

INDUSTRIAL ENERGY EFFICIENCY

UP STREAM NEEDS

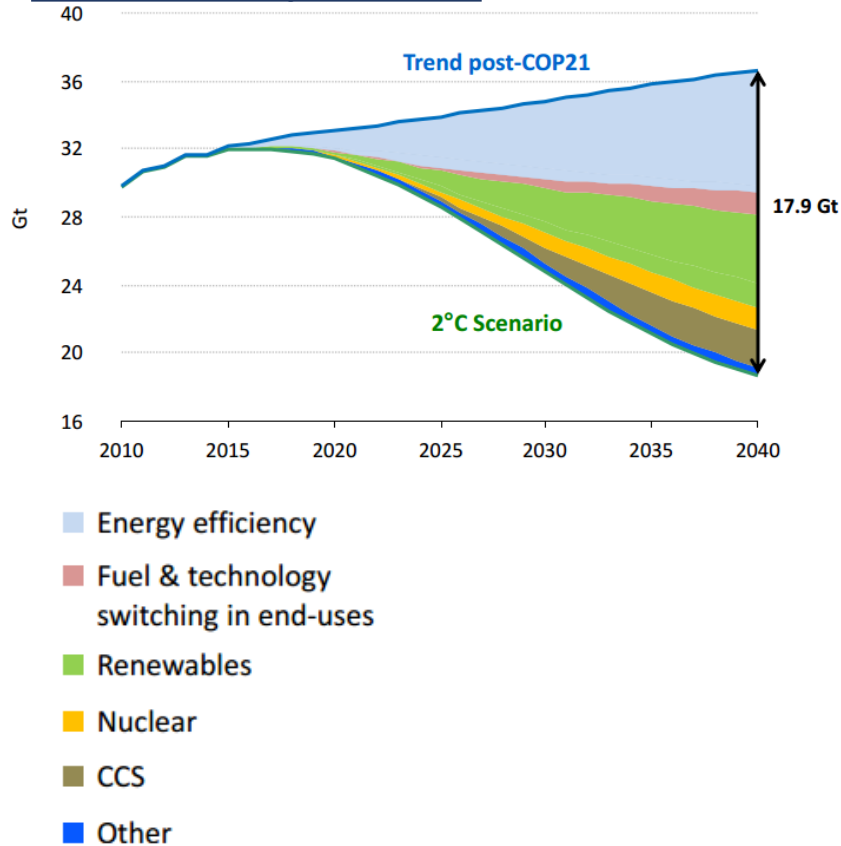
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General Manager ALLICE

