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# Chevron Subsea

Richard Gale
Subsea Team Lead
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# Subsea – a flexible approach

## Summary

### Discussion topics

**Subsea technology**

- Do we have what we need?
- Where do we need new technology?
- Is it a Deepwater driven industry
- Value of production efficiency and ramp-up

### Key messages

**Asset development**

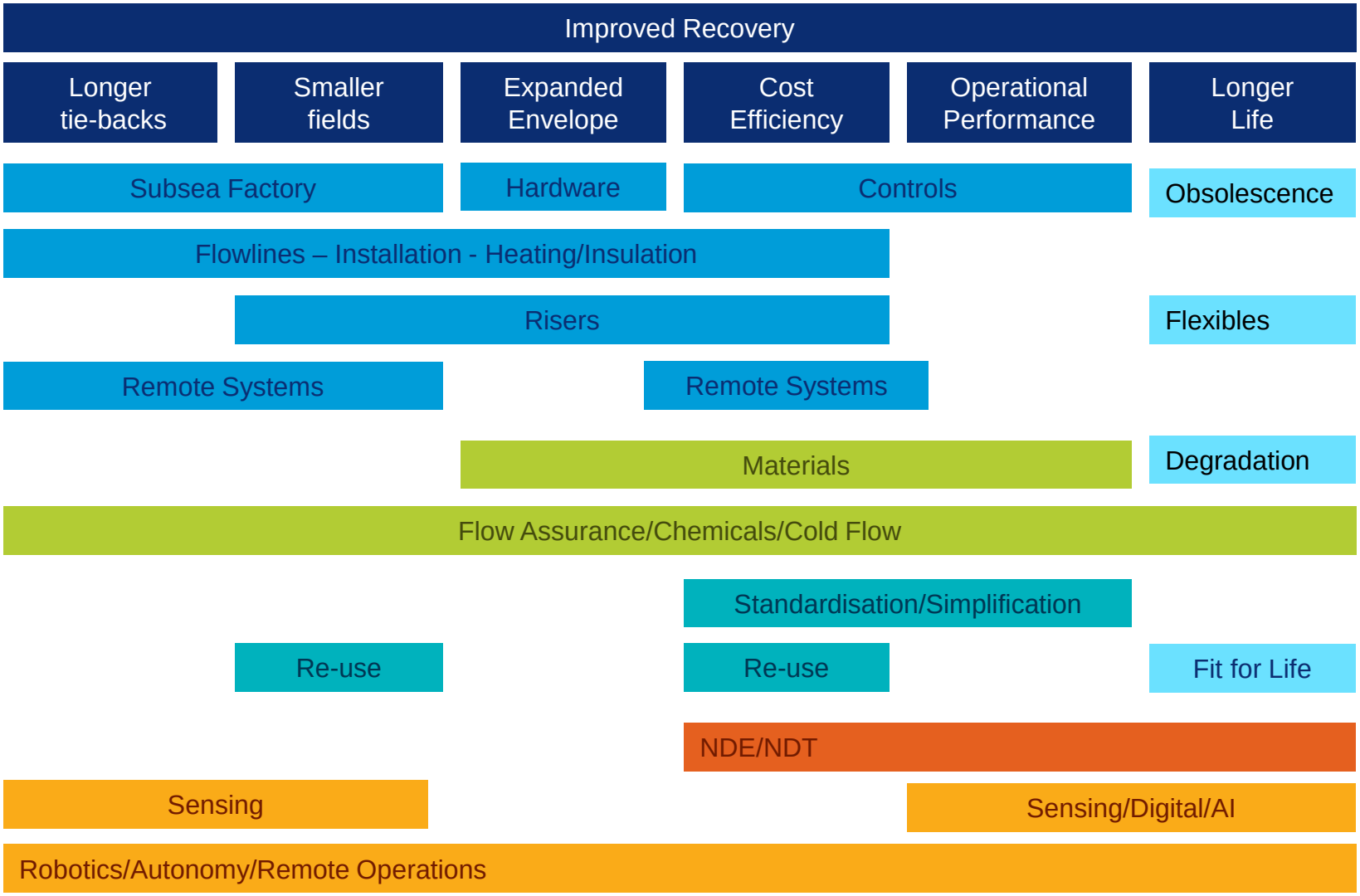
- One size does not fit all
- New technology has a role, but at a price
- Learning from the best of the past
- Design to fit or, fit to design?
- Role of re-use
- Preserving value

