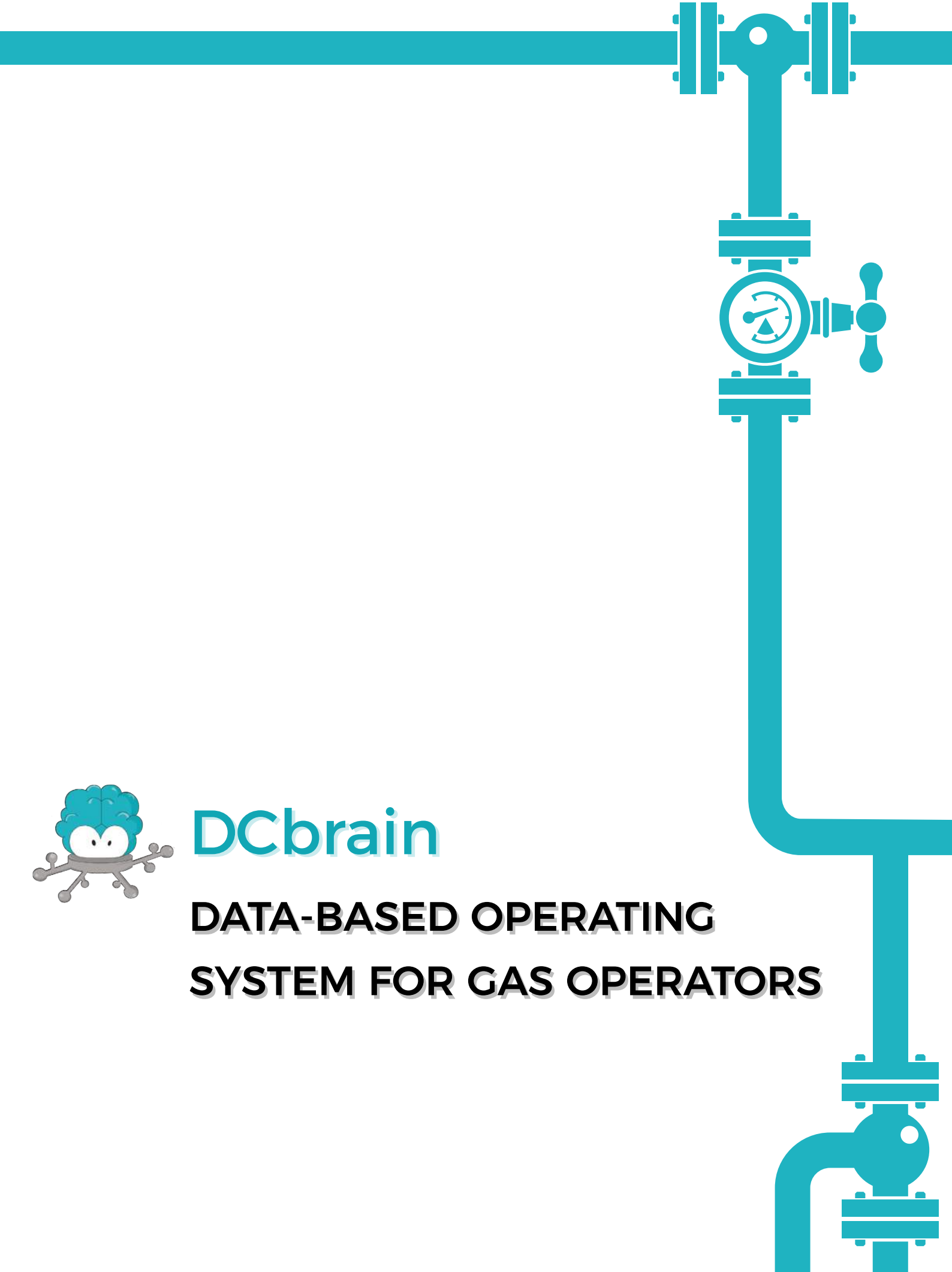


**DCbrain**

**DATA-BASED OPERATING  
SYSTEM FOR GAS OPERATORS**



# INTRODUCTION

The gas industry is widely known for its complexity, its risks and for having expensive and capital-intensive assets. On top of that, with the growing need for renewables and with new actors entering the ecosystem, today's gas Transportation and Distribution networks are changing at an unprecedented pace. According to a **McKinsey Report** "Why oil and gas companies must act on analytics", the main reason why Oil and Gas industries are experiencing performance gaps is because of their operational complexity of production and processing facilities. This has pushed gas network managers in a race for digitalization and innovation with one word in mind: Data. The gas industry is now dumping its old static and time-consuming network steering tools to go with a data-driven approach, allowing them to cope with great complexity in the simplest way.