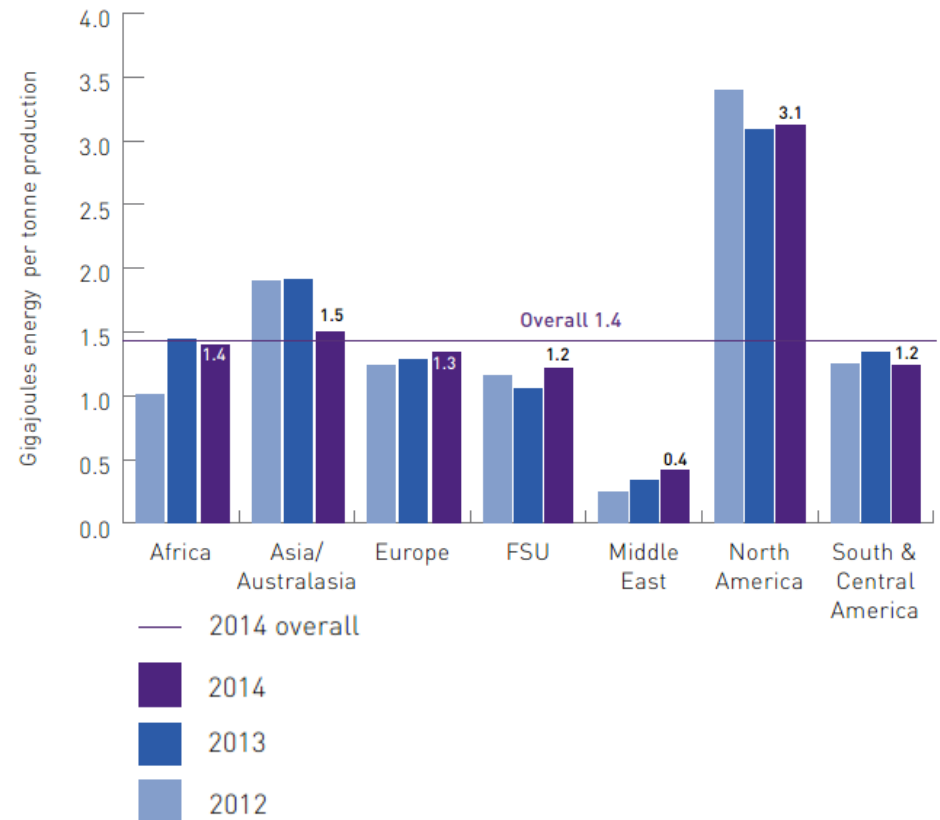
PRESENT SITUATION AND MAIN ISSUES

CO2 Emissions post COP21



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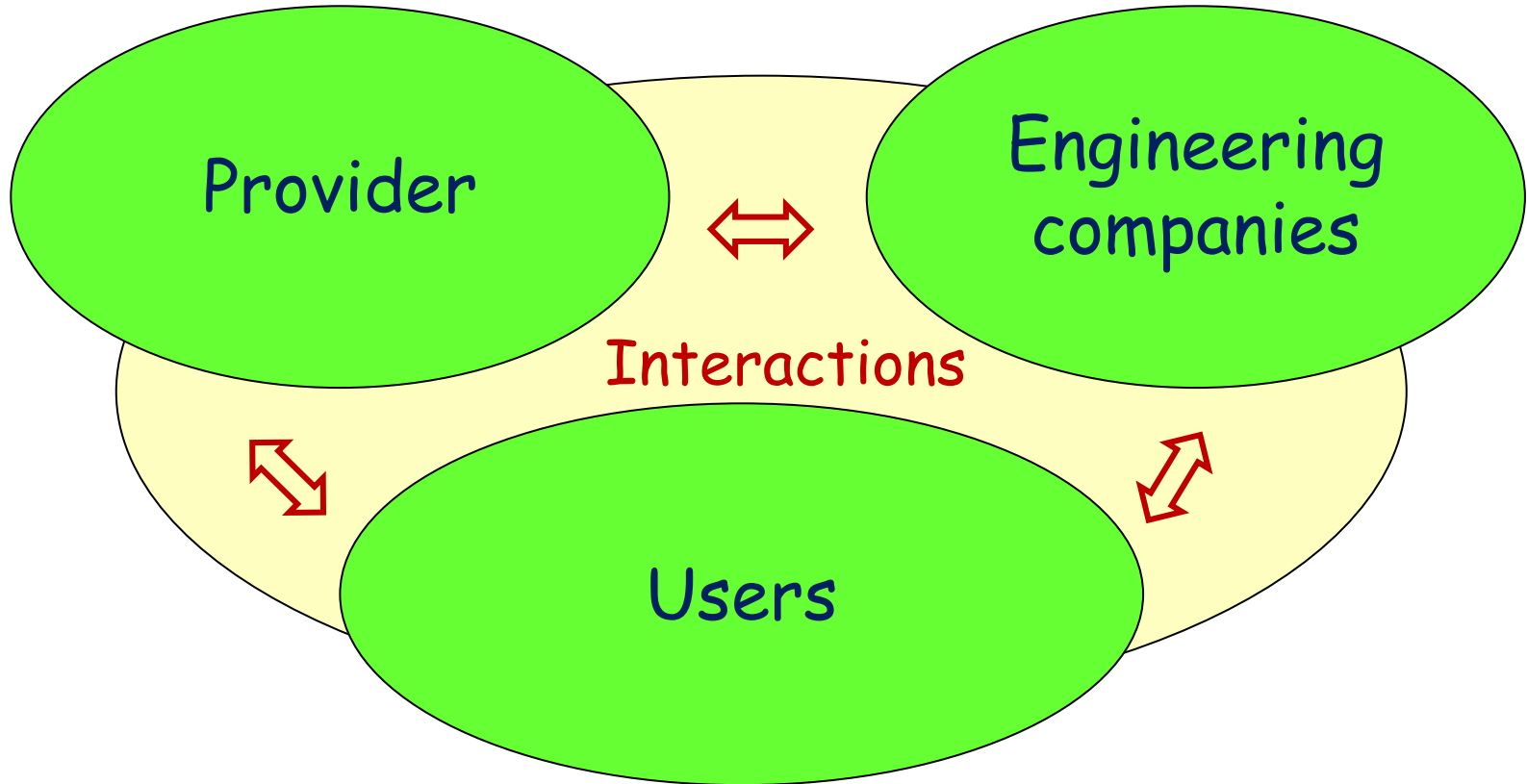
Energy consumption in upstream activities



© International Association of Oil & Gas Producers

**Energy efficiency is a permanent objective.
Technical solutions are depending on local environment**

TECHNICAL DEVELOPMENT MUST BE BASED ON A COLLABORATION BETWEEN PLAYERS



WHICH ARE THE MAIN CHALLENGES?

