Meeting of UNECE Group of Experts on Gas

PROSPECTS OF LNG DEVELOPMENT IN REGIONS OF RUSSIA
PRODUCTION AND FORMING OF EFFICIENT MARKET

Alexander Karasevich
Doctor of Technical Sciences, professor

Geneva, Palace of Nations
Structure of the presentation

- Current situation
- Prospects of LNG development
  - In regions of Russia
  - On the example of Kostroma region
- Problems and solutions
- Proposals
Current situation with gas supply in regions of Russia

Level of gas supply in Russia:
- natural gas and LPG – 68,7%
- natural gas – 57,8%

Level of gas supply for Eastern Siberia and Far East:
- natural gas and LPG – 27,5%
- natural gas – 4,1%

The length of gas transmission pipelines exceed 170 thousands km, gas distribution pipelines – 694 thousands km.
LNG facilities operating in Russia

Today there are 9 small scaled LNG plants in Russia with total LNG production of заводов 93 000 t/year.
Level of natural gas supply for regions of Russia – 57.8%. Objects that are not supplied with natural gas are located far from existing natural gas network and their connection to the grid is not economically viable.

It is reasonable to convert on LNG only objects that use expensive fuel, such as:
- diesel
- heavy oil
- heating oil
- electricity

Each region of Russia has from 20 to 400 objects, that use diesel, heavy oil, heating oil and electricity as a fuel.

The cheapest ways to produce LNG are – on GDS and CNG stations.

Potential of LNG production on GDS in Russia – 22.4 billion standard m³/year.

Potential of LNG production on CNG stations in Russia – 1.3 billion standard m³/year.
Potential for LNG production on GDS

Of 4100 GDS only 311 are suitable for LNG production.

Total annual potential of LNG production on GDS is 22.3 billions m³
Of 219 CNG stations:

- Suitable for LNG production - 137
- Total annual potential of LNG production on GDS - 1,3 billions m³
Future small-scaled LNG projects

It is planned to build 9 small-scaled LNG plants with total LNG production capacity 1,75 mill. t/year.
Current state of Kostroma region gas supply

Area that is connected to natural gas grid - 7 districts
Level of natural gas supply – 78,3%
Population – 472 thousand people

Area that is not connected to natural gas grid -17 districts
Population – 187 thousand people

- Level of gas supply – 78,4% (urban area. – 84,8%, rural area – 66,4%)
- Level of network gas supply– 50,8% (urban area. – 66,3%, rural area– 21,5%)
- Level of gas supply with LPG– 27,6% (urban area. – 18,5%, rural area– 44,9%)
- Gas supplied to 1896 localities (263 with natural gas)
- Natural gas consumption– 4,9 bill. m³/year
- LPG consumption – 3,6 thousand tones
Prospects of natural gas supply for Kostroma region

Natural gas demand for 7 districts – 5,0 bill. m³ (grow 380 mill. m³)

- Reconstruction of 3 GDS
- Construction of 230 km of gas distribution pipelines

17,7 bill. RUR

Natural gas demand for 17 districts – 432 mill. m³

- Construction of 10 new GDS
- Construction of 510 km of trunk pipelines
- Construction of 3,10 thousand km of gas distribution pipelines

31,0 bill. RUR

- districts that are not supplied with natural gas
Fuel balance of districts that are not supplied with natural gas

Fuel consumption structure

Natural gas consumption, mill. m³

VARIANT 1 432.3
VARIANT 2 147.1
VARIANT 3 315.0
Comparison of fuels prices with natural gas prices

Deviations of prices for different fuels to natural gas price are:
- coal – from 1,15 to 1,74;
- heavy oil - from 1,15 to 2,16;
- pit - from 0,87 to 0,98;
- wood - from 0,33 to 0,69.

