



Refinery Configuration & Technology Selection

March 2020



About Phasis Oil Refinery Project



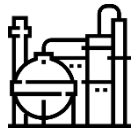
TR has been engaged by **Phasis Oil Company** to carry out a Configuration Study for selecting the best Refinery scheme for producing Gasoline & Diesel Euro VI Quality.



CPC Blend Crude Oil: 45,3° API and 0,56 % Sulphur.



The refinery goal was to reach the maximum conversion and maximizing Gasoline yields at expenses of Middle Distillates.



As a first approach, the new 94500 BPSD Refinery includes at least the following

- Process Units:
- Atmospheric Distillation
 - Gas Processing
 - Naphtha and Middle Distillates Hydrotreaters
 - Catalytic Reforming
 - Isomerization
 - Atmospheric Residue Upgrading Unit
 - Hydrogen Production

About Phasis Oil Refinery Project

Configuration Study

The Study compares four (4) Configurations for Residue Upgrading Unit and analyzes the convenience in terms of Product Yields, Product Quality and Investment Cost:

Configuration 1:

Atmospheric Residue Hydrocracker

Configuration 2:

Atmospheric Residue Fluid Catalytic Cracking.

Configuration 3:

Vacuum Residue Hydrocracker Unit &
VGO FCC Unit

Configuration 4:

Vacuum Residue Hydrocracker Unit &
VGO HCU Unit

The study was carried out with the information received from reputable Licensors of the main Process Units, as well as Técnicas Reunidas know-how for “Open Art Process Units” and wide experience in Oil & Gas Engineering fields.



About Phasis Oil Refinery Project

- ✓ Overall Block Schemes, Material Balances, Utilities Consumption and CAPEX Estimation were developed to a degree of definition sufficient to select the optimum Configuration.
- ✓ The discussions and the comparison tables supplied in the report, together with the investment and operating cost enables to select the scheme which best suits Phasis Oil needs.
- ✓ The economic assessment is not in the scope of work of this study. Overall economics shall be calculated based on the cost of feedstocks, value of products and operating costs.







About Phasis Oil Refinery Project

Main Process Units	Licensors
Crude Distillation	
Hydrotreating	
Hydrocracking	
Fluid Catalytic Cracking	
Alkylation	
Naphtha Isomerization & Catalytic Reformer	



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Other Process Units	Licensors
Gas Processing Unit	
Hydrogen Production Unit	Next stage (Haldor Topsoe, Technip, ...)
Amine Regeneration Unit	
Sour Water Stripping Unit	
Sulphur Recovery Unit	Next stage (Kinetic Technologies, Jacobs, ...)
Utilities & Off-sites	



