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1 – 5 June 2015, Paris, France



Technological Advances in Gas Exploration and Production

WOC-1 Study Group 1.1 Leader

2012-2015 Report

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Working Committee-1 Report – Natural Gas Exploration and Production

2012-2015 Triennium Work Reports

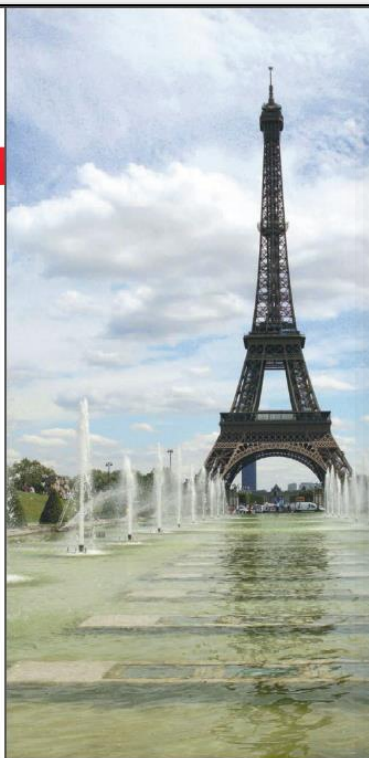


Working Committee 1

Natural gas exploration and production

Chairman: Denis Krambeck Dinelli

June 2015



WOC 1 Triennial Report
2012-2015

STUDY GROUP 1.1
TECHNOLOGICAL ADVANCES IN NA

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Paris
June 2015



1 TECHNOLOGICAL ADVANCES IN NATURAL GAS E&P

Executive Summary

This report was compiled to analyse the present state of knowledge of the most important technologies in use for the exploration and production of conventional and unconventional natural gas.

Reservoir characterization

As fields mature beyond primary depletion and the perception that more needs to be done to maximize extraction out of existing reservoirs, a renewed impetus and drive on understanding reservoir characteristics has grown, gradually at first and rapidly later.

Reservoir characterization seeks to derive all the pertinent information that is required to adequately describe a reservoir in terms of its ability to store and produce hydrocarbons over time. This entails knowing the complete reservoir architecture, including the internal and external geometry, the distribution of reservoir properties and the flow of fluids within the reservoir.

Focus over the years has been on seeing better through seismic and electro-magnetic methods, pore and log scale derivation of reservoir properties, understanding reservoir geometry and continuity, including flow baffles such as fault dynamics, properties and modelling.

Recent advances have led nevertheless to increasing success in exploring for gas fields through better definition of the subsurface and the power of predictive modelling. These two factors have allowed operators to harness subsurface clues to hunt for gas and to utilize the power of computing for describing the unseen subsurface to great details in order to reduce uncertainties during field development and production.

The development of predictive models to simulate subsurface phenomena is extremely useful, but it requires the integration of a full suite of geophysical, geological, reservoir engineering and drilling skills.

Unconventionals

Technology continues to be a game changer for businesses, and one important example in that direction lies in the entry of new players in the production of shale gas, especially in countries seeking to reduce their dependence on foreign energy supplies.

Technology plays a key role in the E&P of Natural Gas

- ❖ Opens up access to and expand new sources of energy supply
- ❖ Hastened adoption of sustainability driven business model

○ Energy Supply

- ❖ Resource depletion makes it imperative to explore new sources in new areas or exploring new frontiers

○ Energy Affordability

- ❖ Technology advancement facilitates in bringing down cost and enhance project economics

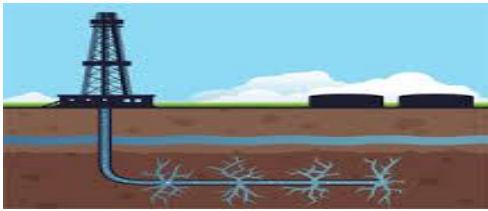
○ Sustainability

- ❖ Technology will remain a key enabler to mitigate future rise in emissions

Advancement and breakthroughs in technology will unlock and deliver various sources of energy to global markets

Current Triennium

TECHNOLOGICAL ADVANCES IN GAS E&P



SUPPLY

- Methane Hydrate
- Unconventional Shale Gas
- Gas Monetization

COST

- Shale Gas Factory Concept
- Better Imaging in Gas Reservoir

SUSTAINABILITY

- CO₂ Emission
- Zero Flaring Zero Venting
- Micro GTL

Diversification in energy supply has encouraged development of methane hydrates as an important energy in the future

