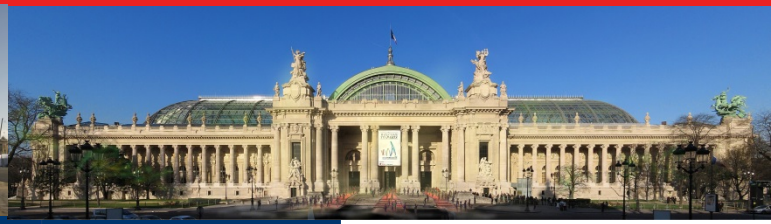
26th World Gas Conference

1 – 5 June 2015, Paris, France



WOC 4.1 DETERMINING FACTUAL PRODUCTIVE CAPACITY RESERVE OF GAS DISTRIBUTION SYSTEMS

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WGCPARIS2015
WORLD GAS CONFERENCE

Gas distribution in Russia. Major facts

Indices	Value	
	As of 01.01.2010	As of 01.01.2014
Number of settlements supplied with natural gas, including	**39 068**	**42 294**
rruralrural	*37 272*	*40 582*
Number of apartments supplied with natural gas (ths.), including	**32 410,3**	**34 361,4**
rural	*6 853,4*	*7 682,8*
Length of external gas pipelines (ths. km), including	**744,3**	**849,6**
rural	*466,0*	*539,9*
Length of internal gas pipelines (ths. km), including	**221,4**	**244,9**
rrurall	*61,9*	*71,7*
Number of operated gas distribution points (ths.), including	**36,9**	**48,9**
rural	*18,3*	*20,5*
Connection to natural gas supply (%), including	**55,6**	**57,1**
rural	*41,0*	*46,3*

Dwelling stock connected to gas supply, %

- Not connected at all
- Connected less than 25 %
- Connected 25 - 50 %
- Connected 50 - 75 %
- Connected over 75 %

Unbundling in the gas industry

Index	Russian gas market
Functional unbundling	Gas companies are distinguished by functionality: production, processing, transportation, storage, distribution and consumer supply
Ownership unbundling	Gas supply is an independent business, effected by companies without involvement in gas distribution network operation
Legal unbundling	Regional gas companies supply gas furnished by different producers (Gazprom and independent producers)
Account unbundling	Account of cost of implementing its functions is kept by each company belonging to the gas chain from production to consumer
Service unbundling	Gas is supplied to consumers by companies without involvement in network operation

Regulation of third-party access to gas supply and distribution facilities

- Federal Law **"On natural monopolies"** of 17.08.95 N 147-ФЗ
- Federal Law **" On Gas Supply in the Russian Federation "** of 31.03.1999 № 69-ФЗ
- Ordinance of the Government of the Russian Federation **"Independent producer ensured access to JSC "Gazprom" Unified Gas Supply System"** of 14.07.1997 № 858
- Ordinance of the Government of the Russian Federation **"Rules of Gas Supply in the Russian Federation"** of 05.02.98 №162
- Ordinance of the Government of the Russian Federation **"Regulation on ensuring access of organizations to local gas distribution networks"** of 24.11.98 N 1370)*
- Ordinance of the Government of the Russian Federation "**Rules of gas use and of rendering gas supply services in the Russian Federation**" of 17.05.02 № 317
- Order of the Federal Antimonopoly Service of 23.12.11 №893 "**On approving forms, deadlines and periodicity of data disclosure by natural monopoly entities rendering services of gas pipeline transport**"
- Ordinance of the Government of the Russian Federation of 30.12.13 N1314 "**On Approving Rules of connecting (utility-connecting) of constructed permanent buildings and facilities to gas distribution networks and on amending and repealing certain Acts of the Russian Federation Government**"

* Presently the Federal Antimonopoly Service (FAS) is completing draft Ordinance of the Government of the Russian Federation "**On ensuring non-discriminated access to the gas distribution networks"** that is to substitute now acting Ordinance N 1370

Gas distribution network development

Basic stages

- Region gas supply and distribution general scheme (issued once every 5 years)
- Gas distribution network and gas facility development and reconstruction programme coordinated with consumer preparedness to take gas (issued for three or five years, amendable early)
- Construction project development
- Construction of inter-settlement gas pipelines and required intra-settlement gas infrastructure

