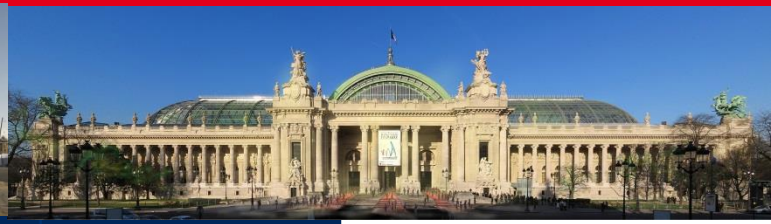
26th World Gas Conference

1 – 5 June 2015, Paris, France



NEW TRANSMISSION PROJECTS
STUDY GROUP REPORT

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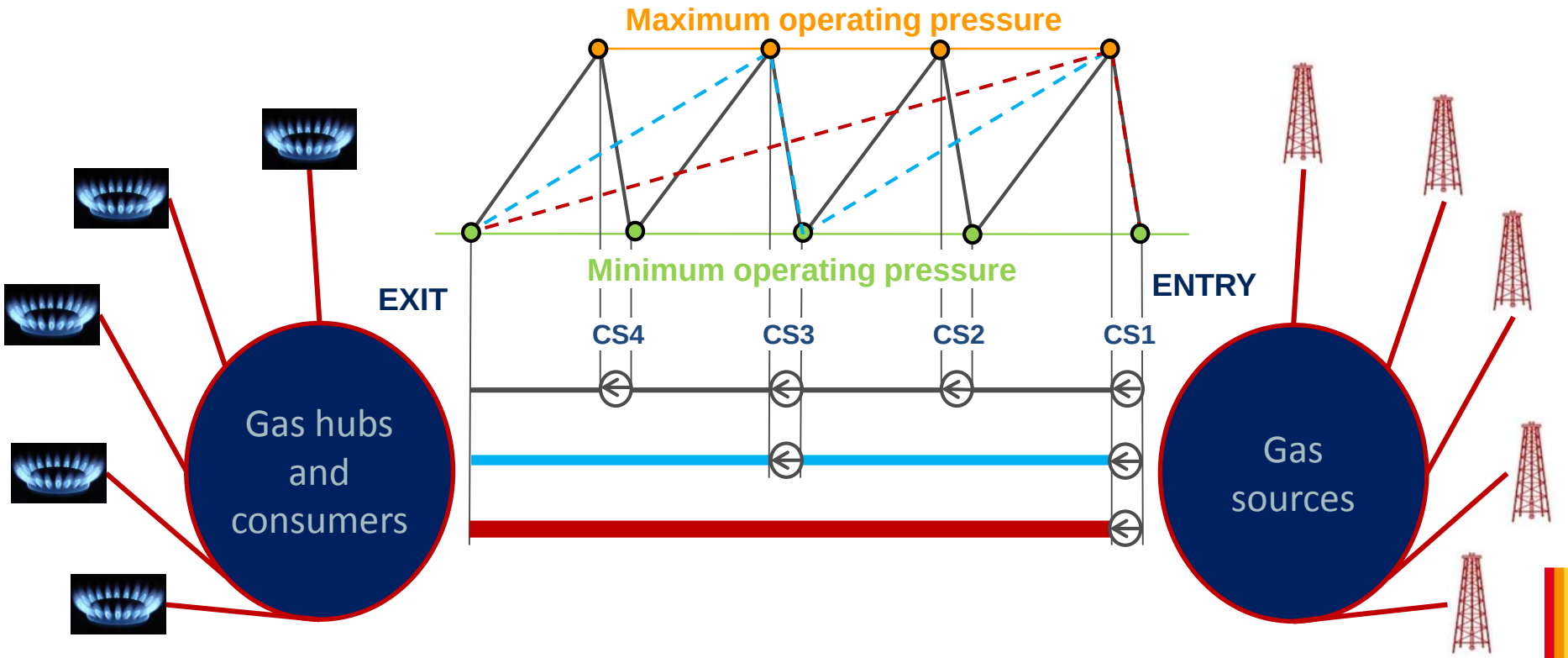
eustream, a.s.

