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# Italgas: Embracing Digital Transformation

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# Abstract

This case study explores the process of digital transformation at Italgas, a leading gas distributor in Italy and Greece and the third largest in Europe. For a company with a 185-year history, digitalization constitutes an important milestone. In the most tangible manner, it alters Italgas' key asset – a 81,582-km distribution network – but also it reshapes its processes and operations and reskills its employees. In a nutshell, it enriches the identity of the company, transforming the organizational culture and mindset of the people who make up Italgas. In a broader context, digital transformation is Italgas' response to the European energy transition scenario, which is geared toward a net zero emissions target and an integrated energy sector. In fact, in view of the European Green Deal, where renewables take centre stage and become integrated in a single system (including gas renewables, such as green hydrogen and biomethane), the digital transformation of a gas grid is the most efficient and readily available solution in facing the challenge of the emission reduction targets set within the new European agenda.

The purpose of this case study is to reveal the management dynamics and the internal and external barriers, as well as the enabling factors, that have formed the elements of a successful implementation of digital transformation. In terms of expected learning outcomes, the case prepares students to understand and undertake digital transformation, i.e. digitalizing a whole range of operations and being aware of the critical areas that need to be monitored and assessed during this process.

The introduction presents the central theme of the case to students. Section 1 provides an overview of Italgas and its 185-year history, highlighting its evolution and the previous challenges it faced in the Italian context. Section 2 introduces a larger institutional framework, focusing on future challenges related to the European Green Deal. In particular, it focuses on energy system integration, providing an overview of existing and future energy sources and discussing the place of the gas grid within this system and the role of energy distributing companies in particular. Section 3 focuses on the gas distribution industry, including the competitive environment, key players, the business model of gas distribution network operators and the key defining and enabling factors in the industry. Section 4 constitutes the core of the case. It reveals the ins and outs of the digital transformation of Italgas, focusing on the factors that have impeded and enabled the process, as well as the key challenges faced by its management and the solutions found along the journey. It depicts the digital transformation as taking place across three interrelated pillars: assets, processes and people. Section 5 addresses perspectives on the future advancement of digital transformation at Italgas and stimulates further reflections on the part of students.

**Key takeaways**

- digital transformation is not only about tech, but rather it also requires a proactive mindset, creative talents, and an integrated view of the whole organization;
- digital transformation is not a one-time event, but an ongoing process that requires focus and a well-defined strategy;
- the market sets the pace of digital transformation, but, as they are compelled to move forward, companies may choose to align their strategy to changes as they are underway or act in advance of the transformation and guide it.

# Introduction

Paolo Gallo, the CEO of the Italgas Group, is thinking back to July 2019, when the pilot project WorkOnSite[1] was about to be launched, and he had some worries. Would the algorithm work smoothly? Would artificial intelligence reduce site visits by technicians? Would the system realistically enhance the efficiency of site supervision? Despite these doubts regarding the ongoing implementation process, Paolo Gallo was sure that the process of working on sites needed to adapt to changing realities. He knew that the race towards Italgas digitalization that had started two years earlier would pay off before long. This moment came sooner than expected. In March 2020, after the Italian government announced a complete lockdown for the whole Country due to the COVID epidemic, something that had been unconceivable even just a month before, Paolo Gallo felt he had struck his target. Just one month before the announcement, the WorkOnSite project was successfully running at testing sites and it started to be extended to the whole company. Thus, the supervision of construction sites and the verification of their compliance with legal parameters – two of the company's key activities – could be carried out remotely, in a completely safe way for personnel. Thus, this bold decision regarding the Italgas digital transformation process was fundamental in maintaining operations during the coming lockdown and in adapting to the new normal afterwards.

1. App to manage checks on gas network worksites.

# 1. Italgas Group: a story of innovation and community service

*"Italgas is a company that's almost two centuries old with the attitude of a recently launched start-up".*
PAOLO GALLO, Italgas CEO

Italgas was established in 1837 as the Gas Lighting Company of Turin (*Compagnia di Illuminazione a Gas per la città di Torino*) and was the first Italian company to be specialized in the manufacturing of illuminating gas by dry distillation – an innovative method that made it possible to produce gaseous products from solid fuel. In 1838 the city council of Turin allowed the company to use its subsoil to provide the gas lightning of several public spaces and private houses for free. Thus, Italgas was the first company in Italy to provide manufactured gas as a public utility.
Along with its market expansion, Italgas Group has kept investing in the technological development of its network. When the pathway towards 'methanization' was first established in Italy in the post-WWII period, Italgas became a key player in this process. Part of the ENI Group, an Italian oil and gas multinational company, at that time Italgas was engaged in the modernization of the existing gas network and in developing new methane-bearing pipelines. Called 'blue gold', methane gas was considered to be an efficient and less environmentally harmful substitute for petroleum derivatives (e.g. liquefied petroleum gas [LPG]). With growing energy demand for public and industrial needs during post-war reconstruction and further economic expansion in Europe, methanization was an appropriate response, paving the road for sustainable economic development. It has considerably contributed to economy decarbonization[2] as a more sustainable form of energy production, owning to the fact that gas, in its various forms, produces less carbon dioxide compared to other fossil fuels.
However, the new century brought new challenges. Increasing awareness of vast societal challenges led European Countries to endorse the search to establish a delicate balance between economic efficiency and environmental safeguards by promoting the transition to the 'Green Economy'[3] through approval of a plan for the whole continent in 2019. This future-oriented vision aims to achieve climate neutrality by 2050 by means of a tailored, innovative strategy that seeks both the modernization of existing energy capacities and the enhancement of new energy sources.
In response to this new challenge highlighted by the European community, Italgas is continuing its 185-year history of innovation. In 2017 it launched a strategy based on innovation and digital technologies to ensure an effective and cost-efficient transition towards decarbonization goals. While prioritizing network modernization and digitization, as well as revising the process of gas distribution in a new energy framework, the company is adapting its infrastructure to meet the current growing need for more efficient energy and to ensure its capacity to transport renewable and decarbonized gases (biomethane and green hydrogen) in the future.

2. Conversion to an economic system that sustainably reduces and compensates for emissions of carbon dioxide ($CO_2$).
3. European Commission (2019). The European Green Deal. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1596443911913&uri=CELEX:52019DC0640#document2.

# 2. The European energy transition

## *2.1 The European Green Deal and energy system integration*

"*I want Europe to become the first climate-neutral continent in the world by 2050*". With this opening statement, on July 16th, 2019, Ursula von der Leyen introduced the European Union's plan to reduce emissions by 50% by 2030 and become the first carbon-neutral continent by 2050. Less than six month later the plan was agreed upon by EU member states, establishing the pillars of the European Green Deal.

The existing European energy system includes four main sources of energy production: gas, electricity, nuclear power, and coal. The shift towards a green economy entails maintaining gas and electrical energy, while phasing out nuclear power and coal. This goal is rather ambitious. It means replacing the production of around 1,400 TWh[4] of energy (Exhibit 1), and at the same time securing growing energy demand. In this context, two of the most highly intensive energy production sectors, electricity (1,010 TWh) and gas (920 TWh), will increase their share of the energy market. In particular, the proportion of energy generation from renewable sources[5] (i.e. solar and wind for electricity production) needs to increase, and biomethane and green hydrogen need to broaden their share within the gas sector. It is important to emphasize that none of these energy sources can meet the challenge of covering all of European energy demand on its own. Not now, and not in the near future. Therefore, electricity and gas will continue to play a complementary role both during the transition phase (defined by two stages in the European Green Deal – the interim by 2030 and final stage by 2050) and in the green economy of the future. In essence, only a combination of renewable electricity and gas can meet this deep decarbonization commitment at the lowest cost to society.[6]

While thinking about the position of the gas distribution sector in a new integrated energy system, Paolo Gallo realized there was a need to be proactive, not just at company level but through cooperation within the entire sector. His vision that the "*gas grid will continue to play an important role in future energy supply for EU citizens and industry, and that it will secure energy transition*"[7] is shared by many gas distributors at the European level. An association of like-minded gas distributor operators, called Gas Distributors for Sustainability (GD4S), was established in 2018 to have a voice and be represented at the EU level. Accounting for the 30% of the European gas distribution market, the GD4S advocates for the role of gas grids in the energy transition process as the most efficient and readily available way to fulfil the EU's orientation towards renewables. They

4. Terawatt - one trillion (1012). This measurement usually describes power station capacity in energy production.
5. Gas Decarbonisation Pathways 2020–2050 (2020). Retrieved from: https://gasforclimate2050.eu/sdm_downloads/2020-gas-decarbonisation-pathways-study/.
6. Gas for climate (2020) Retrieved from: https://gasforclimate2050.eu/wp-content/uploads/2020/03/Navigant-Gas-for-Climate-The-optimal-role-for-gas-in-a-net-zero-emissions-energy-system-March-2019.pdf.
7. Politico (2020). High-level discussion on the future of gas grids in a climate neutral Europe Union. Retrieved from: https://www.politico.eu/event/green-gas-whats-the-future-of-gas-grids-in-a-climate-neutral-eu/.

share the view that decarbonization goals within a specific timeframe and within current energy demand levels is not feasible by means of electrification only. A position now also widely shared by the electricity industry itself and by the European Commission that, in this sense, identifies gas distribution operators as an essential player in promoting the process of decarbonizing economies. Natural gas will continue to play an important role in the ongoing energy transition process, even in 2050, thanks to its many special features: from cost-effectiveness to ease of transport and storage, and flexibility of use. Therefore, the Commission assigns three main objectives to the gas sector for the coming decades: the availability of new essential and strategic infrastructures for the injection of renewable gases into the network, such as biomethane, hydrogen and synthetic methane; the development of smart networks and technologies enabling greater efficiency in consumption; the mitigation of fugitive methane emissions.
Objectives for which Italgas moved well in advance, announcing the solution already in the 2017 Strategic Plan: Italgas has to become a fully digital company. To be a part of a future integrated energy grid, "*gas infrastructure shall become fully digital as a technical precondition for distributing renewable gases such as green hydrogen and biomethane, or mixtures of these gases. This process goes in the direction of creating a new generation of infrastructures based on the latest technology, which will make the remote control of the distribution grid possible, in order to know exactly what is flowing inside it, how it is flowing, and whether the network settings are optimized for the substance*". This means transforming not only assets, but also operations, along with people's attitudes and mindset. Attributing a new digital identity to a company with a 185-year history, however, is a complex task. Is Italgas up to the challenge?
With these thoughts in mind, Paolo Gallo began to visualize the potential of gas infrastructure in a future energy grid and to plan the subsequent steps needed to put Italgas at the forefront of the energy and decarbonization challenges of the present and future.

