Setting new records with subsea boosting systems in fields in the Gulf of Mexico, North Sea, and offshore Angola

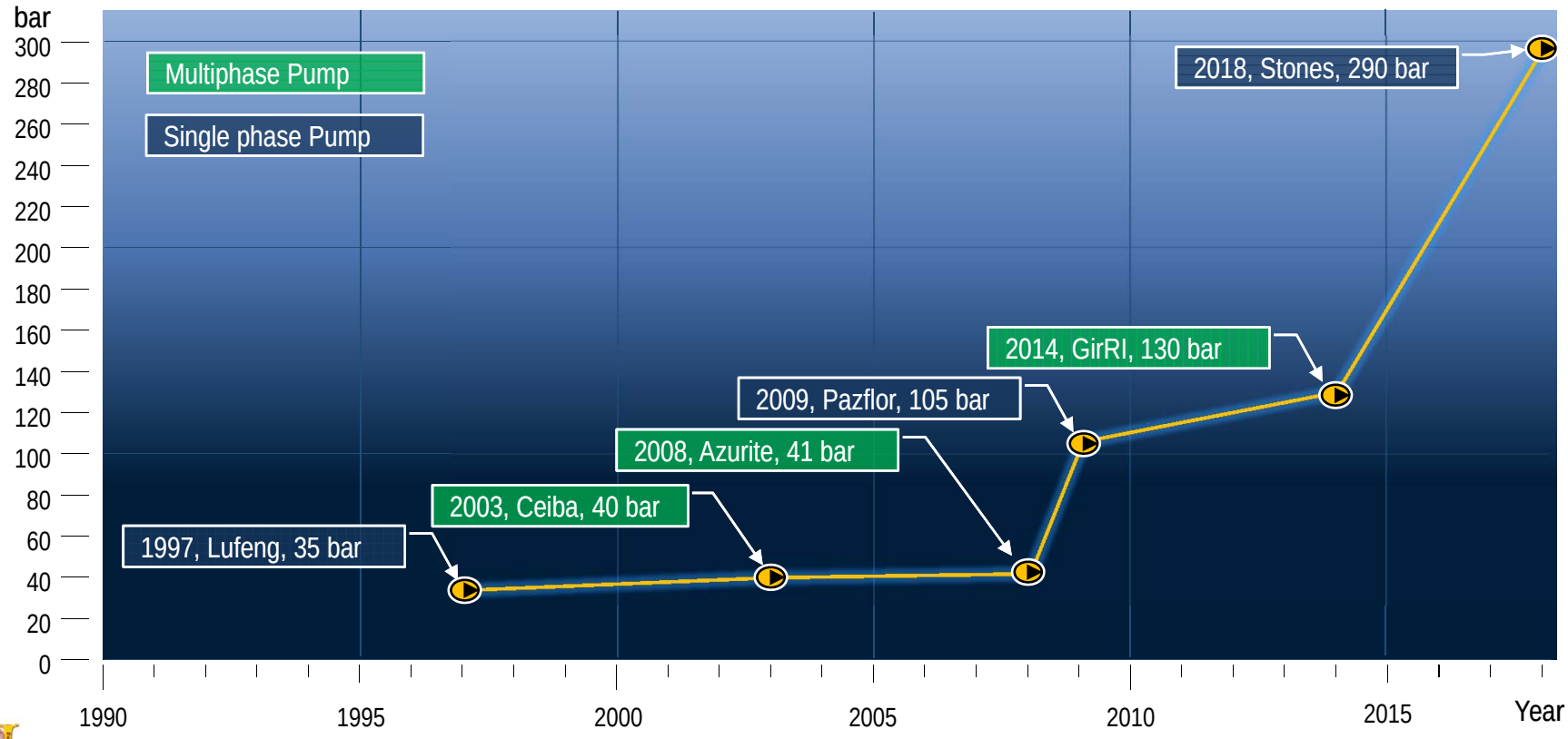
OneSubsea
A Cameron & Schlumberger Company