Locating the Deposits

- **Seismic**
- **Well Logs**

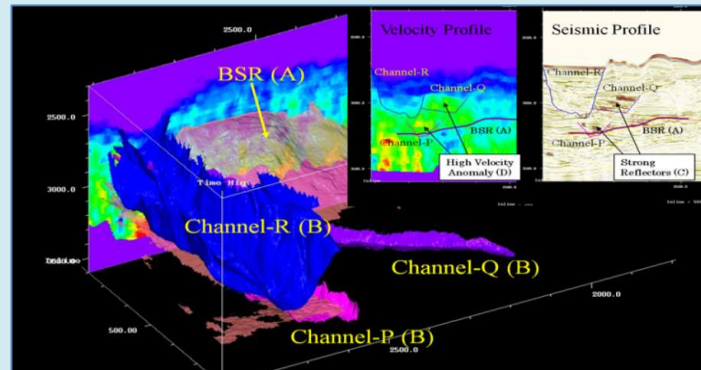


Resources Characterization

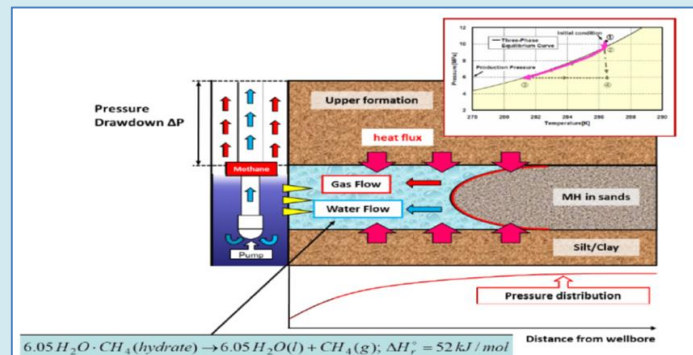
- **Volumetric**

Production Technologies

- **Depressurization**
- **Gravel Pack Completion**
- **Wells & Surface Monitoring Technologies**



Seismic visualization of methane hydrates accumulation



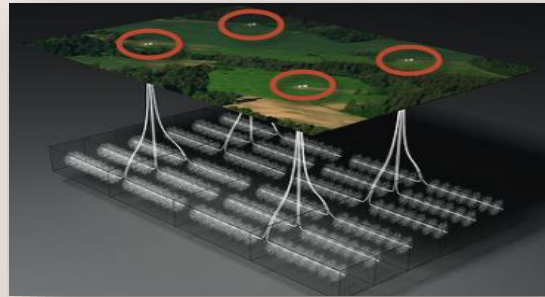
Concept of Methane Hydrate gas production method

Improvements in “Shale Gas Factory” concept drives down E&P costs significantly throughout the value chain

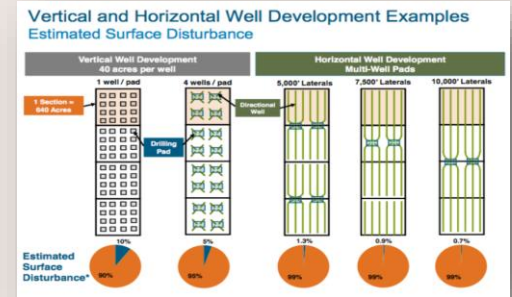
Lean Manufacturing



Multi-well pads



Reducing surface disturbance



“Shale Gas Factory”

- Eliminate uneconomical delays
- Improving wells quality
- Reduce overall footprints



Skidding rigs



Simultaneous operations



Single pipeline connection

Numerous efforts are ongoing in developing energy efficient technologies to mitigate carbon emission

Zero Flaring Zero Venting



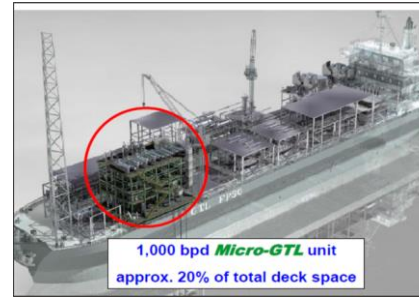
Standards :

- FVI

Financial Incentives :

