Global Spotlight Workshop
What Does COP21 Mean for the Role of Gas?
Asia perspective

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Disclaimer: The views and opinions expressed in this presentation are those of the author and do not necessarily reflect the official policy or position of The Japan Gas Association.
Outline

■ **Asia and Climate Change**
  - Population
  - GDP
  - Energy/Gas Demand
  - CO2 emission
  - Climate Change Threat

■ **Fight Against Climate Change**
  (focusing on China, Japan, Korea, Australia)
  - Intended Nationally Determined Contribution (INDCs)
  - INDC and CO2 emissions projection from respective fuels by country
  - INDC implementation plan

■ **Gas Industry’s Action on Climate Change; Japan**
  - Diffusion of natural gas to 2030
  - CO2 mitigation by diffusion of natural gas energy system
  - R&D target to 2030 Japan

■ **Conclusion**
Asia and Climate Change

Population

1990 World 5.3 billion
Asia 2.9 billion (56%)
2030 World 8.4 billion.
Asia 4.4 billion (52%)

Source: IEEJ, Asia/World Energy Outlook 2014
Asia and Climate Change

- GDP

Source: IEEJ, Asia/World Energy Outlook 2014

2000 World 48 trillion
Asia 11 trillion (22%)

2030 World 119 trillion
Asia 43 trillion (36%)

- Rest of world
- Oceania
- Rest of Asia
- Korea
- Japan
- China
Asia and Climate Change

- Energy Demand (Total Primary Energy)

![Graph showing Total Primary Energy Demand (TPED) from 1990 to 2040.]

- 1990 World: 8762 Mtoe
  - Asia: 2219 Mtoe (25%)
- 2030 World: 16720 Mtoe
  - Asia: 7558 Mtoe (45%)

- Source: WEO2014 New Policies Scenario
Asia and Climate Change

Gas Demand

1990 World 1668 Mtoe
  Asia 135 Mtoe (8%)
2030 World 3797 Mtoe
  Asia 913 Mtoe (24%)

Gas share (Gas/TPED)
1990 World 19.0%  Asia 6.1%
2030 World 22.7%  Asia 12.1%

Source: WEO2014 New Policies Scenario
## Asia and Climate Change

### CO2 emission Asia top 14 countries

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>9,761.07</td>
<td>27.5%</td>
<td>2</td>
<td>China</td>
<td>3,313.75</td>
<td>13.6%</td>
<td>295%</td>
</tr>
<tr>
<td>2</td>
<td>United States</td>
<td>5,994.56</td>
<td>16.9%</td>
<td>1</td>
<td>United States</td>
<td>6,081.19</td>
<td>24.9%</td>
<td>99%</td>
</tr>
<tr>
<td>3</td>
<td>India</td>
<td>2,088.02</td>
<td>5.9%</td>
<td>6</td>
<td>India</td>
<td>850.84</td>
<td>3.5%</td>
<td>245%</td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>1,343.11</td>
<td>3.8%</td>
<td>4</td>
<td>Japan</td>
<td>1,310.78</td>
<td>5.4%</td>
<td>102%</td>
</tr>
<tr>
<td>5</td>
<td>Korea Rep.</td>
<td>768.34</td>
<td>2.2%</td>
<td>9</td>
<td>Korea Rep.</td>
<td>510.66</td>
<td>2.1%</td>
<td>150%</td>
</tr>
<tr>
<td>6</td>
<td>Iran Islamic Rep.</td>
<td>650.36</td>
<td>1.8%</td>
<td>18</td>
<td>Iran Islamic Rep.</td>
<td>303.81</td>
<td>1.2%</td>
<td>214%</td>
</tr>
<tr>
<td>7</td>
<td>Indonesia</td>
<td>548.65</td>
<td>1.5%</td>
<td>21</td>
<td>Indonesia</td>
<td>246.46</td>
<td>1.0%</td>
<td>223%</td>
</tr>
<tr>
<td>8</td>
<td>Australia</td>
<td>374.92</td>
<td>1.1%</td>
<td>17</td>
<td>Australia</td>
<td>333.33</td>
<td>1.4%</td>
<td>112%</td>
</tr>
<tr>
<td>9</td>
<td>Turkey</td>
<td>348.49</td>
<td>1.0%</td>
<td>24</td>
<td>Turkey</td>
<td>196.68</td>
<td>0.8%</td>
<td>177%</td>
</tr>
<tr>
<td>10</td>
<td>Thailand</td>
<td>346.91</td>
<td>1.0%</td>
<td>25</td>
<td>Thailand</td>
<td>182.56</td>
<td>0.7%</td>
<td>190%</td>
</tr>
<tr>
<td>11</td>
<td>Taiwan</td>
<td>332.93</td>
<td>0.9%</td>
<td>23</td>
<td>Taiwan</td>
<td>214.57</td>
<td>0.9%</td>
<td>155%</td>
</tr>
<tr>
<td>12</td>
<td>Malaysia</td>
<td>257.68</td>
<td>0.7%</td>
<td>34</td>
<td>Malaysia</td>
<td>119.23</td>
<td>0.5%</td>
<td>216%</td>
</tr>
<tr>
<td>13</td>
<td>Singapore</td>
<td>226.11</td>
<td>0.6%</td>
<td>36</td>
<td>Singapore</td>
<td>107.41</td>
<td>0.4%</td>
<td>211%</td>
</tr>
<tr>
<td>14</td>
<td>Pakistan</td>
<td>177.42</td>
<td>0.5%</td>
<td>37</td>
<td>Pakistan</td>
<td>96.21</td>
<td>0.4%</td>
<td>184%</td>
</tr>
<tr>
<td>15</td>
<td>Vietnam</td>
<td>154.61</td>
<td>0.4%</td>
<td>58</td>
<td>Vietnam</td>
<td>38.06</td>
<td>0.2%</td>
<td>221%</td>
</tr>
<tr>
<td>16</td>
<td>Colombia</td>
<td>84.27</td>
<td>0.2%</td>
<td>43</td>
<td>Colombia</td>
<td>63.84</td>
<td>0.3%</td>
<td>242%</td>
</tr>
</tbody>
</table>