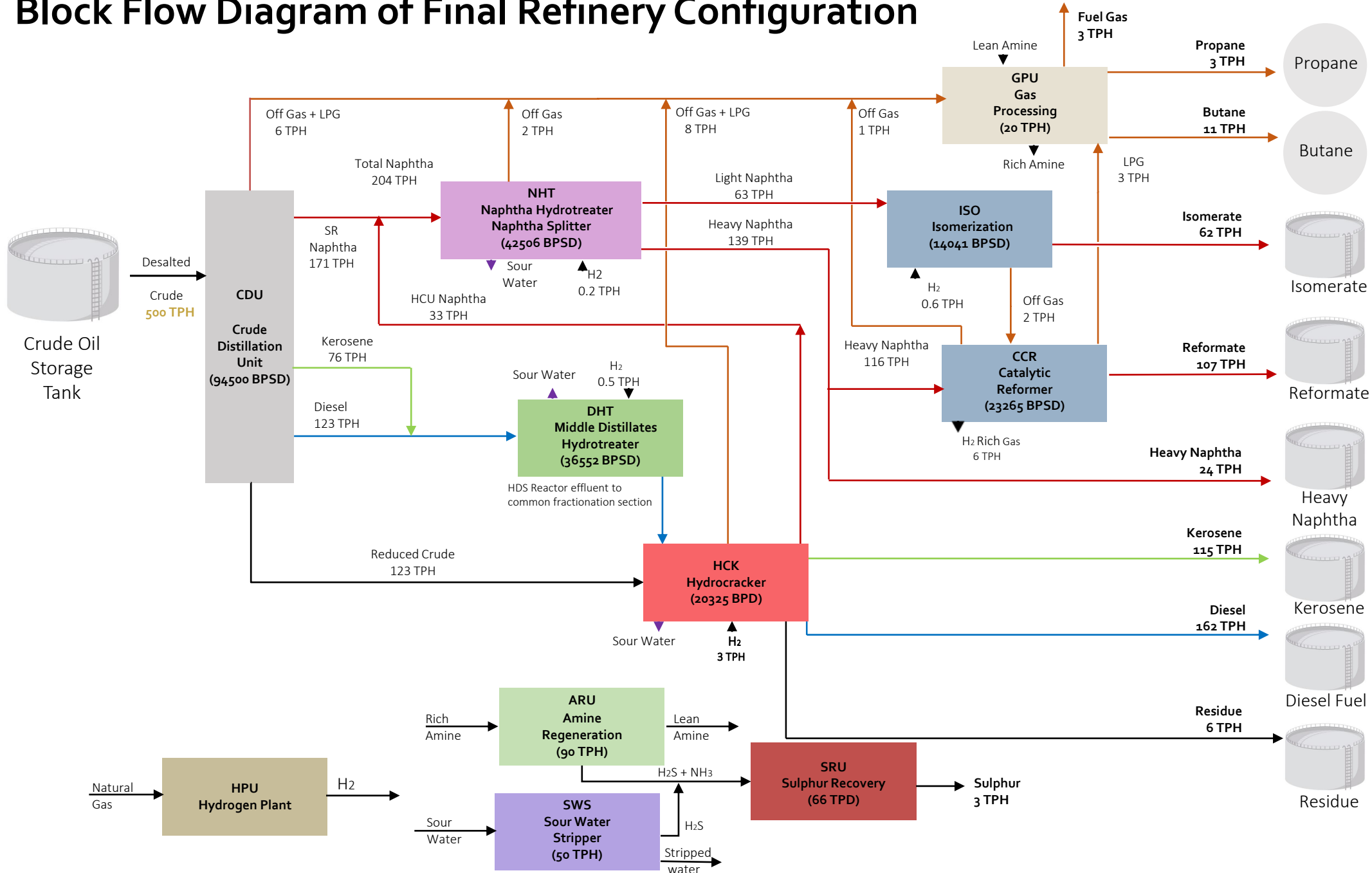
About Phasis Oil Refinery Project

With the aim of reducing the CAPEX of the refinery, the configuration was frozen for maximizing Middle Distillates at expenses of Gasoline.

The reduction on the Overall Refinery CAPEX in conjunction with the gasoline pool optimization and the surplus in the Hydrogen production, brings **TR** to consider **Axens** approach as the best choice for the Naphtha Complex and the construction of the Project in one (1) stage.

PRODUCT YIELDS		
FEEDSTOCKS	tons/h	
CRUDE OIL	500	
BUTANE	5	
MTBE	6,9	
PRODUCTS	tons/h	%
SULPHUR	2,85	0.56
OFFGAS	3,86	0.75
C3/C4	2,7	0.53
GASOLINE	216,3	42.25
KEROSENE	115,6	22.58
DIESEL	162,6	31.75
RESIDUE	6,1	1.20
HYDROGEN	1,9	0.38

