INTEGRITY MANAGEMENT FOR OLD PIPELINE SYSTEM

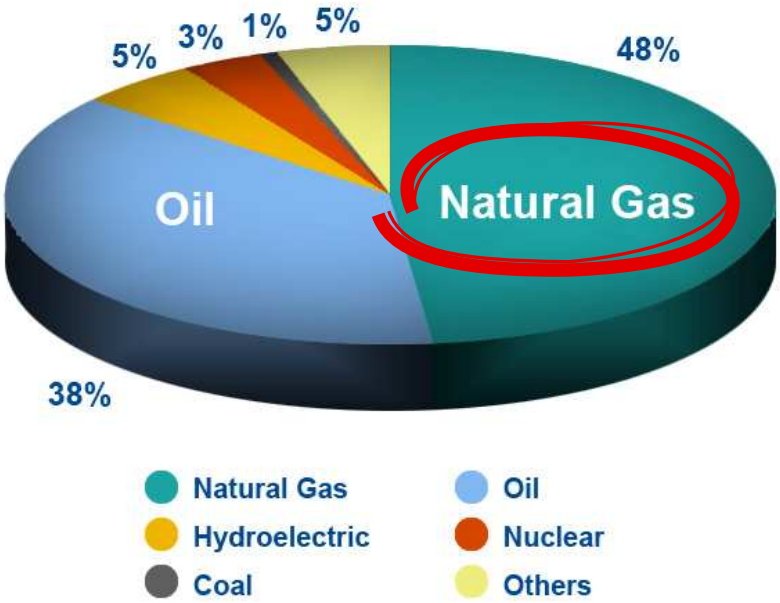
Company: **TRANSPORTADORA DE GAS DEL SUR**
Department: **OPERATIONS**
Area: **PIPELINE INTEGRITY**

