



Using PI AF and PI Analytics to Satisfy Demand Fluctuations with Minimum Operational Expenditures

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I- GRTgaz



Key Figures 2014

- ❑ 32000 km of pipelines
- ❑ 599 MWh of Installed capacity with 27 compressor stations
- ❑ 640 TWh traded at Points of gas exchange
- ❑ Customers:
 - 129 customers shippers
 - 17 Distribution network operators connected
 - 802 industrial customers connected including 12 gas-fired power plant

I- A gaz system player

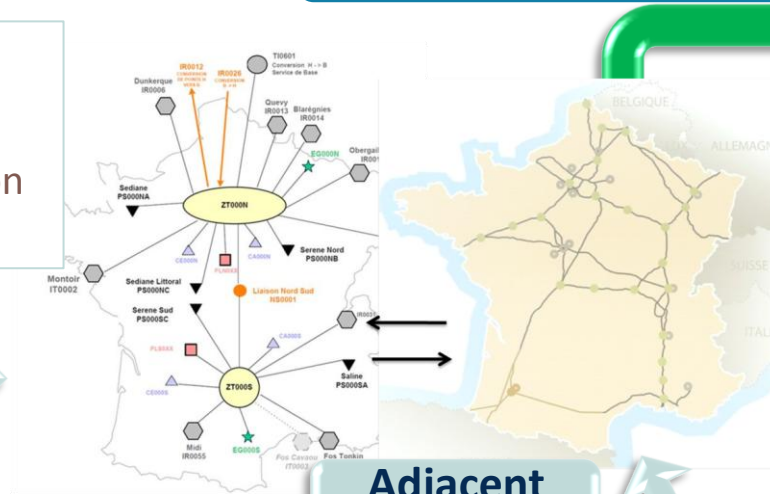
Shippers

- Nominations
- Confirmations
- Contractual balancing on a daily basis.