Block Flow Diagram of Final Refinery Configuration



Licensors Selected as Technology Providers



Atmospheric Residue Hydrocracking
& Middle Distillates Hydrotreating



Naphta Hydrotreating
Catalytic Reforming
Isomerization



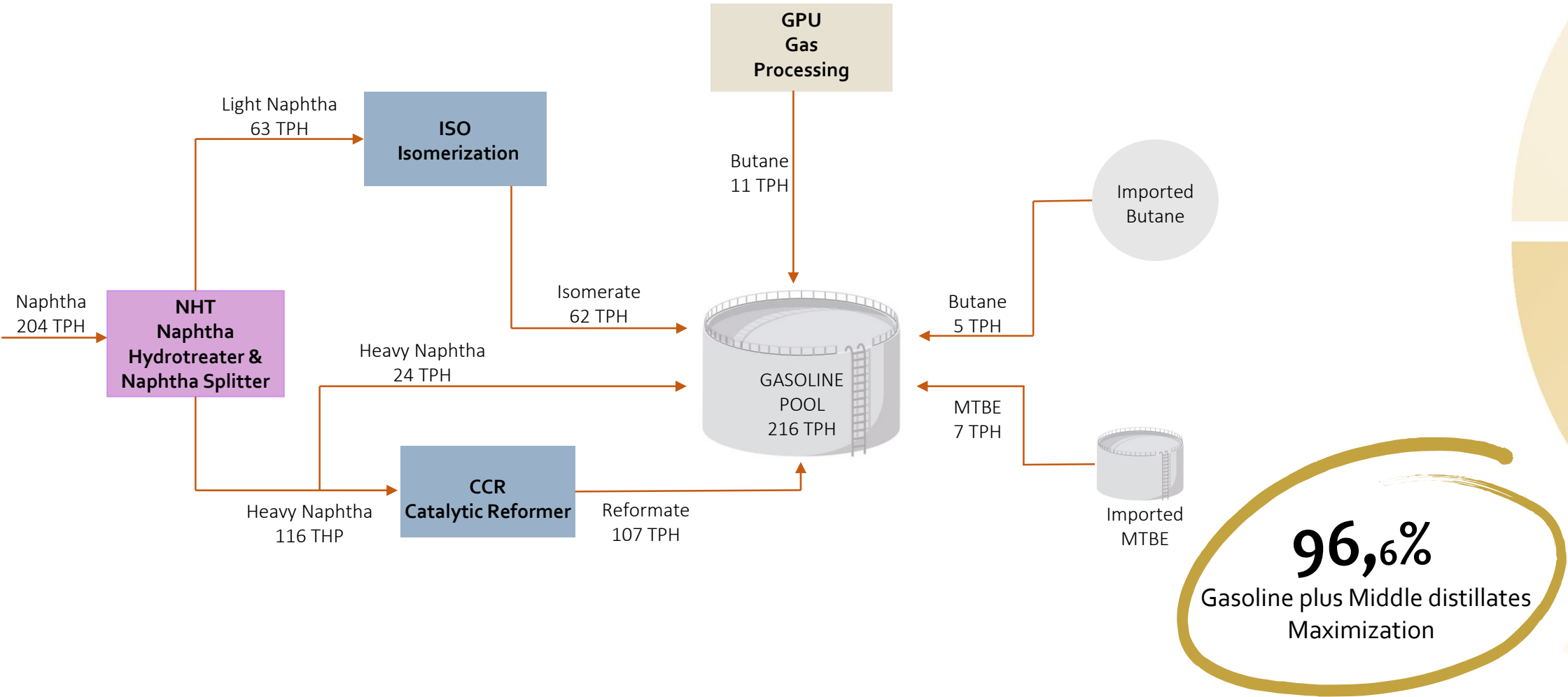
TECNICAS REUNIDAS

Crude Distillation
Gas Processing
Amine Regeneration
Sour Water Stripping
Utilities & Off-sites