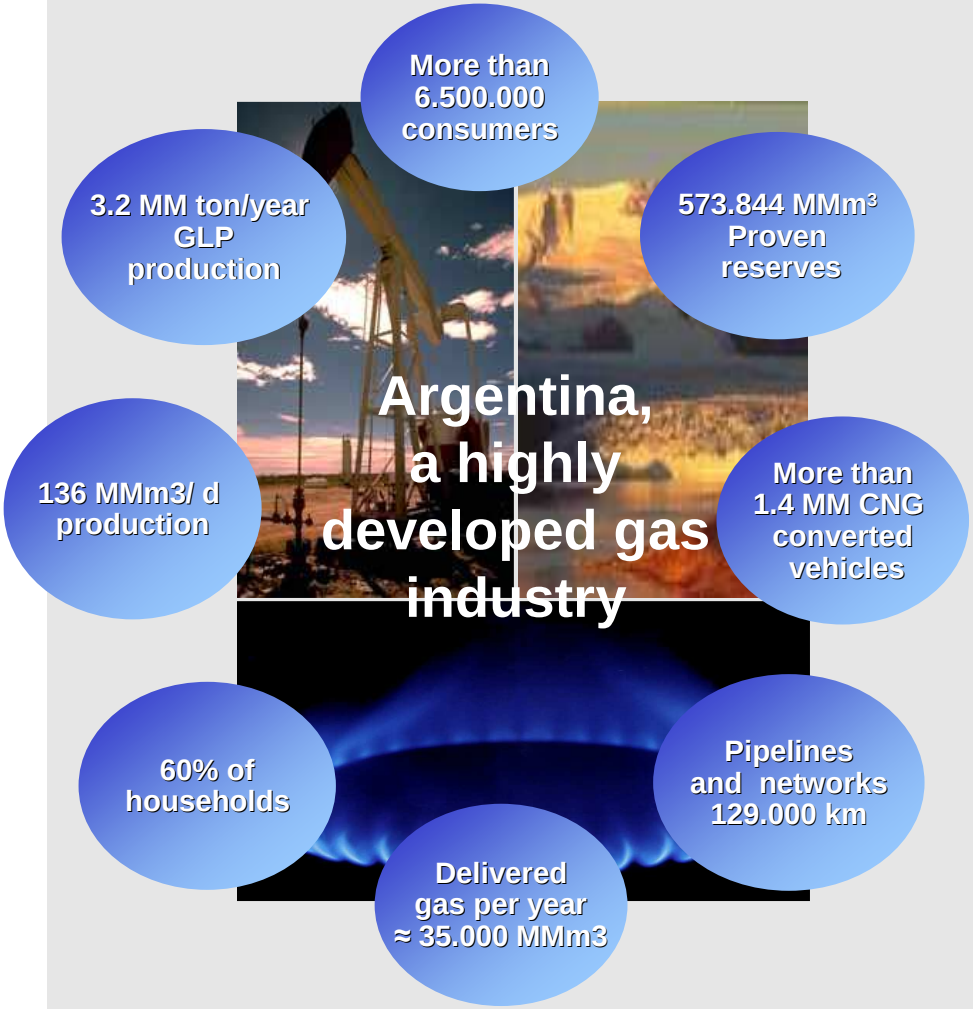
Presenter: ***Daniel Falabella***


AMSTERDAN

Natural Gas in Figures

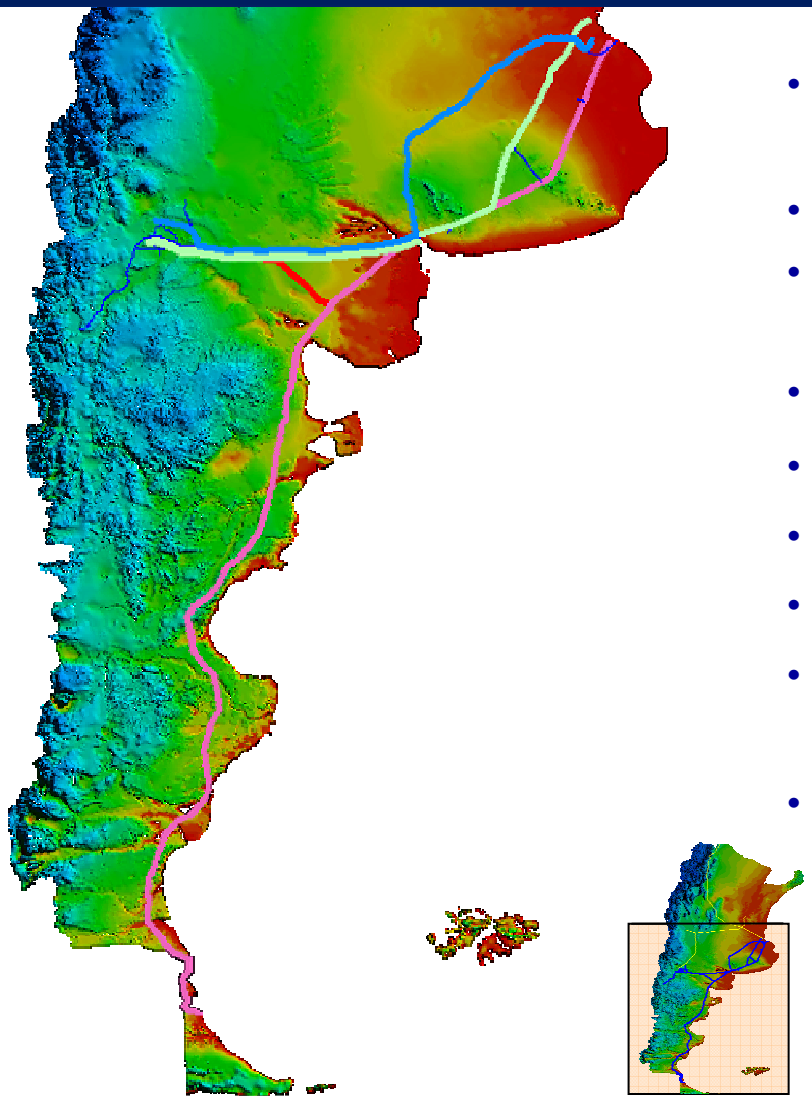
Natural Gas is over 48% in the energy matrix





Note: MM= 1 Million / Source: ADIGAS 2005

Characteristics of TGS system

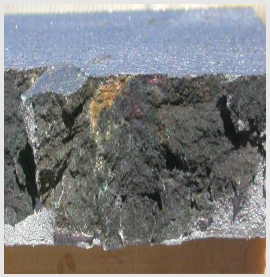


- Largest Gas Transportation Company in Argentina
- Second LPG producer
- Approximately 60% of the Gas Transportation Market in Argentina (65.4 MM m3/day)
- 8,000 km of Gas Pipelines
- 30 Compressor Plants
- Installed capacity: 580,000 HP
- 8 Maintenance bases
- Average age of the Transportation System: 30 years
- Coating type:
  - Asphalt: 5,640 km
  - Tape: 1,230 km
  - Three Layer Coating: 1,130 km

Classification of threats

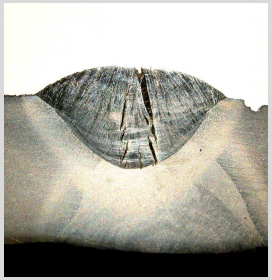
a) **Time Dependent**

1) External Corrosion
2) Internal Corrosion
3) Stress Corrosion Cracking



b) **Stable**

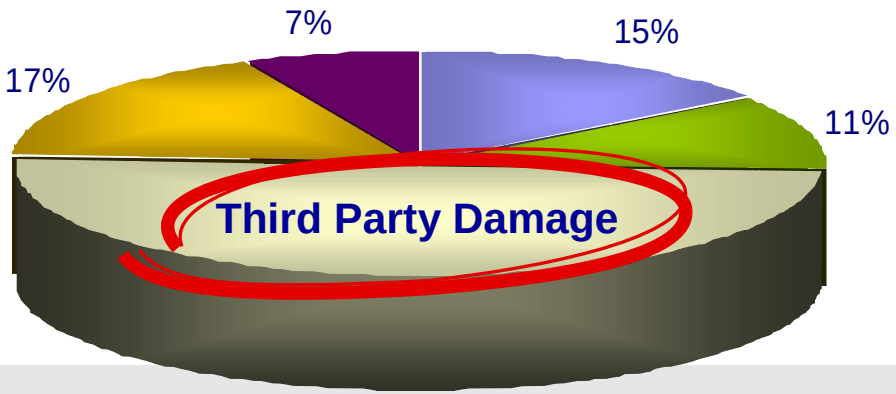
4) Manufacturing Related Defect
5) Welding / Fabrication related
6) Equipment



c) **Time independent**

7) Third Party / Mechanical Damage
8) Incorrect Operations
9) Weather Related and Outside Force

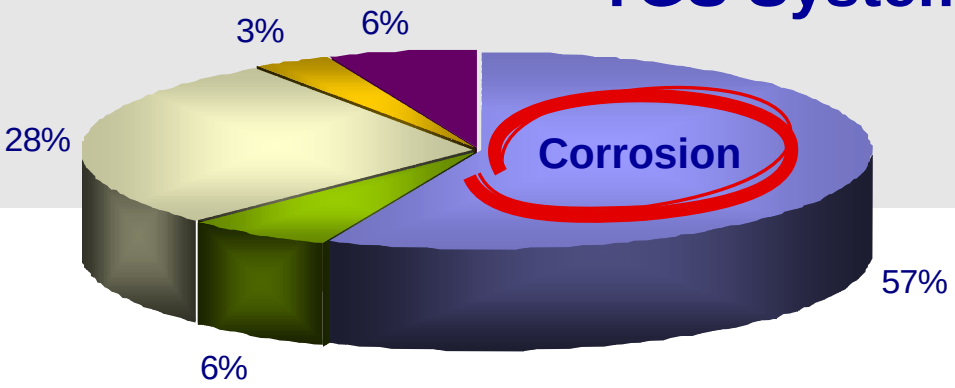
Cause of failure in buried pipelines



In Europe

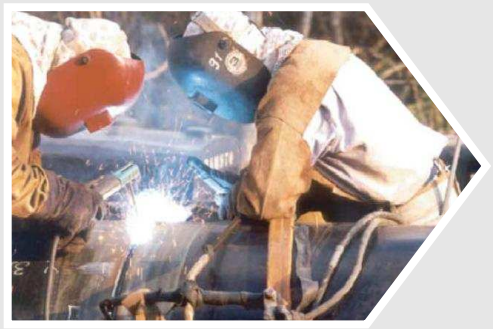
6th Report of the European Gas Pipeline Incident Data Group(EGIG) December 2005

TGS System



Corrosion SCC Third Party Materials Soil Movements

What were our Problems?