Industrial
consumers

DSOs

The Gas System = Gas + Network + IT



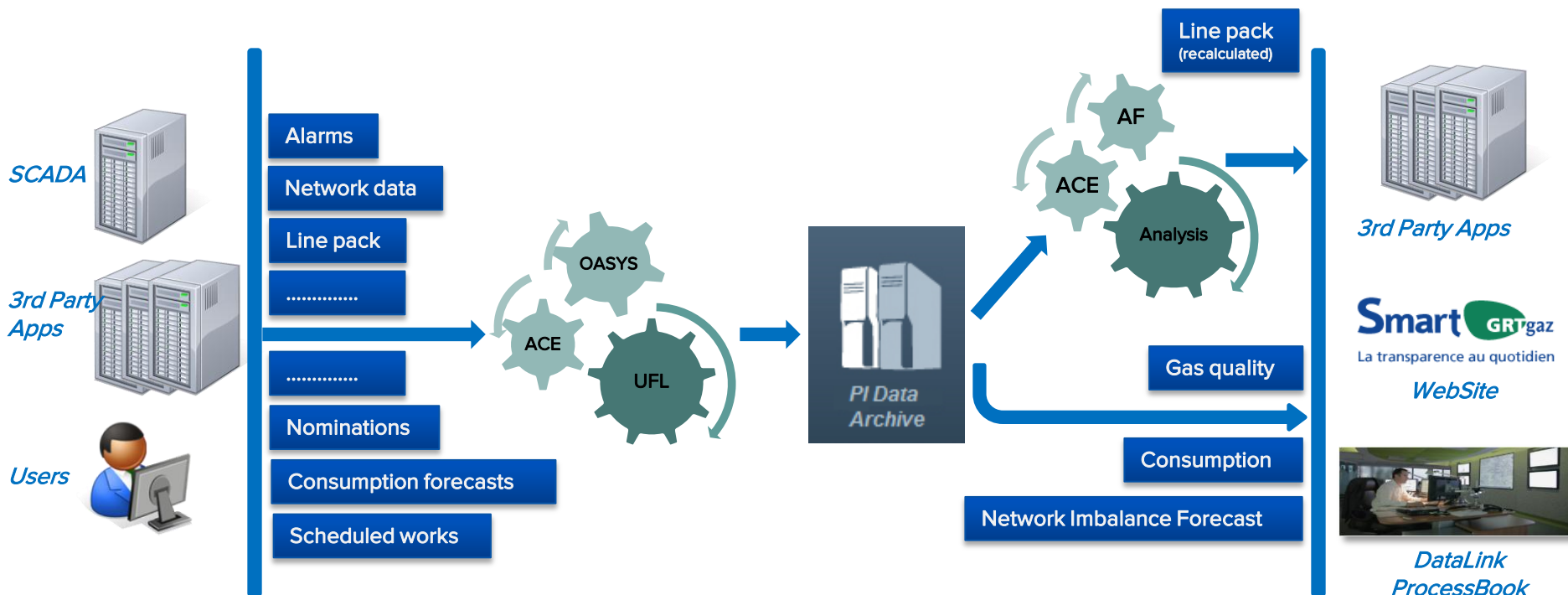
GRTgaz

- Transportation in accordance with the shippers nominations
- Own consumption forecasts
- Management of the residual balancing
 - on a daily basis
 - on an hourly basis.

**Adjacent
operators**

- TSOs
- LNG terminals
- Storage facilities

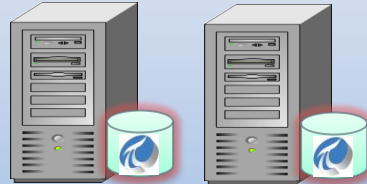
II - An Integrated PI System



II - GRTgaz : An integrated PI System

PI Server Collective (1 million tags)

Primary Secondary



PI AF Server Collective

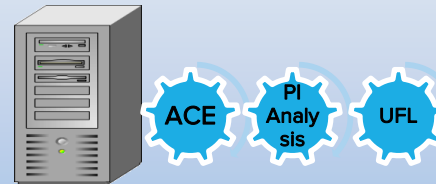
Primary Secondary



PI Server (200 000 tags)



Analysis Server



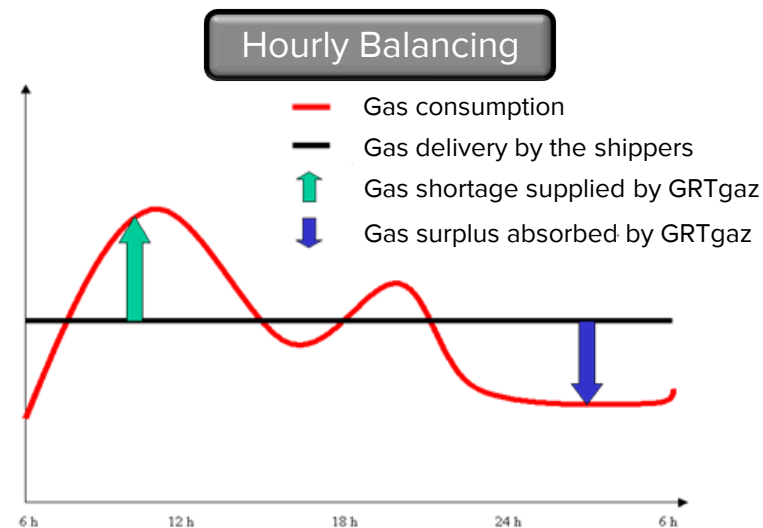
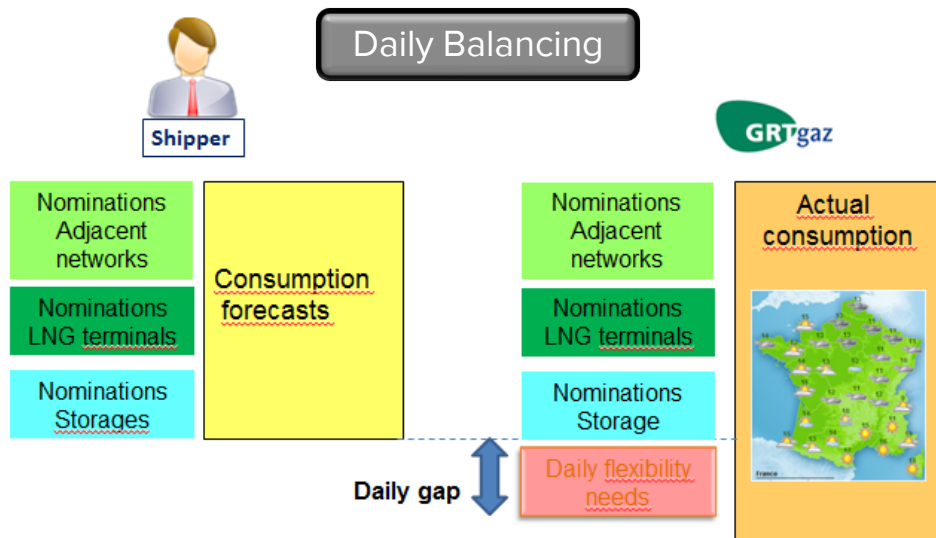
III – Business Challenge