The most Modern Refinery in the area

Optimization for Gasoline Pool by Axens

Clean Fuels on top of Euro VI Quality Standards



CAPEX Estimation

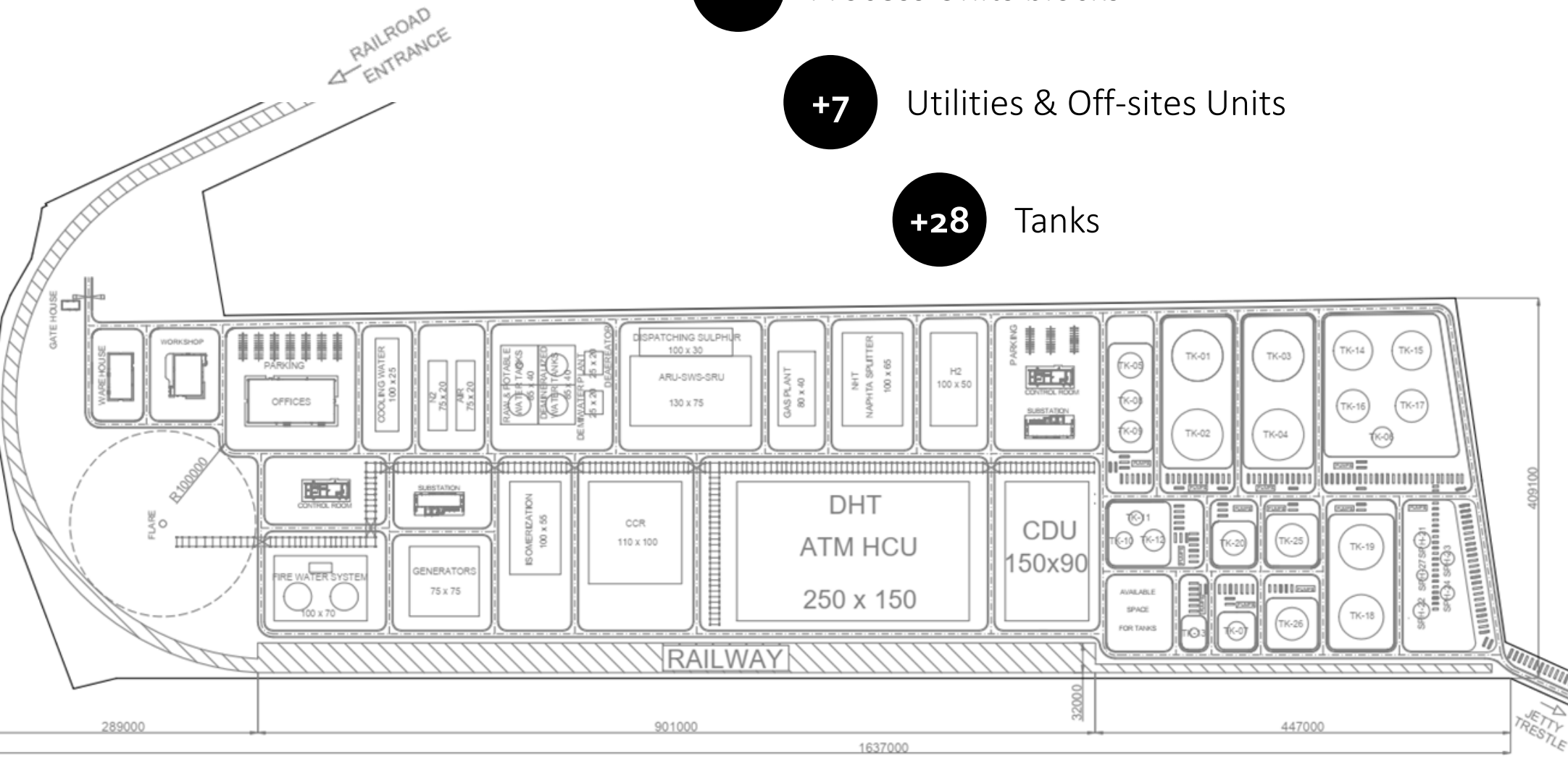
UNIT		UNIT DESCRIPTION		TIC	
SECTION A		Capacity	UoM	(USD Million)	Licensor
1	CDU Crude Distillation Unit	500	Ton/h Feed	115	TR
2	NHT Naphtha Hydrotreater	204	Ton/h Feed	32	Axens
3	DHT Middle Distillates Hydrotreater	200	Ton/h Feed	-	Shell
4	HCK Hydrocracker	123	Ton/h Feed	245	Shell
6 + 7	ISO Isomerization + CR Catalytic Reformer	179	Ton/h Feed	123	Axens
8	GPU Gas Processing	20	Ton/h Feed	70	TR
9	HPU Hydrogen Plant	24600	Nm3/h product	82	
	Total SECTION A			666	
SECTION B	Following Units to be added to SECTION A				
10	ARU Amine Regeneration	90	Ton/h Feed		included (SRU)
11	SWS Sour Water Stripper	50	Ton/h Feed		included (SRU)
12	SRU Sulphur Recovery	66	Ton/day product	122	TR
	Total SECTION B			122	
TOTAL DIRECT COST (ISBL+Utilities)				787	
TOTAL COST OSBL (Estimated)				236	
TOTAL DIRECT COST (ISBL+Utilities+OSBL)				1023	

Overall Plot Plan optimized to comply with safety distances and minimize piping routing

