



## Study Group 1.1

### *Technological Advances in the Exploration & Production of Natural Gas*



**4<sup>th</sup> WOC-1 Meeting, Seoul  
10-13 March 2014**

**Closing Session for  
SG 1.1 WOC-1**

# Update from 4<sup>th</sup> Meeting

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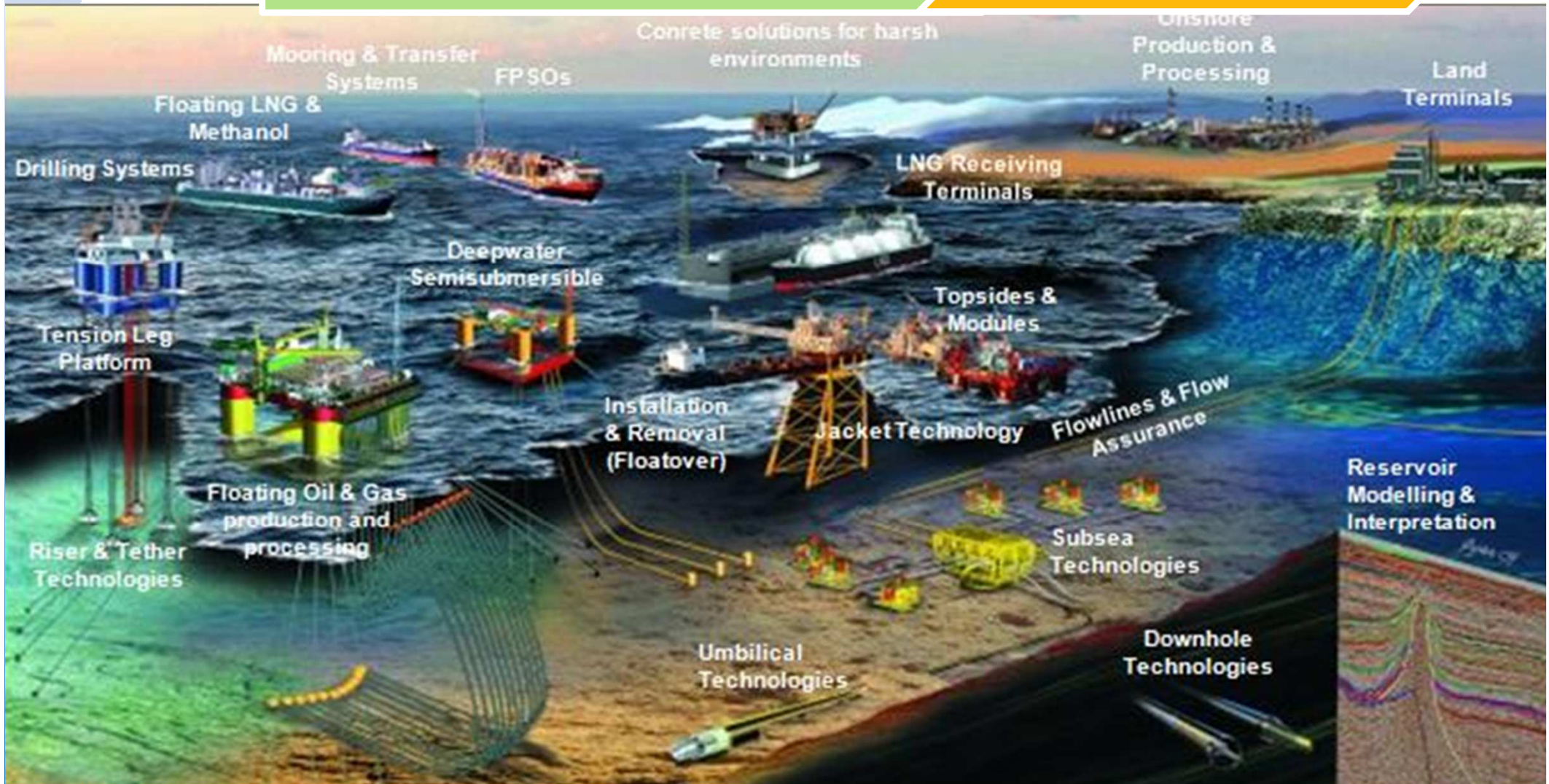
- Sharing of Draft Study Group Report SG1.1 to members
- Agreement on the following:
  - SG 1.1 Report:
    - Remaining Section Contributors – To include KOGAS, CNPC, JOGMEC
    - To include Zero Flaring & Venting chapter
  - Deadline for study group report finalization and submission
  - Expert Panel Forum SG 1.1:
    - Potential Panels – To be confirmed by July 2014
- Updated Work Plan for SG 1.1 – with deadlines on report submission and selection of papers

