1. History and strategy of TOTAL

1.1. History and development

TOTAL S.A., a French *société anonyme* (limited company) incorporated on March 28, 1924 is, together with its subsidiaries and affiliates, the world's fourth largest publicly-traded integrated oil and gas company [(1)].

With operations in more than 130 countries, TOTAL is engaged in every sector of the oil and gas industry, including upstream (hydrocarbon exploration, development and production) and downstream (refining, petrochemicals, specialty chemicals, trading and shipping of crude oil and petroleum products and marketing). TOTAL is also involved in the renewable energies and power generation sectors.

TOTAL began its Upstream operations in the Middle East in 1924. Since then, the Company has grown and expanded its operations worldwide. In early 1999, the Company took over PetroFina S.A. and in early 2000 it took over Elf Aquitaine. Since the repeal in 2002 of the decree of December 13, 1993 that established a golden share of Elf Aquitaine held by the French government, there are no longer any agreements or regulatory provisions governing shareholding relationships between TOTAL and the French government. Information on TOTAL S.A.'s shareholding structure is presented in point 4.1 of chapter 8.

1.2. Strategy

TOTAL is a leading international oil and gas company and aims to be the responsible energy major by helping to supply accessible, affordable and clean energy to as many people as possible. To accomplish this goal, TOTAL leverages its integrated business model, which enables it to capture synergies between the different activities of the Group. To achieve its ambition, TOTAL relies upon its operational excellence, technological expertise and capacity to manage complex projects.

The Group's strategy is based on four main priorities:

- driving profitable, sustainable growth in Exploration & Production's hydrocarbon activities, with priority given to reducing production costs, disciplined investments and cash flow generation;
- continuing to enhance the competitiveness of major integrated refining and petrochemical platforms;
- increasing the distribution of petroleum products, particularly in high-growth regions, and offering innovative solutions and services that meet customers' evolving needs above and beyond the supply of petroleum products; and
- expanding along the full gas value chain by unlocking access to new markets, and developing profitable low-carbon businesses, in particular renewable energies.

This strategy incorporates the challenges of climate change, using as a point of reference the 2°C scenario of the International Energy Agency and its impact on energy markets. TOTAL's challenge is to increase access to affordable energy to satisfy the needs of a growing population, while providing concrete solutions to help limit the effects of climate change and supplying its clients with an energy mix featuring a progressively decreasing carbon intensity.

In addition to safety, the values of respect, responsibility and exemplary conduct underpin TOTAL's Code of Conduct and accompany priority business principles in the realms of safety/security/health/environment, integrity (preventing corruption, fraud and anti-competitive practices) and human rights. It is through strict adherence to these values and principles that TOTAL intends to build strong and sustainable growth for the Group and its stakeholders and deliver on its commitment to better energy.

(1) Based on market capitalization (in dollars) as of December 31, 2016.

1.3. Group organization

In order to implement TOTAL's strategy and in line with the "One Total" company project, a new organization, fully effective since January 1, 2017, was put in place and is structured around four business segments following the creation of the Gas, Renewables & Power (GRP) segment, alongside the existing Exploration & Production, Refining & Chemicals and Marketing & Services segments.

The GRP segment spearheads TOTAL's ambitions in low-carbon businesses by expanding in downstream gas and renewable energies as well as in energy efficiency businesses. This segment brings together the Gas and New Energies divisions (excluding biotechnologies) and a new Innovation & Energy efficiency division. Concerning bioenergies, a new Biofuels division now regroups within the Refining & Chemicals segment all these activities.

In order to improve efficiency, reduce costs and create value within the Group, the new branch Total Global Services (TGS) pools the various segments' support services (Accounting, Purchasing, Information Systems, Training, Human Resources Administration and Facilities Management). The entities making up TGS operate as service companies for internal clients across all four business segments and the corporate Holding level.

Finally, the diverse Corporate entities were regrouped in two divisions.

The new People & Social Responsibility division consists of: the Human Resources division, including Senior Executive Management; the Health, Safety and Environment division, which combines HSE departments across the different segments to establish a strong, unified environmental and safety model; the Security division; and the new Civil Society Engagement division.

The new Strategy-Innovation division is made of: a new Strategy & Climate division, responsible notably for ensuring that TOTAL's strategy incorporates climate issues; the Public Affairs division; the Audit division; the Research & Development division (which replaces the Scientific Development Department and now coordinates all of the Group's R&D activities and notably transversal programs such as on carbon capture, use and storage of CO_2); the Chief Digital Officer; and the Senior Vice President, Technology Experts.

2. Business overview for fiscal year 2016

2.1. Upstream segment

TOTAL's Upstream segment includes the activities of Exploration & Production and Gas. The Group has exploration and production activities in more than 50 countries and produces oil and gas in approximately 30 countries. The Gas division conducts downstream activities related to natural gas, Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG), as well as power generation and trading.

Within the context of the One Total new organization, as of financial year 2017, Upstream activities will be reported within two segments: the Exploration & Production segment and the new Gas, Renewables & Power segment, which includes downstream gas activities (see point 1.3 of this chapter).

2.45 Mboe/d
hydrocarbons produced in 2016

11.5 Bboe
of proved hydrocarbon reserves as of December 31, 2016 [(1)]

$15.1 billion
of organic investments [(2)] and resource acquisitions in 2016

15,191
employees present

Upstream segment financial data

(M$)	2016	2015	2014
Adjusted operating income [(a)]	2,737	4,925	17,156
Adjusted net operating income [(a)]	3,633	4,774	10,504

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.

Upstream adjusted net operating income was $3,633 million for the full-year 2016, compared to $4,774 million in 2015, a decrease of 24%, mainly due the impact of lower hydrocarbon prices which was partially offset by the increase in production combined with the decrease in operating costs as well as the lower effective tax rate. The effective tax rate for the Upstream was 26.6% in 2016 compared to 45.5% in 2015.

Technical costs [(3)] for consolidated affiliates, calculated in accordance with ASC 932 [(4)], were reduced to 20.4 $/boe in 2016 compared to 23.0 $/boe in 2015. This decrease was essentially due to the reduction in operating costs from 7.4 $/boe in 2015 to 5.9 $/boe in 2016.

Price realizations [(a)]	2016	2015	2014
Average liquids price ($/b)	40.3	47.4	89.4
Average gas price ($/Mbtu)	3.56	4.75	6.57

(a) Consolidated subsidiaries, excluding fixed margins.

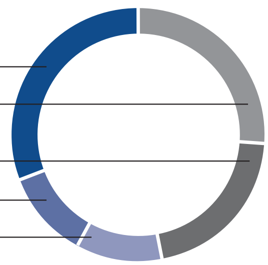
The average liquids price decreased by 15% for the full-year 2016 compared to 2015 and the average gas price decreased by 25% in 2016 compared to 2015.

(1) Based on a Brent crude price of 42.82 $/b (reference price in 2016), according to rules established by the Securities and Exchange Commission (refer to point 2.1.1.2).
(2) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 3.1 of chapter 2).
(3) (Production costs + exploration expenses + depreciation, depletion and amortization and valuation allowances)/production of the year.
(4) FASB Accounting Standards Codification 932, Extractive industries – Oil and Gas.

Production

Hydrocarbon production	2016	2015	2014
Combined production (kboe/d)	2,452	2,347	2,146
Liquids (kb/d)	1,271	1,237	1,034
Gas (Mcf/d)	6,447	6,054	6,063

Europe and Central Asia **757 kboe/d**
Africa[a] **634 kboe/d**
Middle East and North Africa **517 kboe/d**
Americas **279 kboe/d**
Asia-Pacific **265 kboe/d**



(a) Excluding North Africa.

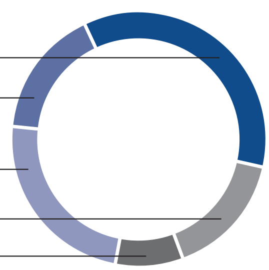
For the full-year 2016, hydrocarbon production was 2,452 kboe/d, an increase of 4.5% compared to 2015, due to the following:

- +6% due to new start ups and ramp ups, notably Laggan-Tormore, Surmont Phase 2, Termokarstovoye, Gladstone LNG, Moho Phase 1b, Vega Pleyade, and Incahuasi;
- -1.5% due to the security situation in Nigeria and Yemen, and wild fires in Canada;
- natural field decline was offset by a positive price effect and portfolio effects.

Proved reserves

As of December 31,	2016	2015	2014
Hydrocarbon reserves (Mboe)	11,518	11,580	11,523
Liquides (Mb)	5,414	5,605	5,303
Gaz (Bcf)	32,984	32,206	33,590

Europe and Central Asia **4,126 Mbep**
Africa[a] **1,872 Mbep**
Middle East and North Africa **2,734 Mbep**
Americas **1,804 Mbep**
Asia-Pacific **982 Mbep**



(a) Excluding North Africa.

Proved reserves based on SEC rules (based on Brent at 42.82 $/b) were 11,518 Mboe at December 31, 2016. The 2016 proved reserve replacement rate[1], based on SEC rules (based on Brent at 42.82 $/b in 2016), was 93% in 2016 and 100% over three years. At a constant price (54.17 $/b in 2015), the proved reserve replacement rate was 136% in 2016. The difference between the proved reserves based on SEC rules and the proved reserves based on a constant price is mainly due to the debooking of proved undeveloped reserves of Canadian oil sands on the Surmont permit.

At year-end 2016, TOTAL had a solid and diversified portfolio of proved and probable reserves[2] representing more than 20 years of reserve life based on the 2016 average production rate.

(1) Change in reserves excluding production: (revisions + discoveries, extensions + acquisitions – divestments)/production for the period.
(2) Limited to proved and probable reserves covered by Exploration & Production contracts on fields that have been drilled and for which technical studies have demonstrated economic development in the price scenario retained by the Group, including projects developed by mining.

2.1.1. Exploration & Production

Exploration & Production (E&P)'s mission is to discover and develop oil and gas fields in order to meet growing energy demand. Safety is a core value for that mission.

In an environment marked by the strong volatility of hydrocarbon prices, E&P's strategy is to develop an oil and gas production model that is resilient (*i.e.*, able to withstand a long period of low oil and gas prices), profitable and sustainable.

This strategy is based on three main levers:

- increase profitability: E&P strives to maximize the value of its assets through operational excellence and to ensure strict investment discipline by being selective in the sanctioning of new projects. In addition, E&P continues to restructure or sell the least performing assets in its portfolio;
- develop operational excellence: in order to ensure its resilience, E&P continues to reduce costs, improve the efficiency of its installations and start up projects on time and within budget. E&P also seeks to minimize the environmental impact of its activities; and
- renew reserves, through exploration as well as accessing already discovered resources, building on E&P's competitive advantages in terms of geographical spread and technical skills.

E&P is exiting a heavy investments phase, which peaked in 2013 and which is expected to enable production to increase 5% on average per year over the period of 2014-2020. That growth is supported, on the one hand, by the start-up of 12 major projects in 2017 and 2018 and, on the other hand, by the improvement of the facilities' operational efficiency. In 2016, 5 projects were started up, contributing to production growth of 4.5% compared to 2015.

2.1.1.1. Exploration and development

TOTAL evaluates exploration opportunities based on a variety of geological, technical, political, economic (including tax and contractual terms) environmental and societal factors.

The exploration strategy deployed since 2015 aims to prioritize the most promising drill targets with a view to creating value and resources. The Group plans balanced exploration investments:

- 50% for core and emerging basins, where the presence of hydrocarbons is already proven;
- 25% for near-field exploration around producing assets; and
- 25% for high-potential frontier basins.

In 2015, a new organization for the Group's exploration activities, adapted to the new strategy, was implemented with a new senior exploration management team. The organizational changes, focused notably on strengthening regional basin mastery and technical excellence, were finalized in 2016 with the transfer of Asia-Pacific and Americas regional hubs to Singapore and Houston, respectively.

In 2016, exploration expenditure from all Exploration & Production subsidiaries was $1.4 billion, mainly in the United States, Norway, Papua New Guinea, Brazil, Iraq, Bulgaria, Myanmar and the United Kingdom, compared to $1.9 billion in 2015 and $2.6 billion in 2014. The 2017 exploration budget is $1.25 billion.

Organic investments[1] from all Exploration & Production subsidiaries were $14.5 billion[2] in 2016, compared to $20.5 billion in 2015 and $23 billion in 2014, and were mainly in Angola, the Republic of the Congo, Nigeria, Norway, Canada, Australia, Kazakhstan, the United Kingdom, Russia, the United States, Abu Dhabi, Indonesia and Brazil.

2.1.1.2. Reserves

The definitions used for proved, proved developed and proved undeveloped oil and gas reserves are in accordance with the United States Securities & Exchange Commission (SEC) Rule 4-10 of Regulation S-X as amended by the SEC Modernization of Oil and Gas Reporting release issued on December 31, 2008. Proved reserves are estimated using geological and engineering data to determine with reasonable certainty whether the crude oil or natural gas in known reservoirs is recoverable under existing regulatory, economic and operating conditions.

TOTAL's oil and gas reserves are consolidated annually, taking into account, among other factors, levels of production, field reassessments, additional reserves from discoveries and acquisitions, disposal of reserves and other economic factors.

Unless otherwise indicated, any reference to TOTAL's proved reserves, proved developed reserves, proved undeveloped reserves and production reflects the Group's entire share of such reserves or such production. TOTAL's worldwide proved reserves include the proved reserves of its consolidated subsidiaries as well as its proportionate share of the proved reserves of equity affiliates. The reserves estimation process involves making subjective judgments. Consequently, estimates of reserves are not exact measurements and are subject to revision under well-established control procedures.

The reserves booking process requires, among other things:

- that internal peer review of technical evaluations are carried out to ensure that the SEC definitions and guidance are followed; and
- that management makes significant funding commitments towards the development of the reserves prior to booking.

For further information concerning the reserves and their evaluation process, see points 1 and 2 of chapter 11.

Proved reserves for 2016, 2015 and 2014

In accordance with the amended Rule 4-10 of Regulation S-X, proved reserves at December 31 are calculated using a 12-month average price determined as the unweighted arithmetic average of the first-day-of-the-month price for each month of the relevant year unless prices are defined by contractual arrangements, excluding escalations based upon future conditions. The average reference prices for Brent crude for 2016, 2015 and 2014 were, respectively, 42.82 $/b, 54.17 $/b and 101.27 $/b.

As of December 31, 2016, TOTAL's combined proved reserves of oil and gas were 11,518 Mboe (58% of which were proved developed reserves). Liquids (crude oil, condensates, natural gas liquids and bitumen) represented approximately 47% of these reserves and natural gas 53%. These reserves were located in Europe (mainly in Norway and the United Kingdom), Africa (mainly in Angola, Gabon, Nigeria and the Republic of the Congo), the Americas (mainly in Canada, Argentina, the United States and Venezuela), the Middle East (mainly in Qatar, the United Arab Emirates and Yemen), and Asia-Pacific (mainly in Australia) and in Kazakhstan and Russia.

(1) For Exploration & Production, organic investments include exploration investments, net development investments and net financial investments.
(2) Excluding the Group's Gas activities.

At a constant oil price (54.17 $/b) the proved reserves were 11,905 Mboe. The difference between the proved reserves based on SEC rules and the proved reserves based on a constant price is mainly due to the debooking of proved undeveloped reserves of Canadian oil sands on the Surmont permit.

Discoveries of new fields and extensions of existing fields added 2,172 Mboe to the Upstream segment's proved reserves during the 3-year period ended December 31, 2016 (before deducting production and sales of reserves in place and adding any acquisitions of reserves in place during this period). The net level of reserve revisions during this 3-year period is +505 Mboe, which was mainly due to the overall positive revisions in field behaviors and to the positive impact of the decrease in hydrocarbon prices in 2015 and 2016 that led to a reserves increase on fields with production sharing or service contracts and on Canadian bitumen fields (royalty effect), which was partially offset by the reserves decrease resulting from the suspension or cancellation due to economic reasons of capital expenditures associated with, or from shorter producing life of, certain producing fields.

The 2016 proved reserve replacement rate[(1)], based on SEC rules (based on Brent at 42.82 $/b in 2016), was 93% in 2016 and 100% over three years. At a constant price (54.17 $/b in 2015), the proved reserve replacement rate was 136% in 2016.

As of December 31, 2015, TOTAL's combined proved reserves of oil and gas were 11,580 Mboe (53% of which were proved developed reserves) compared to 11, 523 Mboe (50% of which were proved developed reserves) as of December 31, 2014. Liquids (crude oil, condensates, natural gas liquids and bitumen) at year-end 2015 represented approximately 48% of these reserves and natural gas the remaining 52% and, at year-end 2014, approximately 46% of these reserves and natural gas the remaining 54%.

Sensitivity to oil and gas prices

Changes in the price used as a reference for the proved reserves estimation result in non-proportionate inverse changes in proved reserves associated with production sharing and risked service contracts (which together represent approximately 19% of TOTAL's reserves as of December 31, 2016). Under such contracts, TOTAL is entitled to a portion of the production, the sale of which is meant to cover expenses incurred by the Group. As oil prices decrease, more barrels are necessary to cover the same amount of expenses. Moreover, the number of barrels recoverable under these contracts may vary according to criteria such as cumulative production, the rate of return on investment or the income-cumulative expenses ratio. This increase is partly offset by a reduction of the duration over which fields can be produced economically. However, the decrease in reserves due to this reduction is generally less than the increase in reserves under production sharing or risked service contracts due to such lower prices. As a result, lower prices usually lead to an increase in TOTAL's reserves. In Canada, a decrease in the reference price per barrel used as a reference for estimating proved reserves leads to a decrease in the volume of royalties and, therefore, an increase of the proved reserves, and vice versa.