Content

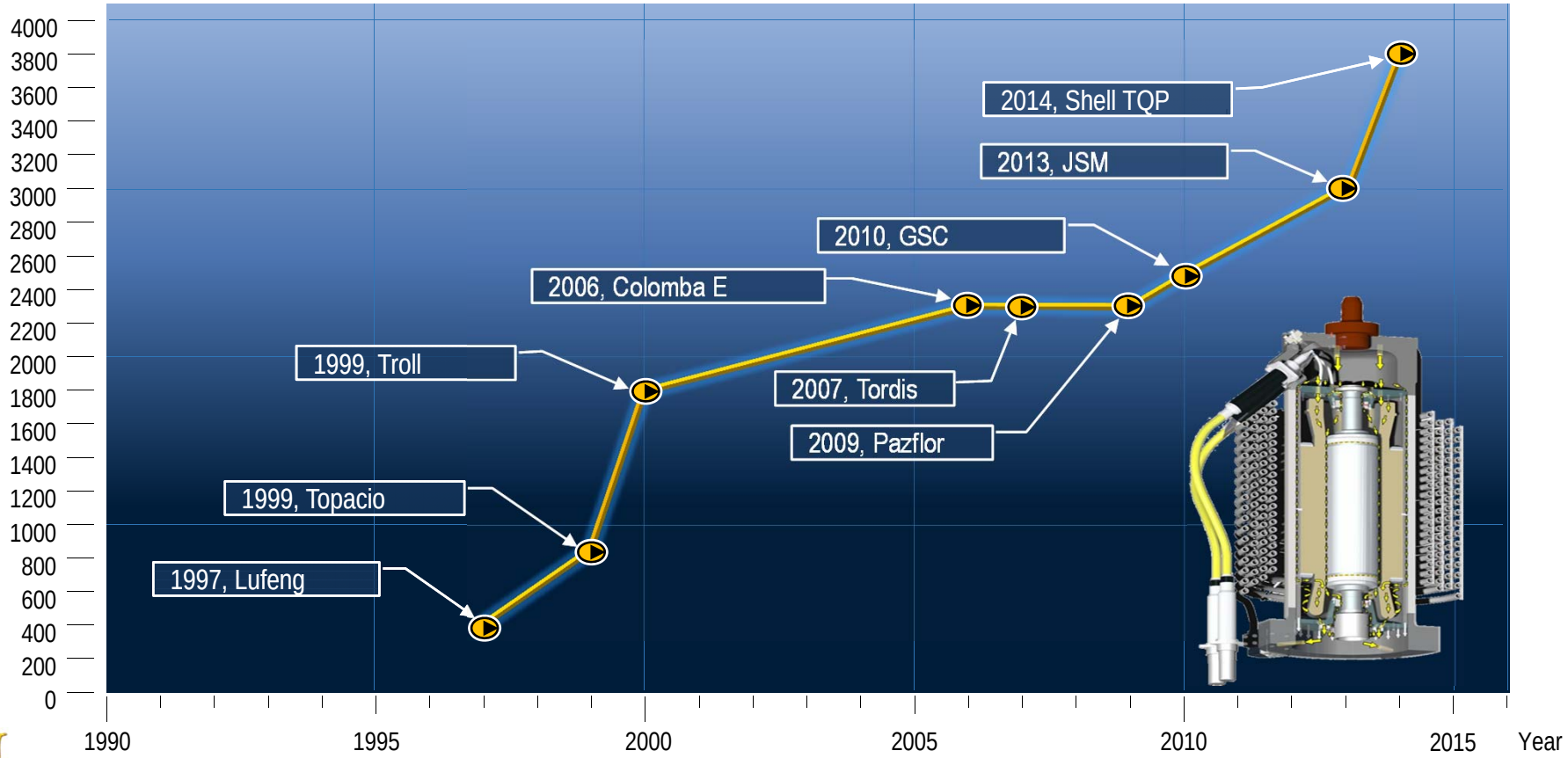
- Introduction
- Historic view of boosting
- Record breaking fields
  - Jack & St Malo
  - Gullfaks
  - GirRI
- Why select boosting as artificial lift