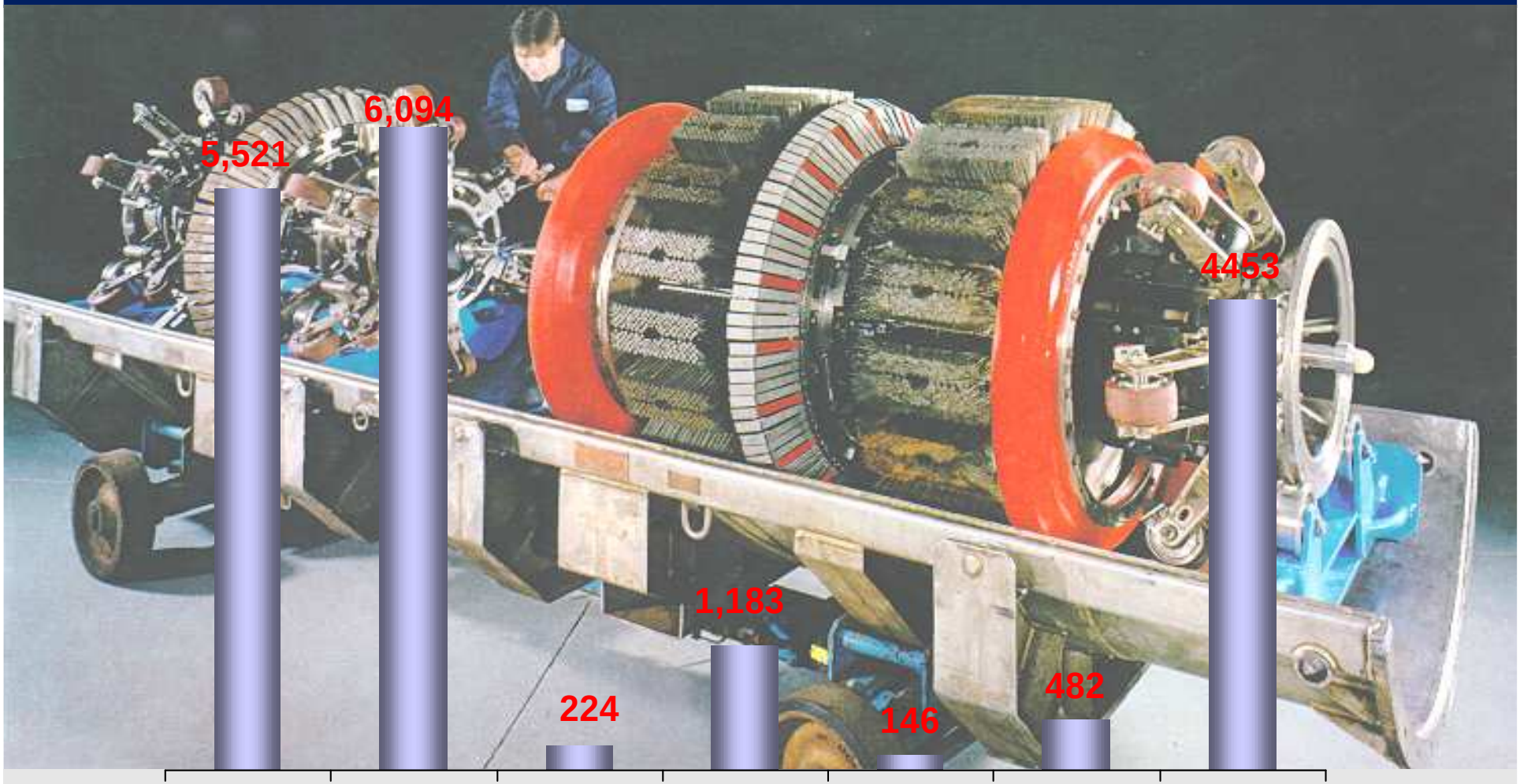


- No Alternative Pipelines
- Contractual Requirements where Maximun Capacity is needed

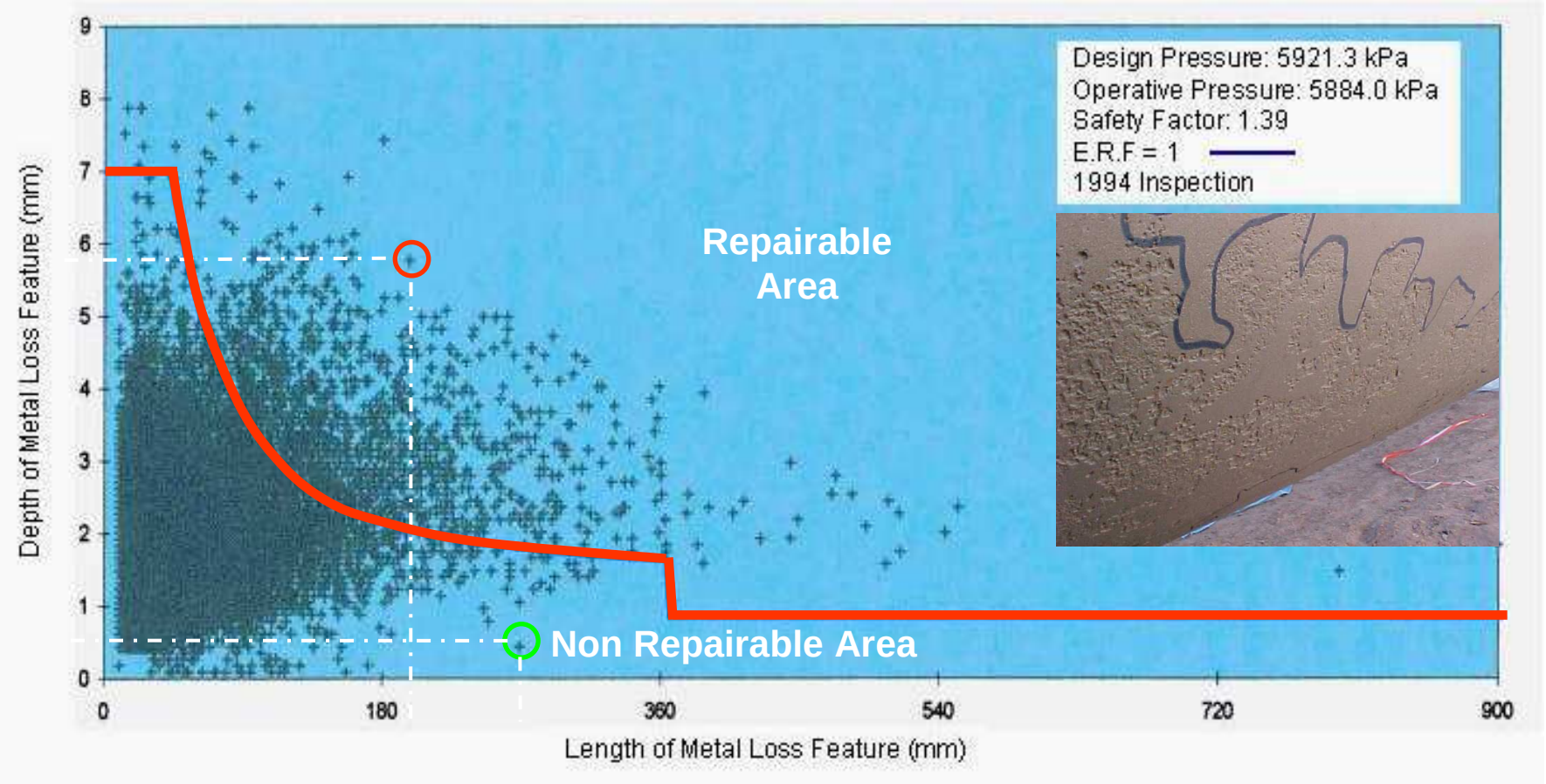
- Very Long Pipeline System
- Poor Coating Condition