Lastly, for any type of contract, a significant decrease in the reference price of petroleum products that negatively impacts projects profitability may lead to a reduction of proved reserves.

2.1.1.3. Production

The average daily production of liquids and natural gas was 2,452 kboe/d in 2016 compared to 2,347 kboe/d in 2015 and 2,146 kboe/d in 2014. Liquids represented approximately 52% and natural gas approximately 48% of TOTAL's overall production in 2016.

The tables on the following pages set forth TOTAL's annual and average daily production of liquids and natural gas by geographic area and for each of the last three fiscal years.

Consistent with industry practice, TOTAL often holds a percentage interest in its fields rather than a 100% interest, with the balance being held by joint venture partners (which may include other international oil companies, state-owned oil companies or government entities). The Group's entities may frequently act as operator (the party responsible for technical production) on acreage in which it holds an interest. Refer to the table "Presentation of production activities by region" on the following pages for a presentation of the Group's producing assets.

As in 2015 and 2014, substantially all of the liquids production from TOTAL's Upstream segment in 2016 was marketed by the Trading & Shipping division of TOTAL's Refining & Chemicals segment (refer to table "Trading's crude oil sales and supply and petroleum products sales" in point 2.2.2.1 of this chapter).

2.1.1.4. Delivery commitments

The majority of TOTAL's natural gas production is sold under long-term contracts. However, its North American production, and part of its production from the United Kingdom, the Netherlands and Norway, is sold on the spot market. The long-term contracts under which TOTAL sells its natural gas usually provide for a price related to, among other factors, average crude oil and other petroleum product prices, as well as, in some cases, a cost-of-living index. Though the price of natural gas tends to fluctuate in line with crude oil prices, a slight delay may occur before changes in crude oil prices are reflected in long-term natural gas prices.

Some of TOTAL's long-term contracts, notably in Bolivia, Indonesia, Nigeria, Norway, Thailand and Qatar, specify the delivery of quantities of natural gas that may or may not be fixed and determinable. Such delivery commitments vary substantially, both in duration and scope, from contract to contract throughout the world. For example, in some cases, contracts require delivery of natural gas on an as-needed basis, and, in other cases, contracts call for the delivery of varied amounts of natural gas over different periods of time. Nevertheless, TOTAL estimates the fixed and determinable quantity of gas to be delivered over the period 2017-2019 to be 4,734 Bcf. The Group expects to satisfy most of these obligations through the production of its proved reserves of natural gas, with, if needed, additional sourcing from spot market purchases (refer to points 1 and 2 of chapter 11).

2.1.1.5. Contractual framework of activities

Licenses, permits and contracts governing the Group's ownership of oil and gas interests have terms that vary from country to country and are generally granted by or entered into with a government entity or a state-owned company and are sometimes entered into with private owners. These agreements usually take the form of concessions or production sharing contracts.

(1) Change in reserves excluding production: (revisions + discoveries, extensions + acquisitions – divestments)/production for the period.

In the framework of oil concession agreements, the oil company owns the assets and the facilities and is entitled to the entire production. In exchange, the operating risks, costs and investments are the oil company's responsibility and it agrees to remit to the relevant host country, usually the owner of the subsoil resources, a production-based royalty, income tax, and possibly other taxes that may apply under local tax legislation.

The production sharing contract ("PSC") involves a more complex legal framework than the concession agreement: it defines the terms and conditions of production sharing and sets the rules governing the cooperation between the company or consortium in possession of the license and the host country, which is generally represented by a state-owned company. The latter can thus be involved in operating decisions, cost accounting and production allocation. The consortium agrees to undertake and finance all exploration, development and production activities at its own risk. In exchange, it is entitled to a portion of the production, known as "cost oil", the sale of which is intended to cover its incurred expenses (capital and operating costs). The balance of production, known as "profit oil", is then shared in varying proportions, between the company or consortium, on the one hand, and the host country or state-owned company, on the other hand.

Today, concession agreements and PSCs can coexist, sometimes in the same country or even on the same block. Even though there are other contractual models, TOTAL's license portfolio is comprised mainly of concession agreements.

On most licenses, the partners and authorities of the host country, often assisted by international accounting firms, perform joint venture and PSC cost audits and ensure the observance of contractual obligations.

In some countries, TOTAL has also signed contracts called "risked service contracts", which are similar to PSCs. However, the profit oil is replaced by a defined cash monetary remuneration, agreed by contract, which depends notably on field performance parameters such as the amount of barrels produced.

Oil and gas exploration and production activities are subject to authorization granted by public authorities (licenses), which are granted for specific and limited periods of time and include an obligation to relinquish a large portion, or the entire portion in case of failure, of the area covered by the license at the end of the exploration period.

TOTAL pays taxes on income generated from its oil and gas production and sales activities under its concessions, PSCs and risked service contracts, as provided for by local regulations.
In addition, depending on the country, TOTAL's production and sales activities may be subject to a number of other taxes, fees and withholdings, including special petroleum taxes and fees. The taxes imposed on oil and gas production and sales activities are generally substantially higher than those imposed on other industrial or commercial businesses.

2.1.1.6. Production by region

The following table sets forth the Group's annual liquids and natural gas production by region, according to the internal business units of the Group.

	2016			2015			2014		
	Liquids Mb[(a)]	Natural gas Bcf[(b)]	Total Mboe	Liquids Mb[(a)]	Natural gas Bcf[(b)]	Total Mboe	Liquids Mb[(a)]	Natural gas Bcf[(b)]	Total Mboe
Europe and Central Asia	**91**	**1,002**	**277**	**80**	**881**	**243**	**73**	**812**	**224**
Azerbaijan	-	-	-	-	-	-	1	22	5
France	-	-	-	-	-	-	-	3	1
Italia	-	-	-	-	-	-	-	-	-
Kazakhstan	1	2	1	-	-	-	-	-	-
Norway	44	226	86	47	224	88	49	210	88
The Netherlands	-	52	9	-	58	10	-	62	11
United Kingdom	18	218	58	13	142	39	11	122	32
Russia	28	504	123	20	457	106	12	393	86
Africa (excluding North Africa)	**186**	**227**	**232**	**190**	**212**	**233**	**179**	**225**	**223**
Angola	84	25	89	86	18	90	70	20	73
Republic of the Congo	31	11	33	30	11	32	32	13	35
Gabon	20	5	21	20	5	22	20	5	21
Nigeria	51	186	89	54	178	89	57	187	94
Middle East and North Africa	**137**	**291**	**189**	**136**	**318**	**193**	**82**	**424**	**159**
Algeria	2	33	8	3	35	9	2	29	7
United Arab Emirates	102	25	107	100	24	105	42	22	46
Iraq	6	<1	7	7	-	7	4	-	4
Libya	5	-	5	5	-	5	10	-	10
Oman	10	23	14	8	21	12	9	22	13
Qatar	11	210	49	12	209	49	12	203	48
Yemen	-	-	-	1	29	6	3	148	31
Americas	**40**	**346**	**102**	**35**	**327**	**93**	**32**	**323**	**90**
Argentina	3	143	29	3	129	26	3	134	27
Bolivia	1	59	12	1	49	10	1	51	11
Canada	12	-	12	5	-	5	4	-	4
United States	11	111	31	13	112	33	10	104	28
Venezuela	12	33	17	13	37	19	14	34	19
Asia-Pacific	**11**	**494**	**97**	**12**	**471**	**94**	**11**	**429**	**87**
Australia	-	33	6	-	10	1	-	8	1
Brunei	1	29	7	1	23	5	1	24	5
China	-	19	4	-	22	4	-	23	4
Indonesia	7	240	51	8	247	54	7	217	47
Myanmar	-	60	8	-	56	7	-	49	6
Thailand	3	112	22	3	113	23	4	108	22
Total production	**465**	**2,360**	**897**	**453**	**2,209**	**856**	**377**	**2,213**	**783**
Including share of equity affiliates	**91**	**694**	**220**	**81**	**667**	**204**	**73**	**726**	**208**
Angola	-	7	2	-	-	-	-	4	1
United Arab Emirates	42	19	45	39	18	43	40	19	43
Oman	9	23	13	8	21	12	8	22	12
Qatar	3	139	28	3	140	28	3	139	28
Russia	25	503	120	17	456	102	9	392	83
Venezuela	12	3	12	14	3	14	14	2	14
Yemen	-	-	-	-	29	5	-	147	27

(a) Liquids consist of crude oil, bitumen, condensates and natural gas liquids (NGL). With respect to bitumen, the Group's production in Canada consists of bitumen only, and all of the Group's bitumen production is in Canada. With respect to NGL, the table above does not set forth separate figures for NGL because they represented less than 7.5% of the Group's total liquids production in each of the years 2014, 2015 and 2016.
(b) Including fuel gas (163 Bcf in 2016, 159 Bcf in 2015, 155 Bcf in 2014).

The following table sets forth the Group's average daily liquids and natural gas production by region, according to the internal business units of the Group.

	2016			2015			2014		
	Liquids kb/d[(a)]	Natural gas Mcf/d[(b)]	Total kboe/d	Liquids kb/d[(a)]	Natural gas Mcf/d[(b)]	Total kboe/d	Liquids kb/d[(a)]	Natural gas Mcf/d[(b)]	Total kboe/d
Europe and Central Asia	**249**	**2,737**	**757**	**215**	**2,413**	**664**	**201**	**2,224**	**613**
Azerbaijan	-	-	-	-	-	-	3	59	14
France	-	-	-	-	-	-	-	9	2
Italia	-	-	-	-	-	-	-	-	-
Kazakhstan	3	6	4	-	-	-	-	-	-
Norway	121	618	235	125	614	239	135	576	242
The Netherlands	-	141	25	1	158	28	1	171	31
United Kingdom	49	595	158	35	389	107	29	333	89
Russia	76	1,377	335	54	1,252	290	33	1,076	235
Africa (excluding North Africa)	**509**	**621**	**634**	**521**	**581**	**639**	**490**	**614**	**610**
Angola	230	68	243	238	49	248	191	54	200
Republic of the Congo	84	29	90	81	30	87	88	35	95
Gabon	55	15	58	55	15	59	55	14	58
Nigeria	140	509	243	147	487	245	156	511	257
Middle East and North Africa	**373**	**795**	**517**	**372**	**874**	**531**	**224**	**1,163**	**438**
Algeria	6	90	23	7	96	25	5	79	20
United Arab Emirates	279	67	291	274	66	287	115	61	127
Iraq	17	1	18	18	1	18	12	1	12
Libya	14	-	14	14	-	14	27	-	27
Oman	26	62	37	25	58	36	24	61	36
Qatar	31	575	134	32	573	134	32	555	132
Yemen	-	-	-	2	80	17	9	406	84
Americas	**109**	**944**	**279**	**95**	**896**	**255**	**89**	**884**	**247**
Argentina	8	391	78	8	354	72	9	367	75
Bolivia	4	160	34	3	133	28	4	139	30
Canada	34	-	34	14	-	14	12	-	12
United States	31	304	86	34	308	89	27	285	78
Venezuela	32	89	47	36	101	52	37	93	52
Asia-Pacific	**31**	**1,350**	**265**	**34**	**1,290**	**258**	**30**	**1,178**	**238**
Australia	-	91	16	-	28	4	-	23	4
Brunei	3	78	18	3	62	15	2	66	15
China	-	53	10	-	59	11	-	63	12
Indonesia	19	657	140	22	676	147	18	594	130
Myanmar	-	165	21	-	153	19	-	135	17
Thailand	9	306	60	9	312	62	10	297	60
Total production	**1,271**	**6,447**	**2,452**	**1,237**	**6,054**	**2,347**	**1,034**	**6,063**	**2,146**
Including share of equity affiliates	**247**	**1,894**	**600**	**219**	**1,828**	**559**	**200**	**1,988**	**571**
Angola	1	20	5	-	-	-	-	10	2
United Arab Emirates	114	51	123	107	50	116	109	51	118
Oman	24	62	36	24	58	34	23	61	34
Qatar	7	379	76	7	383	77	7	381	77
Russia	69	1,375	327	45	1,250	280	24	1,075	227
Venezuela	32	7	33	36	7	37	37	6	38
Yemen	-	-	-	-	80	15	-	404	75

(a) Liquids consist of crude oil, bitumen, condensates and natural gas liquids (NGL). With respect to bitumen, the Group's production in Canada consists of bitumen only, and all of the Group's bitumen production is in Canada. With respect to NGL, the table above does not set forth separate figures for NGL because they represented less than 7.5% of the Group's total liquids production in each of the years 2014, 2015 and 2016.
(b) Including fuel gas (448 Mcf/d in 2016, 435 Mcf/d in 2015, 426 Mcf/d in 2014).

2.1.1.7. Presentation of production activities by geographical zone

The table below sets forth, by geographical zone according to the internal business units of the Group, TOTAL's producing assets, the year in which TOTAL's activities started, the Group's interest in each asset and whether TOTAL is operator of the asset.

TOTAL's producing assets as of December 31, 2016 [(a)]

Europe and Central Asia

Kazakhstan 1992	**Non operated:** Kashagan (16.81%)
Norway 1965	**Operated:** Atla (40.00%), Skirne (40.00%) **Non-operated:** Åsgard (7.68%), Ekofisk (39.90%), Ekofisk South (39.90%), Eldfisk (39.90%), Embla (39.90%), Gimle (4.90%), Heimdal (16.76%), Islay (5.51%) [(b)], Kristin (6.00%), Kvitebjørn (5.00%), Mikkel (7.65%), Oseberg (14.70%), Oseberg East (14.70%), Oseberg South (14.70), Snøhvit (18.40%), Stjerne (14.70%), Troll I (3.69%), Troll II (3.69%), Tune (10.00%), Tyrihans (23.15%), Visund (7.70%), Visund South (7.70%), Visund North (7.70%)
The Netherlands 1964	**Operated:** F6a oil (65.68%), F15a Jurassic (38.20%), F15a Triassic (32.47%), J3a (30.00%), K1a (40.10%), K3b (56.16%), K4a (50.00%), K4b/K5a (36.31%), K5b (50.00%), K6/L7 (56.16%), L1a (60.00%), L1d (60.00%), L1e (55.66%), L1f (55.66%), L4d (55.66%) **Non-operated:** E16a (16.92%), E17a/E17b (14.10%), J3b/J6 (25.00%), K9ab-A (22.46%), Q16a (6.49%)
Russia 1991	**Non-operated:** Kharyaga (20.00%), Termokarstovoye (49.00%) [(c)], several fields through the participation in Novatek (18.90%)
United Kingdom 1962	**Operated:** Alwyn North (100.00%), Dunbar (100.00%), Ellon (100.00%), Forvie North (100.00%), Grant (100.00%), Jura (100.00%), Nuggets (100.00%), Elgin-Franklin (46.17%), West Franklin (46.17%), Glenelg (58.73%), Islay (94.49%) [(b)], Laggan Tormore (60.00%) **Non-operated:** Bruce (43.25%), Markham unitized field (7.35%), Keith (25.00%)

Africa (excl. North Africa)

Angola 1953	**Operated:** Girassol, Jasmim, Rosa, Dalia, Pazflor, CLOV (Block 17) (40.00%) **Non-operated:** Cabinda Block 0 (10.00%), Kuito, BBLT, Tombua-Landana (Block 14) (20.00%) [(d)], Lianzi (Block 14K) (10.00%) [(d)], Angola LNG (13.60%)
Gabon 1928	**Operated:** Anguille Marine (100.00%), Anguille Nord Est (100.00%), Atora (40.00%), Avocette (57.50%), Baliste (50.00%), Barbier (100.00%), Baudroie Marine (50.00%), Baudroie Nord Marine (50.00%), Coucal (57.50%), Girelle (100.00%), Gonelle (100.00%), Grand Anguille Marine (100.00%), Grondin (100.00%), Hylia Marine (75.00%), Lopez Nord (100.00%), Mandaros (100.00%), M'Boukou (57.50%), Mérou Sardine Sud (50.00%), N'Tchengue (100.00%), Port Gentil Océan (100.00%), Torpille (100.00%), Torpille Nord Est (100.00%) **Non operated:** Rabi Kounga (47.50%)
Nigeria 1962	**Operated:** OML 58 (40.00%), OML 99 Amenam-Kpono (30.40%), OML 100 (40.00%), OML 102 (40.00%), OML 130 (24.00%) **Non-operated:** OML 102 – Ekanga (40.00%), Shell Petroleum Development Company (SPDC 10.00%), OML 118 – Bonga (12.50%), OML 138 (20.00%)
The Republic of the Congo 1968	**Operated:** Kombi-Likalala-Libondo (65.00%), Moho Bilondo (including Moho phase 1b) (53.50%), Nkossa (53.50%), Nsoko (53.50%), Sendji (55.25%), Tchendo (65.00%), Tchibeli-Litanzi-Loussima (65.00%), Tchibouela (65.00%), Yanga (55.25%) **Non-operated:** Lianzi (26.75%), Loango (42.50%), Zatchi (29.75%)

(a) The Group's interest in the local entity is approximately 100% in all cases except for Total Gabon (58.28%), Total E&P Congo (85%) and certain entities in Abu Dhabi and Oman (see notes b through k below).
(b) The field of Islay extends partially in Norway. Total E&P UK holds a 94.49% stake and Total E&P Norge 5.51%.
(c) TOTAL's interest in the joint venture ZAO Terneftegas with Novatek (51.00%).
(d) Stake in the company Angola Block 14 BV (TOTAL 50.01%).