### *2.2 The gas grid in the renewables-based energy system*

So, what is the future of the gas grid within a climate-neutral European Union? The European Green Deal will be implemented in two distinct stages. In a nutshell, the sustainable energy transition[8] is a transition to renewable energy sources. However, while the final stage of this shift, between 2030 and 2050, foresees a very high reliance on renewable energy sources, in the initial stage (up to 2030) the share of renewables is expected to be rather low (Exhibit 2). Such a different pace reflects, above all, the availability, expansion and costs of the technologies linked to renewables. Thus, in the first stage of 'decarbonization' and 'denuclearization' goals, the demand for energy which is currently met by coal and nuclear plants should be replaced by other sources. As renewable sources of energy are not yet ready to satisfy this demand, it has to be covered by

8. Transformation of energy system to one dominated by renewable energy.

the electricity and gas grids. Therefore, the importance of natural gas within the energy transition scenario is bound to increase. Further on, the share of natural gas as an energy source will be integrated with gas renewables, such as green hydrogen and biomethane.

Sustainable energy transition has long been associated with solar, wind and hydro sources of electricity generation. The International Renewable Energy Agency estimates that by 2050 the production of electricity will double and its renewable share will increase tenfold, with over 80% of the world's electricity predicted to be coming from renewables.[9] At the same time, there is a time lag between energy production from these sources and actual consumption, which raises two issues, namely energy storage and grid stability. In other words, this refers to the ability of the grid to dynamically adjust energy supply and demand, as it needs to compensate when they are unbalanced. Despite technological advances in the last decade, the storage capacity of existing batteries is still limited. For example, the largest battery in the world has a capacity of 100 MW.[10] A gas power plant, by comparison, produces an average of 500 MW/h. Therefore, the more widespread application of renewable electricity, especially in some industries,[11] is not yet feasible. Besides, such a grid is unstable over time due to its lack of modulation capacity, i.e. the grid produces energy only when there is sun or wind, and otherwise the system shuts down. So, relying only on renewable sources would introduce further rigidity in an already very complex electricity system and increase risks in terms of system-wide stability. A reliable power supply system has to be flexible and modular, i.e. be able to constantly adapt to changing energy demand in terms of both regular (day/night, winter/summer) and extraordinary fluctuations, whereas, for instance, seasonal battery storage of electricity generated by renewables is unrealistic at present, even at strongly reduced costs.[12] Therefore, the unsolved issue of production-consumption highlights the mismatch between the promise of electricity-generating renewables and their system-wide scalability.

The solution to this problem is an integrated approach to the power grid that couples different energy sources and infrastructures into one system to maintain the stability and reliability of the whole energy system (Exhibit 3). From this integrated perspective, a gas grid would offer several advantages: first, a well-developed capillary infrastructure; second, higher systemic flexibility to handle hourly, daily and seasonal fluctuations in demand, instantly adapting supply; third, the capacity to store energy sources in their storage facilities. This kind of effortless flexibility is a

9. Irena (2020). Global renewables outlook. Retrived from: https://irena.org/publications/2020/Apr/Global-Renewables-Outlook-2020.
10. Connellan, S. (2019). The world's largest battery is about to get even bigger. Retrieved from: https://mashable.com/article/tesla-battery-south-australia-expansion/?europe=true.
11. European Commission (2018). A Clean Planet for all. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0773.
12. Gas for climate (2020). Retrieved from: https://gasforclimate2050.eu/wp-content/uploads/2020/03/Navigant-Gas-for-Climate-The-optimal-role-for-gas-in-a-net-zero-emissions-energy-system-March-2019.pdf.

RENEWABLE GAS TECHNOLOGIES

The diversification of energy generating renewables increases the stability and flexibility of the whole power grid. Recent technologies have reinvented gas as a sustainable source of energy, decarbonizing it, and in this way the range of renewables now includes two other sources.

Biomethane is the first generation of decentralized renewable gases, produced from local organic waste through the process of anaerobic digestion. After a purification and upgrading process it may then be injected into a gas network. Biomethane production is a mature technology, and this source is now available in large quantities. Moreover, its use promotes the development of the circular economy and supports local employment. In *the first stage* of the European green transition its significance within the range of renewables is expected to increase significantly.

Green hydrogen is produced from renewable electricity via electrolysis, the process that splits water (H2O) into its basic components – hydrogen (H2) and oxygen (O2). The hydrogen can then be combined with carbon dioxide (CO2) to obtain synthesized methane (Exhibit 4). At present the technology of green hydrogen production is still evolving, and thus it is expensive and not yet competitive – its cost is 5-6 times higher than natural gas. Consequently, its use as a renewable source of energy is not currently feasible. However, these production costs are expected to decline significantly in the coming decade (especially thanks to a reduction in the cost of electrolysers). At that point the full potential of green hydrogen technology will be available for the second stage of the European green transition.

crucial asset for the whole energy system and it could resolve the limitations of the renewables-based electricity grid highlighted above. Thus, the framework of the European Green Deal drives innovation that is focused on a combination of energy sources and it opens up new opportunities for experimentation. One promising application of the integrated framework is power-to-gas (P2G) technology (Exhibit 4), which couples electricity and gas grids in a reliable and flexible green energy system. In essence, it solves the problem of renewables storage in the electricity grid, as it transforms surplus electricity supply (e.g. generated from solar or wind sources) into a carbon-neutral synthesized gas (green hydrogen or synthetic methane) that may be further distributed through the gas network. P2G solves the problem of storage across both temporal (generation today – consumption tomorrow) and spatial dimensions (generation in the South – consumption in the North). All types of gas renewables may be injected into existing natural gas networks. However, the network needs to be modernized, incorporating digital technologies. In this scheme the gas grid is a key enabler of energy transition, and with a low amount of investment it may become the solution for the renewables-heavy European energy sector.

### *2.3 The enabler of the European green transition: gas network digitization*

Having a digital gas network is a technical precondition for introducing renewable gases (green hydrogen, biomethane, and their blends) into the distribution networks. The process of digitization involves the physical installation of digital equipment along the network, where every single component (e.g. gas meters, pressure reduction stations, etc.) is able to receive and transmit messages. This creates a new generation infrastructure, equipped to be constantly controlled remotely, making it possible to monitor exactly what is flowing inside, how it is flowing and whether the network parameters are optimal to distribute the substance. In fact, each gas has its own technical specifications (e.g. hydrogen has a lower calorific value than natural gas), and so network parameters (e.g. pressure) need to be adjusted. Only a digital gas network can guarantee the fulfilment of these specifications. Through constant screening and instant network adaptation, such a network calibrates and registers the quantity distributed to the final customer. A digital network is the only kind that can carry renewable gases and thus deliver on the promise of P2G technology.
For this reason, Italgas has decided to invest over 2 billion euros in its gas distribution network digitization (at the time of writing 60% of this amount had already been invested), setting itself the goal of becoming the only utility in the world with a completely digitized infrastructure by 2022.

### *2.4 REPowerEU, green transition and the role of the infrastructures*

The conflict between Ukraine and Russia, one of the main gas supplier for the European market, has significantly shoked the European scenario of energy transition. The war has forced the European Union and the single countries to reconsider their priorities and to question the urgence of the ecological transitio to address more urgent needs. The main pressure for European countries was to find different and reliable sources of energy to satisfy the internal demand. In this context, the European Commission developed the "REPowerEU", a plan to decrease the European Union's dependency on Russian fossil fuels. This plan allowed on one hand to reinforce the resilience of the European energy system and to acquire autonomy, and on the other to accelerate the process of decarbonization of consumption and therefore the ecological transition.
The sudden need to diversify the energy sources has strengthened the importance of alternative sources like renewable gases (green hydrogen, biomethane, and their blends) to be released into the distribution networks, as in the digital ones of Italgas, which demonstrate not only the Group's development in terms of innovation, compared to other players in the sector, but also the primary role it can play in the future.

# 3. Italgas' standing in the gas distribution sector

Italgas Group operates primarily in the business of gas distribution. It collects gas from withdrawal stations that connect local networks to the national pipeline network and delivers it to end customers, households, and businesses (Exhibit 5). The Italian gas distribution market is highly fragmented – the top six Distribution System Operators (DSOs) make up almost 70% of the existing 22 million Delivery Points (DPs), while the remaining 30% are split among more than 200 players (two decades ago, the level of fragmentation was even higher). To increase the operating efficiency of the sector, the government decided[13] in 2000 to change the distribution regime from one of concessions granted by municipalities through direct negotiations to a tender system with a maximum tender duration of 12 years. In 2007 an additional government provision established the Minimum Territorial Areas (ATEM) for tender execution,[14] requiring the units to be larger than municipalities. As a result, whereas in 2000 there were around 730 operators, this number fell to 430 in 2005 and to 227 in 2014. In 2015, the market was dominated by distributors that were small (between 5000 and 50000 clients) and very small (less than 5000 clients).

The gas distribution sector in Italy is regulated by the Regulatory Authority for Energy Networks and the Environment (*Autorità di Regolazione per Energia Reti e Ambiente*, ARERA). As the regulator requires distribution and sales operations to be distinct entities, gas distributors do not directly charge their customers, but rather charge the sales companies. Traditionally, distribution work is remunerated through an automatic reimbursement mechanism that relies on natural gas metering that collects consumption data and then supplies it to both sales companies and end customers. However, this scheme mostly considers long data verification periods and does not make it possible to measure the amount of gas distributed at every moment. This inefficient mechanism could be enhanced by installing digital technologies in the network that enable the constant monitoring of the amount of gas distributed. The installation of smart meters is directly associated with the efficiency of gas DSOs. To promote the digital agenda, in 2015 ARERA carried out a programme[15] to substitute gas meters with smart meters, i.e. remotely-read meters that show the amount of the gas that has passed through a network in real time and that count gas consumption in a more precise and efficient manner. The energy efficiency has thus become a key driver of the gas distribution sector and it is embedded in the revenue model of DSOs, where the competitiveness of these companies is measured not only by financial factors but by also technological capabilities (Exhibit 6).