### approach

- Chevron project comparison

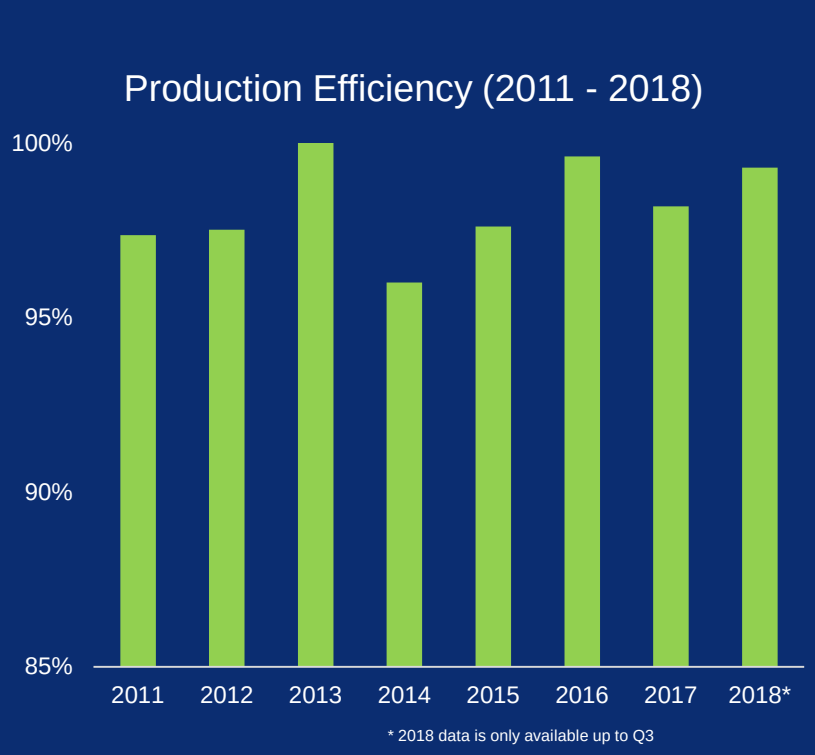
# Subsea – technology roadmap

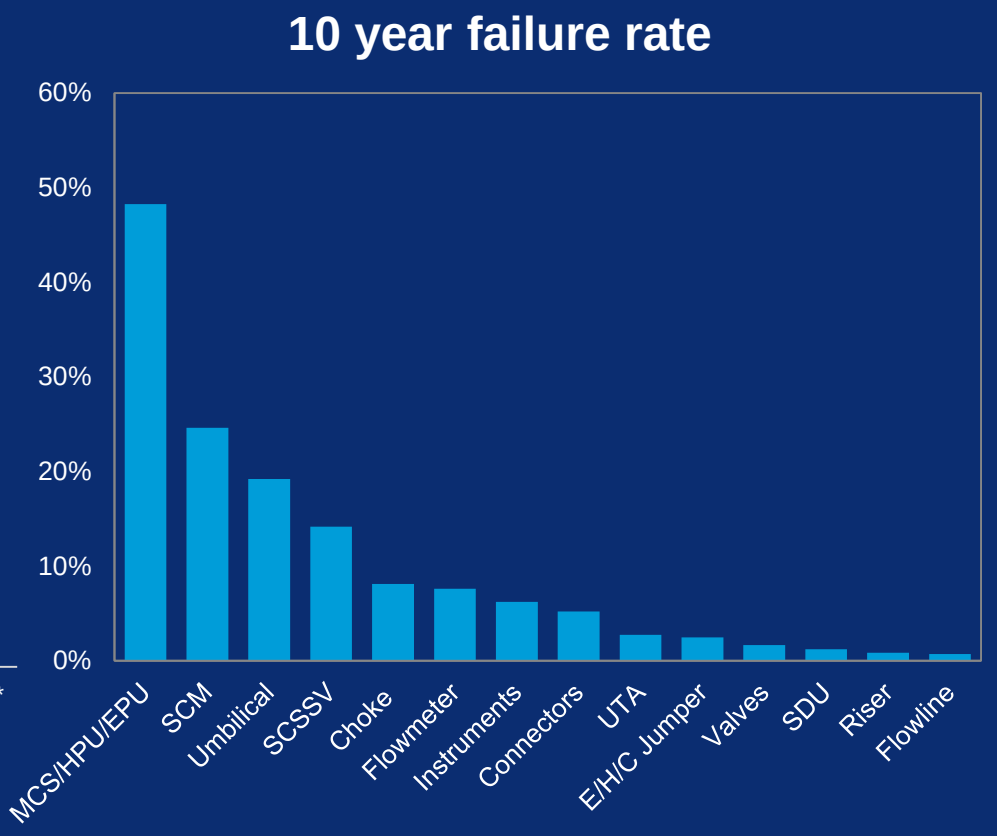
## How does UKCS fit in overall strategy



