HISTORY OF THE AIR LIQUIDE GROUP

1902

ORIGIN

Air Liquide was born of innovation and an encounter between two men: Georges Claude, inventor of an industrial process for the production of oxygen from liquid air, and Paul Delorme, a visionary entrepreneur.

1906

FIRST INTERNATIONAL DEVELOPMENTS

Gas, by its very nature, is difficult to transport and thus local production is required. This was one of the reasons why Air Liquide set its sights internationally early on, building numerous production units abroad. Development was rapid in Europe (1906), Japan (1907), Canada (1911) and the United States (1916). See "A Century of International Development."

1913

LISTING ON THE STOCK EXCHANGE

The critical role played by shareholders became evident in the first years of the Company's development. Listed on the Paris Stock Exchange in 1913, the share celebrated its hundredth-year of listing in 2013. Air Liquide has endeavored to forge a strong and privileged relationship with its shareholders based on an exceptional stock market performance, with an average annual increase in its share price over the 100 years to 2013 of +11.9%.

1952

THE CRYOGENIC REVOLUTION

Storing gas in liquid form in cryogenic tanks allows vast quantities to be transported by road or rail within a radius of approximately 200-250 km from the production site. In 1954, the first liquid oxygen plant was launched in the North of France.

A CENTURY OF INTERNATIONAL DEVELOPMENT

Air Liquide's development was rapid during the early part of the XXth century, with significant business growth between the two world wars. From 1945 to 1970, in an economy that was being rebuilt, the Group consolidated its positions and established itself in South America and South Africa (1946), then in Australia and North Africa (1956).

In the 1970s-80s, international growth was renewed with a major acquisition: Big Three in the United States in 1986. At the end of the 1980s, taking advantage of its long-time presence in Japan, Air Liquide set its sights on other Asian countries and played its part in the development of the electronics market. The Group invested massively in China in the early 2000s; the country is a major growth market for industrial gases and Air Liquide entered into numerous air gas contracts.

In the 1990s, the Group began to develop in Central Europe. During a second phase, in the 2000s, it made inroads further east in Russia, Ukraine and Turkey, winning Large Industries contracts. The Middle East also became a new investment priority.

In the 2000s, there was a second major acquisition: certain businesses of Messer Griesheim in Germany, the United Kingdom and the United States. In 2007, the Group purchased minority interests in its joint ventures in Japan and South-East Asia.

Today, Air Liquide continues to pursue its strategy of expanding its global presence, convinced that the geographical diversity will guarantee resilience and future growth. As a result, the Group is continuously strengthening its historical positions in the major economies worldwide and relentlessly seeking footholds in new markets.

Air Liquide is now present in 80 countries, its global dimension being a fundamental component of its identity.

1960

PIPELINE NETWORK STRATEGY

By delivering gas to several customers through pipelines, Air Liquide adopted a network strategy for the first time, linking its gas production units through a pipeline network. The Group multiplied production capacity to meet soaring demand from large industries: firstly, for oxygen in the steel industry, and secondly, for nitrogen in chemicals.

The Large Industries business was launched with customers committing to long-term contracts of 15 years or more. The Group currently manages more than 9,400 km (≈ 5,800 miles) of pipelines worldwide, in particular in the US along the Gulf Coast of Mexico, in Northern Europe, in the Ruhr valley in Germany and in several Asian countries.

1962

SPACE INDUSTRY

Convinced of the industrial potential of cryogenics, Jean Delorme, Chairman & CEO of Air Liquide, decided to create a research center near Grenoble dedicated to these technologies. The first applications were rapidly integrated in the space industry. Air Liquide has been a partner of the space adventure and the Ariane program for 65 years. The Group's contribution has been as much in the production of the fluids essential for launch (oxygen, hydrogen, helium and nitrogen) and the supply of associated services, as in the design and production of the tanks and cryogenic equipment of the launchers.

1970

A TRADITION OF INVENTIONS

The Claude-Delorme Research Center, located in the Paris-Saclay innovation Cluster and now called the Paris-Saclay Research Center, was created to enhance gas production techniques and their applications (combustion, welding, metalworking, chemicals, electronics, food, respiratory functions, and environmental treatment). It is evidence of the Group's desire to inherently understand the industrial processes of its customers and develop new gas applications to better satisfy their requirements (in terms of quality, productivity and the environment). The Center also develops partnerships with universities and industrial companies. The Group currently has research centers in Europe, North America and Asia.

1976

A TECHNOLOGICAL BREAKTHROUGH

With the Sasol project in South Africa, for the production of synthetic fuel, air separation units (ASUs) have scaled up, dramatically increasing in size. Following this technological breakthrough, Air Liquide became the leader in large ASUs, and remains so today.

1985

A NEW MARKET: ELECTRONICS

In Japan, the Group began to supply ultra-high purity gases to the semiconductor industry: this involves carrier gases, mainly nitrogen, used to transport the specialty gases and keep the chip production tools inert, and specialty gases that are used directly in the manufacturing of semiconductors. In 1987, Air Liquide inaugurated the Tsukuba Research Center in Japan, which is dedicated to the electronics industry.

1995

EXTENDED OFFERING: HYDROGEN AND STEAM

In addition to oxygen and nitrogen, as part of its commitment to protecting the environment and promoting energy efficiency, Air Liquide extended its offering to hydrogen and steam. To ensure the success of this new offering, the Group has used the business model, which is behind the success of its air gas activity, and deployed from the beginning a basin strategy based on a pipeline network, providing customers with flexibility, distribution reliability and service quality at the best price.

PROTECTING LIFE

Originally an oxygen supplier to hospitals, Air Liquide has become a specialist in the healthcare sector. The Group launched its Home Healthcare activity and set up a dedicated network of specialist teams. Medical gases were progressively classified as drugs and manufacturers were required to file market authorizations. The Group also ushered in the hygiene sector, an activity that naturally complemented hospital services. Most recently, Air Liquide launched significant research programs in therapeutic gases, used for anesthesia, resuscitation, and pain relief.

2007

ORGANIZATION BY BUSINESS LINE

The Air Liquide growth drivers for the coming decades are solid and sustainable, based on changing lifestyles: industrial growth of developing economies, increasing energy needs and environmental challenges, healthcare and high technology. To capture this growth, the Group created a new organizational structure based on four World Business Lines. They combine the technical and operational expertise which are specific to each of the businesses of the Group – Large Industries, Industrial Merchant, Healthcare and Electronics – and centralize the specific market expertise. The Group remains geographically focused, but each zone or country benefits from the support and experience of the business lines to accelerate its development.

Conscious of the strategic dimension of Engineering & Construction capabilities, the Group acquired Lurgi in 2007. This company provides Air Liquide with major proprietary technologies such as hydrogen and carbon monoxide production units, or processes relating to gasification or CO_2 purification, adding to the Group's historical competencies in cryogenics. Thanks to this acquisition, the Group now has a complete technological offering and a greater engineering capacity.

2009

RESILIENCE IN AN UNPRECEDENTED CRISIS

Affected by a crisis of unprecedented magnitude, the Group focused its efforts on the management of its cash, costs, and investments (capital expenditures). Having tested the solidity of its long-term contracts, Air Liquide confirmed its resilience and demonstrated the relevance of its business model. In a context of global recession, the Group shows itself to be an exception, posting a stable net profit while preserving the strength of its balance sheet.

2010-2012

NEW TERRITORIES, NEW ACQUISITIONS

The Group accelerated its presence in new territories, including Turkey, Ukraine and Mexico, and strengthened its presence in China. These developments contributed to the increase, in eight years, of the developing economies' share of Gas & Services revenue from 15% to 23% in 2017.

In a weaker growth environment in advanced economies, and particularly in Western Europe, Air Liquide intensified its acquisitions. At the end of 2012, two major home healthcare players joined the Group: LVL Médical in France and Gasmedi in Spain. Other acquisitions were completed in 2013 to strengthen the Group's positions in Healthcare in Poland, Scandinavia and Canada and in Industrial Merchant in Brazil, Russia, the Middle East and China.

2013-2015

NEW INITIATIVES IN THE INNOVATION FIELD – HYDROGEN ENERGY

Innovation is central to Air Liquide's strategy. In 2013, Air Liquide launched two initiatives to promote open innovation: i-Lab (innovation Lab) and ALIAD, the Group's capital investment subsidiary, to make minority investments in innovative technology start-ups. In 2014, the Group decided on new investments with the modernization of the Paris-Saclay Research Center, the creation of a center for the development and industrialization of gas cylinders for industry and healthcare, and the launch of a technical center of excellence for cryogenic production technologies. In 2015, Air Liquide inaugurated Cryocap™ in France, a unique industrial installation that enables the capture of CO_2 released during hydrogen production via a cryogenic process. After being purified, the captured CO_2 can be used to meet a variety of industrial needs for carbonic gas supply.

In addition, on a worldwide scale, Air Liquide actively contributes to the development of the hydrogen energy activity by accompanying automotive manufacturers launching fuel cell electric vehicles on the market. Air Liquide contributes to the construction of hydrogen-charging stations (United States, Japan, France, Germany, Belgium, Denmark and the Netherlands), the majority of which are generally accessible to the public.

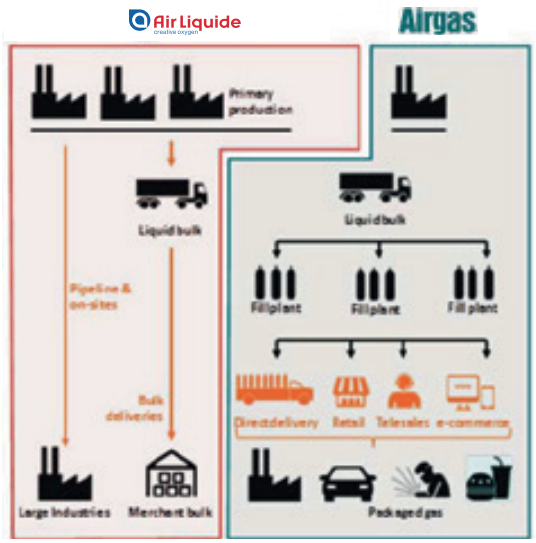
2016

AIRGAS ACQUISITION BY AIR LIQUIDE

On May 23, 2016, Air Liquide completed the acquisition of the American company Airgas. This acquisition enabled the Group to combine two highly complementary businesses and be present on all market segments. At the end of 2017, the United States represented 35% of Gas & Services revenue.

In the USA, Air Liquide's presence was primarily upstream with production both in Large Industries (over 23,000 tons per day of oxygen production capacity, over 2,200 miles/3,500 kilometers of pipelines, principally along the Gulf Coast) and in Industrial Merchant in bulk. Air Liquide also served customers in Electronics and Healthcare (medical gases to hospitals only, no home healthcare) business lines. Airgas was primarily focused on downstream distribution with 300 fill plants and 900 branches/retail stores providing direct delivery of packaged gas and hardgoods to more than one million Industrial Merchant and Healthcare customers (medical gases). Airgas also enjoyed the

most advanced multi-channel network in the United States, including telesales and e-commerce platforms which allowed for next-day direct deliveries from national warehouses for a whole range of complementary products.



The integration of this upstream and downstream coverage creates significant value. Air Liquide plans to realize more than 300 million US dollars of pre-tax synergies: cost synergies by the end of 2018, growth synergies by the end of 2019. Cost synergies account for around 70% of total synergies and are the result of sourcing optimization, better loading of Air Liquide and Airgas' assets, distribution efficiencies and reorganizations. Growth synergies come from cross-selling the various Gas & Services offers to both customer bases. They also result from the roll-out of Air Liquide technologies via Airgas' various distribution networks, as well as support for Airgas customers in their international expansion (in Canada and Mexico in particular). These represent approximately 30% of the total amount of synergies.

Moreover, Air Liquide believes that the Airgas model, in terms of products, digitization of activities, and business model, may be applied in certain regions outside the United States. These additional strategic synergies are not included in the 300 million US dollars already announced.

With this acquisition, Air Liquide strengthens its leading position in the United States, the largest industrial gas market worldwide. This market also enjoys the strongest growth among advanced economies. The US market is expected to deliver 20 to 25% of the global worldwide industrial gases market's mid-term growth. This market is supported by long-term structural strengths such as competitive natural gas and energy prices driving investments and the industrial production.

Approximately half of the US packaged gas market is composed of independent distributors. This current fragmentation of the US market provides further opportunities for growth as Airgas and Air Liquide have significant experience in integrating bolt-on acquisitions.

THE LAUNCH OF THE NEW COMPANY PROGRAM 2016-2020: NEOS

The Group acquired a new dimension following the acquisition of Airgas and thus entered a new phase of its development. On July 6, 2016, Air Liquide published its new company program, NEOS, for the period 2016-2020.

Air Liquide's strategy for profitable growth over the long-term is that of a customer-centric transformation. It is based on operational excellence and the quality of its investments, on open innovation and the network organization already implemented by the Group worldwide. Air Liquide's ambition is to lead its industry, deliver long-term performance and contribute to sustainability.

2017

INTEGRATION OF AIRGAS

Air Liquide continued to generate synergies through the integration of Airgas. Cost synergies are being achieved more quickly than expected and the first growth synergies materialized.

REFOCUSING ON GAS & SERVICES ACTIVITIES

Following the disposal of its Aqua Lung and Air Liquide Welding subsidiaries, Air Liquide focused on its Gas & Services activities and the implementation of its NEOS company program. The Gas & Services activities now represent 96% of the Group's revenue.

NEW VISUAL IDENTITY FOR THE GROUP

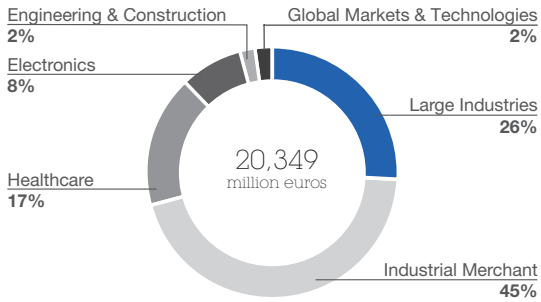
To mark its transformation, the Group created a new logo, the fifth since the company was founded 115 years ago. This new visual identity, which embodies the change within Air Liquide, is that of a leading Group, expert and innovative, that is close to its stakeholders and open to the world.

ACTIVITIES, RISK FACTORS AND INTERNAL CONTROL

Activities

The Group classifies its activities as follows: Gas & Services, Engineering & Construction, Global Markets & Technologies. Additional information is available in the "2017 Performance" section of this report.

2017 GROUP REVENUE



GAS & SERVICES

The supply of gas involves local production in order to limit transport costs. Therefore, Air Liquide gas production units are located throughout the world and can supply many types of customers and industries with the relevant volumes and services required. Air Liquide's structure is made up of a Base, in Paris, and four Hubs: Houston (United States), Frankfurt (Germany), Shanghai (China) and Dubai (United Arab Emirates). These hubs draw on the Group's expertise and presence in these geographic regions (Europe, Americas, Asia Pacific and Middle East and Africa).

Moreover, the operational management of Gas & Services is led by the World Business Lines to better adapt to changes in the different markets:

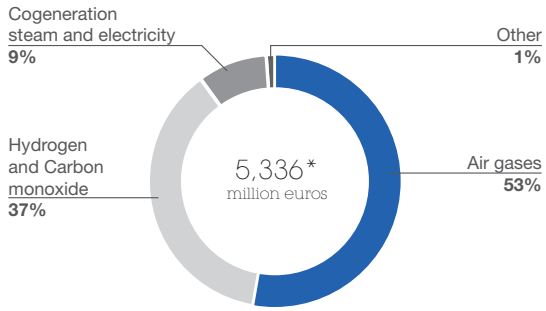
- **Large Industries** supplies industrial gases by operating major production units. It serves customers in the metals, chemicals, refining and energy industries with high gas consumption, requiring delivery through a dedicated plant or pipeline. Large Industries also supplies the Group's other business lines;
- **Industrial Merchant** supplies a wide range of different gases, application equipment and associated services. It serves industries of all sizes that require quantities smaller than those for customers of Large Industries. The product is either distributed in bulk, in liquid form, for medium and large quantities, or in cylinders, in gaseous form, for small quantities;
- **Healthcare** supplies medical gases, hygiene products, medical devices and services to hospitals and patients in their homes. It also produces and distributes healthcare specialty ingredients for the cosmetics, pharmaceutical and vaccine markets;
- **Electronics** supplies gas and services mainly for the production of semiconductors, but also for flat panels and photovoltaic panels.

Depending on their end use, gases are distributed in different states and using various means: in gaseous form through a pipeline network, in liquid form in cryogenic trailers, and in gaseous form in high-pressure cylinders.

LARGE INDUSTRIES

The Large Industries business line proposes gas and energy solutions to customers in the metals, chemicals, refining and energy industries, which are essential for their own industrial production, to improve process efficiency and to make their plants more environmentally friendly. The world leader in this sector, Air Liquide benefits from dedicated in-house development and engineering teams, differentiating proprietary technologies and rigorous processes for selecting investments and carrying out projects.

2017 LARGE INDUSTRIES REVENUE BY ACTIVITY



** 27% of Gas & Services revenue.*

The Large Industries business line provides oxygen, nitrogen, argon, hydrogen and carbon monoxide through a network of plants and pipelines. At the end of 2017, these comprised 374 large Air Separation Units (ASUs), 50 Steam Methane Reformers (SMRs) producing hydrogen and carbon monoxide and a pipeline network of more than 9,400 km (≈ 5,800 miles) worldwide. Moreover, the Group operated 18 cogeneration plants supplying customers with steam and electricity.

The **chemicals** industry uses mainly oxygen, hydrogen and carbon monoxide in its manufacturing processes, as well as nitrogen to inert its installations.

The **refining** industry requires hydrogen to desulfurize fuels and break up heavy hydrocarbons. The demand for hydrogen is growing due to the combination of increasingly stringent emissions legislation and the use of heavier hydrocarbons.

In the **metals** industry, Air Liquide supplies large volumes of oxygen to steel makers, the use of which improves their energy performance and reduces significantly their CO_2 emissions. The majority of new projects are currently located in developing economies.

Numerous industries linked to **energy** or **chemicals** use large quantities of oxygen to transform coal, natural gas and syngas hydrocarbons for the production of chemical products, synfuel or electricity. To meet customer requirements, the supply of large quantities of gas is critical. Air Liquide supplies its customers directly by pipelines from a dedicated plant or different plants linked by a network. Air Liquide has built its own pipeline networks progressively over the last 40 years. With a total length of more than 9,400 kilometers (≈ 5,800 miles), these networks stretch, for example, across Northern Europe, from Rotterdam through to Dunkirk, and along the Gulf Coast in the United States from Lake Charles (Louisiana) to Corpus Christi (Texas). Many other mid-sized local networks have also been built in other significant and fast-developing industrial basins in Germany, Italy, Singapore and, more recently, China.

The use of industrial gases is critical for these various industrial processes. As any discontinuity in the supply necessitates a stoppage of the customer's production operations, supply reliability is crucial. However, although vital, gas supply generally represents a very small part of total production cost for the customer.

The raw materials necessary for the production of industrial gases vary according to the type of unit and the region. The production of oxygen and nitrogen requires air and a large quantity of electricity. Hydrogen and carbon monoxide production units mainly consume natural gas and little electricity. Cogeneration units consume natural gas and water. The energy and capital intensity of these industrial processes is generally high.

The supply of gas is generally contracted for 15 years. For certain specific projects this can be extended to 20 years and beyond. The signing of new contracts for new industrial customers' sites is a strong predictor of future growth. Within these contracts, the Group guarantees long-term service continuity and a high level of reliability with respect to the gas supply via a high-performing industrial solution. In return, the contracts include the indexation of input costs, mainly electricity and natural gas, and guaranteed minimum volumes through take-or-pay clauses.

The Large Industries business line operates under long-term contracts, where costs are indexed, in particular, to energy costs. These contracts, which include take-or-pay clauses, offer considerable visibility of future revenue and protection in the event of a significant fall in customer volume consumption (below the minimum take-or-pay level). The long investment cycle and high capital intensity require a solid balance sheet. The signing of new contracts is a strong predictor of future growth.

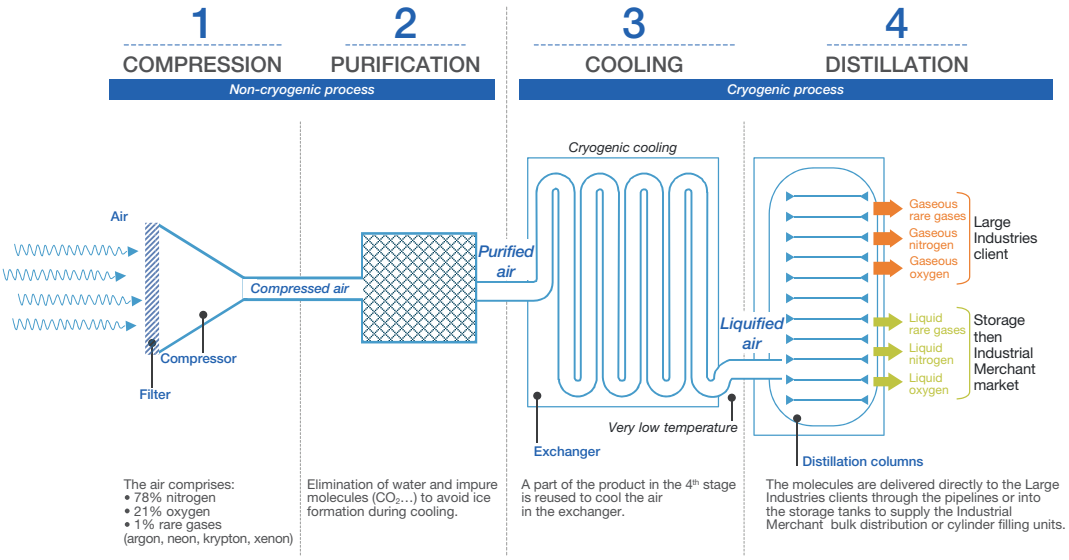
Air Liquide is developing a network strategy in the industrial basins in order to provide customers with greater supply reliability while optimizing operating costs.

LARGE INDUSTRIES PROCESSES

AIR GASES PRODUCTION (ASU: AIR SEPARATION UNIT)

An ASU compresses, liquefies and distills air in order to separate it into its different components: 78% nitrogen, 21% oxygen, 1% argon and rare gases (neon, krypton and xenon). Only certain large ASUs can produce rare gases. Electricity consumption is significant.

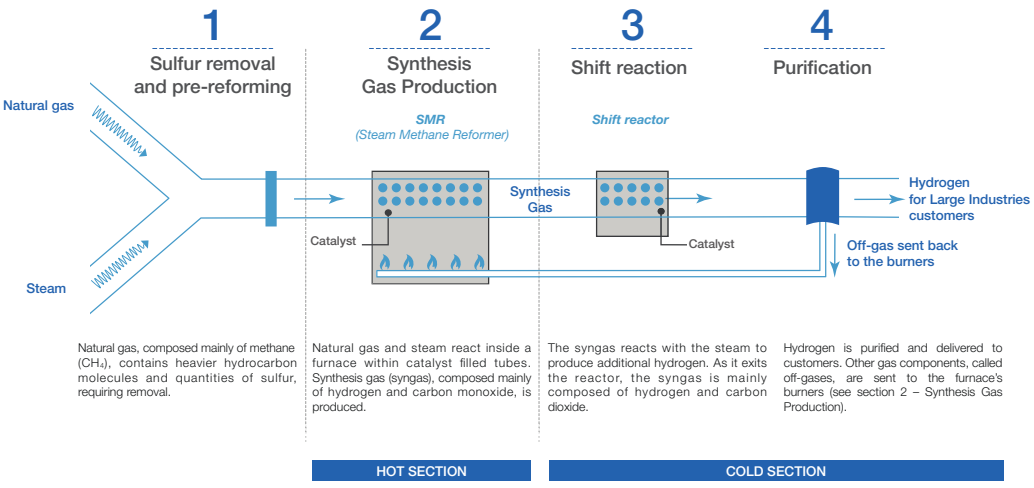
SIMPLIFIED DIAGRAM OF AN AIR SEPARATION UNIT'S OPERATION



HYDROGEN AND CARBON MONOXIDE PRODUCTION (SMR: STEAM METHANE REFORMER)

By steam reforming natural gas, an SMR produces hydrogen and carbon monoxide. The most significant raw material is natural gas; electricity and water consumption is modest.

SIMPLIFIED DIAGRAM OF A HYDROGEN UNIT'S OPERATION



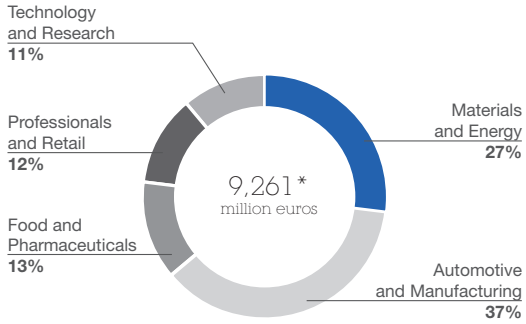
COGENERATION

Cogeneration consists of simultaneously and efficiently producing electricity and steam generally by consuming natural gas and water. The electricity is used by the plant or supplied to the local network, while the steam is required for certain industrial processes.