13. Italian Legislative Decree no. 164 of 23 May 2000 (the Letta Decree).
14. Thus, the distributor who is awarded the tender serves all the municipalities in the ATEM in question.
15. Resolution 554/2015/R/GAS.

### *3.1 Network development*

"*Italgas acquired 12 companies in 18 months and was able to integrate them quickly thanks to a significant organisational effort. We also appointed an Integration Manager and everything went smoothly thanks to Italgas' great expertise.*"
PIER LORENZO DELL'ORCO, CEO Italgas Reti

By leveraging the ongoing consolidation of the sector, Italgas has developed a well-defined strategy of network expansion since its return to the Italian Stock Exchange on November 7, 2016. Italgas has developed a pipeline of acquisitions based on market analysis that has allowed it to narrow down a long list of possible targets to a short list. 'In this process', commented Italgas Reti CEO Pier Lorenzo Dell'Orco, 'we have applied principles of agile project management, which are uncommon for the industry, and have also structured the work pool to be more effective. And this has produced notable results in terms of both acquisitions and the speed of integration of the new entities'. Keeping their promise to investors, during the first 18 months Italgas Group completed 12 acquisitions and extended its network by more than 5000 km, strengthening its geographical presence and increasing the company's RAB by €320 million.
The acquisition of the Sardinian distribution network from CPL Concordia in 2018 stands out in this massive acquisition set. The first concessions Italgas obtained in the region had been companies 'on paper' (i.e. not operational) that were inherited with other acquisitions in the south of Italy. When starting to work in the region, Italgas acquired another local company, Medea, and other concessions from Conscoop Group. These acquisitions were grouped under Medea, and the Italgas management started to unlock their strategic synergy, investing in the digitization of the acquired infrastructure. In the existing network, which transports liquefied petroleum gas (LPG) and propane air, a gradual modernisation and conversion to natural gas transport is underway. These steps are part of the overall process of methanization of the region. Entering the Sardinian market has expanded Italgas' customer base to approximately 40,000 households (with a potential pool of 200,000) and the extension of the distribution network by a further 1,100 kilometres is in progress. In addition, investments in the network have impacted the development of the whole region. Indeed, a year after the Medea acquisition, Italgas established a partnership with Marguerite II, the European Fund for Energy, Climate Change & Infrastructure, attracting approximately 44 million euros in investments in the regional gas infrastructure. The Sardinian case highlights the link between the digital transformation of energy infrastructure and the sustainable development of the territory.
Interestingly enough, Sardinia, the Italian region with the least developed energy system, will benefit from the most modern and advanced infrastructure in the country. The group's plan is to build a 'digital native' network (i.e. a network that is fully digital right from its inception) equipped with widespread sensors that allow the massive acquisition of network physical parameters and their interpretation by specifically developed algorithms. This makes real-time monitoring of

HYDROGEN-READY PLANTS

For the construction of the power-to-gas plant in Sardinia, Italgas is collaborating with two important scientific partners: Politecnico of Turin and CRS4 (research and innovation agency of the Autonomous Region of Sardinia). A partnership with Politecnico is also under way to analyze and assess the impact of hydrogen and gas mixtures within distribution plants. The focus is on the mechanical resistance of the steel pipes and joints inside the risers, the chemical-physical tightness of the seals and membranes of the gas pressure control and regulation devices, and the suitability of the equipment currently used to detect the presence of gas in the air and the meters installed.

network operation, alarm management, big-data analysis, predictive maintenance and leakage detection possible. This advanced network allows Italgas to experiment with a future form of integrated energy infrastructure, and in this way the Sardinian distribution network has become the Italgas testing platform. One ambitious Italgas project tests the potential of P2G technology in real-life conditions, connecting this new infrastructure to a renewable gas production plant. This 15 million-euro investment would include facilities for electricity generation from renewable sources, an electrolyser capable of producing oxygen and hydrogen starting from water, and a methanation section that will transform hydrogen into synthetic natural gas. The gas produced, in the form of green hydrogen and/or synthetic methane, will be supplied to domestic and industrial users on the island. The plant will also be equipped with a buffer storage facility to store the gas produced, which will be used when necessary to generate electricity again, or to be mixed with natural gas in the networks. 'This technology constitutes an additional way towards the convergence of the electricity and gas sectors', said Pier Lorenzo Dell'Orco, CEO of Italgas Reti.

### *3.2 Energy efficiency development*

Seaside is another key acquisition on the part of Italgas in its drive to diversify in the energy efficiency sector. The push from ARERA, in favour of innovation and efficiency improvement in the sector, underscored the need for Italgas to consider diversification in the energy efficiency sector. Since 2005, gas distributors have been required to buy Energy Efficiency Certificates on the market. Called 'white certificates' in sector jargon, they are negotiable securities that certify energy savings achieved through interventions and projects to increase energy efficiency. These certificates are usually bought from Energy Service Companies (ESCOs) that offer services that allow companies to achieve energy efficiency and environmental goals. Initially, Italgas Group was to buy 2 million certificates per year, but now this number is decreasing due to higher efficiency levels achieved by the group. However, the cost of white certificates was very volatile in past years (ranging between 100 and 400 euros), and now it is set at 250-260 euros. Considering the importance and permanence of the energy efficiency factor in the sector, Italgas decided to develop proper in-house expertise in energy efficiency in order to reduce the cost of buying white certificates and to concretely improve the efficiency of its own facilities and operational processes and those of the ESCOs acquired, Seaside and Toscana Energia Green. Seaside is more orientated to

SEASIDE

Seaside is an Italian company based in Bologna that operates in the energy efficiency field. It was founded in 2010 as a start-up by three experts in energy innovation, specifically renewable energies and energy efficiency. Recruiting talent from the technical sector and through collaborations with universities, Seaside has combined highly skilled professionals with niche knowledge in sustainable technologies for the environment.

the private sector and to digital services, while Toscana Energia Green is more for the public sector and building requalification interventions. Indeed, this acquisition served a twofold purpose: solving the issue of white certificates, and exploiting the company's digital skills, which constitutes a crucial step toward digital transformation.

The Seaside acquisition shows Italgas' commitment to looking for innovative energy solutions within the framework of the European Green Deal. When it acquired the company in March 2018, Italgas obtained skills and expertise both for improvements in efficiency and for a quantum leap into digitalization. When integrating Seaside, Italgas included two of the start-up's co-founders in the governing board of the restyled company, as managing directors.

After the acquisition of Seaside, many others have followed: Fratelli Ceresa, an italian energy service provider located in Turin and Toscana Energia GREEN, italian energy service providers specialized in renewables.

In 2021, another big step for Italgas Group. In line with the strategic goals which called for a more significant commitment towards sustainability, efficiency and renewables, Seaside has been at the center of an important operation of merger with Fratelli Ceresa and Toscana Energia GREEN. The merger resulted in the creation of Geoside, whose name means "being on the side of the planet", highlighting the commitment toward the environment (*Side*, which means "from the side of Earth", and *Geo* which is the ancient Greek word for earth). Geoside is active in providing solutions for achieving energy efficiency of buildings. Thanks to its rich pool of technologies from the different constituting companies, Geoside supports any public and private company which wants to reduce its energy and environmental impact, in line with the urgent global call for the achievement of national energy efficiency targets and the decarbonization of consumption. Among the cutting-edge solutions developed, Savemixer emerges as the first *Predictive Energy Analytics* software based on energy data analysis, *Machine Learning* and *Energy Intelligence*.

# 4. Italgas: paving the way to digital

*"In recent years Italgas has experienced an extraordinary change. Since its return to the Stock Exchange [in November 2016] it has been able to undertake important organizational, technological and cultural transformations."*
PAOLO GALLO, CEO of Italgas

*On October 14, 2018 Paolo Gallo gave the then Italian Prime Minister Giuseppe Conte a tour of the new Digital Factory built at the Milan headquarters of Italgas. Along with the presentation of Italgas' new digital transformation engine, the tour was an opportunity to give 'visibility' to the business of gas distribution and highlight the challenges of this fragmented sector*[16] *that operates in a context driven by innovation and technology. As he presented* the fundamentals of *the Industrial Plan, which is a reflection of the Italgas vision that digital transformation is not only able to* improve company operations, efficiency and quality of service *but also ensure the survival of the sector, Paolo Gallo* retraced *the initial steps in this ongoing journey.*

Briefly, digital transformation involves the adoption of digital technologies. The 2016 decision to prioritize digital investments was a turning point for the Italgas Group and the formulation of its strategy. Italgas has allocated considerable financial resources to digitalization (Exhibit 7). For example, in its 2020-2026 business plan, out of a total of €7.5 billion in investments, more than €1 billion has been allocated to the digitization of the network (the adoption of smart technologies to monitor the distribution network) and business processes. However, the transformation does not simply involve the adoption of technologies but rather touches upon all areas and activities in the company, fundamentally altering businesses operations and the customer value proposition. As with many other breakthroughs, in order to reap the benefits of digital transformation, the whole organizational culture, identity and mindset need to be redesigned.
The Italgas Group journey towards digitalization has been carried out progressively. To enable digitalization across the whole company, a number of company dimensions need to be properly reconfigured. The transformation of Italgas is based on three main pillars: physical assets, organizational processes, and people.
The *digitalization of its IT infrastructure* has required Italgas to be engaged in the transformation of its assets and core activities. *Its network digitization* plan called for the installation of digital devices for the massive acquisition of the physical parameters of the network, and the data sets collected were processed by ad hoc algorithms. This was a huge leap, allowing for real-time monitoring of network operations which enabled alarm management, predictive maintenance, and an improved search for leaks. A better grasp of typical operations, thanks to the ongoing adoption of digital/IoT technologies, made the further optimization of operational and business processes feasible, ensuring its transformation into a complete digital company. As Paolo Gallo has fre-

16. Currently the sector includes more than 200 fragmented operators.

quently remarked, 'How can you leverage a digital network if you don't have digital processes?', which emphasizes the need for a systemic turn to digital in order to fully benefit from digital advantages. Indeed, only a full conversion of routines and practices would enable the digital technologies to 'shine'. Lastly, in order to meet the digitalization challenge and allow assets and processes to merge into an efficient self-sustaining system, another key element needs to be transformed – *people*. Essentially, their mindset and attitude towards their work must change.
These steps eased the navigation of Italgas in its digital transformation journey and gradually shaped the digital identity of the company.