# Subsea –NS performance

## Risk v. reward



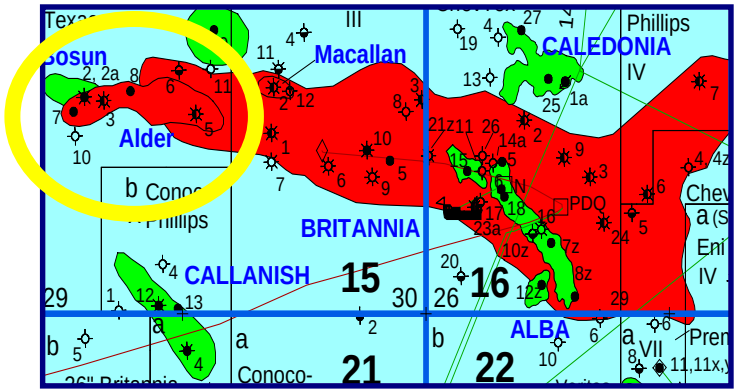

Cost v. Risk | Initial cost v. Life of Field | Certainty in performance, schedule and cost

# Subsea – making technology work

## Invent/adapt/adopt/copy/reuse

### Alder

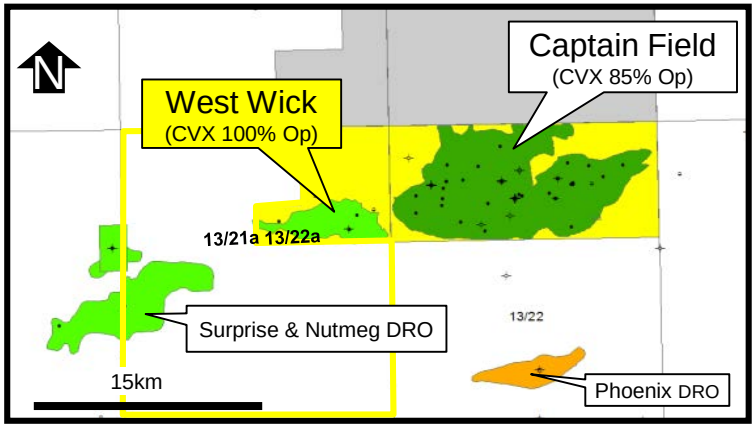
- Block 15/29a of UK North Sea 28km west of the Britannia platform in 152m of water




- Upper Jurassic
  - 14,700 ft reservoir depth
- Gas/Gas condensate
- High pressure and temperature
  - 12,200psi and 305f
- Hydrate and wax concerns
- Natural flow
- Tie-back to third party operator