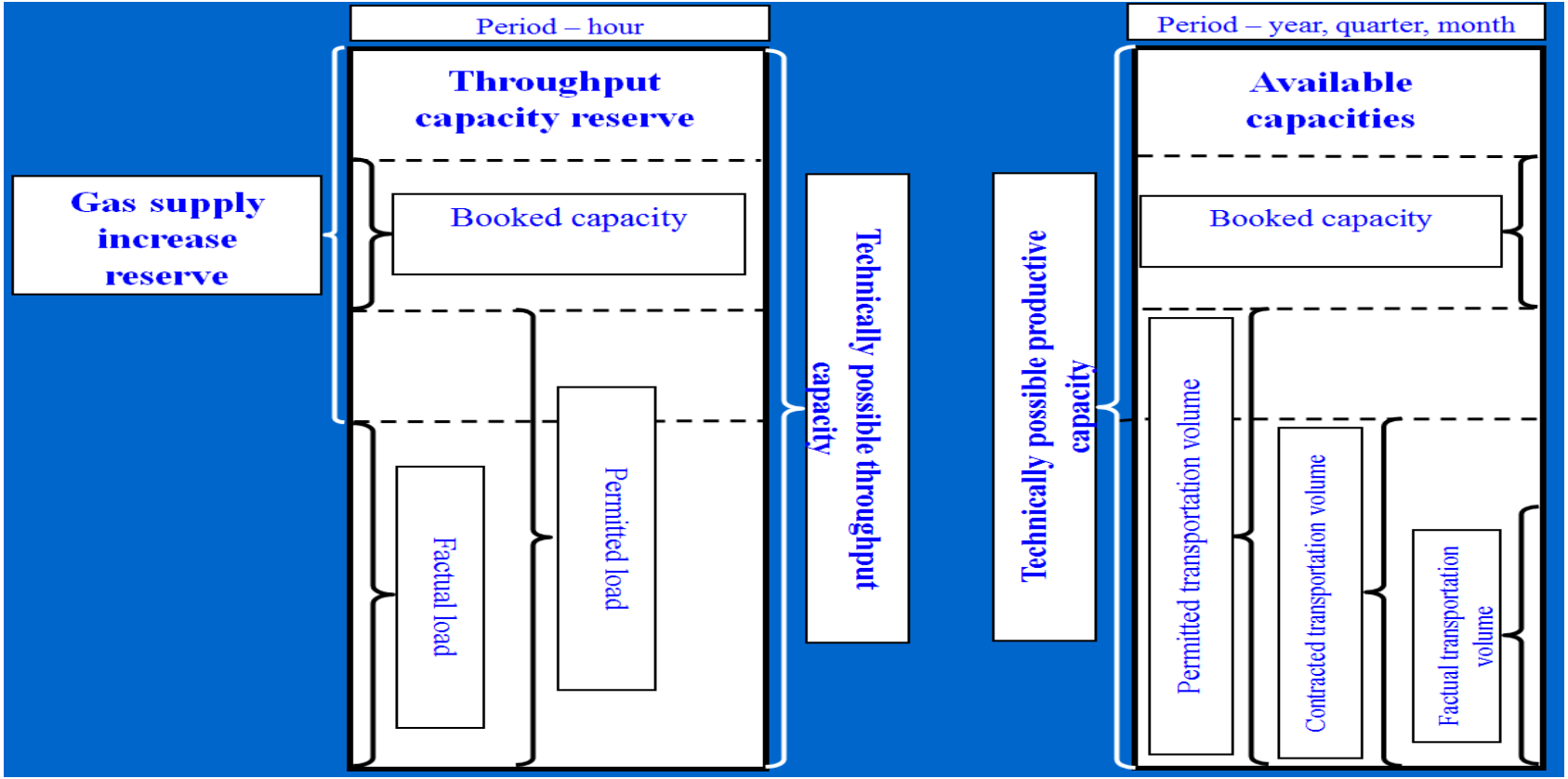
New potential gas consuming facilities non accounted for in the General Scheme

How to ensure new consumer connection by amending General Scheme or Technical Solutions to develop gas supply and distribution?

Determining factual productive capacity reserve of gas distribution systems

- ***Identifying possible points to connect new consumers***
- ***Gas distribution network development and reconstruction solution substantiation***
- ***Coordinating contracts between natural gas suppliers and natural gas consumers***
- ***Issuance of gas distributor's reports on production capacity operation***

Provision for gas supply increase



Throughput capacity assessment

Mathematical statement

Identify maximum consumer gas supply k

$$Q_k^{\text{пс}} = Q_k \to \max, \tag{1}$$

Provide 1st Kirchhoff law compliance

$$\mathbf{A}\vec{q} = \vec{Q}, \tag{2}$$

Law of steady flow via curves of calculation graph

$$\overline{\mathbf{A}}^T \vec{P} = \mathbf{SX}\vec{q}, \tag{3}$$

$$P_i = \left(p_i^*\right)^2, i \in I, \quad P_j = p_j^2, j \notin I, \tag{4}$$

Minimum gas pressure in consumption clusters

$$p_m \geq p_m^{\min}, m \in M \tag{5}$$

Provision of permitted $\vec{Q}^{\text{разр.п}}$ and booked $\vec{Q}^{\text{бр.п}}$ consumer gas supplies

$$Q_k \geq Q_k^{\text{разр.п}} + Q_k^{\text{бр.п}}, \qquad Q_m = Q_m^{\text{разр.п}} + Q_m^{\text{бр.п}}, m \in M, m \neq k. \tag{6}$$