IGU
WGCPARIS2015
WORLD GAS CONFERENCE

Gas Transmission



Gas transmission projects

Key points in the area of gas transmission infrastructures:

- Reporting of strategic transmission infrastructure projects;
- Studying of **improvements concerning the compression processes**, turbo machinery, performance optimization and emissions;
- Assessing the feasibility of construction of new **pipelines across the densely populated areas**;
- Dealing with the problems concerning **technology acceptance** and technical construction.

Key points in the area of public acceptance:

- Identification of the key **public actors / stakeholders**;
- Planning of **stakeholders management;**
- Management and control of **stakeholder engagement**;
- **Effective communication** with the public;
- Mitigation during and after technology construction.

Strategic Transmission Infrastructure Projects

Main gas supply corridors:

- Africa
- Europe
- Middle East
- Eurasia
- Asia
- Australia
- North America
- South America

Structure:

- Main gas corridors (to include the impact of new gas sources on gas the transmission infrastructure development)
- Detailed description of the selected projects (to include the promotion plans and the incentives for specific projects)

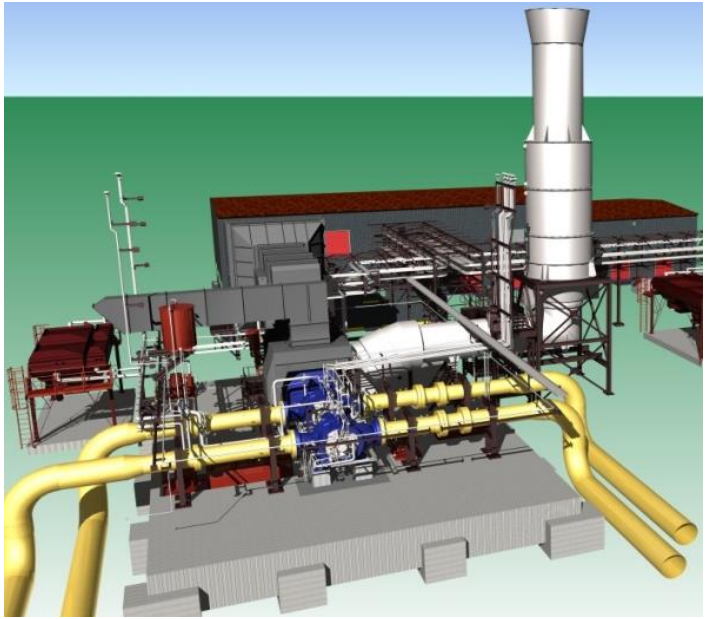
Strategic Transmission Infrastructure Projects

- The time of the big new-built pipelines in Europe is over; **there is a potential for development in Russia** (e.g. Eastern Gas Program), **Middle East and Asia**;
- "Walk the talk": **Keep promises given to people involved in projects**, with regards to compensation, benefits, local content, employment, etc.;
- Technical challenges can be solved; it´s a question of money and intelligence, anyway: **Do not underestimate efforts and time for permitting / ESIA processes / procurement**, which often bring a project on the critical path;
- A project is implemented locally; **bring local people into the project company**, use their special know how and domestic market intelligence;
- **Strong partnership between shareholders is important** - international projects with different shareholders ensure exchange of best practices and implementation of the latest technologies.

Improvements of the Compression Process

The focus of the research including the data collection and their analysis was on the following topics:

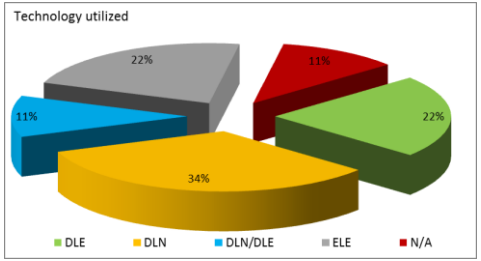
- To evaluate the **current level of both the compressor and drive efficiency** of machines installed during last years;
- To gather the information regarding **emission limits and gas turbine emissions decreasing**;
- To assess the total **power distribution of the compressor station to the particular units** including the backup philosophy;
- To compare **electric drive vs. gas turbine drive**.