Historic View

Subsea booster pumps – differential pressure



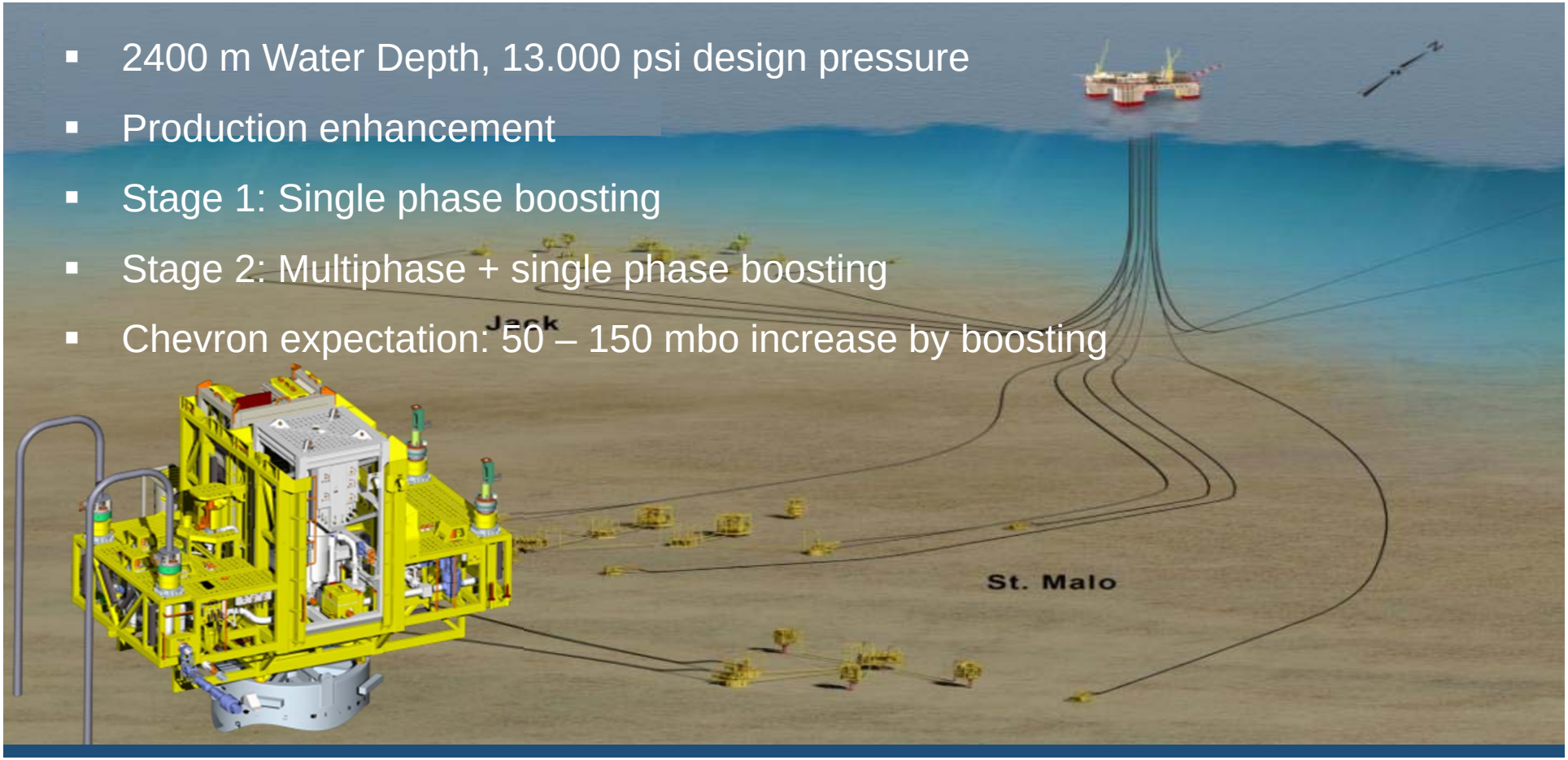
Subsea booster pumps – shaft power