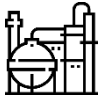
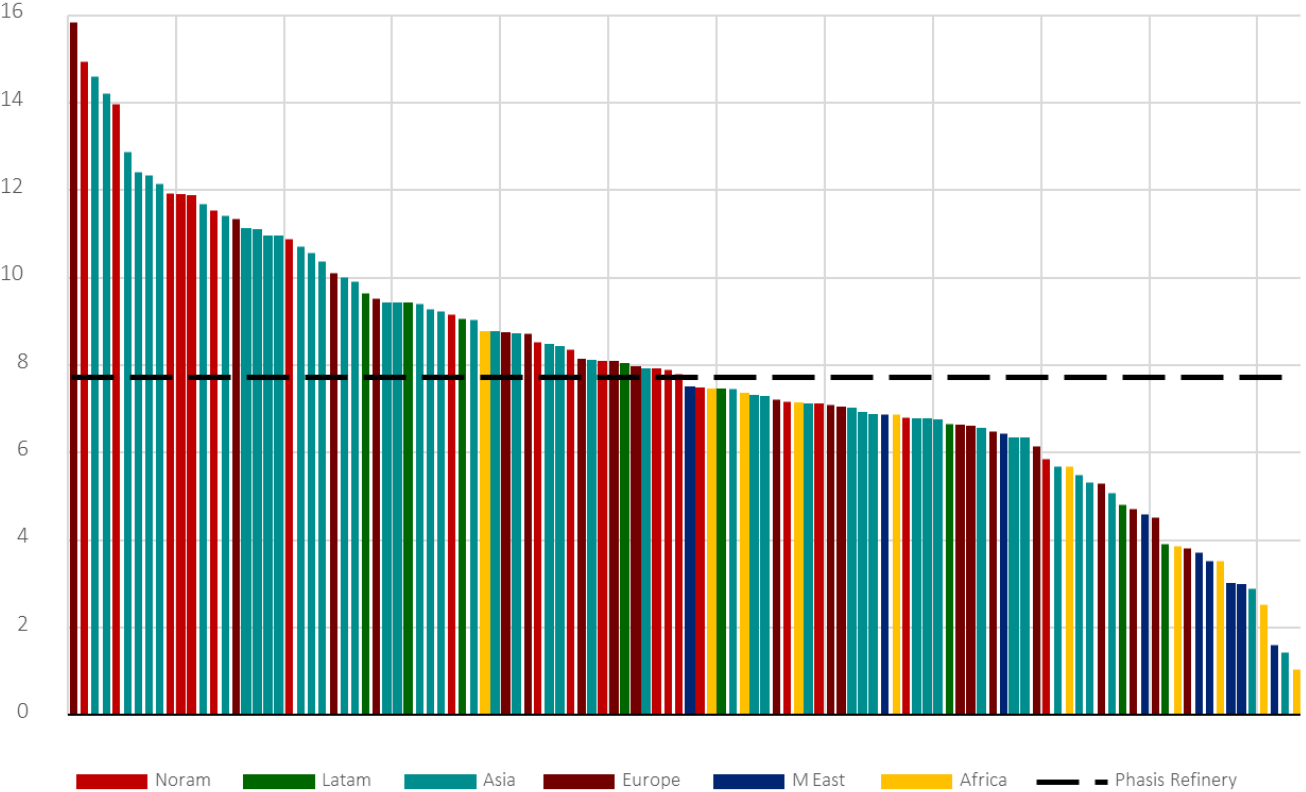
12 Process Units blocks

+7 Utilities & Off-sites Units

+28 Tanks



The new Phasis Refinery compares well with refineries of similar size on a global basis



Phasis Oil Refinery is the cornerstone of oil products in Georgia.



Georgia oil products demand compares more than well with any reference.

Nelson Complexity Index
Benchmark with refineries with size 100 to 140 kbd
(10 refineries between two vertical lines)

Towards low-carbon refinery

Future Upgrading: CO₂ Capture & Utilisation



Towards low-carbon refinery

Future Upgrading: CO₂ Greenhouse Application



About Técnicas Reunidas (TR)

TR is a global leader in the design and build of complex industrial plants



Técnicas Reunidas is a company specialized in the design and management of the execution of industrial plant projects throughout the world, with almost 60 year of experience.

Técnicas Reunidas has designed and managed the construction of more than **1,000** industrial plants in over **60 countries**. Its clients include many of the major national and multinational oil companies.