# Scope of Study Report SG 1.1

**Proposed Framework:**

Build on list of gas technologies in Exploration, Development & Production

Elaborating on recent advances of technologies in the value chain





# Study Report SG 1.1

## 1. Executive Summary

## 2. Introduction

### 2.1 The Natural Gas Industry

### 2.2 Future Gas Outlook

2.2.1 Issue in Discovery & Monetization of Gas

2.2.2 Emergence of Gas Technology

2.2.3 Technology Response to Global Gas Outlook

## 3. Recent Advances in Natural Gas Technology

### 3.1 Gas Discovery & Production

#### 3.1.1 Reservoir Characterization

3.1.1.1 Introduction – Definition & Process

3.1.1.2 Latest Technology

3.1.1.2 Challenges

3.1.1.2 Imaging Technology (Seismic & Non-Seismic)

#### 3.1.2 Drilling System

3.1.2.1 Introduction – Definition & Process

3.1.2.2 Latest Technology

3.1.2.2 Well Construction

3.1.2.2 Well Completion & Production Enhancement

#### 3.1.3 Production System

3.1.3.1 Introduction – Definition & Process

3.1.3.2 Latest Technology (Conventional)

3.1.3.2.1 Downhole Pumps

3.1.3.2.2 Compression Technology

3.1.3.3 Zero Flaring & Venting

#### 3.1.4 Unconventional Shale Gas

3.1.4.1 Introduction – Definition & Process

3.1.4.2 Latest Technology

# Study Report SG 1.1

3.1.3.2.1 Downhole Pumps

3.1.3.2.2 Compression Technology

## 3.1.4 Unconventional Shale Gas

3.1.4.1 Introduction – Definition & Process

3.1.4.2 Latest Technology

3.1.4.2.1 Fracking

3.1.4.2.2 Water Management

## 3.1.5 Unconventional Methane Hydrate

3.1.5.1 Introduction – Definition & Process

3.1.5.2 Latest Technology

## 3.2 Gas Monetization Technology

### 3.2.1 Gas to Liquid

3.2.1.1 Introduction – Definition & Process

3.2.1.2 Catalytic Conversion

### 3.2.2 Gas to Power

3.2.2.1 Introduction – Definition & Process

3.2.2.2 Technology

### 3.2.3 Gas to Chemical

3.2.3.1 Introduction – Definition & Process

3.2.3.2 Catalytic

3.2.3.2 Membrane Technology for Separation

### 3.2.4 Gas to LNG/CNG

3.2.4.1 Introduction – Definition & Process

3.2.4.2 FLNG- Stranded Gas

## 3.3 Case Study

3.3.1 Production of Gas Reserves in Harsh Environment (West Siberia)

3.3.2 Pearl GTL / Prelude FLNG by Shell

# Agreement from 4<sup>th</sup> Meeting

Details	Deadline
<b>1. Report Contributions:</b> <ul style="list-style-type: none"><li>• Gazprom – New Subsea Technology, West Siberian Production System</li><li>• KOGAS – Gas to Chemicals, Gas to Liquid</li><li>• CNPC – Unconventional Shale Gas</li><li>• JOGMEC – Unconventional Methane Hydrate</li><li>• PETRONAS/ Petrobras – Zero Flaring and Venting</li></ul>	31 May 2014
2. Report Finalization	30 June 2014
3. Report Submission	31 July 2014
4. Call for Papers	1 September 2014