**world total.** 35,498.68  | 24,423.00  | **above Asian Countries tot.** 17,378.62  | 49.0%  | 7,850.13  | 32.1%
Asia and Climate Change

- CO2 emission

CO2 emissions (BP statistics) in million ton 1997-2014
Asia and Climate Change

- CO2 emission

CO2 emissions (BP statistics) in million ton 1997-2014

Graph showing CO2 emissions from various countries in Asia from 1997 to 2014.
## Asia and Climate Change

**Climate Change Threat**

### Six Climate Threats, and the 12 Countries Most at Risk

<table>
<thead>
<tr>
<th>Drought</th>
<th>9/12</th>
<th>Flood</th>
<th>8/12</th>
<th>Storm</th>
<th>6/12</th>
<th>Coastal 1m</th>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi</td>
<td></td>
<td>Bangladesh</td>
<td>Philippines</td>
<td></td>
<td></td>
<td>All low-lying Island states</td>
<td>Sudan</td>
</tr>
<tr>
<td>Ethiopia</td>
<td></td>
<td>China</td>
<td>Bangladesh</td>
<td></td>
<td></td>
<td>Vietnam</td>
<td>Senegal</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td></td>
<td>India</td>
<td>Madagascar</td>
<td></td>
<td></td>
<td>Egypt</td>
<td>Zimbabwe</td>
</tr>
<tr>
<td>India</td>
<td></td>
<td>Cambodia</td>
<td>Vietnam</td>
<td></td>
<td></td>
<td>Tunisia</td>
<td>Mali</td>
</tr>
<tr>
<td>Mozambique</td>
<td></td>
<td>Mozambique</td>
<td>Moldova</td>
<td></td>
<td></td>
<td>Indonesia</td>
<td>Zambia</td>
</tr>
<tr>
<td>Niger</td>
<td></td>
<td>Laos</td>
<td>Mongolia</td>
<td></td>
<td></td>
<td>Mauritania</td>
<td>Morocco</td>
</tr>
<tr>
<td>Mauritania</td>
<td></td>
<td>Pakistan</td>
<td>Haiti</td>
<td></td>
<td></td>
<td>China</td>
<td>Niger</td>
</tr>
<tr>
<td>Eritrea</td>
<td></td>
<td>Sri Lanka</td>
<td>Samoa</td>
<td></td>
<td></td>
<td>Mexico</td>
<td>India</td>
</tr>
<tr>
<td>Sudan</td>
<td></td>
<td>Thailand</td>
<td>Tonga</td>
<td></td>
<td></td>
<td>Myanmar</td>
<td>Malawi</td>
</tr>
<tr>
<td>Chad</td>
<td></td>
<td>Vietnam</td>
<td>China</td>
<td></td>
<td></td>
<td>Bangladesh</td>
<td>Algeria</td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td>Benin</td>
<td>Honduras</td>
<td></td>
<td></td>
<td>Senegal</td>
<td>Ethiopia</td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td>Rwanda</td>
<td>Fiji</td>
<td></td>
<td></td>
<td>Libya</td>
<td>Pakistan</td>
</tr>
</tbody>
</table>