INDUSTRIAL MERCHANT

The Industrial Merchant business line serves a wide range of markets and customers – craftsmen, SMEs, large multinational industrial groups – offering comprehensive gas solutions for the implementation and optimization of their industrial processes. Supported by a global network of business experts and extensive geographical coverage, Air Liquide provides more than two millions of its customers with innovative solutions including industrial gases, welding equipment, application and safety equipment and related services.

2017 INDUSTRIAL MERCHANT REVENUE BY END-MARKET



** 47% of Gas & Services revenue.*

INDUSTRIAL MERCHANT KEY FIGURES

- ~24 million cylinders
- ~ 13,000 trucks
- ~ 61,000 tanks at customers sites
- > 1,000 on-site units
- ~ 37,000 employees
- ~ 1,000 stores

The Industrial Merchant activity serves five primary markets:

- **Materials and Energy:** customers in this market use a wide range of different gases. Oxygen is used to reduce energy consumption in glass and metal manufacturing processes and to treat wastewater. Nitrogen is used to create inert atmospheres for the conservation of oxygen-sensitive products. Carbon dioxide is used in drinking water treatment, helium for professional diving and magnetic resonance imaging. Nitrogen and carbon dioxide can be used for the enhanced recovery of oil and gas and, in certain cases, the reduction of water and solvent consumption.

Zoom on the glass industry: in all areas of glass, customers use oxygen to facilitate the melting of raw materials, to reduce fossil fuels and to reduce their emissions of pollutants such as nitrogen oxide. For plate glass manufacturing for construction and automotive industries, glassmaker customers also use nitrogen and hydrogen to improve the quality and transparency of their products, while for container glass used in packaging (bottles, flasks, etc.) or for tableware, customers use oxygen to eliminate manufacturing defects and obtain a quality appearance. These manufacturers receive delivery either by truck, in the form of cryogenic liquid, or by small generators of on site gas production ("on site" units) for larger furnaces. Air Liquide provides the storage and accessories for measuring and controlling of gas flow as well as combustion technologies, such as burners designed by its engineers, to maximize the performance and efficiency of melting furnaces.

- **Automotive and Manufacturing:** argon and argon mixtures are used for metal parts welding in manufacturing industries, hydrogen and nitrogen for thermal treatment, specialty gases for waste gas analysis, helium for airbags, and rare gases (krypton, xenon) for lighthouses and thermal insulation. Oxygen and acetylene are used in metal heating and cutting operations. Air Liquide therefore enables customers to produce high quality products, while improving their manufacturing processes and preserving their working environment.

Zoom on manufacturing: many operations in manufacturing involve cutting, welding or heat treatment of metal parts. Industrial gases play an essential role in improving site productivity while ensuring the quality of the manufacturing. They are supplied in gaseous form at high pressure, with cylinders often equipped with innovative integrated trigger valves, or in liquid form for the larger production sites. The Air Liquide experts accompany their customers in proposing the most adapted gas solutions to their processes and specific needs. Argon, carbon dioxide or helium are essential molecules to ensure the quality of arc welding, oxygen and acetylene are used for metal cutting, nitrogen or oxygen for laser cutting argon or nitrogen for new 3D printing processes while nitrogen or hydrogen are essential for physicochemical treatments such as annealing, carburizing or tempering, making it possible to achieve the final mechanical properties. Air Liquide installs storage or panoplies of packaged gas at client sites as well as the associated equipment to control the relative processes, including devices for measuring and controlling the atmosphere of heat treatment furnaces.

- **Food and Pharmaceuticals:** the Group's technologies help increase shelf life and improve food and pharmaceutical manufacturing and cooling processes. The three major activities in this market are the supply of carbon dioxide for beverages, gas mixtures for modified atmosphere packaging, and nitrogen for inerting or freezing food. Air Liquide ensures these products comply with prevailing market regulations and in particular the complete traceability of its gases.

Zoom on food freezing: cryogenics allows food temperatures to drop very quickly, avoiding surface dehydration and the formation of large ice crystals in the product. This process makes it possible to preserve all the taste properties of frozen foods. Air Liquide provides and guarantees customers as to the quality and food safety of the nitrogen or liquid carbon dioxide required for deep freezing in accordance with the regulatory traceability specifications. Air Liquide also provides agri-business with deep freezing tunnels or cabinets as developed by its engineers, thus enabling them to process their production directly while guaranteeing the best conditions of hygiene, quality, productivity and efficiency. Air Liquide ensures the adjustment and maintenance of this equipment and provides customers with the expertise needed to integrate and use its deep freezing equipment along their production line.

- **Technology and Research:** industrial gases are used in the assembly and encapsulation of electronic components in optoelectronics processes – particularly LED manufacturing and optic fiber and silicon cylinder drawing. Specialty gases required, in particular for the calibration of analysis instruments, are widely used in research centers and analytical laboratories. Specific, highly technical gases and equipment have been developed for these various applications.

Zoom on optoelectronics: the production of an optical fiber initially requires the production of a silica bar called a preform. This preform is consolidated with hydrogen, oxygen and helium, then melted in an oven and stretched into an optical fiber at a speed of 1,500 to 2,000 meters per minute. The stretched fiber is then cooled with helium. Air Liquide assists optical fiber manufacturers by supplying these high purity gases. Moreover, the base material used by the white and blue LEDs requires a nitrogen atom. For this process, UHP (ultra high purity) ammonia is injected during the deposition phase. Liquid at room temperature, the ammonia must be heated to take on its gaseous form. Our induction heating solution, which evaporates UHP ammonia more efficiently, allows our customers to use large volumes of this gas. Air Liquide proposes all of the gases intended for the manufacture of LEDs, including equipment and installation facilities.

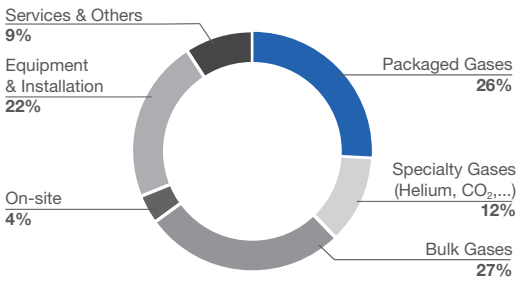
- **Professionals and Retail:** a wide range of gases are offered for use in plumbing, heating, ventilation, air conditioning, industrial maintenance and auto repair activities, mostly for welding. These gases are often sold in special-purpose packaging – cylinders in compressed gaseous form, tailored to customer usage requirements. Across a number of countries, notably in North America, Air Liquide also offers a complete range of welding equipment, wires and units, as well as all personal protective equipment required in order to be able to work safely, enabling customers, craftsmen and contractors to find quickly and in the same place all the elements they need to carry out their welding activities.

Industrial Merchant sells packaged gases (high-pressure gas cylinders) through multiple channels to cover all customer needs: over the phone, e-commerce and/or via its distribution network, to offer a one-stop gas/equipment shopping experience. Cylinders can also be delivered directly to the customers' doors with optimized inventory management based on cylinder traceability. Air Liquide's expertise in customer processes is always offered.

GAS SUPPLY MODES

Industrial Merchant provides gas using the supply mode which is best adapted to the customer's needs. These include one or several of the following supply modes:

- **On-site production units:** for Industrial Merchant customers with major volume requirements, small oxygen, nitrogen or hydrogen generators can be installed at customers' sites (called "on-site units"). Supply is contracted over a long period of time, up to 15 years, and includes a backup system which guarantees supply continuity. This supply mode also significantly reduces the number of kilometers traveled to deliver gases to customers.
- **Bulk:** for medium and large-scale needs or cryogenic systems, gases are provided in liquid form and distributed by tanker trucks. Bulk customers consume the gas directly in liquid form (for example, in the agri-business) or in gaseous form after vaporization.
- **Cylinders:** for smaller scale needs and use on building sites, gases are distributed in cylinders. From an operational point of view, the various gases (nitrogen, oxygen, argon, CO_2) are delivered in liquid form to a filling center where they are stored and then, after vaporization, transformed into gaseous form and transferred into cylinders of different capacities (typically 5 to 50 liters). Gases can be mixed together to better meet customers' needs. Cylinders are then directly delivered to customers or to distributors and stores by a fleet of adapted trucks.



The distribution of gas in cylinders and bulk remains traditionally local with transport distances rarely exceeding a radius of 200 to 250 kilometers around the production site. To ensure this local presence, the Industrial Merchant business relies mainly on the gas production capacity of Large Industries and thereafter develops its own distribution logistics. Air Liquide ensures the reliability of the gas supply and guarantees the quality of the materials used (storage tanks and cylinders). The gas usage and applications equipment are investments made by Air Liquide, who also covers their maintenance.

Industrial Merchant is characterized by a wide range of customers, markets, applications, and solutions and services. The contract terms can be up to five years for cylinders and liquid gas supply and up to 15 years for small on-site gas generators. Revenue comes from the sale of gas and related services.

It is a business based on expertise and services with a high technology and innovation content, extremely local, with dense geographic coverage as a key factor. The competitive environment can vary between areas.

Innovation with regards to markets, products and applications is a major growth driver. Business growth is generally dependent on local industrial production growth trends.

HEALTHCARE

The Healthcare business line provides gases and medical products, specialty ingredients and services which support patients along the continuum of care, from the hospital to their home, and help protect the most vulnerable lives. Air Liquide is one of the world leaders in this business sector, which is subject to both stringent regulatory requirements as well as to multiple stakeholders (patients, doctors and payers). The business line provides products and services in hospitals and in patients' homes in four areas:

- **Medical gases:** Air Liquide provides medical gases to 15,000 hospitals and clinics. Among the main medical gases and their areas of application, Air Liquide provides: medical oxygen for respiratory diseases and intensive care units; medical nitrous oxide, a mixture of oxygen and nitrous oxide O_2/N_2O (KALINOX™) and xenon (LENOXe™) for anesthesia/analgesia; nitrogen monoxide (KINOX™ and VasoKINOX™) for resuscitation.

  Air Liquide ensures compliance with the strictest of safety and quality standards through the installation and maintenance of medical gases' distribution networks in hospitals and permanent stock control.

- **Home Healthcare:** Air Liquide cares for more than 1.5 million patients in their homes suffering from chronic diseases. Once the diagnosis and treatment is established by a doctor, the long-term treatment requires patient education, on-going support, interventions by trained nurses or technicians and the implementation of therapies in the fields of respiratory, perfusion or other.

  Air Liquide has developed an offer beyond oxygen therapy and helps take care of patients suffering from chronic obstructive pulmonary disease, obstructive sleep apnea, chronic respiratory insufficiency, diabetes, pulmonary arterial hypertension, and Parkinson's disease, providing them with services for long-term follow-up care.

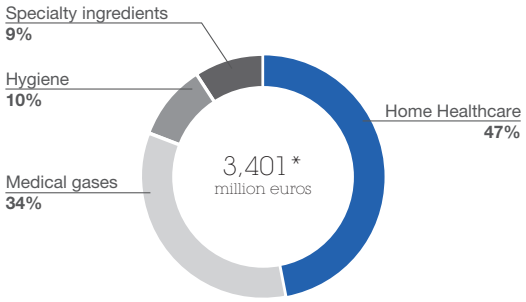
  Demographic and sociological factors such as an aging population and urbanization are contributing to the increase in the number of chronic diseases. Air Liquide's home healthcare activity strives to meet these public health challenges as well as the growing constraints on health spending in advanced economies, by avoiding hospitalization and developing digital monitoring. In developing economies, Home Healthcare is growing in areas where health systems are being introduced.

- **Hygiene:** with its subsidiary Schülke, a leader in hospital disinfection, Air Liquide contributes to the fight against infections and pandemics through a wide range of products used in hospitals and private practice (dentists, family practitioners, etc.).

  For example, Air Liquide provides skin disinfectants for the pre-surgical preparation of patients as well as for medical staff, antiseptics and other products for wound-healing and medical instrument disinfection. These products can be found in operating units and patient rooms.

- **Healthcare specialty ingredients:** through its subsidiary SEPPIC, Air Liquide has designed and developed for over 60 years innovative specialty ingredients for the healthcare sector, in particular adjuvants for vaccines, film-coating systems for the pharmaceutical industry as well as a complete range of eco-friendly thickeners, stabilizers, emulsifiers and active ingredients for the cosmetics market.

2017 HEALTHCARE REVENUE BY ACTIVITY



** 17% of Gas & Services revenue.*

Healthcare activities, in particular medical gases, mainly rely on the gas production capacities of Large Industries and develop its own distribution logistics. Medical gases have a drug designation status which requires market approval from the country's health authorities. They are subject to specific pharmaceutical traceability and are supplied in gas or liquid form by qualified personnel. The integration of the Large Industries and Healthcare business lines has led to synergies and industrial efficiency.

Over the last 20 years, Air Liquide strengthened a leading healthcare role in Western Europe, Canada and Australia. The Group also has businesses in the United States (medical gases only), South America and certain Asian, African and Eastern European countries. It continues to grow in all regions, in particular according to the expansion of healthcare systems. As a result, around 70% of the Healthcare business line's sales are in Europe and around 23% in the Americas.

The Healthcare business line produces and distributes medical gases for hospitals and provides healthcare services for the care of patients at home. It operates in a strict regulatory framework. Density, quality of support services and efficiencies are essential criteria that help to offset pricing pressures of healthcare systems, particularly in advanced economies.

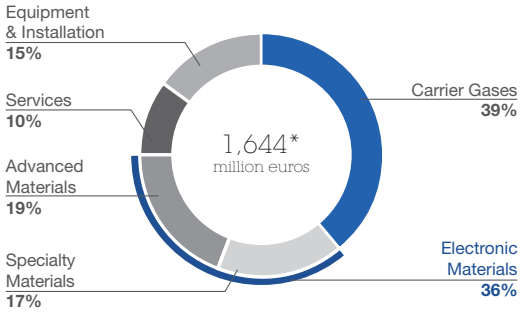
Air Liquide is present along the continuum of care: from treatment of acute diseases (with medical gases in hospitals), to treatment of chronic diseases at home (with Home Healthcare), and prevention/well-being (with activities in Hygiene and Healthcare Specialty Ingredients).

With aging populations and the escalating need for care due to the increase in chronic diseases, as well as the continuing expansion of healthcare systems in developing economies, the Healthcare activity represents a solid growth driver for the Group.

ELECTRONICS

Thanks to its long-term vision, Air Liquide provides innovative solutions to the semiconductor, flat panel and solar cell markets, leveraging its expertise, global infrastructure and strategic proximity to manufacturers worldwide. Its products and services respond to increasingly challenging customer demands for improved mobility, connectivity, computing power and energy consumption. Technological progress is constant and a growth driver for industrial gases.

2017 ELECTRONICS REVENUE BY PRODUCT



** 9% of Gas & Services revenue.*

- **Carrier Gases:** Carrier gases (primarily ultra-pure nitrogen) are supplied by on-site facilities, for the transport of molecules and materials most closely to the chip manufacturing, providing the inerting required to protect electronic systems. The need for a regular and constant supply of carrier gases requires long-term commitments from customers with the building of production units near their premises or even on the customer's site.
- Electronic Materials: **Specialty Materials** are used in semiconductor, flat panel and solar cell manufacturing. **Advanced Materials** are key to the processes used in semiconductor manufacturing. The acquisition of Voltaix in 2013 extended the Group's range of advanced deposition materials. The Group develops and markets offers with strong added value. The most sophisticated of these advanced materials are developed in cooperation with customers and are essential for the miniaturization of new microchips.
- **Equipment & Installation:** The Electronics business line also supplies equipment and installs distribution units and networks gas for ultra-pure gases and chemical products, at its customer's facilities.
- **Services:** On site, manufacturers can rely on the Group's expertise in the total management of fluids and equipment as well as on its cutting-edge analytical services used to continuously improve production processes.

The Electronics business model is primarily based on long-term carrier gas supply agreements with the necessity for continuous technological innovations to satisfy customer requirements by designing new advanced materials also called precursor.

Air Liquide's Electronics activities are based near its customers, including 68% in Asia, 22% in the Americas and 10% in Europe.

The Group's Electronics activity covers four different activities: Carrier gases with a business model based on long term contracts including minimum volumes guaranteed by take or pay type clauses; Electronic Materials with a high level of technical expertise; Equipment & Installation sales which are correlated to the growth of semiconductor plants; Services. In a growing electronics sector, the mix of activities specific to Air Liquide with its long term contracts, offers a true competitive advantage.

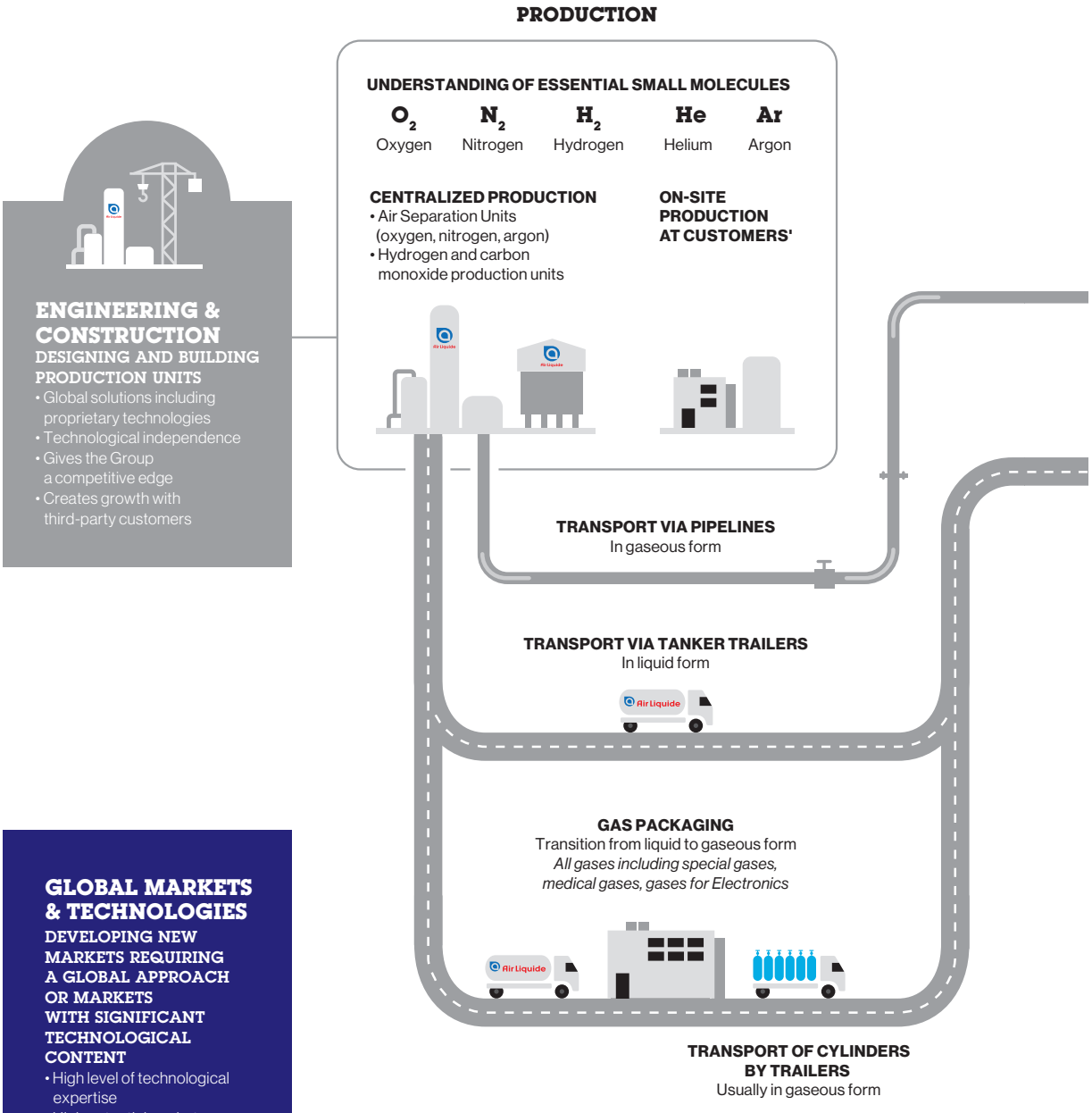
PRODUCTION AND LOGISTICAL SYNERGIES

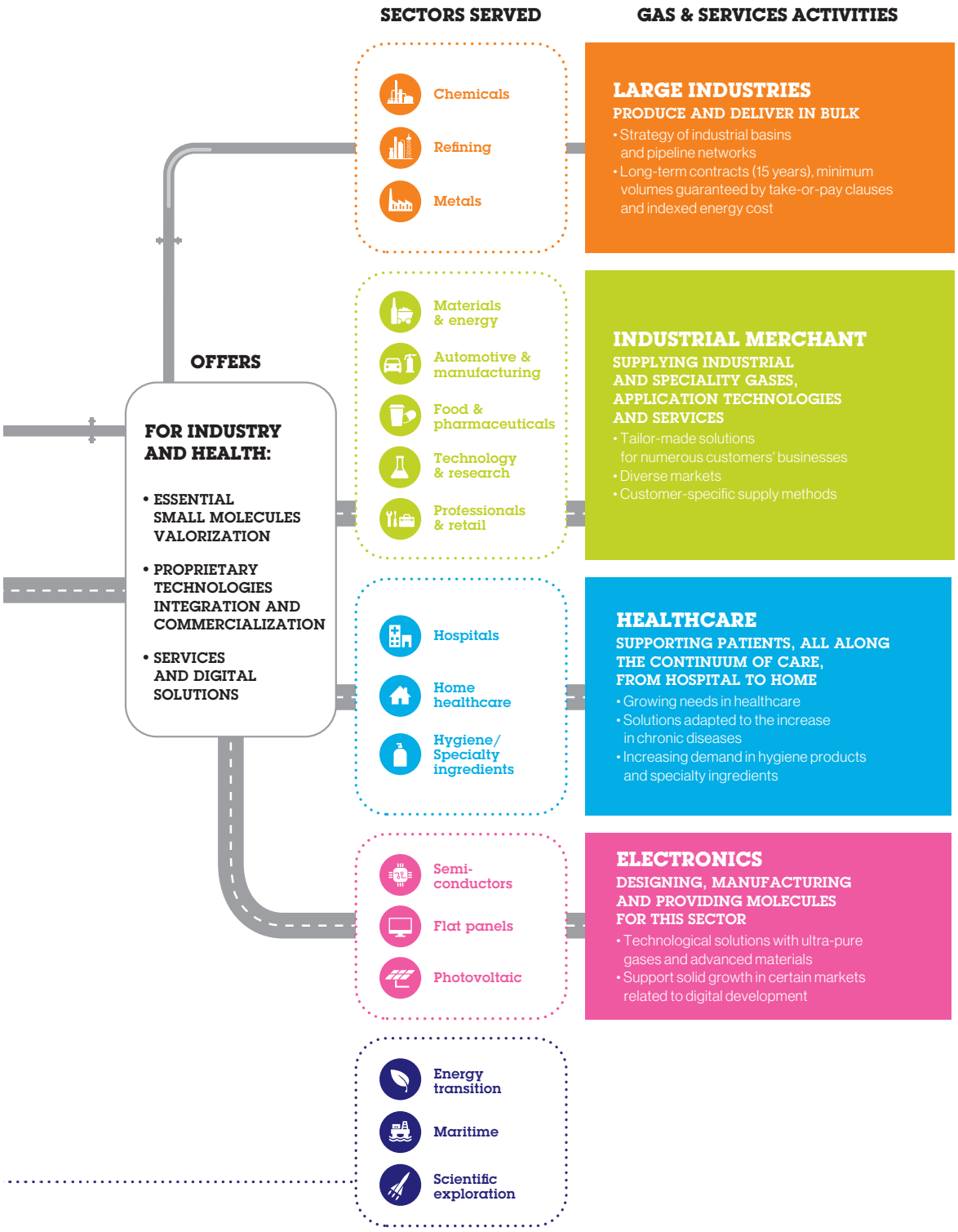
The four business lines comprising the Gas & Services activities are closely tied by a strong industrial philosophy where proximity is key. The following chart illustrates the sharing of both production and distribution assets, between the different business lines. Due to this efficient industrial network, Air Liquide capitalizes on its proximity to its customers to anticipate their needs, understand market changes and offer innovative solutions.

The strong integration of the various World Business Lines allows the Group to create synergies, become stronger and to grow while creating long-term value.