TARGETS

Optimize the design
of industrial plants

Develop necessary
technologies

Optimize the
operating conditions

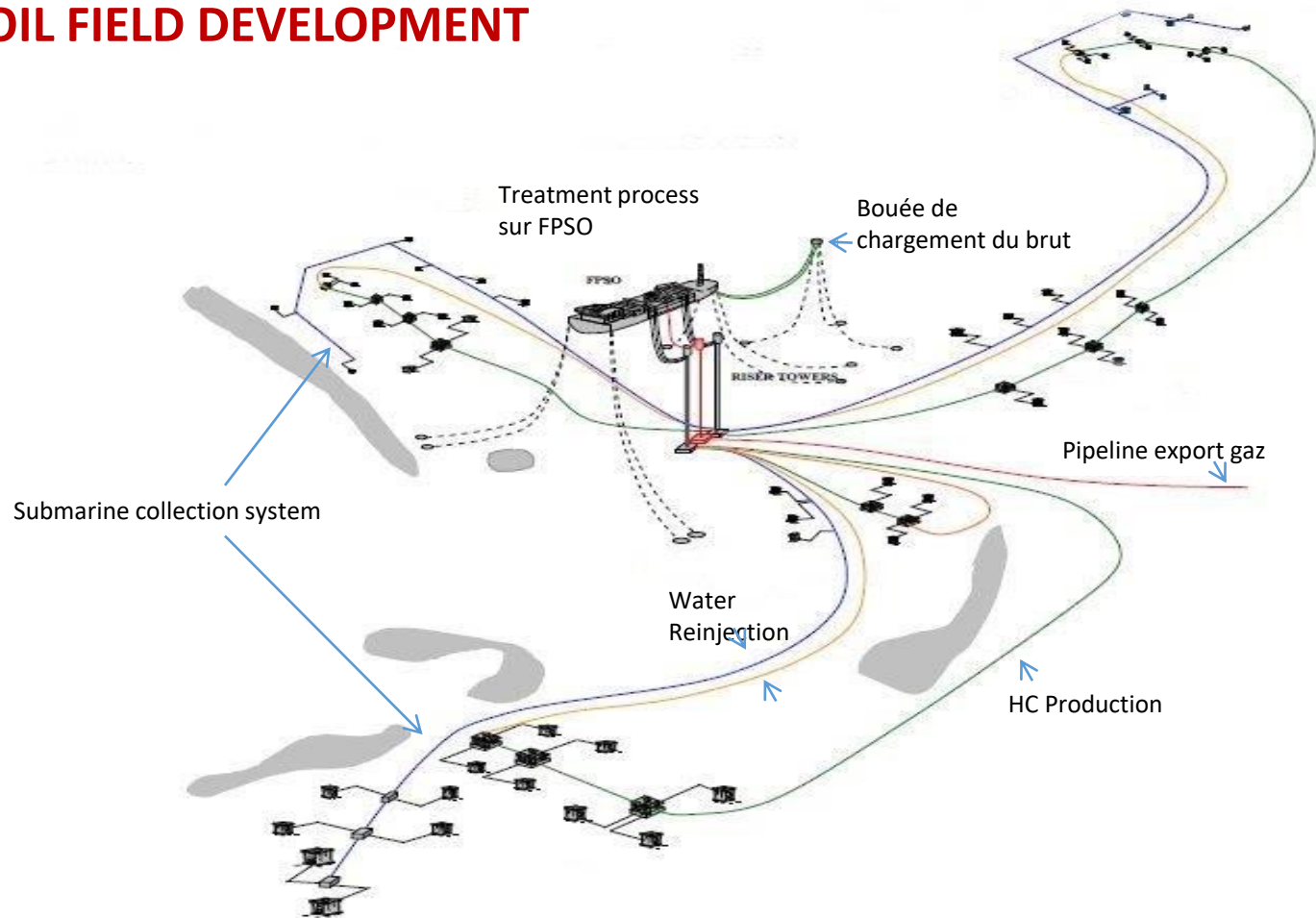
TECHNICAL APPROACH

- Energy and exergetic balance of complex systems (Pinch/Exergy)
- Taking into account **flexibility needs**
- Consider Energy Integration between oil/gas field, treatment units and exportation facilities

- **Séparation techniques**
- **Heat exchangers**
- Rotating equipments
- **Energy transformer**
(Rankine cycle, Absorption heat pump, pressure to energy...)