- Low Level of Cathodic Protection
- Great Number of Defect

In Line Inspection (ILI) in the TGS system (in km)

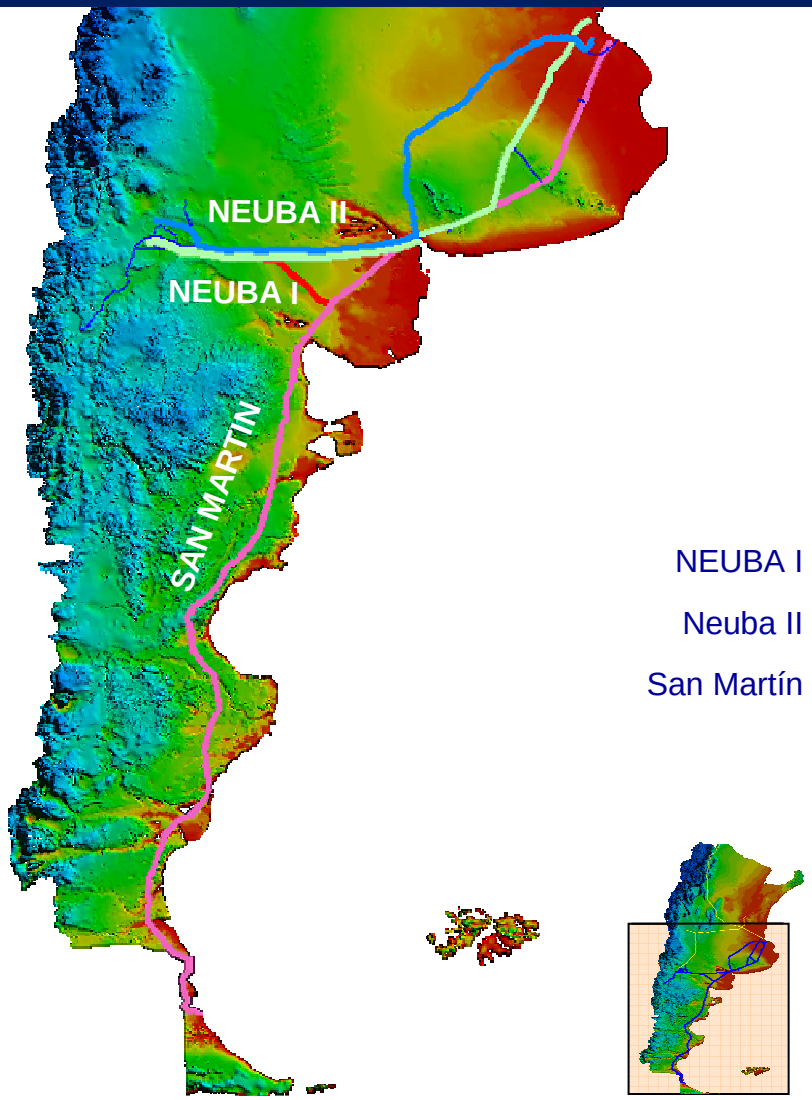


Corrosion Defects - In Line Inspection – 1994



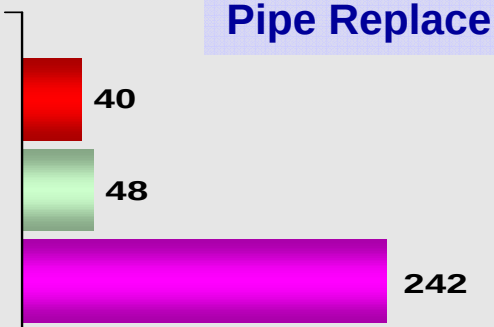
ILI result of a section in our system

Works done in the System

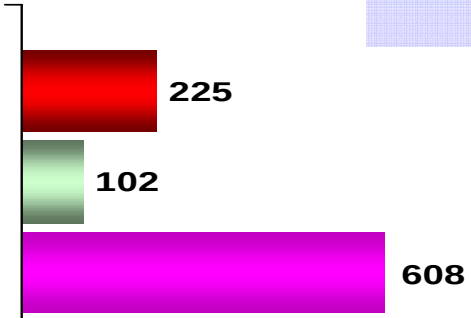