Challenges for gas Transport and Distribution network managers are about both the build-up and the running of the networks : How to better predict in and out flows, how to better regulate all the points in the Transport and Distribution network, how to detect propagation anomalies, how to better manage your assets.... These challenges are now integrated and solved with what we call at DCbrain "**DB GMS**" (**Data-Based Gas Management Systems**).

By gathering the millions of measures coming from the sensors distributed in the network, these tools allow operational teams to have quick and deep insights and recommendations on their networks functioning through digital twins. **DB GMS** are themselves evolving and are now integrating **Artificial Intelligence** to simulate scenarios, analyze their impact and find optimum paths in the gas network.



<sup>1</sup> <https://www.mckinsey.com/industries/oil-and-gas/our-insights/why-oil-and-gas-companies-must-act-on-analytics>

<sup>2</sup> Model-based EMS tools are based from data-sets entered manually by operational teams. They provide recommendations for the regulations on active points in the network based on the in and outflows of the network. These tools work with static thresholds alarming systems and therefore often lack flexibility and are time-consuming.

# DCBRAIN: MAKING GAS NETWORK SMARTER !

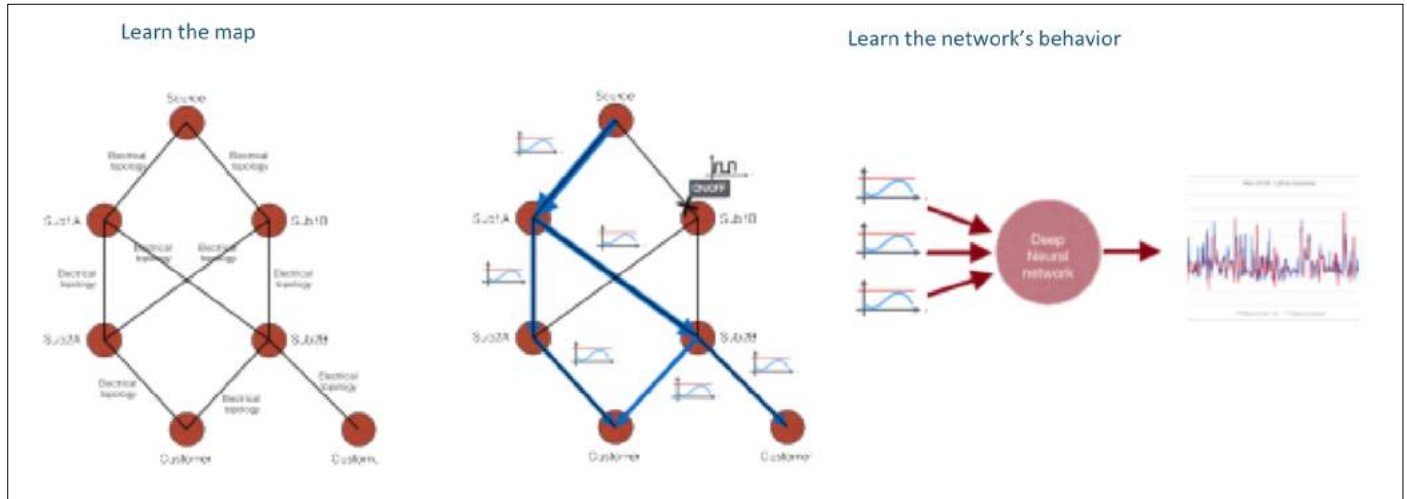
DCbrain is a software editor dedicated to industrial managers. **By using relevant data on networks and combining it with artificial intelligence, DCbrain allows networks operators to visualize, analyze and simulate scenarios** in their networks for optimized exploitation processes, consumptions and for a stronger reliability of their flows. This tool has proven itself relevant for both the exploitation and the building of networks.