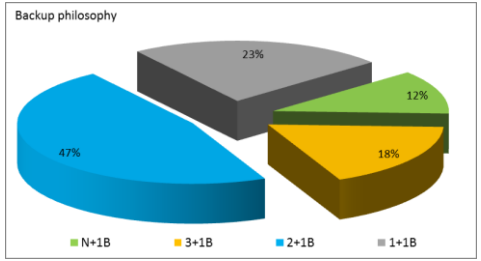
Responses were received from different countries, covering 22 compressor stations and 99 compressor units installations with total power 1146 MW.

Improvements of the Compression Process

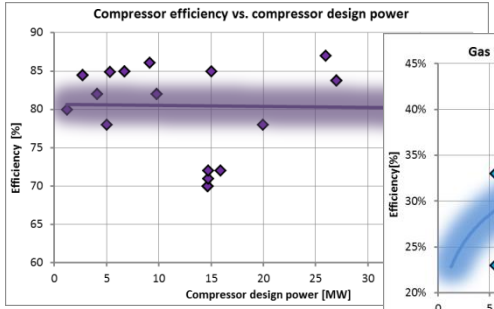
Emissions reduction:

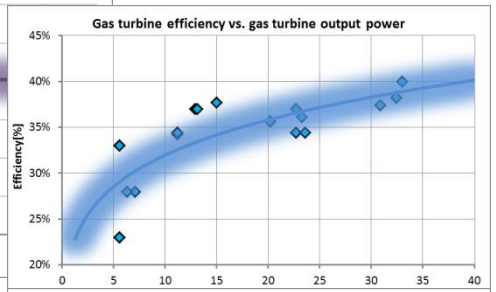


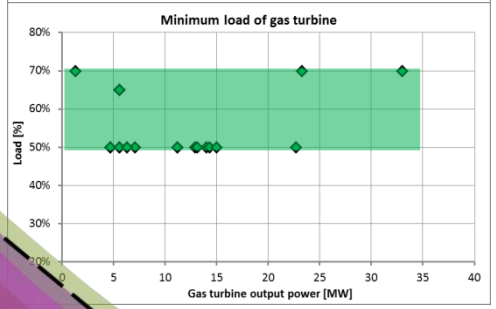
Backup philosophy:



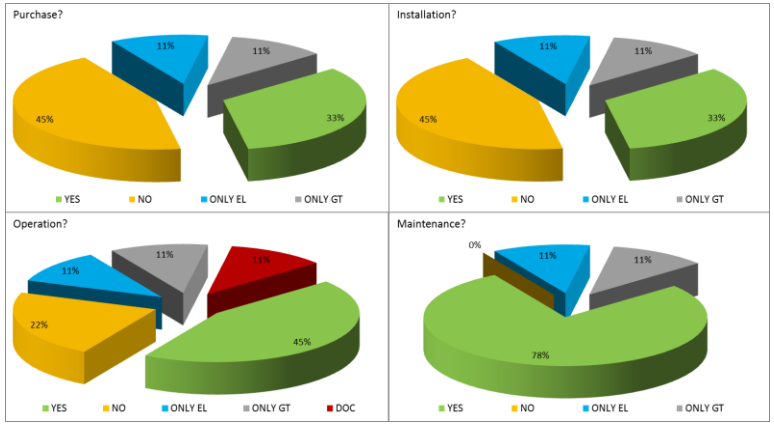
Efficiencies and min. load of gas turbines:



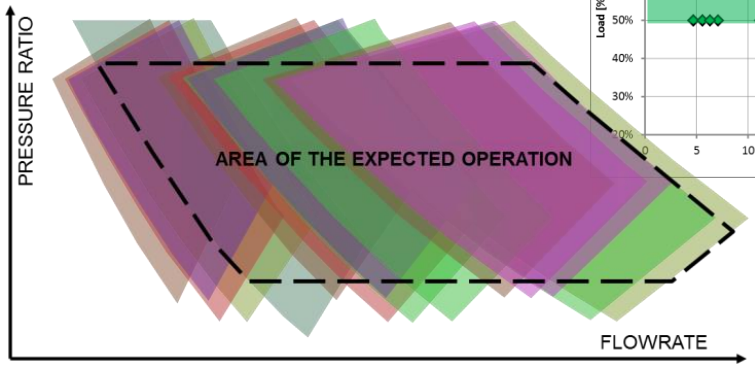




Electric drive vs. gas turbine drive:



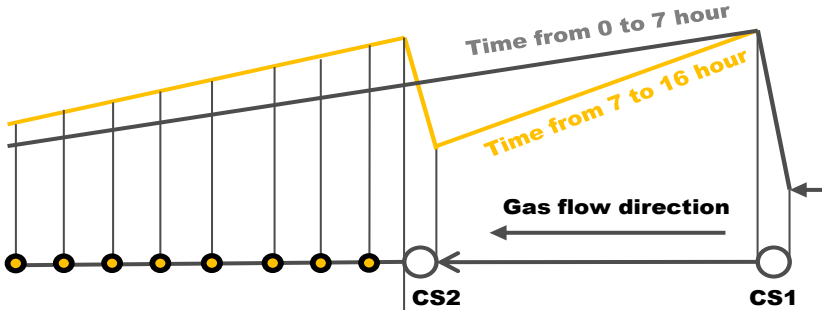
Power distribution:



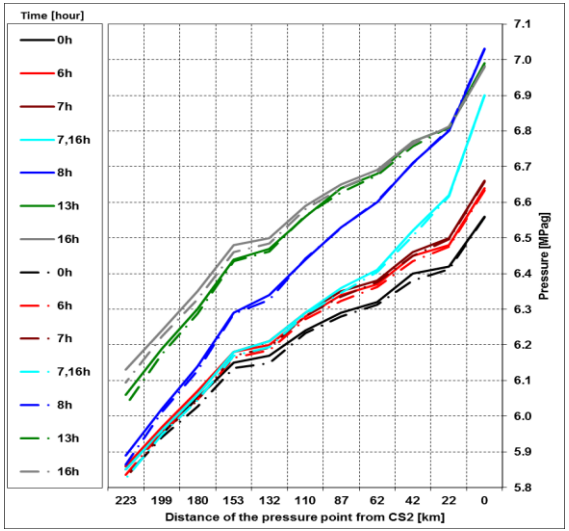
Improvements of the Compression Process

- To determine the proper working area of a compressor, first of all it is necessary **to identify its individual working points following expected modes of operation of the whole transmission system**, in which the compressor will work;
- According to distribution of working points, it is necessary to optimize compressor performance maps; **maximum efficiency of the compressor should correspond to the points where the operation is most likely to occur**;
- If the systems serving for **emission reduction (NOx and CO)** are used, a design should consider **limitation of working area of a compressor** due to limited area, in which these system are able to ensure low emissions;
- A design should clearly take into account **impact of ambient air temperature (summer/winter) on power of a gas turbine**.

Performance Optimization



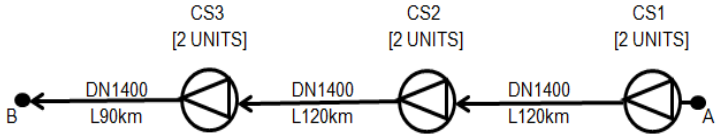
- Considering the complexity of the transmission systems, **hydraulic simulations are used for determination of key gas flow parameters**;