# Agreement from 4<sup>th</sup> Meeting

Detail	Deadline
<p><b>1. Expert Panel Forum:</b></p> <ul style="list-style-type: none"><li>• Potential Panel:<ul style="list-style-type: none"><li>• EY (Attn: Sanjeev Gupta)</li><li>• KOGAS (Gas-to-Chemicals , Attn: LEE)</li><li>• KOGAS ( GTL, Attn: LEE)</li><li>• Methane Hydrate (JOGMEC)</li><li>• Nanotechnology &amp; Impact to O&amp;G</li><li>• Unconventional (CNPC)</li><li>• Arctic Gas/ Harsh Environment (GAZPROM)</li></ul></li></ul>	<ul style="list-style-type: none"><li>- Revert with names of Expert by April '14</li><li>- Invitation to be sent by July '14</li></ul>

# WOC-1 SG 1.1: Milestone

Details	2012		2013				2014				2015		
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	
WOC-1 Meetings		▲ Sep-12	▲ Feb-13			▲ Sep-13			▲ Feb-14		▲ Sep-14	▲ Feb-15	▲ WGC
<b>WOC-1 Study Report</b>													
1. Appointment of SG Leaders & Identify members	█												
2. Develop study TOR		█											
3. Identify technologies that will be studied			█										
4. Select final list of technologies for final report				█									
5. Identify transversalities with other SG and WOC/PGC					█								
6. Conduct literature research					█								
7. Write first draft of report for WOC-1 discussion						█							
8. Compilation, consolidation and review of report (with SG1.2 and SG1.3)							█						
9. Submission of WOC-1 report to CC									█				
10. Review and edit based on CC comments										█			
11. Final submission											█		
<b>Preparation for presentation of papers at WGC2015</b>													
1. Select the themes for call for papers					█								
2. Call for papers							█						
3. Submission of abstracts by authors								█					
4. Review and selection of the abstracts									█				
5. Submission of full paper by authors										█			
Articles for IGU Magazine (2 articles over triennium)													
1. 1 <sup>st</sup> article submission										█			
2. 2 <sup>nd</sup> article submission											█		

❖ Submission of Final Report to WOC1– June 2014



# Committee Session SG 1.1

*Thursday 4 June 2015, 17:00–18:30*

## **Technological advances in gas exploration and production**

**Chaired by Adif Zulkifli**

### **Objectives:**

The potential for the production of conventional and unconventional gas is extensive in many parts of the world, but price volatility and narrow margins are pushing companies to balance their investment portfolios. This session will debate on the technologies that could be a game changer for upstream business by improving production costs, efficiency and productivity.

### **Topics of interest include:**

- Advances in seismic acquisition and imaging;
- Progress in drilling technology and hydraulic stimulation;
- Smart completions;
- Case studies on the use of technology to improve economic performance and energy efficiency;
- Improvements in gas processing.
- Technological advances in Gas to LNG, Gas to Power or Gas to Chemicals

### **Session form:**

- Presentations performed by committee members, invited guests and selected from the call for papers.

### **Keywords:**

Seismic, imaging technology, hydraulic stimulation, well productivity, geological survey, drilling technology, gas processing, FLNG, FGTL, subsea systems, smart completion.

*Friday 5 June 2015, 8:30–10:00*

## **Technologies for the monetization of gas reserves**

Chaired by ...

### **Objectives:**

This session will debate on the use of technological options available to monetize stranded gas reserves, including the production of gas at challenging conditions or difficult locations, and the use of technology transfer as a means to anticipate results and reduce costs.