Role of the National Dispatching : **Daily and Hourly balancing of the gas system**

Challenge :

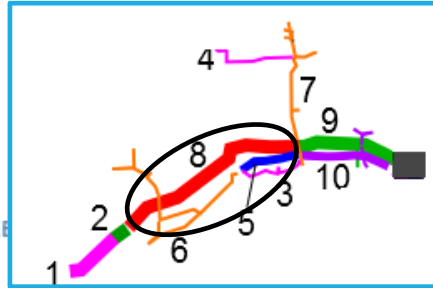
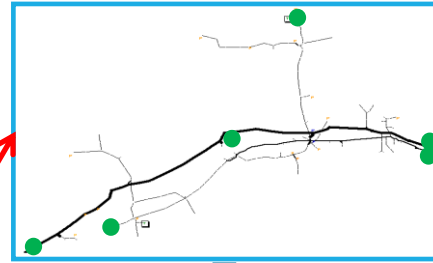
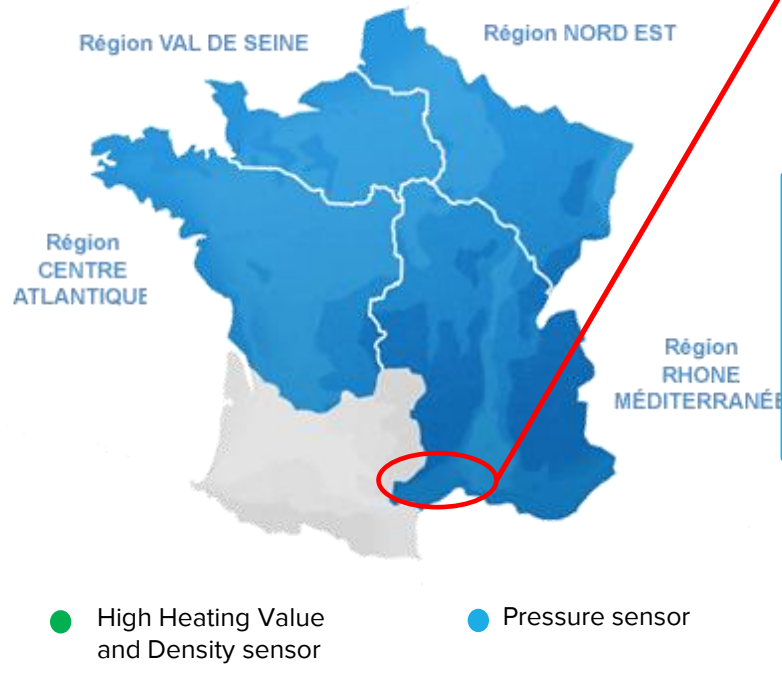
Increase the accuracy of the Line Pack real time calculation

Improve knowledge of the system boundaries



IV – The calculation solution

The Grtgaz network is divided into 4 operating areas with each about 15 sub-networks.



Model's Hypothesis

A Sub-network : set of pipelines with homogeneous higher heating value and gas density