### *4.1 Digital Factory: the engine of digitalization*

*"Digital culture is the binding force between the different generations."*
MARCO BARRA CARACCIOLO, President and Ceo of Bludigit

*Paolo Gallo is very proud of the Italgas 'Digital Factory', the engine of company's digital transformation. The space, specifically designed for technological innovation, is where multifunctional teams are developing new IT solutions in Agile and Time-Boxed modes, in order to transform business processes. The Digital Factory is Italgas' innovation vortex and involves Italgas employees as well as small- and medium-sized companies that want to develop highly innovative technologies and tools with the company's help. It is the heart and engine of the new ecosystem. In fact, Italgas, which was already Italy's leading natural gas distributor and the third largest in Europe, aims to be a global reference model for innovation and business transformation.*

To shape its new digital identity, Italgas has promoted a new organizational culture to be disseminated across all organizational levels. For this purpose, a specific unit was designed to support the continuous development and improvement of digital capabilities within the organization. Opened in November 2018, the 'Digital Factory' is the technology innovation hub created to develop digital solutions across all the departments an areas to enable digital transformation.
It is the heart of this new organizational culture and the engine for digital transformation. The Digital Factory hosts multifunctional teams that develop new IT solutions in Agile[17] and Time-Boxed[18] mode to transform business processes (Exhibit 8). It is a real 'permanent laboratory' that promotes cultural and technological change in the company. 'When I was hired, the Digital Factory was tasked with innovating and working on small pieces of processes, and it was expected to deliver results every 4 months', says Marco Barra Caracciolo, president and CEO of Bludigit, 'but now we are trying to include the Digital Factory in longer and more complex asset transformation processes.

17. AGILE software development refers to a software approach based on the idea of iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams.
18. A timebox is a defined period of time during which a task must be accomplished.

The Digital Factory is physically located on the upper floor of the Italgas Milan headquarters (in 2020 it completely switched its operations to remote working) and it hosts several digital rooms [divisions] (Exhibit 18). Each room focuses on the development of a 'minimum viable product' every 16 weeks. In the first two years they were active, the cross-functional teams collaborating in the Digital Factory developed: the Integrated Centre for Supervision and Control (ICSC), which monitors the distribution network in real time; the 'WorkOnSite' application, which enables the remote control of construction sites; 'ShareView' devices, which allow remote collaboration between technical and operational departments, facilitated by augmented reality; 'ClickToGas', an interactive system for end customers to request new gas connections; 'SmartTracker', an asset management tool to simplify and automate smart meters lifecycle management, the 'Smart Prediction' algorithm for predictive maintenance of smart meter faults. In addition, the Digital Factory rooms are currently working, among other activities, to foster the Multi-channel Digital Experience of customers through the development of a suite of digital interactions through website, HelpOnline, Social Media chatbot and Customer Portal. By 2025 over €70 million will have been allocated for new activities in the Digital Factory and for the development of new applications based on machine learning, big data analytics, 4G/5G connectivity, artificial intelligence and augmented reality technologies.
Finally, to accelerate innovation in energy and infrastructure sectors, leveraging the digital solutions developed by Italgas, the Digital Factory also offers digital services and solutions to third parties. As a matter of fact, it supports small- and medium-sized companies that are willing to develop highly innovative technologies and tools to increase operational efficiency. In this way Italgas pursues a dual goal. On the one hand it exploits acquired digital skills by offering consulting and mentoring services to small enterprises, and, on the other hand, by engaging partners to create an ecosystem of multiple players pursuing the same goal.

### *4.2 Assets: transforming the gas distribution network*

"*At the beginning of 2022 we will have invested a total of over two billion euros in the digital transformation of our network. And by then we will also be able to say that Italgas is the only utility in the world to have a fully digitized network*".
PAOLO GALLO, CEO of Italgas

While drinking an espresso at his favourite café, Paolo Gallo reflects on the condition of the European energy sector and the main trends of industry transformation. He realizes that the group has two options: being proactive and doing something to make things happen, or simply being reactive and waiting for things to unfold before responding. As an engineer, he is accustomed to viewing the world as a set of interacting variables, and a set of processes to be systematized. However, as a specifically aeronautical engineer, he still maintains some 'dreamer' and 'visionary' traits that make him keen on change and transformation.

### 4.2.1 Cloud migration

The first step for Italgas to engage with digital technologies was adopting the Cloud. This began in 2017, right after the demerger from the SNAM group, with the migration of the entire IT infrastructure to the Cloud. The company adopted the Microsoft Azure IaaS (Infrastructure as a Service) cloud-based platform for data storage, and Microsoft Office 365, a SaaS (Software as a Service) suite, for collaboration. Switching to these technologies produced an immediate positive financial effect, reducing costs for on-site data centres, infrastructure set-up, and maintenance (with savings of around 40% compared to the costs required for on-premise infrastructure), as well as time savings that can be quantified in years rather than months. At the same time, the integrated platform enhanced the speed and flexibility of operations and interactions, improving communication, data access and supervision, and optimizing daily tasks. After a while, Italgas further increased the use of Cloud-based services, adopting SaaS solutions to manage its sales forces, financial data, human resources, and CRM-related practices, along with PaaS (Platform as a Service) IoT based technologies for network remote control, smart meter management, and cathodic protection.[19]

### 4.2.2. Smart meters

Gas meters collect continuous information about the amount of gas distributed throughout the network to each customer, which overcomes any issues related to estimating consumption.
'Smart Gas Meters' are electronic devices that collect, record and transfer information about the content of the gas grid from remote locations in real time (Exhibit 9). This way gas distributors may access information on consumption and on the conditions of the grid at any time. These smart meters ensure the stable delivery of gas and households are charged for their exact consumption, while gas operators no longer need to go to consumers' homes to record gas readings. Thus the replacement of traditional meters with smart meters has created a win-win situation for all parties involved in the process – gas consumers, gas suppliers and gas distributors (Exhibit 10).
Italgas started to replace customers' gas meters with digital substitutes in 2016. This process called for significant investment, yet this became an enabling factor for the broader digitization of the company. In 2021, Italgas will complete its plan to replace the 7.7 million traditional gas meters with the latest generation meters (Exhibit 11). To date, over 98% of the overall total has been replaced. Although smart meter replacement was set in motion by an exogenous factor, it also constituted an incentive to create a platform to manage the newly installed smart meters.

19. Technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell.

This IoT-based platform was designed in-house, but not in the Digital Factory. The platform was initially designed to control the smart meters, and it was later enhanced to also manage back office processes, such as electronic invoices.
The installation of smart meters is consistent with the future energy scenario, where several sources of energy, such as green hydrogen or natural gas, will be distributed throughout the same network (i.e. the Italgas distribution network), and where companies will need to constantly monitor the material distributed through the network in order to adjust parameters accordingly. In this respect, a fully digitalized network is a key requirement to handle such change.

### *4.3 Transforming processes: how digital technologies enhance work on sites*

*"Curiosity, in a broad sense, is the main driving force of Italgas digital transformation... Openness to novelty and to change are the competences of the digital age".*
PAOLO GALLO , CEO of Italgas

The digitization of the gas distribution network was the first step in Italgas' transformation. Although it was a fairly easy step in terms of implementation, thanks to its tangible character and because it depended on the investment of money and time, it created ripple effects that extended to the whole organization. Stretching to organizational processes and routines, i.e. iterative patterns of common behaviour occurring in the organization, it changed how people work, interact and fulfil their duties. Several projects were particularly important in transforming these processes.

#### 4.3.1 Work on sites

The WorkOnSite application was developed for a faster and more efficient monitoring of Italgas distribution network worksites. As emphasized previously, the gas network is the main asset of a gas distributor operator, so work on sites is an important daily activity as it allows the company to ensure the full operational capacity of the network. The aim is to repair and replace damaged or outdated network sections, perform predictive maintenance to prevent malfunctions and breakdowns, and build network extensions. Site control activities are carried out by operators, who always need to carefully evaluate the condition of the site and the amount of work that is necessary. Before the WorkOnSite application was introduced, these inspections were done with the use of paper forms. In contrast, since 2020 the on-site checks have become automated and digital and they occur in real time. The application relies on two digital technologies, artificial intelligence and augmented reality, that process the information received by an operator in charge of carrying out the work on a site. Using tablets on which the app has been installed, the operator uploads pictures from the site. In real time the artificial intelligence algorithm recognizes the image and checks the compliance of the visible characteristics of the site with design spec-

ifications. While working on site the operator receives continuous feedback from Italgas technicians, who supervise every stage of work instantly from their remote location by virtue of augmented reality technology, assessing its advancement and proper execution. Thus, the execution of all works passes through a three-fold check in real time by the operator on site, the algorithm, and the technician at the main premises of Italgas.
The application and the algorithm were designed by a cross-functional team working on the project at the Digital Factory. The pilot stage of the project was launched in April 2019, which tested the functioning of the app itself, guiding the operators in taking pictures of the yards. This stage was completed in July 2019. The second phase of the project was the organization of a virtual control room that made it possible to assign each of the images to be checked to specialized Italgas technicians located in different parts of the country. This 'human neural network' trained the algorithm to 'understand' images and assess the state of a site according to specifications (i.e. the correct state of the site), relying on the technicians' expertise. The virtual room still exists at Italgas premises and receives images from AI if additional verification is required. The second part of the project was conducted in the period from September to December 2019. The third stage of the project was launched in January 2020 and it integrated the artificial intelligence component. At this stage, experimentation and the initial assessments of the whole system's functioning started on the first construction sites. These tests confirmed the viability of the newly established process of working on site – the proper functioning of the app, its correct use by operators, and their seamless interaction with technicians. Thus, starting in February the use of the app was gradually extended to all construction sites. In May 2020, with the loosening of lockdown measures, the application allowed all worksites to restart rapidly, helping to limit the visits by operators.