Our activities

Shared resources and expertise to serve diverse customers




SECTORS SERVED
GAS & SERVICES ACTIVITIES
OFFERS
FOR INDUSTRY AND HEALTH:
• ESSENTIAL SMALL MOLECULES VALORIZATION
• PROPRIETARY TECHNOLOGIES INTEGRATION AND COMMERCIALIZATION
• SERVICES AND DIGITAL SOLUTIONS
Chemicals
Refining
Metals
LARGE INDUSTRIES
PRODUCE AND DELIVER IN BULK
• Strategy of industrial basins and pipeline networks
• Long-term contracts (15 years), minimum volumes guaranteed by take-or-pay clauses and indexed energy cost
Materials & energy
Automotive & manufacturing
Food & pharmaceuticals
Technology & research
Professionals & retail
INDUSTRIAL MERCHANT
SUPPLYING INDUSTRIAL AND SPECIALITY GASES, APPLICATION TECHNOLOGIES AND SERVICES
• Tailor-made solutions for numerous customers' businesses
• Diverse markets
• Customer-specific supply methods
Hospitals
Home healthcare
Hygiene/ Specialty ingredients
HEALTHCARE
SUPPORTING PATIENTS, ALL ALONG THE CONTINUUM OF CARE, FROM HOSPITAL TO HOME
• Growing needs in healthcare
• Solutions adapted to the increase in chronic diseases
• Increasing demand in hygiene products and specialty ingredients
Semi-conductors
Flat panels
Photovoltaic
ELECTRONICS
DESIGNING, MANUFACTURING AND PROVIDING MOLECULES FOR THIS SECTOR
• Technological solutions with ultra-pure gases and advanced materials
• Support solid growth in certain markets related to digital development
Energy transition
Maritime
Scientific exploration

ENGINEERING & CONSTRUCTION

To provide customers with the gases required for their industrial production, Air Liquide engineers have developed innovative proprietary technologies. The Group designs and constructs, from the feasibility study stage through to the delivery of the complete installation, gas production units for its own use or for sale to customers who prefer insource their gas requirements. Air Liquide complies with the increasingly strict safety, reliability and competitiveness requirements of air gas separation units and hydrogen units.

Since the acquisition of Lurgi in 2007, the Group has expanded its range of technological expertise. It possesses its own proprietary technologies (as developed by Lurgi over 50 years) to produce hydrogen and carbon monoxide through steam methane reforming. This acquisition also expanded the Group's offering of natural gas conversion technologies to produce syngas, synthetic natural gas, methanol, propylene, liquid fuels and biofuels. This expanded Engineering & Construction aptitude has assisted the Group's involvement, upstream of industrial gas production projects as well as in the development of its customer processes, thus boosting sales growth.

The majority of Air Liquide's Engineering & Construction activity is geared toward industrial gas production technologies, and in particular the manufacture of air gases, hydrogen and carbon monoxide production units.

To cover all of the primary industrial markets and manage its production costs, the Engineering & Construction business has extensive geographical coverage with engineering centers located mainly in North America, Europe and Asia.

The Group favors the development of its gas sales activity over equipment sales. Nonetheless, Engineering & Construction has great strategic value for the Group, both internally and externally.

Internally, the Group benefits from the relevant engineering resources during the investment phase of project of its Gas & Services activity. It provides a high level of expertise, crucial to the design of efficient units which specifically respond to the needs of the Group's industrial gas customers. It provides support for the Group during site takeovers, by ensuring the appropriate assessment of the quality of assets purchased.

The Engineering & Construction activity also acts for third-party customers. Air Liquide designs and builds customized units which customers will own and operate. Also, this third-party customer activity allows the Group to permanently assess the competitiveness of its own technologies and commercial offering. In particular, Air Liquide is able to forge close relations with customers who produce their own gas and better understand their industrial processes and investment projects. In certain cases, negotiations initially steered toward the sale of equipment were finalized by the signing of a long-term industrial gas supply contract. As part of this third-party customer activity, the strategy consists of favoring research and equipment supply contracts and to not support construction risks. Accordingly, Engineering & Construction's contribution to consolidated revenue can vary significantly from year to year.

The Engineering & Construction activity provides the Group with a genuine competitive edge, enabling it to offer turnkey solutions to its customers and to engage for its own purposes in a process of continuous improvement of industrial processes and reduction in the cost of its industrial assets.

In 2017, consolidated third-party Engineering & Construction sales totaled 335 million euros.

GLOBAL MARKETS & TECHNOLOGIES

The Global Markets & Technologies (GM&T) WBU delivers technological solutions (molecules, equipment and services) to support the new markets of energy transition, maritime logistics and scientific exploration, in order to accelerate Air Liquide sustainable growth.

To support the energy transition, GM&T brings environmentally friendly solutions to the clean energy market with hydrogen energy and Bio–Natural Gas for vehicles, refrigerated transport using nitrogen, but also the treatment and injection of Biogas into the energy grid as a local power source.

As a player of the deep tech sector, GM&T commercializes technologies dedicated to Space, Aerospace and scientific exploration. GM&T also supplies gases for players in of the maritime sector and provides logistics for cryogenic transportation by sea of value added molecules, such as helium.

GM&T employs 1,800 people world-wide and generated a 2017 revenue of 372 million euros.

Competition

At a global level, the industrial gases industry comprises four main players: Air Liquide, Linde (Germany), Praxair (United States) and Air Products (United States). There are also a number of regional players, such as Taiyo Nippon Sanso (Japan), Messer (Germany), Yingde (China) and Hangzhou Hangyang (China). Finally, numerous smaller-sized players are also present in local markets. At the end of 2016, Linde and Praxair presented an agreement in principle on a merger of equals between the two companies. In 2017, Praxair shareholders approved the merger during a special meeting of shareholders while those of Linde accepted to tender their shares. The merger transaction remains subject to the approval of regulatory authorities.

In Large Industries, the customer can choose between self-production and over-the-fence gas supply. Self-production is estimated to account for 80% of hydrogen production and 65% of oxygen production globally, although with significant geographical disparities. Companies self-producing gas thus remain the Group's greatest competition. However, the potential to convert self-production into over-the-fence supply represents a major growth opportunity for the Large Industries business line. The level of self-production varies strongly depending upon the region, type of industry or local culture. In advanced economies, the supply of oxygen is largely over-the-fence, while the supply of hydrogen for refining remains primarily in-house. In developing economies, while relatively new, over-the-fence supply is accelerating significantly. Air Liquide, the world leader in Large Industries, is in competition with the three other major global players and the local players.

Industrial Merchant is a local business: transport costs limit the operating area to within 200 to 250 km of a production unit, except for high value-added gases such as argon. This market, which is highly diversified due to the size and activity of its customers, thus includes numerous small and medium-sized local competitors, either ensuring gas production and distribution or simply playing the role of a gas distributor.

In Electronics, five companies play a major role: Air Liquide, Linde, Versum, Air Products and Taiyo Nippon Sanso. Air Liquide is the leader in this industry.

Finally, in Healthcare, most gas industry players also supply hospitals with oxygen, but few are present in the treatment of chronic diseases at home. Air Liquide is number one in Europe in Home Healthcare. This market remains fragmented in almost all regions with a multitude of small companies and associations. This fragmentation provides bolt-on acquisition opportunities. Finally, Air Liquide is the only industrial and medical gases company to have developed a Hygiene and Specialty Ingredients activity.

In Engineering & Construction, Air Liquide also competes with industrial gas players. In "cold" technologies used for air separation, the main competitors are Linde, Hangzhou Hangyang (China), Kaifen (China), Air Products and Praxair. Chinese competitors are gaining ground due to high demand in their country. In "hot" technologies used for producing hydrogen and the chemical conversion of syngas, the largest competitors are Technip (France), Haldor Topsoe (Denmark) and Linde.

Risk factors

The Group identifies the risk factors to which it is exposed using a formal risk management approach.

The risks presented below, at the date of this Reference Document, are the risks of which the Group considers that the occurrence may have a significant negative impact on its business, results, outlook, or reputation. The list of these risks is, however, not exhaustive and other risks, unknown at the date of this document, could occur and have a negative effect on the Group's business.

As part of the Group's risk management approach, the Group is committed to regularly assessing the risks and to reducing the likelihood that they will occur or their potential impact by implementing the internal control and risk management procedures described on page 31, as well as formalized and specific action plans.

SPECIFIC BUSINESS-RELATED RISKS

The industrial gas business is characterized by a significant technology content (both in the design phase and the construction of production units), local production capacity, high capital intensity, and substantial energy requirements.

The risks associated with these characteristics are mitigated by various factors, which include primarily the diversity of industries and customers served by the Group, the multiple applications that it offers them, as well as the large number of geographical locations in which it operates. In addition, a significant share of business is subject to specific contracts, a strict investment project authorization and management process, and a tailored energy policy.

Industrial risks

Industrial risks are linked to the various industrial processes and distribution methods implemented by the Group. They are distributed over a large number of sites from which it operates.

The Group's key priority is safety, with a formal objective of "zero accidents, on every site, in every region, in every unit". The safety results for the past 25 plus years illustrate the long-term effectiveness of Group's actions in this area.

Over and above the usual risks inherent in all industrial activities, Air Liquide's businesses entail more specific risks relating to:

- products: the intrinsic properties of certain products packaged by the Group classifies them in the dangerous materials category, for which tailored procedures and means of securing the products are required to ensure compliance with local regulations as a minimum;
- processes and their operation: cryogenics is used to separate gases by distillation, store them and transport them. This very low temperature technique requires specific means of control and protection. The same applies for high temperature techniques, used in particular in the production of hydrogen. In addition, pressure is central to the Group's processes. Pressurized equipment must be designed with security features restricting uncontrolled release which may trigger accidents;
- logistics and transportation: each year, delivery vehicles, sales staff and technicians travel many kilometers. Non-compliance by the drivers with the highway code or the lack of regular maintenance of vehicles would expose drivers and third parties to risks of accidents. Preventive measures are regularly implemented, such as awareness campaigns. In addition, industrial sites use a lot of motorized lifting gears. Training and authorization are required to operate them;
- engineering and construction: industrial risks are factored in and must commence at the design phase of future installations. Subsequently, during the construction phase, the lack of prevention plans and rigorous organization would hamper the coordination among the various trades; the project and competences management tools aim to reduce these risks;
- delivery reliability: a variety of solutions aimed at reducing the risks of fault in the systems supplying gas to customers: direct pipeline connection from a production unit, on-site storage with remote surveillance enabling the automatic trigger of resupply or bar-coded gas cylinders ensuring the traceability of products;
- challenges in the medical area: the products and services for the healthcare and wellbeing of patients are regulated by internal standards and specific regulations, and must be subject to particular attention by the teams in question.

To manage these risks, the Group has an Industrial Management System (IMS), that is described in greater depth in Internal control and risk management procedures on page 33.

Moreover, considering the changing international climate and in particular the terrorist threat, the Group, its sites, and assets may be exposed locally to a higher security risk in certain countries, for which additional measures are being taken.

Industrial investment-related risks

The Group may be exposed to certain risks specific to its industrial investments. Each investment project may be affected, particularly in its profitability, by different factors linked primarily to project location, customer quality, the strength of its projects, and particularly the respect of its implementation schedule, the competitiveness of the site, as well as to design, cost estimates and the construction of gas production units.

The investment authorization process is led by Resources & Investment Committees, which apply extremely strict appraisal criteria to projects. These Committees comprise regional, technical and financial managers as well as World Business Lines managers that vary depending on the nature of the project considered, and are chaired by an Executive Committee member. They take place in each hub or World Business Unit. The investment decision-making process is detailed in the "Investment cycle and financing strategy" section on page 52.

Supply-related risks

Electricity and natural gas are the main raw materials used by production units. Their availability is thus essential to the Group. Due to the geographic spread of its activities, Group supply contracts are diversified. Where the local market permits, Group subsidiaries secure these resources through medium to long-term supply commitments and competitive bidding scenarios with the objective of achieving the most reliable and competitive energy costs available in any particular market. The Group passes on cost variations to its customers via indexed invoicing integrated into medium and long-term contracts.

Commodity risk is described in note 27.1 to the consolidated financial statements on page 281.

Engineering & Construction-related risks

Air Liquide enters into contracts to design and build gas production units worldwide. The primary role of Group Engineering is to undertake internal investment projects. It also performs projects for third-party customers that are selected based on criteria aimed at limiting the risks associated with these Engineering & Construction activities.

These projects generally extend over several years. Potential risks relating to design, purchasing, transport or construction and more generally to the overall quality of work may arise at different stages of the project. Risks relating to these projects are often greater during the construction stage, in particular for turnkey projects:

- the quality and delivery times for critical equipment on the one hand, and costs and on-site construction costs and deadlines on the other may give rise to project start-up setbacks and impact project profitability;
- unexpected technical problems may also arise as a result of new innovative processes being implemented. Preliminary tests on pilot or demonstration units are therefore meant to help reduce such risks prior to commercial implementation;
- certain projects are located in regions that may be a source of political risks and are therefore subject to constant monitoring.

The impact of the risks described above depends also on the contractual commitments given to customers.

Measures to limit commitments on the most complex projects are described in the Internal control and risk management procedures on page 34.

Business-related risks

The primary business-related risk is the risk of customer bankruptcy or closure of a customer's production site. The diversity of the Group's geographic presence in 80 countries distributes the risk among customers and markets. The Group's subsidiaries serve a very large number of customers (more than two million worldwide) in a broad range of industries: chemicals, steel, refining, food, pharmaceuticals, metals, automotive, healthcare, electronics, photovoltaic and research laboratories, etc. The Group's top customer represents around 2% of revenue, the Group's top 10 customers represent around 10% of revenue and the top 50 customers represent around 24% of revenue.

Moreover, a significant part of the Industrial Gas business is covered by customer contracts, with commitment periods specific to the relevant business line:

- the Large Industries business and a third of the Electronics business respectively rely on 15-year to 20-year, and 10-year, take-or-pay secured contracts, ensuring a guaranteed minimum revenue. These contracts provide strong future cash flow predictability;
- the contracts in the Industrial Merchant business, generally with a one to five-year duration, also include services relating to storage and cylinders;
- in the Healthcare business, positions vary between health systems, with certain countries awarding one to five-year contracts on a regional and pathology basis following public tenders.

In addition, some Group clients' business may be interrupted for climatic or major political events.

The impact on the Group of the risks of customer business interruption following major climatic or political events is, however, limited by the wide diversity of countries in which it operates. This impact can be reduced by the necessary recourse to gases in critical situations. Indeed, gases are needed to secure industrial or chemical installations (inert gases), maintain local industrial activity (essential to industrial processes) and even sustain life (medical gases). They are therefore often protected or prioritized depending on the situation.

The amount of operating receivables as well as allowance for doubtful receivables are shown in note 19 "Trade receivables" to the consolidated financial statements on page 258.

Finally, on a worldwide level it is noted that the planned merger Linde and Praxair, if confirmed, will result in a change in the competitive landscape in certain regions, with a particular impact on divestiture operations that will involve the competition authorities.

DIGITAL RISKS

The Group's activities, expertise and, more generally, its relations with all the stakeholders (customers, suppliers, communities of experts, etc.) depend on increasingly dematerialized and digitalized operations. These operations depend on interdependent information systems and communication networks both in functional, technical, as well as human level terms.

The Group's pursuit of this digital transformation increases its exposure to risks in both data confidentiality and in the availability of IT systems and applications. For data confidentiality, the increase in expectations and requirements for protection also adds the risk of regulatory non-compliance.

All these risks are increasing in intensity due to the severity and frequency of digital attacks and to their changing nature (historically, cyber risks constituted industrial espionage or data hacking and have come to involve the risks of cybercriminality, cyber attacks, and extortion). These attacks have the potential to affect all regions and businesses, with extremely significant impacts on the industrial activity (disturbance of production or distribution activities), the capacity for communication, notably internal, and on the Group's image (digital identity theft, dissemination of false information, etc.).

This constant and rapidly changing background requires continuous strengthening of the Group's preventative and monitoring measures and of its ability to react within the priority areas and activities. The Digital Security Policy and the associated risk management operational program are described on page 34.

FINANCIAL AND TAX RISKS

Financial risk management is a priority for the Group.

The financial risk management processes are detailed on page 35, in accordance with a governance structure that defines the role of the Finance Department, the various Committees and the role of local entities.

The Finance Department also analyzes country and customer risks on investment decisions; it participates in Investment Committee meetings.

Foreign exchange risk

Since industrial and medical gases are not transported over long distances, most products are manufactured in the country where they are sold. The Group considers that its activities and its profitability have a low level of exposure to currency fluctuations.

Foreign exchange transaction risk is related both to cash flows arising from royalties, technical support and dividends, as well as to foreign currency commercial cash flows from operating entities. These commercial cash flows in foreign currencies are not material when compared to consolidated revenue on an annual basis. This foreign exchange transaction risk is managed through the hedging policy implemented by the Finance Department.

Furthermore, the Group provides a natural hedge and reduces its exposure to exchange rate fluctuations by raising debt in the currency of the cash flows generated to repay debt. Thus, financing is raised either in local currency, or when sales contracts are indexed in euros or US dollars, in foreign currency (EUR or USD).

The Group presents its financial statements in euros. Foreign exchange risk related to the translation of local currency financial statements into euros mainly corresponds to the sensitivity to the main foreign currencies – the US dollar (USD), the Japanese yen (JPY) and the Chinese renminbi (CNY).

Following the acquisition of Airgas in the United States, the exposure of the Group's revenue and assets to the US dollar has increased, as has the Group's US dollar denominated debt, with a risk linked to the translation of the financial statements:

- large fluctuations in the value of the euro against the US dollar will have a more significant impact on the Group's published results than before the acquisition;
- these foreign exchange variations will have an impact on the figures presented in the Group's balance sheet, particularly concerning the debt.

Note 26.3 to the consolidated financial statements presents the net indebtedness by currency and note 27.1 to the consolidated financial statements describes the foreign exchange transaction risk management process and the derivative instruments used, as well as sensitivity to foreign currency exchange rates.

Interest rate risk

The interest rate risk is mainly linked to the fluctuation of future cash flows on debt when the rate is variable, indexed to indices such as Euribor or Libor. The Group's objective is to reduce the impact of interest rate fluctuations on its interest expenses and, guided by the principle of prudence, to finance long-term assets with shareholders' equity and fixed-rate long-term debt. Since most of Air Liquide's investments are based on long-term contracts (10 to 20 years), a policy promoting interest rate risk hedging ensures control over financing costs when deciding on long-term investments.

Group policy is to maintain, over a medium to long-term period, a majority of total debt at fixed rates, mainly by using firm or option hedges. This approach enables the Group to limit the impact of interest rate fluctuations on financial expenses.

Due to the increased level of indebtedness resulting from the Airgas acquisition, and particularly in case of a significant increase in interest rates upon future renewals of bonds in euros and in US dollars issued post-acquisition, the Group may find itself obliged to devote a more significant portion of cash flows from its operational activities to service the debt.

Note 26.4 to the consolidated financial statements presents the fixed-rate portion of debt and note 27.1 to the consolidated financial statements describes the sensitivity of the Group's financial expenses to interest rate fluctuations and the interest rate repricing schedule for fixed-rate debt and interest rate risk hedging instruments.

Risk involving credit ratings

As anticipated, following the Airgas acquisition, S&P downgraded L'Air Liquide S.A.'s credit rating for the long-term debt by two notches (from A+ to A-). A stable outlook was associated with this credit rating as well as the first credit rating issued by Moody's (A3) in May 2016. In addition, like all groups that are subject to ratings, Air Liquide could suffer a negative impact on its ability to finance its continuing operations and to refinance its debt should a rating agency significantly downgrade its rating below their current levels, due to a higher level of indebtedness than expected or for other credit-related reasons.

Financial counterparty and liquidity risk

Financial counterparty risk primarily relates to outstanding amounts on short-term investments and derivative instruments for hedging, to trade receivables, and to credit facilities contracted with each bank. To ensure its development and independence, the Group must have sufficient and permanent sources of liquidity, meaning adequate financing resources available at any time and at the lowest cost from banks and financial markets. In this area, the Group adopts a prudent approach to counterparties and their diversification, applying a strict limit on individual outstandings.

Note 27.1 to the consolidated financial statements describes financial counterparty and liquidity risk for the year ended December 31, 2017. Notes 19.1 and 19.2 to the consolidated financial statements provide a breakdown of trade and other operating receivables and allowances for doubtful receivables.

Tax risks

The Group is exposed to tax risk in certain countries, due to changes in applicable regulations, which may have an impact on its activities or its results. Its Tax Department and operational Finance Departments monitor these changes carefully to ensure the Group complies with these regulations.

HUMAN RESOURCES MANAGEMENT RISKS

The long-term performance of the Air Liquide Group is driven, in particular, by the quality of its employees, their expertise and their motivation.

The Group may be faced with difficulties in finding and sustaining the required skills at the right time and in the right place, in particular in developing economies where the Group is expanding its activities.

The Group ensures the building of a performance-focused, motivating and involved professional environment, through a human resources policy aiming to identify, attract, retain and develop competent employees from all walks of life. The objectives of this policy are set out on page 36.

Moreover, considering the changing international climate and its presence in a large number of countries, the Group and its employees may be exposed locally to a higher security risk, for which additional measures are being taken.

LEGAL RISKS

The Group has a worldwide presence. Its companies operating industrial and medical gas production facilities must comply with the rules and regulations in force locally, particularly in the technical field, and monitor any changes.

In Healthcare in particular, the regulatory environment constantly evolves and specific regulatory constraints exist which relate notably to public markets, to the marketing of products which may be subject to drug regulatory control, and the protection of private information on each patient. In this domain, the evolution of the regulatory environment is monitored with particular vigilance and adapted reinforced means implemented.

In addition, the Group is faced with the risks relating to contracts and competition law, as well as anti-corruption and international trade issues that are also subject to individual monitoring.

To the Group's knowledge, there have been no governmental, judicial or arbitration proceedings, including any such proceedings which are pending or threatened, of which we are aware, which may have, or have had in the past 12 months, significant impacts on the financial situation or profitability of the Company and/or Group.

Liabilities and contingent liabilities related to disputes are described in notes 24 and 32 to the consolidated financial statements.

Innovation and intellectual property-related risks

The Group's activity is not dependent on third-party patents. It is mainly based on technology, processes and designs which are mostly protected by patents, drawings and models, and utility models as well as by brands; these technologies, processes and designs are developed internally, notably by its Research and Development, Marketing, Engineering and other innovation teams, as well as through partnerships with third parties. There is, nonetheless, a risk of third-party rights being infringed, in particular when several market players are developing similar technologies. The Group is also developing innovative activities through collaboration with partners, acquisitions, or buying shares in innovative entities: risks may arise in the breakdown between stakeholders of rights and obligations relating to intellectual property.

Measures aimed at ensuring the respect of intellectual property are set out on page 36.

ENVIRONMENTAL AND CLIMATIC RISKS

The industrial and medical gas business presents few environmental risks. Around 85% of the Group's large production units separate the components of atmospheric air, i.e. oxygen, nitrogen, argon and rare gases. These plants "without chimneys" do not use any combustion processes and consume almost exclusively electrical energy. They are particularly environmentally friendly as they emit almost no CO_2, sulfur oxides or nitrogen oxides.

Nonetheless, electricity consumption generates CO_2 emissions by the suppliers of this energy, known as indirect emissions.

Besides, the Group's two other main activities, namely hydrogen production and cogeneration, account for nearly 15% of large production units and use combustion processes emitting CO_2 and nitrogen oxides, as well as low quantities of sulfur oxides.

Water is a resource necessary to these three main Group processes. Air gas separation units use water exclusively for cooling purposes during the separation process. Hydrogen production units require water in the form of steam in the reaction producing hydrogen. Finally, the cogeneration units produce steam, which is mainly supplied to customers.

Environmental risks primarily comprise the following components that are subject to rigorous monitoring:

- the environmental footprint, involving the Group's activities worldwide: including direct and indirect greenhouse gas emissions which are measured at all production sites;
- respect for applicable legislation and its evolution.

Climatic risks notably comprise weather and climatic disasters which may disrupt the smooth running of operations in particular on the main sites in the regions at risk. Adaptation measures covering risks relating to extreme weather-related phenomena and to the scarcity of water in geographic regions under water stress exist at the main sites located in high-risk areas.

The scheme to manage environmental and climatic risks is detailed in the Sustainable Development Report on page 67 as well as on page 36.

INSURANCE MANAGEMENT

The Group has adequate insurance coverage, underwritten by first-rate insurers, for civil liability, property damage and business interruption.

Property damage and business interruption

Group property and business interruption are covered by property and casualty insurance policies underwritten in each country in which the Group operates. Almost all of these policies are integrated into an international program.

These policies, which are generally of the "All Risks" form, cover fire, lightning, water damage, explosions, vandalism, impact, machinery breakdown, theft and, depending on the country and in limited amounts, natural disasters.

Business interruption is insured for most production sites under these same policies. The coverage period for business interruption is 12 to 18 months. Deductible amounts are correlated to the size of the sites. Insurers conduct regular visits at the main industrial sites for risk prevention purposes.

Civil liability

In terms of civil liability, the Group maintains two separate covers, one for the North American zone and another for the rest of the world. The North American zone is covered by insurance underwritten in the United States. For the other zones, the Group has subscribed an umbrella policy, underwritten in France, which covers both the Company and its subsidiaries outside of the United States and Canada, beyond any local coverage provided for the subsidiaries.

These two policies cover liability of the Group companies for any damage they might cause to a third party in the course of doing business (operational risk) or arising from their products (product risk).

The coverage amounts underwritten exceed 500 million euros. Both policies are built on several overlapping insurance lines and each line has been underwritten for a given amount with several insurers sharing the risk. Beyond the first line, the upper lines pick up the excess risk from the lower lines.

The policy underwritten by the Company in France serves as an umbrella for subsidiaries outside of North America. Under this umbrella, each foreign subsidiary has its own policy covering damages to third parties incurred through its activities or products. The amount insured for each subsidiary in its policy depends on the amount of its revenue. The coverage under the Group's umbrella policy is supplemental to any local amounts.

The main exclusions are deliberate acts, war, nuclear incidents and repair of defective products.