- Fiscal & Tax Regimes
- Carbon Pricing

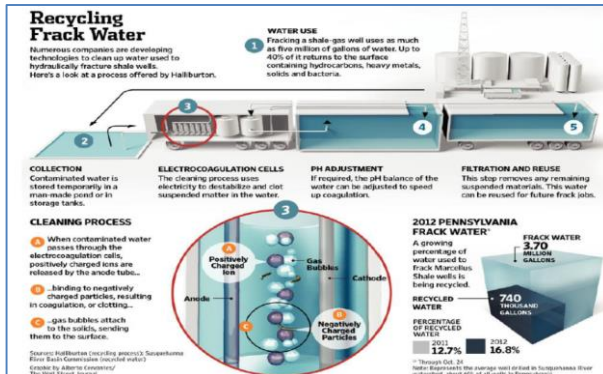
Technologies for Gas Flaring and Venting Reduction



Micro GTL

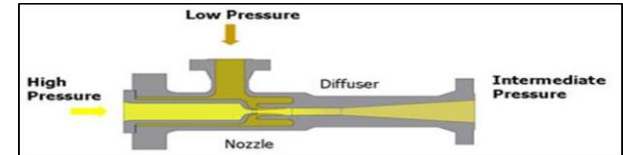
- Modular Design
- Simplicity
- Automation
- Robustness of Operation

Water Recycling in Shale Gas

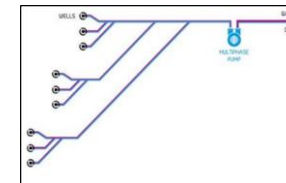


Recycling of Associated Gas

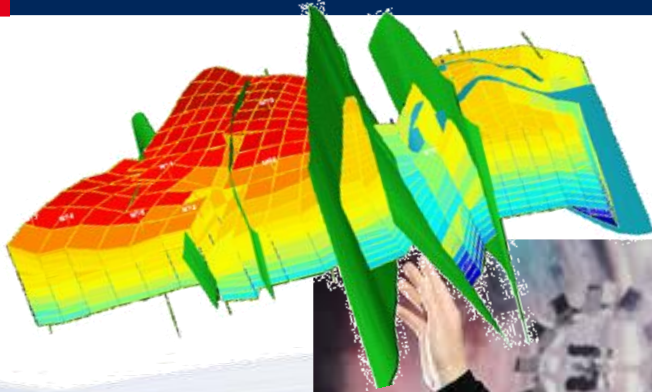
- Gas Ejectors



- Multiphase Pumps



Advanced Computing and Robotics & Automation will be the next big thing



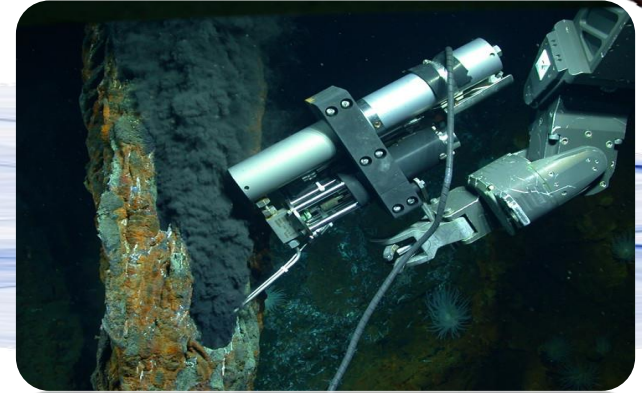
Advanced Computing



- **Data mining : Medical diagnostics to Basin/Prospect diagnostic**
- **Visualization : Gaming Industry into E&P**
- **Virtual Reality environments**



Robotics and Automation



- **Asset Integrity**
- **Speed and Productivity**
- **Labor Turnover**

Conclusion

- ❖ Technology continues to be a game changer for businesses
- ❖ Under the current oil price scenario, the impetus to find technologies to lower cost of production of unconventional oil and gas has also impacted the production of conventional hydrocarbons
- ❖ The fields of automation, materials and robotic innovation is seen as future gamechangers in the fields of production and monetization as players seek to cut operating base costs, ensure profitability and increase affordability for higher risk exploration ventures
- ❖ The industry has moved ahead embarking on innovations that could yield a significant reduction of upstream emissions despite unattractive gas price

Special Thank You



The Study Group report was prepared in collaboration with the committee members from CNPC of China, PETRONAS of Malaysia, KOGAS of South Korea, GAZPROM of Russian Federation, PTT of Thailand and ATPG of Tunisia

Merci!