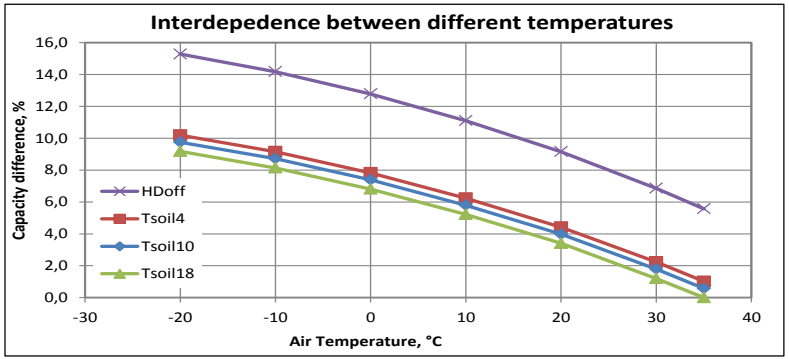


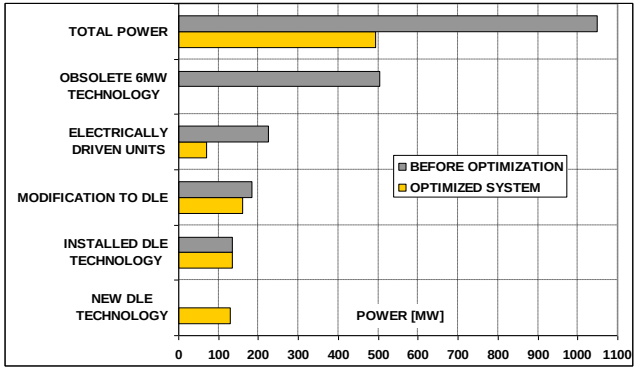
- Within the framework of this field, we have **compared the results of simulations (—) with real data (--)** from transmission system operation **for dynamic changes**;
- **Impact of the ambient air temperature and the soil temperature on technical capacity** of a model system with compression stations has been analysed;
- In terms of optimization, we focused on **reducing power necessary for gas transmission**, as well as optimum distance between the compression stations.

Performance Optimization

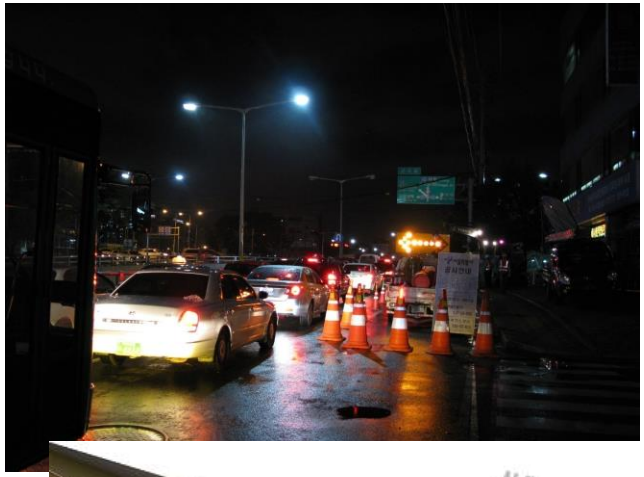
- When calculating maximum technical capacities, **it is very important to take into account impact of ambient air temperature on gas turbine power**, as the difference between the capacities of examined systems at air temperatures -20 °C versus 35 °C was approximately 9 %;
- In terms of **soil temperature** the difference at the temperatures of 4 °C versus 18 °C was approximately 1 % and such difference **doesn´t represent significant impact**;
- If required technical capacity of a system or nature of its operation is changed, the **optimization to new conditions** will be necessary.