### West Wick

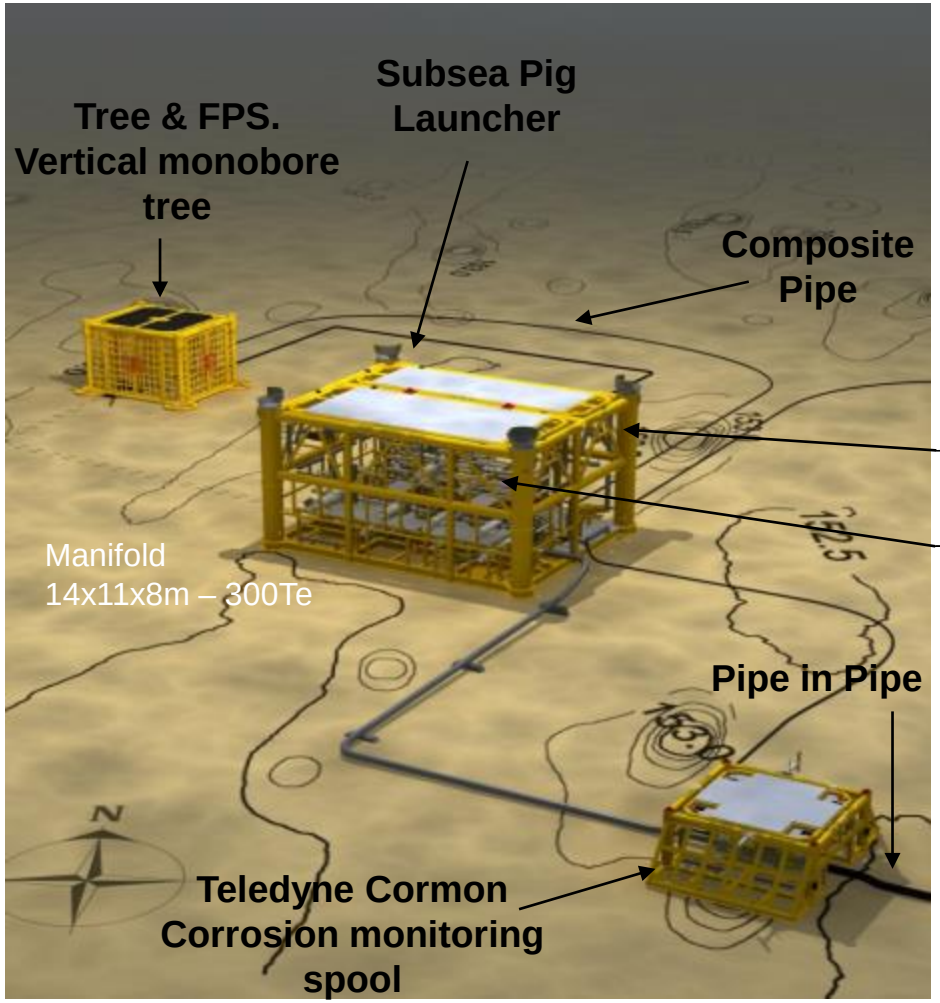
- Block 13/21 of UK North Sea, 1km west of Chevron Op Captain Field



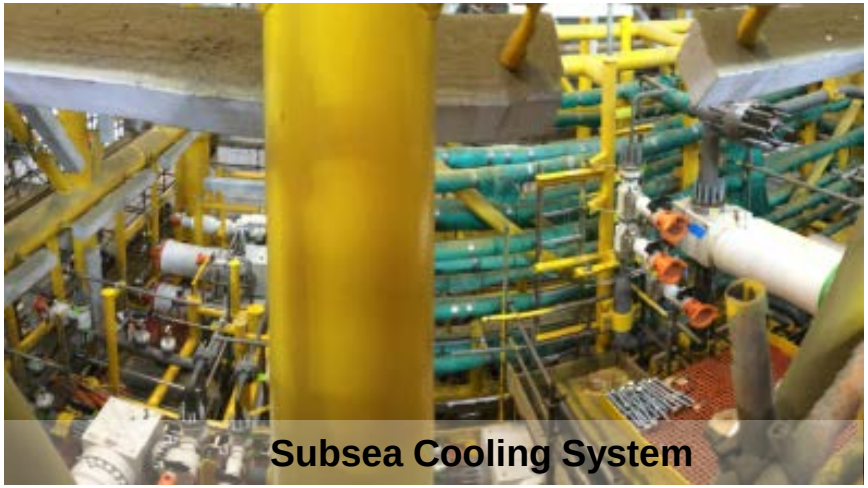

- Lower Cretaceous, Upper Captain Sand
- Heavy oil, high viscosity (~125cp)
- Low pressure and temperature
  - 1300psi and 87f
- Pressure support from aquifer
- Water flood
- Tie-back to operated facility