Captive reinsurance

A portion of risks of damage and operating losses is kept by the Group via a captive reinsurance company located in Luxembourg, which also participates, since July 1, 2015, in the coverage of the Group's civil liabilities excluding the North American zone.

This company covers losses of up to a maximum of 5 million euros per loss over and above the deductibles to a maximum of 23.5 million euros per year. Beyond these amounts, risks are transferred to insurers. Their management is entrusted to a captive manager approved by the Luxembourg Insurance Commission.

This captive reinsurance company is fully consolidated. Its balance sheet as of December 31, 2017 totaled 75 million euros.

OTHER RISKS LINKED TO AIRGAS

The following paragraph summarizes, as of December 31, 2017, the risk factors more specifically linked to Airgas; the activities are exposed to types of risk that are very similar to Air Liquide's (industrial risks inherent in the production and distribution of industrial gases, in the sale of materials in a shop or on online platforms, as well as in issues relating to the medical field, with all these risks being spread over many sites).

After a period dedicated to operational integration and the realization of the synergies sought, Airgas could once more be exposed to certain operational risks linked in particular to the speed at which Air Liquide's products are adopted by existing Airgas customers and vice versa, to the final stages of integration for some information systems, or to the management of some supply contracts as they reach maturity. In human resources, Airgas, which is exposed to the risks inherent in managing a large number of employees that have differing career paths, pay structures, and cultures, has started to adopt some Group measures (succession and retention plans, management of certain populations, etc.). In industrial safety, Airgas, with an already strong industrial risk management system, launched actions aimed at strengthening the detection and reporting of incidents, as well as specific analyses of risks relating to manufacturing procedures.

Internal control and risk management procedures instituted by the Company

This section describes the main internal control and risk management procedures instituted by the Company.

They are based on the reference framework of the internal control and risk management system, developed under the supervision of the French financial markets authority (AMF) and which were prepared with contributions from several departments (particularly Finance, Group Control, Legal, Safety and Industrial Systems, etc.).

INTERNAL CONTROL OBJECTIVES

In addition to the Principles of Action, (https://www.airliquide.com/group/groups-principles-action) which reaffirm the Group values with particular reference to stakeholders (shareholders, customers and suppliers, employees, etc.), the Group's policies are grouped together in an overall Reference Document, the BLUEBOOK, which is available to employees on the Intranet. They constitute a set of internal control and risk management procedures, which must be implemented by each entity included in the Group's consolidated financial statements.

The BLUEBOOK is the cornerstone of the Group's internal control system.

The internal control system aims to ensure that:

- the Group's activities and the conduct of its members:
  - comply with laws and regulations, internal standards and applicable best practices,
  - comply with the objectives defined by the Company, especially in terms of risk prevention and management policies,
  - contribute to safeguarding the Group's assets;
- all financial and accounting information communicated either internally or externally gives a true and fair view of the situation and activity of the Group and complies with prevailing accounting standards.

Generally, the Group's internal control system should contribute to the management of its activities, the efficiency of its operations and the efficient use of its resources.

As with other "assurance systems", it cannot provide an absolute guarantee that the Group's objectives will be met.

In 2017, the Group pursued the actions undertaken in previous years, with more than 70 material Group entities and shared service platforms (representing over 90% of consolidated Group revenue), reviewing the appropriateness of their internal control system in relation to the Reference Framework for internal control and risk management systems. These entities also implemented actions aimed at improving their control system in terms of annual guidelines defined at the beginning of the year by the hubs and World Business Unit, the Group Control Department and the Finance Department. The latter two together organize these improvement measures and report on their progress and the Group's accounts to Executive Management then to the Audit Committee.

Audits are coordinated by the Group Control Department and the Statutory Auditors, based on a joint work program, to verify assessments of the internal control system and the correct implementation of key operating controls, including in small and medium-sized entities based on a framework of key control processes adapted for their use.

In 2017, the Group continued its measures to improve the quality of its internal control and risk management system, and in particular:

- to support the changes in organization around the hubs and the grouping of countries into clusters, the adjustment of the management and control bodies with the setting up, on one hand, of SICR meetings (Strategy – Investment – Corporate Policies Review) that periodically review the strategy, large investments, and Group under the chairmanship of the Chairman and Chief Executive Officer and, on the other hand of a Group performance management committee, which meets every month under the chairmanship Executive Management;
- at Airgas, the integration process focused primarily on operating activities and industrial safety, then on other more functional areas such as human resources;
- in the area of digital security, the launch of the compliance program for European General Data Protection Regulation rules and certain targeted actions for industrial and operational systems to provide greater protection for assets and sensitive data; in addition, significant awareness-raising efforts and user training is being pursed;
- in the area of ethics, definition of an action plan aimed at integrating the new anti-corruption measures relating to the Sapin 2 Act within the Group's pre-existing measures (risk mapping, face-to-face training or e-learning, supplier and third party assessment, control – including of accounts, and whistleblowing systems);
- in the area of safety and industrial reliability, following an in-depth examination of the IMS, validation of proposals aimed at adapting the system to simplify its operational implementation;
- in the area of regulatory and operational compliance, in addition to the Group's pre-established anti-corruption, competition law, and export control programs, initiatives aimed at raising awareness within management teams of local non-compliance risks (identification and treatment);
- in the societal area, creation of an Environment and Society Committee alongside the Board of Directors that examines the Group's strategy and commitments in terms of sustainable development, assesses environmental and societal risks, and ensures monitoring of actions rolled out in this area (particularly relating to air quality, energy consumption, and greenhouse gas emissions).

ORGANIZATION

The Group is organized and based on a consistent Group strategy. It is supported by a method of management which centers on mid-term objectives that are categorized by business, as well as a steering process for activities based on annual budgetary objectives, which are further categorized down to the individual plan level. As part of the NEOS company program, the organization has developed into a network structure that promotes communication and shortens decision-making circuits.

The organization breaks down into:

- hubs (Houston, Frankfurt, Shanghai and Dubai) which ensure the Group's presence in the main global regions. With the Base (Head Office), they are responsible for defining the Group's operational strategy and its global performance. They accommodate the representatives of the Corporate functions and World Business Lines that ensure that the Group strategy is properly implemented locally;
- entities, grouped in country groups (Clusters) for better sharing of resources, which ensure the operational management of their activities and implementation of the strategy in the countries where the Group is located;
- the World Business Lines, which:
  - with the hubs and Strategy Department, produce the mid-term strategic objectives for their related activities,
  - are responsible for strategic Marketing, transformation of their respective businesses, the industrial policy, and the appropriateness of skills in their field of activity;
- the World Business Units specific to certain activities (Healthcare, Engineering & Construction);
- the Innovation and Development Department, which groups the innovation and research means, technologies development, digital transformation, the World Business Unit Global Markets & Technologies, and Hydrogen Energy.

This organization also includes the Corporate functions, which notably comprise the three key control departments that report to Executive Management:

- the Finance Department, which is responsible for:
  - the reliability of accounting and financial information,
  - the Group financial and tax risk management,
  - management control through the drafting of Group objectives and monitoring of performance, on the basis of financial data prepared by the accounting teams and analyzes conducted by the financial teams of the various entities;
- the Group Control Department, which:
  - provides expertise and assistance to entities in the roll-out of their risk management approach (see below) and builds a Group synthesis,
  - verifies the effective application of internal control and risk management procedures through audits carried out according to a defined program presented to the Group's Audit and Accounts Committee. This program, developed and based on the risk analysis, is regularly monitored by the Audit and Accounts Committee itself. Audit Reports are systematically supplemented by corrective action plans, which are supervised by a member of the Executive Committee. These reports, as well as subsequent follow-up reports, are the subject of various communications and periodic discussions with the Statutory Auditors,
  - helps Group entities ensure compliance with and promotion of both the Group's ethical values, particularly through training and awareness-raising actions and the treatment of fraud and deviations (all these actions, organizations, and tools are presented in detail in the Sustainable Development Report), as well as with international trade regulations,
  - provides guidance to Group entities, through the Digital Security Department, which reports directly to the Group Control Department, on the identification and protection of their data, systems, and digital applications (definition of rules, roll-out expertise and advice, control of proper implementation);
- the Legal Department, which identifies legal risks, issues internal guidelines and codes, and then oversees their proper implementation. It also monitors the main litigation cases and manages insurance.

Finally, this organization relies on a framework of authorizations and delegations:

- to members of the Executive Committee and certain departments and services in order to define their commitment and payment powers for commercial transactions (sales or purchasing);
- to certain executives in charge of entities or sites in France, in order to ensure the prevention and control of industrial risks in terms of hygiene and safety;
- to certain financial executives, in order to ensure the security of transactions and financial flows.

The managers of the various Group subsidiaries exercise their duties under the control of the Boards of Directors and in accordance with laws and regulations applicable in the countries where they operate.

RISK MANAGEMENT

To ensure the continued development of its activities, the Group must actively pursue an approach to prevent and manage the risks (especially industrial and financial risks) to which it is exposed.

In terms of the Group's business activities, industrial risk management must essentially focus on prioritizing safety and security while maintaining a permanent focus on the reliability of installations.

Financial risk management requires strict control over investments, combined with prudent and rigorous practices regarding the accounting and financial aspects of the activities.

The Group formal risk management approach aims to ensure:

- the regular identification of the different forms of risk (industrial, financial and other) encountered by the Group during the pursuit of business activities, which are assessed according to both potential damage and probability of occurrence;
- the assessment of the risk management level of each risk based on a common scale with respect to the quality of policies, organizations, processes and controls in place;
- the progress of the main corrective action plans undertaken to mitigate the risks, by focusing monitoring activities on a limited number of priorities.

This three-phase risk management process (mapping, management levels, mitigation plans) covers over 70 entities representing more than 90% of consolidated Group revenue.

The Risk Management Department within the Group Control Department leads this approach using:

- resources dedicated by the hubs, World Business Units and World Business Lines to manage the approach in their respective scopes of responsibility (under the supervision of the Boards of Directors of the entities concerned) and provide a summary thereof;
- the work of members of the Risk Committee that it coordinates. This Committee brings together the Corporate functions, which provide their expertise to the hubs, World Business Units and World Business Lines. Presided by the Chairman & CEO, it meets twice a year to report on the progress of initiatives, particularly in terms of priorities, and to establish a Group risk management synthesis as well as define the directions for the following year.

The Audit and Accounts Committee reviews Group risk management based on presentations covering:

- the progress of the approach (on an annual basis);
- each major risk management system based on a multi-year program structured according to the challenges;
- internal audit summaries of these risk management systems.

Finally, an annual summary of risk management actions undertaken by the Group is presented to the Board of Directors; each year it validates the Audit Committee's provisional program which is presented to it beforehand, as well as a list of subjects of strategic interest or with particular relevance that will be presented in a more specific manner.

CONTROL ACTIVITIES

The main internal control and risk management procedures established and communicated by the Group in the BLUEBOOK aim to:

1. Ensure the safety and security of people, products and installations, as well as the reliability of operations, in compliance with the rules and regulations for accident prevention

To this end, the Group has an Industrial Management System (IMS), which operates based on:

- empowerment of the Management bodies governing the Group's various entities for the effective implementation of this system;
- the issue of key management and organizational procedures that aim to ensure:
  - regulatory compliance,
  - design management,
  - industrial risk management,
  - hygiene, health and environmental management,
  - training and certification of personnel,
  - management of operating and maintenance procedures,
  - management of industrial purchasing,
  - change management,
  - analysis and treatment of incidents and accidents,
  - shared technical standards within Group entities.

The IMS document base is updated and supplemented on an ongoing basis.

The Safety and Industrial Systems Department and the Industrial Departments of the relevant World Business Lines supervise and control the implementation of the IMS, by notably relying on:

- on-going awareness-raising actions for teams by providing specifically related training;
- the presentation of various indicators designed to review performance in terms of the safety and reliability of operations;
- the process audits conducted by the Safety and Industrial Systems Department to verify the implementation conditions and compliance of operations with IMS requirements;
- technical audits carried out by the Industrial Departments to ensure the compliance of operations with Group rules.

Safety performance of operations and their level of compliance with IMS requirements are regularly monitored by the Executive Committee.

Moreover, considering the changing international climate and in particular the terrorist threat, the Group, which is present in many countries, has defined and rolled out additional measures to protect its employees and secure its products and sites that are most exposed locally to an external threat.

2. Ensure extremely strict control of Group investments and commitments, with:

- an in-depth review of investment requests using very strict assessment criteria as well as the medium and long-term contractual commitments which may arise therefrom, within the Resources and Investments Committees. These Committees remain in each hub or World Business Unit; they comprise regional, technical and financial managers as well as World Business Lines managers that vary depending on the nature of the project considered, and are chaired by an Executive Committee member;
- control of investment decisions through the specific follow-up of authorizations granted as well as contributions expected and seen during the initial years. In addition, the subsidiaries are obliged to report (above certain thresholds) all budget overruns and implement corrective action plans aimed at ensuring the profitability of the investments concerned; for the largest ones, they are supported by experts ("Capital Implementation" teams) in order to secure good preparation as well as execution;
- more in-depth profitability analyzes (comparative analyzes prior and subsequent to completion) for certain significant investments.

3. Ensure control of energy purchasing, particularly with respect to availability and matching with Group commitments to customers

The energy management policy defines rules governing energy purchasing and the related decision-making processes. The Enrisk Group Committee reviews the procurement strategies of the entities, validates the most significant commitments and ensures the relevant policies are properly applied.

Each month, the Enrisk Group Committee brings together the Vice President in charge of the Large Industries World Business Line, the Energy Vice President and the Group Deputy Chief Financial Officer.

Meeting minutes are sent to all Executive Committee members.

4. Ensure the protection of Group IT data and applications

The Digital Security Policy sets the basic rules governing the identification of digital security stakes and handling of associated risks, and outlines the roles and responsibilities in this area. It is accompanied by:

- procedures describing, in particular, how to secure data and applications, detect and deal with incidents;
- codes outlining principles to be respected by IT users and administrators.

The Digital Security Department reports directly to the Group Control Department and uses resources set aside in the hubs, Clusters, World Business Units and World Business Lines to coordinate and control in conjunction with the IT Department the roll-out of this policy from a risk assessment that is regularly updated according the development of threats. This roll-out is centered on a long-term operational program aimed at defining the key areas and measures to be taken under the supervision of a member of the Executive Committee, with in particular:

- the risk prevention and awareness raising for employees using teaching tools such as phishing campaigns, e-learning courses on information protection and use of IT tools, etc.;
- better consideration of digital security from the project design phase, as an inherent part of any resulting solution, and continued treatment of IT vulnerabilities, protection of critical applications and of the most sensitive information; monitoring of digital threats and major cyber incidents that could affect the Group's activities;
- implementing regulatory compliance for the organization using specific projects or programs (Military Planning Act, General Data Protection Regulation, etc.);
- revision of the incident management system completed by undertaking diagnosis to assess the quality and efficiency of the protection of our sensitive digital assets.

5. Manage financial and tax risks

Financial decision-making governance is the responsibility of the two Finance Committees (Strategic Finance Committee and Operational Finance Committee), with the former considering issues relating to the financing strategy and the latter dealing with the practical methods of its implementation.

The Company has defined financial policies, which forbid speculative transactions notably on financial instruments, and that are subject to regular review. These policies were brought together in a Group financial policy. These procedures set out the principles and procedures for the management of financial risks to which the activity is exposed, notably in relation to:

- foreign exchange risk: the Company has defined methods for hedging foreign exchange risk, whether this is carried by the holding companies or the operating entities, in terms of authorized hedging instruments, the decision process and the execution of transactions;
- interest rate risk: the Company has defined methods managed on a centralized basis for the hedging of interest rates related to indebtedness that is carried in major currencies (mainly EUR, USD, JPY, and CNY), which represent more than 90% of total net indebtedness with:
  - a selection of authorized tools,
  - the hedging decision processes,
  - the methods of executing transactions.

For other foreign currency indebtedness, rules have been defined in order to ensure that the transactions initiated to hedge interest rate risk are consistent with Group objectives:

- counterparty risks: the Company has defined rules aimed at ensuring that there is sufficient diversification and financial solidity of counterparties at Group level (commitment limits/minimum rating);
- liquidity risks: the Company has defined rules aimed at ensuring an appropriate level of "confirmation" and diversification (by type and maturity) for all external financing sources. The Group staggers short- and long-term repayment maturities over time in order to limit amounts to be refinanced each year and has precautionary facilities.

These measures are supplemented by treasury management rules adapted to local circumstances, which are aimed at ensuring compliance and security of transactions and optimizing the management of liquidity (forecasting of cash in/cash out, etc.).

The application of this financial policy is controlled by the Finance Department. The majority of transactions are executed directly on a centralized basis (financing and management of related interest rate risk, hedging of foreign exchange risk), which is completed by consolidated reports provided by various Group entities on a monthly or quarterly basis, depending on the type of risk.

The activities are managed on the basis of highly segregated duties, using a multilateral negotiation platform, cash management software, and a communication platform linked to the Swift banking network.

In terms of tax, the Group attaches great importance to compliance with local regulations which are monitored by its Tax Department and its Financial Departments.

6. Ensure the reliability of financial and accounting information

In order to guarantee the quality and reliability of financial and accounting information produced, the Group primarily relies on a set of accounting principles and standards, as well as a consistent accounting and management reporting system for data which is unique and feeds both the Group consolidation process and the business analysis that is under the responsibility of independent departments, which report to the Finance Department.

The Group accounting manual, which includes the Group financial policy, defines the accounting rules and principles as well as the consolidation methods applicable and states the formats applicable for reporting financial and accounting information. This manual is regularly updated by the Finance Department with the amendments to IFRS or their interpretations.

Management and Accounting Reports are each prepared under the responsibility of independent but interactive departments that follow identical methods and principles:

- this independence allows for the enhancement of information and analyzes through the use of complementary indicators and data, particularly those which are specific to each activity;
- the fact that these bodies are interactive provides for better control of the reliability of information through the systematic and regular reconciliation of data.

The reports primarily include:

- monthly management reporting, known as the "Monthly Flash Report", that provides information on revenue and the main financial indicators: income statement, cash flow from operating activities, net indebtedness and the amount of investments authorized and committed;
- quarterly reporting, known as the "Management Control Report", which provides details of the primary items of the income statement, balance sheet and cash flow statement;
- a quarterly "variance analysis" report to assess the various components of the change in operating income recurring.

These three documents are compiled by each management entity according to a predefined yearly timetable.

They are systematically accompanied by comments on activities drawn up by the Director and the controller within the entity, and are consolidated at Group level with a breakdown for each hub and activity;

- quarterly reporting for accounting consolidation is compiled by each subsidiary which, in addition, must provide (on a semi-annual basis) information on off-balance sheet commitments that may include:
  - energy purchasing,
  - financial guarantees and deposits,
  - all other contractual commitments.

Accounting consolidation statements and monthly reporting are escalated to the Central Consolidation Department. This department prepares the consolidated data and works in conjunction with the Operations Control Department, whose duty is to analyze and comment on the results, identify and explain any differences with respect to forecasts, and to update the forecasts.

As part of the scope of the Group performance steering committee, a rolling forecast for the rest of the current year is systematically presented by the Finance Department, in order to identify, when applicable, any differences with respect to yearly targets and take the necessary steps.

Through regular controls, the Finance Department ensures the effective application of accounting methods and principles in the various Group entities. The most complex accounting standards, particularly those relating to employee benefits (IAS19R), methods of consolidation (IFRS10/11) and derivative financial instruments (IAS32/39, IFRS7) are subject to tighter controls or treated directly by the Finance Department.

It also relies on audits carried out by the Group Control Department, with which it has regular contact.

The quality and reliability of financial and accounting information also depends on information systems which are increasingly integrated (such as ERP), a Group consolidation software package.

The project, which aims to further harmonize ERPs, continues (mainly in the Asia Pacific, Americas, and Middle East and Africa zones) based on the definition of an accounting and financial framework tailored to the various business lines.

7. Ensure the development of the Group's expertise and talents

The Human Resources policy defines the main rules, together with the roles and responsibilities of the different parties in their implementation, with respect to, among others:

- the acquisition and sustaining of requisite skills, in particular through the SPRING long-term program, which identifies and manages critical skills. Training provided under the Air Liquide University brand also contributes to this goal and in particular e-learning courses attended by an increasing number of users (more than 55,000 in 2017) in a wide range of domains (ethics, industrial safety, competition law, etc.);
- accompanying employees in their personal development with the continuing roll-out of improvement tools for the management of training programs (LMS: Learning Management System), the management of careers and skills (TMS: Talent Management System) and the communication of career advancement opportunities (TAS: Talent Acquisition System);
- measuring and recognizing performance and contributions for all employees. Other than remuneration policies, the Group's specific programs promote, for example, technical expertise (Technical Community Leaders), inventors (inventor recognition program) and entrepreneurs.

8. Ensure that laws, regulations and internal management rules are respected within the Group, notably in the legal and intellectual property areas

- With the Group legal policy, which encompasses:
  - a Group procedure relating to Powers (limitations and delegations) for use by Group entities;
  - a Group procedure on the governance of subsidiaries (Boards of Directors);
  - an Insurance Guide for all Group entities;
  - Group codes on how to behave in order to comply with competition laws (including Europe and the United States), accompanied by surprise audits and training that includes e-learning;
  - a Group code recapping the rules of ethical behavior to prevent the risk of corruption, and related procedures, accompanied by regular training sessions;
  - a memorandum, specifying the rules to be observed to prevent market abuse (insider trading), various contract guides (for Large Industries, Engineering & Construction, Industrial Merchant, Electronics and Financing) and Codes of Good Practices (for Healthcare).
- In the intellectual property area, with a Group policy and procedures aimed at:
  - ensuring Air Liquide's compliance with valid patents held by third parties in its different areas of activity;
  - protecting Group intellectual property, by protecting its inventions, designs and brands through their identification (on an official filing basis) and in the event of partnerships or other third-party relations targeting innovation;
  - managing the Group's obligations in terms of the recognition of their inventors.

To this end, the Group relies on an Intellectual Property Department, comprising professionals located at the Group's head office and in the main geographic regions.

9. Manage environmental and climate risks

The Group has a policy that aims to ensure its development while limiting its carbon footprint and its environmental impacts.

In particular, the carbon footprint and certain environmental risks (emissions into the atmosphere, annual water supply, etc.) are part of the criteria for analyzing investment projects.

In addition, the Group initiated an approach that promotes purchasing energy from suppliers with the best carbon footprint and aims to continually improve its energy efficiency (in particular for air gas and hydrogen production) and that of its transport used to deliver products to its customers. These improvements are monitored using indicators collected and consolidated at Group level.

Finally, as well as the vigilance it exercises over its own activities, the Group offers its customers many applications and services to help them reduce their own carbon footprint.

The Group is also attentive to climatic risks and particularly risks related to the extreme weather-related phenomena, which are the subject of specific adaptation plans on the main sites located in high-risk areas.

All these subjects are detailed in the Sustainable Development Report in chapter 2 of the Reference Document.

MONITORING OF CONTROL MEASURES

The Board of Directors exercises its control over Group management based on the various quarterly activity reports it receives from Executive Management and the work of the Audit and Accounts Committee, according to the methods and principles described above (reports, debriefings, etc.).

Executive Management team exercises its control over risk management, particularly through:

- SICR meetings (Strategy - Investment - Corporate Policies Review) that periodically review the strategy, large investments, and Group policies. Taking part in these reviews together with the Chairman & CEO are the Executive Vice-President in charge of Finance, the Innovation and Development Director, and the Director of Strategy, and depending on the topic, the Vice-President of the hub or activity, or the Director of the Group function concerned. The Innovation and Development Director acts as secretary;
- monthly meetings of the Group performance steering committee which decides the investment budgets and the action plans to undertake or amend in order to achieve the annual or multi-annual objectives. They replace the Executive Management meetings and bring together, with the Chairman & CEO and Executive Vice-President in charge of Finance, the Executive Vice-Presidents and managers in charge of the hubs, the Innovation and Development Director, and the Strategy Director. The Group Operations Control Director acts as secretary.

It also relies on existing reports and:

- Executive Committee meetings, with, in particular, debriefings from the Safety and Industrial System Department regarding Group performance in terms of security and the progress of current actions;
- work carried out by the Finance Department, and the Group Control Department;
- recommendations made by various Group Committees set up to ensure enhanced management of certain commitments and more significant stakes (the role and members of these Committees are described below).

These control measures are enhanced by the involvement of operational departments and the Executive Committee in the implementation and follow-up of actions needed to improve and strengthen the quality of internal controls.

THE RISK COMMITTEE

The purpose of this Committee is to provide support and expertise to the hubs, World Business Units and World Business Lines which must implement and coordinate the risk management approach in their respective scopes of responsibility.

It brings together the Corporate functions: Legal, Finance, Communication, Safety and Industrial System, Human Resources, Group Operations Control and Group Control (notably covering ethics and digital security).

Chaired by the Chairman & CEO and attended by two Executive Vice-Presidents and the Strategy Director, it meets twice a year to report on the progress of initiatives, particularly in terms of priorities, and to prepare a Group risk management synthesis.

THE FINANCE COMMITTEES

The Strategic Finance Committee

The purpose of this Committee is to verify the effective application of the Group's financial policy, to approve financial management proposals and suggestions that have been submitted and to approve the rules governing the Group's financial policy, which are subjected to regular review.