Operated (Group share in %).
Non-operated (Group share in %).

Middle East and North Africa

Algeria 1952	**Non-operated:** Tin Fouyé Tabankort (35.00%)
U.A.E. 1939	**Operated:** Abu Al Bukhoosh (75.00%) **Non-operated:** ADCO (10.00%), Abu Dhabi offshore (13.33%)(e), GASCO (15.00%), ADGAS (5.00%)
Iraq 1920	**Non-operated:** Halfaya (22.5%)(f)
Libya 1959	**Non-operated:** zones 15, 16 & 32 (75.00%)(g), zone 129 & 130 (30.00%)(g)
Oman 1937	**Non-operated:** various onshore fields (Block 6) (4.00%)(h), Mukhaizna field (Block 53) (2.00%)(i)
Qatar 1936	**Operated:** Al Khalij (40.00%) **Non-operated:** North Field-Block NF Dolphin (24.50%), North Field-Qatargas 1 Downstream (10.00%), North Field-Qatargas 1 Upstream (20.00%), North Field-Qatargas 2 Train 5 (16.70%)
Yemen 1987	**Non-operated:** Various onshore fields (Block 5) (15.00%)

Americas

Argentina 1978	**Operated:** Aguada Pichana (27.27%), Aguada San Roque (24.71%), Rincon La Ceniza (45.00%), Aries (37.50%), Cañadon Alfa Complex (37.50%), Carina (37.50%), Hidra (37.50%), Kaus (37.50%), Vega Pleyade (37.50%), La Escalonada (45.00%) **Non-operated:** Rincón de Aranda (45.00%), Sierra Chata (2.51%)
Bolivia 1995	**Operated:** Incahuasi (50.00%) **Non-operated:** San Alberto (15.00%), San Antonio (15.00%), Itaú (41.00%)
Canada 1999	**Non-operated:** Surmont (50.00%)
United States 1957	**Operated:** several assets in the Barnett Shale area (100.00%) **Non-operated:** several assets in the Utica Shale area (25.00%)(j), Chinook (33.33%), Tahiti (17.00%)
Venezuela 1980	**Non-operated:** PetroCedeño (30.32%), Yucal Placer (69.50%)

Asia-Pacific

Australia 2005	**Non-operated:** several fields in UJV GLNG (27.50%)(k)
Brunei 1986	**Operated:** Maharaja Lela Jamalulalam (37.50%)
China 2006	**Non-operated:** South Sulige (49.00%)
Indonesia 1968	**Operated:** Bekapai (50.00%), Handil (50.00%), Peciko (50.00%), Sisi-Nubi (47.90%), South Mahakam (50.00%), Tambora (50.00%), Tunu (50.00%) **Non-operated:** Badak (1.05%), Nilam-gas and condensates (9.29%), Nilam-oil (10.58%), Ruby-gas and condensates (15.00%)
Myanmar 1992	**Operated:** Blocks M5/M6 (Yadana, Sein) (31.24%)
Thailand 1990	**Non-operated:** Bongkot (33.33%)

(e) Via Abu Dhabi Marine Areas Limited (equity affiliate), TOTAL holds a 13.33% stake in the Abu Dhabi Marine Areas (ADMA) concession operated by ADMA-OPCO.
(f) TOTAL's interest in the joint venture.
(g) TOTAL's stake in the foreign consortium.
(h) TOTAL's indirect interest (4.00%) in the concession, via its 10% interest in Private Oil Holdings Oman Ltd. TOTAL also has a direct interest (5.54%) in the Oman LNG facility (trains 1 and 2), and an indirect participation (2.04%) through OLNG in Qalhat LNG (train 3).
(i) TOTAL's direct interest in Block 53.
(j) TOTAL's interest in the joint venture with Chesapeake.
(k) TOTAL's interest in the unincorporated joint venture.

Operated (Group share in %).
Non-operated (Group share in %).

2.1.1.8. Main activities by geographical zone

The information below describes the Group's main exploration and production activities presented by geographical zones according to the internal business units[1] of the Group, without detailing all of the assets held by TOTAL. In each area, the countries are presented in decreasing order of production. The capacities referred to herein are expressed on a 100% basis, regardless of the Group's stake in the asset.

Europe and Central Asia

In 2016, TOTAL's production in the zone of Europe and Central Asia was 757 kboe/d, representing 31% of the Group's total production, compared to 664 kboe/d in 2015 and 613 kboe/d in 2014. The two main producing countries in this zone in 2016 were Russia and Norway.

In **Russia**, where the largest percentage of TOTAL's proved reserves are located (nearly 21% as of December 31, 2016), the Group's production was 335 kboe/d in 2016, compared to 290 kboe/d in 2015 and 235 kboe/d in 2014. This production comes from the Kharyaga and Termokarstovoye fields and TOTAL's stake in PAO Novatek[2]. Since 2015, Russia has been the leading contributor to the Group's production.

In addition to the shareholding in Novatek, TOTAL currently participates in the Yamal LNG and Termokarstovoye projects with Novatek via a direct stake:

- Yamal LNG: in 2013, the company OAO Yamal LNG[3] launched this project aimed at developing the onshore field of South Tambey (gas and condensates) located on the Yamal peninsula, and at building a three-train gas liquefaction plant with total LNG capacity of 16.5 Mt/y. The Yamal LNG project's financing was finalized in 2016 in compliance with applicable regulations. At year-end 2016, 75% of the project was completed and over 96% of the LNG volumes have been sold through long-term sale agreements. Production is expected to start by year-end 2017.
- Termokarstovoye (an onshore gas and condensates field, located in the Yamalo-Nenets region): the development and production license of Termokarstovoye field is held by ZAO Terneftegas, a joint venture between Novatek (51%) and TOTAL (49%). The field came into production in 2015 (capacity of 65 kboe/d).

In August 2016, TOTAL sold a 20% interest in the Kharyaga field (thus reducing its stake to 20%) and transferred operatorship of the field to the purchaser, Zarubezhneft.

Since 2014, certain Russian persons and entities, including various entities operating in the energy sector, are subject to international economic sanctions adopted, in particular, by the United States, the European Union. TOTAL complies with sanctions applicable to its activities. For further information, refer to point 1.9 of chapter 4 (Risk factors).

In **Norway**, TOTAL has equity stakes in 93 production licenses on the Norwegian maritime continental shelf, 35 of which it operates. The Group's production in 2016 was 235 kboe/d compared to 239 kboe/d in 2015 and 242 kboe/d in 2014.

- In the Greater Ekofisk area, the Group holds a 39.9% stake in the Ekofisk and Eldfisk fields. Production at Ekofisk South started in 2013 and at Eldfisk II in 2015 (capacity of 70 kboe/d each).
- In the Sleipner area, the development of the Gina Krog field located in the north of Sleipner and approved in 2013 is underway. In December 2016, the Group sold a stake of 15% in this field, reducing its participation from 30% to 15%.
- In the Greater Hild area, the development of the Martin Linge field (51%, operator, estimated capacity 80 kboe/d) is underway.
- In the Barents Sea, the Group holds an 18.4% stake in the gas liquefaction plant of Snøhvit (capacity of 4.2 Mt/y). This plant is supplied with production from the Snøhvit and Albatross gas fields.

In the **United Kingdom**, the Group's production was 158 kboe/d in 2016 compared to 107 kboe/d in 2015 and 89 kboe/d in 2014. More than 90% of this production comes from operated fields in the three main areas described below.

- In the Alwyn/Dunbar area (100%) in the Northern North Sea, production from the Alwyn and Dunbar fields represents 25% and 18% of production, respectively, of this area. The rest of the production comes from satellites, which are:
  1) linked to Alwyn by subsea tieback: the Forvie gas and condensates field joined by the Jura and Islay fields and the Nuggets gas field network; and
  2) linked to Dunbar: the Ellon (oil and gas) and the Grant (gas and condensates) fields.

  On the Dunbar field (100%), the additional development phase (Dunbar phase IV) was stopped in 2016 for technical and economic reasons.
- In the Elgin/Franklin area in the Central Graben, TOTAL holds stakes in the Elgin-Franklin and West Franklin fields (46.17%, operator). Concerning the Elgin redevelopment project (drilling of five wells), two wells were drilled in 2016. The West Franklin Phase II project, comprising the addition of two platforms and the drilling of three wells, was completed in 2016 when the last well was drilled.
- In the West of Shetland area, the Laggan and Tormore fields (60%, operator) came into production in 2016. Production is expected to start on the Edradour and Glenlivet fields (60%, operator) in 2017 (total production capacity of 90 kboe/d). TOTAL also operates the P967 license, including the Tobermory gas discovery (30%).

Impairments on gas assets in the United Kingdom were recognized in the 2015 and 2016 Consolidated Financial Statements.

In addition, TOTAL holds five shale gas exploration and production licenses (PEDL 139 and 140, 40%; PEDL 273, 305 and 316, 50%) located in the Gainsborough Trough basin (East Midlands region).

The sale of interests held by Total E&P UK in transport pipelines (FUKA and SIRGE) and the St. Fergus terminal was finalized in March 2016.

In the **Netherlands**, the Group's production was 25 kboe/d in 2016 compared to 28 kboe/d in 2015 and 31 kboe/d in 2014. This decrease was due to natural field decline. TOTAL holds interests in 24 offshore production licenses, including 20 that it operates, and an offshore exploration license (K1c, 30%).

(1) The geographical zones are as follows: Europe and Central Asia; Africa (excluding North Africa); Middle East and North Africa; Americas; and Asia-Pacific. The information presented relating to 2015 and 2014 production has been restated accordingly.
(2) A Russian company listed on stock exchanges in the Moscow and London stock exchanges and in which the Group held an interest of 18.9% as of December 31, 2016.
(3) OAO Yamal LNG is held by PAO Novatek (50.1%), Total E&P Yamal (20%), CNODC (20%), a subsidiary of China National Petroleum Corporation, and Silk Road Fund (9.9%).

In **Kazakhstan**, TOTAL holds a stake in the North Caspian license (16.81%), which covers the Kashagan field. Production of the first phase of the Kashagan field and the associated processing plant (capacity of 370 kb/d) restarted in October 2016 after pipeline problems had taken it off stream for three years. Replacement of the pipelines by the operator was completed in the summer of 2016. The Group's production was 4 kboe/d in 2016 and is expected to gradually increase between now and the end of 2017. In July 2016, TOTAL withdrew from the Nurmunaï North and South onshore exploration licenses (51.1%, operator) located in the southwest of the country, due to negative results from the two exploration wells drilled in 2015.

In **Italy**, TOTAL holds stakes in the Tempa Rossa field (50%, operator), located on the Gorgoglione concession (Basilicate region), and three exploration licenses. The Tempa Rossa development project is underway, with production expected to start at the end of 2017.

In **Azerbaijan**, TOTAL signed an agreement in November 2016 establishing the contractual and commercial conditions for a first phase of production of the Absheron gas and condensate field located in the Caspian Sea and discovered by TOTAL in 2011 (40%, operator). The agreement enabled to define a cost-competitive development scheme by tying the field to existing infrastructure in order to deliver gas at a competitive price. The capacity production from this high pressure field is expected to be approximately 35 kboe/d. The produced gas will supply Azerbaijan's domestic market.

In **France**, the Group's production ended in 2014 with the sale of the Lacq concessions to Geopetrol. Total E&P France remains the owner of parts of the Lacq industrial site, located in the southwest of France, and is carrying out decommissioning, dismantling and site rehabilitation activities.

In **Bulgaria**, where TOTAL has been present since 2012, the Group drilled a deep offshore exploration well in 2016 on the Han Asparuh block (14,220 km²), 100 km offshore in the Black Sea, which revealed the presence of oil in this area for the first time.

In **Denmark**, TOTAL relinquished the two shale gas exploration licenses (80%, operator) it acquired in 2010, in July 2015 for the license 2/10 (Nordsjaelland) and in June 2016 for the license 1/10 (Nordjylland).

Rest of the Europe and Central Asia area
TOTAL also holds interests in an exploration license without activity in Tajikistan.

Africa

In 2016, TOTAL's production in the zone of Africa (excluding North Africa) was 634 kboe/d, representing 26% of the Group's total production, compared to 639 kboe/d in 2015 and 610 kboe/d 2014. The two main producing countries in this zone in 2016 were Nigeria and Angola.

In **Nigeria**, the Group's production, primarily offshore, was 243 kboe/d in 2016, compared to 245 kboe/d in 2015 and 257 kboe/d in 2014. This drop in production was due mainly to the sale of interests in certain licenses of the Shell Petroleum Development Company (SPDC) joint venture as well as to difficult operational security conditions in the Niger delta that had a negative impact on onshore production and, in particular, the oil export of the Forcados terminal operated by Shell.

TOTAL operates 5 of the 35 oil mining leases (OML) in which it has interests and also holds interests in 3 oil prospecting licenses (OPL).

TOTAL has offshore operations (production was 160 kboe/d in 2016) notably on the following leases:

- On OML 139 (18%), the Owowo-3 exploration well, drilled in 2016, confirmed the discovery of oil made in 2012 and should enable progress in the preparation of the development plan. The discovery is located near OML 138 (20%), where three oil discoveries were made in 2014 and 2015.
- OML 130 (24%, operator): the development of the Egina field (200 kboe/d capacity) launched in 2013 is underway, and production is expected to start in 2018. The assessment of the Preowei field is planned in 2017.
- On OML 102 (40%, operator), in 2014 TOTAL stopped routine flaring on the Ofon field (Ofon phase 2 project). The gas associated with the production of oil is now compressed and sent onshore to the Nigeria LNG plant. All activities of the Ofon 2 project were completed in 2016 and the drilling of 24 additional wells, started in 2015, continues.
- On OML 99 (40%, operator), studies are ongoing for the development of the Ikike field.
- On OML 118 (12.5%), the Bonga field contributed 19 kboe/d to the Group's production in 2016. Optimization studies of the Bonga South West Aparo project (10% unitized) are ongoing with an investment decision target in 2018.

TOTAL has onshore operations (production was 83 kboe/d in 2016), notably:

- On OML 58 (40%, operator), under its joint venture with Nigerian National Petroleum Corporation (NNPC), a gas production capacity of 550 Mcf/d was reached and delivery of gas to the Nigerian domestic market started in 2016.
- In relation to the SPDC joint venture (10%), which includes 20 oil mining leases (of which 17 are located onshore), the 2016 production was 46 kboe/d (of which 43 kboe/d was onshore). TOTAL sold its 10% interest in OML 24 (in 2014) and OMLs 18 and 29 (in 2015), operated via the SPDC joint venture. In addition, the sale process of OML 25 is underway.

TOTAL is also developing LNG activities with a 15% stake in the Nigeria LNG Ltd company, which owns a liquefaction plant with a 22 Mt/year total capacity. Assessments are ongoing for the installation of an additional capacity of approximately 8.5 Mt/year.

In **Angola**, where TOTAL is the leading oil operator in the country[1], the Group's production was 243 kboe/d in 2016, compared to 248 kboe/d in 2015 and 200 kboe/d in 2014. This production comes from Blocks 17, 14 and 0, and Angola LNG.

- Deep offshore Block 17 (40%, operator), TOTAL's main asset in Angola, is composed of four major producing hubs: Girassol, Dalia, Pazflor and CLOV. TOTAL continued to invest in brown field projects in 2016, including in particular Dalia Phase 2A and Girassol M14, which are expected to start production in 2017. In 2015, Dalia Phase 1A went into production and the start of multiphase pumps enabled production to be increased at Girassol. The Zinia phase 2 project, a satellite development of Pazflor, is moving forward.
- On the ultra-deep offshore Block 32 (30%, operator), the Kaombo project was launched in 2014 to develop the discoveries in the southeast part of the block via two FPSOs (floating production storage and offloading facilities) with a capacity of 115 kb/d

(1) Company data.

each. The drilling campaign of 59 wells began in 2015. In June 2016, a presidential decree was published providing new tax conditions for the project. The center and north parts of the block (outside Kaombo) offer additional exploration potential and are currently being assessed.
– On Block 14 (20%)[(1)], production comes from the Tombua-Landana and Kuito fields as well as the BBLT project, comprising the Benguela, Belize, Lobito and Tomboco fields.
– Block 14K (36.75%) is the offshore unitization area between Angola (Block 14) and the Republic of the Congo (Haute Mer license). The Lianzi field, which is connected to the existing BBLT platform (Block 14), started production in 2015. TOTAL's interest in the unitized zone is held 10% through Angola Block 14 BV and 26.75% through Total E&P Congo.
– On Block 0 (10%), the second phase of the Mafumeira field development project started production in March 2017.

TOTAL is also developing its LNG activities through the Angola LNG project (13.6%), which includes a gas liquefaction plant near Soyo supplied by gas associated with production from Blocks 0, 14, 15, 17 and 18. LNG production started in 2013, but various technical incidents required an extended shutdown of the plant. LNG production restarted in May 2016. Taking into account the revised gas price assumptions, an impairment on Angola LNG was recognized in the 2016 Consolidated Financial Statements.

In the Bas-Congo basin, TOTAL is also the operator of exploration Block 17/06 (30%).

In the deep offshore Kwanza basin, TOTAL is the operator of Blocks 25 (35%) and 40 (40%).The Block 39 license (7.5%) expired at the end of December 2016.

In the **Republic of the Congo**, the Group's production, through its subsidiary Total E&P Congo[(2)], was 90 kboe/d in 2016, compared to 87 kboe/d in 2015 and 95 kboe/d in 2014.