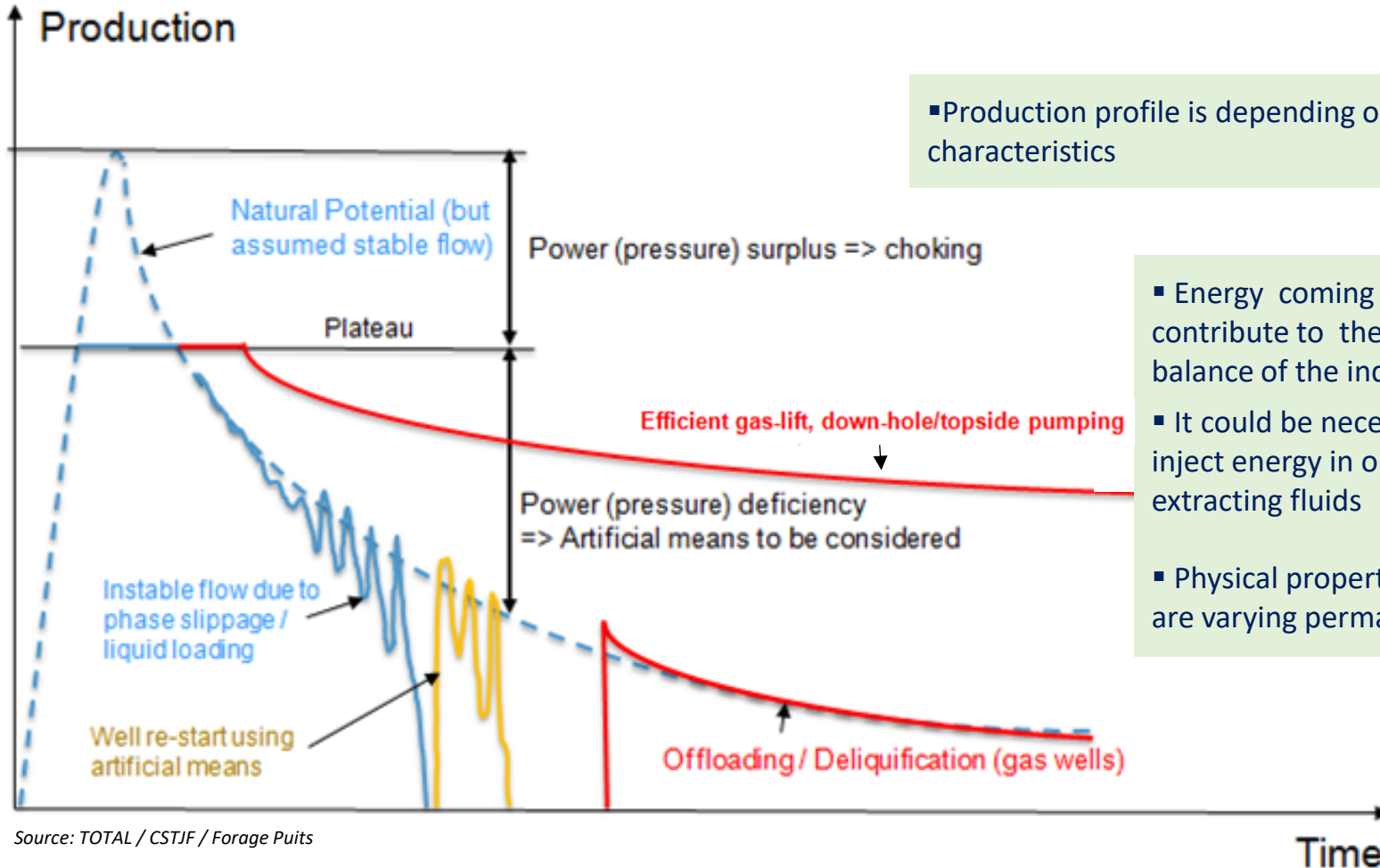
- **Operating condition analysis**
- **Process control**

