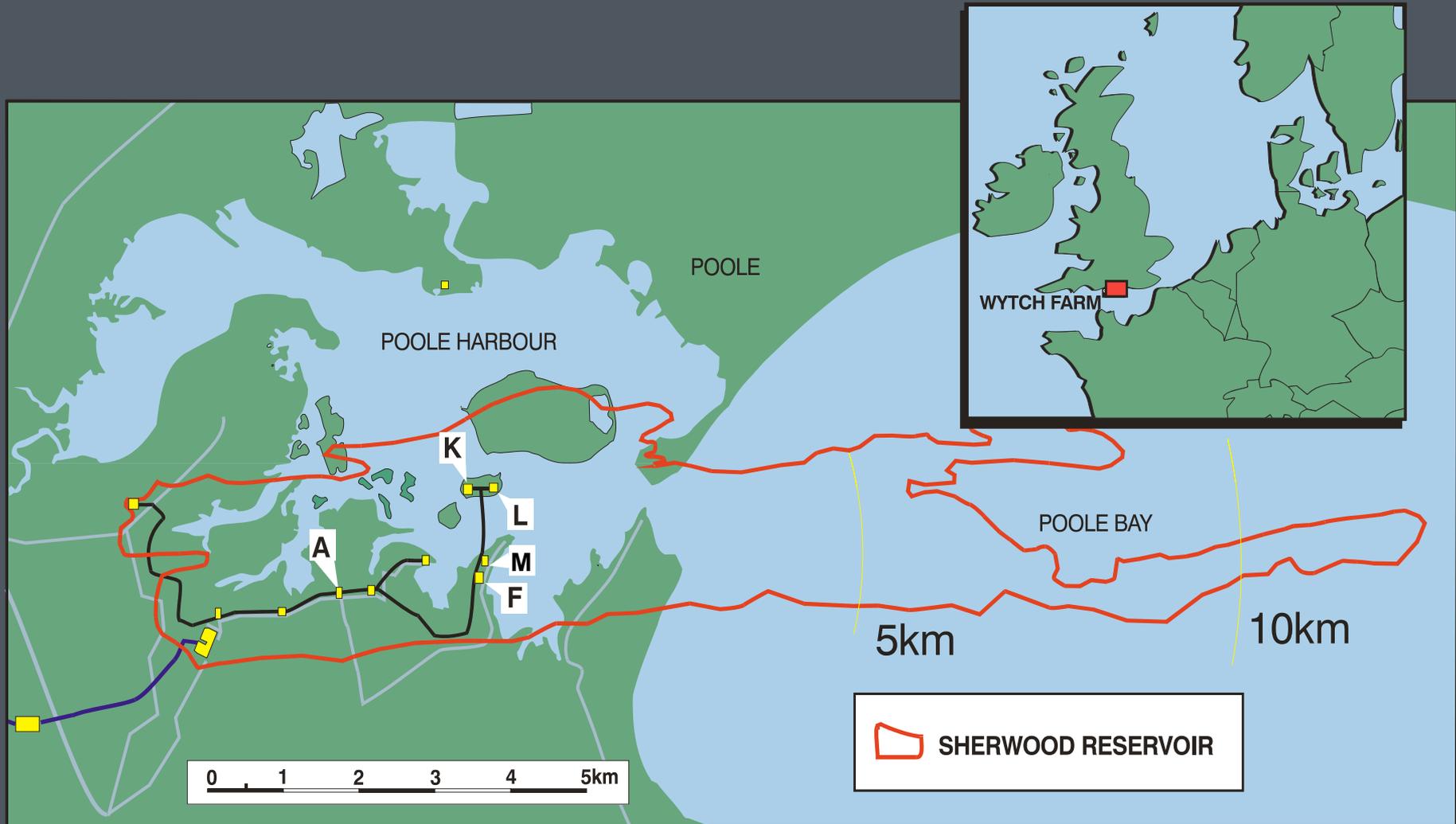
Perenco Group Overview



- Independent oil and gas company
- Operations in 13 countries, ranging from Northern Europe to Africa and from South America to Southeast Asia
- 4,500 employees worldwide
- Production of approximately 450,000 boepd (250k net to company)
- Headquarters in London

- Perenco SNS (Southern North Sea)
 - Dimlington and Bacton Terminals
 - Offshore gas / condensate fields
- **Perenco Wytch Farm**
 - Largest onshore oilfield in Western Europe
 - Operator: Perenco UK [2011-]
 - Joint Venture: Perenco / Premier / Maersk / Summit Petroleum Dorset Ltd / Talisman
 - Crude oil & sales gas export by pipeline, LPG export by road
 - Developed Sites = 105 acres ; Land Management Sites = 310 acres (includes 64 acre conservation area)

Wytch Farm Location



Environmental Designations

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- World Heritage Site (Jurassic Coast)
 - Ramsar Sites
- Special Protection Areas
 - Special Areas of Conservation
 - Sites of Special Scientific Interest
- Area of Outstanding Natural Beauty
 - National Nature Reserves
 - National Trust land

