Presentation at 4-th ERGEG Workshop on the 10-Year Network Development Plan June 14, 2010

"Simulation of the EU gas transportation system – view from the RF experience and concerns' point of view"

Dr. Vladimir I. Feygin, Principal Director,
Institute for Energy and Finance
with contribution from the totality of RF experts
at the Workshop

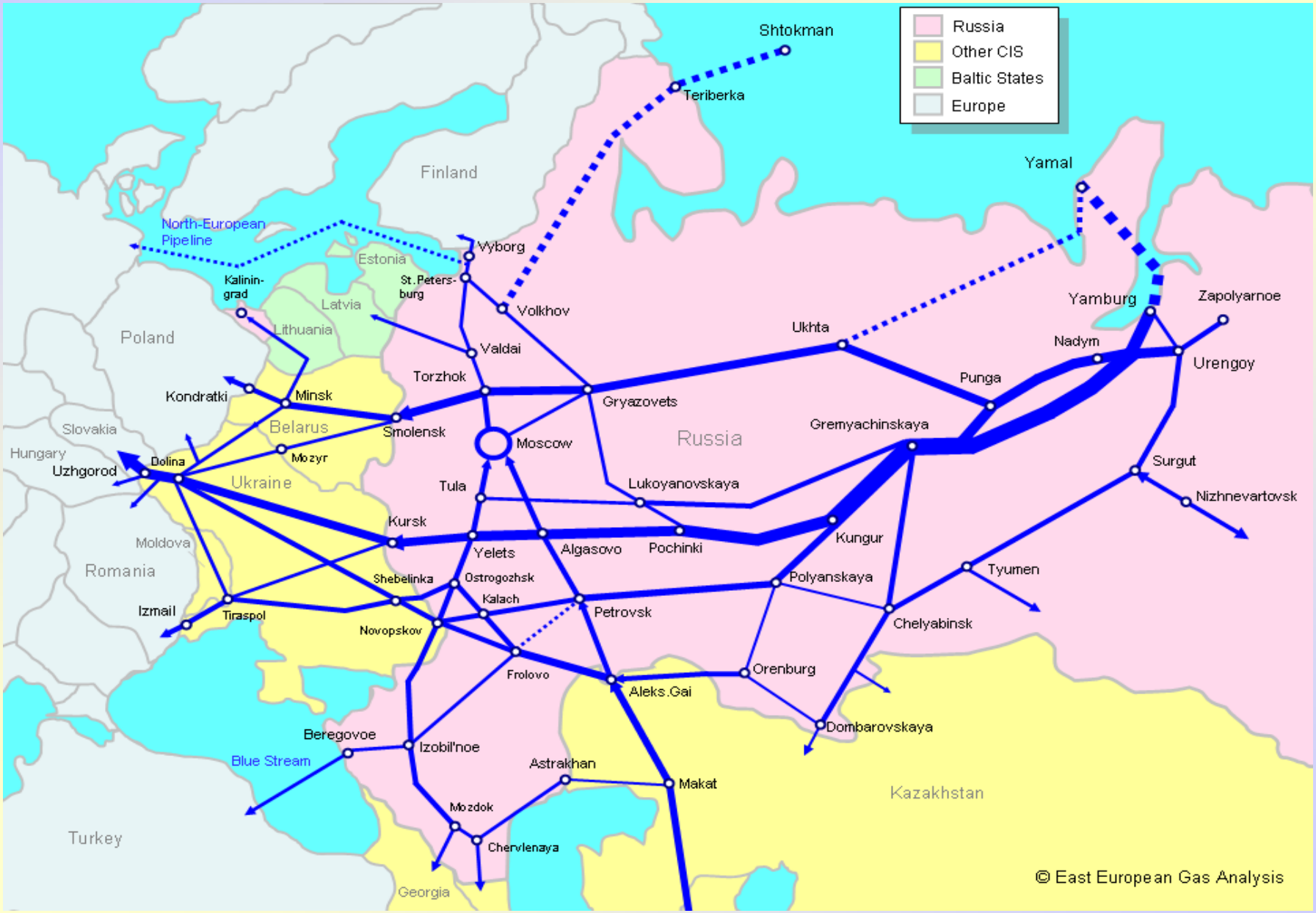
IEF
INSTITUTE FOR ENERGY AND FINANCE

Main topics:

1. Two systems – UGSS of Russia (part of FSU UGSS) and appearing EU GTS
2. Experience of simulation
3. Comments on the EWI Study

1. Two systems – UGSS of Russia (part of FSU UGSS) and appearing EU GTS

Current view of the gas transportation infrastructure in the RF and abroad



European Transmission Grid 1970

Pipelines/LNG-Terminals

- European transmission pipelines
- other gas pipelines
- LNG-Terminals

European Transmission Grid 2004

Pipelines/LNG-Terminals

existing

under construction or planned

Original opposite approaches:

- ETS was a combination of national subsystems; in some countries – corporate subsystems
- UGSS was designed and developed as unified system from the beginning

Only recently this situation started to modify

It results in relevant

APPROACHES TO ANALYSIS, OPERATION, GAS INFRASTRUCTURE PROJECTS:

- in simple direct lines' systems
- in looped systems:
  - system simulation (flow models, scenarios of development and operation)
  - economic (contractual/regulatory) environment for operation

In the EU:

- Different stages of development – on the basis of LOCAL CORPORATE and NATIONAL WIDE systems
- Mature infrastructure state of development
- Consequent Gas Directives and movement to united European wide gas market
- A crucial role of Third Party Access for system development
- Role of planning by System Operators
- **Lack of system-wide optimization of capacity use and of system means (storage, interconnections etc.) for consumer reliable supply in various regimes (incl. extraordinary ones)**

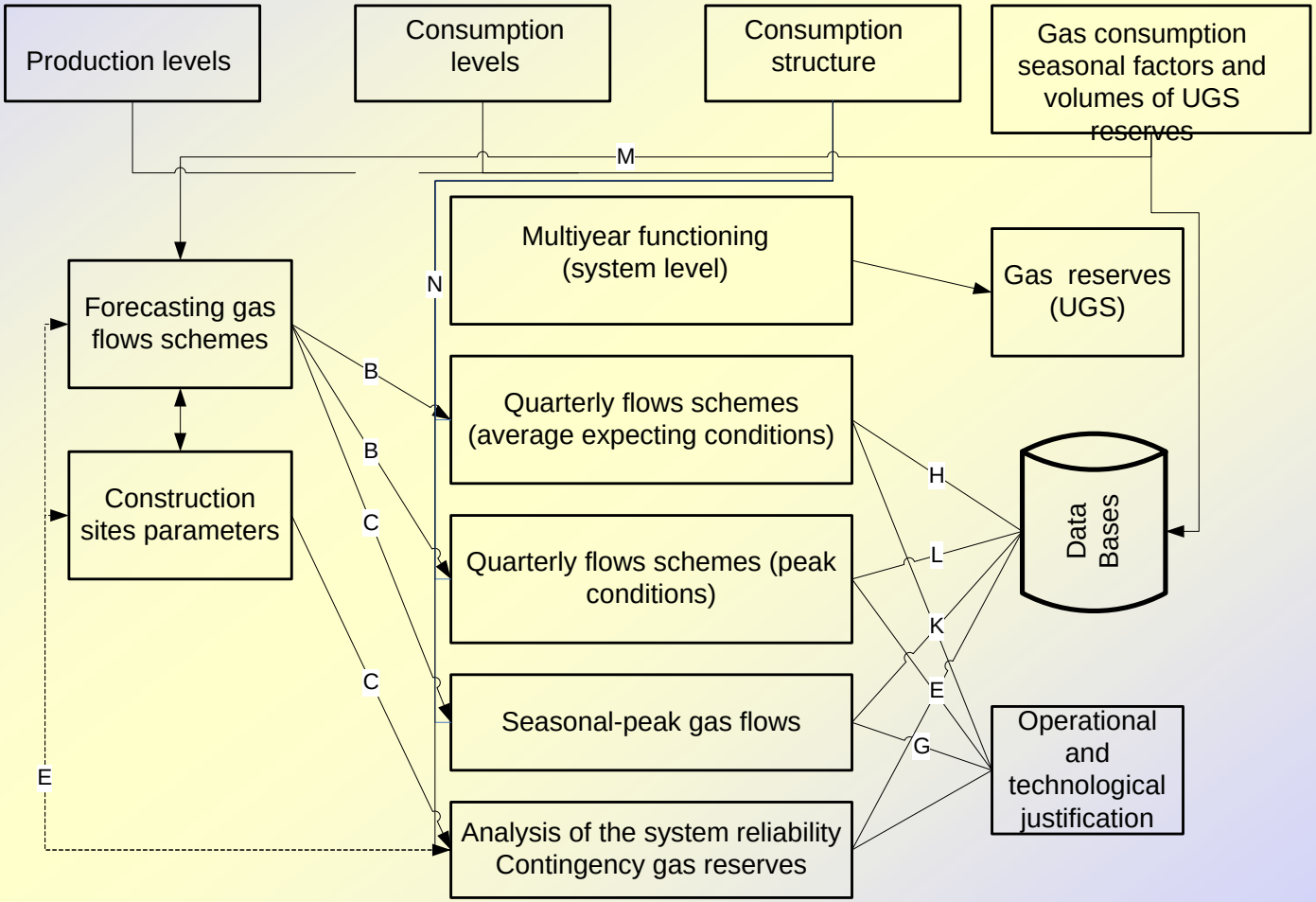
2.Experience of simulation in the RF

Levels of Simulation:

- Balances in various scenarios (comp. original 10Y Plan approach)
- Representation of Integrated infrastructure links
- Detailed simulation of flows/system requirements in various conditions/scenarios (comp. EWI Study)
- Specific design level

Links with Stages of **Decision Making**

Scheme 1


Production levels
Consumption levels
Consumption structure
Gas consumption seasonal factors and volumes of UGS reserves
M
N
Multiyear functioning (system level)
Gas reserves (UGS)
Forecasting gas flows schemes
B
B
C
C
E
Quarterly flows schemes (average expecting conditions)
Quarterly flows schemes (peak conditions)
Seasonal-peak gas flows
Analysis of the system reliability Contingency gas reserves
Construction sites parameters
H
L
K
E
G
Data Bases
Operational and technological justification

Principal structure and blocks

Block 1 – Optimization of the gas flows schemes;

Block 2 – Modeling of principal questions of UGSS operation;

Block 3 – Basic models of consumption/flows swing factors;

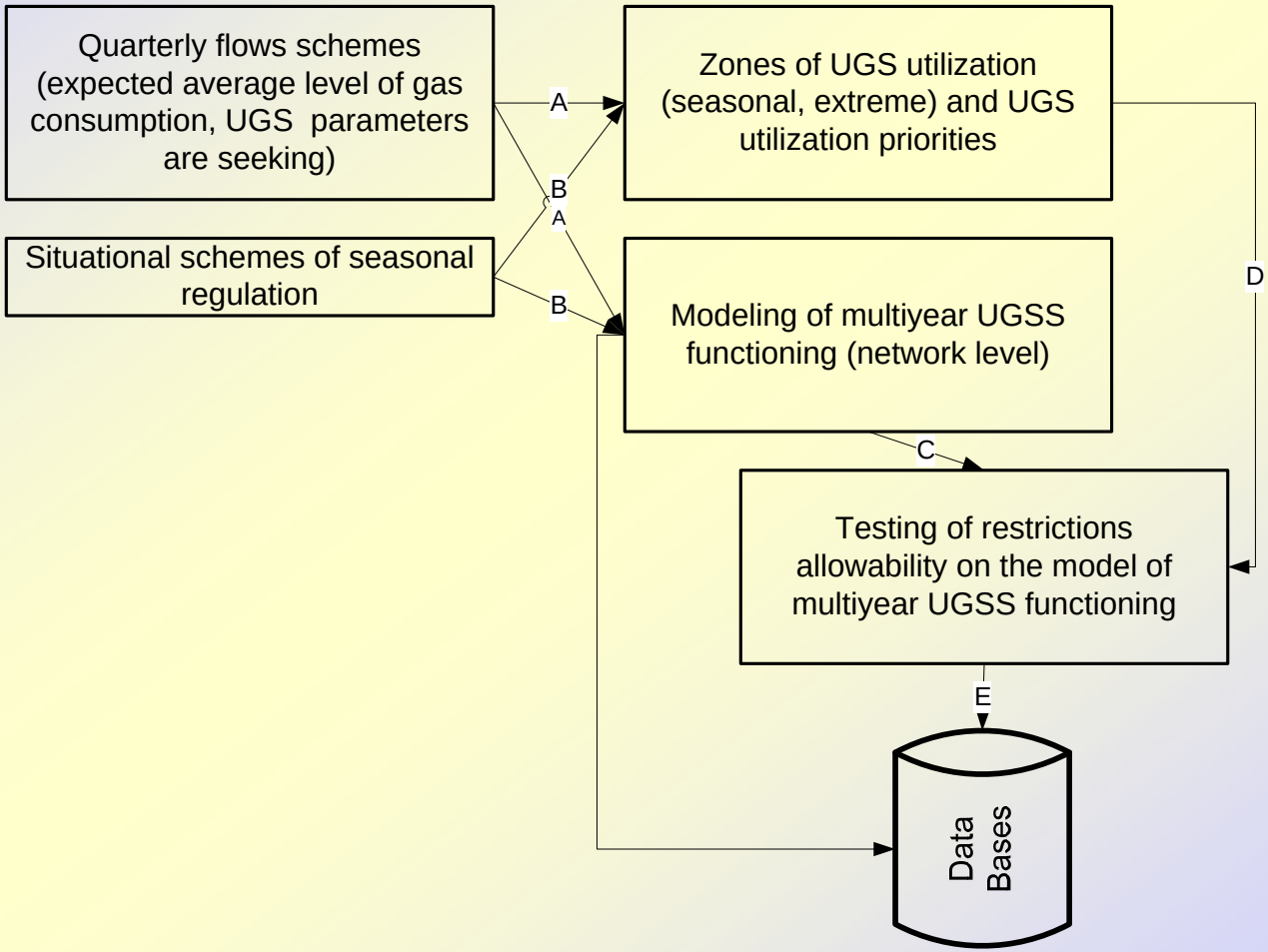
Block 4 – Models of Calendar Planning;

Block 5 - Situational modeling of consumption/flows swing factors;

Block 6 - Formation of the lists on the new construction objects and technical – economic parameters of gas transportation;

Block 7 - Forecast of the system reliability parameters.