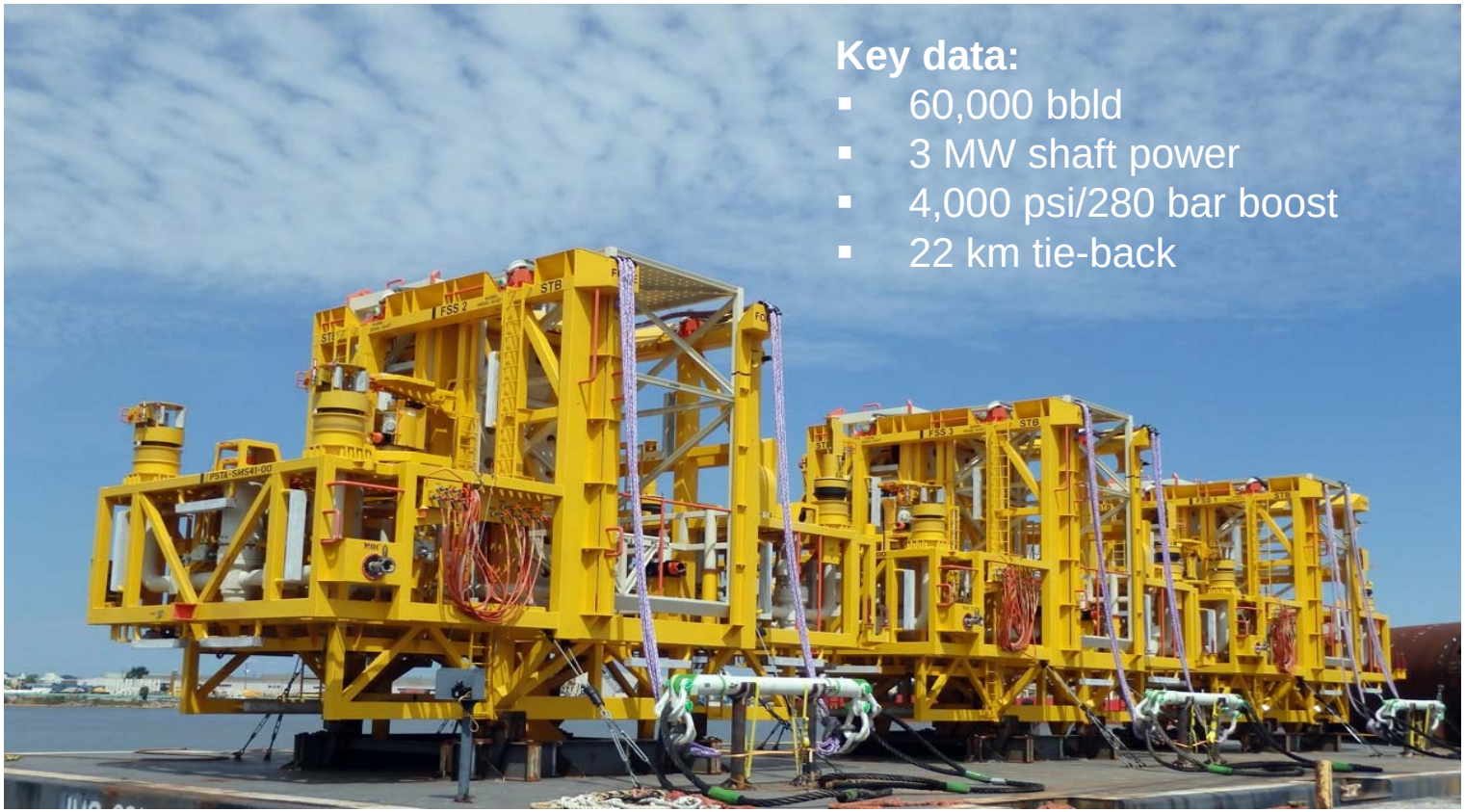
Fields

Chevron - Jack & St Malo, Gulf of Mexico

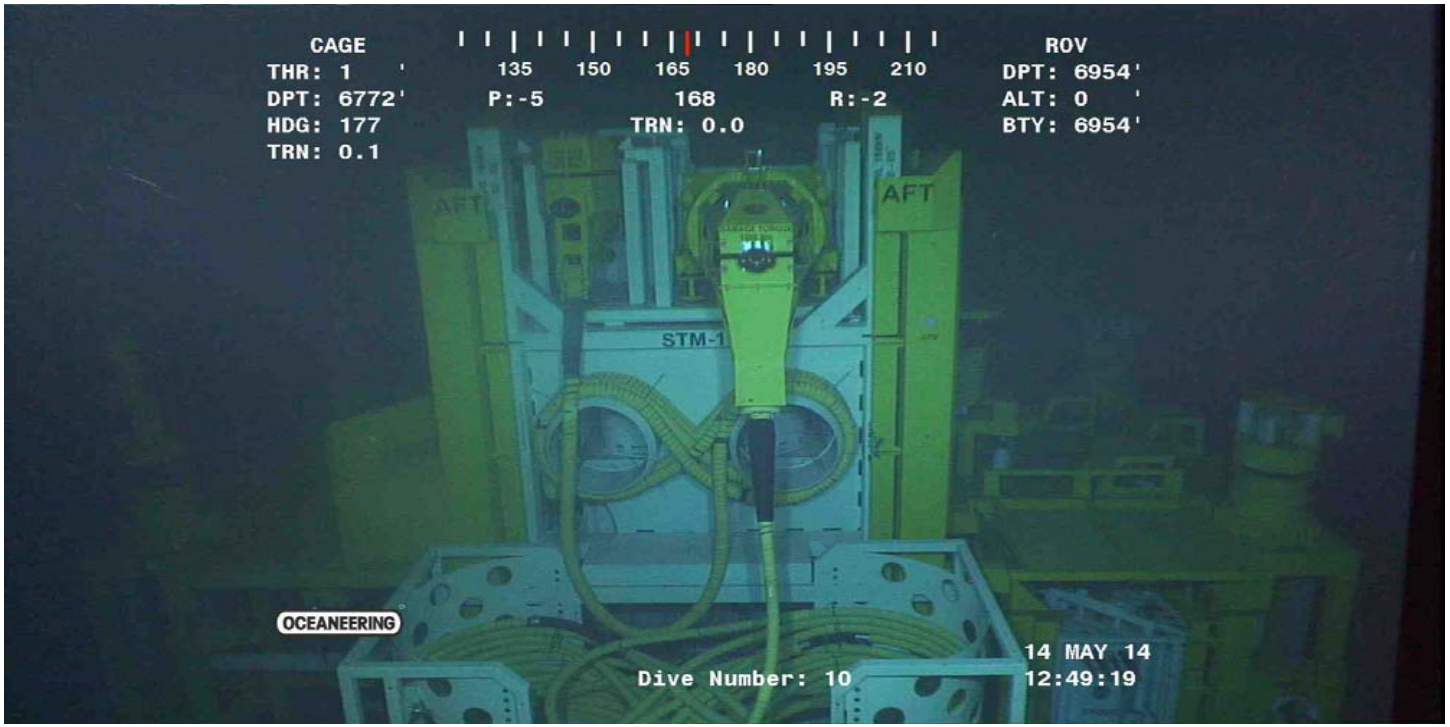
- 2400 m Water Depth, 13.000 psi design pressure
- Production enhancement
- Stage 1: Single phase boosting
- Stage 2: Multiphase + single phase boosting
- Chevron expectation: 50 – 150 mbo increase by boosting