60 years of continued growth

+9,000 professionals of over 70 nationalities

60 countries where we have operated

+\$50 billion in projects in the last 10 years

More than 1,000 industrial plants

Safety Performance / Zero Incident Target

\$4 billion per year in purchasing and subcontracting

≈> 195,000,000 Construction Hour/Year

≈ > 9,000,000 Engineering Hour/Year



2019

Backlog, M€ 10,026

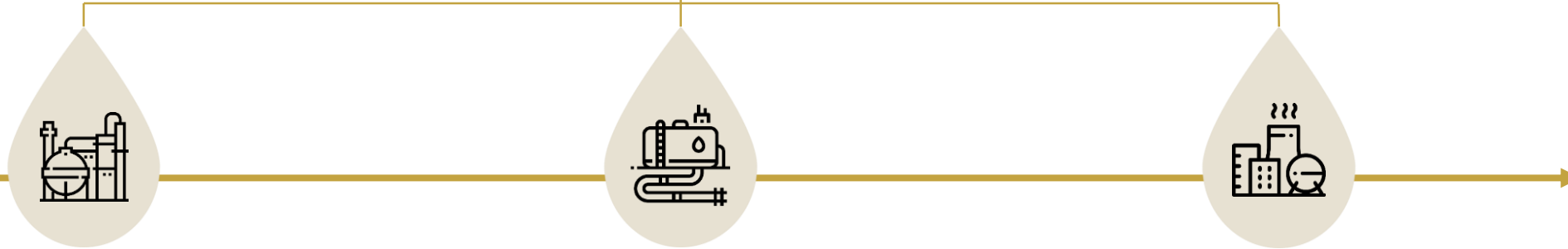
Sales, M€ 4,700

Employees +9,000

Main Markets

Saudi Arabia, UAE, Kuwait, Bahrein, Oman, Algeria, Singapur, Indonesia, Malaysia, Turkey, Russia, Poland, Finland, UK, Azerbaijan, Peru, Chile, Mexico, Canada, US, China, Australia

TR covers almost the whole energy value chain



DOWNSTREAM Track record/highlights

- 421 Refining Units
- 150 Petrochemical Units
- Top Ten International contractor
- Worldwide leader in Heat Transfer, Nitric Acid, Ammonium Nitrate and Hydrometallurgy Technologies

UPSTREAM & GAS Track record/highlights

- Oil & Gas Fields Development
- World Leader in LNG terminals
- Pipelines & Storage

POWER & WATER Track record/highlights

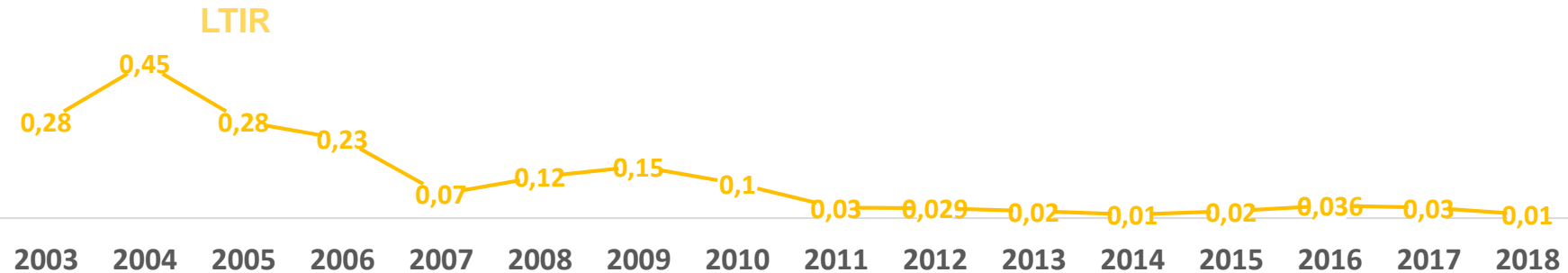
- Thermal plants
 - Gas Turbine
 - Conventional
 - Reciprocating
- Biomass and Waste to Energy
- Nuclear Experience
- Water Treatment
 - Desalination
 - Effluent Treatment (WWTP)
 - Drinking Water Treatment



