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DIAGNOSTICS OF GAS TRANSMISSION LINES AND RISK MANAGEMENT

(Revised draft questionnaire, prepared by the delegation of the Czech Republic)

Note by the secretariat: This revised questionnaire was prepared by the rapporteurs from the Ministry of Industry and Trade of the Czech Republic, Messrs. Jiri FILIPPI and Josef ANTOŠ, in accordance with the decision of the sixth session of the Ad Hoc Group of Experts held in Geneva in January 2005.

INTRODUCTION

1. The dependence of Europe on remote sources of natural gas and the necessity of gas transportation via international pipeline system presents a problem of safety and reliability of the system. For this reason, it is necessary to investigate the legislative, technical and, in some cases, trading rules. The risks in operating transportation systems should be minimized while at the same time meeting the requirements of an open gas market. The main objective is to ensure the reliable and safe transportation of natural gas. It is important to harmonize the approaches of the respective countries in solving the problems of international transportation.

2. The development of national transportation systems in the past and their gradual interconnection are currently creating an extensive international transportation system. All pipeline parts and installations fulfil their function within the system. The respective operators are responsible for reacting flexibly to emergency situations (breakdowns etc.) and to market requirements according to market rules and agreed contracts.

3. Following the decision of the Ad Hoc Group of Experts, the delegation of the Czech Republic has prepared a draft questionnaire, which will help to collect information on international gas pipelines, including their third-party-access (TPA) conditions and risk management policy and rules. Although changes might be expected due to further regulation of the European gas market, it is necessary, for the safety of international gas transportation, to map all relevant parts of installations and how they are integrated, as for example in power engineering (UCTE).

4. The purpose of the questionnaire is to identify the existing methods of diagnostic of major gas transportation pipelines which are part of an international transportation system, and also to consider and identify a methodology in the field of risk management of those pipelines.

5. The questions are focused on identification of relevant legislation and regulation, system of operations (including safety regulations) and risk management of internationally connected high-pressure transportation lines with a designed pressure higher than 16 bars, including its installations.

I. SITUATION IDENTIFICATION – CHARACTERISTICS OF GAS PIPELINES

6. For reasons of safety of long-distance international gas transportation (transit) pipelines, it is necessary to map the main transit systems, including all connections and range of capacity/operating pressure.

7. The following definitions (marking definitions) are used in the questionnaire.

Definitions.

A - Input points (marked **Input**) – gas input/transfer places equipped with commercial metering of quality and quantity;

A-1. Cross border input points ..... **Input CB**

These are border transfer stations that are found near the state borders, where natural gas entering the transportation system is metered:
- In the territory of the state where the operator has its seat ..... **Input CB in**
- Outside the territory of the state where the operator has its seat ..... **Input CB out**

Give a list of all **Input CB** points with other data in accordance with the following model: Input CB in (or out) / Country of station with location/projected max. capacity inflow (million m3 per hour) / name of the connected input gas pipeline and its operator / name of the locations if there is one.

A-2. Input transfer stations that connect the transportation system with an adjacent transportation system of another operator ..... **Input Conn**

- In the territory of the state where the operator has its seat ..... **Input Conn in**
- Outside the territory of the state where the operator has its seat ..... **Input Conn out**

Give a list of all **Input Conn** points interconnecting the transportation system with adjacent systems of other operators with other data in accordance with the following model:
Input Conn in (or out) / Country of station with location / projected max. capacity inflow (million m3 per hour) / name of the neighbouring input gas pipeline and its operator / name of the location if there is one.

A-3. <u>Input transfer and metering stations connecting the transportation system to upstream pipeline</u> ..... Input Upstream

- In the territory of the state where the operator has its seat ..... **Input Upstream in**
- Outside the territory of the state where the operator has its seat..... **Input Upstream out**

Give a list of all input transfer and metering stations interconnecting the transportation system with upstream pipelines, with complementary information in accordance with the following model:
Input Upstream in (or out) / Country of the station with location / projected max. capacity inflow (million m3 per hour) / name of the producer – operator of the upstream pipelines / geographical name of the metering station if there is one.

