

# Simulation and optimization of gas networks

*Gas transmission network modelling, simulation and optimization (GANESO)*

H2020 SOCIETAL CHALLENGES: Secure, clean and efficient energy

PRODUCTIVE SECTOR: Energy and Environment

## MATHEMATICAL AND COMPUTATIONAL METHODS

### PROBLEM DESCRIPTION

Research and development on the integrated and optimal management of natural gas transmission infrastructures.

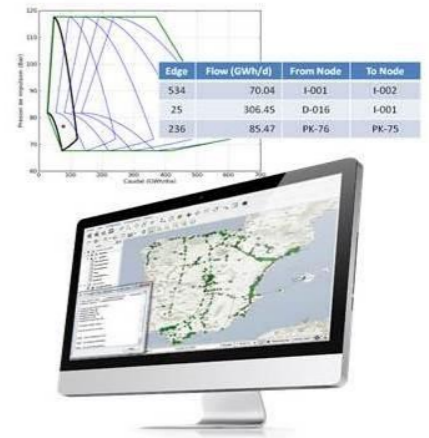
### CHALLENGES AND GOALS

Development of GANESO software, an IT tool that allow clients to interactively obtain optimal distribution of the gas flow based on different criteria, tariff calculation, simulation in transient conditions, and network expansion planning under uncertainty.

- Steady-state and transient-state simulation.
- Steady-state optimization.
- Modelling with numerical simulation physical processes.
- Planning under uncertainty using stochastic programming.
- Calculation of network access tariffs.
- Parallel computing.

In order to optimize the gas transport network, a two-stage procedure has been developed:

- Disregarding some second order physical effects, a first algorithm obtains an initial solution, which is used to configure the network (compressor stations, PCVs,...). Based on Sequential Linear Programming techniques.
- A second algorithm refines the previous solution with the aid of a simulator. Based on Control Theory techniques.



National Natural Gas Network represented in the graphic interface of the GANESO software

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## Results and Benefits

GANESO allows to study the use of current infrastructures, optimize them and assess the investment in future infrastructures, enabling, in this sense, users to make decisions regarding management and expansion of gas transportation networks.

The software helps when making strategic decisions for the company, which reduces costs. In addition, it is competitive with existing commercial tools since it presents a great advantage for the company: control over future developments, tariff calculations and can incorporate new features on demand.



Configuration of a case study of the Spanish Gas Network

**Design and development of an innovative simulation and optimization software (GANESO) based on a new techniques of mathematical programming and applied mathematics.**

**Decision making tool.**



Spanish Network for Mathematics & Industry (math-in)



Name of the company