NEUBA I
Neuba II
San Martín

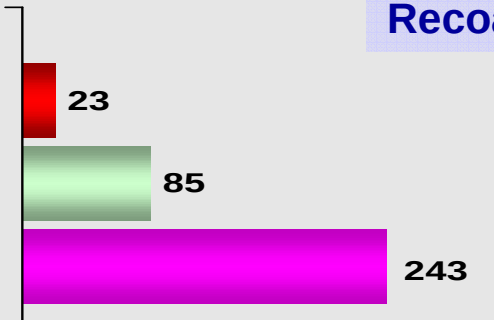
Pipe Replacement: 330 Km •



Sleeves: 935 •

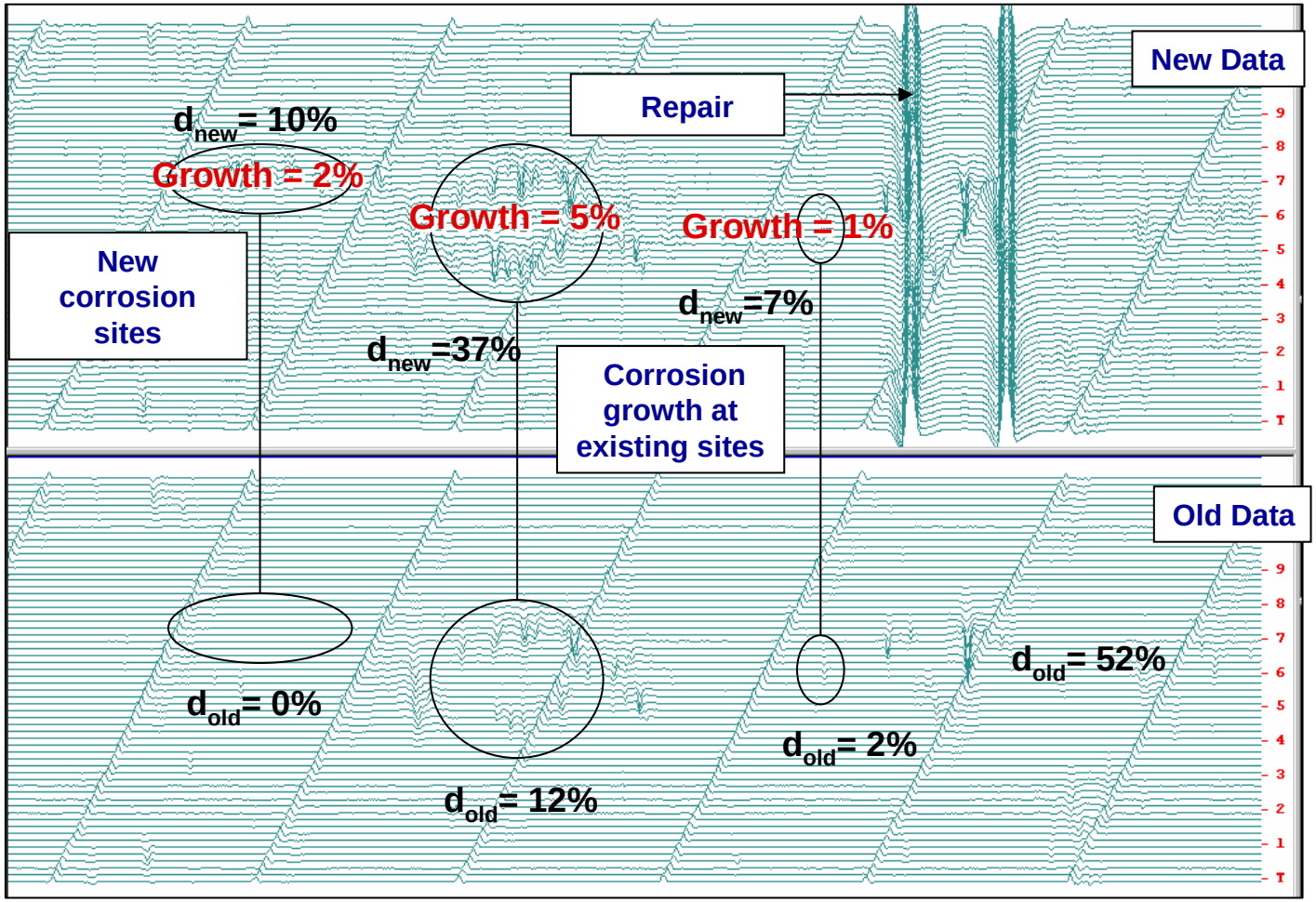


Recoating: 351 Km •



TGS

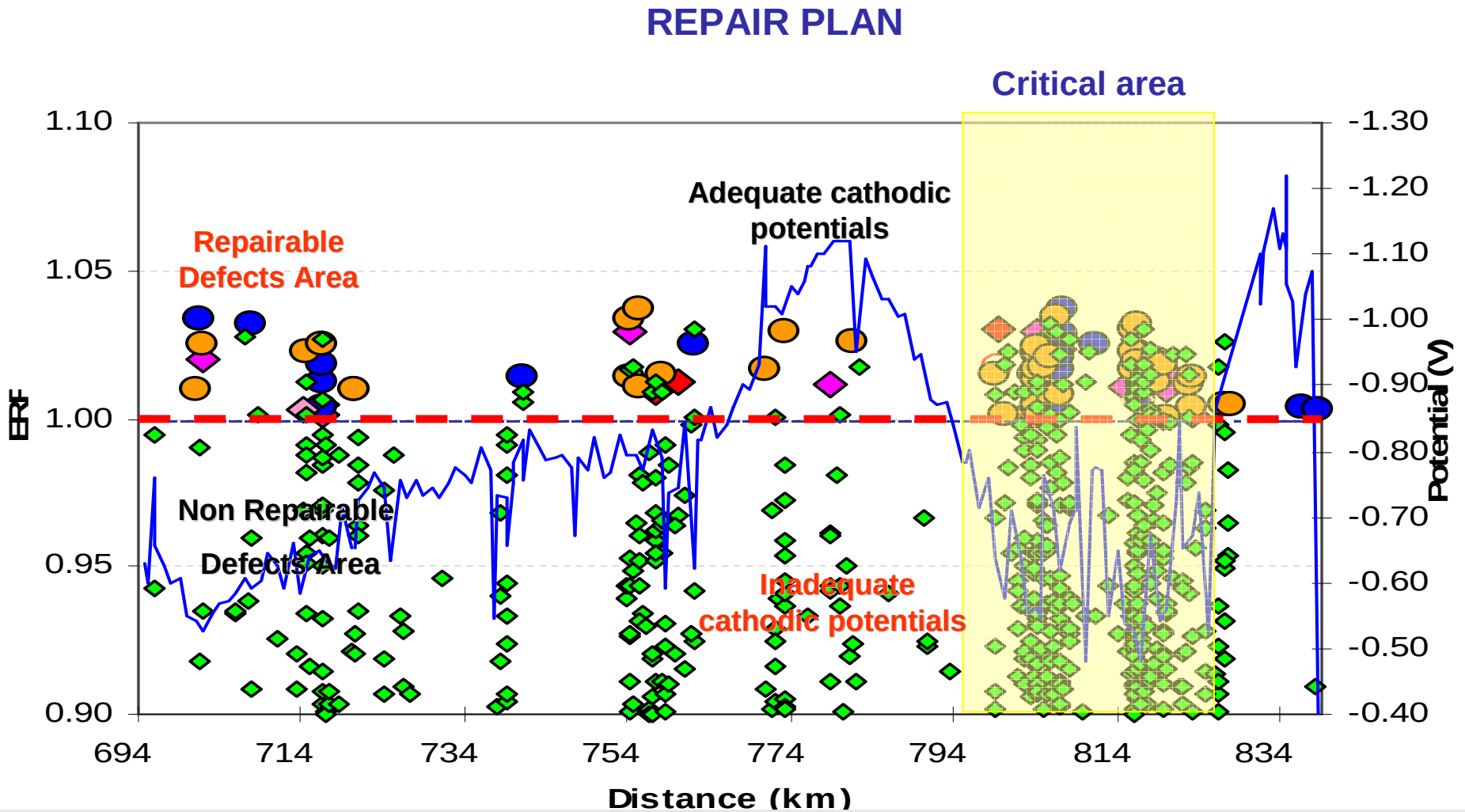
Determination of Corrosion Growth Rates



$$Growth = \frac{depth_{new} - depth_{old}}{Time}$$