Available and reserved gas distribution capacities

Throughput capacity reserve depends on the set of values

$$R^{\text{сети}} = \|R_k\|, k \in M$$

$$R_k = q_k^{\text{твпс}} - q_k^{\text{разр.п}} - q_k^{\text{бр.п}}, k \in M$$

$q_k^{\text{твпс}}$ *is constituent* ***k*** *of technically possible gas distribution network throughput capacity as determined with regard to permitted and booked consumer gas consumptions*

$q_k^{\text{разр.п}}$ is permitted gas *consumption at the connection point* ***k****,*

$q_k^{\text{бр.п}}$ *is booked gas consumption by perspective consumer at connection point* ***k****.*

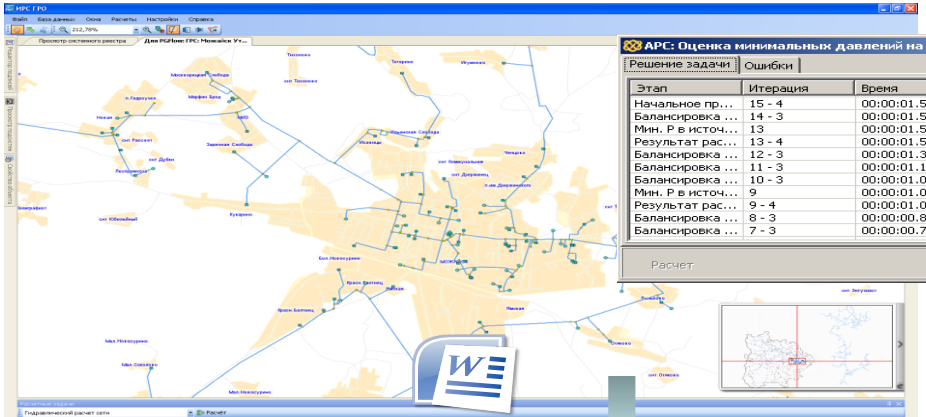
Available capacity within a month, quarter, year to supply with gas consumer $k, k \in M$ is found using the formula

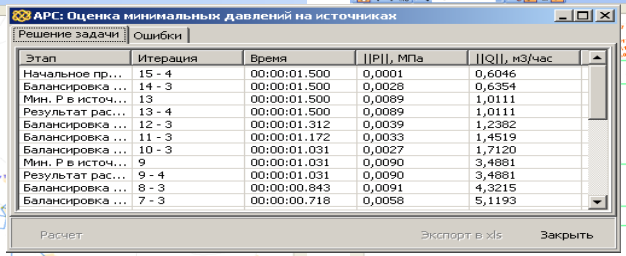
$$S_k^{\text{п}} = Q_k^{\text{твп}} - Q_k^{\text{разр.п}} - Q_k^{\text{бр.п}}, k \in M$$

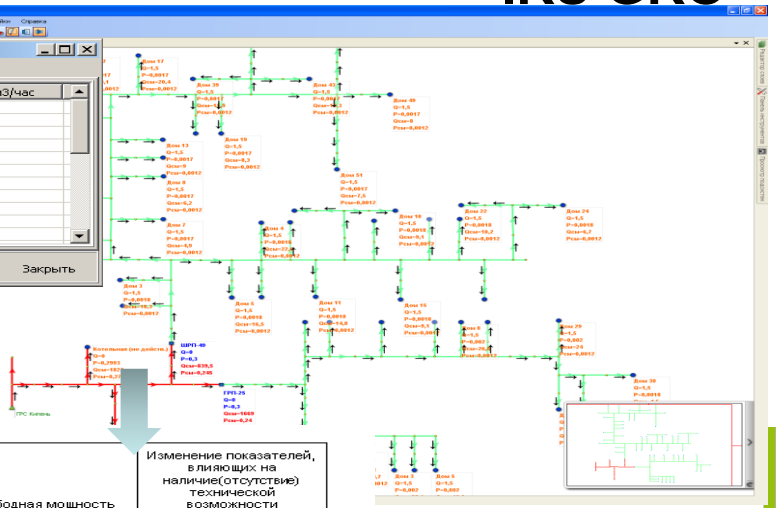
IRS GRO - specialized software complex to model gas distribution systems

- **Hydraulic calculations and control of factual modes**
- **Available capacity identification**
- **Issuance of connection technical conditions**

IRS GRO







№ п/п	Наименование газораспределительной сети	Зона входа в газораспределительную сеть	Зона выхода из газораспределительной сети	Свободная мощность газораспределительной сети, м3/час	Изменение показателей, влияющих на наличие(отсутствие) технической возможности доступа к услугам по транспортировке газа по газораспределительной сети
1	2	3	4	5	6
100	ГРС Кипень ср.д.	ГРС Кипень	ЗАО "п/ф Скворицы"	10166,41	-
			Котельная (не действ.)	1827,03	-
			ГРП-25	1669,02	-
			ШРП-49	839,51	-

Thank you for attention

For further contacts please write to
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