Jack & St Malo pump stations



Installed and commissioned



OneSubsea® multiphase compressor system

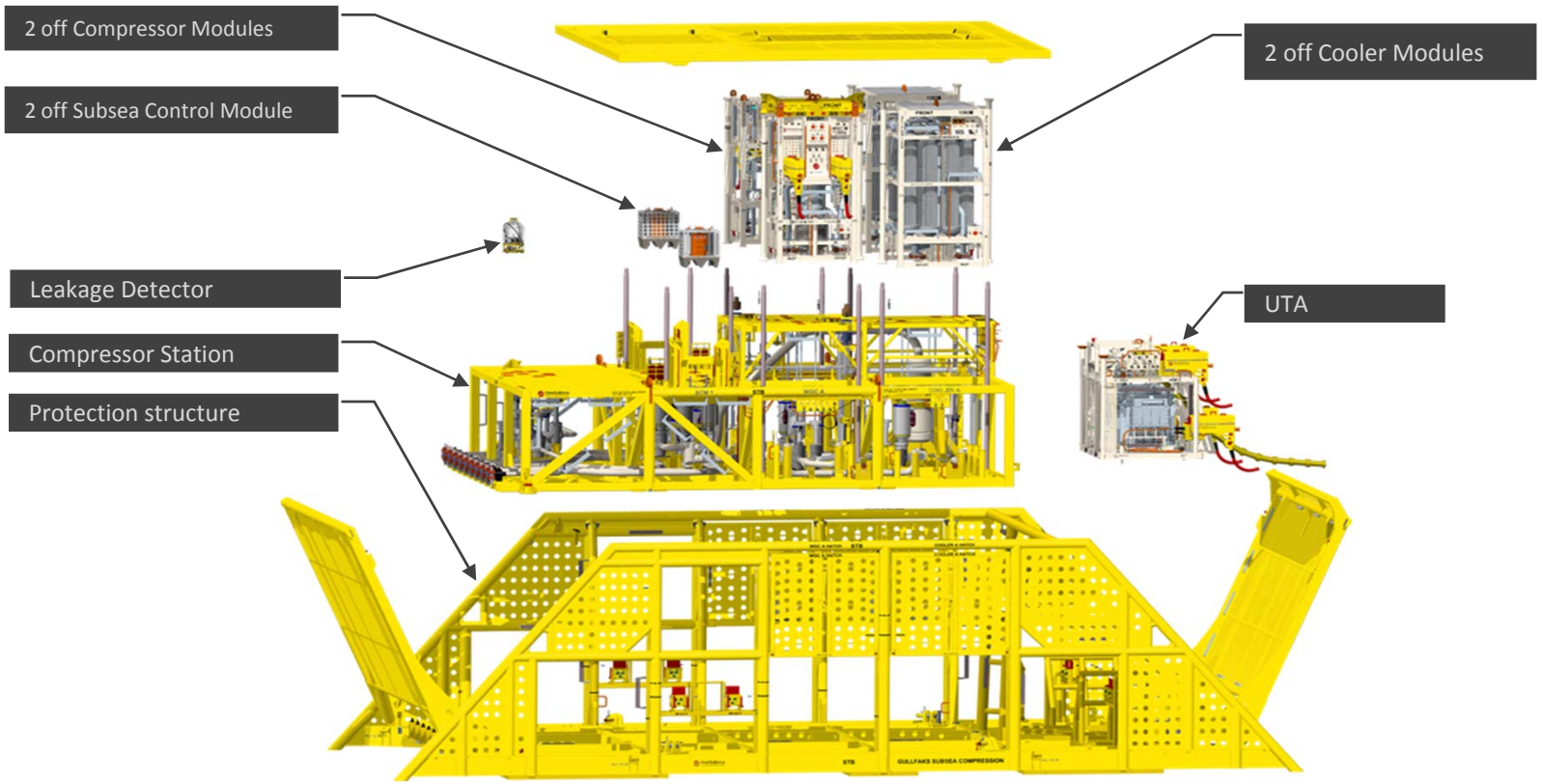
- OneSubsea multiphase compressor technology has been developed over the last 25 years.
- All subsea components are based on an unparalleled experience of more than 2,5 mill. accumulated operational hours of subsea pumps.