It brings together the Group Chief Financial Officer and the Group Corporate Finance and Treasury Director, who meet under the authority of the Chairman & CEO.

The Committee meets at least three times a year and upon request, if necessary.

The Operational Finance Committee

The purpose of this Committee is to make day-to-day decisions concerning the financial management of the Group, to propose structuring transactions to the Strategic Finance Committee and to ensure their implementation after approval.

It brings together the Group Chief Financial Officer, the Corporate Finance and Treasury Director, the head of Corporate Finance, and the head of Group Financing, assisted by a Committee Secretary.

The Committee meets every four to six weeks, and the minutes of these meetings are sent to the Chairman and CEO.

THE RESOURCES & INVESTMENT COMMITTEES

The purpose of these Committees is to assess and approve requests for investments that have been submitted, as well as medium and long-term contractual commitments and human resource requirements that may arise therefrom.

Each Committee meeting is chaired by a member of the Executive Committee in charge of the hub or of the World Business Unit involved and brings together managers of the business line concerned by the investment, as well as representatives of the Group Finance Department.

They meet regularly (usually once or twice a month) for each hub (Houston, Frankfurt, Shanghai, and Dubai) and World Business Unit (Healthcare, Engineering & Construction) and for the Innovation and Development Division (IDD).

THE ETHICS COMMITTEE

The purpose of this Committee is to supervise the Group's ethics program (monitoring of actions undertaken to prevent deviations, proposing short- and medium-term orientations) and to recommend sanctions in case of significant deviation.

It brings together the Legal, Group Control, and Human Resources Departments as well as a representative of operational functions; it meets at least once per year and more often when required.

THE DIGITAL SECURITY COMMITTEE

This Committee is responsible for setting the strategic directions for digital security and for ensuring the operational progress of certain Group projects (industrial IT, digital innovation, etc.).

It brings together the IT, Digital Transformation, and Digital Security managers and other Corporate Departments when required.

It meets each month under the chairmanship of a member of the Executive Committee.

2017 PERFORMANCE

2017 was marked by an acceleration in comparable sales growth during the second half and an improvement in operating performance which was reflected in an increase in operating margin and return on capital employed, and by a high level of cash flow.

Group revenue totaled **20,349 million euros** in 2017, up **+12.2%** as published, following the consolidation of Airgas sales over 12 months. Comparable growth stood at **+2.9%** and benefited from a marked step-up in Gas & Services sales growth throughout the year. The currency impact became strongly negative in the second half and stood at -1.6% for the year as a whole. The energy impact, at +1.5% for the year, eased significantly during the second half. **Gas & Services revenue** totaled **19,642 million euros**. Comparable growth, of **+3.5%** for the year, picked-up pace in the second half (+4.2%). Sales were up across all business lines, in particular Industrial Merchant (+3.8%) which enjoyed a strong recovery in growth quarter-by-quarter. Developing economies (+8.1%) and China in particular remained growth drivers.

The 2017 **operating margin** stood at **16.5%**, up **+70 basis points** compared with the adjusted 2016 operating margin and excluding the energy impact. Productivity efforts in 2017 generated **323 million euros of efficiencies** and **170 million US dollars of Airgas synergies**, 40 million US dollars more than the initial objective. **Net profit (Group share)** amounted to **2,200 million euros**, up **+19.3%**. Excluding the non-cash impacts of non-recurring items and the US tax reform, net profit (Group share) totaled **2,029 million euros**, up **+10.0%**. This "recurring" net profit will be the reference used to evaluate the 2018 performance.

Net cash flow after changes in working capital requirements was up **+15.1%** compared with 2016 and represented **20.9% of sales**, driven by a high level of operating cash flow and an improvement in working capital requirements. Net debt at December 31, 2017 reached 13,371 million euros, down 1,997 million euros compared with end-2016. The **debt-to-equity** ratio (gearing) stood at **80%** at the end of December 2017, down compared with 90% at the end of 2016.

The Group pursued its growth initiatives with **investment decisions** of **2.6 billion euros** compared with 2.2 billion euros in 2016. The increase is due to industrial decisions and reflects the momentum of the business in terms of biddings. **Gross industrial capital expenditure** represented **10.7% of sales** and was in line with the medium-term strategic plan.

The Board of Directors proposed a nominal **dividend** to be submitted to the Annual General Meeting of 16 May 2018 at **2.65 euros per share**. This represents a +12.4% increase taking into account the free share attribution in October 2017. The pay-out ratio is estimated at 53%.

Terms « published » and « comparable » used in this document refer to the definitions below:

- **Published growth** vs 2016 data is calculated in accordance with IFRS 5. Other Activities (Aqua Lung and Air Liquide Welding) are reported under "Net income from discontinued operations" in the 2016 and 2017 income statement. The 2016 Balance Sheet also presents Assets and Liabilities held for sale under a dedicated line.
- **Adjusted 2016 revenue and operating income recurring** are computed as if, on January 1, 2016, Airgas had been fully consolidated and the divestitures requested by the U.S. Federal Trade Commission completed, and Aqua Lung and Air Liquide Welding had been deconsolidated.
- **Comparable growth:** in 2017, Air Liquide communicates on a comparable variation **based on 2016 adjusted data, excluding currency, energy** (natural gas and electricity) **and significant scope impacts.**
- **Reference to Airgas** now corresponds to the Group's Industrial Merchant and Healthcare activities in the United States within the new scope, after the merger of Airgas and Air Liquide U.S. operations.

Unless otherwise stated, all variations in revenue and operating income recurring outlined below are on a **comparable basis**.

2017 Key Figures

(in millions of euros)	FY 2016	FY 2017	2017/2016 published change	2017/2016 comparable change [a]
Total Revenue	**18,135**	**20,349**	**+12.2%**	**+2.9%**
Of which Gas & Services	*17,331*	*19,642*	*+13.3%*	*+3.5%*
Operating income recurring	3,024	3,364	+11.2%	+7.5%
Operating income recurring *(as % of revenue)*	16.7%	16.5%	-20 bps	+70 bps [g]
Other non-recurring operating income and expenses	36	(344)		
Net profit (Group share)	1,844	2,200	+19.3%	
Adjusted earnings per share *(in euros)* [b]	**4.64**	**5.16**	**+11.2%**	
Adjusted net dividend per share *(in euros)* [b]	**2.36**	**2.65** [f]	**+12.4%**	
Net cash flows from operating activities [c]	3,697	4,254	+15.1%	
Net capital expenditure [d]	13,609	1,850		
Net debt	15,368	13,371		
Debt-to-equity ratio	90%	80%		
Return On Capital Employed – ROCE after tax [e]	**7.8%**	**8.2%**		

(a) Comparable growth based on 2016 adjusted figures excluding the currency, energy and significant scope impacts.
(b) 2016 figures restated for the impact of the free share attribution on October 4, 2017.
(c) Cash flow from operating activities after changes in working capital requirements and other elements.
(d) Including transactions with minority shareholders.
(e) Return on capital employed after tax: see definition in appendix.
(f) Subject to the approval of the Annual General Meeting on May 16, 2018.
(g) Excluding energy, variation 2017 vs 2016 adjusted.

2017 Highlights

INDUSTRIAL DEVELOPMENTS

Large Industries

- In early January 2017, Air Liquide and **ArcelorMittal**, signed **long-term contracts** for the supply of oxygen, nitrogen and argon to ArcelorMittal's production sites in Benelux and France.
- In January, Air Liquide announced having recently commissioned **the largest hydrogen storage facility in the world**. This underground cavern is located in Beaumont, Texas, in the Gulf Coast region of the U.S. This unique hydrogen storage cavern complements Air Liquide's robust supply capabilities along the Gulf Coast, offering greater flexibility and reliable hydrogen supply solutions to customers via Air Liquide's extensive Gulf Coast Pipeline System. This facility is **1,500 meters deep** and nearly **70 meters in diameter** and is capable of holding enough hydrogen **to back up a large-scale steam methane reformer (SMR) unit for 30 days.**
- Air Liquide inaugurated on January 26 in France, in the frame of the **Connect** project, an operation center that is unique in the industrial gas sector. It enables the **remote management of production** for 22 of the Group's production units in France, optimizing their energy consumption and improving their reliability. With **"technological showcase"** certification from the Industry of the Future Alliance, Connect represents an investment of **20 million euros**. This project is based on the implementation of new digital technologies at French production sites and on the creation of new skills.
- In early April, Air Liquide and **Oman Oil Refineries and Petroleum Industries Company** (Orpic), Oman's national refining company, signed a **long-term agreement** for the supply of nitrogen to the Liwa Plastics Industries Complex (LPIC), a new plastics production complex including the country's first steam cracker Orpic is adding to its existing production facilities, in Sohar industrial port area in Oman. Investing around **20 million euros** to build a state-of-the-art nitrogen production unit with a total capacity of 500 tons of nitrogen per day, Air Liquide will strengthen its leadership position in a key industrial area to support the growth of its customer Orpic.

- In early September, Air Liquide announced the signature of a new long term agreement with Pemex Transformación Industrial, a subsidiary of Petróleos Mexicanos (**PEMEX**), the state-owned oil & gas company, to supply hydrogen to PEMEX's refinery located at Tula de Allende, in the state of Hidalgo in the central region of Mexico. Through a **50 million euros investment for the take over and optimization of PEMEX's existing hydrogen production unit**, this agreement will allow Air Liquide to supply 90,000 Nm^3 per hour of hydrogen to PEMEX and to strengthen its presence in central Mexico.

- In mid-October, Air Liquide entered into a new joint venture with **Sinopec** in Beijing, for **the takeover and optimization of three existing ASUs** (Air Separation Units) and the building of a **new nitrogen unit**, for a total investment of **40 million euros**. In the third quarter 2017, Air Liquide also **commissioned** a new state-of-the-art ASU for the supply of oxygen and nitrogen to Sinopec in South China.

- Air Liquide recently signed a **long-term contract** with Kumho Mitsui Chemical Inc (**KMCI**), a major chemical group in South Korea, according to which Air Liquide will increase its supply to this customer of both hydrogen and carbon monoxide at the Yeosu industrial complex. Air Liquide will invest around **100 million euros** to build a new state-of-the-art hydrogen production unit that will be integrated into its existing piping system in the industrial basin. The unit is **expected to start in 2020** and strengthens the Group's leadership position in a key industrial area of South Korea.

Industrial Merchant

- In June 2017, Air Liquide signed new **supply contracts** covering periods of **10 to 15 years** with **three major Chinese fiber optics manufacturers**. In the frame of these new contracts with Futong Group Communication Technology, Yangtze Optical Fibre, and Zhongtian Technology Fine Materials, Air Liquide will supply a total exceeding 6,000 Nm^3 per hour of hydrogen and 4,000 Nm^3 per hour of nitrogen via on-site generator solutions, together with bulk oxygen, helium, argon and carbon dioxide. Air Liquide will thus support the further development of China's fiber optics industry.

Electronics

- 2017 was a **record year** for the Electronics activity of Air Liquide in Asia: the Group announced the **signature** of **several new long-term contracts** with major electronics manufacturers in China, as well as Japan and Singapore. Air Liquide will invest more than **150 million euros** in the region to supply ultra-pure carrier gases to its customers' new fabs which manufacture integrated circuits, memory, imaging sensors and flat panel displays for customer electronics and mobile devices.

Engineering & Construction

- In May 2017, Air Liquide Engineering & Construction signed a **major contract amounting around 100 million euros** to design and build **three Air Separation Units** (ASU) for Yankuang Group, one of the largest energy and chemical companies in China. Each of the ASUs will have a production capacity of **3,200 tonnes per day of oxygen, plus nitrogen** for the production of methanol-based chemicals. All three ASUs **will start operation in the second half of 2019**.

DEVELOPMENTS IN HEALTHCARE

- In 2017, Air Liquide pursued its external growth strategy in Healthcare. The Group's subsidiary Seppic, designer and supplier of specialty ingredients for health and beauty, recently finalized the **acquisition** of the **Serdex** division of Bayer. This acquisition strengthens Seppic's footprint in **natural active ingredients for cosmetics**. The specialty active ingredients for cosmetics represent a global market over 900 million euros, of which natural active ingredients are a fast growing segment.

- The Group announced in January the acquisition of **Oxymaster**, a national **home healthcare sector player in Colombia**. Present in the Colombian market for almost 20 years, Oxymaster is specialized in **home treatment and support for patients suffering from respiratory conditions** (sleep apnea, Chronic Obstructive Pulmonary Disease, chronic respiratory failure). Oxymaster has more than 240 employees and serves over 21,000 patients. The company generated revenues of approximately **9 million euros in 2016**.

- Air Liquide strengthens its position in **home care for patients with diabetes** and participates in the **French artificial pancreas project**. By signing a partnership with CERITD, the French Center for Studies and Research for the Intensification of Diabetes Treatment, at the request of physicians, Air Liquide's nurses will be able to help provide even more personalized follow-up for patients with diabetes treated at home. In addition, Air Liquide has acquired an equity stake in the **French startup Diabeloop**, which is developing an **electronic artificial pancreas** composed of an insulin pump in the form of a patch and a glucose sensor both connected. The investment made by Air Liquide in Diabeloop confirms the **Group's commitment to digital technologies and healthcare**, in the aim of helping patients achieve a better quality of life and care.

- In early September, Air Liquide announced the deployment of "**Chronic Care Connect**™", a **remote monitoring** solution in order to support remotely patients with chronic conditions at home using digital. Depending on the medical monitoring protocol prescribed by the physician, patients use one or more connected systems (blood pressure monitor, scale, pulse oximetry, glucose meter or ventilator, for example). Thanks to this technology, patients are monitored remotely on a daily basis with **individualized support provided by Air Liquide nurses** via a certified nursing center. This solution helps to **improve their quality of life**. As for their physicians, they have access to an operational solution that allows for preventive management of patient condition evolution. By avoiding hospitalization, the Air Liquide **connected solution for the remote monitoring** of patients also meets the **challenges of healthcare costs control**.

- At the end of September, Air Liquide expanded its healthcare business in **Japan** with the **acquisition** of **Sogo Sangyo Kabushiki Kaisha** ("SSKK"), a major Japanese player with a strong presence in the home healthcare and medical gases markets especially in the Tokyo region. Present in the Japanese market for 60 years, **SSKK** is specialized in the medical gases field serving more than **2,000 hospitals and clinics** and home treatment for patients suffering from respiratory diseases. SSKK has more than **150 employees** and generated revenue of approximately **27 million euros** in 2016. This acquisition increases the number of **patients** served at home by Air Liquide in Japan to reach **20,000**.

PROJECTS IN INNOVATION AND TECHNOLOGY

- Air Liquide and 12 leading energy, transport and industry companies have launched in January, a global initiative, the "**Hydrogen Council**", to voice a united vision and ambition for hydrogen to foster the energy transition. In November 2017, at the COP23 in Bonn, the leaders of the Hydrogen Council (28 at the end of 2017) revealed the first ever globally quantified vision of the role of hydrogen. According to this study, developed with McKinsey's support, **hydrogen is not only a key pillar of energy transition**, but also has the potential to develop 2.5 trillion US dollars of business, creating more than 30 million jobs by 2050 and **contribute to roughly 20% of the CO_2 abatement required to limit global warming to two degrees Celsius.**

- In March, Air Liquide completed the construction of **two hydrogen charging stations in Japan**. The Fukuoka Miyata and Kobe Shichinomiya stations are respectively the 4th and 5th hydrogen charging stations for public use in Japan.

- On December 7, 2017, Air Liquide and Group ADP inaugurated, at the Paris-Orly Airport, the **first public hydrogen station installed in an airport zone in France**. Designed and installed by Air Liquide with the support of Fuel Cells and Hydrogen Joint Undertaking ("**FCH JU**"), it promotes the deployment of "**Hype**", the world's first hydrogen-powered taxi fleet. This collective project is opening up a new clean mobility option in the Greater Paris Area. To date, **more than 100 hydrogen charging stations have already been designed and installed by Air Liquide** worldwide.

BOND ISSUE

- In March, a transaction, issued under the Group's 12 billion euro Medium Term Note (EMTN) program, allowed the issuance of a **600 million euros** bond with a **10-year** maturity at a yield of **1.116%.** Proceeds from this bond allowed the Group to refinance its two bonds maturing in June and July 2017, and to continue funding sustainably its long-term growth while benefiting from very attractive market conditions.

PORTFOLIO MANAGEMENT

- At the end of July 2017, Air Liquide announced that it had **completed the sale of Air Liquide Welding**, its subsidiary specialized in the manufacture of welding and cutting technologies, to Lincoln Electric France SAS, subsidiary of Lincoln Electric Holdings, Inc. ("**Lincoln Electric**"). Lincoln Electric is the world leader in design, development and manufacture of arc welding products, robotic arc welding systems, plasma and oxy-fuel cutting equipment. Air Liquide focuses on its Gas & Services activities following the acquisition of Airgas, as well as the implementation of its company program NEOS for the 2016-2020 period.

- On October 10, Airgas completed **the sale of Airgas-Refrigerants, Inc**., its subsidiary specializing in the distribution, packaging and reclamation of refrigerant gases, to **Hudson Technologies, Inc**. Airgas-Refrigerants had **a trailing 12-months revenue of 142 million US dollar** through the end of June 2017. The sale of this subsidiary is reflective of Airgas' focus on its core business.

NEW VISUAL IDENTITY

- The acquisition of Airgas and the launch of the NEOS company program for the 2016-2020 period mark a new milestone in the history of Air Liquide. The Group is transforming and is changing its visual identity with a **new logo**, the fifth since the company was founded 115 years ago. This new visual identity introduced in January 2017, which embodies the transformation of Air Liquide, is that of a leading Group, expert and innovative, that is close to its stakeholders and open to the world.

2017 Income Statement

CURRENCY, ENERGY AND SIGNIFICANT SCOPE IMPACTS

Applied method

In addition to the comparison of published figures, financial information is given excluding currency, natural gas and electricity price fluctuation and significant scope impacts.

- Since industrial and medical gases are rarely exported, the impact of currency fluctuations on activity levels and results is limited to euro translation impacts with respect to the financial statements of subsidiaries located outside the euro zone. **The currency effect** is calculated based on the aggregates for the period converted at the exchange rate for the previous period.

- In addition, the Group passes on variations in the cost of energy (electricity and natural gas) to its customers via indexed invoicing integrated into their medium and long-term contracts. This indexing can lead to significant variations in sales (mainly in the Large Industries Business Line) from one period to another depending on fluctuations in prices on the energy market.

  An energy impact is calculated based on the sales of each of the main subsidiaries in Large Industries. Their consolidation allows the determination of the energy impact for the Group as a whole. The foreign exchange rate used is the average annual exchange rate for the year N-1.

  Thus, at the subsidiary level, the following formula provides the energy impact, calculated for natural gas and electricity respectively:

  Energy impact = Share of sales index to energy year (N-1) x (Average energy price over the year (N) - Average energy price over the year (N-1))

  This indexation effect of electricity and natural gas does not impact the operating income recurring.

- **The significant scope effect** corresponds to the impact on sales of all acquisitions or disposals of a significant size for the Group. These changes in scope of consolidation are determined:
  - for acquisitions during the period, by deducting from the aggregates for the period the contribution of the acquisition;
  - for acquisitions during the previous period, by deducting from the aggregates for the period the contribution of the acquisition between January 1 of the current period and the anniversary date of the acquisition;
  - for disposals during the period, by deducting from the aggregates for the previous period the contribution of the disposed entity as of the anniversary date of the disposal;
  - for disposals during the previous period, by deducting from the aggregates for the previous period the contribution of the disposed entity.

(in millions of euros)	Group	Gas & Services
FY 2017 Revenue	**20,349**	**19,642**
2017/2016 published change *(in %)*	+12.2%	+13.3%
Significant perimeter impact (Refrigerant divestiture)	(19)	(19)
Currency impact	(311)	(301)
Natural gas indexation impact	243	243
Electricity indexation impact	52	52
2017/2016 adjusted comparable growth *(in %)*	**+2.9%**	**+3.5%**
FY 2017 Operating income recurring	**3,364**	**3,587**
2017/2016 published change *(in %)*	+11.2%	+10.8%
Significant perimeter impact (Refrigerant divestiture)	(6)	(6)
Currency impact	(62)	(60)
Natural gas indexation impact	-	-
Electricity indexation impact	-	-
2017/2016 adjusted comparable growth *(in %)*	**+7.5%**	**+7.2%**

The sale of **Airgas refrigerants** in October 2017 generated a significant scope effect. The 2017 revenue of the activity is broken down per quarter below:

(in millions of euros)	Q1 2017	Q2 2017	Q3 2017	Q4 2017
Airgas refrigerants	35	36	26	1

Operating income recurring (OIR) and OIR Margin:

(in millions of euros and %)	FY 2016	FY 2016 Adjusted	FY 2017	FY 17/16	FY 17/16 Comparable
Revenue	18,135	19,812	20,349	+12.2%	+2.9%
Operating income recurring	3,024	3,189	3,364	+11.2%	+7.5%
OIR margin	16.7%	16.1%	16.5%		+40 bps
OIR margin excluding energy effect [a]			16.8%		+70 bps

(a) Operating income recurring on revenue excluding energy = 3,364 / (20,349-243-52).

RETURN ON CAPITAL EMPLOYED – ROCE

Applied method

Return on capital employed after tax is calculated based on the Group's consolidated financial statements, by applying the following ratio for the period in question:

For the numerator: net profit - net finance costs after taxes for the period in question.

For the denominator: the average of (total shareholders' equity + net indebtedness) at the end of the past three half-years.

ROCE FY 2017 *(in millions of euros)*		FY 2016 (a)	H1 2017 (b)	FY 2017 (c)	ROCE Calculation
	Profit for the period			2,291.6	2,291.6
	Net finance costs			(421.9)	(421.9)
	Group effective tax rate [a]			29.4%	29.4%
	Net financial costs after tax			(297.9)	(297.9)
	Profit for the period - Net financial costs after tax			**2,589.5**	**2,589.5**
Denominator ((a)+(b)+(c))/3	Total equity	17,125.0	16,049.0	16,718.4	16,630.8
	Net indebtedness	15,368.1	15,610.1	13,370.9	14,783.0
	Average of (total equity + net indebtedness)				**31,413.8**
ROCE					**8.2%**

ROCE FY 2016 *(in millions of euros)*		FY 2015 (a)	H1 2016 (b)	FY 2016 (c)	ROCE Calculation
	Profit for the period			1,926.7	1,926.7
	Net finance costs			(389.1)	(389.1)
	Group effective tax rate			28.2%	28.2%
	Net financial costs after tax			(279.2)	(279.2)
	Profit for the period - Net financial costs after tax			**2,205.9**	**2,205.9**
Denominator ((a)+(b)+(c))/3	Total equity	12,770.8	12,329.7	17,125.0	14,075.2
	Net indebtedness	7,238.7	19,859.8	15,368.1	14,155.5
	Average of (total equity + net indebtedness)				**28,230.7**
ROCE					**7.8%**

(a) Group effective tax rate excluding significant events.

Excluding the non-cash impacts of exceptional items and the US tax reform on 2017 net profit, the ROCE amounted to 7.7%, an improvement of +80 basis points compared to adjusted 2016 ROCE (6.9%) taking into account the acquisition of Airgas over the entire year.

REVENUE

Revenue *(in millions of euros)*	FY 2016	FY 2017	2017/2016 published change	2017/2016 comparable change
Gas & Services	17,331	19,642	+13.3%	+3.5%
Engineering & Construction	474	335	-29.3%	-28.1%
Global Markets & Technologies	330	372	+12.8%	+13.9%
TOTAL REVENUE	**18,135**	**20,349**	**+12.2%**	**+2.9%**

Group

Group revenue in 2017 totaled **20,349 million euros**, up +12.2% as published compared to 2016, following the consolidation of Airgas sales for twelve months. Comparable growth was **+2.9%** and benefited from a marked acceleration in sales growth for Gas & Services throughout the year and developments in Global Markets & Technologies partially offsetting a low level of activity in Engineering & Construction.

The currency impact turned sharply negative during the second half of the year, amounting to -1.6% for the full year due to the euro appreciating against the US dollar, the Japanese yen and the Chinese renminbi. The energy impact softened substantially between the first quarter (+2.7%) and the fourth quarter (+0.5%) to contribute +1.5% for the year.

Revenue by quarter *(in millions of euros)*	Q1 2017	Q2 2017	Q3 2017	Q4 2017
Gas & Services	5,046	4,932	4,787	4,877
Engineering & Construction	53	93	75	114
Global Markets & Technologies	77	92	82	121
TOTAL REVENUE	**5,176**	**5,117**	**4,944**	**5,112**
2017/2016 Group published change	**+38.5%**	**+19.5%**	**-0.3%**	**-0.8%**
2017/2016 Group comparable change	**+1.5%**	**+2.0%**	**+3.5%**	**+4.5%**
2017/2016 Gas & Services comparable change	**+2.8%**	**+2.7%**	**+4.0%**	**4.4%**

Gas & Services

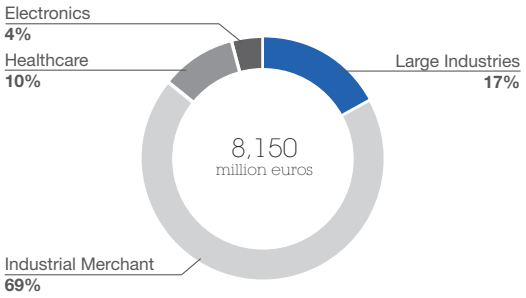
Gas & Services revenue totaled **19,642 million euros** in 2017. Published sales growth, at +13.3%, benefited from the consolidation effect of Airgas sales for twelve months. During the fourth quarter, the disposal of Airgas' refrigerants activity had an unfavorable scope impact on sales. The currency impact was negative for the year at -1.6%, but was almost entirely offset by a positive energy impact (+1.5%). Comparable growth came to **+3.5%** in 2017, with a faster pace during the second half (+4.2%) than during the first half (+2.8%). Sales increased overall in every business line, and particularly in Industrial Merchant, which experienced a sharp recovery in growth gradually throughout the year (first quarter +2.6%, second quarter +3.1%, third quarter +4.3%, fourth quarter +5.3%).