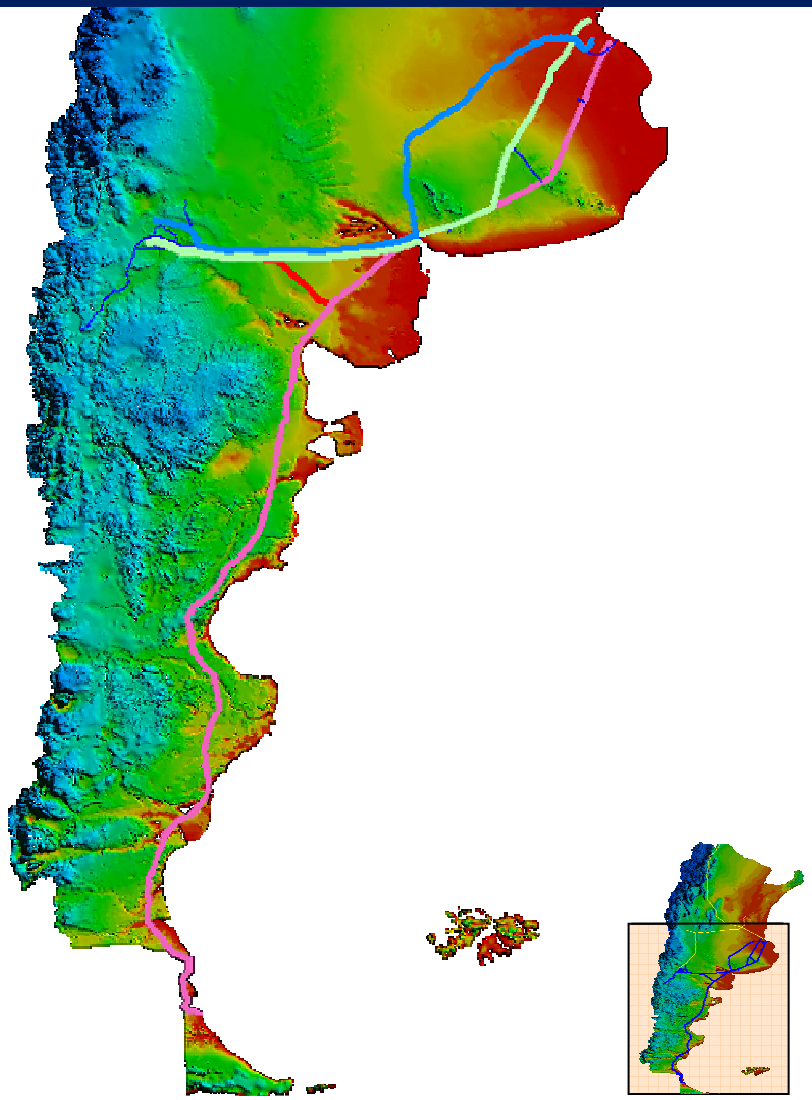
Time (between Inspections): 5 years

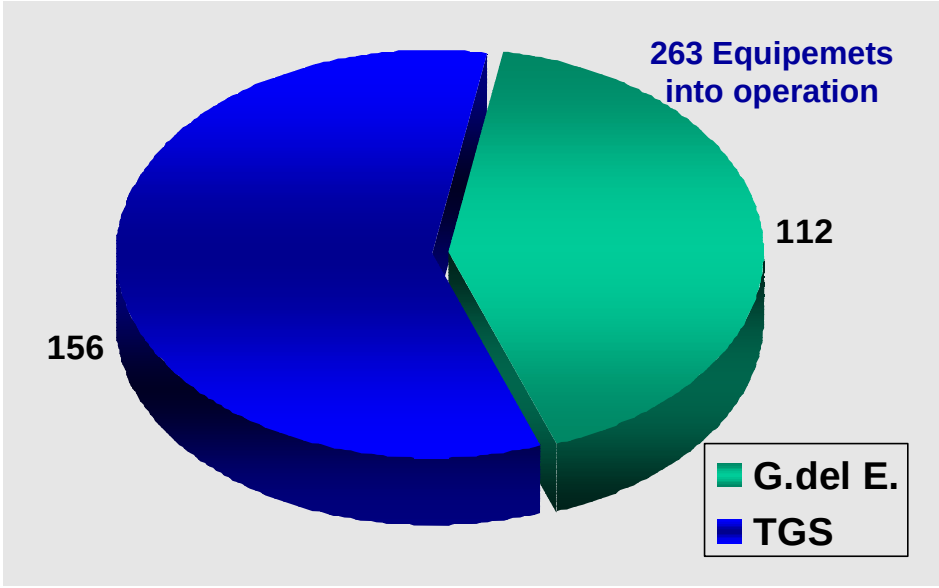
Corrosion Growth Rates + Cathodic Potentials



TGS

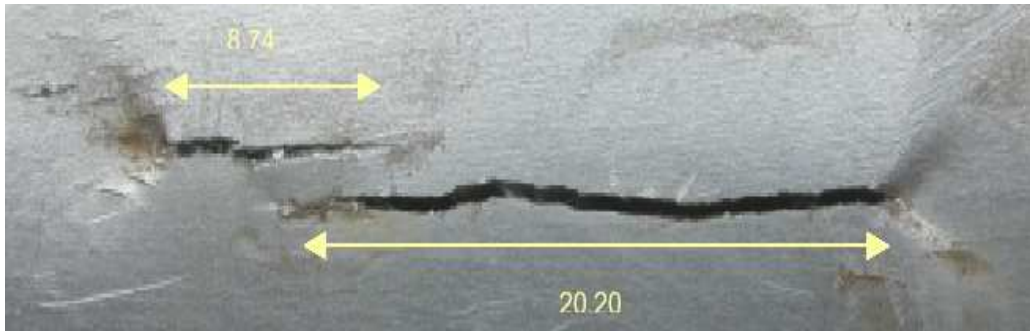
CP Units Evolution





Year	Pipeline (km)	Total CP Units	Protected Pipeline (%)	Km /CP Units
1993	5,899	112	**55**	**52**
2005	8,000	263	**100**	**30**