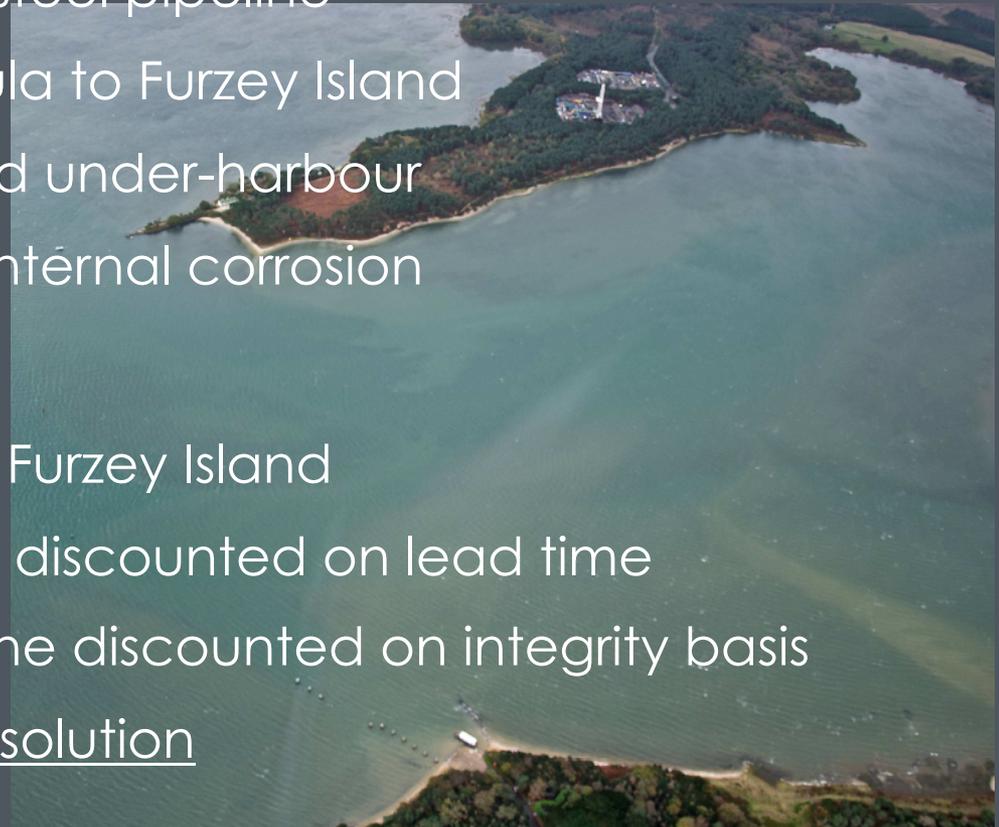
Furzey Island (Wellsites K and L)

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Water Injection Pipeline

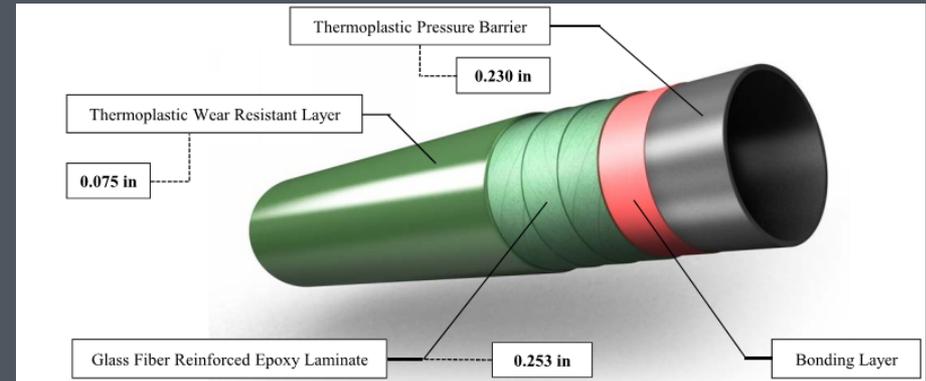
- Existing Pipeline:
 - 90bar water injection
 - 6,4km 10"/8" X52 carbon steel pipeline
 - 80kbpd Goathorn Peninsula to Furzey Island
 - 1,3km 8" horizontally drilled under-harbour
 - Inline inspection Nov'14- Internal corrosion
- Project Scope:
 - Restore water injection to Furzey Island
 - HDD of a new pipeline discounted on lead time
 - Lining of existing pipeline discounted on integrity basis
 - Pipe-in-pipe preferred solution



Technology Selection

NOV Fiberspar

- GRE lined with HDPE core and jacket
- Continuous spoolable pipe
- Compatibility
 - Full pressure/temperature rating
 - Corrosion free
 - Permeability checks
 - Chemical checks
- Flow Rate Matching
 - Two off 5", One off 4"
 - Three parallel out of use pipelines selected as carrier pipes under harbour



2 x 5" Lines being loaded at Southampton docks having arrived from the USA

Installation (1/4)