As compared with traditional model-driven network management systems which are relying on static physical rules, DCbrain technology is data-driven, meaning the understanding of the network is made in real-time through data.

**"As compared with traditional model-driven network management systems which are relying on static physical rules, DCbrain technology is data-driven"**





This unique technology combines graphs (for a real-time network mapping) with artificial intelligence (for an understanding of the network's behavior). From several historical data-sets, DCbrain's deep flow engine learns the network yield's function and finds the optimum tuning.

## DCBRAIN : KEY PRINCIPLES



*Our technology is based on graph data Bases and Artificial Intelligence*

## OUR TECHNOLOGY IS USED ON SEVERAL USE CASES :

-  - Consumption prediction
-  - Network fine tuning with prescriptive recommendations
-  - Network simulation (integration of a new point, maintenance simulation)
-  - Asset Management



# SOME EXAMPLES OF DB GMS IMPLEMENTATION

## “ A CASE FOR A NETWORK EXPLOITATION : COMPRESSOR OUTPUT OPTIMIZATION : TIGF

TIGF is one of the two operators of the gas transmission network in France with GRTgaz (which manages the network outside the southwestern part of France). The company is also specialized in the storage of natural gas. **TIGF transmission network comprises more than 5,000 kilometers**, or 16% of the French network of major transmission pipelines, and six compressor stations. TIGF also manages two underground natural gas storage sites in Lussagnet and Izaute, representing 24% of France's gas storage.

On a daily basis, **TIGF plans its gas** movement management program according to inflows and outflows previsions. **TIGF tries to improve its OPEX (mainly electricity and gas consumption) of its compressors, installed along its gas pipelines, and on its gas storage sites.**

This activity is processed by the Transport and Storage operational units, which are responsible for the good injection and delivery of gas to industrial clients or Gas DSOs.

In order to do so, these teams are using an outdated Excel Macro, with the following functionalities :

- Manual integration of the data: Network topology (network structure), consumption patterns, in and outflows of biomethane distributed in the network :
- Calculation of use rate for each compressor



TIGF now wants to improve this process, with the goal to better tune the different compressors, and thus improving its energy efficiency (electrical and gas). One of the key elements was to learn the output curve for each compressor based on historic databases and automatically propose the right com-

pressing mix for a specific demand. TIGF wanted a complete Gaz Management System, including the following functionalities :

- Tuning parameters calculation
- Impact analysis in terms of cost and CO2 emissions
- Maintenance operations simulation, and impact analysis on tuning parameters
- Scenario benchmarking
- Automatic report generation
- Historic Data DataMining