### **Topics of interest include:**

- Technologies to reduce capital expenditure and increase well productivity;
- Technologies for the production of unconventional gas;
- Liquefaction and conversion processes;
- FLNG, FGTL and other upstream concepts;
- Subsea to shore options;
- Sour gas, high CO<sub>2</sub> content, hydrates and gas processing technologies;
- Case studies taken from the Arctic, deep waters and unconventional reservoirs.

### **Session form:**

Contributions from the call for papers and invited panelists from exploration, production and service companies.

### **Keywords:**

FLNG, GTL, monetization, remote gas, stranded gas, small fields, unconventional gas, CBM, hydrates

**Thank you**

# Status Update

No.	Details
1.	<p data-bbox="450 419 853 464"><b><u>Update on SG Report:</u></b></p> <ul data-bbox="450 523 1733 616" style="list-style-type: none"><li data-bbox="450 523 1541 568">• ETAP, INGC, CNPC has yet to send their contribution on their sections</li><li data-bbox="450 571 1733 616">• Detail section topics - PTTEP, Gazprom, Schlumberger has submitted their portions</li></ul>
2.	<p data-bbox="450 647 1189 692"><b><u>Update on WGC matters/ Seoul Meeting:</u></b></p> <ul data-bbox="450 751 1798 1238" style="list-style-type: none"><li data-bbox="450 751 1429 796">• Call for Papers - launched on 1 Feb 2014, closing 1 Sept 2014</li><li data-bbox="450 799 1798 844">• Secured venue, time and date for Committee Session and Expert Forum for WGC 2015<ul data-bbox="555 847 1592 1238" style="list-style-type: none"><li data-bbox="555 847 1592 892">• SG1.1 Committee Session on Technological Advances in Gas E&amp;P<ul data-bbox="660 895 1256 1042" style="list-style-type: none"><li data-bbox="660 895 994 940">• Leader : Adif Zulkifli</li><li data-bbox="660 943 1256 987">• Day 4 Thursday @ 17.00 – 18.30 pm</li><li data-bbox="660 991 1155 1035">• Estimated participant: 350 pax</li></ul></li><li data-bbox="555 1045 1010 1090">• SG 1.1 Expert Panel Forum<ul data-bbox="660 1093 1189 1238" style="list-style-type: none"><li data-bbox="660 1093 1072 1137">• Leader : Rashidah Karim</li><li data-bbox="660 1141 1189 1185">• Day 5 Friday @ 8.30 – 10.00 am</li><li data-bbox="660 1189 1155 1233">• Estimated participant: 350 pax</li></ul></li></ul></li></ul>

### Study Group Leader

Adif Zulkifli (Petronas, Malaysia)

Updated on 6 Sept 2013

### Study Group Members

1. Shiguo Lin (Petrochina, China)
2. Yanan Bian (Petrochina, China)
3. Li Yang (Petrochina, China)
4. Joel Hervochoon(TOTAL, France)
5. Seungho Lee (Kogas, Korea)
6. Datin Rashidah Karim (PETRONAS, Malaysia)
7. Im Xaxanuhani Zulkifli (PETRONAS, Malaysia)
8. Nazri Idzlan Abdul Malek (PETRONAS, Malaysia)
9. Lenny Marlina Omar (PETRONAS, Malaysia)
10. Ilya Shireen A Harith (PETRONAS, Malaysia)
11. Andrey Kniazev (Gazprom, Russian Federation)
12. Boris Sharipov (Gazprom, Russian Federation)
13. Ekaterina Litvinova (Gazprom, Russian Federation)
14. Phatompat Boonyasaknanon(PTT E&P, Thailand)
15. Vincent Trocme (GDF Suez, France)
16. Ik Hyun Park (Kogas, Korea)
17. Yassine Mestiri (ATPG ETAP, Tunisia)
18. Reza Mesgarian (NIGC, Iran)