A- 4. <u>Input transfer and metering stations interconnecting the transportation system with a terminal for storage of liquefied natural gas</u> ..... Input Terminal

- In the territory of the state where the operator of the transportation system has its seat ..... **Input Terminal in**
- Outside the territory of the state where the operator of the transportation system has its seat ..... **Input Terminal out**

Give a list of all input metering stations interconnecting the transportation system with terminals, with complementary information in accordance with the following model:
Input Terminal in (or out) / Country of the station with location / projected max. capacity inflow (million m3 per hour) / name of the terminal / name of the operator of the terminal

A-5. <u>Input transfer and metering stations interconnecting the transportation system directly with the source or gas production facility</u> ..... Input Source

- In the territory of the state where the operator of the transportation system has its seat ..... **Input Source in**
- Outside the territory of the state where the operator of the transportation system has its seat ..... **Input Source out**

Give a list of all input metering and transfer stations interconnecting the transportation system directly with the source or natural gas production facility, with complementary data in accordance with the following model:
Input Source in (or out) / Country of the station with location / projected max. capacity inflow (million m3 per hour) / name of the producer.

A-6. Input points connected to a collector with an input connection to one or more sources of natural gas or a transportation system and with one or more outputs from the collector ..... **Input Collector**

- In the territory of the state where the operator of the transportation system has its seat ..... **Input Collector in**
- Outside the territory of the state where the operator of the transportation system has its seat ..... **Input Collector out**

Give a list of all input transfer and metering stations at the inlet to a collector interconnecting a terminal or source of gas or upstream pipeline or another transportation system with the collector in accordance with the following model:
Input Collector in (or out) / Country of the collector with location / Terminal or Source or Upstream or Conn / max. capacity inflow (million m3 per hour) / name of the operator of the collector if it is operated by another operator / name of the operator of the terminal or upstream pipeline or the producer or operator of the connected transportation system.

A-7. Input points – metering stations interconnecting the transportation system with a gas storage (underground, etc.) ..... **Input Storage**

- In the territory of the state where the operator of the transportation system has its seat ..... **Input Storage in**
- Outside the territory of the state where the operator of the transportation system has its seat ..... **Input Storage out**

Give a list of all input points – metering stations interconnecting the transportation system with an underground gas storage facility or another storage facility of gas in the compressed state, with complementary information in accordance with the following model:
Input Storage in (or out)/Reverse – if it is possible to reverse the gas flow direction through the same metering point as the output from the transportation system to the Underground Storage Facility / Country of the storage with location / max. projected capacity of metering equipment in million m3 per hour / storage capacity million m3 / geographical name if there is one / name of the operator of the storage facility.

B - Output points (marked **Output) -** output places where there are transfer – metering stations equipped with commercial metering of quality and quantity

B -1. Cross border output points ..... **Output CB**

These are border transfer stations that are situated near the border, where natural gas leaving the transportation system is metered:

- In the territory of the state where the operator has its seat ..... **Output CB in**
- Outside the territory of the state where the operator has its seat ..... **Output CB out**

Give a list of all **Output CB** stations with further data in accordance with the following model: Output CB in (or out) / Country of station with location/projected max. capacity inflow (million m3 per hour) / name of the neighbouring connected transportation gas pipeline and its operator / name of its location if there is one.

B-2. <u>Output transfer points that connect the transportation system to an adjacent transportation system of another operator</u> ..... **Output Conn**

- In the territory of the state where the operator has its seat ..... **Output Conn in**
- Outside the territory of the state where the operator has its seat ..... **Output Conn out**

Give a list of all **Output Conn** points interconnecting the transportation system with adjacent systems of other operators with other data in accordance with the following model:
Output Conn in (or out) / Country of station with location/projected max. capacity inflow (million m3 per hour) / name of the neighbouring connected gas pipeline and its operator / name of its location if there is one.