(in millions of euros)	FY 2016	FY 2017	2017/2016 published change	2017/2016 comparable change
Americas	6,230	8,150	+30.8%	+3.9%
Europe	6,593	6,776	+2.8%	+1.3%
Asia-Pacific	3,936	4,081	+3.7%	+5.3%
Middle East & Africa	572	635	+11.0%	+10.3%
GAS & SERVICES REVENUE	**17,331**	**19,642**	**+13.3%**	**+3.5%**
Large Industries	5,037	5,336	+5.9%	+1.7%
Industrial Merchant	7,565	9,261	+22.4%	+3.8%
Healthcare	3,111	3,401	+9.3%	+5.0%
Electronics	1,618	1,644	+1.6%	+3.8%

Americas

2017 revenue for Gas & Services in the Americas zone totaled **8,150 million euros,** up **+30.8%** as published following the consolidation of Airgas over the entire year and a very solid comparable growth at **+3.9%.** The fourth quarter reflects a high activity level in Large Industries and in Industrial Merchant, with sales catching-up slightly in particular after the hurricanes hit during the third quarter. In a more favorable economic environment, growth in Industrial Merchant sales improved gradually throughout the year. Healthcare continued to enjoy sustained growth in 2017, particularly in Canada and in South America.

AMERICAS GAS & SERVICES 2017 REVENUE

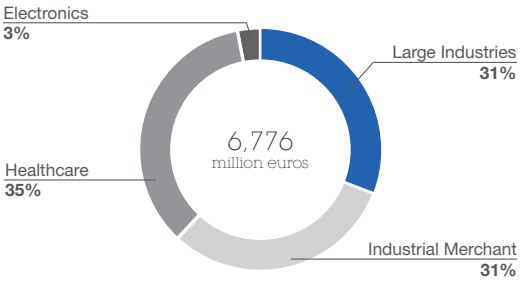


- **Large Industries** reported a **+2.8%** increase in sales in 2017. The strong growth during the fourth quarter (+4.7%) benefited in particular from a slight catch-up in sales after the hurricanes of the third quarter. In North America, oxygen volumes rose substantially over the year. In South America, demand for hydrogen contributed to the activity's development.
- In **Industrial Merchant,** 2017 was marked by a gradual and sustained pick-up in activity. Sales growth was **+4.1%** over the year and +6.1% during the fourth quarter. In North America, liquid gas and cylinder volumes as well as hardgoods sales posted a strong growth. In the United States, sales were up in almost all end-markets. In Canada, sales increased strongly in the Energy and Metal Fabrication sectors. Growth in South America remained dynamic and volumes continued to improve in Brazil. The price impact in the zone was **+1.7%.**
- **Healthcare** revenue rose **+6.6%** in 2017. Growth was solid in Canada, driven by bolt-on acquisitions in Home Healthcare. Business continued to develop in Latin America, where it benefited from a bolt-on acquisition in Colombia made at the beginning of the year.
- **Electronics** revenue posted a slight decline of **-1.0%** due to a weak level of Equipment & Installation sales.

Europe

Revenue in the Europe zone totaled **6,776 million euros**, up **+1.3%** over the year. In Large Industries, volumes were solid even though sales were down, particularly due to the stoppage of activity in Ukraine in the first quarter and a high comparison basis in the fourth quarter of 2016. Growth maintained momentum in Industrial Merchant, especially during the second half of the year, despite an unfavorable working day impact. Healthcare continued its steady development, while the contribution of bolt-on acquisitions to growth remained limited.

EUROPE GAS & SERVICES 2017 REVENUE

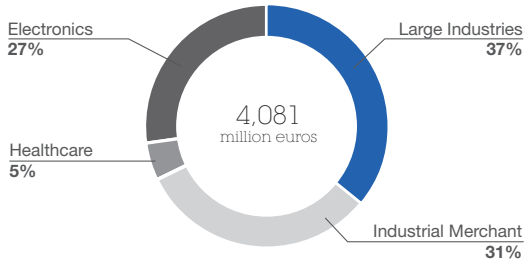


- Down **-3.4%** over the year, revenue for **Large Industries** was penalized by the stoppage of activity in Ukraine in the first quarter as well as by an exceptional indemnity related to a customer contract in the fourth quarter of 2016, creating an unfavorable comparison effect in 2017. Without these two impacts, revenue growth would be slightly positive. Hydrogen volumes grew substantially due to a good activity level in the refineries, especially in Benelux. Sales in Eastern Europe continued their development.
- Revenue for **Industrial Merchant** rose **+3.3%** in 2017. The increase in sales during the second half of the year (+3.8%) was higher than during the first half (+2.7%) despite an unfavorable working day impact, confirming a solid recovery after several years without growth. Activity improved in all countries, particularly in Southern Europe (Iberia, Italy), Benelux and Eastern Europe (Poland, Russia). Liquid gas as well as cylinder volumes grew. Recovery was noticeable in all end-markets, and especially in Materials & Energy and Automotive & Manufacturing. The price impact became positive during the second quarter and came to **+0.2%** in 2017.
- **Healthcare** continued its steady growth, with sales up **+3.8%** and a limited impact from bolt-on acquisitions. The number of patients continued to increase in Home Healthcare. Sales in Hygiene and Specialty Ingredients grew significantly, strengthened by a small acquisition.

Asia Pacific

Revenue in the Asia-Pacific zone for 2017 totaled **4,081 million euros,** up **+5.3%,** and was driven, in particular, by business momentum in China (> +10%). All business lines posted solid growth, stronger during the second half than the first. In Large Industries, the increase in revenue was driven by the start-up of new units and solid volumes. Industrial Merchant experienced a strong progression, in particular with very high growth in China since the second quarter. Electronics sales growth continued to accelerate throughout the year, reaching +12.2% during the fourth quarter.

ASIA PACIFIC GAS & SERVICES 2017 REVENUE



- **Large Industries** sales increased **+5.4%** in 2017, driven by the start-up of two Air Separation Units (ASU) in China during the third quarter, a takeover and the ramp-up of a unit in Australia. Customer demand was very robust, particularly in China, South Korea and Singapore.
- **Industrial Merchant** revenue rose **+3.3%** over the year, with +4.7% recorded during the second half of the year. Performance was contrasted by country. In China, growth was more than +15% for the last three quarters, driven by a price increase (argon, in particular) and a rise in liquid gas and cylinder volumes. Revenue in Japan declined this year, particularly due to lower equipment sales compared to 2016. Business in Australia fell slightly in a sluggish environment. The price impact strengthened to **+1.5%;** it was especially strong in China.
- **Electronics** revenue rose sharply **+5.8%** in 2017, with an acceleration of growth throughout the year, reaching +12.2% in the fourth quarter. After an unfavorable comparison impact in Equipment & Installation sales during the first half of the year, sales sharply increased during the second half. They benefited from good momentum in Advanced Materials, particularly in China, Taiwan and South Korea, start-ups in Carrier Gases, and strong Equipment & Installation sales during the fourth quarter of 2017.

Middle East and Africa

Revenue from the Middle East and Africa zone totaled **635 million euros,** up **+10.3%** in 2017. In Large Industries, sales benefited from the two large-scale hydrogen production units operating at full capacity in Yanbu, Saudi Arabia as well as the start-up at the end of the fourth quarter of the biggest Air Separation Unit (ASU) in the world in South Africa. In Egypt, production unit start-ups during the third quarter supported sales growth. Industrial Merchant improved in this zone during the fourth quarter. South Africa continued its sustained growth in Healthcare.

Engineering & Construction

Engineering & Construction revenue amounted to **335 million euros** in 2017, down **-28.1%** excluding the currency impact, due to the low level of order intake in 2016. However, sales gradually stabilized during the second half of the year and were up +3.0% during the fourth quarter.

Order intake reached **730 million euros** for the year, representing nearly twice the amount achieved in 2016. Around 70% of orders were for Air Separation Units (ASU). These mainly included Group projects and orders on behalf of third parties, in the Energy and Chemicals sectors in particular. The number of tenders continued to increase.

Global Markets & Technologies

Global Markets & Technologies revenue in 2017 was up **+13.9%** to **372 million euros.** This increase partially offset the decrease in Engineering & Construction revenue. Sales were particularly strong in the Maritime, Hydrogen Energy and Biogas sectors. They benefited from the contribution of an acquisition in Norway in Biogas and Liquefied Natural Gas sectors for industry and transportation.

Order intake amounted to **350 million euros** for the year.

OPERATING INCOME RECURRING

The **operating income recurring before depreciation and amortization** reached **5,142 million euros,** up **+11.5%** as published compared to 2016, and +13.4% excluding the currency impact. This increase reflected the consolidation of Airgas over all of 2017 as well as the improved performance over the year.

Purchases increased by +15.4%, at a higher rate than published sales growth of +12.2%: this difference was due to more trading activity at Airgas (hardgoods sales). Personnel costs also rose at a faster pace than sales (+13.1%), mainly due to the change in business mix. Indeed, Industrial Merchant, which now accounts for close to half of Group sales, requires more staff than other activities such as Large Industries. However, other expenses grew at a much slower pace (+6.7%), as Airgas' structure is lighter, for example without a Research & Development department.

Depreciation and amortization totaled **1,778 million euros,** up +12.0%. They went up slightly less rapidly than sales as the relative weight of Industrial Merchant, an activity that has a lower capital intensity than Large Industries, increased within the Group's business lines.

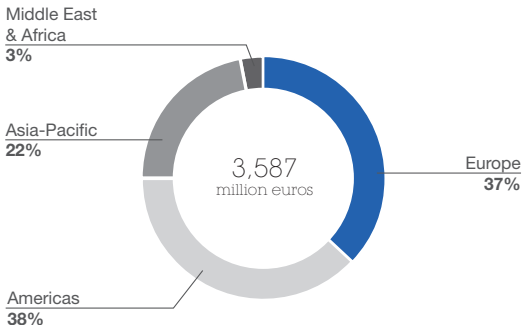
Over the year, **efficiencies** totaled **323 million euros** and were higher than the annual objective of 300 million euros of the NEOS program. They represent savings of 3.1% of the cost basis (excluding Airgas). More than 40% of these efficiencies came from industrial projects related in particular to reducing logistics costs, optimizing production unit operations and improving plant reliability by stepping up the integration of remote operations centers (Smart Innovative Operations, SIO). Savings on purchases accounted for more than one-third of the total efficiencies and were primarily related to the purchases of energy in Large Industries, molecules in Electronics and equipments in Home Healthcare in Europe. The balance of efficiencies mainly included administrative efficiencies and realignment plans in several countries and activities including Engineering & Construction.

Airgas synergies represent **215 million US dollars cumulatively** since the acquisition of Airgas in May 2016, and 170 million US dollars in 2017 alone – 40 million more than initial objectives. **Cost synergies** reached approximately 190 million US dollars cumulatively and materialized faster than anticipated. The savings made on Airgas purchases as well as on the Group's purchases thanks to the scale effect of the Airgas integration (for example, hardgoods purchases in Canada) exceeded expectations. Synergies from integrating cylinder operations, with site closures and restructuring plans, were achieved earlier than anticipated. **Growth synergies** totaled approximatively 25 million US dollars cumulatively and are in line with expectations. In total, cumulated synergies at the end of 2019 will be **higher than 300 million US dollars.,** cost synergies at the end of 2017 being higher than initial objectives, some synergies materializing faster than anticipated. Growth synergies are ramping-up.

The Group's **operating income recurring (OIR)** reached **3,364 million euros** in 2017, a published increase of +11.2%, or +7.5% on a comparable basis compared to the 2016 adjusted OIR. At **16.5%,** the operating margin (operating income recurring to revenue) was up +40 basis points compared to the 2016 adjusted operating margin. **Excluding the energy impact,** it stood at 16.8%, or an improvement of **+70 basis point** compared to the 2016 adjusted operating margin, in line with the Group's objective to improve profitability.

Gas & Services

GAS & SERVICES 2017 OPERATING INCOME RECURRING



Operating income recurring for Gas & Services amounted to **3,587 million euros,** an increase of +10.8% as published compared to 2016. The operating margin as published was **18.3%.** Excluding the energy impact, it stood at 18.5%, or a **+60 basis points** improvement compared to the 2016 adjusted operating margin.

In an environment where global inflation is limited, sales prices increased +0.6% for the year, thanks in particular to Industrial Merchant **(+1.3%).** Pressure on prices in Healthcare has continued, in particular in Europe.

Efficiencies totaled **297 million euros** in 2017 for Gas & Services.

Gas & Services Operating margin [a]	2016	2017
Americas	17.3%	16.8%
Europe	20.0%	19.3%
Asia-Pacific	18.5%	19.7%
Middle East & Africa	19.9%	17.2%
TOTAL	**18.7%**	**18.3%**

(a) Operating income recurring/revenue, as published figures.

Operating income recurring in the **Americas** zone reached **1,365 million euros,** an increase of **+26.8%.** Excluding the energy impact, the operating margin was 16.9%, down -40 basis points compared to the 2016 margin as published, but **up +120 basis points compared to the adjusted 2016 margin.** Indeed, the change in business mix following the consolidation of Airgas, with reinforcement of the relative weight of Industrial Merchant, affected the margin by -160 basis points. The gradual recovery in the business, especially in Industrial Merchant, the efficiencies and synergies generated, supported a +120 basis point improvement in margin. The momentum is positive, with the margin substantially increasing between the first and second half of the year.

Operating income recurring in the **Europe** zone was **1,309 million euros,** nearly stable compared to 2016. Excluding the energy impact, the operating margin came to 19.6%, down **-40 basis points** due to an exceptional indemnity related to a customer contract received at the end of 2016. Excluding this impact, the margin was up +10 basis points, with efficiencies offsetting an unfavorable business mix within the zone and continued pricing pressure in Healthcare in 2017.

In the **Asia Pacific** zone, operating income recurring amounted to **804 million euros,** an increase of **+10.2%.** Excluding the energy impact, the operating margin amounted to 19.9%, a sharp increase of **+140 basis points**. This performance was driven by fast-growing volumes in Large Industries and Industrial Merchant, by price increases in Industrial Merchant, by a favorable business mix in Electronics with strong developments in Advanced Materials and Carrier Gases, and by a significant contribution from efficiencies.

Operating income recurring in the **Middle East and Africa** zone was **109 million euros,** down **-4.5%** compared to 2016. Excluding the energy impact, the operating margin totaled 18.5%, a decrease of **-140 basis points.** The 2016 margin had benefited from an exceptional profit related to a customer indemnity received at the end of the year. In 2017, the dynamic business expansion in the zone and the high loading rate of the Yanbu production units in Saudi Arabia partially offset this impact.

Engineering & Construction

Operating income recurring for Engineering & Construction totaled **-23 million euros,** penalized by a low volume of activity in a difficult environment. The Group's mid-term target range for the margin remains between 5% and 10%.

Global Markets & Technologies

The operating income recurring of Global Markets & Technologies amounted to **42 million euros** and the operating margin to 11.3%, improving by +100 basis points compared to 2016. A portion of these activities is in start-up phase and the margin level, which depends on the nature of the projects carried out during the period, may vary rather significantly.

Research & Development and Corporate costs

Research & Development (R&D) and Corporate costs totaled **242 million euros,** down -4.6% compared to 2016.

NET PROFIT

Other operating income and expenses showed a **balance of -344 million euros.** They include -400 million euros in non-cash exceptional items following a strategic review of the asset portfolio as part of the NEOS program. After the review, it was decided to impair certain assets or to provision risks linked to the sustainability of some assets in various countries such as India, China or Fort McMurray in Canada. It also concerned some E&C assets as well as intangibles related to evolving technologies. Excluding these items, the contribution was a positive +56 million euros. It corresponds in particular to the balance of gains on several business disposals, including Airgas' refrigerants, integration costs of Airgas and costs related to realignment plans realized in different countries and businesses.

The **financial result of -489 million euros** was +21.4% higher as compared with 2016. Net finance costs in 2017 totaled -422 million euros and were up +8.4%, notably due to financing of the Airgas acquisition over 12 full months in 2017. Excluding currency, the increase was +8.2%. The **average cost of net debt** of **3.2%** rose slightly by +30 basis points compared to 2016 (2.9%). Indeed, in 2017, finance costs for the Airgas acquisition via long-term bonds were taken into account over 12 months. In addition, net financing of larger projects located in developing economies in local currency (particularly in China, Saudi Arabia and South Africa), where interest rates are higher, contributed to the increase in the average cost of net debt. The increase in "other financial income and expenses" (+54 million euros) largely related to fees from bank card payments following the consolidation of Airgas.

Taxes reached **207 million euros,** down -540 million euros. An exceptional non-cash gain of 586 million euros was recognized in 2017, mainly due to US tax reform (the US Tax Cuts and Jobs Act) signed into law on December 22, 2017. Lowering the US federal income tax rate from 35% to 21% generated a deferred tax saving whose positive impact was partially offset by the estimation of a provision related to the new onetime repatriation tax for reserves accumulated abroad by subsidiaries of US-based companies, the payment of which will be spread out over eight years. Due to these exceptional impacts, the effective tax rate came to 8.2%. Excluding these items, the tax charge would come out to **793 million euros. In 2018,** the US tax reform should reduce the Group's tax expenses by **50 to 70 million US dollars,** applied to **a recurring effective tax rate currently at 29.4%.**

The **share of profit of associates** amounted to **5 million euros,** compared to 7 million euros in 2016. **The share of minority interests** is up **+11.2%** and reached 92 million euros as the profit from subsidiaries with minority shareholders rose, particularly in Saudi Arabia.

Net profit from discontinued operations was **-37 million euros** and reflected the impact on the 2017 fiscal year of the disposal of Air Liquide Welding finalized in July.

Net profit (Group share) amounted to **2,200 million euros** in 2017, up **+19.3%**. Excluding the non-cash impacts of non-recurring items and the US tax reform, the net profit (Group share) totaled **2,029 million euros,** a **+10.0%** increase. This "recurring" net profit will be the reference used to evaluate the 2018 performance.

At **5.16 euros, net earnings per share as published** was up **+11.2%** compared to 2016. The growth of net earnings per share as published was less than the net profit (Group share) due to the October 2016 capital increase. Excluding the non-cash exceptional items mentioned above, net earnings per share amounted to **4.76 euros,** a growth of +2.6% after taking into account the capital increase. Please note that net earnings per share for previous fiscal years was restated for the free share attribution carried out in October 2017. The average number of outstanding shares used to calculate net earnings per share as of December 31, 2017 was **426,409,142.**

Change in the number of shares

	2016	2017
Average number of outstanding shares [(a)]	**397,747,479**	**426,409,142**
Number of shares as of December 31, 2016		388,875,761
Options exercised during the year, prior to the free share attribution		462,734
Cancellation of treasury shares		(1,100,000)
Free shares issued		39,814,353
Options exercised during the year, after the free share attribution		344,702
NUMBER OF SHARES AS OF DECEMBER 31, 2017		**428,397,550**

(a) Used to calculate net earnings per share and adjusted in 2016 for the free share attribution that took place on October 4, 2017.

DIVIDEND

At the Annual General Meeting on May 16, 2018, the payment of a dividend of **2.65 euros per share** will be proposed to shareholders for fiscal year 2017. This represents a **+12.4%** increase taking into account the free share attribution that took place on October 4, 2017.

The total estimated pay-out taking into account share buybacks and cancellations would amount to **1,162 million euros,** representing a **pay-out ratio of 53%** as published or 57% of "recurring" net profit. The ex-dividend date is scheduled for May 30, 2018 and the payment is scheduled for May 30, 2018.

2017 Cash Flow and Balance Sheet

(in millions of euros)	2016	2017
Cash flow from operating activities before change in working capital	**3,523**	**4,133**
Change in working capital requirement	331	188
Other items	(158)	(67)
Net cash flow from operating activities	**3,696**	**4,254**
Dividends	(1,019)	(1,099)
Purchases of property, plant and equipment and intangible assets, net of disposals [(a)]	(13,609)	(1,850)
Increase in share capital	3,361	70
Purchase of treasury shares	4	(158)
Impact of exchange rate changes and net indebtedness of newly consolidated companies & others	(563)	780
Change in net indebtedness	**(8,129)**	**1,997**
Net indebtedness as of December 31	(15,368)	(13,371)
Debt-to-equity ratio as of December 31	**90%**	**80%**

(a) Including transactions with minority shareholders.

NET CASH FLOW FROM OPERATING ACTIVITIES

Cash flow from operating activities before changes in working capital requirements totaled 4,133 million euros, up **+17.3%** as compared with 2016, and stood at **20.3% of Group sales.**

Net cash flow from operating activities after changes in working capital requirements amounted to **4,254 million euros,** up **+15.1%** as compared with 2016 and reached **20.9%** of sales. This improvement is the result of measures taken to reduce working capital requirements.

CHANGES IN WORKING CAPITAL

The working capital requirements (WCR) **decreased by -188 million euros** in 2017. This improvement primarily came from Gas & Services; it was mainly due to a reduction in trade receivables, through factoring measures and a decrease in payment delays of certain customers, which more than offset the increase in inventory. The decrease in WCR for Engineering & Construction, which was due to a decline in activity, was more than offset by the increase in WCR of Global Markets & Technologies, where sales benefitted from good momentum. The working capital requirements excluding tax came to **6.4% of sales**, down compared with the ratio of 7.2% of 2016 adjusted.

CAPITAL EXPENDITURE

In 2017, **gross capital expenditures** totaled **2,327 million euros,** including transactions with minority shareholders.

(in millions of euros)	Industrial investments	Financial investments [(a)]	Total capital expenditures [(a)]
2011	1,755	103	1,858
2012	2,008	890	2,898
2013	2,156	401	2,557
2014	1,902	273	2,175
2015	2,028	395	2,423
2016	2,259	12,180	14,439
2017	**2,183**	**144**	**2,327**

(a) Including transactions with minority shareholders.

Proceeds from the sale of fixed assets, for a total of **477 million euros,** mainly related to the disposals of Air Liquide Welding and Airgas's refrigerants business.

Net capital expenditure, including the buyout of minority interests, amounted to **1,850 million euros.**

Industrial investments

Gross industrial capital expenditures for the Group amounted to **2,183 million euros** in 2017, down -3.4% compared with 2016. They represented **10.7% of sales.** For Gas & Services, these expenditures totaled 1,931 million euros and their geographical split is described below.

	Gas & Services				
(in millions of euros)	Europe	Americas	Asia Pacific	Middle East and Africa	Total
2016	566	737	599	155	2,057
2017	**578**	**690**	**509**	**154**	**1,931**

Financial investments

Financial investments amounted to **144 million euros,** including minority interest transactions of 4 million euros.

NET INDEBTEDNESS

Net indebtedness as of December 31, 2017 reached **13,371 million euros,** a significant decline of -1,997 million euros compared to the end of 2016 due to a very high level of net cash flow generated by operating activities in 2017. Currency and to a lesser extent scope impacts were also favorable and contributed -780 million euros. The **debt-to-equity ratio** (gearing) stood at **80%** at the end of December 2017, a decline compared to 90% at the end of 2016.

ROCE

The return on capital employed (ROCE) after tax was **8.2%,** a +40 basis point improvement compared to 2016. Excluding the non-cash impacts of exceptional items and the US tax reform on 2017 net profit, the ROCE amounted to **7.7%,** an improvement of **+80 basis points compared to adjusted 2016 ROCE** (6.9%) taking into account the acquisition of Airgas over the entire year. The Group confirmed the NEOS objective of returning to a ROCE above 10% by 2021/2022.

INVESTMENT CYCLE AND FINANCING STRATEGY

The Group's steady long-term growth is largely due to its ability to invest in new projects each year. Investment projects in the industrial gas business are spread throughout the world, highly capital intensive and supported by long-term contracts, in particular for Large Industries. Air Liquide has thus tailored its financing strategy to the nature of its projects, based on the diversification of funding sources, the prudent management of the balance sheet and innovative financing methods. This financing strategy is fundamental for the Group's continued development.

Investments

OVERVIEW

The Group's investments reflect its growth strategy.

They can be classified into two categories:

- industrial investments, which bolster organic growth or guarantee the efficiency, maintenance or safety of installations;
- financial investments, which strengthen existing positions, or accelerate penetration into a new region or business segment through the bolt-on acquisition of companies or assets already in operation.

The nature of the industrial investment differs from one World Business Line to the next: from gas production units for Large Industries and Electronics, to filling centers, logistics equipment, storage facilities and management systems for Industrial Merchant, Electronics and Healthcare. Capital intensity varies greatly from one activity to another.