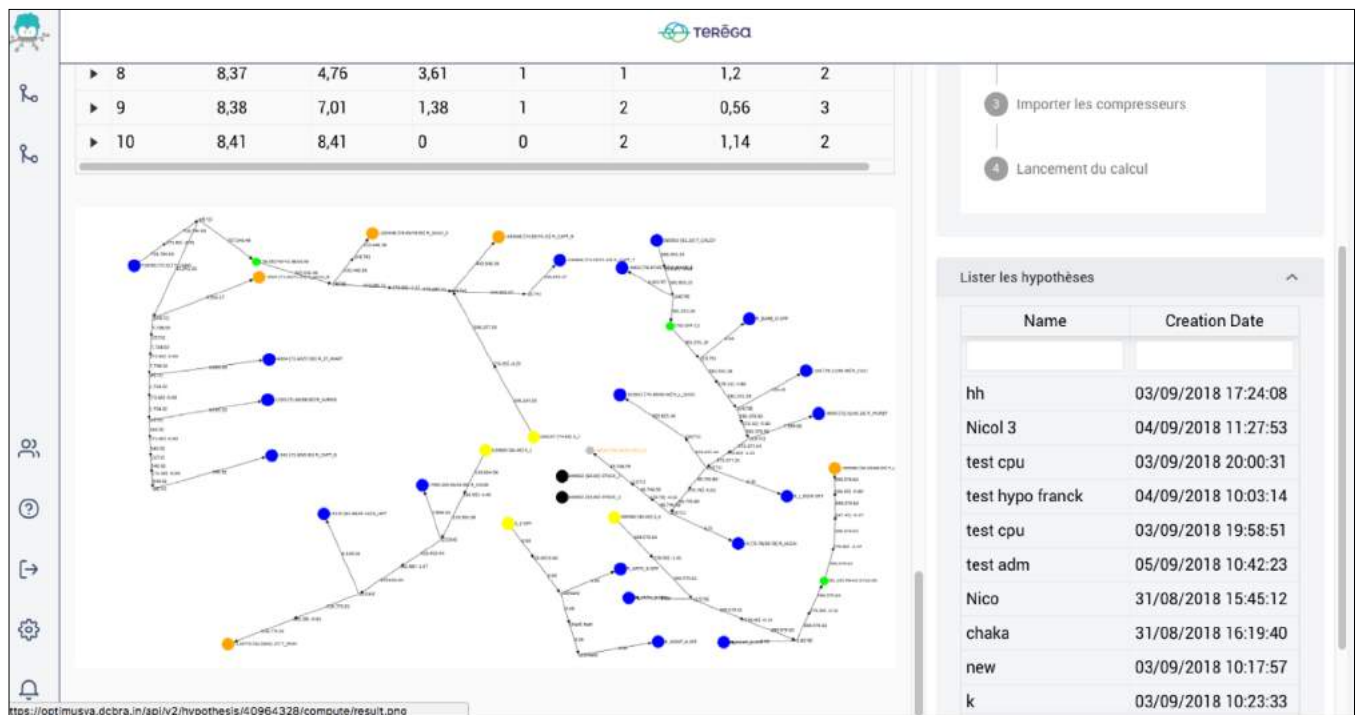
**" TIGF also wanted a tool that could be used by both the transport and the storage team ".**



### Results

After only 3 months of deployment, both teams have access to an ergonomic tool, able to :

- Identify compressor output optimum, based on data
- Better fine tune compressors use rate, depending on gas demand

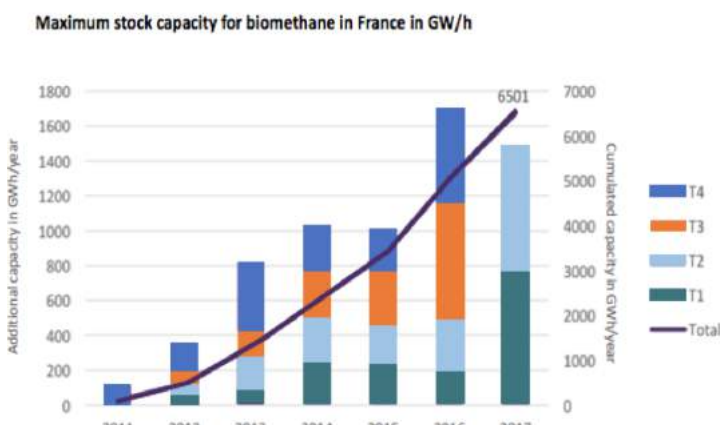


Interface example

## “ A CASE FOR A NETWORK BUILDING : EASY INTEGRATION OF BIOGAS FOR A GAS DISTRIBUTION COMPANY !

DCbrain's latest use case with GRDF, Europe's largest gas distributor, illustrates well the breakthroughs data-driven management systems are providing to network operators in a context of growth. This use case is placed at the heart of a national challenge: the integration of biogas as a major source of energy in France, representing a great source of renewable energy. Yet, France has shown itself quite slow in its development as compared to its European neighbors. In fact, a EurObserv'ER study shows that France injected 5,8 TWh of biogas in 2015 as compared to the 102,3 TWh injected by Germany. In that sense, the French government has set the objective to considerably accelerate the development of biomethane installations in its territory. With 35 installations in 2017, the goal is to reach 1000 in 2020.

In line with the government's objective, GRDF is getting ready to integrate this increasing number of biomethane injection points in its biogas distribution network that involves the farmers and manufacturers producing and processing their biomethane from their daily wastes. Each additional injection point is subject to technical and financial studies which are conducted by regional engineering offices. These regional engineering offices define GRDF's entire integration process for every new biomethane injection points and play therefore a critical role in the company's objective.



