presented by

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IEA
natural gas statistics

ESCWA EGM on compilation and analysis of energy statistics and indicators

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Outline

- Overview: natural gas in the world
- Natural gas statistics
  - Basic Concepts
  - Natural Gas Production
  - Supply and Consumption
- IEA/ Eurostat/ UNECE Questionnaire
  - Table description and definitions
  - Relations within the questionnaire
  - Specific problems
Gas: share in global primary energy supply

1973
- Oil: 45%
- Gas: 16%
- Coal: 25%
- Combustible renewables & waste: 11%
- Nuclear: 1%
- Other: 0.1%

6034 Mtoe

2006
- Oil: 34%
- Gas: 21%
- Coal/peat: 26%
- Nuclear: 6%
- Combustible renewables & waste: 10%
- Other**: 1%

11741 Mtoe

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World natural gas production by region

1990-2006: Middle East increased production by 3.5 times

Largest producers in the region: Iran, Saudi Arabia, Qatar, UAE
Overview: natural gas in the world

Natural Gas statistics
  Basic Concepts
  Natural Gas Production
  Supply and Consumption

IEA/ Eurostat/ UNECE Questionnaire
  Table description and definitions
  Relations within the questionnaire
  Specific problems
Natural gas: units of reporting

- Natural gas comprises several gases, but consists mainly of **methane**
- As a gas expands or compresses according to temperature and pressure, it is important that **temperature and pressure** are taken into account when measuring natural gas
- Gas is usually measured in:
  - energy: **TJ** - Gross Calorific Value
  - volume: **million m³**
- Eurostat/IEA use **Standard Conditions**:
  - **Standard Conditions** = 15 degrees C; 760 mm Hg (=1 atm)
Calorific value

- Calorific Value: Energy per unit volume (e.g.: kJ/m³)
- Careful about the difference between Gross and Net Calorific Value:

Net Calorific value =
Gross Calorific Value - latent heat of vaporisation of the water vapour produced during combustion of gas.

- For natural gas, the difference between Net and Gross is about 10%
Natural gas - production

- Extraction of Crude Oil and Associated Gas
  - Gas Flared or reinjected
  - Wellhead Separation (onshore wells)

- Extraction of Non-Associated Gas
  - Vented
  - Removal of Sulphur and Impurities

- Other Separation (offshore wells)
  - Removal of Liquids in Natural Gas Processing Plants

- Associated Gas
  - Marketed Production
  - NGL
  - Crude Oil
  - Annual Oil Questionnaire

- Non-Associated Gas
  - Colliery Gas
  - Annual Gas Questionnaire

Report production at this level!
Overview: natural gas in the world

Natural Gas statistics
   Basic Concepts
   Natural Gas Production
   Supply and Consumption

IEA/ Eurostat/ UNECE Questionnaire
   Table description and definitions
   Relations within the questionnaire
   Specific problems
The natural gas questionnaire

- 2 units (million m3, TJ)

- 5 tables
  - Supply of Natural Gas
  - Consumption of Natural Gas
    - Net Inland Consumption by Sector
    - Total Final Consumption by Sector
  - Imports by Origin
  - Exports by Destination
  - Gas Storage Capacity
### Supply of Natural Gas – Table 1

<table>
<thead>
<tr>
<th></th>
<th>Million m³ (at 15°C, 760 mm Hg)</th>
<th>TJ (Gross Calor. Value)</th>
<th>Average GCV (kJ/m³)</th>
<th>Average NCV (kJ/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>+ Indigenous Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated Gas</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Associated Gas</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colliery Gas</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ From Other Sources</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Imports ¹</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Exports ²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- International Marine Bunkers</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Stock Changes ³</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Inland Consumption (calc)</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Statistical Difference</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Inland Consumption (obs) ⁴</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Recoverable Gas

|                          |                     |                         |                     |                     |
|--------------------------|---------------------|-------------------------|---------------------|
| Opening Stock Level      | 13                  |                         |                     |                     |
| Closing Stock Level      | 14                  |                         |                     |                     |

#### Memo:

- Gas Vented 15
- Gas Flared 16

#### Memo: Cushion Gas

|                          |                     |                         |                     |                     |
|--------------------------|---------------------|-------------------------|---------------------|
| Closing Stock Level      | 17                  |                         |                     |                     |

#### Memo: From Other Sources

|                          |                     |                         |                     |                     |
|--------------------------|---------------------|-------------------------|---------------------|
| of which                 |                     |                         |                     |                     |
| Oil                      | 18                  |                         |                     |                     |
| Coal                     | 19                  |                         |                     |                     |
| Renewables               | 20                  |                         |                     |                     |
Supply – Table 1

Indigenous Production

• dry marketable production
  (after purification and extraction of NGL and sulphur)

Imports and Exports

• are considered imported or exported when having crossed the physical boundary of a country

Stock changes and levels

• stock levels of recoverable gas
• change of stock is opening - closing stock level of recoverable gas
## Inland Consumption