SCC failures in NEUBA I Pipeline



Hydraulic Test

- Hydrostatic Test: 134 km
- 460 m of pipeline were replaced from service

- 23 SCC Colonies were detected
- 3 Cracks failed

TGS

MFL + TFI Tools

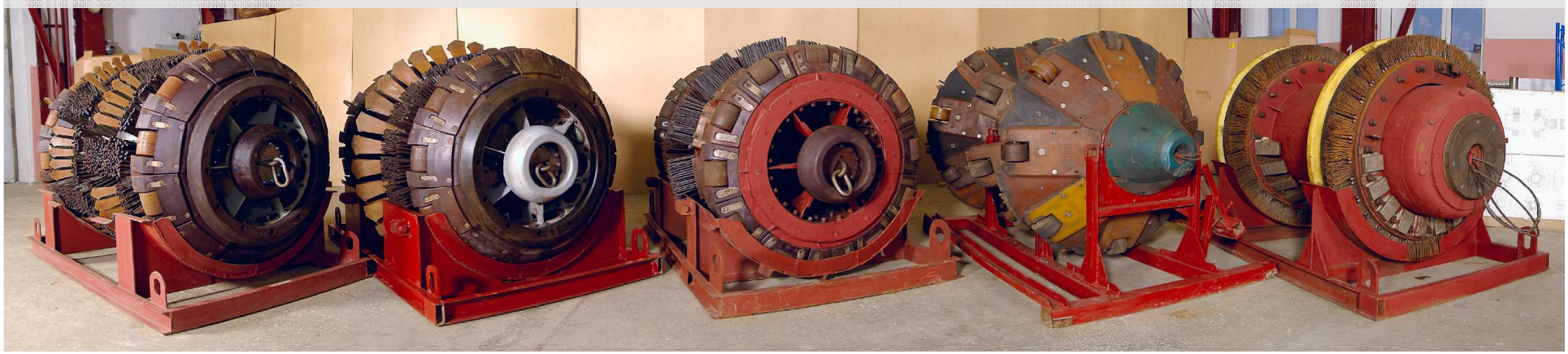
Detector piston with cross-section magnetization

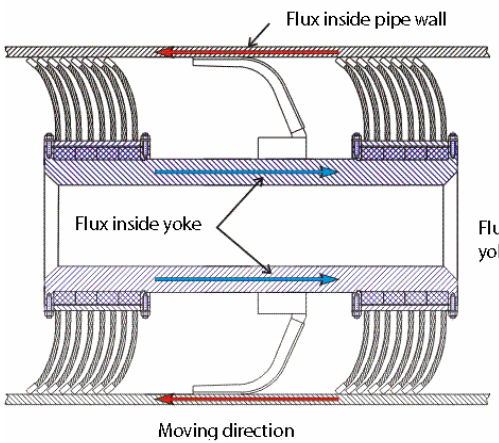
Detector piston with longitudinal magnetization