Main Features:

- Contra-rotating impeller shafts
- Multiple stages without diffusers
- Surge-free blade design
- Integrated flow mixing
- Field-proven motor, seals, and bearing technologies

- *Development and qualification of OneSubsea's multiphase compressor technology was carried out in close cooperation with major operators, such as Statoil and Shell.*

Gullfaks multiphase compression system – Installed 2015 - **worlds first**



Compressor station installation

Power

- 10 MW Shaft total power
- Controlled from Gullfaks A

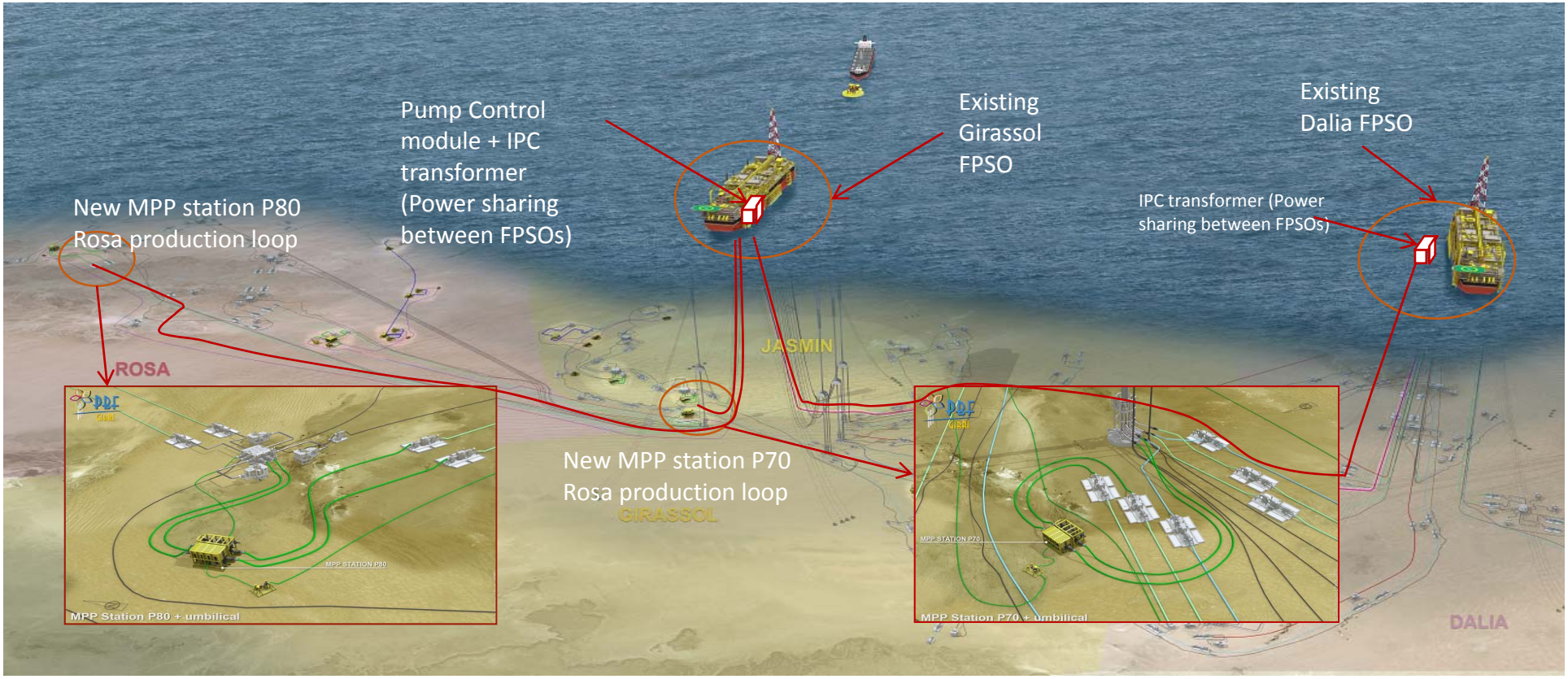
Flowrate

- 6000 Am^3/h = 406 MMScft/d)
- Mix of gas and liquid

Pressure increase from inlet to outlet

- Up to 32 bar per compressor, 64 bar in series

GirRI - a bold multiphase pumping project



Illustration; Courtesy by Total

GirRI pump system

Challenge

- 15 and 7 km tie-back (P80 and P70)
- 1400 m water depth
- **130 bar differential pressure**