# Joint Committee Meeting Agenda : 10 – 13 March 2014

Date	Time	Presentation Topics	Venue
11 March 2014 (Day 2)	17:00 - 18:00	WOC1, PGC A & C Chairs, Secretaries Meeting	Secretariat Room
	19:00 - 21:00	Welcome Dinner hosted by KGU	Diamond 1, Venue Hotel
	9:00 - 10:40	<p><b>WOC1, PGC A &amp; C Joint Plenary Session:</b></p> <ul style="list-style-type: none"> <li>• Welcome Speech by Chairmen of WOC1, PGC A &amp; C</li> <li>• Congratulatory Speech by Seokhyo JANG, Presi. &amp; CEO of KOGAS</li> <li>• IGU Update Report by Georges LIENS, IGU CC Chairman</li> <li>• Introduction of Korea's Gas Industry by Kun Ho LEE, KOGAS</li> <li>• Gas: Global and Sustainable Soon? By Karen Sund, Sund Energy</li> <li>• Q&amp;A</li> </ul>	Diamond 1, Venue Hotel
	10:40 - 11:00	Coffee Break	
	11:00 - 12:40	<p><b>WOC1, PGC A &amp; C Joint Plenary Session:</b></p> <ul style="list-style-type: none"> <li>• Global O &amp; G Transactions Review Jaishankar Krishnamurthy, E&amp;Y</li> <li>• Future of Gas to Power in Europe Ross McVey, Gazprom M&amp;T</li> <li>• Global LNG: Will new demand and new supply mean new pricing?</li> <li>• Sanjeev Gupta, E&amp;Y</li> <li>• The Key Challenges for Asian Buyers: from Geopolitics to Pricing</li> <li>• Leslie Palti-Guzman, Eurasia Group</li> <li>• Q&amp;A</li> </ul>	Diamond 1, Venue Hotel

# SG1.1 Meeting Agenda : 11 – 12 March 2014

Date	Time	Presentation Topics	Presenter
11 March 2014 (Day 2)	14.00 – 14.30	<p><b><u>WOC-1 Plenary Session</u></b></p> <ul style="list-style-type: none"> <li>• Opening Remarks by Chairman of WOC-1</li> <li>• Advances for WOC-1</li> <li>• Expectation Setting for 4<sup>th</sup> Meeting</li> <li>• Study Group Breakup Session</li> </ul>	Mr. Denis Krambeck Dinelli, Chairman of WOC1
	14.30 – 18.00	<p><b><u>SG 1.1 Session</u></b></p> <p>Study Report Updates</p> <ul style="list-style-type: none"> <li>• Status update of SG 1.1 Draft Report</li> <li>• Identify outstanding report sections and section contributor</li> <li>• Update by SG 1.1 members</li> </ul>	
12 March 2014 (Day 3)	09.00 – 12.30	<p><b><u>SG 1.1 Session</u></b></p> <ul style="list-style-type: none"> <li>• Continue Discussion on Study Report:                             <ul style="list-style-type: none"> <li>• Plans for report completion</li> <li>• Timeline for finalization</li> </ul> </li> <li>• Call for Papers:                             <ul style="list-style-type: none"> <li>• Setup Review Committee for Paper Selection</li> </ul> </li> <li>• WGC Expert Panel                             <ul style="list-style-type: none"> <li>• Selection of Expert Panel</li> </ul> </li> </ul>	Ms Rashidah Karim, On behalf of; Study Group Leader of SG1.1
	14.00 – 16.00	<p>Wrap up for Plenary Presentation – Recap &amp; Update, Timeline, Workplan</p> <p><b><u>WOC-1 Plenary Session</u></b></p> <p>Study Group 1.1 Advances and Next Steps</p>	
	16.00 – 18.00	Joint Plenary Session – WOC-1, PGC-A, PGC-C	Chairmen of Committees