Source: World Bank

## Fight Against Climate Change

**Intended Nationally Determined Contribution (INDCs)**

<table>
<thead>
<tr>
<th>Economies</th>
<th>Submitted</th>
<th>Type</th>
<th>Reduction level (%)</th>
<th>Reference year</th>
<th>Time frames</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>2015/8/11</td>
<td><strong>Absolute reduction</strong> from base year emissions</td>
<td>26-28</td>
<td>2005</td>
<td>2030</td>
</tr>
<tr>
<td>Japan</td>
<td>2015/7/17</td>
<td><strong>Absolute reduction</strong> from base year emissions</td>
<td>26</td>
<td>2013</td>
<td>2030</td>
</tr>
<tr>
<td>United States</td>
<td>2015/3/31</td>
<td><strong>Absolute reduction</strong> from base year emissions</td>
<td>26-28</td>
<td>2005</td>
<td>2025</td>
</tr>
<tr>
<td>China</td>
<td>2015/6/30</td>
<td><strong>Intensity reduction</strong> from base year intensity</td>
<td>60-65</td>
<td>2005</td>
<td>2030</td>
</tr>
<tr>
<td>India</td>
<td>2015/10/1</td>
<td><strong>Intensity reduction</strong> from base year intensity</td>
<td>33-35</td>
<td>2005</td>
<td>2030</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>2015/6/30</td>
<td>Emissions reduction relative to a Business As Usual baseline</td>
<td>37</td>
<td>BAU</td>
<td>2030</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2015/9/24</td>
<td>Emissions reduction relative to a Business As Usual baseline</td>
<td>29</td>
<td>BAU</td>
<td>2030</td>
</tr>
</tbody>
</table>
**Fight Against Climate Change: China**

- **INDC and CO2e**

  Emissions projection from respective fuels by country (WEO 2014)

<table>
<thead>
<tr>
<th>Intensity reduction from base year intensity</th>
<th>▲60-65%</th>
<th>2030/2005</th>
</tr>
</thead>
</table>

Source: INDCs, WEO2014 New Policies Scenario

### Intensity reduction target

- **MtCO2e (MtCO2e)**
  - **Gas**
  - **Oil**
  - **Coal**

**Intensity reduction from base year intensity**

- **2010**
  - Total: 8314
  - Gas: 272 (3%)

- **2030**
  - Total: 12654
  - Gas: 885 (7%) +325%

**Intensity reduction target**

- ▲60-65%
- 2030/2005

**Source:** INDCs, WEO2014 New Policies Scenario
Fight Against Climate Change; Japan

- INDC and CO2e emissions projection from respective fuels by country (WEO 2014)

**Absolute reduction** from base year emissions ▲26% 2030/2013

- Gas
- Oil
- Coal

Absolute reduction target

Source: INDCs, WEO2014 New Policies Scenario
Fight Against Climate Change: Australia + Korea + NZ

- **INDC and CO2e**
- Emissions projection from respective fuels by country (WEO 2014)

### Emissions Projections (MtCO2e)

<table>
<thead>
<tr>
<th>Year</th>
<th>Gas (OECD Asia Oceania-Japan)</th>
<th>Oil (OECD Asia Oceania-Japan)</th>
<th>Coal (OECD Asia Oceania-Japan)</th>
<th>INDC (Australia+Korea)</th>
<th>Australia</th>
<th>Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1,232</td>
<td>21 (7%)</td>
<td>326 (11%)</td>
<td>131</td>
<td>183 (15%)</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>1,202</td>
<td>20 (8%)</td>
<td>313 (10%)</td>
<td>119</td>
<td>178 (15%)</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>1,172</td>
<td>19 (7%)</td>
<td>300 (9%)</td>
<td>107</td>
<td>173 (15%)</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>1,142</td>
<td>18 (6%)</td>
<td>286 (8%)</td>
<td>95</td>
<td>167 (15%)</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td>1,112</td>
<td>17 (6%)</td>
<td>272 (8%)</td>
<td>83</td>
<td>160 (15%)</td>
<td></td>
</tr>
</tbody>
</table>