OFFSHORE OIL FIELD DEVELOPMENT



A large challenge for optimizing the collection network for minimizing pressure drop and investment

OPTIMIZE THE PROCESS DESIGN FOR THE OVERALL LIFE TIME

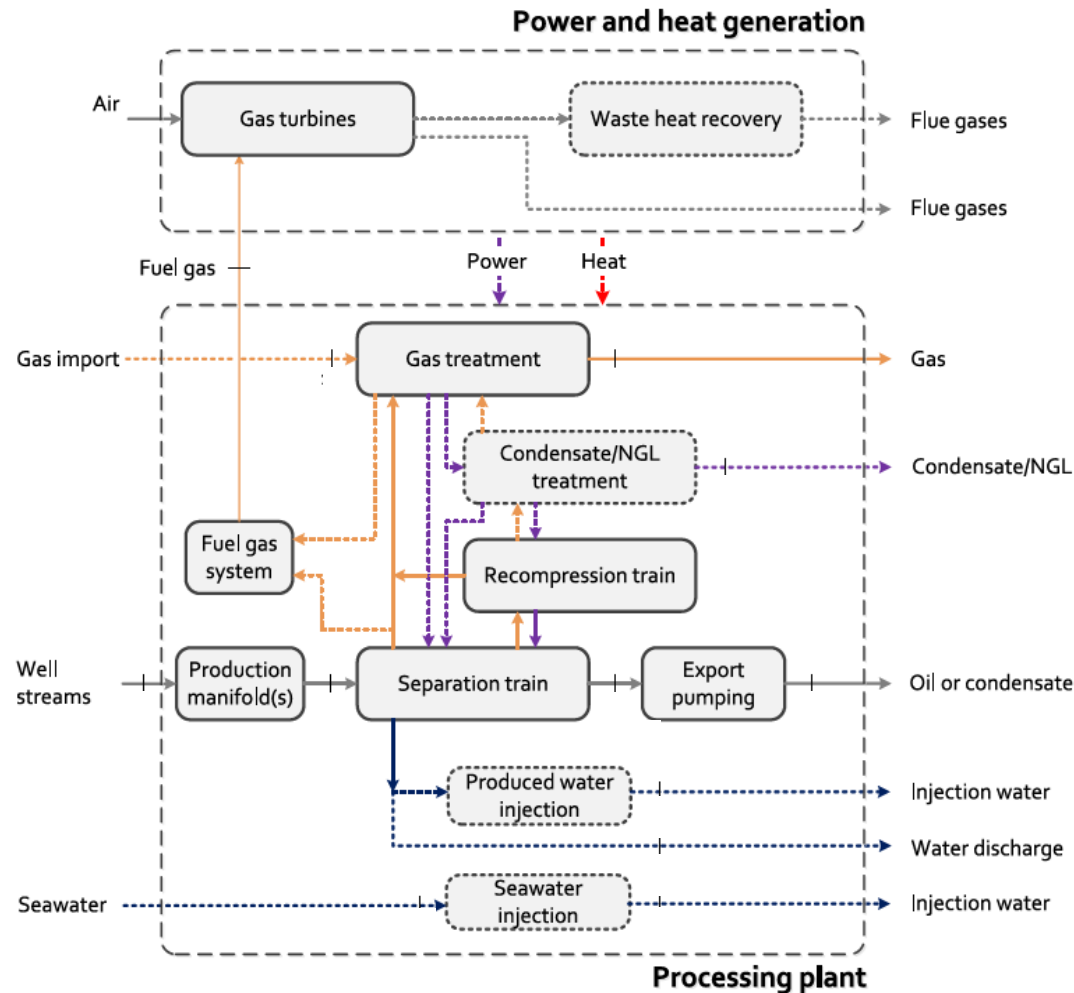


- Production profile is depending on oil field characteristics

- Energy coming bedrocks can contribute to the energy balance of the industrial unit
- It could be necessary to inject energy in oil well for extracting fluids
- Physical properties of fluids are varying permanently.