Scheme 2


Quarterly flows schemes (expected average level of gas consumption, UGS parameters are seeking)
Situational schemes of seasonal regulation
A
B
A
B
Zones of UGS utilization (seasonal, extreme) and UGS utilization priorities
Modeling of multiyear UGSS functioning (network level)
C
Testing of restrictions allowability on the model of multiyear UGSS functioning
D
E
Data Bases

Information flows and the decisions making. Coding system on Schemes 1&2.

- A – seasonal volumes regulation by UGS;
- B – allocation of extreme volumes by UGS;
- C- formation of the restrictions on the gas transportation system sections development and the rules on UGS management while injection and extreme situations;
- D, E – change in UGS allocation and type of reserves.

UGSS: Security of supply – basic principles

- Technical reliability of supply to be achieved via:
  - Unit equipment reliability (not at highest level)
  - Redundancy at facility level
  - **Multi-line pipeline systems in large corridors with interpipe connections**
  - **Integrated storage** (incl. Strategic)
  - **Integrated dispatch flow/pressure control**
- Priority of operation in the outages/extreme conditions cases
  - Specifically – position of export

UGSS: System security of supply – modelling issues

- Probabilities of various outages in typical seasonal regimes
- Simulation of single outages, corresponding system control (priorities) and optimal flows
- Simulation of “sufficient” number of double outages
- Formation of “statistics” of delivery constrains (by nodes), pipe sections load factors, UGS operation
- Formation of prognosis for integrated characteristics as:
  - – awaiting delivery vrs demand by nodes
  - –demand for resources of gas in UGSs for these purposes (distribution function of this variate)

This might be helpful for further development of the the EWI analysis of system outcomes

3. Comments on the EWI Study

- Definitely a positive step as it is a transfer to a simulation of the EU wide transportation system on a network level
- Scenario approach incl. regarding an implementation of import pipeline projects and/or LNG import
- A simulation of a variety of modes of system operation (annual, seasonal, peak)
- An analysis of an impact of few potential major interruptions of supply
- Definitely a helpful tool for a view on undoubtedly necessary network extensions (minimal requirements)
- Simulation of the physical flows on fully integrated system

But:

- No link to supply/delivery contracts at all
- Understanding of an “effective market” based on artificially calculated (as shadow prices?!) node prices
- No link to “enter-exit” system in tariffs and capacity booking – simply a contradiction to these current approaches
- An idealistic view on the interaction of TSOs without even an indication of the potential scale of rerouting of nominations and ways they proceed
- No link between “dispatch” simulation and system development

Concerns:

- An uncertainty regarding available information on gas demand locations (on sub-national level)
- Potential underestimation of system demands due to methodology issues
- Potentially wrong interpretations of market operations, pricing etc. (i.e. role of “cost of production” in pricing?)
- Lack of clarity regarding most realistic scenarios (comp. Gazprom Export presentation)
- Still lack of integration between development and dispatch simulation

Some suggestions on a way forward

1. To develop a more realistic model of the EU GTS operation. It could be based not on integral flows (without any link to contracts) but on flows on system paths which are an arithmetic sum of contractual flows.

   This will let as well to simulate (at an early stage – to realistically limit) size of swaps which TSOs have to manage.

2. To introduce – within the integral model or in parallel to a flow model – a simulation of the operation of "entry-exit" approach and its potential development in line with alternatives of capacity allocation procedures.

Some recommendations:

- To analyze further options of infrastructure development in the context of more realistic operational mode.
- To investigate (using further developed simulation technique) whether the efficient operation of an integrated EU ETS will need a sort of united operational center (for a combination of the dispatch center functions plus planned ACER functions on system development).
- For this purpose to analyze what sort of consequences could come from not a perfect joint actions of TSO
- To come to simulation of not only for 2019 but for intermediate time frames in order to realistically plan new investments

Final comments:

- We mark an important step forward in the EU integration of the gas transportation simulation (not yet of an operation)
- We see a number of further challenges caused by current transformations
- We see a lot of opportunities for modelling analysis and its development
- We believe in an increase of EU-RF cooperation in this sphere as well

THANK YOU FOR YOUR ATTENTION!