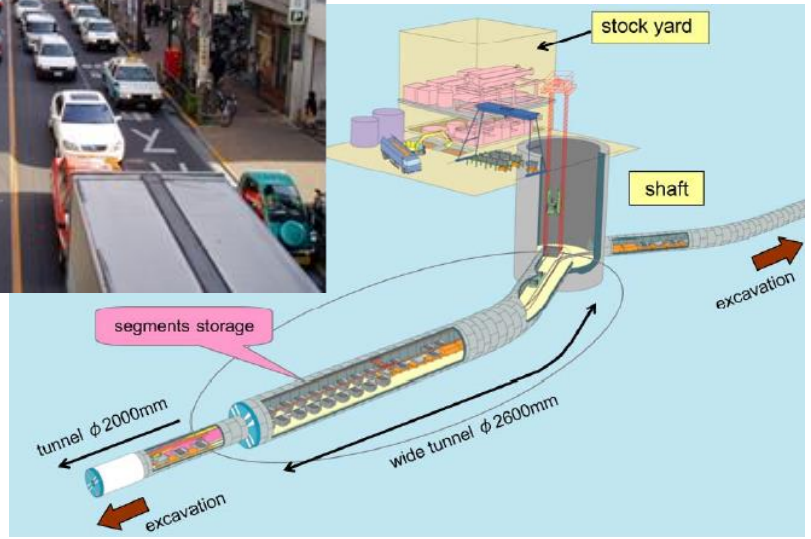


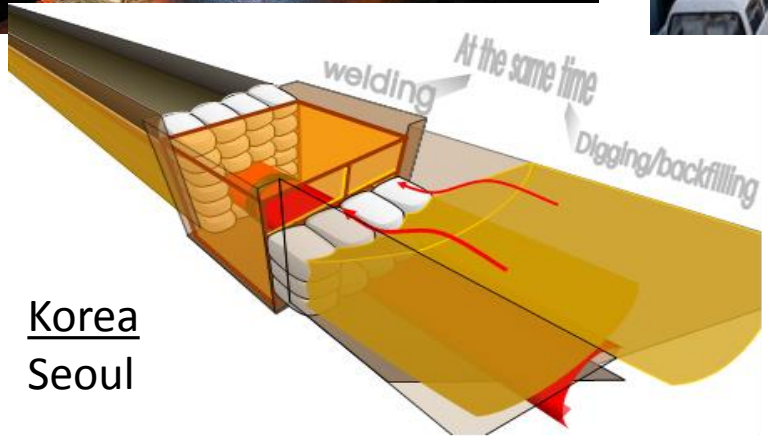


Construction in Areas of High Population Density



Japan
Tokyo





Korea
Seoul

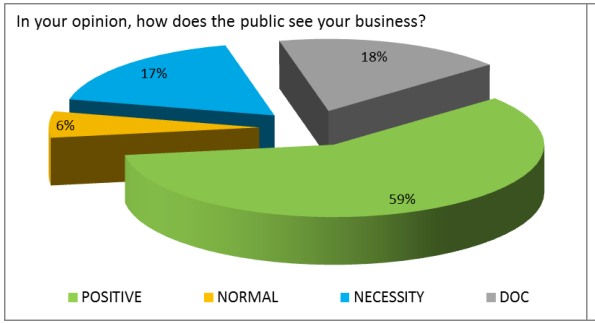
Alternative utilization of pipelines - CO2 transportation

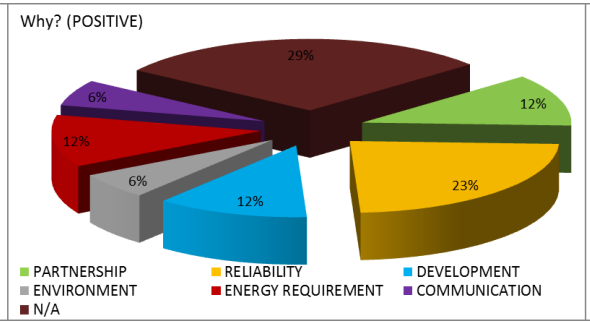
- The chance to **“re-use” existing natural gas pipeline for CO2 transmission doesn’t appear to be an option** because the minimum operating pressure for a dense phase carbon dioxide transmission (7.4 - 8 MPa) falls within the range of maximum operating pressure of the gas onshore networks (usually 8 MPa);
- Results of the transient simulation of the CO_2 pipelines indicate that the **CO_2 mixtures from different capture technologies show different dynamic behaviour during the pipeline transmission**;
- Considering the intermittency of renewable sources, it seems to be reasonable to assume **variable delivery rates of CO_2** in separation plants, since the fossil fuel based power plants will have to provide necessary swing capacity;
- Therefore, **detailed design of pipeline infrastructure for CO_2 sequestration should be on the premise that the flow is unsteady**.