### 4.3.2 Shareview

The Shareview technology is an augmented reality headset designed at the Digital Factory to allow remote collaboration between Italgas technicians and network operators. The device facilitates interaction and knowledge transfer between employees and simplifies the work of on-site employees (Exhibit 12). Specifically, Shareview allows operators to make video calls from the sites to get assistance from technicians at Italgas premises and enables collaboration between operators and technicians in real time. Technicians are able to see the execution of work as if they were physically on site, while operators get instructions from both technicians and specification pop-ups, enabled by augmented reality technology. The latter allows them to consult procedures and technical documents in real time and fill in the intervention report once works are completed.

### 4.3.3 Monitoring the network: Cavity Ring-Down Spectroscopy

The important aspect of network digitization for a gas distribution operator is the increase in network safety, i.e. early detection of any gas leakage, which also corresponds to the containment of

fugitive methane emissions. This issue has recently become central to the agenda of the European Commission. The traditional way to detect a leakage required technicians to drive along the gas network and look for leaks using detectors installed on the car. The disadvantages of the traditional leakage detection process were its slowness, since the maximum speed of the car had to be 15 km/h, and the presence of physical obstacles that might impede the leakage search (for example, parked cars). To overcome these issues, Italgas installed a modern 'Cavity Ring-Down Spectroscopy' (CRDS) system that is composed of sophisticated sensing technology that offers significant advantages compared to the traditional process in terms of speed and the size of the areas subject to control (Exhibit 13). This technology was developed by the US company Picarro, a leader in the supply of intelligent software for detecting the presence of gas in the air, water and land. The agreement allows Italgas to use Picarro Surveyor, which is currently the most advanced technology in the field of gas network monitoring, in Europe.

### *4.4 People: mapping digital competences, upskilling and reskilling personnel*

*"Three cultures dominate in the Italgas Group: engineering, financial, and a new culture, promoted by Paolo Gallo. The latter should be the culture that contaminates the two other and makes for a profound change in the organization".*
PETER DURANTE, Chief Human Resources Officer, Italgas

The transformation of human resources constitutes the last 'piece of the puzzle' that leverages Italgas' digitalization. Sustainable digitization, indeed, requires redesigning not only the tangible ways of working (which include procedures and routines) but also embracing the innermost layers of organization, such as culture, knowledge generation practices and the acquisition of a company identity. Promoting a new digital culture is the most critical step in digital transformation, as the effort needs to be supported by employers who are eager to develop skills and capabilities that are in tune with the changing environment. 'After digitalizing the assets and the processes, it's the people's turn. The current organizational model is not in line with the new digital processes. There is too much technology. We need to change the organizational paradigm', says Peter Durante, Chief Human Resources Officer at Italgas.
In October 2019, in the midst of asset digitization, Italgas started a comprehensive process of mapping its staff's digital skills and scheduling the consequent up-skilling plan. The programme's goal was to take a snapshot of the state of employee digital skills, and to eventually define a new set of relevant aptitudes and skills for the ongoing transformation and create an inspiring and dynamic learning environment.
First, a digital competence survey was launched in December 2019. A total of 3109 respondents took part in the survey, out of the total of 4079 employees included (Exhibit 14 shows the respondents' roles in the company in detail). The data collected through the survey was processed with the help of the 'Digital Skills Matrix' (Exhibit 15), a tool which maps predisposition to innovation

(DigitalSkill & DigitalMindset) and identifies 'Digital Ambassadors' – the employees with the most advanced digital skills, who can foster digital culture within the company. According to the results, 62% of employees had poor digital skills, while 38% of employees demonstrated both good digital skills and a positive aptitude for innovation and a digital mindset. Within that 38%, 276 candidates were selected to become 'Italgas Digital Ambassadors'. The ambassadors were instructed in line with the train-the-trainer model[20] and were put in charge of promoting the digital transition of the company. The introduction of informal leaders helped to build a stronger consensus among employees, to persuade the sceptics and to mitigate the classic resistance to change due to the 'fear of the unknown'. Essentially, a 'viral contamination' began among employees, so that 60 current digital ambassadors had managed to train around 1200 of their colleagues by the end of 2020. 'The introduction of this knowledge sharing system has helped to further develop a strong sense of community, of helping each other', commented one of the company's digital ambassadors. After mapping digital competences, the management undertook a massive up-skilling and reskilling programme to align people with the new digital identity of the company. In line with the objective of the programme, training relied on digital tools and platforms. A library of 'digital tips' were available on the My Learning platform. This library included 17 tips (steps) to improve digital competences, with topics ranging from social networks, e-commerce and digital payments for beginners, to blockchains, augmented reality, artificial intelligence, cloud services, IoT and Industry 4.0 for more advanced employees. In addition, an e-learning tool on features of Office 365 was provided to allow each employee to acquire knowledge of Office 365 services.

Digital transformation requires not only upskilling the current employees of the company, but also creating new roles and professional profiles that can carry out new tasks faced by the company. In recent years Italgas has enriched its staff by creating new professional profiles (Exhibit 16). These include designers for the Digital Factory, data scientists, digital experts, and other professional profiles such as a scrum master, an agile coach, and a solution architect, all meant to design customized infrastructures, platforms and software. New management profiles have also been introduced, a Chief Security Officer (CSO) and a Chief Information Officer (CIO). The introduction of a 'dedicated' management role for digital tools is a clear signal of the group's transformation. 'There was a need for a boost of novelty and contamination of new ideas from outside. It's human and normal for that to happen; for example, the idea people have of change is very likely to be just an evolution, an improvement from x to x+1. To foster change you also need new people who are blank sheets', notes Marco Barra Caracciolo, who joined the company in 2019.

Last but not least, two new departments dedicated to Business Digital Transformation and People Digital Transformation were created to move from knowledge to adoption, and to further accelerate the transformation path in terms of two of the three main areas. In particular, the Business

20. Framework for training potential instructors or subject matter experts to enable them to train other people in their organizations.

Digital Transformation department, created within the group's operating arm, Italgas Reti, is a further indicator of the determination of Italy's leading company in natural gas distribution to consolidate its leadership by focusing on a technological leap in all its activities. In fact, this dedicated function has the objective of promoting innovation and its deployment in the company, facilitating digital transformation and technical innovation in order to increase the efficiency and safety of the system and reduce costs, actively collaborating with operational functions to promote the re-engineering of processes with a lean and digital scope. The new department, which reports directly to Italgas Reti CEO Pier Lorenzo Dell'Orco, operates in four main areas: innovation (scouting for new technologies and solutions, their introduction into company processes and testing), network analytics (the development of data-driven projects, implementation of big data acquisition processes and their enhancement, and the introduction of algorithms to optimize the predictive maintenance of assets), device and material testing (management of laboratories, research and development activities and material testing) and project implementation (ensuring the adoption of new innovations and technological development solutions within the company). Inherent in this organisational effort and in the activities of both functions is the objective of contributing to the development of a digital mindset that permeates the company at all levels, fostering its growth and the achievement of business objectives. Pier Lorenzo Dell'Orco commented, 'At Italgas Reti, a decisive challenge of change management is underway, both for very operational roles, so that they embrace the full digitization project, and for intermediate roles, to encourage the spread of a true culture devoted to innovation and the maximum use of digital tools.

### *4.5 The digital dimension as a driver for all Italgas Group activities*

The evolving digital nature of Italgas has become a dominant component of its organizational culture and is being extended to every part of the group (Exhibit 17). The know-how acquired is allowing it to adopt a new outlook on other lines of business and develop strategies for their transformation. The Italgas Strategic Plan for 2020-2026 aims to invest about 240 million euros in other lines of the group's businesses, injecting digital transformation into water and energy efficiency activities.
By leveraging the excellence developed in the management of gas networks, Italgas has been able to introduce the same best practices and technologies to water networks, as well, to improve service quality and reduce losses (e.g. on average water networks lose 40% of the water they carry). At the end of 2020, Italgas launched a program to transform its nine water network concessions in Caserta and its province over a total of 270 km serving about 30,000 customers. In addition, thanks to its partnership with an Israeli company, TaKaDu, a global leader in the development of digital systems for water networks, this water network will be enhanced with 'water smart meters', which are based on ultrasound technology. They are expected to replace all traditional meters by 2021. Together with sensors, installed along city networks, smart meters will make it possible to keep the water infrastructure and its operating parameters under constant control, quickly detecting leaks and intervening immediately.

Similarly, Italgas digital know-how can be applied in the energy efficiency sector. At the end of 2021, Italgas Group launched Savegas, a service that offers ready-to-go energy requalification interventions. Savegas is a single operator that can manage the whole process during requalification works – starting from project assessment to the implementation of interventions – as well as handling administrative procedures for fiscal reimbursements.

### *4.6 Scaling the digitalization: Bludigit*

To leverage on the expertise acquired with the digital transformation process, in 2021 Italgas Group has decided to give a "concrete shape" to the digital dimension and the skills acquired during the digital transformation process. This led to the creation of Bludigit S.p.A, constituted spinning-off all the activities concerning Information Technology, Digital Solutions and all the activities related, such as the Digital Factory. The new company, led by Marco Barra Caracciolo as president and CEO, previously CIO of Italgas, includes 100 people and has a dual market: the Italgas Group internal one to increase the internal efficiency, and an external one to offer cutting-edge digital solutions developed in-house.