Capital intensity

Capital intensity is the ratio of capital required to generate one euro of supplementary revenue, when projects or activities reach maturity. This capital is either invested in industrial assets (production units, storage facilities, logistics equipment, etc.), or used as working capital to finance the development of the activities.

Capital intensity varies significantly from one business line to another:

- in Large Industries:
  - air gases production has a capital intensity of between 2 and 3. It varies with the trend in electricity prices,
  - hydrogen and cogeneration have a capital intensity of between 1 and 1.5, due to the high proportion of natural gas in the cost of sales. This capital intensity varies with the trend in natural gas prices;
- Industrial Merchant capital intensity to launch the activity in a new market is between 1.5 and 2;
- Electronics has an average capital intensity close to 1;
- Healthcare has a capital intensity, excluding acquisitions, of around 1 depending on the product mix.

The Group's capital intensity continues to vary depending on the activity mix, project type and prices of raw materials.

Whatever the capital intensity, any project must enable the Group to achieve its Return On Capital Employed (ROCE) objective over the long term. Therefore, for the same level of return on investment, the operating margin (OIR to revenue ratio) of a project will depend on the capital intensity of the activity in which the project is carried out.

The theoretical lifespan of gas production unit contracts

Long-term development is one of the key characteristics of the industrial gas business. It is particularly evident in the investment cycle, where there is approximately a five-year span between the study of a new construction project for a Large Industries customer and the first corresponding industrial gas sales. Investment cycles in other business lines are generally shorter. Monitoring the lifespan of these projects is essential to anticipating the Group's future growth. The chart below provides details of each stage of this process based on the example of a Large Industries contract.

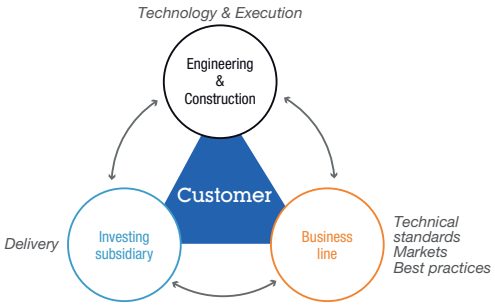
INVESTMENT CYCLE OF A LARGE INDUSTRIES CONTRACT

Applying a theoretical capital intensity of 2, an investment of 100 million euros in a new project should generate 50 million euros of sales per annum, fully ramped-up.

- **Identification and Negotiation phase:** the project is included in the portfolio of investment opportunities and enters into the development process. Projects exceeding 5 million euros of investment are monitored within the portfolio of potential opportunities and split between those for which a decision is expected within 12 months and and those for which the investment decision will take more than one year. Projects are then discussed and negotiated with the customer. Projects can be removed from the portfolio for several reasons:
  1. the contract is signed, it is removed from the portfolio and therefore becomes an investment decision;
  2. the project is abandoned by the customer;
  3. the customer decides against an over-the-fence gas supply, or the project is awarded to a competitor;
  4. the project is delayed beyond 12 months: it is removed from the 12-month portfolio but remains in the long-term portfolio.
- **Signature** phase: the two parties reach an agreement. The signing of a long-term contract represents an investment decision validated by the internal governance bodies. The project is removed from the portfolio of investment opportunities and is registered in current investments.
- **Construction** phase: the construction of the unit generally takes between 12 and 24 months and sometimes up to 36 months depending on the size of the project. This is the capital expenditure period. The project remains in current investments.
- **Revenue phase:**
  1. **commissioning:** this corresponds to the start-up of the unit. Sales reflect the needs of the customer with a guaranteed minimum volume at the **take-or-pay** level, guaranteeing minimum profitability from the beginning of the contract;
  2. **ramp-up:** this is the unit's ramp-up phase. Over the course of the contract term, volumes increase above the take-or-pay level to the nominal amount defined in the contract. Nominal capital intensity is achieved only at the end of this phase.

Governance of major growth projects

Three Air Liquide entities are at the heart of major growth projects, from development through to its execution.



The involved Business line ensures the global customer relationship, provides the required know-how and ensures the overall consistency of the project, in terms of both contract and technical standards. It is also responsible for good internal governance practices.

The local subsidiary proposes the development project and, once the contract has been signed, carries the investment on its balance sheet. It is then responsible for operations, customer relations and the project's financial profitability.

Engineering & Construction provides the technologies and guarantees that they are competitive, both overall and specifically for each project, thanks to a good industrial architecture solution. Engineering & Construction is responsible for the technical part of the execution of the project.

Potential projects are identified well in advance, based on good market knowledge and a strong local presence. The first stage includes selecting the opportunities in which the Group would like to invest both commercial and technical resources, in line with its global strategy. This selection process is followed by a series of validation stages.

During the development stage, the project is submitted for the approval of the geographic region on which it depends. At the Group level, two major bodies validate the relevance of the project: the RIC (Resources & Investment Committee – see below), and the ERC (Engineering Risk Committee) which is responsible for assessing technical and execution risk.

Once the project has been validated through the decision process, approved by Air Liquide and signed with the customer, it is executed by a team composed of representatives of the investing subsidiary and of Engineering & Construction, under the supervision of the geographic region.

The type, complexity, geography and size of investment opportunities have changed significantly during recent years. A dedicated CIG (Capital Implementation Group) made up of experts strengthens the team in charge of executing investments.

THE RESOURCES & INVESTMENT COMMITTEE (RIC)

The purpose of these Committees is to assess and approve requests for investments that have been submitted, as well as medium and long-term contractual commitments and Human Resource requirements that may arise therefrom.

They meet regularly (usually once or twice a month) for each hub (Houston, Frankfurt, Shanghai, and Dubai) and each World Business Unit (Healthcare, Engineering & Construction, "Innovation and Development Division" (IDD), Headquarters).

Each Committee meeting is chaired by a member of the Executive Committee and brings together business managers concerned by the investment, as well as representatives of the Group Finance Department.

The Committee's decisions are reviewed by Executive Management.

The decision is based on a rigorous assessment of individual projects as well as each project's expected profitability. The following criteria are systematically reviewed:

- the location of the project: the analysis will take into account whether the project is based in an industrial basin with high potential, whether it is connected to an existing pipeline network, or whether it is in an isolated location;
- the competitiveness of the customer's site: based on size, production process and particularly of their environmental footprint, cost of raw materials and access to markets;
- customer risk;
- contract clauses;
- end products and the stability of future demand for these products;
- quality of the technical solution;
- country risk: evaluated on a case-by-case basis and can lead to changes in the financing policy and supplementary insurance cover;
- Corporate Social Responsibility criteria, in particular relating to greenhouse gas emissions, water consumption, and relations with local communities.

Following approval by the RIC and signing with the customer, the project is transferred to the Current investment category.

INVESTMENT OPPORTUNITIES

The **12-month portfolio of opportunities** totaled **2.1 billion euros,** as of December 31, 2017, down -100 million euros compared to the end of 2016. It is stable since the end of June 2017, new projects entering the portfolio offsetting those signed by the Group, awarded to the competition or delayed.

Developing economies accounted for nearly 40% of 12-month portfolio, a decline compared to the breakdown as of June 30, 2017, due in particular to substantial activity in North America. The Americas remained the first geographic zone for investment opportunities, followed by Europe, then Asia. This breakdown of the portfolio of opportunities is close to the breakdown of Group sales.

Around half of the investment opportunities corresponded to projects with investments of less than 50 million euros, and only a few projects were greater than 100 million euros. The smallest size projects contribute to a better distribution of risk.

INVESTMENT DECISIONS AND INVESTMENT BACKLOG

(in billions of euros)	Industrial investment decisions	Financial investment decisions (acquisitions)	Total investment decisions
2012	2.0	0.9	2.9
2013	2.2	0.5	2.7
2014	1.9	0.2	2.1
2015	1.9	0.5	2.4
2016	2.0	12.2	14.2
2017	**2.4**	**0.2**	**2.6**

In 2017**, industrial and financial investment decisions** reached **2.6 billion euros** compared to 2.2 billion euros in 2016 excluding the Airgas acquisition.

Industrial decisions represented **more than 90%** of this amount and were greater than in 2016 excluding the acquisition of Airgas. Industrial Merchant represented a third of investment decisions, Large Industries nearly 30%, Healthcare and Electronics close to 15%, with the remainder in Global Markets & Technologies. These decisions concerned projects located for almost 40% in the Americas, a third in Europe, nearly a quarter in Asia and the remainder in Middle East and Africa.

Financial investment decisions reached approximately **180 million euros** in 2017 and were almost stable compared to 2016. They mainly involved bolt-on acquisitions in Healthcare, in Industrial Merchant and in Global Markets & Technologies.

The **investment backlog** amounted to **2.1 billion euros,** stable compared with the end of 2016. The investment backlog should lead to a future contribution to annual revenue of approximately 0.8 billion euros per year after the plants are fully ramped up.

START-UPS

In 2017, **19 new production units** started up, including a major Air Separation Unit in South Africa for the customer Sasol at the end of December. Start-ups are broken down between ten units in Asia, including eight in China, three units in Middle East and Africa, three units in the Americas and three units in Europe.

As a result, for 2017, the **contribution of unit ramp-ups and start-ups to sales** reached **190 million euros,** slightly higher than the latest forecasts. This contribution should be **significantly higher in 2018, greater than 370 million euros,** benefiting from numerous large unit start-ups at the end of the year in 2017 and during the first half of 2018.

INVESTMENT CYCLE DEFINITIONS

Investment opportunities at the end of the period
Cumulative value of investment opportunities taken into account by the Group for a decision within the next 12 months. Industrial projects generating revenue of >5 million euros for Large Industries and >3 million euros for other business lines. Includes replacement assets and efficiency projects. Excludes maintenance and security-related investments.

Decisions during the period
Cumulative value of industrial and financial investment decisions. Growth and non-growth industrial projects, including replacement, efficiency, maintenance and security assets. Financial decisions (acquisitions).

Investments backlog at the end of the period [(a)]
Cumulative value of investments for projects that have been decided but not yet started up. Industrial projects of >10 million euros, including replacement assets and efficiency projects, excluding maintenance and security, alone.

Sales backlog
Cumulative value of forecast annual revenue, generated by current investments at the end of the period, fully ramped-up.

(a) Different from construction in progress (see note 14.1 to the consolidated financial statements on page 254) without threshold or activity criteria.

Financing Strategy

The financing strategy is regularly reviewed to provide support to the Group's development and take into account changes in financial market conditions, while respecting a credit profile in line with Standard & Poor's and Moody's long term-minimum "A" rating. This credit profile depends on key ratios such as net debt to equity and cash flow from operating activities before change in working capital requirements to net debt.

Following the acquisition of Airgas in 2016, Air Liquide's long-term credit rating was downgraded two notches, from "A+" to "A-", by Standard & Poor's on May 24, 2016. At the time of this acquisition and the preparation of its funding, the decision was taken to add the long-term rating of a second rating agency. Long-term rating from Moody's for Air Liquide is "A3", the equivalent of Standard & Poor's "A-". Moreover, the short-term ratings attributed to Air Liquide are "A2" for Standard & Poor's and "P2" for Moody's. Standard & Poor's, on July 7, 2017, and Moody's, on May 19, 2017, confirmed their ratings and have maintained their stable outlook.

In 2017, the existing principles of prudence were maintained:

- pursuing the diversification of financing sources and spreading of debt maturities in order to minimize refinancing risk;
- backing commercial paper issues with confirmed credit facilities;
- hedging interest rate risk to ensure visibility of financing costs, in line with long-term investment decisions;
- funding investments in the currency of the operating cash flows, to ensure a natural currency hedging;
- a permanent centralization of funding and excess cash through Air Liquide Finance, a wholly-owned entity of L'Air Liquide S.A.

DIVERSIFYING FINANCING SOURCES

Air Liquide diversifies its financing sources by accessing various debt markets: commercial paper, bonds and banks.

Air Liquide uses the short-term commercial paper market, in France, through two French Commercial Paper programs of up to an outstanding maximum of 3 billion euros each, and in the United States through a US Commercial Paper program (USCP) of up to an outstanding maximum of 2 billion US dollars.

Air Liquide also has a Euro Medium Term Note (EMTN) program to issue long-term bonds of up to an outstanding maximum amount of 12 billion euros. As of the end of 2017, outstanding bonds issued under this program amounted to 7.9 billion euros (nominal amount). The Group's EMTN program allows, in particular, for bonds to be issued in the principal currencies (euro, US dollar, Japanese yen) as well as in other currencies (Chinese renminbi, Swiss franc, pound sterling and ruble).

Thus, in March 2017, under its EMTN program, the Group conducted a public bond issue for an amount of 600 million euros. This issue enabled the Group to meet its financing needs.

As of December 31, 2017, funding through capital markets accounted for 90% of the Group's total gross debt, for an amount of bonds outstanding of 13.3 billion euros, across all programs, and 0.2 billion euros of commercial paper. The total amount of bonds outstanding includes the Airgas issues for a total of 1.15 billion US dollars (equivalent to 1.0 billion euros), following the early redemption, on December 21, 2017, of the 400 million US dollars bond issue, issued on August 11, 2015.

The Group also raises funds through bank debt (loans and credit facilities).

To avoid liquidity risk relating to the renewal of funding at maturity, and in accordance with the Group's internal policy, the Group aims to limit its short-term debt maturities to an amount which is covered by committed credit facilities. As of December 31, 2017, the amount of bilateral credit facilities totaled 1.8 billion euros, the same amount as of December 31, 2016. In addition, the Group has a 1.3 billion euros syndicated credit facility reaching maturity in November 2020.

As of December 31, 2017, the amount of debt maturing in 2018 was 2.5 billion euros, compared to 2.0 billion euros to December 31, 2016. This evolution is related to the increase of the annual maturities after the Airgas acquisition, regarding several bonds, mainly in euros and in US dollar, maturing in 2018. These bonds will be partly renewed, in particular on the European capital market.

NET INDEBTEDNESS BY CURRENCY AS OF DECEMBER 31

	12/31/2016	12/31/2017
Euro	25%	31%
US dollar	59%	52%
Japanese Yen	4%	3%
Chinese renminbi	5%	5%
Other	7%	9%
TOTAL	**100%**	**100%**

Investments are generally funded in the currency in which the cash flows are generated, creating a natural currency hedge. In 2017, US dollar debt decreased because of sales of non-strategic assets, along with a very high level of net cash flows. It also benefited from a favorable currency impact. The weighting between the euro and the US dollar has thus shifted slightly, in favor of the euro. Despite a higher average debt, the share of the debt denominated in Chinese renminbi remains stable at December 31, 2017. Debt denominated in Japanese yen has decreased due to lower funding requirements.

CENTRALIZATION OF FUNDING AND EXCESS CASH

To benefit from economies of scale and facilitate capital markets financing (bonds and commercial paper), the Group uses a dedicated subsidiary, Air Liquide Finance. As of December 31, 2017, this subsidiary centralized the vast majority of the Group's financing transactions. It also hedges currency, interest rate and energy risk for the Group's subsidiaries in those countries where it is permitted by law.

In the countries where local regulations permit, Air Liquide Finance also centralizes cash flow balances through direct or indirect daily cashpooling of these outstanding balances or through term loans. When this method is not possible, there exist, nonetheless, local cashpoolings which allow periodic intercompany loans to Air Liquide Finance. In 2017, Air Liquide Finance included the Japanese yen and the Hong Kong dollar in its daily cashpooling.

As of December 31, 2017, Air Liquide Finance had granted, directly or indirectly, the equivalent of 15.6 billion euros in loans and received 4.9 billion euros in excess cash as deposits. These transactions were denominated in 25 currencies (primarily the euro, US dollar, Japanese yen and Chinese renminbi) and extended to approximately 220 subsidiaries.

Due to the currency matching within Air Liquide Finance, resulting from the currency hedging of intra-group loans and borrowings, these internal financing transactions do not generate a foreign exchange risk for the Group.

Furthermore, the purpose of the European Market Infrastructure Regulation (EMIR) covering OTC ("Over the Counter") derivatives is to improve the transparency of OTC markets and reduce the systemic risk of financial markets. It applies to all derivative transactions carried out by entities within the European Union.

Pursuant to this regulation which came into force in August 2012, Air Liquide Finance, the Group's centralizing entity for financial transactions, continues to be classified as a non-financial counterparty (NFC-), since the transactions were still below the clearing thresholds at the end of 2017. It is thus required to apply risk mitigation measures and report all its derivative transactions to the chosen trade repository, "DTCC", in accordance with the technical standards published by ESMA. The mandatory reporting arising from the 2010 Dodd-Frank Act of the United States is also centralized via the "DTCC".

Furthermore, in certain specific cases (e.g. regulatory constraints, high country risk, joint ventures, etc.), the Group limits its risk by setting up specific financing in the local banking market, and by using credit risk insurance.

DEBT MATURITY AND SCHEDULE

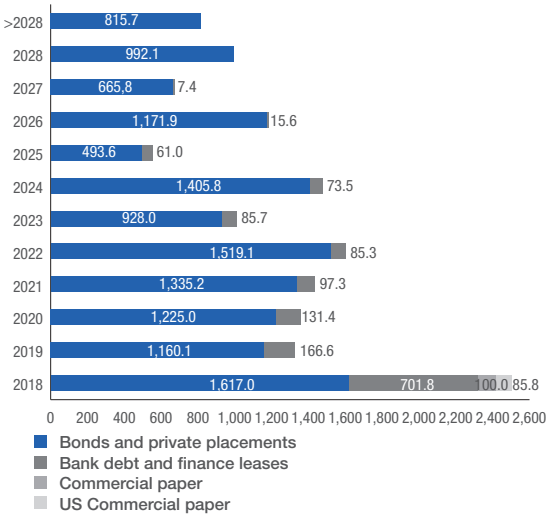
To minimize the refinancing risk related to debt maturity schedules, the Group diversifies financing sources and spreads maturities over several years. This refinancing risk is also reduced by the regularity of the cash flow generated from Group activities.

The average of the Group's debt maturity is 6.2 years at December 31, 2017, stable compared to December 31, 2016.

The following chart represents the Group's debt maturity schedule. The single largest annual maturity represents approximately 17% of gross debt.

DEBT MATURITY SCHEDULE

(in millions of euros)



BANK GUARANTEES

The Group's subsidiaries grant bank guarantees essentially in favor of Engineering & Construction and Healthcare customers either during the tender period (bid bond), or after contract award, during contract execution until the end of the warranty period (advance payment bond, retention bond, performance bond, and warranty bond).

The most common bank guarantees extended to customers to secure the contractual performance are advance payment bonds and performance bonds.

In the Group's ordinary course of business, certain subsidiaries are required to provide financial payment guarantees to secure rental or insurance obligations.

The projects, for which these guarantees are granted, are regularly reviewed by management and when guarantee payment calls become probable, the necessary provisions are recorded in the consolidated financial statements.

INNOVATION

Innovation is one of the pillars of the Group's strategy. As part of its customer-centric transformation strategy in the NEOS company program, open innovation, through external partnerships, represents the predominant path to growth.

Innovating and transforming the Group

The **Group's innovation expenses** amounted to **292 million euros** in 2017. This amount is higher than that of the past five years. Innovation expenses correspond to the OECD definition, namely research and development, market launch and marketing expenses for new offers and products. Likewise, applying the OECD definition, **3,800 employees** work in entities dedicated to innovation or contribute to innovation through the development and the market launch of new offers and products.

Air Liquide Group's **Innovation and Development Division (IDD)** brings together:

- **R&D,** with a focus on science and the knowledge of Essential Small Molecules (oxygen, hydrogen, nitrogen, CO_2, etc.) which embed the Group's scientific territory;
- The drive and financing of **Engineering & Construction's Innovation initiatives;**
- **The Digital Transformation teams** (including i-Lab, La Factory and ALIZENT) working with the Information Systems, Digital Security and World Business Lines teams, with the aim of providing digital solutions to become the leader in customer experience;
- **The Global Markets & Technologies WBU,** which was strengthened in 2017 to support the new markets of energy transition, maritime logistics and scientific exploration;
- **The Hydrogen Energy WBU,** created in 2017, to develop markets opened by the use of hydrogen in energy transition;
- **ALIAD,** Air Liquide's capital venture arm, whose role it is to invest in **minority stakes in technology start-ups,** by encouraging the implementation of **technological and/or business agreements** between the start-ups and the Group's entities, in three sectors: energy transition, healthcare and digital;
- The **Intellectual Property** Department.

The Group's network organization has improved **collaborative work between the Hubs and clusters and the Innovation and Development teams.** Both, the implementation of R&D projects in the clusters to support operations and customers, and the Digital Fabs, project teams dedicated to a digital transformation subject, with diverse expertise including an operating entity, allow the Group to **innovate close to customer usages.** The Innovation and Development teams also work in close partnership with the World Business Lines.

The operational teams in the 80 countries where the Group operates are responsible for rolling out innovations on a local basis as soon as they come on to the market. They also contribute to incremental innovation on the ground and act as pilot in the definition and development of new solutions.

In 2017, Air Liquide continued to **invest in new innovation centers.** The Group is building its new Paris-Saclay Research Center, which will replace the existing center. It will be home to 350 researchers and experts in the area of environment, healthcare and digital, at the heart of the Paris-Saclay science and technology ecosystem. This new building will provide the opportunity to implement innovations emerging from R&D projects. More than 50% will involve renewable energy sources like solar power and biogas, with a focus on the use of a fuel cell to meet the heating, cooling and electricity needs of the center. Moreover, in September 2017, Air Liquide laid the foundations of its **innovation center in Japan,** which will house, in particular, as of 2019, the R&D, Innovation and Development teams, in the city of Yokosuka near Tokyo.

The number of **patented new inventions** reflects, in particular, the Group's innovation capacity. **More than 300 new inventions** were protected in 2017. These are complemented by **third-party intellectual property rights,** obtained by partnerships, which contribute to exploring new growth opportunities or testing new technologies and digital solutions. Air Liquide has a portfolio of **3,335 inventions,** which are protected by at least one patent. Air Liquide's portfolio contains **over 11,000 patents,** and the Group applies for the registration of around 1,000 new patents every year.

In 2017, **Air Liquide continued to strengthen its open innovation strategy:**

- by **relying on the Group's teams contributing to innovation,** placing an emphasis on collective intelligence;
- by **leveraging external ecosystems** to identify relevant technologies and reduce development times;
- by **focusing on major trends** which represent growth opportunities, while responding to the challenges of the Group's customers and patients: energy transition, healthcare and digital transformation.

Relying on the Group's teams contributing to innovation

The inventiveness of the teams that interact with customers and patients on a day-to-day basis enables Air Liquide to reinvent its business, anticipate the challenges of its markets and take into account new customer usages. The Group has not only implemented **internal programs to encourage and recognize the talent** and expertise of its **technical experts** who contribute to innovation, but also, since 2014, the talent of its internal entrepreneurs.

The **recognition of technical expertise** is a key factor for innovation. In 2003, Air Liquide launched **Technical Community Leaders (TCL),** a promotion and recognition program for the technical field and for the expertise of Group employees. Since TCL was created, **more than 3,000 experts** have been recognized, thus, playing a key role in sharing expertise, knowledge and technical excellence. In 2017, three International Fellows, 24 International Senior Experts and 52 International Experts from different regions of the world (Europe, Asia Pacific, North and South America) received this recognition.

This community of the Group's technology experts contributes to the transfer of technical know-how, to the sharing of best practices, and to the long-term development of the skills that Air Liquide will need in the future. This is carried out in close collaboration with the World Business Lines and with R&D which houses the communities of experts.

The Group's Inventors Recognition Program, #iNVENT, rewards the inventors of patented inventions that are successfully marketed, or that give Air Liquide a competitive advantage. Moreover, a trophy is awarded for the best invention of the year, selected among the patent applications filed within each World Business Line in the past two years, and a bonus to inventors when a patent is delivered. This program ensures greater responsiveness for rewarding inventors, and better monitoring of inventions. Air Liquide celebrated 20 years of the #iNVENT program in 2017, the oldest employee recognition program of the Group. More than 2,500 rewards have been awarded to inventors employed by Air Liquide since 1997.

These patented inventions mainly come from the employees in the Group's R&D, Engineering & Construction and Global Markets & Technologies teams, but also from certain operating entities. The geographic spread of new patent applications filed in 2017 was as follows: 34% in Europe, 25% in Americas, 30% in Asia Pacific and 11% in Middle East & Africa.

Air Liquide also recognizes its **employee entrepreneurs** who contribute to innovation by imagining new ways of developing the Group's business or by adapting Group offerings to make them more customer-centric. In 2017, Air Liquide honored **99 internal entrepreneurs, in Paris and in all its Hubs.**

This **collective intelligence approach,** which involves the creation of transversal teams, with a strong diversity of profiles, contributes to the efficiency of innovation.

Leveraging external ecosystems

The dynamic management of interactions between internal communities and external innovation ecosystems, known as **"open innovation",** is a key innovation factor for the Group. Thanks to the development of collaborations between, on one hand, its operating and Innovation entities, and, on the other hand, its customers, scientific partners and technology institutes, SMEs, suppliers and start-ups, this "open innovation" has enabled Air Liquide to accelerate the pace of its innovation.