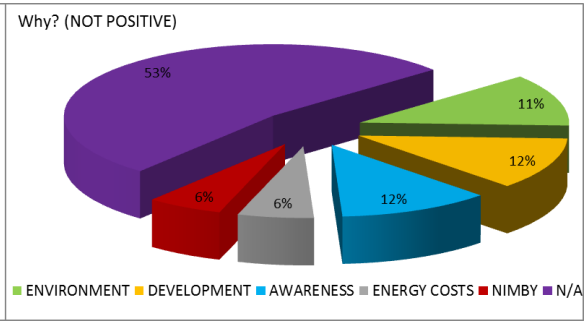
Public Acceptance of Technology

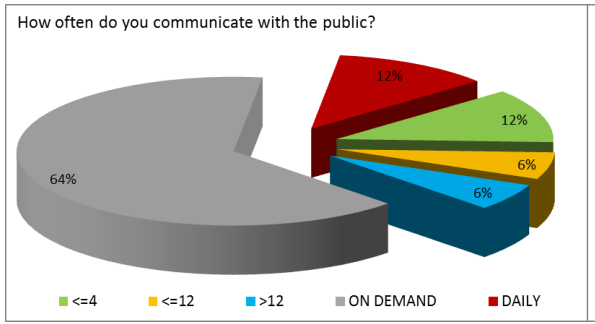
- To ensure **effective communication** with the public in all areas;
- To enhance **public support of the technology** and the **support of authorities and politicians to the specific projects**;
- To use the **advantage of the first impression** and to involve the public within the planning stage;
- To suppress or **reduce as much as possible the adverse impacts** of gas infrastructures on landscape, bio diversity, urbanization, archaeology and agriculture, through adopting the best practices;
- To **engage early in local discussions** about particular projects (e.g. at social networks) and present ourselves in a good manner;
- To keep an open-minded attitude and to **integrate lessons learned by other companies** in order to increase professionalism of the company.

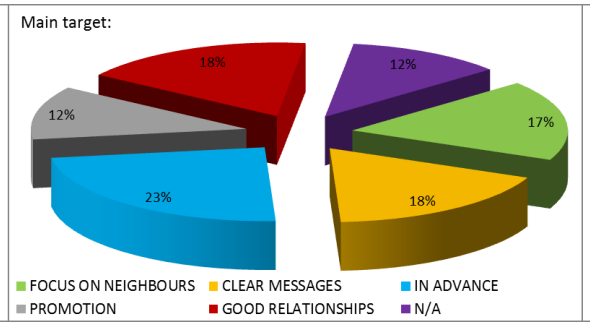
Public Acceptance of Technology

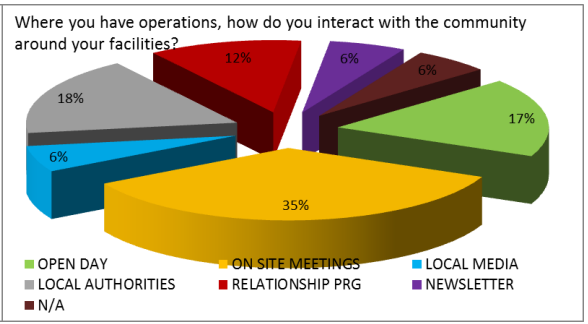












Public acceptance of technologies or technical construction is not easily visible; what is visible is the resistance of the public and its resistance to new infrastructure projects and their operation.

Study Group Members

Last Name	First Name	Organisation/ Company	Country
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We would like to thank all the study group members for their input and sharing of knowledge and best practices related to new gas transmission infrastructure projects.