# Alder

## Technology applications





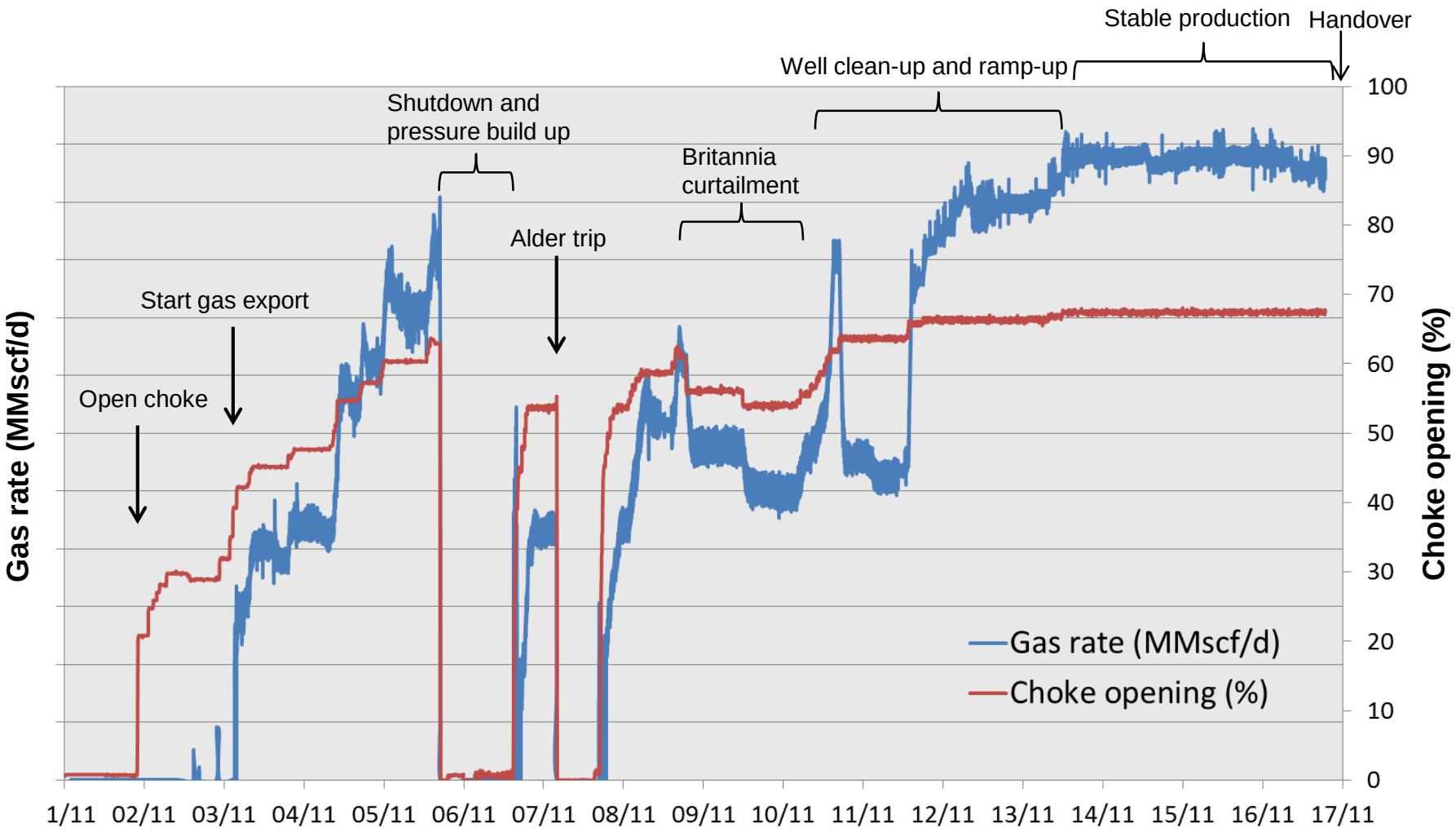


# Alder - Technology

| Project Enabling Technology | Innovate/Adapt/Adopt/Copy/Reuse |
|---|---|
| Subsea HIPPS | Copy - Shell/BP |
| Vertical Tree System – OSS 15K, 300F<br>Tree, Tubing Head Spool, Wellhead, Fishing Protection Structure (post Macondo) | Adapt - CVX GOM |
| Reeled Pipe-in-Pipe (reelable bulkheads) | Adapt – Erskine |
| Subsea Cooling loop – in two controllable sections | Copy – Shell |
| Corrosion Monitoring & Management:<br>Corrosion monitor – RPCM<br>Subsea Pig Launcher – for IP. | Adapt – CVX Gorgon |