– On the offshore field Moho Bilondo (53.5%, operator), the Phase 1b project (estimated capacity of 40 kboe/d) started production in 2015. The Moho Nord project (estimated capacity of 100 kboe/d) started production in March 2017.
– Block 14K (36.75%) corresponds to the offshore unitization area between the Republic of the Congo (Haute Mer license) and Angola (Block 14 located in Angola). The Lianzi field started production in 2015. TOTAL's interests in the unitization area are held 26.75% by Total E&P Congo and 10% by Angola Block 14 BV.
– Total E&P Congo is operator of Djéno (63%) the sole oil terminal in the country.
– On December 31, 2016, Total E&P Congo returned its interests in the Tchibouela, Tchendo, Tchibeli and Litanzi fields (65%) to the Republic of the Congo, as the licenses have expired.

In **Gabon**, the Group's production was 58 kboe/d in 2016 compared to 59 kboe/d in 2015 and 58 kboe/d in 2014. The Group's activities in Gabon are primarily carried out by Total Gabon[(3)]. TOTAL wholly owns and operates the Anguille and Torpille sector offshore fields, the Mandji Island sector onshore fields and the Cap Lopez oil terminal. TOTAL is also the operator of the Baudroie-Mérou offshore fields (50%) and the Diaba deep offshore license (42.5%), where the Diaman gas discovery was made in 2013. In February 2017, TOTAL signed an agreement for the sale of stakes and the transfer of operatorship in various mature assets. The transaction is subject to approval by the authorities.

In **Uganda**, a growth area for the Group TOTAL has been present in the upstream since 2012, and has a 33.33% stake in the licenses EA-1, EA-1A (Lyec), EA-2 (Bulisa and Kaiso Tonya area) and EA-3 (Kingfisher) all located in the Lake Albert region. TOTAL is the operator of licenses EA-1 and EA-1A. In January 2017, TOTAL signed an agreement to acquire 21.57% of the 33.33% interest held by Tullow in the licenses EA-1, EA-1A, EA-2 and EA-3. TOTAL will take over operatorship from Tullow of license EA-2, enabling significant efficiency gains and synergies. This agreement remains subject to the approvals of the Ugandan authorities and the pre-emption rights of the partners.

In April 2016, the Government of Uganda decided to export the Lake Albert oil through a pipeline (EACOP) via Tanzania to the port of Tanga. In August 2016, the production licenses for EA-1 and EA-2 were formally granted. The partners of the Uganda Joint Venture have launched the FEED (Front End Engineering and Design) phase for the Upstream and the EACOP pipeline.

Rest of the zone of Africa
TOTAL also holds interests in exploration licenses in South Africa, Côte d'Ivoire, Kenya, Mauritania, Mozambique and the Democratic Republic of the Congo, and is negotiating with the authorities with a view to resuming exploration activities in the Republic of South Sudan. In July 2016, TOTAL withdrew from the Bemolanga license in Madagascar.

Middle East and North Africa

In 2016, TOTAL's production in the zone of the Middle East and North Africa was 517 kboe/d, representing 21% of the Group's total production, compared to 531 kboe/d in 2015 and 438 kboe/d in 2014. The two main producing countries in this zone in 2016 were the United Arab Emirates and Qatar.

In the **United Arab Emirates**, the Group's production was 291 kboe/d in 2016 compared to 287 kboe/d in 2015 and 127 kboe/d in 2014. The Group holds, since January 1, 2015, a 10% stake in the Abu Dhabi Company for Onshore Petroleum Operations Ltd. (ADCO) concession for a period of 40 years, which follows a previous onshore concession. This concession covers the 15 main onshore fields of Abu Dhabi and represents more than half of the Emirate's production.

TOTAL holds a 75% stake (operator) in the Abu Al Bukhoosh field and a 13.3% stake in the Abu Dhabi Marine (ADMA) concession, which operates two of the main offshore fields in Abu Dhabi (Umm Shaif and Lower Zakum). TOTAL also holds a 15% stake in Abu Dhabi Gas Industries (GASCO), which produces NGL and condensates from the associated gas produced by ADCO. In addition, TOTAL holds 5% of the Abu Dhabi Gas Liquefaction Company (ADGAS), which processes the associated gas produced by ADMA in order to produce LNG, NGL and condensates, and 5% of National Gas Shipping Company (NGSCO), which owns eight LNG tankers and exports the LNG produced by ADGAS.

TOTAL holds a 24.5% stake in Dolphin Energy Ltd. in partnership with Mubadala, a company owned by the government of Abu Dhabi, that markets to the United Arab Emirates gas coming from Qatar. In October 2016, a long-term gas sale and purchase agreement

(1) Stake held by the company Angola Block 14 BV (TOTAL 50.01%).
(2) Total E&P Congo is owned by TOTAL (85%) and Qatar Petroleum (15%).
(3) Total Gabon is a company under Gabonese law, the shares of which are listed on Euronext Paris and owned by TOTAL (58.28%), the Republic of Gabon (25%) and the public (16.72%).

was signed with Qatar Petroleum for the supply of an additional 0.3 Bcf/d of gas coming from Qatar to be sold domestically.

The Group also owns 33.33% of Ruwais Fertilizer Industries (FERTIL), which produces urea (production capacity of 2 Mt/year).

In **Qatar**, the Group's production was 134 kboe/d in 2016 and in 2015, compared to 132 kboe/d in 2014.

In June 2016, TOTAL signed an agreement granting it a 30% stake in the Al-Shaheen offshore oil field concession for a period of 25 years beginning July 14, 2017. The Al-Shaheen field has been producing since 1994 and lies offshore 80 km north of Ras Laffan. Production, which represents approximately half of Qatar's oil production[(1)], is provided by 30 platforms and 300 wells. As of July 2017, the Al-Shaheen field will be operated by a new operating company, North Oil Company, held by TOTAL (30%) and Qatar Petroleum (70%).

TOTAL operates the Al Khalij field (40%, operator) and participates in the production, processing and exporting of gas from the North Field through its stakes in the Qatargas 1 and Qatargas 2 LNG plants and in Dolphin Energy:

– Qatargas 1: TOTAL holds a 20% stake in the upstream block of Qatargas 1 supplying the three LNG trains of Qatargas 1 (capacity of 10 Mt/y), in which the Group has a 10% interest.
– Qatargas 2: the Group holds a 16.7% stake in train 5, which has an LNG production capacity of 8 Mt/y. TOTAL offtakes part of the LNG produced under the 2006 contracts that provide for the purchase of 5.2 Mt/y of LNG by the Group.
– Dolphin Energy (24.5%): the contract signed in 2001 with Qatar Petroleum provides for the production and sale of gas and liquids from the Dolphin block located on the North Field. Raw gas is processed at the Dolphin plant in Ras Laffan, where the liquids are extracted. This gas is then routed to the United Arab Emirates by a 360 km gas pipeline in order to be sold (contract of 2 Bcf/d over a 25-year period).

In **Oman**, the Group's production was 37 kboe/d in 2016, compared to 36 kboe/d in 2015 and 2014. TOTAL participates in the production of oil principally in Block 6 (4%)[(2)], but also in Block 53 (2%). The Group also produces LNG through its investments in the Oman LNG (5.54%)/Qalhat LNG (2.04%)[(3)] liquefaction complex, with an overall capacity of 10.5 Mt/y.

In **Algeria**, TOTAL's production was 23 kboe/d in 2016 compared to 25 kboe/d in 2015 and 20 kboe/d in 2014. All of the Group's production in Algeria comes from the Tin Fouyé Tabankort (TFT) field (35%). In addition, the development of the Timimoun gas field (37.75%) continued in 2016 with engineering activities, activities related to the construction of the plant and drilling.

In **Iraq**, the Group's production was 18 kboe/d in 2016, stable compared to 2015, and 12 kboe/d in 2014. TOTAL holds a 22.5% stake in the development and production contract for the Halfaya field, located in Missan province. In 2016, the development of phase 3 of the project (to increase production to 400 kb/d) was the subject of additional studies. In Iraqi Kurdistan, TOTAL relinquished four exploration blocks that expired in 2016. An impairment on the assets in Iraqi Kurdistan was recognized in the 2016 Consolidated Financial Statements.

In **Libya**, where security conditions remain unstable, the Group's production was 14 kboe/d in 2016 and in 2015, compared to 27 kboe/d in 2014. This production comes from blocks located on offshore areas 15, 16 and 32 (Al Jurf, 75%[(4)]), which have not been affected by security issues. Since the fourth quarter of 2014, production as well as exploration activities have been stopped on Mabruk – onshore areas 70 and 87 (75%[(4)]) – and on the fields of El Sharara – onshore area 130 and 131 (24%[(4)]). The production on the fields of El Sharara – onshore area 129 and 130 (30%[(4)]) – resumed at the end of December 2016. Taking into account the uncertain context in Libya, an impairment on the onshore assets was recognized in the 2015 Consolidated Financial Statements.

In **Yemen**, the Group had no production in 2016, compared to 17 kboe/d in 2015 and 84 kboe/d in 2014. Due to the security conditions in the vicinity of Balhaf, Yemen LNG, in which the Group holds a stake of 39.62%, stopped its commercial production and export of LNG in April 2015, when Yemen LNG declared *force majeure* to its various stakeholders. The plant is in a preservation mode.

TOTAL is a partner in Block 5 (Marib basin, Jannah license, 15%) and holds various stakes in four onshore exploration licenses.

In **Iran**, TOTAL signed a heads of agreement in November 2016 to develop phase 11 of the giant South Pars gas field (expected production capacity of 370 kboe/d), pursuant to which TOTAL is expected to operate South Pars 11 with a 50.1% interest alongside Petropars (19.9%), a wholly-owned subsidiary of the National Iranian Oil Company ("NIOC"), and the Chinese state-owned company CNPC (30%). The produced gas is expected to supply the Iranian domestic market. Two development phases are planned: the first for the construction of two platforms, 30 wells and two connecting lines to existing onshore treatment facilities, and the second for the installation of offshore compression facilities. This project fits with TOTAL's strategy of expanding its presence in the Middle East and growing its gas portfolio by adding a low unit cost, long plateau gas asset. For further information on the international sanctions concerning Iran, refer to point 1.9 of chapter 4 (Risk factors).

In **Syria**, TOTAL has had no production and no activity since December 2011. The Group has a 100% stake in the Deir Ez Zor license, which was operated by the joint venture company DEZPC, in which TOTAL and the state-owned company SPC each have a 50% share. Additionally, TOTAL is holder of the Tabiyeh contract which came into effect in 2009. For further information on the international sanctions concerning Syria, refer to point 1.9 of chapter 4 (Risk factors).

Rest of the zone of the Middle East and North Africa

TOTAL also holds interests in exploration licenses in Cyprus and Egypt.

(1) Company data.
(2) TOTAL holds an indirect 4% stake in Petroleum Development Oman LLC, operator of Block 6, via its 10% stake in Private Oil Holdings Oman Ltd.
(3) TOTAL's indirect stake via Oman LNG's stake in Qalhat LNG.
(4) TOTAL's stake in the foreign consortium.

Americas

In 2016, TOTAL's production in the zone of the Americas was 279 kboe/d, representing 11% of the Group's total production, compared to 255 kboe/d in 2015 and 247 kboe/d in 2014. The two main producing countries in this zone in 2016 were the United States and Argentina.

In the **United States**, the Group's production was 86 kboe/d in 2016, compared to 89 kboe/d in 2015 and 78 kboe/d in 2014.

Following the exercise of its preemption right, TOTAL acquired in November 2016 the 75% stake held by Chesapeake in the Barnett shale gas assets area located in North Texas, in which the Group had already a 25% interest since 2009. This transaction provides for the restructuring of the gas gathering and transportation contracts with respect to the acquired stake. The planned work relates to well intervention and well restarts. No wells were drilled in 2016 compared to 4 in 2015 and 40 in 2014.

TOTAL also has a 25% stake in a joint venture operated by Chesapeake in the Utica basin (on an acreage mainly located in Ohio) that produces shale gas. TOTAL was not involved in the drilling of any wells in 2016 compared to 8 in 2015 and approximately 170 in 2014.

Following successive decreases in gas prices in the United States, impairments on shale gas assets were recognized in the 2014 and 2015 Consolidated Financial Statements.

In the Gulf of Mexico, TOTAL holds interests in the deep offshore fields Tahiti (17%) and Chinook (33.33%). In Tahiti, the Tahiti Vertical Expansion (TVEX) project was launched in 2016 in order to extend the production level of the field.

The TOTAL (40%) – Cobalt (60%, operator) alliance, formed in 2009 for exploration in the Gulf of Mexico, continued its work to delineate the North Platte discovery.

In **Argentina**, TOTAL operated approximately 30%[1] of the country's gas production in 2016. The Group's production was 78 kboe/d in 2016 compared to 72 kboe/d in 2015 and 75 kboe/d in 2014.

- In Tierra del Fuego, the Group operates the Carina and Aries offshore fields (37.5%). The drilling of two additional wells off the existing platform was completed in 2015. The Vega Pleyade field (37.5%, operator), where development work was launched in 2013 (with a production capacity of 350 Mcf/d), started production in February 2016.
- In the Neuquén basin, two pilot projects were launched following positive initial results of the exploration campaign on its mining licenses in order to assess its gas and shale oil potential: the first on the Aguada Pichana Block (27.27%, operator), where production started mid-2015, and the second on the Rincón la Ceniza (45.00%, operator) and La Escalonada (45.00%, operator) Blocks, where production started in July 2016.

In **Venezuela**, the Group's production was 47 kboe/d in 2016 compared to 52 kboe/d in 2015 and 2014. TOTAL has stakes in PetroCedeño (30.32%) and Yucal Placer (69.50%) as well as the offshore exploration Block 4 of Plataforma Deltana (49%).

Development of the extra heavy oil field of PetroCedeño continues (39 production wells were drilled in 2016 compared to 47 in 2015 and 86 in 2014), as well as the debottlenecking project for the water separation and treatment facilities.

In **Bolivia**, the Group's production, mainly gas, was 34 kboe/d in 2016, compared to 28 kboe/d in 2015 and 30 kboe/d in 2014. TOTAL is active on seven licenses: three production licenses at San Alberto (15%), San Antonio (15%) and Block XX Tarija Oeste (41%); two licenses in development phase, Aquio and Ipati (50%[2], operator); and two exploration phase licenses, Rio Hondo (50%) and Azero (50%, operator of the exploration phase).

- The Incahuasi gas field, located in the Aquio and Ipati Blocks, started production in August 2016. A second development phase, which would involve the drilling of three additional wells, is under consideration.
- TOTAL holds a 50% stake in the Azero exploration license located in the Andean foothills, which extends over an area of more than 7,800 km². The exploration period began in 2014. A geophysical data acquisition campaign was started in the fourth quarter of 2016 and is expected to be followed by the drilling of a well in 2018.

In **Canada**, the Group's production was 34 kboe/d in 2016 compared to 14 kboe/d in 2015 and 12 kboe/d in 2014. The Group's activities were not significantly affected by the wildfires that struck Alberta in May and June 2016. The Group's production comes entirely from the Surmont (50%) project developed by SAGD[3], the second phase of which was commissioned in 2015. Following the ramp-up of this phase in 2016 and 2017, the project is expected to produce a total of approximately 150 kb/d (75 kb/d Group share).

Construction of the Fort Hills oil sands mining project was more than 80% complete at year-end 2016, and the operator expects to start production at the end of 2017.

As a result of a full comparative analysis of its global asset portfolio in the context of lower oil prices, the Group decided in 2015 to decrease its exposure to Canadian oil sands and reduced its stake in Fort Hills from 39.2% to 29.2%. An impairment on the part of the asset sold was recognized in the 2015 Consolidated Financial Statements.

On the Joslyn (38.25%, operator) and Northern Lights (50% operator) licenses, the projects were suspended in 2014 and works have been strictly limited to legal and contractual obligations, and maintaining safety.

An impairment on the oil sands assets was recognized in the 2014 Consolidated Financial Statements.

In **Brazil**, a growth area for the Group, TOTAL acquired in 2013 a 20% stake in the Libra field, located in the Santos basin.

The Libra field is located in the ultra-deep offshore (2,000 m) approximately 170 km off the coast of Rio de Janeiro, and covers an area of 1,550 km². In 2014, construction started on a 50 kb/d capacity FPSO for long-term production testing. At year-end 2016, in addition to the discovery well, eight wells have been drilled in the field. Development phase 1 (17 wells connected to an FPSO with a capacity of 150 kb/d) is expected to start in 2017.

In addition, the Group holds 17 exploration licenses located in the Foz do Amazonas, Barreirinhas, Ceará, Espirito Santo and Pelotas

(1) Source: Department of Federal Planning, Public Investment and Services, Energy Secretariat.
(2) In 2016, TOTAL reduced its stake in Aquio and Ipati from 60% to 50%.
(3) Steam Assisted Gravity Drainage, production by injection of recycled water vapor.

basins. An initial exploration well is expected to be drilled by year-end 2017 in the Foz do Amazonas basin.

In February 2017, TOTAL and Petrobras signed definitive contracts in relation to a package of upstream and downstream gas and electricity assets in Brazil and other international opportunities contemplated by their strategic alliance agreed in December 2016. As part of this strategic alliance, TOTAL will hold a 22.5% interest in the concession area named Iara, located in Block BM-S-11, which is currently under development, as well as a 35% interest and the operatorship in the Lapa field concession area, located in Block BM-S-9. The Lapa field entered into production in December 2016. Petrobras will have the option of taking a 20% stake in the deep-water exploration Block 2 (Perdido Belt) recently obtained during the bid round in Mexico. Finally, technical cooperation between the two companies will be strongly reinforced, in particular by the joint assessment of the exploration potential of promising areas in Brazil and by the development of new technologies, in particular in deep-water. The deal is subject to regulatory approvals, the potential exercise of preemptive rights by current partners on the Iara concession and other conditions precedent.