# 5. Future perspectives

Paolo Gallo, an engineer by training, is very proud of his '185-year-old company with a 3-year-old start-up mindset'.
During his end-of-the year speech, Paolo Gallo did not miss the opportunity to 'threaten' his employees several times. 'I will never be satisfied. I will keep on raising the bar, because I want to reach this goal, and I want it now'.
The future challenge for the Italgas Group is the development of a digital culture and mindset, especially in daily operations. People need to be challenged and inspired and they need positive feedback from the transformation, in order to be pushed out of their comfort zone.
The next important step is to increase the scale of people digitalization – making digitalization a part of the administrative apparatus, so as to digitalize internal processes.
Additionally, big data analytics need to be strengthened. 'We are a gas distributor; we do not interact with mass customers. The implementation of big data analytics is usually led by the need to understand consumers, which is why we are lagging slightly behind other industries. For sure, we have daily data from 8 million smart meters, which is quite a little treasure to be exploited', observed Marco Barra Caracciolo. Predictive analytics, machine learning, and automatization are the goals in the coming years.
In addition, another important future challenge concerns bringing together three different cultures coexisting within Italgas: the old school engineering culture; the financial and economics-oriented culture, which characterized the last 15 years of the group's life (when associated with Eni and Snam); and a new culture fostered by a visionary leader, Paolo Gallo, which encapsulates the need to revolutionize an old, stationary industry.
Moreover, the group's management system needs to be upgraded in compliance with new practices and a novel management and leadership approach. New performance indicators need to be developed. Its management style needs to shift from that of an organization based on control (e.g. of teams and the activities they perform at every moment) to one based on objectives achieved. In other words, there is a need to switch from quantitative KPI to new performance indicators (e.g. indicators measuring the advancement of projects).
Last but not least, the Digital Factory can be further employed to push asset digitalization forward to enhance the potential scalability of the lab.
As Paolo Gallo said, 'We are ahead by two to three years compared with any other company just beginning their digital transformation, not so much in terms of assets, but in terms of our significant achievements with processes, people and organization. But the journey has just begun'.
The Italgas Group experience is an important lesson for those who want, of necessity or out of virtue, to engage in digital transformation, demonstrating the right ingredients to achieve this goal: a proactive, visionary leader; the focus on people; and the willingness to embrace a new approach of thinking about design. However, as the journey 'has just begun', the company needs to prepare for the forthcoming challenges:

- Should Italgas Group develop an ecosystem? How? Who would the potential players be?
- Should the company strengthen its international position, adopting a less cautious approach?

- What would be the potential implications of adopting a more sophisticated data management approach? How could this contribute to enhancing its value proposition?
- How should organizational design and structure evolve in response to upcoming challenges? Are the traditional, bureaucratic models suitable for emerging organizational needs?

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# Appendix

Exhibit 1. Electricity production by fuel type. Source: European Environmental Agency

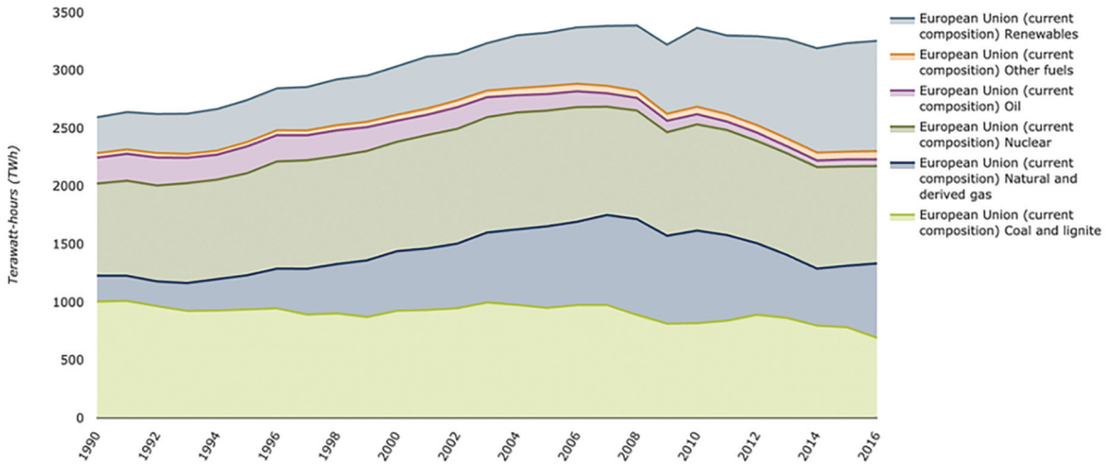



Exhibit 2. Projected share of renewables in the European energy system. Source: IRENA, 2020

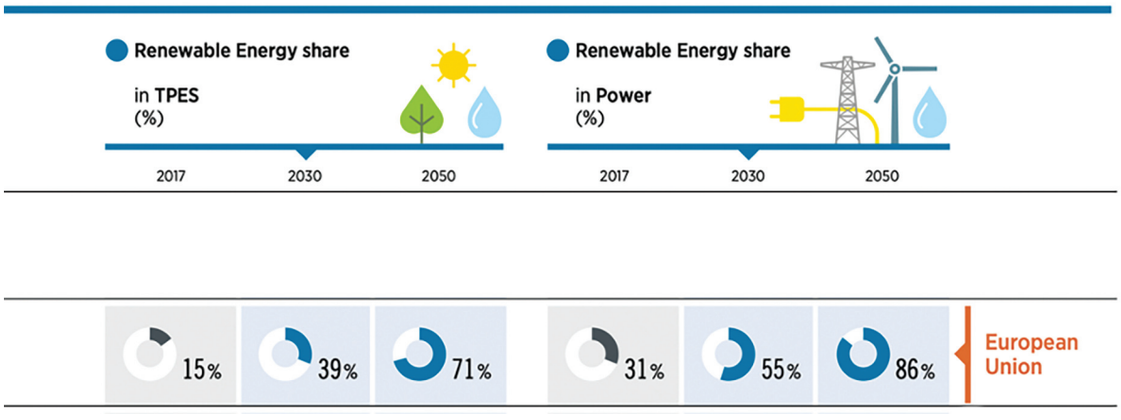


Exhibit 3. Gas grid, electricity grid and renewables integration

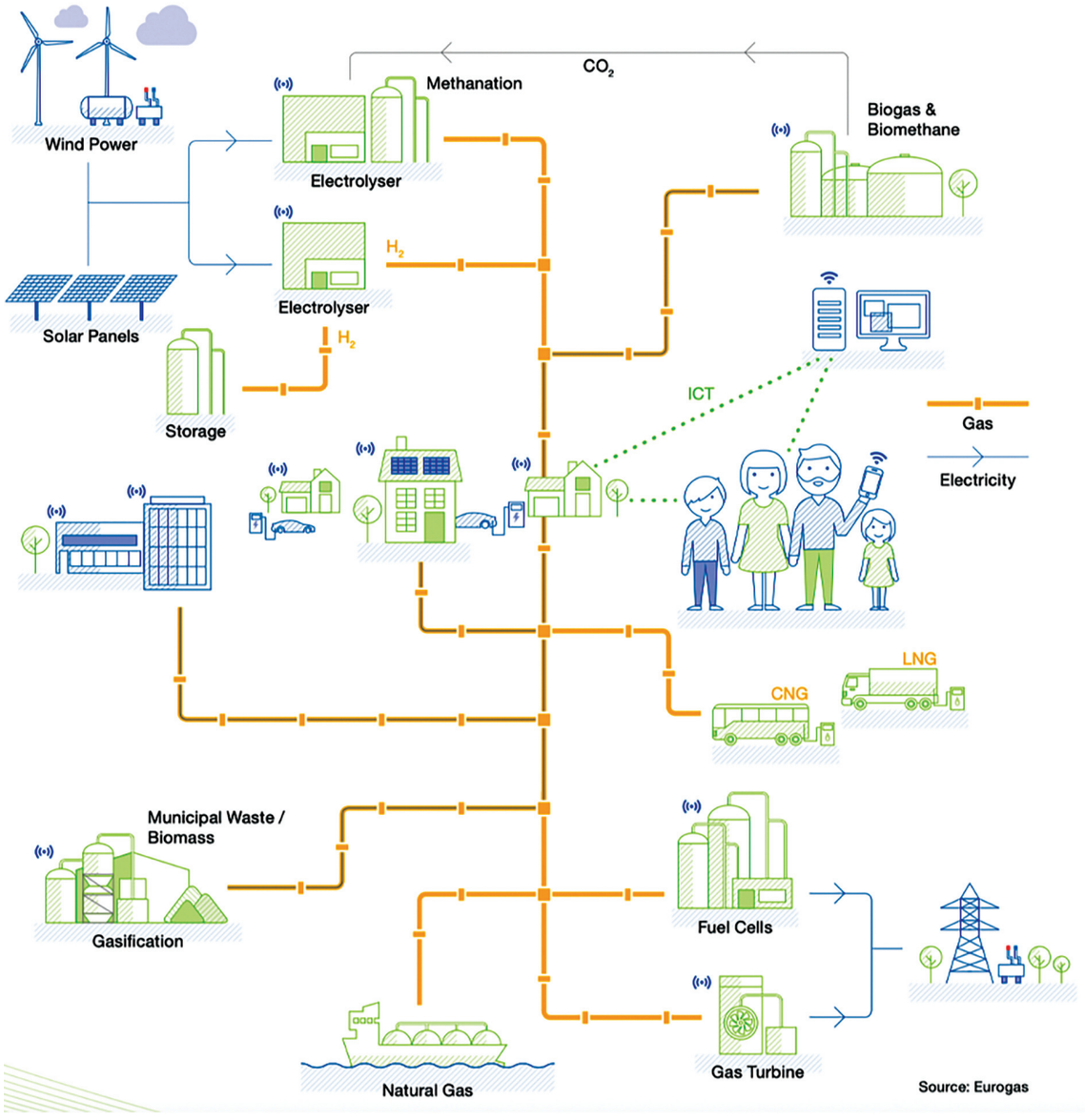


Exhibit 4. Power-to-gas integration framework. Source: Italgas internal document

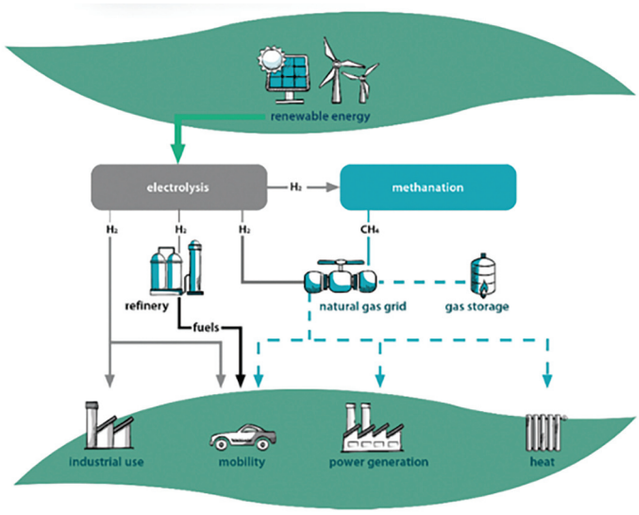



Exhibit 5. Natural gas production and delivery. Source: US energy Information Administration