- **Absolute reduction** from base year emissions: ▲26-28 (2030/2005)
- **Emissions reduction relative to a Business As Usual baseline**: ▲37 (2030/BAU)

Source: INDCs, WEO2014 New Policies Scenario
**Fight Against Climate Change; Gas**

- CO2 emissions projection from Gas by country

![Chart showing CO2 emissions projection from Gas by country](chart)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total (MtCO2)</th>
<th>China (MtCO2)</th>
<th>Japan (MtCO2)</th>
<th>Aus.+NZ +K (MtCO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>715</td>
<td>272</td>
<td>260</td>
<td>183</td>
</tr>
<tr>
<td>2030</td>
<td>1,300</td>
<td>885</td>
<td>205</td>
<td>211</td>
</tr>
</tbody>
</table>

- **Total change**: +82%
- **China change**: +225%
- **Japan change**: ▲21%
- **Australia + NZ + Korea change**: +15%

*Source: WEO2014 New Policies Scenario*
**Fight Against Climate Change; China 1/2**

- INDC implementation plan
  - Implementing Proactive National Strategies on Climate Change, Strengthen laws and regulations
  - Improving Regional Strategies on Climate Change
  - Building Low-Carbon Energy System
    - Coal: Control total coal consumption and enhance the clean use of coal. Highly-efficient electricity generation from coal.
    - Natural Gas: Expand the use of natural gas by 2020 to 10% share on primary energy base), 30 billion cubic meters of coal-bed methane production
  - Hydro power, Nuclear power, Wind power, Solar power, Geothermal energy, bio-energy and maritime energy (Carbon free, carbon neutral energy)
  - Recovery and utilization of vent gas and oilfield-associated gas

Source: INDCs, WEO2014 New Policies Scenario
Fight Against Climate Change; China 2/2

- INDC implementation plan

- Distributed energy and strengthen the construction of smart grid
- Improving energy efficiency of building, Green buildings (Renewable energy based)
- Increasing Carbon Sinks, Afforestation, increasing the forest carbon sinks
- Promoting the Low-Carbon Way of Life, Education, Change of lifestyle
- Enhancing Support in terms of Science and Technology, R&D Low carbon technology
- Promoting Carbon Emission Trading Market

Source: INDCs, WEO2014 New Policies Scenario
Fight Against Climate Change; Korea

- INDC implementation plan

- Emission Trading Scheme (2015)
- Renewable Portfolio Standards for power sector
- Expand infrastructure for environment-friendly public transportation
- Introducing low-carbon standards for fuel efficiency and emissions produced from automobiles
- Various incentives, tax reductions for electric and hybrid vehicles
Fight Against Climate Change; Australia

- INDC implementation plan

- $2.55 billion Emissions Reduction Fund (ERF)

- Renewable Energy Target scheme (23% from renewable sources by 2020)

- A National Energy Productivity Plan with a National Energy Productivity Target of a 40 per cent improvement between 2015 and 2030

- Undertake consultation to determine further post-2020 domestic emissions reduction policies in 2017-2018
Fight Against Climate Change; Japan 1/3

- INDC implementation plan
- Gas Industry’s involvement (direct & indirect)

- Industry sector
  - Promotion and enhancement of the industries’ action plans towards a low carbon society
  - Industry sector voluntary reduction

Voluntary Plan Under Keidan-ren: Gas produced and CO2 Emissions

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2 emissions after adjustment</td>
<td>10,000 t-CO2</td>
<td>132.8</td>
<td>105.2</td>
<td>81.7</td>
<td>45.3</td>
<td>29.4</td>
<td>35.1</td>
<td>34.8</td>
<td>32.2</td>
<td>49.6</td>
</tr>
<tr>
<td>CO2 emissions intensity after adjustment</td>
<td>g-CO2/m3</td>
<td>83.6</td>
<td>46.2</td>
<td>32.2</td>
<td>13.6</td>
<td>8.0</td>
<td>9.3</td>
<td>9.2</td>
<td>8.8</td>
<td>10.1</td>
</tr>
<tr>
<td>Amount of city gas produced</td>
<td>100 mil. m3</td>
<td>159</td>
<td>228</td>
<td>254</td>
<td>333</td>
<td>369</td>
<td>378</td>
<td>379</td>
<td>367</td>
<td>502</td>
</tr>
<tr>
<td>CO2 emissions intensity (1990=100)</td>
<td></td>
<td>100.0</td>
<td>55.3</td>
<td>38.5</td>
<td>16.3</td>
<td>9.6</td>
<td>11.1</td>
<td>11.0</td>
<td>10.5</td>
<td>12.1</td>
</tr>
</tbody>
</table>