Biomethane farm

With the ambition to reach its global goal, GRDF wanted to make this process easier and faster! That's why they approached DCbrain!

GRDF had accumulated a significant number of projects ready to be launched. Adding to this the company's legal obligation to perform a prefeasibility study of any bio gas project in less than 2 weeks, the need seems clear: Optimize GRDF engineering processes in terms in of time consumption and accuracy

### THE NEED FOR A FASTER APPROACH!

GRDF could not continue using traditional model-driven tools and go forward with this new state objectives. These feasibility studies aimed at addressing two key issues pertaining to GRDF's biomethane network exploitation:

- 1) Does the consumption for each region of the network allow the integration of a new biomethane injection point?
- 2) How to minimize the costs of each additional connection in the biomethane network?

This implies finding the optimum rerouting scenario depending on the length of the connections and

the capacity of GRDF's existing exploitations. On top of that, the distributor must assure the feasibility of remeshing each biomethane production unit with each-other in the network.

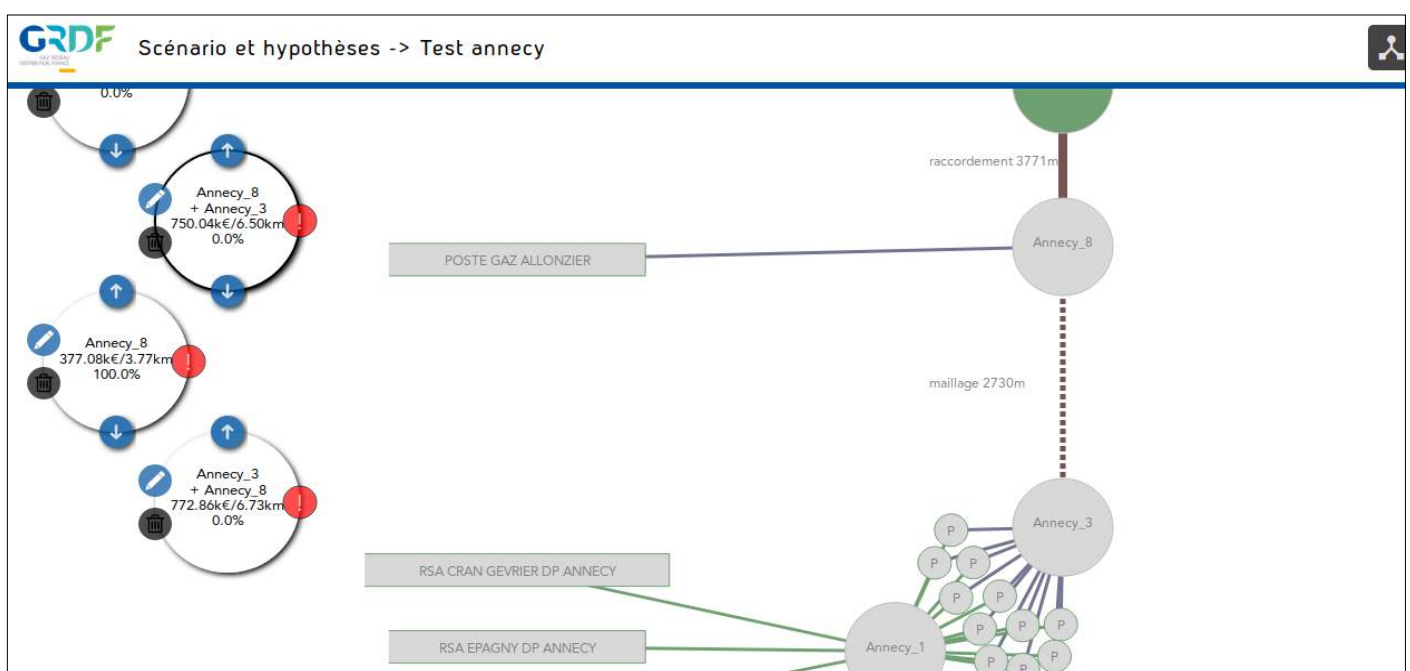
Originally, GRDF's dedicated research department's analytical tools were too timely, generic and non-automatized. Considering GRDF's objective of increasing its number of cases studies in their biomethane network, these tools had to be replaced.