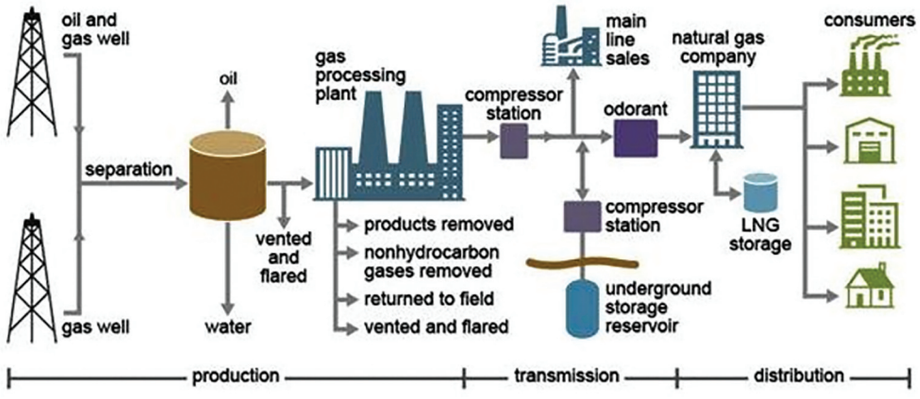
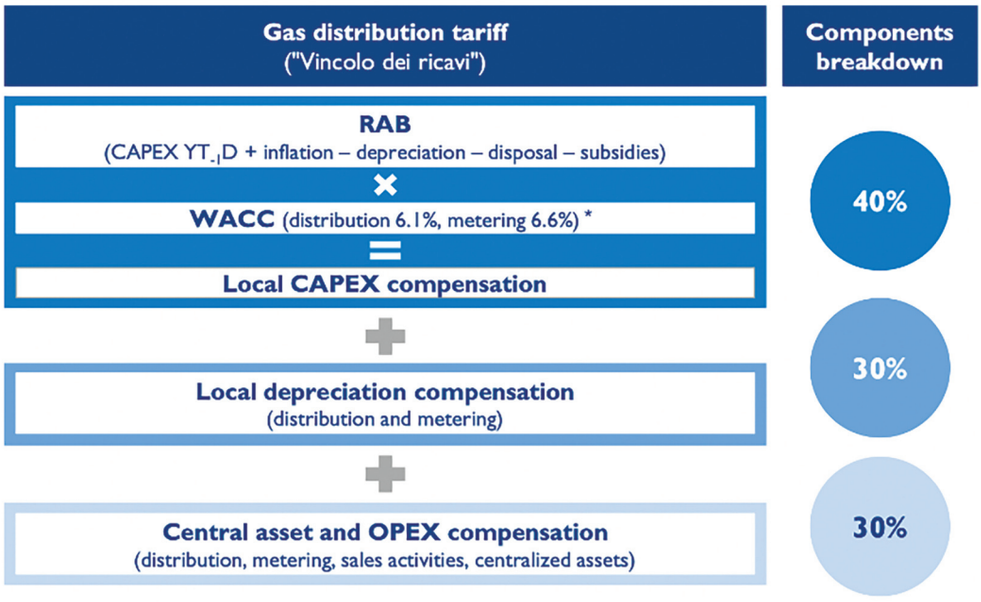


Exhibit 6. Revenue model of Italian gas DSOs. Source: Arthur D. Little analysis on MSE and AEEGSI data, 2017




*Note that in 2018 the distribution parameter was raised to 6.3% and the metering parameter to 6.8%

Exhibit 7. Projected investments in digitization. Source: Italgas business plans

| | **Digitization (bln euros)** | |
|---|---|---|
| **Investment plan** | Smart meter installation | Assets/Processes digitization |
| **2020-2026** | 0.34 | 0.75 |
| **2019-2025** | 0.42 | 0.54 |
| **2018-2024** | 0.53 | 0.31 |
| **2017-2023** | 0.84 | 0.06 |

Exhibit 8. The agenda of the Digital Factory. Source: Italgas internal document

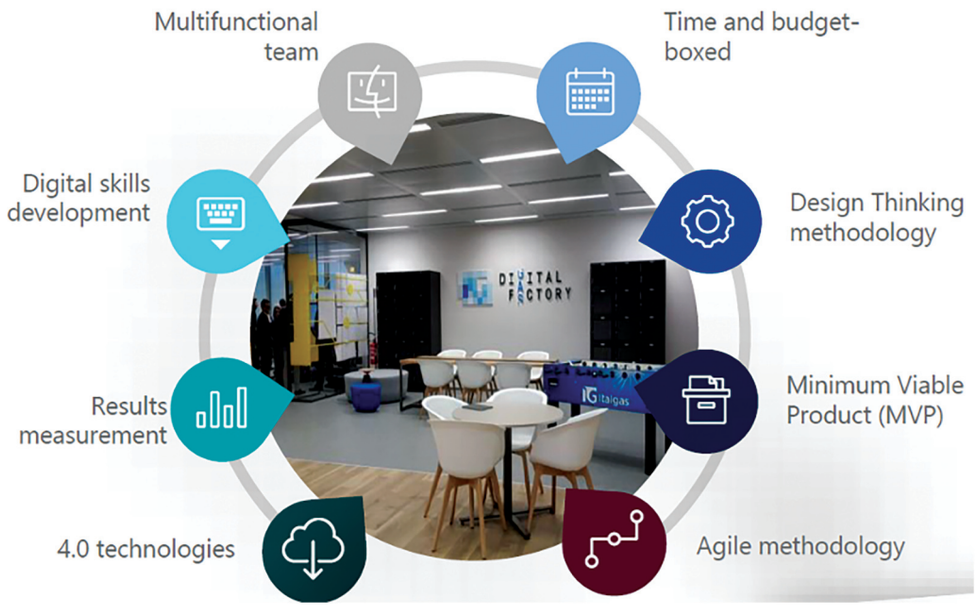



Exhibit 9. Smart Meters in the gas distribution grid. Source: Italgas internal document

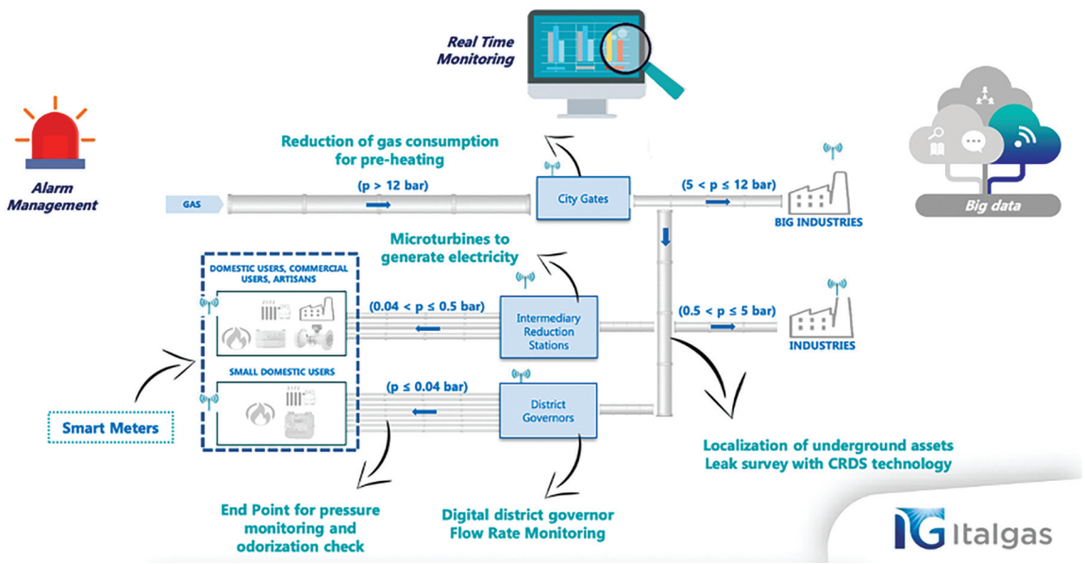


Exhibit 10. Benefits of Smart Meters. Source: Italgas internal document

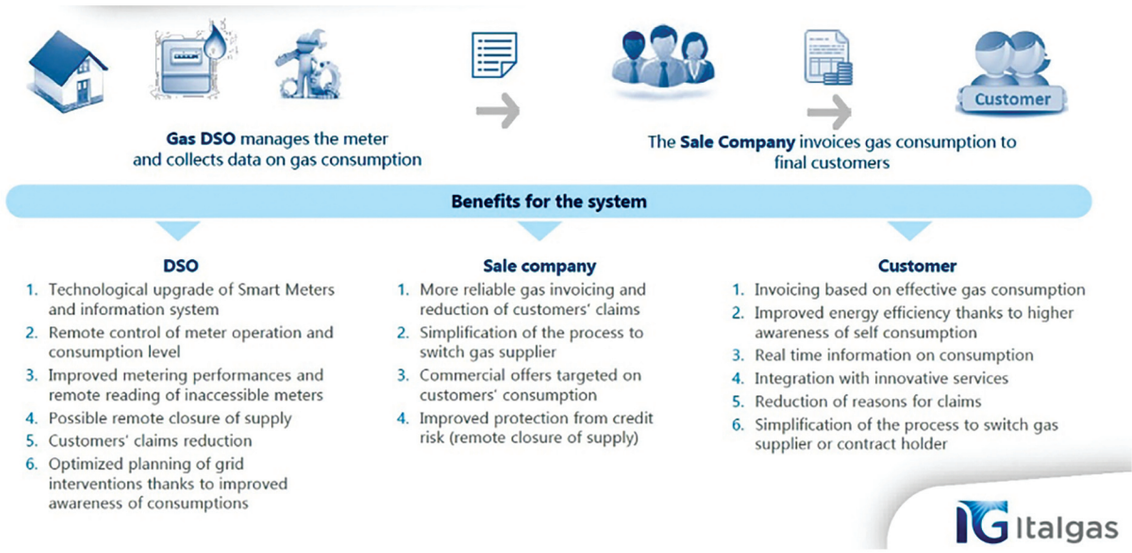



Exhibit 11. Installation of Smart Meters as a part of the Italgas investment plan. Source: Italgas internal document