Source: TOTAL / CSTJF / Forage Puits

OPTIMIZE OPERATING CONDITIONS

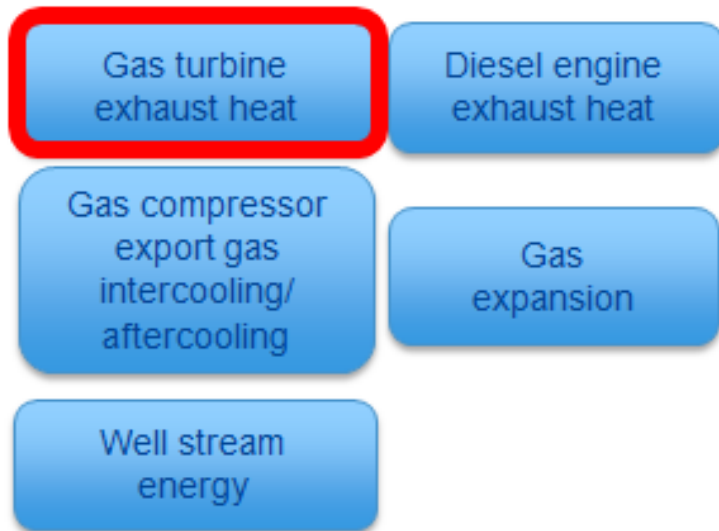


Source: Nguyen T-V, et al., Energy efficiency measures for offshore oil and gas platforms, Energy (2016)

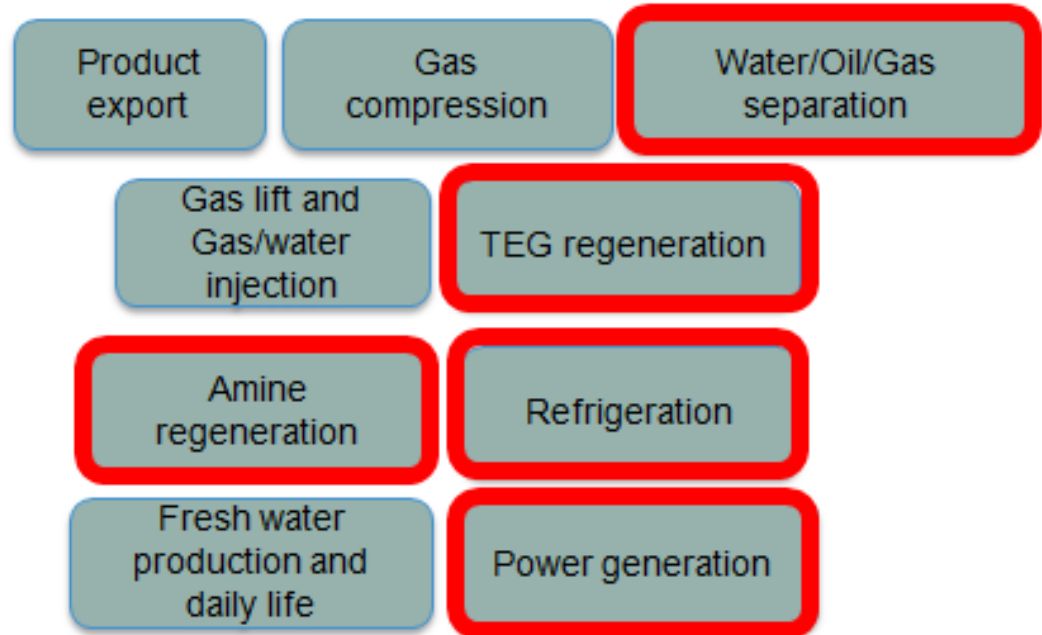
- A large challenge for:
- improving the separation unit
 - Developing more flexible gas turbine or compressors....

SIMPLIFIED ANALYSIS OF HEAT SOURCES AND HEAT SINKS

Sources



Demands



Usually, exhaust of gas turbines represents the main heat sources

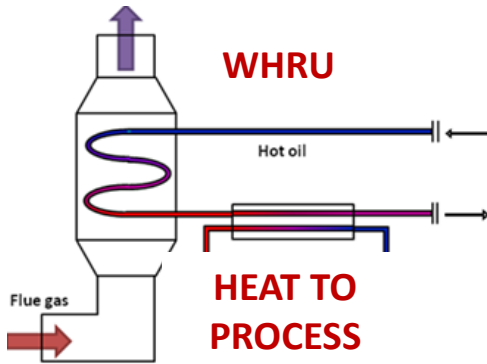
WHRU (Waste Heat Recovery Unit) - HRSG (Heat Recovery Steam Generation)