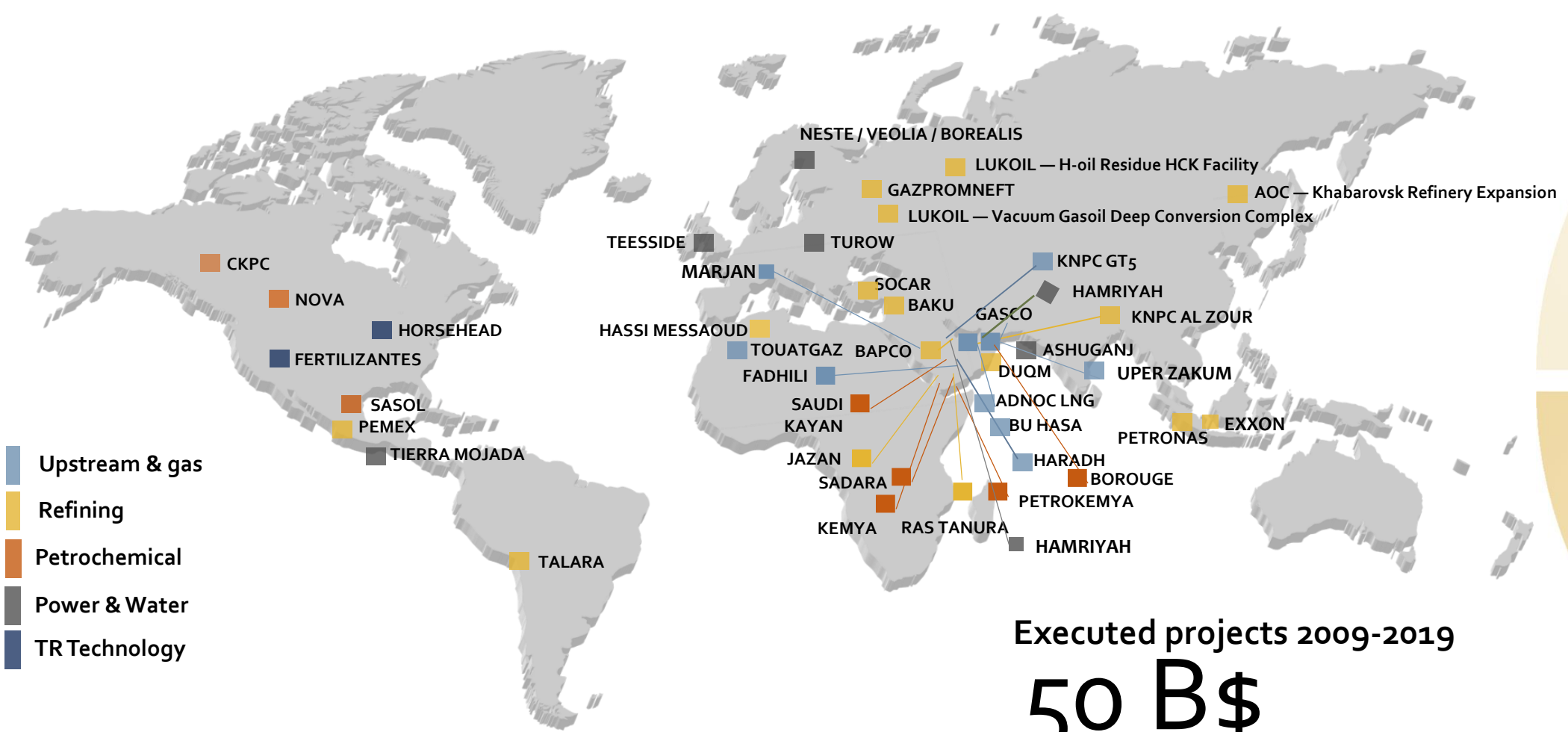
TR Safety Performance / Zero Incident Target

Safety and Environment

TR is committed to maintain the highest safety and environmental standards for the Employees, Clients and Suppliers