Scope

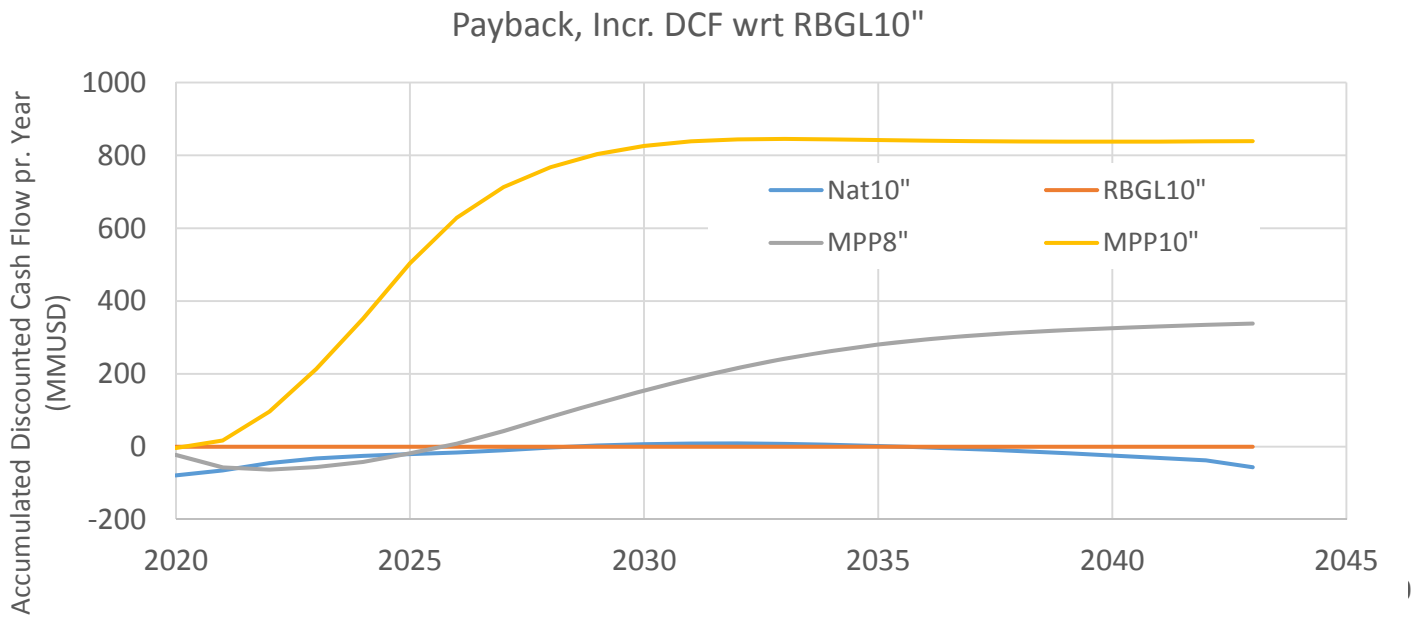
- 2 dual pump stations
- 2 suction anchors (manuf. in Angola)
- 6-off subsea high boost pumps
- Topside power and control module

GirRI pump system - Testing

GirRI P70 pump system in operation

Why select boosting for Artificial Lift

Typical AL screening study



«Promissing technology for 25 years...»

- Boosting adds energy
- Increases flow/recovery rates (30 – 100% +)
- Large differential pressures (200 bar)
- Maintain plateau production
- Enabling technology
- Allows smaller ID pipelines
- Improves flow assurance
- Tie-backs 100 to 150 km available today
- 3000 m water depth
- Fully qualified technology (20 years experience)
- **What more does it take?**