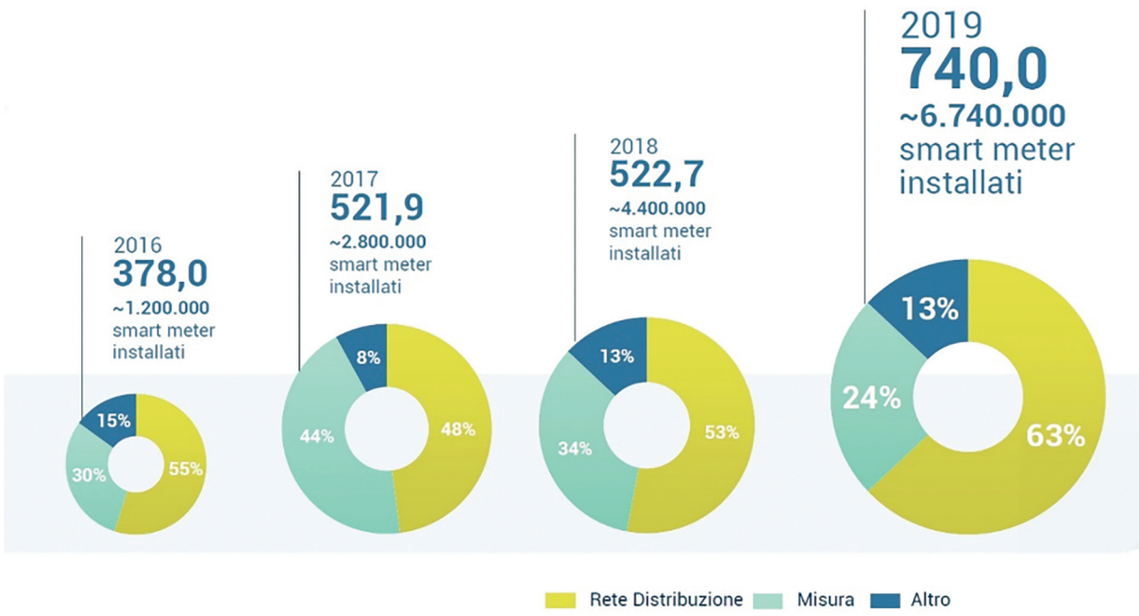


Exhibit 12. Share View technology. Source: Italgas internal document

Exhibit 13. Traditional gas detection vs CRDS gas detection. Source: Italgas internal document

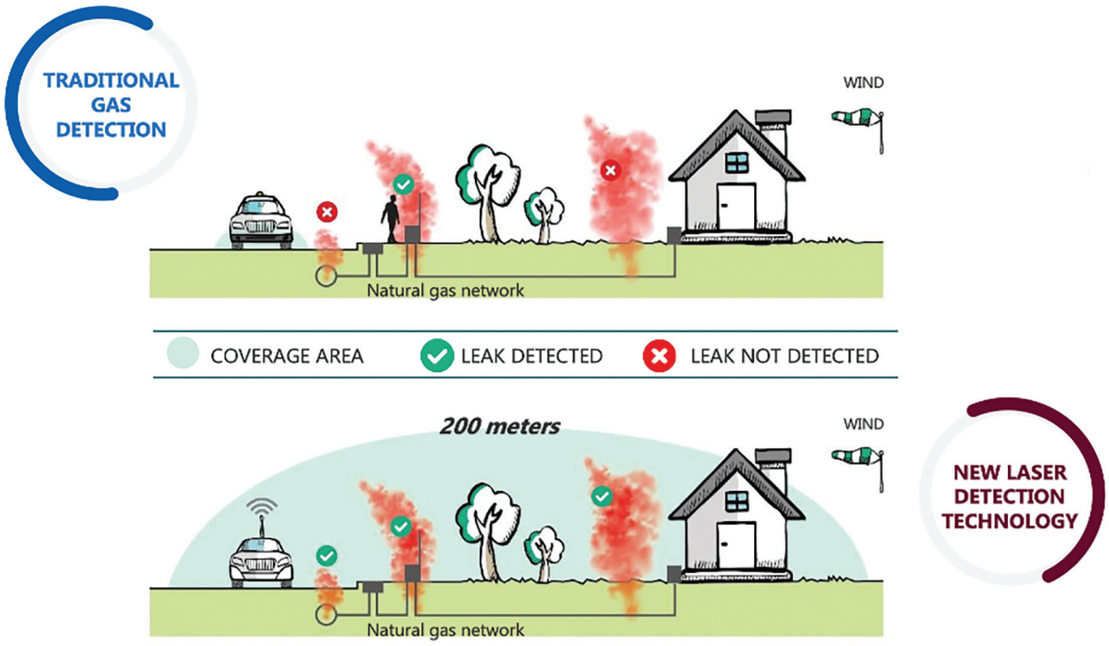


Exhibit 14. Survey respondent profile. Source: Italgas internal document

| Top Managers | Middle Managers | Employees | Technicians |
|---|---|---|---|
| 94,80% | 89,60% | 81,90% | 63,80% |

Exhibit 15. Digital skills matrix. Source: Italgas internal document

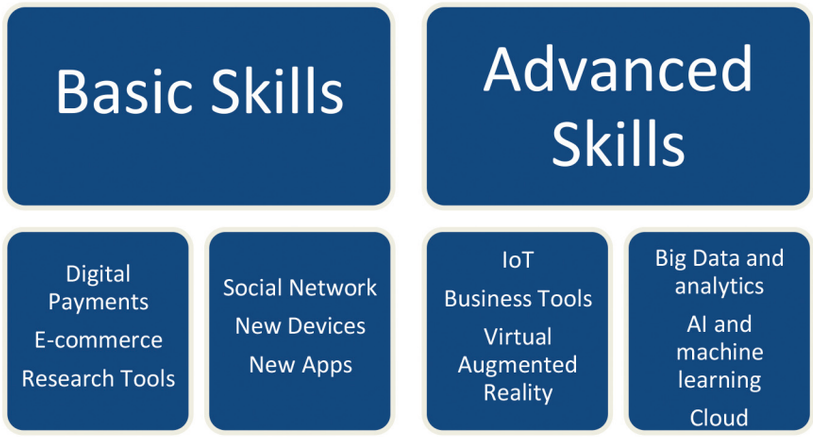



Exhibit 16. New professional profiles at Italgas. Source: Italgas internal document

| Position | Main task assigned |
|---|---|
| **Designers for the Digital Factory** | to design processes from scratch, foster the creative process of teams, enable the "envisioning" that accompanies major transformations |
| **UX (User Experience UI (User Interface)** | to make new tools (apps, systems, etc.) simple, intuitive and engaging |
| **Data Scientist** | to develop insights to support strategy and operations, based on the premise that "data is the new oil" |
| **Enterprise architect** | to develop a resilient and efficient infrastructure and applications architecture |
| **Digital Expert** | a transversal professional able to "embrace" all areas related to digital transformation, from communication to customer engagement, to social management |
| **Scrum master and Agile coach** | to set up and "guide" transformation processes |
| **Solution architect** | experts in the new application technologies (i.e. salesforce) that are difficult to find on the market |

Exhibit 17. Italgas group structure. Source: Italgas internal document

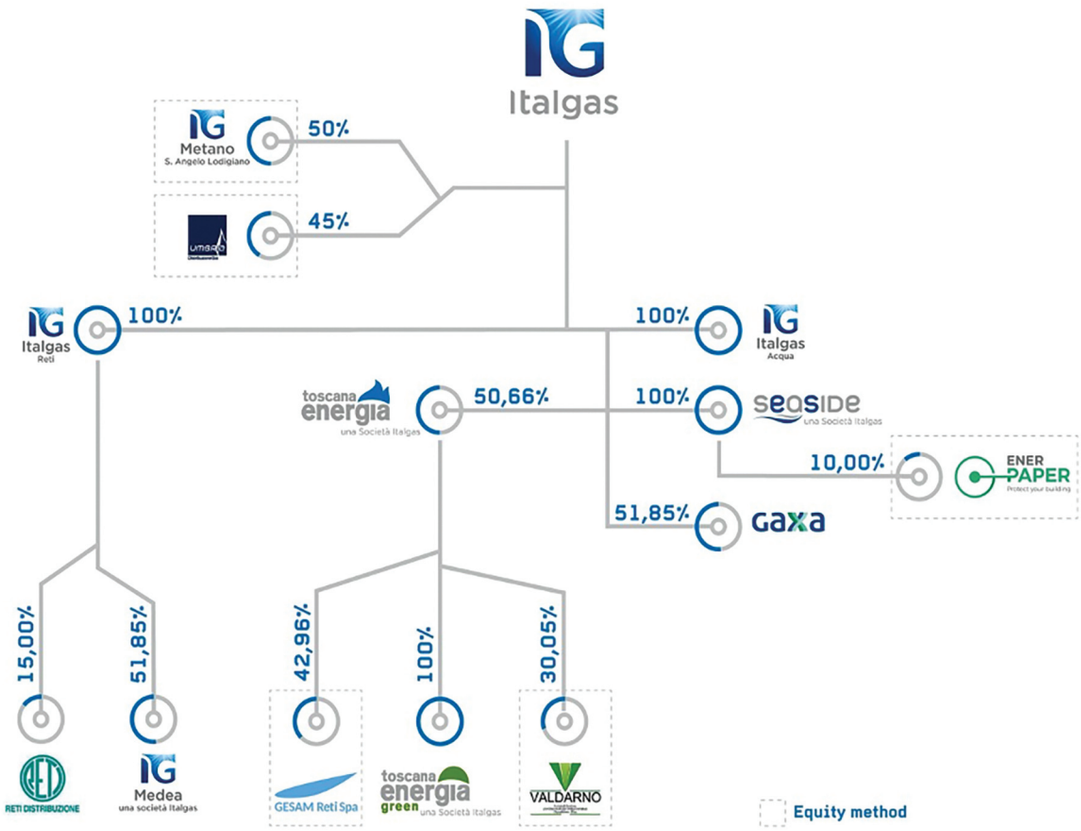



Exhibit 18. View of Digital Factory rooms