*2000-2012 intensity & amount target
*2020, 2030 CO2 intensity target

Absolute CO2 Amount
vs 1990 ▲ 75.8%
vs 2005 ▲ 28.9%

Intensity
vs 1990 ▲ 89.5%
vs 2005 ▲ 35.0%
- Commercial and other sectors
  - Setting energy saving standards
  - Introduction of high efficient water heater
    (latent heat collection water heater etc)
  - Introduction of highly efficient lighting
  - Improvement of energy efficiency and conservation performance of equipment by the top runner program etc.
  - Utilizing BEMS and energy efficiency diagnosis
  - Promotion of nation wide campaigns (thorough promotion of Cool Biz/Warm Biz, repair of local government buildings)
  - Expansion of shared use of energy

**Energy – Efficiency label (Eco Label)**
(more than 100%, not reaching standard)
Residential sector

- Setting energy saving standards for newly housing
- Thermal insulation in renovation of existing houses
- High-efficient water heater
  (CO2 refrigerant HP water heater, latent heat collection water heater, fuel cell, solar water heater)
- High-efficient lighting
- Top runner program, etc.
- HEMS and smart meters
- Promotion of nation wide campaigns (thorough promotion of Cool Biz/Warm Biz, and encouragement of purchase of upgraded, Home CO2 advisor)
Fight Against Climate Change; Japan 3/3

- INDC implementation plan **Gas Industry’s involvement**

- **Transport sector**
  - Improvement of fuel efficiency
  - Promotion of next-generation automobiles
  - Modal shift to railway, eco-friendly ship transportation,
  - Energy consumption efficiency improvement of railways and **aviation**
  - Intelligent Transport Systems ITS (centralized control of traffic signals),
  - LED traffic lights
  - Automatic driving, eco-driving and car sharing

- **Energy conversion sector**
  - Renewable energy
  - Nuclear power generations whose safety is confirmed
  - Pursuit of high efficiency in thermal power

- **Cross-sectional strategies**
  - Promotion of the J-Credit Scheme
### Gas Industry’s Action on Climate Change

#### Diffusion of natural gas to 2030   Japan

<table>
<thead>
<tr>
<th>Low-Carbon Apparatus</th>
<th>Expected Expansion of Use (2010⇒2030)</th>
<th>Expected CO2 Reduction [10,000 tons]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cogeneration</td>
<td>4.6 mil. kW ⇒ 30 mil. kW</td>
<td>3800</td>
</tr>
<tr>
<td>Fuel cells for household use*¹ (ENE-FARM)</td>
<td>20,000 units ⇒ 5,300,000 units</td>
<td>650</td>
</tr>
<tr>
<td>Switching to natural gas (industrial sector)</td>
<td>10.7%*² ⇒ 25%</td>
<td>800</td>
</tr>
<tr>
<td>Gas air-conditioning</td>
<td>13 mil. RT ⇒ 26 mil. RT</td>
<td>288</td>
</tr>
<tr>
<td>Natural gas vehicles</td>
<td>40,000 units ⇒ 500,000 units</td>
<td>670</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>▲62 mil.T</td>
</tr>
</tbody>
</table>

In calculating expected CO2 reduction, 0.69 Kg-CO2/kWh is used as the CO2 emissions factor grid power.  
*1: Including LPG fueled equipment  
*2: Standard in 2009

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**24% of national target**  
Japan’s INDC  
2010 1304 mil.T > 2030 1042 mil.T  
▲ 262  62/262=24%
Gas Industry’s Action on Climate Change

- CO2 mitigation by diffusion of natural gas energy system Japan

- Estimated CO2 emission reduction on demand side is approx. 100 times larger than the increase of CO2 emission on supply side.

- Relative CO2 emission reduction associated with the use of natural gas system.
Q. What Does COP21 (Climate Change Discussion) Mean for the Role of Gas (and the industry) in Asia?

It's a great opportunity........

- for Natural Gas to be recognized, once again, as most promising and established transitional (bridge) energy.
- for the gas industry to be a significant part of solution by taking active action.
- for the domestic gas industry to expand business and become a global energy player.
gracias

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