R&D PARTNERSHIPS

More than 60% of Research and Development projects were conducted in the frame of partnerships with laboratories, start-ups, industrial players and customers in 2017. Air Liquide steers **85 industrial partnerships and 101 scientific partnerships,** and supports **three research chairs** in France with the École Centrale Paris, the Mines ParisTech school and the Paris Sud University. The diversity of these partnerships is part of the R&D strategic roadmap.

In 2017, **three new partnerships, established with the winners of the 2016 Air Liquide Essential Molecules Challenge, were implemented:** the École Polytechnique Fédérale de Lausanne in Switzerland, the Kyoto University and the Nagoya University in Japan, as well as the Paris-Diderot University and the Centre National de la Recherche Scientifique (CNRS) in France. These partnerships aim to transform the scientific proposals into innovative, market-adapted technologies.

In Europe, Air Liquide continued its partnerships with **the CEA and the CNRS** as part of long-term strategic agreements and projects with its partners in Germany: the **Freiberg University of Technology and the Erlangen-Nuremberg University.** In Healthcare, the Group has continued its partnerships with the **Institut Pasteur** on new therapeutic applications of medical gases and with the **Institut du Cerveau et de la Moelle épinière sur les Maladies neurodégénératives** (Brain and Spine Institute – Neuronal Degeneration).

In the United States, Air Liquide works in partnership with several **DoE** (Department of Energy) laboratories and participates in six multi-partner consortia, in particular the CELDI, led by the **Carnegie Mellon University** working on decision-making tools for the optimized management of production units. In 2017, teams at the Delaware Research & Technology Center entered a partnership with the **University of Princeton,** New Jersey, in data and applied mathematics to develop expertise in the use of mathematical models as decision-making tools. In Canada, Air Liquide is working with the University of Montreal on the treatment and monitoring of patients suffering from Chronic Obstructive Pulmonary Disease (COPD).

In Asia, the **Shanghai Research and Technology Center (SRTC),** which was opened in 2016, and which houses almost 250 employees including researchers, experts in customer applications and business development teams, has become a major center of innovation for the Group in the Asia Pacific region. The center focuses on energy transition, reduction of CO_2 emissions, wastewater treatment, air quality, food safety and healthcare. Covering 12,000 m^2, the center houses laboratories, offices, a showroom and pilot demonstration platforms and welcomes on average **500 visitors per month,** of which half are external to the Group, who collaborate with the Air Liquide teams to develop new innovative solutions. Moreover, in Japan, the partnership with **Kyoto University and Nagoya University** on organic metals has led to encouraging results in gas separation and storage.

COLLABORATIONS WITH START-UPS

As part of its open innovation strategy, Air Liquide works with **more than 100 start-ups worldwide,** within supply, distribution and co-development agreements.

ALIAD, Air Liquide's capital venture arm, is fully integrated into this strategy. ALIAD has completed **more than 30 investments in technology start-ups** since its creation in 2013 with a total commitment of **around 80 million euros** in three sectors: energy transition, healthcare and digital. Air Liquide makes minority investments in these start-ups, with a specificity which provides a strong business foothold: each equity investment is accompanied by a business partnership or technological agreement with the start-up.

In 2017, ALIAD invested in **Ubleam,** a start-up based in Toulouse that specializes in the Internet of Things, which is developing a tag technology to enhance the information delivered to the customer; in **Dietsensor,** a French company in the health-nutrition sector, which has developed an application for diabetic patients that helps them track the carbohydrate levels of their meals; in the private equity firm **Investisseurs & Partenaires,** which offers financial support to the development of microfinance institutions and small to mid-size businesses located across 15 African countries; in **Libhéros,** which has developed an online platform as well as a mobile application which simplifies the booking of appointments for at-home treatments; in **CombaGroup,** a Swiss start-up which is developing an environmentally-friendly solution based on aeroponics technology for growing lettuce with a longer shelf-life; in **Diabeloop**, which is developing an artificial pancreas to improve the treatment of diabetes patients; and in ENS Urban, a Dutch start-up which has developed a solution to capture particulate matter to improve air quality. ALIAD has also increased its financial commitment in six companies in its portfolio, underlining its long-term strategy to provide ongoing support for start-ups.

In terms of **co-development,** the Group's innovation entities (R&D, i-Lab, Digital Transformation teams...) and Operations work in partnership with start-ups to develop offerings and digital solutions in agile mode by rapidly accessing complementary technologies. For example, a chat bot which provides the Group's industrial operators with better spare parts management for maintenance operations was developed as a Proof of Concept with the start-up **Zelros** in France; **ALIZENT,** Air Liquide's entity dedicated to the industrial Internet of Things, signed a partnership agreement with **Sigfox** to market a joint offering.

Air Liquide relies on **incubators and accelerators** to source start-ups and support their growth. In 2017, Air Liquide became a **founding-member of Techstars,** a US start-up accelerator, when it launched its new Paris-based program. The Group was again the partner of **Hello Tomorrow and its Challenge** - an international competition for technology start-ups open to young researchers and entrepreneurs throughout the world, and took part in major events, accompanying start-ups to **CES in Las Vegas,** in the United States, and to **Viva Technology** in Paris.

Air Liquide was recognized in November 2017 as one of the three most advanced major groups in the **"Co-development" category of The French Tech Barometer of Start-up Corporate Collaborations,** among 40 major companies. This barometer, which measures the economic success of these collaborations and identifies best practices to improve the ecosystem, rewards the companies which are the most committed and perform the best with start-ups.

Innovation preventing the global warming, improving healthcare and supporting digital transformation

The allocation of the Group's innovation spending focuses on subjects which correspond to the three major trends which are shaping the Group's markets.

Almost 60% of innovation expenses in 2017 were related to projects that contribute to improve the environmental footprint, air quality and healthcare. Innovation expenses correspond to the OECD definition, namely research and development, market launch and marketing expenses for new offers and products.

Projects related to reducing the environmental impact mainly included:

- research and development programs for new technologies that improve the **energy efficiency** of the Group's production units and thus, reduce the environmental impact, in particular CO_2, of the Group's activities and help to improve that of its customers and partners;
- all the **hydrogen production and distribution** processes, and the development of new technologies to support the roll-out of hydrogen energy;
- **biogas** purification and valorization to market it in the form of Natural Biogas and as Bio-NGV fuel to inject back into the energy grid.

Close to 30% of the Group's innovation expenses in 2017 is devoted to **reducing CO_2 emissions,** by reducing the carbon content of its products or those of its customers.

BLUE HYDROGEN®

Blue Hydrogen® is an Air Liquide initiative that aims to gradually lower the carbon content of its hydrogen production dedicated to energy applications. Concretely, Air Liquide is committed to achieving at least 50% of low carbon hydrogen necessary for these applications by 2020, by combining:

- the use of low carbon energies, water electrolysis and reforming of biogas;
- carbon capture and valorization technologies for the CO_2 emitted during the production of hydrogen from natural gas.

Even when produced using natural gas, hydrogen is a virtuous energy: over an equal distance traveled, the use of hydrogen fuel cell electric vehicles decreases greenhouse gas emissions by 20% compared with combustion vehicles and does not emit any particulate matter.

Healthcare-related innovations include:

- research and development on **medical gases,** in particular for analgesia and in respiratory diseases;
- support for patients through **connected monitoring solutions;**
- development of **specialty and active ingredients** for cosmetics;
- work on **hygiene** and disinfection products to fight against nosocomial infections.

Finally, to support the **digital transformation,** Air Liquide created a **Data & Decisions Lab** in 2017, the aim of which is to ensure the Group's scientific excellence in areas of data science including data analysis, machine learning and artificial intelligence, and in areas of decision sciences such as financial mathematics and game theory. This initiative will help identify new scientific opportunities, support the adoption of data science within the Group and broaden the Group's range of digital services for its customers.

Some initiatives carried out in 2017

INNOVATING FOR PATIENTS AND HEALTHCARE PROFESSIONALS

In Healthcare, Air Liquide has rolled out its first e-health solution, **"Chronic Care Connect™"**, a medical telemonitoring solution to provide remote support to patients suffering from chronic diseases in their homes thanks to digital advances which make the daily monitoring and personalized support of patients possible. According to the medical care protocol defined by the doctor, the patient uses one or more connected measuring devices (e.g., blood pressure monitor, scale, pulse oximeter, blood glucose monitor), which are linked to a digital tablet and provide the patient with access to his or her monitoring. The patient's medical data is transferred and remotely analyzed by nurses at Air Liquide's monitoring center, who have regular discussions with the patient and his or her doctor. This connected monitoring solution helps patients improve their quality of life by staying at home, and helps doctors manage in a preventive fashion any changes in the health of their patients. It also helps manage the health system's expenses, by avoiding hospitalization. In 2017, this solution was rolled out in France and Spain, for patients suffering from heart failure and diabetes.

By signing a partnership with **CERITD, the French Center for Studies and Research for the Intensification of Diabetes Treatment,** Air Liquide is strengthening its position in home healthcare for patients with diabetes. With this new collaboration, Air Liquide continues the approach based on cooperation between hospital teams and homecare nurses. Moreover, Air Liquide has acquired an equity stake in the French start-up **"Diabeloop",** which is designing an **electronic artificial pancreas** composed of a connected insulin pump in the form of a patch and a glucose sensor. Driven by an algorithm, which determines the correct insulin dose, this system will allow the automated delivery of insulin in real time and thus, reproduce the functions of the defective pancreas and improve the patient's glucose regulation.

Air Liquide also inaugurated in Thiès, Senegal the **first Oxygen House,** a central location for the Access Oxygen offering. This offering aims to make medical oxygen accessible to small health posts and health centers which care for patients living in suburban and rural areas in emerging countries. Medical oxygen is essential for the treatment of respiratory and cardiac diseases and in the fight against infant and maternal mortality. After Thiès, a region that has more than 140 small health structures without access to medical oxygen, Access Oxygen is being rolled out throughout **Senegal.** This solution includes training and maintenance programs for healthcare professionals led by an Air Liquide biomedical engineer, and a digital application designed for doctors and nurses in these small health structures. This project was led by **i-Lab,** Air Liquide's innovation laboratory, and is part of the Group's **Inclusive Business** approach, which proposes a new offering for the BoP (Bottom of the Pyramid) market while creating a social impact.

INNOVATIVE ELECTRONIC MATERIALS TO DECREASE THE ENVIRONMENTAL IMPACT OF THE SECTOR

Air Liquide continued to roll out its new **innovative etching materials** to meet the architectural challenges of **chips,** and with a priority on increasingly complex memories, linked to their reduction in size and etching on three sides. The current trend is to increase the performance of these memories and to decrease the energy consumption of electronic equipment. In response to these technological challenges, Air Liquide's R&D teams in the United States and Japan, and the operational subsidiaries of the Electronics activity, started developing new etching molecules back in 2010, in active partnership with customers, universities and equipment manufacturers. In preparation for the transition to an architecture of three-dimensional (3D) chips, the R&D centers invested in additional competencies and capabilities to identify and develop more than one hundred etching molecules.

The **enScribe™** product offering covers a family of etching materials for applications which provide greater technological value in the production of memories and logic circuits. Etching gases have a high Global Warming Potential (GWP): the chemical structure of enScribe™ molecules was reworked so that they have a shorter lifespan in the atmosphere, but maintain the same level of performance. The enScribe™ materials address technical challenges, but also reduce the environmental impact carried by semi-conductor manufacturing.

INTRODUCTION OF NEW OFFERS FOR CRAFTSMEN AND INDUSTRIES

EXELTOP™, the next generation of **built-in regulators for industrial gas cylinders,** continues to be deployed throughout the world. Current territories include Singapore, Middle East, South Africa, France, UK, some Northern and Eastern European countries and Canada. EXELTOP™ provides users with stability and accuracy thanks to its two-stage built-in regulator and a quick connection available for all gases. This product has an intuitive design with an on/off lever, an easy-access graduated handwheel and greater resistance with a strengthened metallic valve, which improves the safety of cylinders.

Air Liquide is a partner of the "LIFE CleanOx" project, supported by the European Commission, which aims to validate the relevance of the new **HeatOx™** generation, a solution based on oxy-combustion for the **glass industry.** Energy efficiency and the reduction of emissions are two major challenges for the glass sector, where large amounts of energy are needed to reach the very high temperatures required to melt glass. This solution consists of extracting heat from combustion fumes in order to heat oxygen and fuel. This technology improves the performance of the oxy-combustion process by 10% and provides up to 50% energy savings and up to 50% CO_2 emission reductions compared to air combustion.

DIGITAL TRANSFORMATION: DEPLOYMENT OF THE SMART INNOVATIVE OPERATIONS PROGRAM

The Group continues to deploy its Smart Innovative Operations program which aims to transform its Large Industries activity. In January 2017, Air Liquide inaugurated, near Lyon, a **remote operation and optimization center** for Air Liquide sites in France, as part of the *Connect project*. Through a national view of its customers' needs and the ability to adapt plant production levels according to customer demand, this center allows the Group to remotely pilot the production of 22 plants in France and to optimize their energy consumption. With the analysis of big data, Air Liquide has strengthened its reliability through the development, for example, of predictive maintenance with the identification of the weak signals that precede a malfunction. With the creation of the pilot center and the introduction of new technologies (touch tablets, 3D scanning, video tutorials, etc.) in the daily work of employees, this project is part of Air Liquide's open innovation approach which brings together production site, IT and Digital Transformation teams, and the French ecosystem of technology start-ups. Air Liquide has also launched its **remote operation center in Shanghai** which, in the long-term, will pilot all the large production units in China.

CONTINUING ROLL-OUT OF HYDROGEN STATIONS

The Group commissioned 13 new **hydrogen stations** in 2017. **Air Liquide's** Anaheim **station**, in the **United States,** where the State of **California** has launched a program to support the deployment and use of hydrogen vehicles, has carried out 6,400 **fill-ups,** which represents **almost 20,000 kg of hydrogen**.

In **Dubai,** Air Liquide opened, in partnership with Al-Futtaim Motors, Toyota's exclusive retailer in the country, the first hydrogen charging station in the United Arab Emirates. Moreover, Air Liquide has opened seven new stations in **Germany,** in the towns of Cham, Limburg, Mülheim, Bad Rappenau, Wolfsburg, Koblenz, and Hirschberg, and two in **Japan,** in Fukuoka and Kobe. In the Paris region, Air Liquide opened a second hydrogen charging station, at **Paris Orly** airport. This station fuels the fleet of STEP, with 75 taxis under deployment. Two further openings are expected in France in 2018, near Versailles and at Paris Roissy Charles de Gaulle airport, as well as 13 in Germany, one in Japan and 7 in the United States. To date, Air Liquide has already developed and installed **100 hydrogen charging stations** worldwide, of which the Group invested directly in 40.

All hydrogen stations installed by Air Liquide can fill in less than five minutes for a **range of around 500 kilometers**. Used in a fuel cell, hydrogen combines with oxygen from the air to produce electricity, with water as the only by-product. Air Liquide masters the entire hydrogen supply chain, from production to storage, and from distribution to the development of applications for end users, thus contributing to the wider use of **hydrogen as a clean energy source.**

In 2017, the **Hydrogen Council,** a global committee which brought together 28 leaders in the energy, transport and industry sectors, to promote hydrogen with a view to achieve climate change-related objectives (as agreed in the Paris Agreements), was created. During the launch of the first global initiative of its kind, the members of the Hydrogen Council demonstrated their desire to intensify their investments in the development and marketing of hydrogen and fuel cells. Their investments are currently estimated at 1.4 billion euros per year. At the end of 2017, the Council was co-managed by Air Liquide and Toyota. According to a study presented by the Hydrogen Council in November 2017, hydrogen could contribute to the energy transition, **accounting for 20% of the reduction of CO_2 emissions targets by 2050.** This study also highlights that hydrogen has the potential to generate 2,500 billion US dollars in revenue and create more than 30 million jobs.

ACCELERATION IN THE PRODUCTION OF BIOGAS AND THE DEPLOYMENT OF MULTI-ENERGY STATIONS

Air Liquide has completed the **acquisition of ENN Clean Energy UK.** This acquisition marks an additional step in Air Liquide's development of transportation solutions that reduce CO_2 emissions in the **United Kingdom.** The company operates three natural gas stations dedicated to trucks in the United Kingdom, which are now part of Air Liquide's European network of **more than 60 bio-NGV** (Natural Gas for Vehicle) **stations,** mostly supplied by the Air Liquide biogas purification units in the United Kingdom, France, Sweden and Norway.

Air Liquide has entered the **biogas market in Norway** through the acquisition of a majority stake in the Norwegian company **Skagerak Naturgass SA.** The company operates a distribution network delivering natural gas to industry and **biomethane** to the Norwegian transport sector through four bio-NGV stations. This new joint venture allows Air Liquide to pursue its business development in the Scandinavian biogas market which is one of Europe's key markets in the development of sustainable mobility. The Norwegian government has declared targets for reducing greenhouse gas emissions and is committed to phasing out fossil fuels in the transportation sector altogether by 2030.

Air Liquide has inaugurated **two new multi-energy stations** in Servon and Crépy-en-Valois **in France** in partnership with Carrefour, a French retailer. These stations will provide NGV and bio-NGV for transport vehicles. Carrefour is rolling out **bio-NGV** stations throughout France in order to ensure fuel for its trucks, with a target of 200 biomethane-fueled trucks by the end of 2017. Air Liquide is partnering with major retailers and transport specialists to support the development of clean fuel alternatives. Bio-NGV is a clean and renewable energy that reduces CO_2 emissions by 90% and noise by up to 50% compared with diesel fuel. This renewable biofuel is produced using waste at Air Liquide's biogas valorization plants. At the end of 2017, Air Liquide operated **8 multi-energy stations** in France.

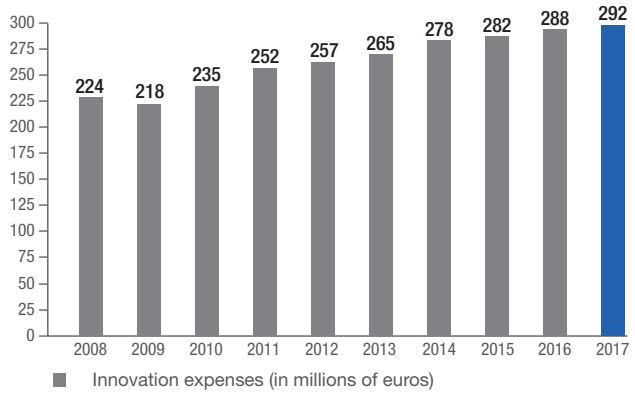
Moreover, a project led by Air Liquide was chosen in a 20-million-pound government-led program for the deployment of zero-emission vehicles in the **United Kingdom.** This project will involve carrying out **tests on 80 natural gas-powered trucks.** The aim of these tests will be to measure the consumption of these vehicles, along with their performance and cost.

In **China,** Air Liquide has built its first **biomethane production plant,** which processes agricultural waste and contributes to reducing greenhouse gas emissions. This plant supplies NGV stations, bearing in mind that China is the world's largest NGV market with five million vehicles.

Innovation indicators concerning the Group as a whole (a)

	As at December 31, 2017
Number of employees working on innovation	3,800
including researchers	1,100 researchers of 41 nationalities
including Global Markets & Technologies employees	1,800
including employees working on innovation in E&C and further entities	900
R&D industrial partnerships	85
R&D scientific partnerships (academic and technology institutes)	101
Start-ups collaborating with the Group	100

INNOVATION EXPENSES (a)



Patents	2013	2014	2015	2016	2017
Number of inventions protected by at least one patent	3,288	3,369	3,200	3,363	3,335
New patent applications filed during the year	321	287	271	296	318

(a) Applying the OECD definition.

STRATEGY AND OUTLOOK

Strategy

Air Liquide's ambition is to lead its industry, deliver long-term performance and contribute to sustainability. Its strategy for profitable growth over the long-term is that of a customer-centric transformation. It is based on operational excellence and the quality of its investments, on open innovation and the network organization already implemented by the Group worldwide. Air Liquide addresses energy and environmental transition, changes in healthcare, and digitalization through the commitment and inventiveness of its collaborators.

COMPOUND ANNUAL GROWTH RATE (CAGR) OVER 30 YEARS

- Revenue: +6.0%
- Cash flow from operating activities before changes in working capital: +6.9%
- Net profit: +8,1%
- Earnings per share [(a)]: +7.5%
- Dividend per share [(a) (b)]: +8.6%

(a) Adjusted for the 2-for-1 share split in 2007, for attribution of free shares and for a factor of 0.974 reflecting the value of the rights of the capital increase completed in October 2016.
(b) Subject to the approval of the Shareholders' Meeting on May 16, 2018.

The industrial gases industry has enjoyed steady growth over the last 100 years due to the ever increasing needs of new and growing economies, the emergence of new applications supported by innovation and technological research, and increased customer outsourcing of gas production. The demand for industrial gas, therefore, has risen faster historically than industrial production.

Within this framework, the Group's strategic approach has shifted from a geographical viewpoint, where industrial growth came mainly from capacities increase in developing economies, to a **market-based focus,** where each country aims to attract new investments in growth sectors.

A SOLID MODEL

Two Business lines, Large Industries and Healthcare, are the least dependent on economic cycles. Industrial Merchant is impacted by local industrial production momentum, whereas Electronics is correlated to the semi-conductor sector. In Large Industries, the supply of gas is contracted for a duration of 15 years, or more for specific projects, and incorporate take-or-pay clauses which guarantee a minimum level of revenue. Underlying market for Healthcare activities ensure growth in demand which is decorrelated from economic cycles. Industrial Merchant serves a very wide range of markets and multiple customers in various industrial processes. The development of the semi-conductor industry with its numerous digital applications is the main source of Electronics sales growth, an industry which is maturing. Moreover, through its four World Business Lines, the Group serves numerous customers in a variety of industries and across a wide range of geographies. These characteristics, which are inherent to the Industrial Gas and Healthcare businesses, reinforce the strength of the business model.

CORPORATE PROGRAM NEOS

The previous strategic program of Air Liquide named ALMA™ finished at the end of 2015. Following the Airgas acquisition, the Group acquired a new dimension and thus entered a new phase of its development. On the occasion of its Capital Markets Day on July 6, 2016, Air Liquide has presented its vision of the evolution of its markets, its strategy, its growth prospects, and its new company program NEOS for the period 2016-2020, which marks a new step in the development of the Group.

In an economic environment characterized by moderate global growth and major changes related to scientific and technological advances, Air Liquide has identified three major long-term trends, which are sources of growth for its businesses. These trends are energy and environment transition, changes in healthcare, and digitization. The latter affects both asset management and the way in which the Group interacts with customers and patients, and is part of an open ecosystem.

Air Liquide's ambition is to lead its industry, deliver long-term performance and contribute to sustainability. To address these key challenges and this new market potential, Air Liquide can rely on its leading positions in the major industrial basins worldwide, its proprietary technologies, its capacity for innovation, its solutions and services, its operational excellence, and its network organization.

The financial aims of the NEOS program for the 2016-2020 period are based on: a revenue compound annual growth rate (CAGR) of +6% to +8%, including in 2017 the scope effect relating to the consolidation of Airgas, which contributes +2% to the CAGR; substantial recurrent efficiency gains of more than 300 million euros on average per year from 2017, in addition to synergies related to Airgas for a total amount above 300 million US dollars; a Return On Capital Employed (ROCE) in excess of 10% after five to six years; and, finally, maintaining its long-term "A" range rating thanks to the strength of its balance sheet.

With NEOS, the Group is able to deliver a long-term performance by being more connected to its stakeholders as well as more innovative.

PERFORMANCE AND SUSTAINABLE DEVELOPMENT

The Group has confirmed its ambition to be the leader in its industry, by demonstrating its long-term performance and behaving responsibly in its contribution to a more sustainable world. As part of the NEOS program, the Group has reinforced its actions aimed at improving the air quality for a better environment and health. Air Liquide will pursue an active dialog with its stakeholders to contribute to a more sustainable world. The Group set up the Corporate Sustainability Program (CSP), see pages 81 to 92.

The Group thus creates a virtuous dynamic where sustainable development is an integral part of performance.

Outlook

The year 2017 marks a new step for the Group, which successfully integrated Airgas and which has acquired a new scale, with annual sales surpassing 20 billion euros.

In a more favorable global economic environment, all Gas & Services activities grew in 2017, in particular Industrial Merchant, which accounts for nearly half of our revenue and whose recovery is being confirmed quarter after quarter. On a geographic level, growth was mainly driven by the developing economies, China in particular, the solid level of activity in the Americas, and the Large Industries projects in the Middle East.

The Group's operating performance is improving, with high efficiency gains globally and synergies related to Airgas ahead of our forecast that contribute to the increase in the operating margin and to higher net profit. The balance sheet is strong: the high level of cash flow making a significant contribution to lowering debt by nearly 2 billion euros in the year.

The Group can also rely on its investment decisions, particularly in favor of innovation, which reached a total of 2.6 billion euros in 2017, as well as on its 2.1 billion euros investment backlog to fuel its future growth. Thanks to its new size, efforts to improve competitiveness, and initiatives launched in connection with its strategic program, the Group is well-positioned for future growth and development.

Accordingly, assuming a comparable environment, Air Liquide is confident in its ability to deliver net profit growth in 2018, calculated at constant exchange rate and excluding 2017 exceptionals [(a)].

(a) 2017 exceptionals: exceptional non-cash items having a net positive impact on 2017 net profit.