Block : set of pipelines with homogeneous pressure

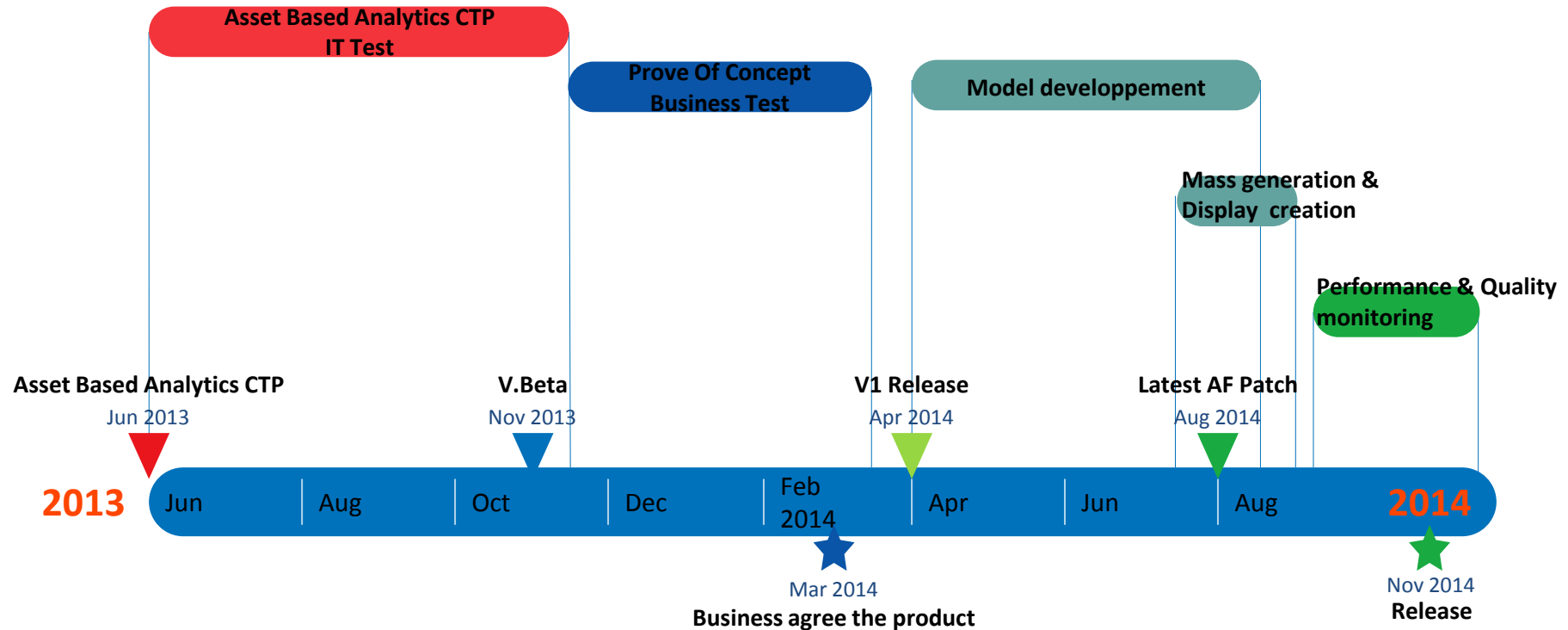
$$Z = f(HHV_{ave} ; Density_{ave})$$

$$LP = f(Pressure_{ave} ; Z)$$

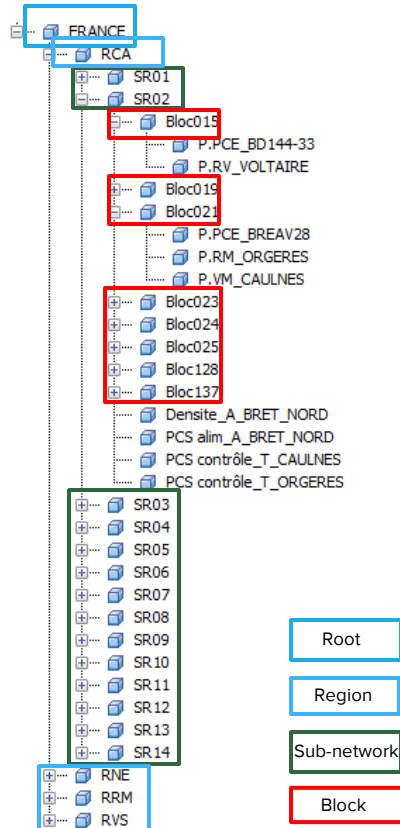
figures:

- 60 sub-networks
- 500 Blocks
- 1500 pressure sensors
- 250 HHV sensors
- 150 density sensors

V – IT Implementation



VI – The IT solution



Library

- Test_ABACUS
 - Categories
 - Analysis Categories
 - Attribute Categories
 - Element Categories
 - Reference Type Categories
 - Table Categories
 - Templates
 - Element Templates
 - Bloc
 - Densite
 - FRANCE
 - PCS alim
 - PCS controle
 - Pression
 - Région
 - SR
 - Event Frame Templates
 - Model Templates
 - Transfer Templates
 - Enumeration Sets
 - Reference Types
 - Tables
 - Table Connections