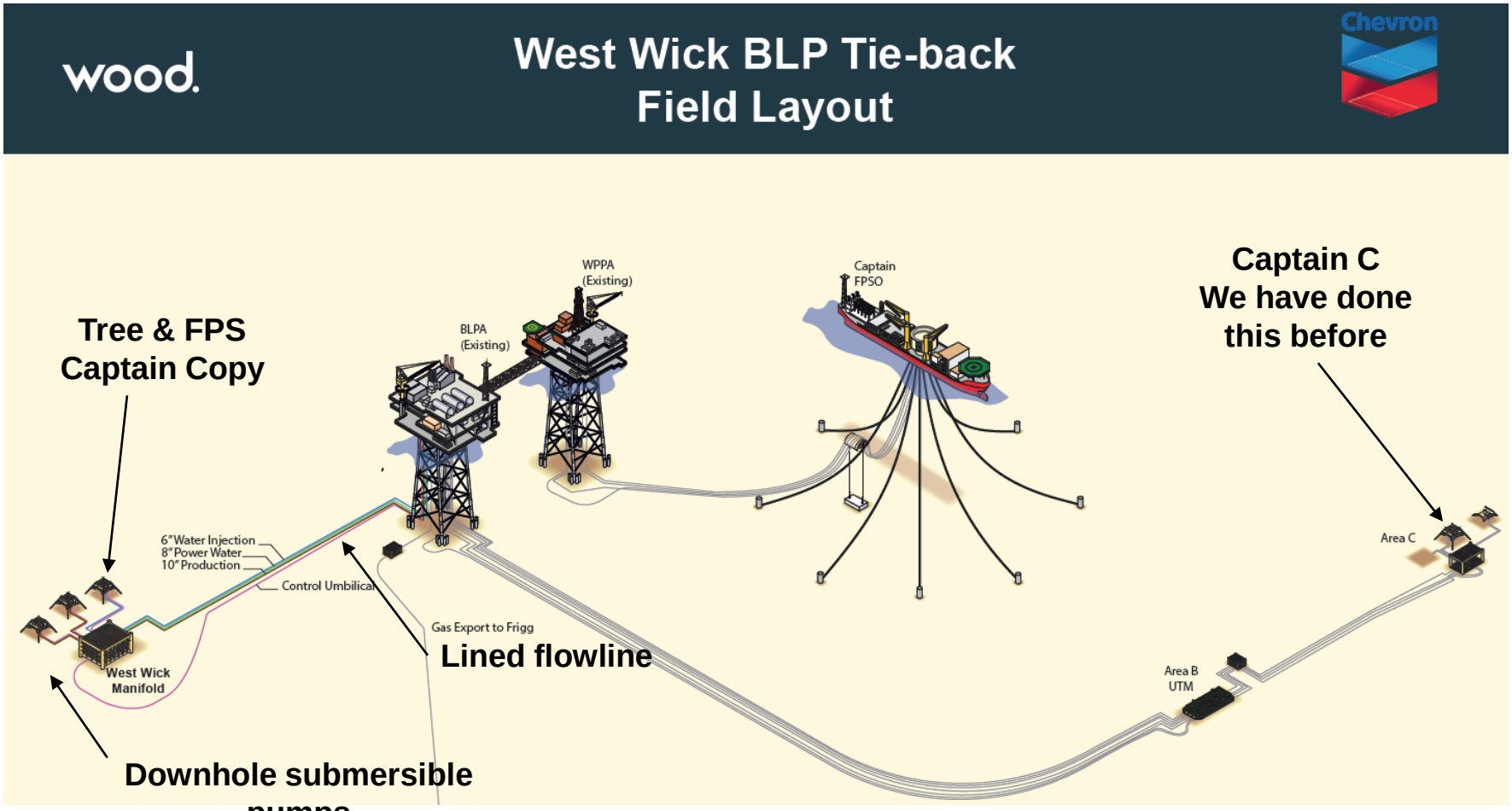
| Project Enhancing Technology | Innovate/Adapt/Adopt/Copy/Reuse |
|---|---|
| Composite Pipe (Airborne) – HP Methanol | Innovate – first use |
| Controls Modular Distribution Unit / Manifold Mounted Control Modules | Adapt – CVX used for Strathspey 20 y/o design |
| Reeled Pipe-in-Pipe (reelable bulkheads) | Best Practice – great value is rapid ramp up |

# Start-up timeline



# West Wick

## Technology applications



# West Wick - Technology

| Project Enabling Technology | Innovate/Adapt/Adopt/Copy/Reuse |
|---|---|
| Re-order Subsea equipment by part number<br>Use existing designs where possible<br>Use existing spare equipment/tooling (production trees) | Copy – 20 y/o Captain design<br>Reuse – Captain equipment and tooling |
| Minimise design requirements<br>Where new equipment required, leverage current design<br>Retain operating philosophy – HSP | Adapt – Captain enabling 20 years ago (HSPs) |

| Project Enhancing Technology | Innovate/Adapt/Adopt/Copy/Reuse |
|---|---|
| Fixed / Standard lengths of Flexibles / PUJ internal manifold jumpers | Adapt – as Strathspey |
| Composite Pipe | Adapt – Alder experience |
| Swagelining considered to mitigate corrosion / MIC / pigging requirement | Copy -??? |

# Subsea technology

## Chevron insight


- Most of the technology we need already exists
- Think reuse/copy/adopt/adapt/invent
- Leverage value of simplification – and learn from lessons of past
- Design to fit or fit to design – facilities or reservoir driven
- Data science can simplify systems