### TOOL IMPLEMENTATION

DCbrain intervention's aim was to provide GRDF a data driven simulation tool to improve these regional engineering offices' studies processes. DCbrain used the OSRM engine (Open Source Routing Machine) to crunch graphical data from the road and gas network and upon these, will find the optimum transportation path (prioritizing fast and large roads that facilitate circulation).

### Results

Thanks to our technology, GRDFs' engineers now reach their global goal, avoiding any bottlenecks in terms of feasibility Studies. The analyses are made based on detailed data, the range of scenarios simulated has increased and the network processes are easily visible in an intuitive graph!



GRDF's biogas network digital twin interface.

# GOING FORWARD IN DB GMS : OUR CONVICTIONS !

Those 2 projects are amongst many others on how data can elevate the gas distribution and transportation industry in their missions for being environmentally friendly and in the same time greatly improve operational efficiencies. Data-driven tools are proving themselves highly efficient in optimizing the exploitation of gas networks, maintaining assets, defining scenarios of capital expenditures or finding the optimal regulations for compressors. DCbrain has acquired expertise in this field and has dealt with many specific problematics in this context.

One key aspect of this transformation is about people and culture. Major companies like GRDF, GRT or TIGF generate millions of data on a daily basis and must value them through analytical tools to evolve along with their fast-moving environment. Although data and technology are critical in the success of these evolutions, they do not represent the biggest challenge for organization. Enabling capabilities and organizational culture also play a critical role. Many companies, although open to change and experimentations, often have difficulty in coping with structural change in their organization. To evolve, these companies should therefore be ready to fully implement the changes initiated by companies like DCbrain through strong communication and cultural change.

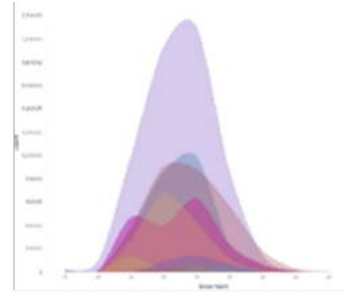
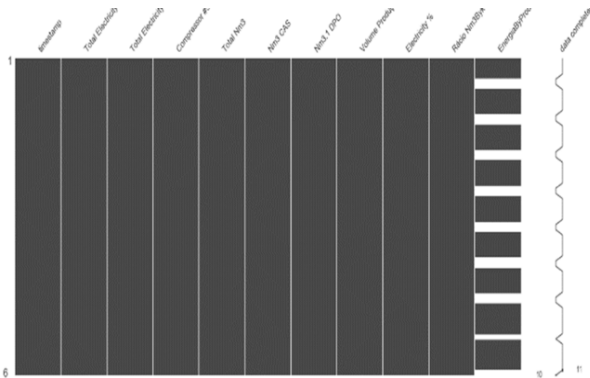
## What we learnt from these projects !

In order to overcome those challenges, we are now convinced that a data driven project 'success rely on 2 key components :

- A thorough Data Audit, able to identify quickly which data set can be used in the short/ middle / long term.
- The need to integrates users from day one, to ensure a good integration into every day's processes.



## “ THE DATA AUDIT IS A MUST HAVE IF YOU WANT TO GAIN VALUE FROM YOUR DATA !



Data Audit example (missing time stamps identification)

A great part of DCbrain's work relies on giving consistency in the company's data-sets. For example, for GRDF, data on biomethane consumption would come from unknown sources or some cities would have different names. We therefore have used an automatic testing system to process such data which was particularly long as the data audit had to be done on a national scale.

The agile methodology is a process under which re

quirements and solutions for the software development continuously evolve through the collaborative effort of self-organizing and cross-functional teams. Leaving aside the need for formalized specification needs, this methodology has allowed DCbrain to make ongoing arrangements for newly identified functionalities during the project.

The ambition is to shorten and ease the deployment phase!





## Contact

Feel like there is opportunities for you to go forward with DBGMS ?

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