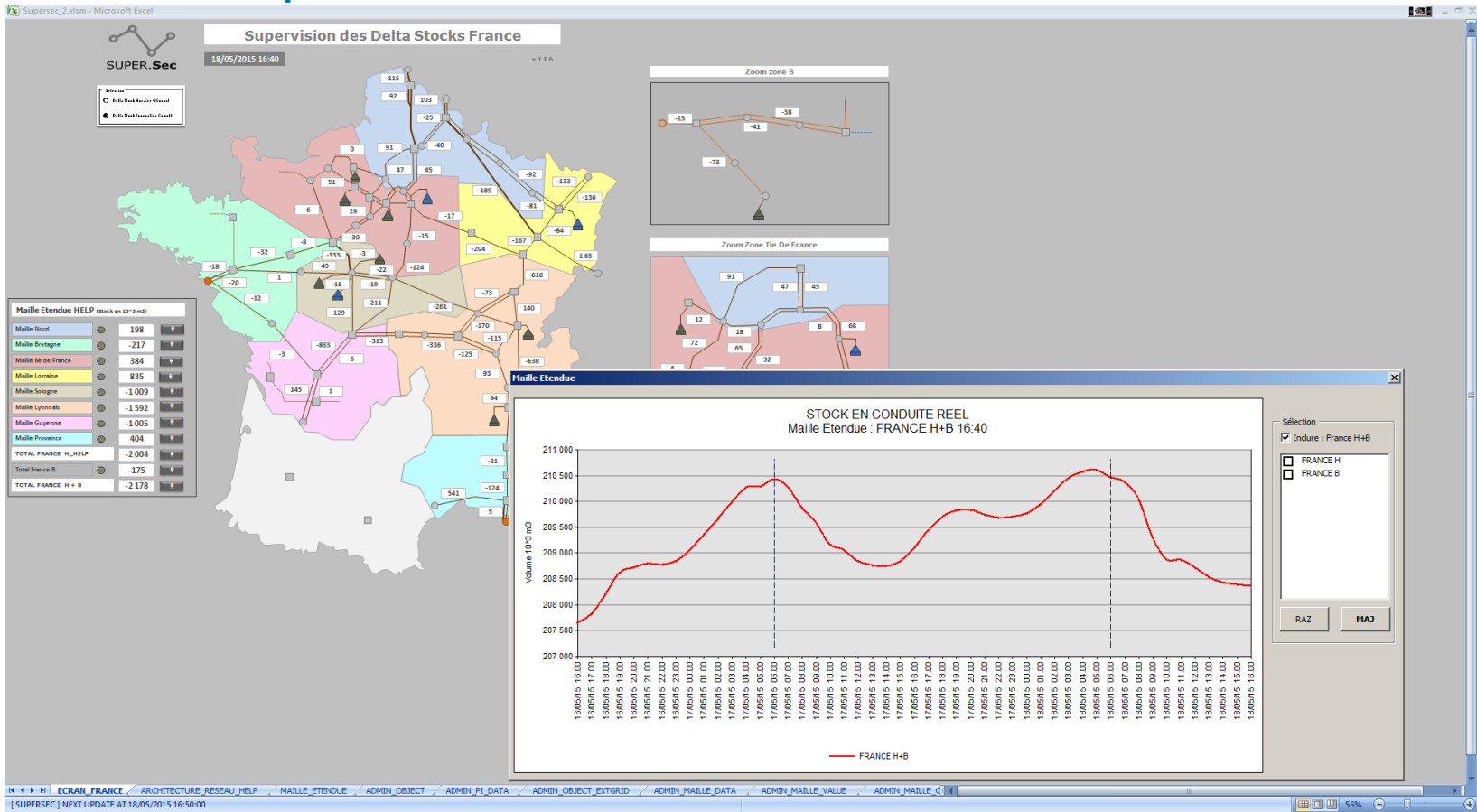
Bloc

General Attribute Templates Ports Analysis Templates

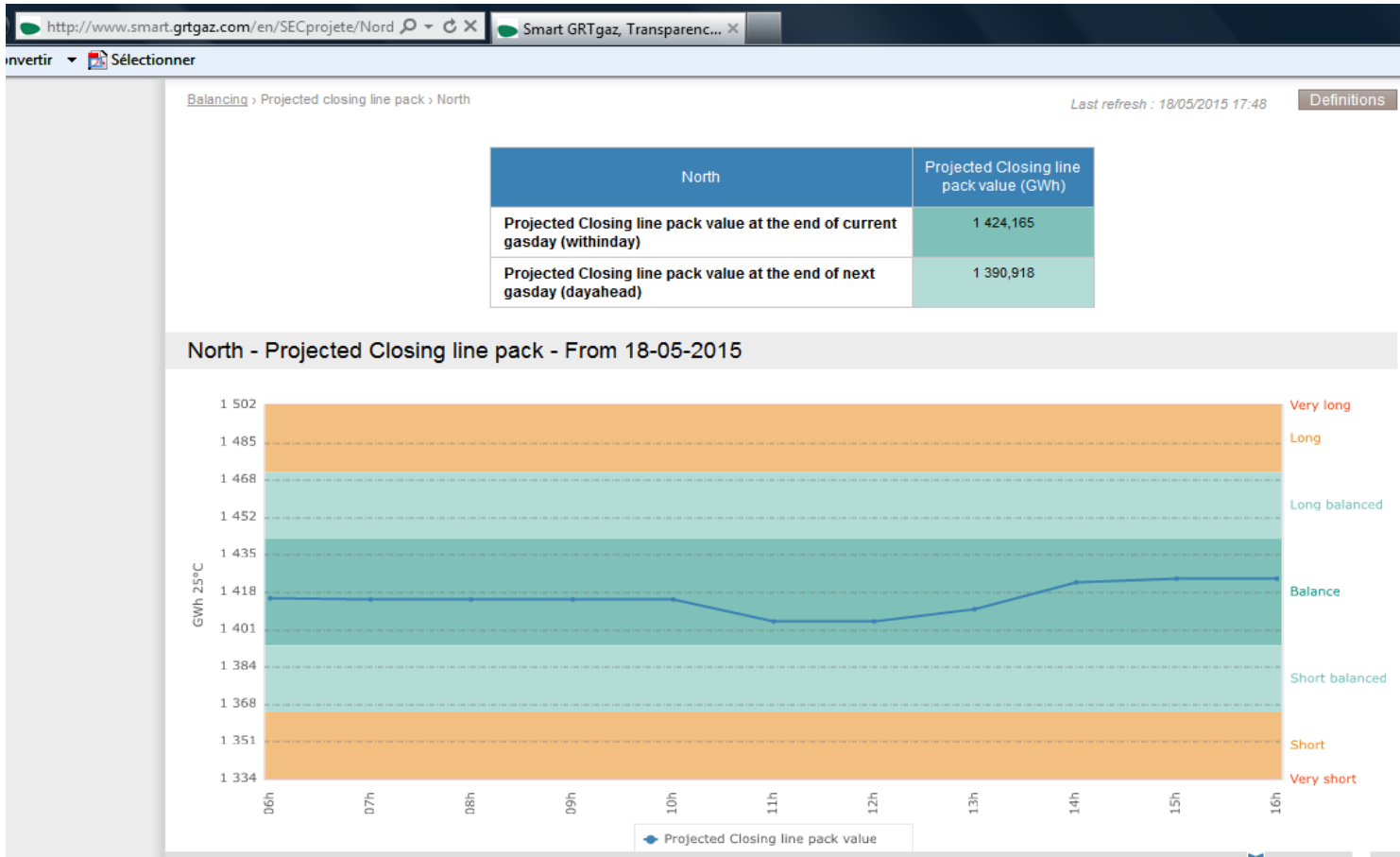
Filter

Name	Description	Default Value
Code_Artere_HELP	N/A si réseau r...	N/A
Densite_moyenne_SR		0
Facteur_de_compressibilite		0
Maille_etendue		0
Nom_artere		0
Nombre_de_capteurs		0
PCS_moyen_SR		0
Pression_moyenne		0
SEC_Energie_bloc		0
SEC_Volume_bloc		0
Somme_des_pressions_au_carre		0
Temperature_du_gaz		11 °C
Type_Artere	Ite: Intermaile...	0
Type_gaz		H
Variation_bloc		0
Volume_en_eau		0 m3
Zone_gaz		Nord

VII – Exploitation of results



VII – Exploitation of results



VIII – Benefits

A. Business

- **Increase Client Performance** → Improving the quality of Line Pack Datas published on the user portal and the public data platform
- **Increase Economic Performance** → real-time Line Pack is an important input for GRTgaz's real-time optimization & supervising applications
- **Increase reliability of the gas system** → As an extra level of control for the detection of error in measurement



B. IT

- Easy to use and develop by business
- Update of an existing tool
- No need for the service of a third party company





THANK YOU

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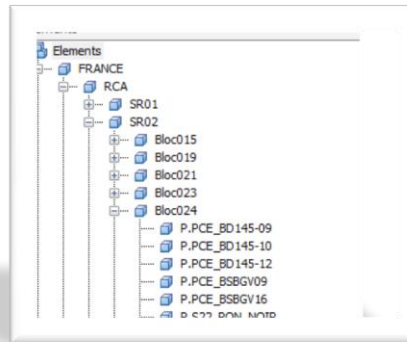
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Business Challenge

- Increase the accuracy of the Line Pack real time calculation
- Improve knowledge of the system boundaries

Solution



Results