Power (MW_{th})

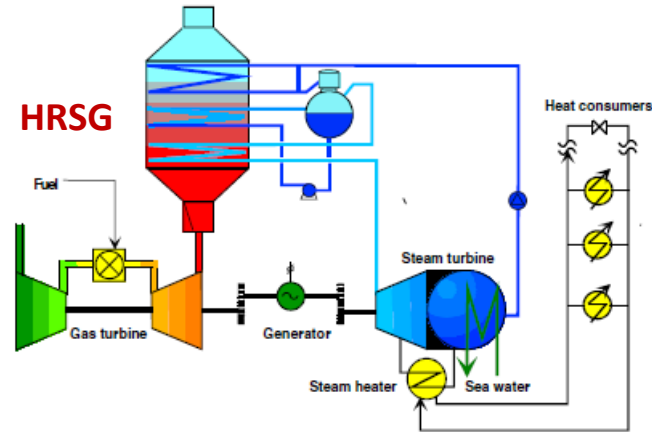
100

Onshore / Offshore
65 WHRU

50

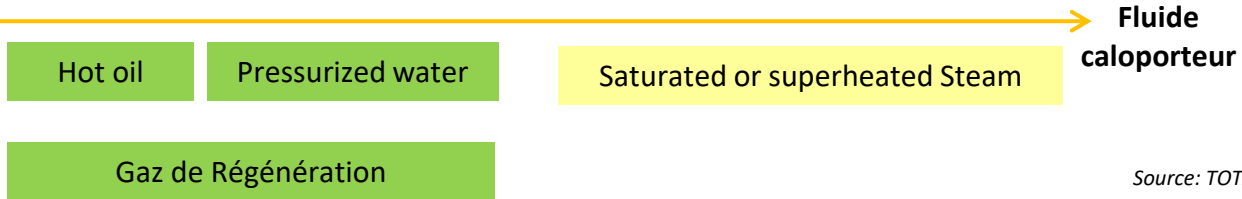


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Onshore: Standard technology

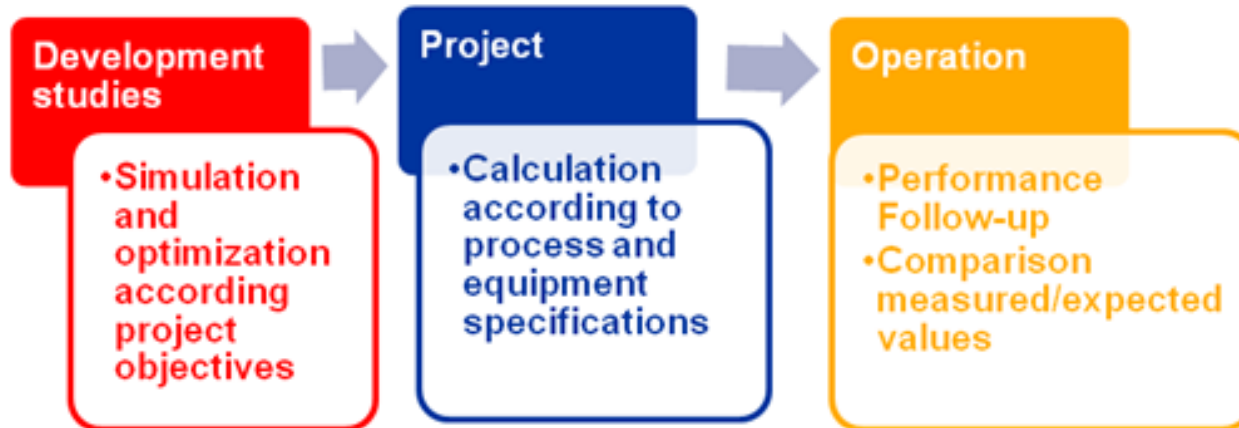
Offshore: A challenge for developing application



Source: TOTAL / Direction Technique

A challenge: reduce the weight and the cost of this equipment

SOFTWARE DEVELOPMENT AND DATA MANAGEMENT



DESIGN

- Simulation tools
- Optimization
 - Process
 - Architecture
 - Main equipments
 - Integration

OPERATION

- Mass and heat balance. Performance indicator
- 'Follow up and optimization:
 - Discrepancy detection and analysis
 - Policy for solving the problems

Thank you for your attention

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ALLICE –Alliance for Industrial Competitvity and Energy Efficiency