B-3. <u>Output transfer and metering stations interconnecting the transportation system with (upstream pipelines)</u> ..... **Output Upstream**

- In the territory of the state where the operator has its seat ..... **Output Upstream in**
- Outside the territory of the state where the operator has its seat ..... **Output Upstream out**

Give a list of all output transfer and metering stations interconnecting the transportation system with upstream pipelines with complementary information in accordance with the following model:
Output Upstream in (or out) / Country of the station with location/projected max. capacity inflow (million m3 per hour) / name of the producer - operator of upstream pipelines / geographical name of the metering station if there is one.

B- 4. <u>Output transfer and metering stations interconnecting the transportation system with a liquefying station</u> – a terminal for storing liquefied natural gas (in cases where natural gas is transported through a pipeline for liquefying) ..... **Output Terminal**

- In the territory of the state where the operator of the transportation system has its seat ..... **Output Terminal in**

- Outside the territory of the state where the operator of the transportation system has its seat ..... **Output Terminal out**

Give a list of all output metering stations interconnecting the transportation system with liquefying stations - terminals with complementary information in accordance with the following model:
Output Terminal in (or out) / Country of the station with location / projected max. capacity inflow (million m3 per hour)/name of the terminal / name of the operator of the terminal.

B-5. Output points from a collector connected to the transportation system or a liquefying station of a terminal or a gas storage facility ..... **Output Collector**

- In the territory of the state where the operator of the transportation system has its seat ..... **Output Collector in**

- Outside the territory of the state where the operator of the transportation system has its seat ..... **Output Collector out**

Give a list of all output transfer and metering stations at the output of the collector interconnecting the collector as a part of the transportations system with an adjacent transportation system or a liquefying station of a terminal with complementary information in accordance with the following model:
Output Collector in (or out) / Country of the collector's location / geographical name of the collector / name of the operator of the collector if different from the operator of the transportation system / Terminal or Upstream or Conn or Conn regional – depending on the type of connected facility and gas pipeline type / max. capacity outflow (million m3 per hour) / name of the operator of the collector if it is operated by another operator / name of the operator of the directly connected liquefying station - terminal or upstream pipeline or the operator of the connected transportation system.

B-6. Output points – metering stations for :

a) Distribution systems. .....**Output Regional**
Give their number and total output capacity – outflow (million m3 per hour)

b) Directly connected pipelines of end customers .....**Output Straight pipelines**
Give their number and total output capacity – outflow (million m3 per hour**)**

B-7. Output points – metering stations connecting the transportation system to a gas storage facility without the possibility of using the same metering equipment (reverse) for pumping from the storage

PLEASE ANSWER THE FOLLOWING QUESTIONS:

2.1. Are pressure losses of natural gas in the transportation system compensated:

- by the natural pressure gradient (pressure differential) and the initial energy of the source (mark PD)
- by compressor stations installed in this transportation system (CS/total number)

- by compressor stations in the previous transportation system (CSFin/total number)
- by compressor stations of the subsequent transportation system (CSFout/total number)

2.2. Is the transportation system exclusively used for transit across the territory of the state (mark TR) or at the same time for intrastate transportation (mark TRI)?

2.3. Give the proportion of the annual volume of transit transportation and intrastate transportation, e.g. 3.5: 1

2.4. Is the transportation system exclusively controlled by the control station of TSO or is its management subject to another, e.g. central control station? (Give their locations)

2.5. Does the transportation system have standby capacities for reasons of safety and reliability of transportation (yes, no)? If yes, estimate the percentage of the monthly spare capacity in the winter period with full load and at ten years' temperature minimum.

2.6. Is it possible to reverse the gas flow in the transportation system? Give the number of compressor stations where this reversal is possible.