**Table 2a**

<table>
<thead>
<tr>
<th>Country</th>
<th>Unit: TJ (CCV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inland Consumption (1)</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Transformation Sector - Total</strong></td>
<td></td>
</tr>
<tr>
<td>Main Activity Electricity Plants (2)</td>
<td>0</td>
</tr>
<tr>
<td>Autoproducer Electricity Plants (2, 3)</td>
<td>0</td>
</tr>
<tr>
<td>Main Activity Combined Heat &amp; Power Plants (3)</td>
<td>0</td>
</tr>
<tr>
<td>Autoproducer Combined Heat and Power Plants (2, 3)</td>
<td>0</td>
</tr>
<tr>
<td>Main Activity Heat Plants (2)</td>
<td>0</td>
</tr>
<tr>
<td>Autoproducer Heat Plants (2, 3)</td>
<td>0</td>
</tr>
<tr>
<td>Gas Works</td>
<td>0</td>
</tr>
<tr>
<td>Coke Ovens</td>
<td>0</td>
</tr>
<tr>
<td>Blast Furnaces</td>
<td>0</td>
</tr>
<tr>
<td>Gas-to-Liquids (GTL) Plants</td>
<td>0</td>
</tr>
<tr>
<td>Non-specified (Transformation)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Energy Sector - Total</strong></td>
<td>0</td>
</tr>
<tr>
<td>Coal Mines</td>
<td>0</td>
</tr>
<tr>
<td>Oil and Gas Extraction</td>
<td>0</td>
</tr>
<tr>
<td>Inputs to Oil Refineries</td>
<td>0</td>
</tr>
<tr>
<td>Coke Ovens</td>
<td>0</td>
</tr>
<tr>
<td>Blast Furnaces</td>
<td>0</td>
</tr>
<tr>
<td>Gas Works</td>
<td>0</td>
</tr>
<tr>
<td>Own Use in Electricity, CHF and Heat Plants</td>
<td>0</td>
</tr>
<tr>
<td>Liquefaction (LNG) / Regasification Plants</td>
<td>0</td>
</tr>
<tr>
<td>Gas-to-Liquids (GTL) Plants</td>
<td>0</td>
</tr>
<tr>
<td>Non-specified (Energy)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Distribution Losses</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Final Consumption (4)</strong></td>
<td>0</td>
</tr>
</tbody>
</table>

(1) Equal to the sum of rows 2, 14, 25, 26; should correspond to cell L38 on table 1.
(2) Should correspond to quantities in table 6C in the Annual Electricity and Heat Questionnaire.
(3) Should correspond to quantities in row 1 in table 5.
(4) Should correspond to the sum of cell IA and IB in table 2b.
### Inland Consumption - Table 2a

**Transformation Sector**
- Natural Gas used for producing another type of energy (electricity, heat) which is used for final consumption
- Example: Gas-to-Liquids

**Energy Sector**
- Natural Gas consumed by Energy Industry
- Example: Liquefaction plants

**Distribution Losses**
### Final consumption

**Table 2b**

<table>
<thead>
<tr>
<th>Country</th>
<th>2005</th>
<th>TOTAL FINAL CONSUMPTION BY SECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Menu</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of which Biogas</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Pipeline Transport</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Non-specified (Transport)</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td><strong>Industry Sector - Total</strong></td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Chemical and Petrochemical (2)</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Non-Ferrous Metals</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Non-Metallic Minerals</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Transport Equipment</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Machinery</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Mining and Quarrying</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Food and Tobacco</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Paper, Pulp and Print</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Wood and Wood Products</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Construction</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Textile and Leather</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>Non-specified (Industry)</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td><strong>Other Sectors - Total</strong></td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Commercial and Public Services</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Residential</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>Agriculture/Forestry</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Fishing</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Non-specified (Other)</td>
<td>26</td>
<td>0</td>
</tr>
</tbody>
</table>

**Unit: TJ (GCV)**

<table>
<thead>
<tr>
<th>Energy Use</th>
<th>Non-Energy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

(1) Corresponds to the sum of rows 2, 7, 21.
(2) Please report fuel use in column A.
(3) The sum of cells 1A and 1B should correspond to cell A26 in table 2a.
Final consumption - Table 2b

Three categories of **final consumption:**
- Industry Sector
- Transport Sector
- Other Sectors

Classification of Use

- **Non-Energy Use**
  Report Natural Gas used as a raw material for producing other products (Chemical and Petrochemical Industry)

- **Energy Use**
  Report Natural Gas used as fuel
Imports / Exports - Tables 3,4

Requested Data

- 2 Units: million m³ and TJ
- Natural Gas by pipeline and LNG

Geographical Breakdown

- 62 import origin
- 48 export destination

Trade

- Importance of the ultimate origin or destination
- Transit trade and re-exports are not to be included
Natural gas questionnaire: relations within different tables and with other questionnaires

Table 1
Supply

Imports = Total Imports
Exports = Total Exports
Inland Consumption (observed) = Inland Consumption

Table 2
Inland Consumption = Transformation + Energy + Distribution + Losses + Total Final Consumption

Table 3
Imports by Origin

Table 4
Exports by Destination

Table 2a
Net Inland Consumption by Sector

Table 2b
Total Final Consumption by sector
Energy-use
Non-energy use

Table 5
Inputs to Autoproducer Heat and Electricity Generation per plant type

Inputs to Gross Electricity and Heat Production

Electricity and Heat questionnaire Table 6a - 6c

Electricity and Heat questionnaire Table 9g

Oil questionnaire Table 1

Coal questionnaire Table 1

Renewables questionnaire Table 1

LPG
Manufactured gases
Biogases

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Some specific problems on natural gas reporting

Trade

- transit trade is often reported as import / export
- origin not always known due to contracts
- increasing difficulties with liberalised market

Units

- measurement in million cubic metres under Standard conditions - often reported under Normal conditions
- data in TJ often reported as Net rather than Gross
The IEA publication on natural gas statistics

Publication and CD-ROM

Natural Gas Information (hard copy, pdf)

CD-ROM

On-line Data Service
   Pay-Per-View
   Data download

Derived publications/analysis:
   Natural Gas Market Review
   Energy Statistics of OECD Countries
   Energy Balances of OECD Countries
   CO2 Emissions from Fuel Combustion

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Any questions, comments, feedback....?