In **Mexico**, TOTAL was awarded in December 2016 exploration licenses on three blocks in offshore Mexico, following the country's first competitive deep water bid round resulting from the reform of the energy sector. Located in the Perdido basin, Block 2 (50%, operator) covers a surface area of 2,977 km² at water depths ranging from 2,300 m to 3,600 m. Block 1 (33.3%) and Block 3 (33.3%) are located in the Salina basin and cover a surface area of 2,381 km² and 3,287 km², respectively.

Rest of the zone of the Americas
TOTAL also owns interests in exploration licenses in Aruba, Colombia, French Guyana and Uruguay.

Asia-Pacific

In 2016, TOTAL's production in the zone of Asia-Pacific was 265 kboe/d, representing 11% of the Group's overall production, compared to 258 kboe/d in 2015 and 238 kboe/d in 2014. The two main producing countries in this zone in 2016 were Indonesia and Thailand.

In **Indonesia**, the Group's production was 140 kboe/d in 2016 compared to 147 kboe/d in 2015 and 130 kboe/d in 2014.

TOTAL's operations in Indonesia are primarily concentrated on the Mahakam license (50%, operator), which in particular includes the Peciko and Tunu gas fields. The Group also has a stake in the Sisi-Nubi gas field (47.9%, operator). The Mahakam license expires in December 2017. The Indonesian government has decided to allocate 100% of the participating interest to Pertamina (operator) from January 1, 2018 onwards, while giving Pertamina the possibility to farm out some interests to TOTAL and its current partner, INPEX. The Group delivers most of its natural gas production to the Bontang LNG plant. These volumes of gas represented more than 80% of the Bontang plant's supply in 2016. To this gas production was added the operated production of oil and condensates from the Handil and Bekapai fields.

– On the Mahakam license, the works aimed at maintaining production on the Tunu, Peciko, South Mahakam, Sisi-Nubi and Bekapai fields continued.
– On the Sebuku license (15%), production from the Ruby gas field is routed by pipeline for processing and separation at the Senipah terminal (operated by TOTAL).
– TOTAL also holds stakes in two exploration blocks: Mentawai (80%, operator) and Telen (100%).

In addition, the Group holds stakes in blocks with no activity and for which a relinquishment process is underway: South Mandar (49.3%), South Sageri (100%), South West Bird's Head (90%, operator) and South East Mahakam (50%, operator).

In **Thailand**, the Group's production was 60 kboe/d in 2016 compared to 62 kboe/d in 2015 and 60 kboe/d in 2014. This production comes from the offshore gas and condensate field of Bongkot (33.33%). PTT (the Thai state-owned company) purchases all of the natural gas and condensate production. New investments are underway for maintaining the plateau and responding to gas demand.

In **Myanmar**, the Group's production was 21 kboe/d in 2016, compared to 19 kboe/d in 2015 and 17 kboe/d in 2014.

The Yadana field (31.24%, operator), located on the offshore Blocks M5 and M6, primarily produces gas for delivery to PTT for use in Thai power plants. The Yadana field also supplies the domestic market via an offshore pipeline built and operated by MOGE, a Myanmar state-owned company. The LCP-Badamyar project, which includes the installation of the Badamyar field compression and development platform connected to the Yadana facilities, was launched in 2014. Drilling at Badamyar began in November 2016.

In 2014, TOTAL was awarded the deep offshore Block YWB (100%, operator) during the offshore round launched by the local authorities. The PSC was signed in 2015.

In 2015, the Group sold its stake in the offshore Block M11 (47.06%) and entered exploration license A6 (40%) located in the deep offshore area west of Myanmar. A first well was drilled in 2015 on which a natural gas discovery has been made and which requires further evaluation work.

In 2016, TOTAL signed farm-in agreements on the deep offshore licenses MD-02 (40%), MD-04 (40%) and MD-07 (50%).

In **Brunei**, TOTAL operates the Maharaja Lela Jamalulalam offshore gas and condensate field on Block B (37.5%). The Group's production was 18 kboe/d in 2016 compared to 15 kboe/d in 2015 and 2014. The gas is delivered to the Brunei LNG liquefaction plant. Discussions are underway regarding the terms of the unitization of the northern part of the Maharaja Lela Jamalulalam field with the Malaysian part of the field.

On the Maharaja Lela South project, a first debottlenecking phase for the production processing plant was completed in 2015, increasing production capacity by 20% (from 165 Mcf/d to 200 Mcf/d). Offshore, the installation of a third platform was completed at the end of 2015 and the drilling campaign is ongoing. Three wells started production in 2016.

Studies are currently being conducted to reassess the potential of the deep offshore exploration Block CA1 (86.9%, operator), which includes the Jagus East discovery. A well was drilled in 2015, and has confirmed the connection of the Jagus East field with the Gumusut-Kakap reservoirs in Malaysia. Discussions regarding the terms of the unitization of these two reservoirs are underway. They aim to ensure unified governance of the fields while setting out the distribution of costs and production between the parties.

In **Australia**, where TOTAL has had mining rights since 2005, the Group's production was 16 kboe/d in 2016, compared to 4 kboe/d in 2015 and 2014.

- The Ichthys project (30%) involves the development of a gas and condensate field located in the Browse Basin. This development will include a floating platform designed for the production, processing and export of gas, an FPSO (with condensate processing capacity of 100 kb/d) to stabilize and export the condensate, an 889 km gas pipeline and an onshore liquefaction plant (with 8.9 Mt/y LNG and 1.6 Mt/y LPG capacities) at Darwin. The LNG has already been sold, mainly to Asian buyers, under long-term contracts. As per the information provided by the operator, production is expected to start before the end of 2017.
- Gladstone LNG (GLNG) (27.5%) is an integrated gas production, transportation and liquefaction project with a capacity of 7.8 Mt/y from the Fairview, Roma, Scotia and Arcadia fields. Train 1 of the plant started production in 2015 and train 2 in May 2016. An impairment was recognized in the 2015 and 2016 Consolidated Financial Statements.

In **China**, where TOTAL has been operating since 2006, the Group's production was 10 kboe/d in 2016 compared to 11 kboe/d in 2015 and 12 kboe/d in 2014. This production comes from the South Sulige Block (49%) in the Ordos Basin of Inner Mongolia, where the drilling of tight gas development wells is ongoing.

In **Papua New Guinea**, where TOTAL has been active since 2012, the Group owns a stake in Block PRL-15 (40.1%, operator since 2015). The State of Papua New Guinea retains the right to take a stake in the license (when the final investment decision is made) at a maximum level of 22.5%. In this case, TOTAL's stake would be reduced to 31.1%.

Block PRL-15 includes the two discoveries Elk and Antelope, growth areas for the Group. A delineation program of these discoveries is underway. The results of the first wells drilled have confirmed the level of resources in the Elk and Antelope fields. In 2015, the location of the various production sites was announced to the authorities. In 2016, work on the development studies continued and the Group carried out the environmental and societal baseline studies in the country that are necessary for the granting of authorization to start production in the fields.

In 2016, TOTAL signed an agreement to obtain a 35% stake in exploration license PPL339, located in Gulf Province.

In 2016, the authorities awarded TOTAL (100%) deep offshore exploration license PPL576 in the Coral Sea. A multi-client seismic survey was performed on the block during the fourth quarter of 2016.

Rest of the zone of Asia-Pacific

TOTAL also holds interests in exploration licenses in Malaysia and the Philippines. In Cambodia, TOTAL is working to implement an agreement entered into in 2009 with the Cambodian government for the exploration of Block 3 located in an area of the Gulf of Thailand disputed by the governments of Cambodia and Thailand. This agreement remains conditioned on the establishment by both countries of an appropriate contractual framework.

2.1.1.9. Oil and gas acreage

As of December 31, (in thousands of acres at year-end)		2016 Undeveloped acreage[(a)]	2016 Developed acreage
Europe and Central Asia (excl. Russia)	Gross	18,416	719
	Net	6,989	154
Russia	Gross	3,584	503
	Net	666	93
Africa (excl. North Africa)	Gross	79,517	806
	Net	46,071	200
Middle East and North Africa	Gross	37,148	2,606
	Net	9,991	371
Americas	Gross	24,569	992
	Net	13,155	468
Asia-Pacific	Gross	44,242	738
	Net	27,373	276
Total	**Gross**	**207,476**	**6,364**
	Net[(b)]	**104,245**	**1,562**

(a) Undeveloped acreage includes leases and concessions.
(b) Net acreage equals the sum of the Group's equity stakes in gross acreage.

2.1.1.10. Number of productive wells

As of December 31, (wells at year-end)		2016 Gross productive wells	2016 Net productive wells[(a)]
Europe and Central Asia (excl. Russia)	Oil	415	106
	Gas	259	87
Russia	Oil	232	39
	Gas	489	80
Africa (excl. North Africa)	Oil	2,091	561
	Gas	96	19
Middle East and North Africa	Oil	9,385	609
	Gas	161	44
Americas	Oil	954	322
	Gas	3,585	2,230
Asia-Pacific	Oil	124	55
	Gas	2,802	976
Total	**Oil**	**13,201**	**1,692**
	Gas	**7,392**	**3,436**

(a) Net wells equal the sum of the Group's equity stakes in gross wells.

2.1.1.11. Number of net productive and dry wells drilled

As of December 31, (wells at year-end)	2016 Net productive wells drilled[(a)(b)]	2016 Net dry wells drilled[(a)(c)]	2016 Net total wells drilled[(a)(c)]	2015 Net productive wells drilled[(a)(b)]	2015 Net dry wells drilled[(a)(c)]	2015 Net total wells drilled[(a)(c)]	2014 Net productive wells drilled[(a)(b)]	2014 Net dry wells drilled[(a)(c)]	2014 Net total wells drilled[(a)(c)]
Exploratory									
Europe and Central Asia (excl. Russia)	1.1	1.0	2.1	1.0	4.6	5.6	1.4	0.2	1.6
Russia	-	-	-	-	-	-	-	0.3	0.3
Africa (excl. North Africa)	0.7	-	0.7	0.2	2.1	2.3	1.7	2.3	4.0
Middle East and North Africa	0.8	-	0.8	0.3	0.5	0.8	0.6	1.3	1.9
Americas	2.1	0.8	2.9	1.4	0.6	2.0	2.1	0.3	2.4
Asia-Pacific	1.6	-	1.6	2.0	0.9	2.9	1.2	1.1	2.3
Total	**6.3**	**1.8**	**8.1**	**4.9**	**8.7**	**13.6**	**7.0**	**5.5**	**12.5**
Development									
Europe and Central Asia (excl. Russia)	13.6	0.5	14.1	15.7	0.4	16.1	9.0	-	9.0
Russia	18.7	-	18.7	22.9	-	22.9	28.8	0.8	29.6
Africa (excl. North Africa)	14.6	-	14.6	21.4	-	21.4	24.1	1.0	25.1
Middle East and North Africa	49.3	1.1	50.4	36.6	0.6	37.2	36.6	0.2	36.8
Americas	35.4	-	35.4	60.6	0.1	60.7	128.1	0.2	128.3
Asia-Pacific	151.0	-	151.0	86.9	-	86.9	106.0	0.5	106.5
Total	**282.6**	**1.6**	**284.2**	**244.1**	**1.1**	**245.2**	**332.6**	**2.7**	**335.3**
Total	**288.9**	**3.4**	**292.3**	**249.0**	**9.8**	**258.8**	**339.6**	**8.2**	**347.8**

(a) Net wells equal the sum of the Company's fractional interests in gross wells.
(b) Includes certain exploratory wells that were abandoned, but which would have been capable of producing oil in sufficient quantities to justify completion.
(c) For information: service wells and stratigraphic wells are not reported in this table.

2.1.1.12. Wells in the process of being drilled (including wells temporarily suspended)

As of December 31, (wells at year-end)	2016 Gross	2016 Net[(a)]
Exploratory		
Europe and Central Asia (excl. Russia)	4	0.9
Russia	-	-
Africa (excl. North Africa)	18	4.6
Middle East and North Africa	2	0.8
Americas	10	3.5
Asia-Pacific	5	1.3
Total	**39**	**11.1**
Other wells[(b)]		
Europe and Central Asia (excl. Russia)	45	11.8
Russia	111	27.9
Africa (excl. North Africa)	72	21.3
Middle East and North Africa	174	25.2
Americas	46	28.0
Asia-Pacific	421	116.7
Total	**869**	**230.9**
Total	**908**	**242.0**

(a) Net wells equal the sum of the Group's equity stakes in gross wells. Includes wells for which surface facilities permitting production have not yet been constructed. Such wells are also reported in the table "Number of net productive and dry wells drilled", above, for the year in which they were drilled.
(b) Other wells are developments wells, service wells, stratigraphic wells and extension wells.

2.1.1.13. Interests in pipelines

The table below sets forth interests of the Group's entities[(1)] in the main oil and gas pipelines as of December 31, 2016.

Pipeline(s)	Origin	Destination	(%) interest	Operator	Liquids	Gas
Europe and Central Asia						
Azerbaijan						
BTC	Baku (Azerbaijan)	Ceyhan (Turkey, Mediterranean)	5.00		X	
Norway						
Frostpipe (inhibited)	Lille-Frigg, Froy	Oseberg	36.25		X	
Heimdal to Brae Condensate Line	Heimdal	Brae	16.76		X	
Kvitebjorn Pipeline	Kvitebjorn	Mongstad	5.00		X	
Norpipe Oil	Ekofisk Treatment center	Teeside (UK)	34.93		X	
Oseberg Transport System	Oseberg, Brage and Veslefrikk	Sture	12.98		X	
Sleipner East Condensate Pipe	Sleipner East	Karsto	10.00		X	
Troll Oil Pipeline I et II	Troll B et C	Vestprosess (Mongstad refinery)	3.71		X	
Vestprosess	Kollsnes (Area E)	Vestprosess (Mongstad refinery)	5.00		X	
Polarled	Asta Hansteen/Linnorm	Nyhamna	5.11			X
The Netherlands						
Nogat Pipeline	F3-FB	Den Helder	5.00			X
WGT K13-Den Helder	K13A	Den Helder	4.66			X
WGT K13-Extension	Markham	K13 (via K4/K5)	23.00			X
United Kingdom						
Alwyn Liquid Export Line	Alwyn North	Cormorant	100.00	X	X	
Bruce Liquid Export Line	Bruce	Forties (Unity)	43.25		X	
Central Graben Liquid Export Line (LEP)	Elgin-Franklin	ETAP	15.89		X	
Frigg System: UK Line	Alwyn North, Bruce and others	St. Fergus (Scotland)	100.00	X		X
Ninian Pipeline System	Ninian	Sullom Voe	16.00		X	
Shearwater Elgin Area Line (SEAL)	Elgin-Franklin, Shearwater	Bacton	25.73			X
SEAL to Interconnector Link (SILK)	Bacton	Interconnector	54.66	X		X
Africa (excl. North Africa)						
Gabon						
Mandji Pipes	Mandji fields	Cap Lopez Terminal	100.00[(a)]	X	X	
Rabi Pipes	Rabi fields	Cap Lopez Terminal	100.00[(a)]	X	X	
Nigeria						
O.U.R	Obite	Rumuji	40.00	X		X
NOPL	Rumuji	Owaza	40.00	X		X
Middle East and North Africa						
Qatar						
Dolphin	North Field (Qatar)	Taweelah-Fujairah-Al Ain (United Arab Emirates)	24.50			X
Americas						
Argentina						
TGN	Network (Northern Argentina)		15.38			X
TGM	TGN	Uruguyana (Brazil)	32.68			X
Brazil						
TBG	Bolivia-Brazil border	Porto Alegre via São Paulo	9.67			X
TSB	Argentina-Brazil border (TGM) Porto Alegre	Uruguyana (Brazil) Canoas	25.00			X
Asia-Pacific						
Australia						
GLNG	Fairview, Roma, Scotia, Arcadia	GLNG (Curtis Island)	27.50			X
Myanmar						
Yadana	Champ de Yadana field	Ban-I Tong (Thai border)	31.24	X		X

(a) Interest of Total Gabon. The Group has a financial interest of 58.28% in Total Gabon.

(1) Excluding equity affiliates, except for the Yadana and Dolphin pipelines.

2.1.2. Gas

The activities of TOTAL in the gas business have a primary objective to contribute to the growth of the Group by ensuring market outlets for its current and future natural gas production.

Beyond the production and liquefaction of natural gas (refer to point 2.1.1 of this chapter), TOTAL actively markets natural gas, which is sold either by pipeline or in the form of Liquefied Natural Gas (LNG) and develops a downstream portfolio for its trading and shipping activities, as well as regasification terminals.

In order to enhance the value of the Group's gas resources, the activities of Gas also include the trading and marketing of natural gas, LNG, Liquefied Petroleum Gas (LPG) and electricity as well as shipping of LNG and LPG. The Group also has stakes in infrastructure companies (including regasification terminals, natural gas transportation and storage, and power plants) necessary to implement its strategy.

2.1.2.1. Purchases, sales and shipping of LNG

A pioneer in the LNG industry, TOTAL is today one of the world's leading players[(1)] in the sector and has sound and diversified positions both in the upstream and downstream portions of the LNG chain. LNG development is a key element of the Group's strategy, strengthening its positions in most major production zones and markets.