II. RISK ANALYSIS

Definitions

Safety report

The safety report proves the introduction of a system of identification and prevention of serious accidents, a system of construction, operation and maintenance measures that minimizes the risk of an accident, the procedure and result of identification of sources of risks and prevention methods, and an information system ensuring provision of all required information both for prevention as well as internal states of emergency and for the external environment, which could be affected by the state of emergency.

The operator must provably provide its employees with the safety report, inform them about the risks of a serious accident, about preventive safety measures and their desirable behaviour in cases of emergency.

Risk analysis

The risk analysis evaluates the possibility and scope of failures and the probability of their occurrence, on the basis of determined symptoms monitored on-line or during periodic checks, and the impact of these failures or their removal on the operation or/and smoothness of natural gas transportation.

Emergency plan

The emergency plan is a document that describes all activities and measures to be taken in the case of serious breakdown aimed at mitigation of its impacts, mainly scenarios of response to a serious breakdown adapted to the local specific situation as well as time concurrence of several events.

There are usually two types of emergency plan: Internal emergency plan (within the site or facility) and External emergency plan (in the vicinity of the site or facility).

Qualitative risk assessment

Expert estimate on the basis of experience and input data concerning the probability of occurrence (frequency) of events and their impact on the operation.

Quantitative risk assessment

Calculation of losses due to damage to the equipment

PLEASE ANSWER THE FOLLOWING QUESTIONS:

3.1 Does the TSO keep a systematic overview of the equipment and parts of pipelines, damage to which can immediately endanger the transportation of natural gas? What pieces of equipment are included in the overview?

- 3.1.1. Pipeline system
- 3.1.2. Compressor station
- 3.1.3. Transfer stations
- 3.1.4. Metering stations
- 3.1.5. Underground gas storage facilities

3.2. Which executive body approves the elaboration of Emergency Plans in your country?

3.3. Does TSO have a methodology processed for identification and assessment of risks?

3.4. Is the elaboration of a Safety Report compulsory by law?

3.5. Specify the author/body of the safety report and who approves it.

3.6. Is Risk Analysis part of the

- 3.6.1. Safety Report
- 3.6.2. Emergency Plan
- 3.6.3. Inspection and Maintenance Plan

3.7. What method does TSO use to assess risks?

- 3.7.1. No systematic assessment
- 3.7.2. Systematic qualitative assessment, usually by means of an expert estimate and division into classes and categories
- 3.7.3. Systematic quantitative assessment, detailed numerical risk assessment.

3.8. Does TSO have available stand-by capacities (material resources and special equipment) for work with natural gas under pressure? How do they work?

3.9. Is the transportation system operated by TSO drawn in the Geographical Information System and to what extent? Are areas of increased risk identified there?

3.10. Are employees of the operator and supplier organizations systematically informed and trained about risks of the operation? In what form?

3.11. Is information about risk elimination measures requested by the competent public administration body? In what form?

3.12. What methods does TSO use to eliminate risks in areas with increased risk (describe):

- 3.12.1. Increased frequency of inspections

3.12.2. Additional inspection methods
3.12.3. On-line monitoring systems
3.12.4. Other, specify what type

3.13. Has TSO introduced a risk management information system?
3.13.1. Is this IS linked to the Geographical Information System?
3.13.2. Is this IS linked to the IS of operation and maintenance control?

3.14. Who operates the IS (specify) on gas transportation to and from neighbouring countries?
3.14.1. TSO
3.14.2. Market operator
3.14.3. Another organization, specify which.

III. LEGISLATION

PLEASE ANSWER THE FOLLOWING QUESTIONS:

4.1 Does any special national legislation exist in the area of breakdown prevention and risk management in transportation and storage of natural gas? Specify.

4.2 Is documentation of safety and reliability of the process system a binding condition for granting a licence to operate the transportation system?

4.3 Does the legislation include a requirement for obligatory insurance of the transportation system against the consequences of a breakdown?