1 – is a price of network gas for 3-d group 4390 RUR/1000m3 (3889 RUR./t.c.e).
Possible gas consumption in districts that are currently not supplied with gas

<table>
<thead>
<tr>
<th>Districts</th>
<th>TOTAL</th>
<th>population</th>
<th>boilers</th>
<th>CHP</th>
<th>TOTAL</th>
<th>population</th>
<th>Boilers</th>
<th>CHP</th>
<th>TOTAL</th>
<th>population</th>
<th>boilers</th>
<th>CHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Antropovskiy</td>
<td>4,8</td>
<td>2,7</td>
<td>1,5</td>
<td>0</td>
<td>3,3</td>
<td>2,7</td>
<td>0,6</td>
<td>0</td>
<td>3,3</td>
<td>1,8</td>
<td>1,5</td>
<td>0</td>
</tr>
<tr>
<td>2. Vohomskiy</td>
<td>8,8</td>
<td>4,7</td>
<td>4,1</td>
<td>0</td>
<td>5,5</td>
<td>4,7</td>
<td>0,8</td>
<td>0</td>
<td>6,4</td>
<td>2,3</td>
<td>4,1</td>
<td>0</td>
</tr>
<tr>
<td>3. Kadyiskiy</td>
<td>5,3</td>
<td>4,1</td>
<td>0,8</td>
<td>0,4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Kologrivskiy</td>
<td>4,6</td>
<td>3,1</td>
<td>1,5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. Makarievskiy</td>
<td>9,1</td>
<td>7,7</td>
<td>1,3</td>
<td>0,1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. Manturovskiy</td>
<td>31,9</td>
<td>11,2</td>
<td>20,7</td>
<td>0</td>
<td>24,9</td>
<td>11,2</td>
<td>13,7</td>
<td>0</td>
<td>29,6</td>
<td>8,9</td>
<td>20,7</td>
<td>0</td>
</tr>
<tr>
<td>7. Mejevskiy</td>
<td>3,6</td>
<td>2,1</td>
<td>1,5</td>
<td>0</td>
<td>2,6</td>
<td>2,1</td>
<td>0,5</td>
<td>0</td>
<td>3,0</td>
<td>1,6</td>
<td>1,4</td>
<td>0</td>
</tr>
<tr>
<td>8. Neiskiy</td>
<td>13,1</td>
<td>4,8</td>
<td>6,0</td>
<td>0</td>
<td>10,3</td>
<td>4,8</td>
<td>5,5</td>
<td>0</td>
<td>10,3</td>
<td>4,3</td>
<td>6,0</td>
<td>0</td>
</tr>
<tr>
<td>9. Oktyabrskiy</td>
<td>3,1</td>
<td>2,4</td>
<td>0,7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10. Ostrovskiy</td>
<td>14,4</td>
<td>6,4</td>
<td>8,0</td>
<td>0</td>
<td>7,9</td>
<td>6,4</td>
<td>1,5</td>
<td>0</td>
<td>10,7</td>
<td>2,6</td>
<td>8,1</td>
<td>0</td>
</tr>
<tr>
<td>11. Pavinskiy</td>
<td>3,0</td>
<td>2,4</td>
<td>0,6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12. Parfienievskiy</td>
<td>14,4</td>
<td>2,5</td>
<td>2,4</td>
<td>8,8</td>
<td>3,2</td>
<td>2,5</td>
<td>0,7</td>
<td>0</td>
<td>3,2</td>
<td>0,8</td>
<td>2,4</td>
<td>0</td>
</tr>
<tr>
<td>13. Ponazyrevskiy</td>
<td>5,6</td>
<td>3,3</td>
<td>1,5</td>
<td>0</td>
<td>4,1</td>
<td>3,3</td>
<td>0,8</td>
<td>0</td>
<td>4,1</td>
<td>2,5</td>
<td>1,6</td>
<td>0</td>
</tr>
<tr>
<td>14. Pystchugskiy</td>
<td>3,5</td>
<td>2,6</td>
<td>0,9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15. Soligalichskiy</td>
<td>172,3</td>
<td>5,1</td>
<td>23,2</td>
<td>144,0</td>
<td>24,3</td>
<td>5,1</td>
<td>19,2</td>
<td>0</td>
<td>170,5</td>
<td>3,3</td>
<td>23,2</td>
<td>144,0</td>
</tr>
<tr>
<td>16. Chukhlomskiy</td>
<td>6,4</td>
<td>5,7</td>
<td>0,7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17. Sharienskiy</td>
<td>128,4</td>
<td>25,2</td>
<td>54,9</td>
<td>48,3</td>
<td>61,0</td>
<td>25,2</td>
<td>35,8</td>
<td>0</td>
<td>71,3</td>
<td>16,4</td>
<td>54,9</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>432,3</strong></td>
<td><strong>96,0</strong></td>
<td><strong>130,3</strong></td>
<td><strong>201,6</strong></td>
<td><strong>147,1</strong></td>
<td><strong>68,0</strong></td>
<td><strong>79,0</strong></td>
<td><strong>0,0</strong></td>
<td><strong>315,0</strong></td>
<td><strong>46,3</strong></td>
<td><strong>124,8</strong></td>
<td><strong>144,0</strong></td>
</tr>
</tbody>
</table>
Gas supply development of Kostroma region
(variant – network gas)