Through its stakes in liquefaction plants located in Qatar, the United Arab Emirates, Oman, Nigeria, Norway, Yemen, Angola and Australia and its gas supply agreement with the Bontang plant in Indonesia, the Group markets LNG in all global markets. In 2016, the share of LNG production sold by TOTAL was 11 Mt, compared to 10.2 Mt in 2015 and 12.2 Mt in 2014. The reduction between 2014 and 2015 was due to *force majeure* being declared in 2015 for the Yemen LNG[(2)] joint venture due to the deterioration of security conditions. The growth of LNG production sold by TOTAL over the coming years is expected to be ensured by the Group's liquefaction projects under construction in Australia and Russia and by projects currently under consideration, including a new project in Papua New Guinea and the expansion of the Nigeria LNG plant.

In January 2017, TOTAL finalized the acquisition of approximately 23% of Tellurian Investments Inc. ("Tellurian"), announced in December 2016, in order to develop an integrated gas project, from the acquisition of gas produced at a competitive cost in the United States to the delivery of LNG to international markets from the Driftwood LNG terminal. Driftwood LNG is in the engineering design and pre-filing phase.

Long-term Group LNG purchases and sales

TOTAL acquires long-term LNG volumes mainly from liquefaction projects in which the Group holds an interest, including Qatargas 2 (Qatar), Yemen LNG (Yemen), Nigeria LNG (Nigeria) and Snøhvit (Norway). These volumes support the expansion of the Group's worldwide LNG portfolio.

Since 2009, a growing portion of the long-term volume purchased by the Group that was initially intended for delivery to North American and European markets has been diverted to more buoyant Asian markets.

New LNG sources are expected to support the growth of the Group's LNG portfolio, including Ichthys LNG (Australia), Yamal LNG[(3)] (Russia), trains 3 and 5 of Sabine Pass LNG (United States) and Cameron LNG (United States).

TOTAL has entered into several significant long-term agreements throughout the world for the sale of LNG from the Group's global LNG portfolio, notably in China, Indonesia, Japan, South Korea and Spain.

LNG shipping

As part of its LNG transport activities, TOTAL uses two long-term chartered LNG tankers: since 2006, the *Arctic Lady*, with a capacity of 145,000 m^3, and since 2011, the *Meridian Spirit*, with a capacity of 165,000 m^3, primarily for the transport of volumes from Snøhvit in Norway.

TOTAL continues to develop its fleet. The Group also signed a long-term charter agreement in 2013 with SK Shipping and Marubeni for two 180,000 m^3 LNG tankers. The vessels will serve to fulfill the purchase obligations of Total Gas & Power Limited, including commitments relating to the Ichthys and Sabine Pass projects. They will be among the largest LNG tankers to navigate the Panama Canal and are expected to be delivered in 2017 and 2018 respectively.

2.1.2.2. Trading

In 2016, TOTAL continued its strategy downstream from natural gas and LNG production by developing its trading, marketing and logistics activities. The aim of this strategy is to optimize access for the Group's current and future production to markets supplied based on long-term contracts and to markets open to international competition (with short-term contracts and spot sales). Furthermore, the Group is developing new LNG markets by promoting LNG import infrastructure projects such as described in point 2.1.2.4, below. The Group also has operations in electricity trading and the marketing of LPG and petcoke. Since 2016, TOTAL has also been active in the marketing of sulfur. In 2016, the Group stopped its coal trading activities.

The trading teams are located in London, Houston, Geneva and Singapore.

Gas and electricity

TOTAL is pursuing gas and electricity trading operations in Europe and North America in order to sell the Group's production, to supply its marketing subsidiaries and to support other entities of the Group.

In **Europe**, TOTAL traded 887 Bcf (25.1 Bcm) of natural gas in 2016, compared to 849 Bcf (24 Bcm) in 2015 and 911 Bcf (25.8 Bcm) in 2014. The Group also traded 49.1 TWh of electricity in 2016, compared to 41.1 TWh in 2015 and 44.8 TWh in 2014, mainly from external sources.

In **North America**, TOTAL traded 356 Bcf (10.1 Bcm) of natural gas in 2016 from its own production or from external resources compared to 441 Bcf (12.5 Bcm) in 2015 and 593 Bcf (16.8 Bcm) in 2014.

(1) Company data, based on upstream and downstream LNG portfolios in 2016.
(2) The Yemen LNG plant has been shut down since April 2015. For more information, refer to point 2.1.1.8 of this chapter.
(3) OAO Yamal LNG, which is developing the Yamal LNG project, is held by PAO Novatek (50.1%), Total E&P Yamal (20%), CNODC (20%), a subsidiary of China National Petroleum Corporation, and Silk Road Fund (9.9%). For information on international economic sanctions concerning Russia, refer to point 1.9 of chapter 4.

LNG

TOTAL operates LNG trading activities through both spot sales and long-term contracts such as those described in point 2.1.2.1 above. Significant sales and purchase agreements (SPAs) have permitted appreciable development of the Group's activities in LNG trading, especially in the Asian markets (China, South Korea, India and Japan). The spot and fixed-term LNG portfolio allows TOTAL to supply gas to its main customers worldwide, while retaining a sufficient degree of flexibility to react to market opportunities.

In 2016, TOTAL purchased 51 contractual cargoes under long term contracts (from Qatar, Nigeria and Norway) and 19 spot or medium term cargoes, compared to, respectively, 64 and 20 in 2015 and 88 and 7 in 2014. Deliveries from Yemen LNG have been interrupted since April 2015.

LPG

In 2016, TOTAL traded nearly 5.3 Mt of LPG (propane and butane) worldwide, compared to 5.8 Mt in 2015 and 5.5 Mt in 2014. Nearly 28% of these quantities come from fields or refineries operated by the Group. This trading activity was conducted by means of 9 time-chartered vessels. In 2016, 323 voyages were necessary for transporting the negotiated quantities, including 217 journeys carried out by TOTAL's time-chartered vessels and 106 journeys by spot-chartered vessels.

Petcoke and sulfur

TOTAL has been trading petcoke produced since 2011 by the Port Arthur refinery in the **United States**. 1.1 Mt of petcoke were sold on the international market in 2016, compared to 1.1 Mt in 2015 and 1.3 Mt in 2014.

In 2014, TOTAL began trading petcoke from the Jubail refinery in **Saudi Arabia**. In 2016, 890 kt were sold, compared to 720 kt in 2015 and 100 kt in 2014.

Petcoke is sold to cement producers and electricity producers mainly in India, as well as in Mexico, Brazil and other Latin American countries and in Turkey.

In 2016, TOTAL sold 0.7 Mt of sulfur, mainly from its refineries' production.

2.1.2.3. Marketing

To optimize its position throughout the value chain and to leverage the synergies from the Group's other activities, TOTAL has been developing the business of marketing natural gas and electricity to end users.

In the **United Kingdom**, TOTAL markets gas and electricity to the industrial and commercial segments through its subsidiary Total Gas & Power Ltd. In 2016, the volumes of gas sold were 143 Bcf (4.0 Bcm), compared to 140 Bcf (4.0 Bcm) in 2015 and 135 Bcf (3.8 Bcm) in 2014. Electricity sales were 7.4 TWh in 2016, compared to 6.0 TWh in 2015 and 5.3 TWh in 2014.

In **France**, TOTAL operates in the natural gas market through its marketing subsidiary Total Énergie Gaz, the sales of which were 77 Bcf (2.2 Bcm) in 2016, compared to 84 Bcf (2.4 Bcm) in 2015 and 95 Bcf (2.7 Bcm) in 2014.

In **Germany**, Total Energie Gas GmbH, a marketing subsidiary of TOTAL, marketed 29 Bcf (0.9 Bcm) of gas in 2016 to industrial and commercial customers, compared to 31 Bcf (0.9 Bcm) in 2015 and 24 Bcf (0.7 Bcm) in 2014.

In 2016, the volumes of gas delivered to the industrial and commercial segments were 4 Bcf (0.1 Bcm) in **Belgium** (Total Gas & Power Belgium) and 9 Bcf (0.3 Bcm) in the **Netherlands** (Total Gas & Power Nederland B.V.), an increase with respect to previous years, these two subsidiaries having started marketing gas in 2013.

In 2015, the natural gas marketing subsidiaries in France, Germany, Belgium and the Netherlands extended their activities to the marketing of electricity to industrial and commercial consumers. The volumes sold in 2016 are still modest.

As part of its development strategy for its gas and electricity marketing activities, TOTAL finalized in September 2016 the acquisition of Lampiris, the third-largest gas and electricity supplier in Belgium with more than 750,000 metering points. Lampiris is also active in France, where it markets gas and electricity to the residential and commercial segments.

In **Spain**, TOTAL markets natural gas to the industrial and commercial segments through Cepsa Gas Comercializadora, in which it holds a 35% stake. In 2016, the volumes of gas sold reached 100 Bcf (2.8 Bcm), compared to 105 Bcf (3.0 Bcm) in 2015 and 94 Bcf (2.7 Bcm) in 2014.

In **Argentina**, the subsidiary Total Gas Marketing Cono Sur oversees the marketing of gas on behalf of Total Austral, the Group's production subsidiary in Argentina. In 2016, the volumes of gas sold reached 142 Bcf (4.0 Bcm), compared to 128 Bcf (3.6 Bcm) in 2015 and 131 Bcf (3.7 Bcm) in 2014.

The Group also holds stakes in the marketing companies that are associated with the LNG regasification terminals located at Altamira in **Mexico** and Hazira in **India**.

2.1.2.4. Gas facilities

Downstream from its natural gas and LNG production activities, TOTAL holds stakes in natural gas transport networks and LNG regasification terminals.

Transportation and storage of natural gas

The Group holds stakes in several natural gas transportation companies located in **Brazil** and **Argentina**. These companies are facing a difficult operational and financial environment in Argentina.

In **France**, TOTAL sold in February 2016 its stake in Géosud, which held an interest in Géométhane, a company that owns and operates several natural gas storage caverns in Manosque.

LNG regasification

TOTAL has entered into agreements to obtain long-term access to LNG regasification capacity worldwide: in the Americas (United States, Mexico and Brazil), Europe (France and the United Kingdom), Asia (India) and Africa (Côte d'Ivoire). This diversified market presence allows the Group to access new liquefaction projects by becoming a long-term buyer of a portion of the LNG produced, thereby strengthening TOTAL's LNG supply portfolio.

In **France**, TOTAL holds a 27.5% stake in the company Fosmax and has access to a regasification capacity of 78 Bcf/y (2.25 Bcm/y). The terminal received 54 vessels in 2016, compared to 46 in 2015 and 2014.

TOTAL holds a 9.99% stake in Dunkerque LNG, which operates an LNG receiving terminal with a capacity of 459 Bcf/y (13 Bcm/y). Trade agreements have also been signed that allow TOTAL to reserve up to 2 Bcm/y of regasification capacity over a 20-year term. Commercial operations started on January 1, 2017.

In the **United Kingdom**, through its equity interest in the Qatargas 2 project, TOTAL holds an 8.35% stake in the South Hook LNG receiving terminal with a total capacity of 742 Bcf/y (21 Bcm/y) and an equivalent access right to the regasification capacity. The terminal received 67 cargoes in 2016, compared to 84 in 2015 and 67 in 2014.

In **Mexico**, TOTAL has reserved 25% of the regasification capacity of the Altamira receiving terminal, *i.e.*, 59 Bcf/y (1.7 Bcm/y), through its 25% stake in Gas del Litoral.

In the **United States**, TOTAL has reserved a regasification capacity of approximately 353 Bcf/y (10 Bcm/y) in the Sabine Pass terminal (Louisiana) for a 20-year period until 2029. In 2012, TOTAL and Sabine Pass Liquefaction (SPL) signed agreements allowing SPL to gradually obtain access to TOTAL's reserved capacity. Access to 38 Bcf/y commenced in 2012, growing to 195 Bcf/y from the start-up of train 3 scheduled in 2017 and plateauing at substantially all of TOTAL's capacity from the start-up of train 5 scheduled in 2019. In return, SPL will pay TOTAL a fee linked to the capacity assigned.

In **India**, TOTAL holds a 26% stake in the Hazira receiving terminal, with a regasification capacity of 244 Bcf/y (6.9 Bcm/y). Located in the Gujarat state, this merchant terminal with operations that cover both LNG regasification and gas marketing, received 60 vessels (equivalent) in 2016, compared to 57 in 2015 and 45 in 2014.

In **Côte d'Ivoire**, a consortium led by TOTAL (34%, operator) has been assigned responsibility for developing and operating an LNG regasification terminal in Abidjan with a capacity of 3 Mt/y and a start-up scheduled in 2018.

In **Brazil**, as part of its strategic alliance with Petrobras, the definitive contracts of which were signed in February 2017, TOTAL expects to proceed with the acquisition from Petrobras of regasification capacity in the Bahia LNG terminal.

2.1.2.5. Electricity generation

In a context of increasing global demand for electricity, TOTAL has developed expertise in the power generation sector, especially through cogeneration and combined-cycle power plant projects.

In **Abu Dhabi**, the Taweelah A1 gas-fired power plant, which is owned by Gulf Total Tractebel Power Company (TOTAL, 20%), combines electricity generation and water desalination. The plant, in operation since 2003, currently has a net power generation capacity of 1,600 MW and a water desalination capacity of 385,000 m^3 per day. The plant's production is sold to Abu Dhabi Water and Electricity Company (ADWEC) as part of a long-term agreement.

In **Thailand**, in September 2016 TOTAL sold the 28% stake it held in Eastern Power and Electric Company Ltd which operates the Bang Bo gas-fired combined cycle power plant with a capacity of 350 MW.

In **Brazil**, as part of its strategic alliance with Petrobras, TOTAL expects to proceed with the acquisition from Petrobras of a 50% interest in two co-generation plants located in the Bahia area.

2.1.2.6. End of coal production and trading

Following completion of the sale in 2015 of its subsidiary Total Coal South Africa, the Group ceased its coal production activities. In addition, in 2016 the Group ended its coal trading activities.

2.2. Refining & Chemicals segment

Refining & Chemicals is a large industrial segment that encompasses refining, petrochemicals and specialty chemicals operations. It also includes the activities of Trading & Shipping.

As part of the One Total new organization, Group biomass activities will be reported within the Refining & Chemicals segment as of financial year 2017 (refer to point 1.3 of this chapter). They were previously part of New Energies within the Marketing & Services segment.

Among the world's 10 largest integrated producers (1)

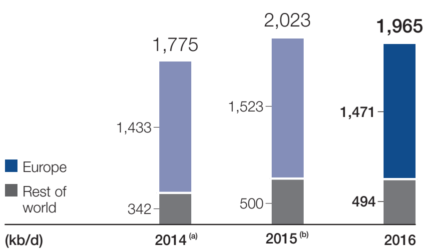
Refining capacity of 2.0 Mb/d at year-end 2016

One of the leading traders of oil and refined products worldwide

$ 1.6 billion of organic investments (2) in 2016

50,433 employees present

Refinery throughput (3)



(a) Excluding the condensate splitters of Port Arthur and Daesan.
(b) Since 2015, Port-Arthur and Daesan condensate splitters are integrated in the Group's refining capacity and the 2015 data have been restated.

Refinery throughput decreased by 3% for the full-year 2016 compared to 2015, notably due to shutdowns in Europe and the US in the second quarter and the sale of the Schwedt refinery in Germany in the fourth quarter 2015.

Refining & Chemicals segment financial data

(M$)	2016	2015	2014
Non-Group sales	65,632	70,623	106,124
Adjusted operating income (a)	4,373	5,649	2,739
Adjusted net operating income (a)	4,201	4,889	2,489
of which specialty chemicals	*581*	*496*	*629*

(a) Adjusted results are defined as income at replacement cost, excluding non-recurring items, and excluding the impact of fair value changes.

The ERMI average was 34 $/t for the full-year 2016, a decrease of 30% compared to the high level of 2015, in the context of high inventories of refined products. Petrochemicals continued to benefit from a favorable environment in 2016.

Adjusted net operating income from the Refining & Chemicals segment was $4,201 million for the full-year 2016, a decrease of 14% compared to 2015 essentially due to the decrease in refining margins. Petrochemicals continued to generate good results, notably due to the strong contribution from the Group's major integrated platforms in Asia and the Middle East.

(1) Based on publicly available information, production capacities at year-end 2015.
(2) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 3.1 of this chapter).
(3) Includes share of TotalErg, as well as refineries in Africa and the French Antilles that are reported in the Marketing & Services segment.

2.2.1. Refining & Chemicals

Refining & Chemicals includes the Group's refining, petrochemicals and specialty chemicals businesses:

– the petrochemicals business includes base petrochemicals (olefins and aromatics) and polymer derivatives (polyethylene, polypropylene, polystyrene and hydrocarbon resins); and
– the specialty chemicals business covers elastomer processing. The sales of electroplating chemistry (Atotech) and adhesives (Bostik) activities were completed in early 2017 and in 2015, respectively.

The volume of its Refining & Chemicals activities places TOTAL among the top ten integrated chemical producers in the world[(1)].

The strategy of Refining & Chemicals integrates a constant requirement of safety, a core value of the Group, and priority given to respect of the environment. In a context of rising worldwide demand for oil and petrochemicals driven by non-OECD countries and the entry of new capacities into the market, the strategy involves:

– improving competitiveness of refining and petrochemicals activities by making optimal use of industrial means of production, concentrating investments on large integrated platforms and adapting production capacity to changes in demand in Europe;
– developing petrochemicals in the United States and the Middle East by exploiting the proximity of advantaged oil and gas resources in order to supply growth markets, in particular Asia; and
– innovating in low-carbon solutions/products by developing biofuels and biopolymers as well as materials and solutions contributing to the energy efficiency of the Group's customers, in particular in the automotive market.