4.4 Does your legislation deal with the responsibilities and competences of TSO in the sphere of solving risks and states of emergency. Through what legal act(s)?

4.5 What legal form is used by the state to ensure safety of gas transportation across its territory?
4.5.1. Legislative
4.5.2 Contractual

4.6 Does the legislation distinguish between multinational transportation (transit) across the territory of your state and intrastate transportation?

4.7 Do you find it suitable for the state to conclude contracts with the respective transportation companies on ensuring the reliability and safety of transportation?

4.8 Does the state have a monitoring system based on valid legislation whose task is to control imports, transit and exports of natural gas?

4.9 Specify the body that is authorized by your state's legislation to execute this monitoring system.

IV. DIAGNOSTICS, OPERATION, PREVENTION

Definitions:

Internal inspection

Internal inspection of the technical condition of the pipeline carried out by an intelligent sensor based on a magnetic or ultrasonic principle.

Stress-test:

Pressure test of pipelines carried out with water, used also to remove local tensions and oval shape of the cross-section.

Reliability Centred Maintenance (RCM)

Maintenance focused on reliability of the system and on breakdown prevention with a view to prolonging the life of the equipment and minimising the economic consequences of damage.

PLEASE ANSWER THE FOLLOWING QUESTIONS:

5.1 Has TSO implemented a system for planning and evaluation of preventive maintenance?

5.2 Has TSO introduced an information system for maintenance management?

5.3 Does the maintenance IS contain automatic planning of prescribed inspections and tests?

5.4 Has TSO introduced minimum standards for the operation of the transportation system
- 5.4.1 in maintenance
- 5.4.2 in operation
- 5.4.3 in states of emergency

Specify the basic technical standard (e.g. EN 1594) or legislative document.

5.5 Does TSO carry out systematic regular inspections of the technical condition of specified/ selected technical facilities of the transportation system? In accordance with what rules?

5.6 To what extent is cathode protection of the pipeline used? (specify %)

5.7 Does TSO continuously monitor parts of pipelines where the stray current often occurs and those with an increased risk of corrosion?

5.8 How often is stray current measured and by what method(s)?

5.9 Does TSO check the pipeline system by using internal inspection?
- 5.9.1 To what extent?
- 5.9.2 By what method(s)?

5.10 Does TSO check the external insulation of the pipeline system of the transportation system?
- 5.10.1 To what extent?
- 5.10.2 By what method(s) and how often?

5.11 What methods does TSO use to protect the transportation system against interventions of third parties?
- 5.11.1 Legislative, by determining protective zones
- 5.11.2 By air? How often?

5.11.3 With other technical means (specify)

5.12 Does TSO carry out pressure tests – stress-tests? To what extent?

5.13 What is the normal method of securing the missing capacity of transportation due to planned repairs or stress tests?

5.13.1 Spare capacity of a parallel line
5.13.2 Bypass
5.13.3 In other ways – alternative transportation through gas pipelines of another TSO (specify)

5.14 Does TSO use RCM procedures (Reliability Centred Maintenance)? In what facilities of the transportation system?

5.15 Are there automatic protection systems in the transportation system that close the pipeline at the nearest points in case of damage?

5.16 Does the transportation system have a standby capacity to ensure safety and reliability of gas transportation? Specify the standby capacity volume in %

- in summer – average day
- in winter – the day with maximum consumption.

5.17 Which parts of the transportation system are continuously monitored for the possible gas leakage? Specify.

5.18 Does TSO monitor the sulphur content in natural gas and the impact on the material? In what way?

5.19 Are there binding standards for the design, implementation and safe operation of the pipelines of the transportation system? Specify

5.20 What methods are used to determine the qualifications of supplier companies capable of carrying out special work (assembly, welding, etc.)?

5.20.1 ISO certification
5.20.2 National certification system
5.20.3 Other.

5.21 Are there supervisory bodies required by law whose duty is to supervise the operational safety of the gas transportation system? Specify

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