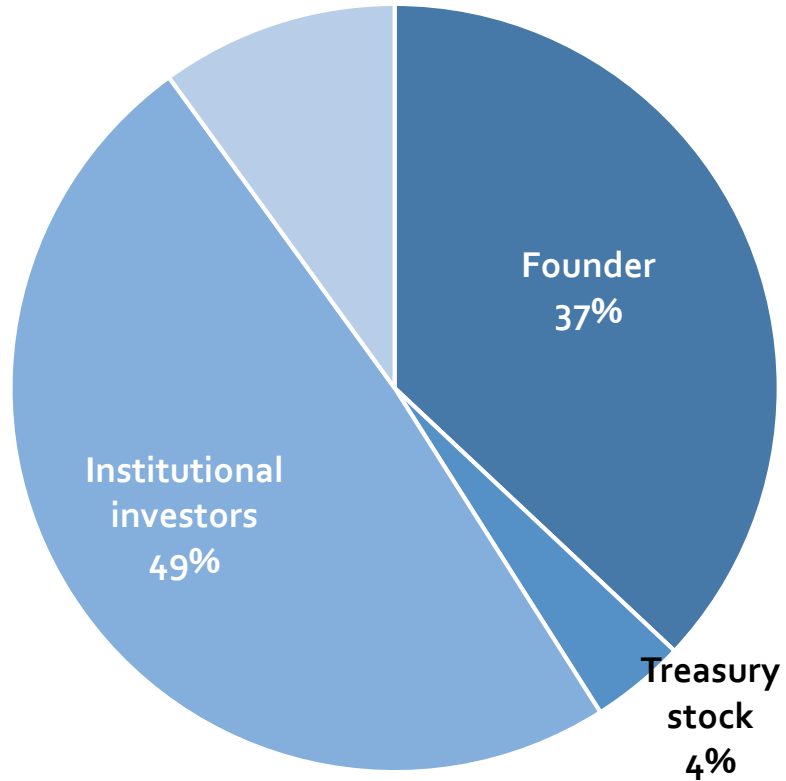


TR have executed some of the most emblematic projects of the industry

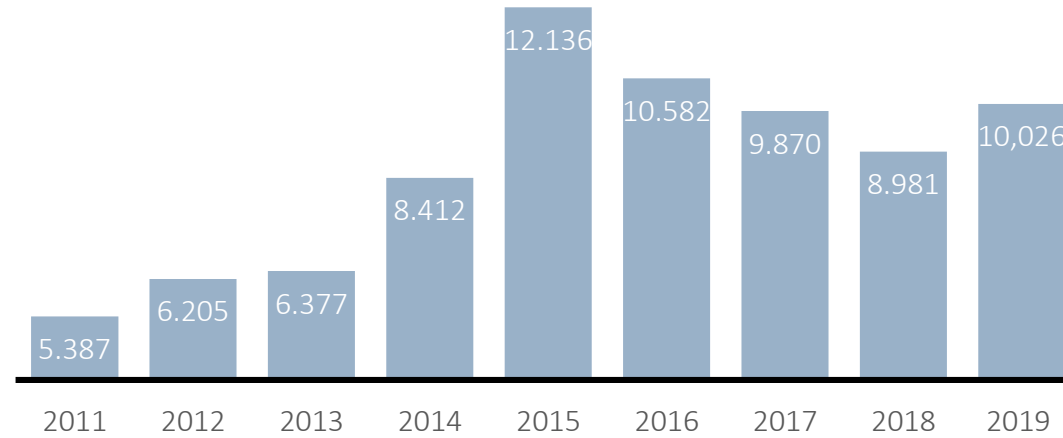


TR has a strong shareholder structure, and an impressive history of growth

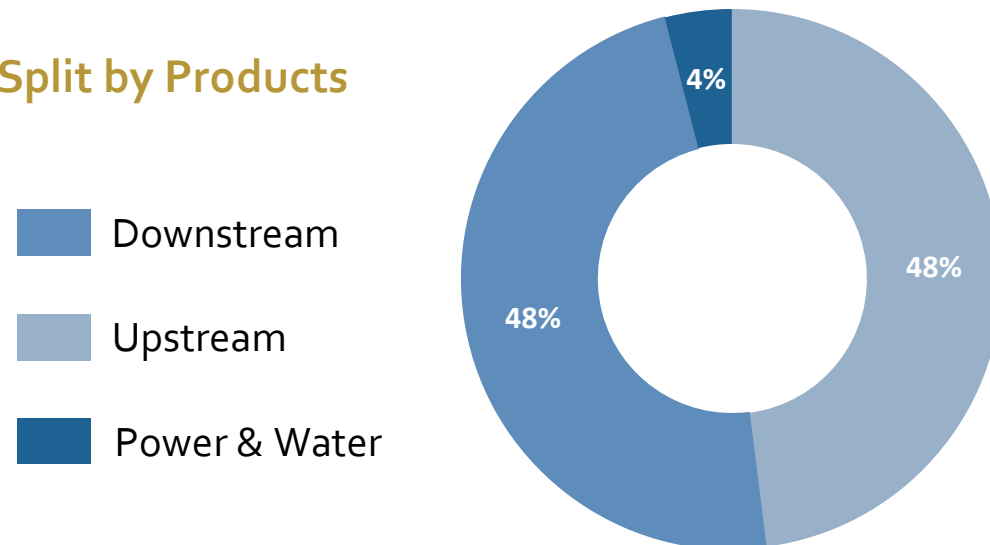
One of the 35 reference companies in the Spanish Stock Exchange



Backlog, M€



Split by Products



TR has renowned and recurrent clients, ongoing investors in energy infrastructures