2.2.1.1. Refining and petrochemicals

TOTAL's refining capacity was 2,011 kb/d as of December 31, 2016, compared to 2,247 kb/d at year-end 2015 and 2,187 kb/d at year-end 2014. TOTAL has equity stakes in 19 refineries (including nine operated by companies of the Group), located in Europe, the United States, Africa, the Middle East and Asia.

The Refining & Chemicals segment manages refining operations located in Europe (excluding TotalErg in Italy), the United States, the Middle East, Asia and Africa[(2)] with a capacity of 1,962 kb/j at year-end 2016, *i.e.*, 98% of the Group's total capacity.

The petrochemicals businesses are located mainly in Europe, the United States, Qatar, South Korea and Saudi Arabia. Most of these sites are either adjacent to or connected by pipelines to Group refineries. As a result, TOTAL's petrochemical operations are integrated within its refining operations, thereby maximizing synergies.

Between 2011 and 2016, the Group reduced its production capacities in Europe by 20%, thereby fully meeting the target it had set itself for 2017. The year 2016 saw the continuation of plans to adapt the Lindsey refinery in the United Kingdom with closure at the end of September of one of the two atmospheric distillation towers, and the La Mède refinery in France with stoppage in December of the crude oil treatment prior to the transformation of the site into a bio-refinery scheduled for 2018. TOTAL also continued to develop its major investment project launched in 2013 on the integrated Antwerp platform in Belgium, which is intended to improve the site's conversion rate.

Activities by geographical area

Europe
TOTAL is the largest refiner in Western Europe[(3)].

Western Europe accounts for 72% of the Group's refining capacity, *i.e.*, 1,454 kb/d at year-end 2016, compared to 1,699 kb/d at year-end 2015 and 1,736 kb/d at year-end 2014, in line with the Group's target of reducing capacity in Europe.

The Group operates eight refineries in Western Europe (one in Antwerp, Belgium, five in France in Donges, Feyzin, Gonfreville, Grandpuits and La Mède, one in Immingham in the United Kingdom and one in Leuna, Germany) and owns stakes in the Vlissingen refinery (Zeeland) in the Netherlands and the Trecate refinery in Italy through its interest in TotalErg.

The Group's main petrochemical sites in Europe are located in Belgium, in Antwerp (steam crackers, aromatics, polyethylene) and Feluy (polyolefins, polystyrene), and in France, in Carling (polyethylene, polystyrene), Feyzin (steam cracker, aromatics), Gonfreville (steam crackers, aromatics, styrene, polyolefins, polystyrene) and Lavéra (steam cracker, aromatics, polypropylene). Europe accounts for 49% of the Group's petrochemicals capacity, *i.e.*, 10,383 kt at year-end 2016, compared to 10,394 kt at year-end 2015 and 10,909 kt at year-end 2014.

– In **France**, the Group continues to adapt its refining capacity and to improve its operational efficiency against the backdrop of structural decline in the demand for petroleum products in Europe.

  In 2016, TOTAL continued the significant modernization plan announced in April 2015 for its refining facilities in France, in particular at La Mède, with an investment decision made in 2015 for over €200 million to transform the site and in particular create the first bio-refinery in France. The first step relating to this investment took place at the end of 2016 when the treatment of crude oil was ended. The industrial transformation of La Mède will allow TOTAL to respond to the growing demand for biofuel in Europe. Other activities, such as a logistics and storage platform, a solar energy farm, a training center and an AdBlue production plant[(4)], will also be developed on the site.

  In Donges, the €400 million investment project for the construction of intermediate feedstock desulfurization units and hydrogen production units is being considered. This program requires the re-routing of the railroad track that currently crosses the refinery. A three-party memorandum of intent to fund this re-routing work between the state, local authorities and TOTAL was signed at the end of 2015.

  In 2014, the Group completed its industrial plan, launched in 2009, to reconfigure the Gonfreville refinery in Normandy by commissioning a new diesel desulfurization unit. In addition, the Group modernized production of specialty products on the site and decreased the base oil production capacity.

(1) Based on publicly available information, refining and petrochemicals production capacities at year-end 2015.
(2) Earnings related to certain refining assets in Africa and to the TotalErg joint venture are reported in the results of the Marketing & Services segment.
(3) Based on publicly available information, 2015 refining capacities.
(4) Fuel additive intended for road transport and designed to lower nitrogen oxide (NOx) compound emissions.

In petrochemicals, the Group reconfigured the Carling platform in Lorraine. Steam cracking ended in October 2015. New hydrocarbon resin and compound polypropylene production units were commissioned in 2016.

- In **Germany**, TOTAL operates the Leuna refinery (100%). In 2015, the Group completed the sale of its stake in the Schwedt refinery (16.7%) and acquired a majority stake in Polyblend, a manufacturer of polyolefin compounds that are mainly used in the automotive industry.
- In **Belgium**, the Group launched a major project in 2013 to modernize its Antwerp platform which is expected to be commissioned in 2017:
  - new conversion units in response to the shift in demand towards lighter petroleum products with a very low sulfur content,
  - a new unit to convert part of the combustible gases recovered from the refining process into raw materials for the petrochemical units.

  In addition, the Group is developing a project to enable greater flexibility on one of the steam-cracking units in order to process European ethane as from 2017.
- In the **United Kingdom**, TOTAL decreased the capacity of the Lindsey refinery by half in 2016, reducing it to 5.5 Mt/y. The investment plan also focused on improving the conversion ratio, adapting logistics and simplifying the refinery's organization, thereby lowering the site's break-even point.

North America

The Group's main sites in North America are located in Texas, at Port Arthur (refinery, steam cracker), Bayport (polyethylene) and La Porte (polypropylene), and in Louisiana, at Carville (styrene, polystyrene).

At Port Arthur, TOTAL holds at the same site a 100% interest in a 178 kb/d capacity refinery and a 40% stake in BASF Total Petrochemicals (BTP), which has a condensate splitter and a steam cracker. The Group continues to work on strengthening the synergies between these two plants.

A pipeline connecting the Port Arthur refinery to the Sun terminal in Nederland was commissioned in 2014 to facilitate access to all domestic crudes, which are priced advantageously compared to the international market. Following investments to adapt its furnaces and the construction of a tenth ethane furnace, which was commissioned in 2014, BTP's cracker can produce more than 1 Mt/year of ethylene, including more than 85% from advantaged feedstock (ethane, propane, butane). BTP thus benefits from favorable market conditions in the United States. In addition, in mid-2016, TOTAL completed detailed studies (FEED) for the construction of a new ethane steam cracker with an ethylene production capacity of 1 Mt/y on the Port Arthur site, in synergy with the refinery and BTP steam cracker.

Asia, the Middle East and Africa

TOTAL is continuing to expand in growth areas and is developing sites in countries with favorable access to raw materials. The Group has high-level platforms in these markets which are ideally positioned for growth.

In **Saudi Arabia**, TOTAL has a 37.5% stake in the company SATORP (Saudi Aramco Total Refining and Petrochemical Company), which operates the Jubail refinery. It has been fully operational since mid-2014 and technical and financial completions were reached in June 2016. This refinery has an initial capacity of 400 kb/d and is situated close to Saudi Arabia's heavy crude oil fields. The refinery's configuration enables it to process these heavy crudes and sell fuels and other light products that meet strict specifications and are mainly intended for export. The refinery is also integrated with petrochemical units: a 700 kt/y paraxylene unit, a 200 kt/y propylene unit, and a 140 kt/y benzene unit.

In **China**, TOTAL holds a 22.4% stake in WEPEC, a company that operates a refinery located in Dalian. Discussions are underway to sell this stake to the Chinese partners of the joint venture.

The Group is also active through its polystyrene plant in Foshan in the Guangzhou region and its polystyrene plant in Ningbo in the Shanghai region, each with a capacity of 200 kt/y.

In **South Korea**, TOTAL has a 50% stake in Hanwha Total Petrochemicals Co., Ltd. ("HTC"), which operates a petrochemical complex in Daesan (condensate splitter, steam cracker, styrene, paraxylene, polyolefins). Following the launch in 2014 of new aromatics (paraxylene and benzene) and polymer units (EVA2), HTC continued to expand its activities in 2015 with debottlenecking of the steam cracker and a styrene unit thereby raising its ethylene production capacity to 1.09 Mt/y and styrene production capacity to 1.04 Mt/y. At the end of 2016, the EVA2 unit was debottlenecked. In 2016, the Group benefited from these investments in a favorable economic environment.

In **Qatar**, the Group holds interests [1] in two ethane-based steam crackers (Qapco, Ras Laffan Olefin Cracker – RLOC) and four polyethylene lines (Qapco, Qatofin), including the Qatofin linear low-density polyethylene plant in Messaied with a capacity of 550 kt/y and a 300 kt/y low-density polyethylene line operated by Qapco, which started up in 2012. The Group is considering the debottlenecking of these sites to optimize benefits from the available ethane in the region.

TOTAL holds a 10% stake in the Ras Laffan condensate refinery, the capacity of which increased to 300 kb/d following completion of the project to double the refinery's capacity; the new facilities were commissioned in late 2016.

In Africa, the Group holds interests in four refineries (Cameroon, Côte d'Ivoire, Senegal, South Africa) after the sale of its interest in the refinery in Gabon in 2016. Refining & Chemicals provides technical assistance for two of these refineries: the Natref refinery with a capacity of 109 kb/d in **South Africa** and the SIR refinery with a capacity of 80 kb/d in **Côte d'Ivoire**.

(1) TOTAL shareholdings: Qapco (20%); Qatofin (49%); RLOC (22.5%).

Crude oil refining capacity

The table below sets forth TOTAL's crude oil refining capacity [(a)]:

As of December 31

(kb/d)	2016	2015	2014
Nine refineries operated by Group companies			
Normandy-Gonfreville (100%)	253	247	247
Provence-La Mède (100%)	- [(b)]	153	153
Donges (100%)	219	219	219
Feyzin (100%)	109	109	109
Grandpuits (100%)	101	101	101
Antwerp (100%)	338	338	338
Leuna (100%)	227	227	227
Lindsey-Immingham (100%)	109	207	207
Port-Arthur (100%) and BTP (40%) [(c)]	202	198	169
Subtotal	**1,558**	**1,799**	**1,770**
Other refineries in which the Group has equity stakes [(d)]	453	448	417
Total	**2,011**	**2,247**	**2,187**

(a) Capacity data based on refinery process unit stream-day capacities under normal operating conditions, less the impact of shutdown for regular repair and maintenance activities averaged over an extended period of time.
(b) Crude oil processing stopped indefinitely at the end of 2016.
(c) The condensate splitter held by the joint venture between TOTAL 40% and BASF 60% located in Port-Arthur refinery has been taken into account since end 2015.
(d) TOTAL's share in the 10 refineries in which it has equity stakes as of December 31, 2016 ranging from 10% to 55% (one each in the Netherlands, China, Korea, Qatar, Saudi Arabia, Italy and four in Africa). In addition to the sale of its participation in the Schwedt refinery in November 2015 and to the sale of its 50% stake in Société Anonyme de la Raffinerie des Antilles (SARA) in Martinique in May 2015, TOTAL completed in December 2016 the sale of its stake in the SOGARA refinery in Gabon. In addition, the condensate splitter of Daesan in Korea has been taken into account since end 2015, for a capacity of 79 kb/d (in TOTAL share of 50%).

Refined products

The table below sets forth by product category TOTAL's net share [(a)] of refined quantities produced at the Group's refineries:

(kb/d)	2016	2015 [(c)]	2014 [(d)]
Gasoline	324	346	344
Aviation fuel [(b)]	182	190	148
Diesel and heating oils	795	825	787
Heavy fuels	140	131	134
Other products	430	439	329
Total	**1,871**	**1,931**	**1,742**

(a) For refineries not 100% owned by TOTAL, the production shown is TOTAL's equity share in the site's overall production.
(b) Avgas, jet fuel and kerosene.
(c) Since 2015, the condensate splitters of Port Arthur and Daesan are integrated in the refining capacities and 2015 data have been restated.
(d) Excluding the condensate splitters of Port Arthur and Daesan.

Utilization rate

The tables below set forth the utilization rate of the Group's refineries:

On crude and other feedstock [(a) (b)]	2016	2015 [(c)]	2014 [(d)]
France	81%	81%	77%
Rest of Europe	92%	94%	88%
Americas	97%	111%	106%
Asia and the Middle East	86%	80%	50%
Africa	85%	84%	77%
Average	**87%**	**88%**	**81%**

(a) Including equity share of refineries in which the Group has a stake.
(b) Crude + crackers' feedstock/distillation capacity at the beginning of the year.
(c) Since 2015, the condensate splitters of Port Arthur and Daesan are integrated in the refining capacities and 2015 data have been restated.
(d) Excluding the condensate splitters of Port Arthur and Daesan.

On crude [(a) (b)]	2016	2015	2014
Average	85%	86%	77%

(a) Including equity share of refineries in which the Group has a stake.
(b) Crude/distillation capacity at the beginning of the year.

Petrochemicals: breakdown of TOTAL's main production capacities

As of December 31

(in thousands of tons)				2016	2015	2014
	Europe	North America	Asia and Middle East [(a)]	Worldwide	Worldwide	Worldwide
Olefins [(b)]	4,373	1,525	1,571	7,468	7,433	7,791
Aromatics [(c)]	2,903	1,512	2,429	6,844	6,783	6,773
Polyethylene	1,120	445	773	2,338	2,338	2,338
Polypropylene	1,350	1,200	400	2,950	2,950	2,950
Polystyrene	637	700	408	1,745	1,745	1,805
Other [(d)]			63	63	63	63
Total	**10,383**	**5,382**	**5,643**	**21,407**	**21,312**	**21,720**

(a) Including interests in Qatar, 50% of Hanwha Total Petrochemicals Co. Ltd. and 37.5% of SATORP in Saudi Arabia.
(b) Ethylene + propylene + butadiene.
(c) Including monomer styrene.
(d) Mainly monoethylene glycol (MEG) and cyclohexane.

Development of new avenues for the production of fuels and polymers

TOTAL is exploring new ways to monetize carbon resources, conventional or otherwise (natural gas, biomass, waste). These projects are part of the Group's commitment to building a diversified energy mix generating lower CO_2 emissions.

As regards biomass development, TOTAL is pursuing several industrial and exploratory projects. The scope of these developments is broad since they entail defining access to the resource (nature, sustainability, location, supply method, transport), the nature of the molecules and target markets (fuels, petrochemicals, specialty chemicals) and the most appropriate, efficient and environmentally friendly conversion processes.

Biomass to fuels

In Europe, TOTAL produces biofuel, notably hydrotreated vegetable oils (HVO) for incorporation into diesel, and ether produced from ethanol and isobutene (ETBE) for incorporation into gasoline.

In 2016, the Group blended, at its European refineries and several depots [(1)], 424 kt of ethanol [(2)] in gasoline, and 1,872 kt of fatty-acid-methyl-ester (FAME) or HVO [(2)] in diesel.

In addition, as part of the La Mède refinery transformation program announced in 2015, the Group will construct the first bio-refinery in France. Work is expected to begin in 2017 with a view to reaching a production capacity of almost 500 kt/y of biofuel, mainly high-quality biodiesel (HVO), but also biojet and petrochemical bio-feedstocks. This will therefore allow the La Mède plant to meet the growing biofuel market. Furthermore, the Group entered into a partnership in 2016 with Suez to increase the supply and the recycling of used oil, which could then be processed at La Mède.

In 2016, TOTAL engaged in extensive research activity targeting the emergence of new biofuel solutions. Construction now underway as part of the BioTFuel consortium of a pilot demonstration unit on the Dunkirk site is expected to lead to commencement in 2017 of a gasification test program for conversion of biomass into fungible, sulfur-free fuels.

Biomass to polymers

TOTAL is actively involved in developing activities associated with the conversion of biomass to polymers. The main area of focus is developing drop-in solutions for direct substitutions, by incorporating biomass into the Group's existing units, for example HVO or other hydrotreated vegetable oil co-products in a naphtha cracker, and developing the production of new molecules such as polylactic acid polymer (PLA). Thus, in November 2016, the Group signed a cooperation agreement with Corbion to create a joint venture for construction of a PLA production site in Thailand.

2.2.1.2. Specialty chemicals

As part of active management of its business portfolio, TOTAL completed in early 2017 the sale of its subsidiary Atotech, specialized in electroplating technologies. In 2016, Atotech had almost 4,000 employees with 18 production sites in the world and its sales were €1 billion ($1.1 billion). In 2015, TOTAL also completed the sale of its subsidiary Bostik, specialized in adhesive chemicals.

Hutchinson actively contributes to the mobility of the future by addressing its customers' needs (automotive, aerospace and major industries – defense, rail, energy) in order to offer a greater level of safety, comfort and energy performance, as well as more responsible solutions.

The company draws on wide-ranging expertise and deploys its know-how from the custom design of materials to the integration of connected solutions: structural sealing solutions, precision sealing, management of fluids, materials and structures, anti-vibration systems and transmission systems.

To serve its customers, Hutchinson had 89 production sites across the world (of which 56 are located in Europe and 18 in North America) and 34,200 employees at December 31, 2016.

Hutchinson's sales were €4.0 billion ($4.5 billion) in 2016, up 5.4% compared to 2015 and 16.7% compared to 2014. This growth was due to outperformance on the world's automotive markets, especially among German and Asian manufacturers. In 2016, Hutchinson also performed well on its other markets, particularly commercial aircrafts.