Magneto-cleaning piston

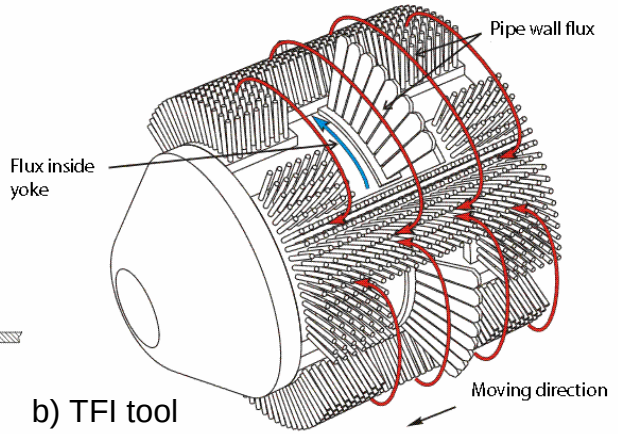
Electronic-profiling piston

Cleaning piston





a) MFL tool



b) TFI tool

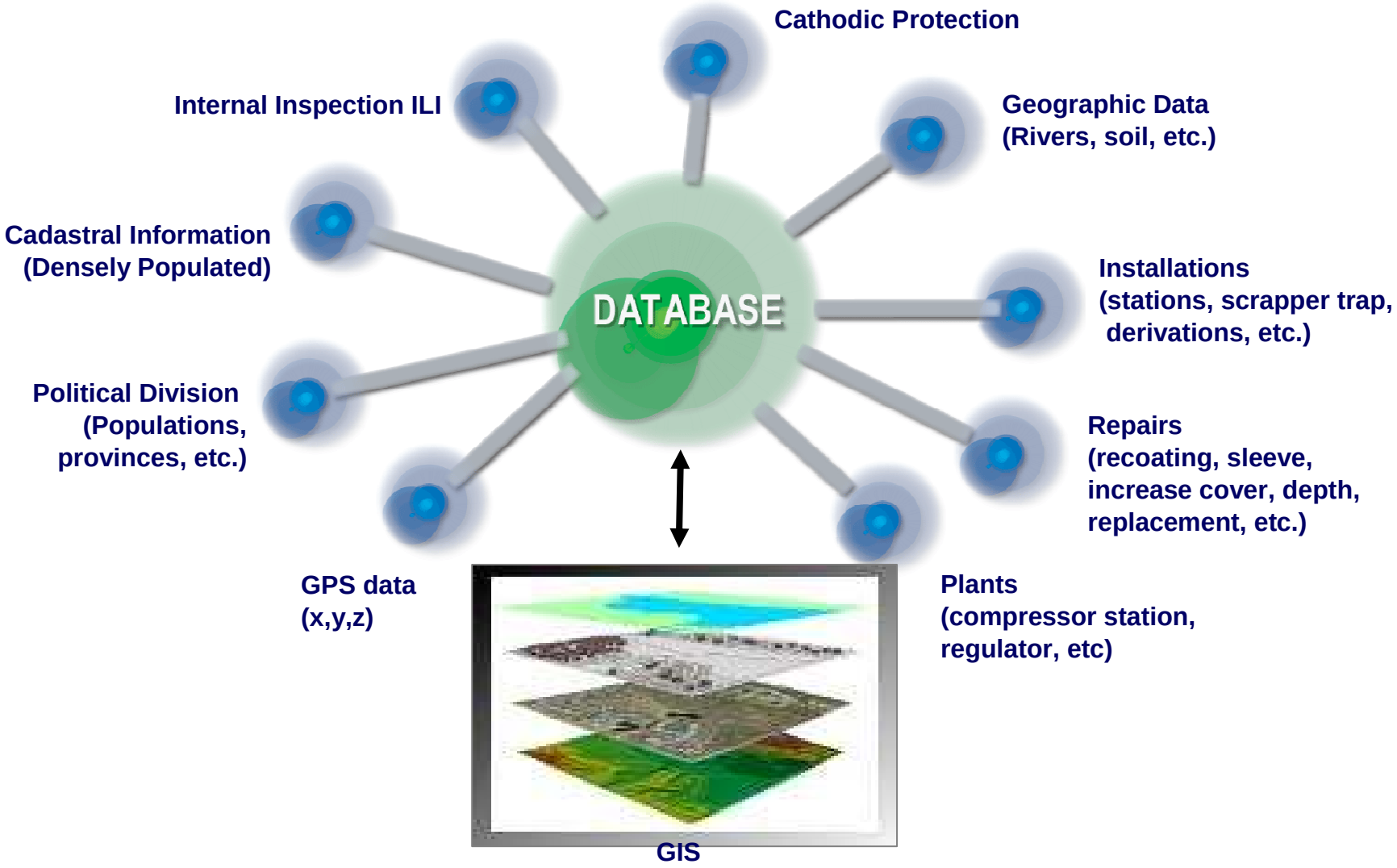
SCC Susceptibility Model

As first task were carried out
a soil detail study

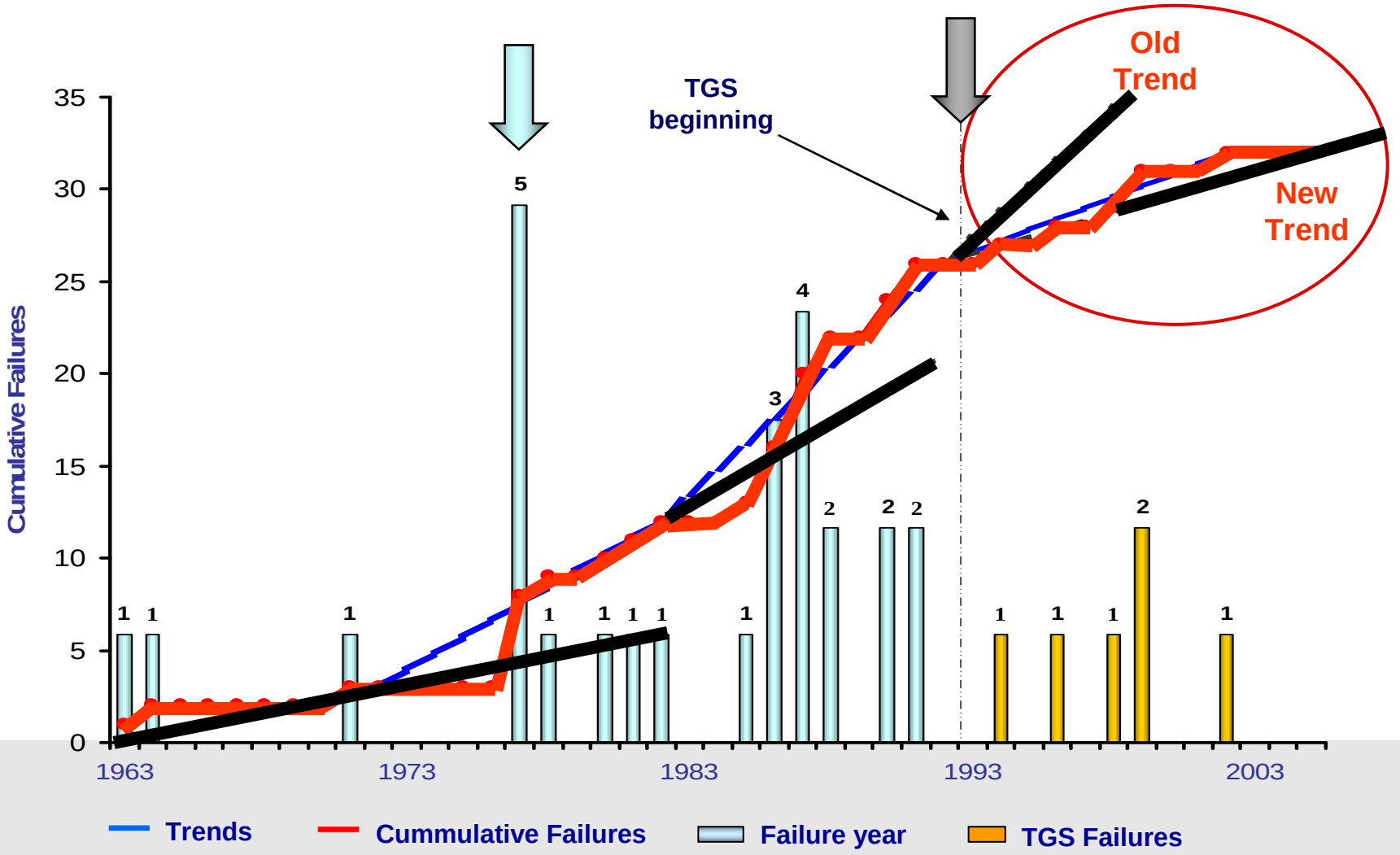
- Detailed (morphological, physical, and chemical) characterization of soils at the areas where SCC events were detected, and recognition of common patterns among the various areas under study.

Enlargement: **X 600**

Data Integration



Main Pipeline System – Incident Summary



Conclusions

- A 20-year old pipeline system may be reliably and safely operated at its maximum design pressure, provided there is a strategic Integrity Plan and if the required investments are made.
- To be able to plan the inspection and mitigation procedures, it is essential to identify threats to pipeline integrity.
- For the purpose of managing the variables that must be considered in order to develop an Integrity Plan efficiently, TGS implemented a thematic management of the information by means of a GIS platform

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