- Substantial excavations at both sites
- Approved spoil storage areas



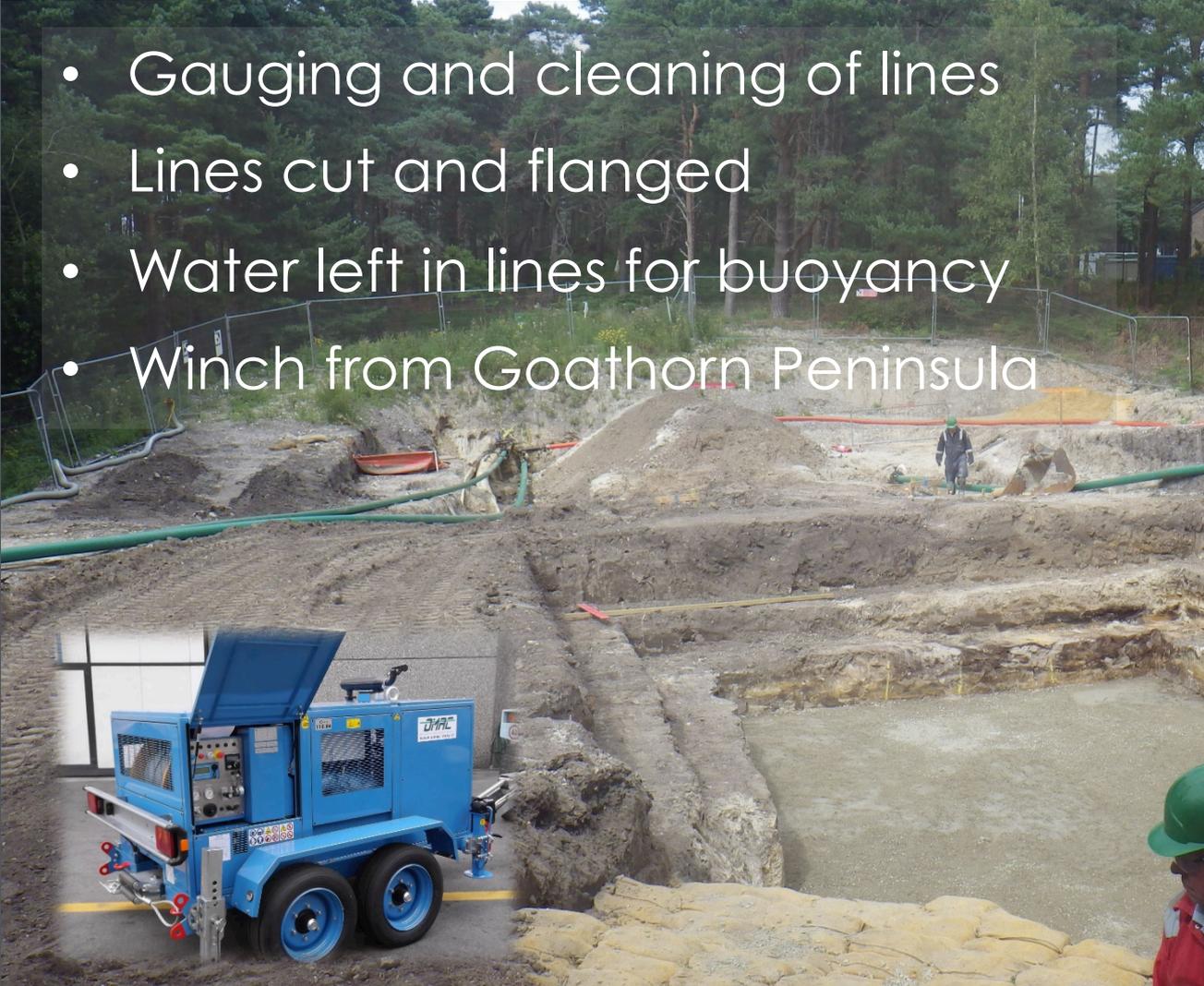
Installation (2/4)

- Transport spools to Furzey Island



Installation (3/4)

- Gauging and cleaning of lines
- Lines cut and flanged
- Water left in lines for buoyancy
- Winch from Goathorn Peninsula



Hydrostatic Testing (4/4)

- Contraction advised on initial hydrostatic testing:
 - Cross-wound fibre lay-up
 - Shop pressure tested
 - Re-rounding of pipeline following spooling and pull-through
- OEM stand-off clamp restraints by design not considered fit for purpose
- Slip and loss of excess pre-cut length
- Lesson learned:
 - Limited OEM experience at site tests beyond 110%
 - Cut oversize and allow free contraction (clamp after)
 - Account for resultant axial loadings at tie-ins

Carbon steel tie in manifolds

- Line size increase 8" to 10"
- 3D scanning route design (congested flowlines and protected areas)
- Induction bending
- Piggable tees
- BS-PD-8010-1
- Manifold Inspection Pits



Completion

- Water injection restored at 6 months
- Full ground remediation

Integrity Monitoring

- GRE composite: UT ILI technology unavailable
- Front end Integrity assurance:
 - Manufacturing
 - Installation (backfill quality, hydrostatic testing)
- Future monitoring:
 - Product design life
 - Process conditions (fatigue / temperature / chemical / velocity / solids)
 - Annulus vent inspection routines
 - Routine UT of remaining carbon steel sections

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Thank you

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