Grow of natural gas consumption – 147 mill. m³
Investments – 11,0 bill. RUR

- Construction of 6 GDS and 270 km of trunk pipelines
- Construction of 300 km of gas distribution pipelines
Gas supply development of Kostroma region (variant - LNG)

Grow of natural gas consumption – 147 mill. m³
Investments – 9,1 – 13,8 bill. RUR

- Construction of LNG plant in Galich or on GDS Kostroma-3 (23 t/hour)
- Construction of 16 LNG regasification units
Gas supply development of Kostroma region
(mix variant – network gas and LNG)

Grow of natural gas consumption – 147 mill. m³
Investments – 7.5 – 12.2 billion RUR

- Construction of 1 GDS
- Construction of 50 km of gas distribution pipelines
- Construction of LNG plant in Galich or on GDS Kostroma-3 (20 t/hour)
- Construction of 10 LNG regasification units
## Comparison of different Kostroma region gas supply development’s variants

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Variant 1 (network gas)</th>
<th>Variant 2 (LNG)</th>
<th>Variant 3 (mix of LNG and network gas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grow of gas consumption, mill. m³/year</td>
<td>147</td>
<td>147</td>
<td>147</td>
</tr>
<tr>
<td>Investments, billions RUR, including</td>
<td>11,0</td>
<td>9,1-13,8</td>
<td>7,5-12,2</td>
</tr>
<tr>
<td>network gas supply</td>
<td>11,0</td>
<td>-</td>
<td>0,7</td>
</tr>
<tr>
<td>LNG gas supply</td>
<td>-</td>
<td>9,1-13,8</td>
<td>6,8-11,5</td>
</tr>
</tbody>
</table>

The recommended variant is Variant 3 (mix of LNG, network gas and LPG)
Problems of small-scaled LNG market development

**Low level of legal framework:**
- Outdated requirements of normative documents for LNG infrastructure design and operation
- Difficulties with obtaining approvals for construction
- Fire safety regulations for LNG infrastructure is not match real level of risk

**High price for domestic equipment:**
- Low competition level among domestic cryogen equipment producers
- Absence of incentive to develop technologies and decrease cost of equipment

**High gas price for end-user:**
- Absence of LNG pricing mechanisms
- Big share of foreign equipment that price is dependent on economic situation
- Absence of interaction mechanisms among LNG gas supply participants
Comparison of Russian and foreign norms for LNG infrastructure placement (example – Kostroma region)

Necessary to change Russian norms in accordance with foreign. Requirements changing from Russian to foreign decrease autonomy gas supply projects capital cost and improve projects economic.
THANK YOU!