(1) Excluding the Group's participation in TotalErg.
(2) Including ethanol from ETBE (ethyl-tertio-butyl-ether) expressed in ethanol equivalent and HVO expressed in FAME equivalent. These equivalents are defined according to the EU Renewable Energy Directive.

2.2.2. Trading & Shipping

Trading & Shipping focuses on serving the Group's needs by:

- selling and marketing the Group's crude oil production;
- providing a supply of crude oil for the Group's refineries;
- importing and exporting the appropriate petroleum products for the Group's refineries to be able to adjust their production to the needs of local markets;
- chartering appropriate ships for these activities; and
- undertaking trading on various derivatives markets.

In addition, with its acquired expertise, Trading & Shipping is able to extend its scope beyond the aforementioned activities.

Trading & Shipping conducts its activities worldwide through various wholly-owned subsidiaries established on strategically important oil markets in Europe, Asia and North America.

2.2.2.1. Trading

In 2016, crude oil prices reached their lowest point in January and then strengthened progressively, while remaining low, with high volatility and a reduction in the contango[1] structure of certain oil indexes compared with 2015. Significant storage capacities in different parts of the world, made available through leases, contributed to the strong performance of Trading's activities. The Group's offices in Houston and Singapore also contributed to the growth of results by expanding their respective activities.

TOTAL is one of the world's largest traders of crude oil and petroleum products on the basis of volumes traded. The table below presents Trading's worldwide crude oil sales and supply sources and petroleum products sales for each of the past three years. Trading of physical volumes of crude oil and petroleum products amounted to 5.6 Mb/d in 2016, compared to 5.2 Mb/d in 2015 and to 4.9 Mb/d in 2014.

Trading's crude oil sales and supply and petroleum products sales[a]

(kb/d)	2016	2015	2014
Group's worldwide liquids production	**1,271**	**1,237**	**1,034**
Purchased from Exploration & Production	1,078	935	791
Purchased from external suppliers	2,444	2,336	2,227
Total of Trading's crude supply	**3,522**	**3,271**	**3,018**
Sales to Refining & Chemicals and Marketing & Services segments	1,590	1,668	1,520
Sales to external customers	1,932	1,603	1,498
Total of Trading's crude sales	**3,522**	**3,271**	**3,018**
Petroleum products sales by Trading	**2,105**	**1,961**	**1,854**

(a) Including condensates.

Trading operates extensively on physical and derivatives markets, both organized and over the counter. In connection with its Trading activities, TOTAL, like most other oil companies, uses derivative energy instruments (futures, forwards, swaps and options) with the aim of adjusting its exposure to fluctuations in the price of crude oil and petroleum products. These transactions are entered into with a wide variety of counterparties.

For additional information concerning derivatives transactions by Trading & Shipping, see Note 16 (Financial instruments related to commodity contracts) to the Consolidated Financial Statements (refer to point 7 of chapter 10).

All of TOTAL's Trading activities are subject to strict internal controls and trading limits.

2.2.2.2. Shipping

The transportation of crude oil and petroleum products necessary for the activities of the Group is coordinated by Shipping. These requirements are fulfilled through balanced use of the spot and time-charter markets. The additional transport capacity can also be used to transport third-party cargo. Shipping maintains a rigorous safety policy, mainly through a strict selection of chartered vessels.

In 2016, Shipping chartered approximately 2,900 voyages (relatively stable compared to 2015 and 2014) to transport 131 Mt of crude oil and petroleum products, compared to 126 Mt in 2015 and 122 Mt in 2014. On December 31, 2016, the mid- and long-term chartered fleet amounted to 59 vessels (including 8 LPG vessels), compared to 55 in 2015 and 48 in 2014. None of these vessels is single-hulled and the average age of the fleet is approximately six years.

Like a certain number of other oil companies and ship owners, the Group uses freight rate derivative contracts to adjust Shipping's exposure to freight rate fluctuations.

(1) Contango is the price structure where the prompt price of an index is lower than the future price.

2.3. Marketing & Services segment

The Marketing & Services segment includes worldwide supply and marketing activities in the oil products and services field as well as the activity of New Energies.

As part of the One Total new organization, New Energies has been reorganized. As from financial year 2017, solar activities will be reported within the new Gas, Renewables & Power segment, while biomass activities will be reported within the Refining & Chemicals segment (refer to point 1.3 of this chapter).

Historically among the largest marketers in Western Europe[1]

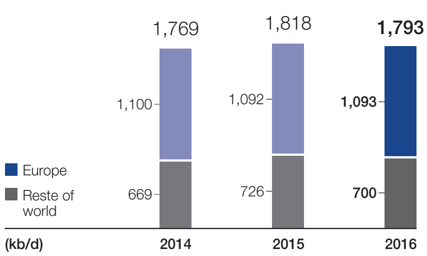
Leading marketer in Africa[2]

16,461 branded service stations[3] at year-end 2016

$ 1.4 billion of organic investments[4] in 2016

32,036 employees present

2016 petroleum products sales[a]



(a) Excludes trading and refining bulk sales, including share of TotalErg.

In 2016, refined product sales decreased slightly compared to 2015, essentially due to the sale of the retail network in Turkey. Excluding portfolio effects, retail network sales increased by nearly 4%. Sales of land-based lubricants also increased by nearly 4%.

Marketing & Services segment financial data

(M$)	2016	2015	2014
Non-Group sales	69,421	77,887	106,509
Adjusted operating income[a]	1,818	2,098	1,709
Adjusted net operating income[a]	1,586	1,699	1,254
including New Energies	*26*	*108*	*10*

(a) Adjusted results are defined as income using replacement cost, adjusted for special items, excluding the impact of changes for fair value.

Adjusted net operating income from the Marketing & Services segment was $1,586 million for the full-year 2016, a 7% decrease compared to 2015. Excluding New Energies, which was particularly high in 2015 due to the delivery of the Quinto solar farm in the United States, net operating income was stable despite asset sales.

(1) Data published by the companies based on quantities sold.
(2) PFC Energy and Company data 2015.
(3) Total, Total Access, Elf, Elan and AS24, including service stations owned by third parties.
(4) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests (refer to point 3.1 of this chapter).

2.3.1. Marketing & Services

The Marketing & Services (M&S) business segment is dedicated to the development of TOTAL's petroleum products distribution activities and related services throughout the world. Present in more than 150 countries [(1)], M&S conveys TOTAL's brand image to its customers, both individual and professional. TOTAL's brand renown, underpinned by advertising campaigns, substantial investment in R&D and a digital transformation plan, all contribute to building M&S's highly visible, innovative and assertive lineup of commercial solutions for its customers. Close proximity to its customers is a core tenet of M&S's strategy and the Group aims to promote this proximity in all of its business segments. Finally, M&S is committed to supplying environmentally responsible solutions.

M&S pursues a proactive, primarily organic, development strategy. M&S is consolidating its market share in its key western European markets [(2)], where it has reached critical mass and is one of the main distributors of petroleum products [(3)]. M&S continues to develop its activities in high-growth areas, particularly in Africa where it is the market leader [(4)], and in Asia. In 2016, organic investments were approximately $1 billion, stable compared to 2015, and focused mainly on network development.

M&S is implementing an active portfolio management strategy. In 2016, it completed the sale of its network of service stations in Turkey and, with its partner Erg, started the process of selling the joint venture TotalErg in Italy. In 2014 and 2015, M&S disposed of several assets to optimize its position in Europe (sales of the Liquefied Petroleum Gas (LPG) marketing subsidiaries in France and Hungary and the LPG/commercial sales activity in Switzerland). M&S also disposed of low-growth mature assets (stakes in the Société Anonyme de la Raffinerie des Antilles and the Société Réunionnaise de Produits Pétroliers). In parallel, M&S made targeted acquisitions. In 2016, M&S announced the acquisition of assets in East Africa (Kenya, Uganda and Tanzania), and in 2014 and 2015, it completed acquisitions in Pakistan, Vietnam and the Dominican Republic.

M&S's three main business areas are:

– **Retail**, with a network of more than 16,000 service stations. The Group is focusing on its key markets in Western Europe and continues to develop in Africa, where it is already present in more than 40 countries. In addition to the sale of high-performance fuels and petroleum products, M&S captures new customers and builds customer loyalty by diversifying its offer in its stores and service stations (*e.g.*, car wash, catering, car servicing) through partnerships with other leading brands. The aim of these additional offerings is to support customers in their mobility by providing them with all of the products and services they need at "one stop shop" service stations. In 2016, excluding the portfolio effect, retail saw a 4% growth in sales compared to 2015.
– The production and sales of **lubricants**, a highly profitable sector that accounts for more than one third of M&S's results [(5)], and in which TOTAL intends to pursue growth. M&S has entered into commercial and technological partnerships with European and Asian car manufacturers. With its 41 blending plants, including the plant in Singapore commissioned in 2015, and its R&D investments, M&S is able to supply high-quality lubricants to its customers worldwide. In 2016, inland [(6)] lubricants sales increased by nearly 4% compared to 2015.
– The distribution of products and services for **professional markets**. TOTAL is a partner of choice and a local supplier of products (mainly bulk fuels, aviation fuel, special fluids, LPG, bitumens, heavy fuels and marine bunkers) and a solution provider that helps its customers to manage all their energy needs with services such as the maintenance of on-site facilities and the optimization of consumption.

As part of its activities, M&S holds interests in four refineries in Africa, following the sale in 2016 of its minority interest in a refinery in Gabon, and one in Europe through its 49% stake in TotalErg in Italy.

To meet its customers' current and future needs, M&S has strengthened its efforts in R&D, which increased by 19% between 2014 and 2016, in order to design and develop new product ranges, in particular for the engine technologies of the future.

2.3.1.1. Sales of petroleum products

The following table presents M&S petroleum products sales [(7)] by geographical area:

(kb/d)	2016	2015	2014
Europe	1,093	1,092	1,100
France	541	541	547
Europe, excluding France	552	551	553
Africa (excl. North Africa)	419	423	380
Middle East	55	85	77
Asia-Pacific [(a)]	150	148	134
Americas	76	70	78

(a) Including Indian Ocean islands.

For data on biofuels, refer to point 2.2.1.1 of this chapter.

2.3.1.2. Service stations

The table below presents the geographical distribution of the Group's branded [(a)] service stations:

As of December 31	2016	2015	2014
Europe [(b)]	8,309	8,391	8,557
of which France	3,593	3,667	3,727
of which TotalErg	2,585	2,608	2,749
Africa (excl. North Africa)	4,167	4,058	3,991
Middle East	809	816	796
Asia-Pacific [(c)]	1,790	1,531	1,033
Americas	585	464	452
AS24 network (dedicated to heavy-duty vehicles)	801	763	740
Total	**16,461**	**16,023**	**15,569**

(a) TOTAL, Total Access, Elf, Elan and AS24. Including service stations not owned by TOTAL.
(b) Excluding AS24 network.
(c) Including Indian Ocean islands.

(1) Including via national distributors.
(2) France, Germany, Belgium, Luxembourg and the Netherlands.
(3) Publicly available information, based on quantities sold in 2015.
(4) PFC Energy and Company data 2015.
(5) Adjusted net operating income of M&S, excluding New Energies.
(6) For non-maritime transportation and industrial applications.
(7) In addition to M&S's petroleum product sales, the Group's sales also include international Trading (1,690 kb/d in 2016, 1,538 kb/d in 2015 and 1,385 kb/d in 2014) and bulk refining sales (700 kb/d in 2016, 649 kb/d in 2015 and 615 kb/d in 2014).

2.3.1.3. Main activities by geographical area

Europe

Retail
In Western Europe, the Group aims to optimize its activities in the countries where it has a large market share, enabling a high level of profitability. It has a retail network of more than 8,300 service stations[(1)] mainly spread throughout France, Belgium, the Netherlands, Luxembourg, Germany and Italy. TOTAL is regaining market shares in Western Europe by developing an innovative and diversified line of products and services.

– In **France**, the Group's dense retail network includes over 1,500 TOTAL-branded service stations, nearly 700 Total Access stations (service station concept combining low prices and premium TOTAL-branded fuels and services) and almost 1,300 Elan service stations, which are mainly located in rural areas. Since its launch in 2011, Total Access has led to the Group regaining nearly 3%[(2)] market share.
– In **Germany**, where TOTAL is the country's fourth-largest operator[(3)] with nearly 1,200 service stations at the end of 2016, and in **Belgium**, where TOTAL is the country's biggest operator[(3)] with more than 530 service stations, the Group's market share has increased by almost 1% in three years.
– In **Italy**, TOTAL and its partner Erg have started the process of selling the joint venture TotalErg, in which the Group has a 49% stake. TotalErg's network includes nearly 2,600 service stations. TOTAL will continue to have a presence in the country through its marketing of lubricants and jet fuel.
– In the overall perimeter and bolstered by a network of more than 800 branded service stations, AS24 targets the heavy-duty vehicles segment in 28 countries and seeks continued growth primarily through expansion in the Mediterranean basin and Eastern Europe and through its toll payment card service, which covers nearly 20 countries.

TOTAL is also a major player in the European market for fuel payment cards with nearly 3.3 million cards issued, enabling companies of all sizes to improve fuel cost management and access an ever-increasing number of services.

Lubricants
TOTAL is pursuing its development in high-growth segments throughout Europe. It relies mainly on its lubricant production sites in Rouen (France) and Ertvelde (Belgium). In 2016, TOTAL launched the construction of a lubricant production site in Russia.

Professional markets and other specialties
TOTAL produces and markets specialty products in Europe, and relies on its industrial facilities to produce special fluids (Oudalle in France) and bitumen (Brunsbüttel in Germany).

In France, TOTAL promotes a large fuel and service offering to 120,000 vehicle fleet managers. As for fuel sales (heavy fuels, domestic fuels, etc.), they reach nearly one million customers.

Africa & the Middle East

Retail
TOTAL is the leading marketer of petroleum products in Africa. The Group achieved an average market share of nearly 18%[(4)] in retail in 2016, an increase of 1% compared to 2014. It is pursuing a strategy of profitable growth and increased market share in Africa.

In the zone Africa & the Middle East, the retail network has made of approximately 5,000 service-stations in 2016, spread across more than 40 countries. The Group operates major networks in South Africa, Nigeria, Egypt and Morocco.

As part of its dynamic asset management policy, TOTAL finalized in 2016 the disposal of its network of 450 service stations in Turkey, while retaining its brand and lubricants business in the country.

In order to achieve its goal of gaining market share in all of the countries where it operates in Africa & the Middle East, and in addition to its organic growth strategy, M&S acquires independent petroleum networks in certain countries. The acquisition underway of assets in Kenya, Uganda and Tanzania will strengthen the supply and logistics system in the region and speed up the growth of the service station network, particularly in Tanzania.

M&S is diversifying its offering at service stations and is deploying a range of innovative products and services through partnerships in catering and stores, as well as in digital solutions.

Lubricants
TOTAL continues to pursue a growth strategy in lubricants in Africa & the Middle East. M&S relies in particular on its lubricant production plants in Dubai, Egypt and Saudi Arabia. In Africa, TOTAL is the leading distributor of lubricants with 16.5%[(5)] market share.

Professional markets and other specialties
TOTAL acts as a leading partner, notably for mining customers in Africa by delivering complete supply chain and management solutions for fuels and lubricants.

M&S also offers a diverse range of products and services aimed at professionals in Africa. Among the different products, the bitumen offering meets the requirements of the public works sector in Africa with a variety of packaging options, and special fluids form an integral part of development projects in the petroleum, mining and agricultural sectors. Industrial customers also receive support from TOTAL for the maintenance of on-site facilities through lubricants in service analysis, among others.

Asia-Pacific

At year-end 2016, TOTAL was present in 20 countries in the Asia-Pacific zone and continued to strengthen its position in the distribution of fuels and specialty products.

Retail
TOTAL operates service station networks in China, Pakistan, the Philippines, Cambodia and Indonesia, and is a significant player in the Pacific islands. The Group network continued to expand, and reached nearly 1,630 service stations at year-end 2016, an increase of nearly 800 compared to 2014.

(1) Excluding AS24 network.
(2) Company data between 2011 and 2016.
(3) Source: IHS 2015.
(4) Retail market share in Africa in the countries where the Group operates, based on 2015 publicly available information on quantities sold.
(5) Company data.

- In **Pakistan**, TOTAL's acquisition in 2015, with its local partner PARCO, of Chevron's distribution network, has increased the TOTAL network by 500 service stations and strengthened the Group's distribution and logistics capacities in Pakistan.
- In the **Philippines**, TOTAL doubled its market share (from 3% to 6% [1]) in retail through the creation of a joint venture with its local operator FilOil in 2016. TOTAL has thus increased its retail network by 200 service stations.
- In **China**, TOTAL was operating more than 230 services stations at year-end 2016 through a wholly-owned subsidiary and two joint ventures with Sinochem, one of which obtained a commercial wholesales license in 2016 that will enable it to expand its activities.

Lubricants

TOTAL's share of the inland lubricant market reached 3.6% in 2016 in this region. One of the Group's largest lubricant production plants started up in mid-2015 in **Singapore** in order to support M&S's ambitions for growth in the region. It has a production capacity of 310 kt/year.

TOTAL lubricant sales in **China** increased in 2016. To support its ambitions for growth in China and in the region, TOTAL opened a grease production site in Tianjin (China) in 2016.

Professional markets and other specialties

TOTAL continues to strengthen its presence in the specialties markets in the region, in particular in **Vietnam**, where the Group confirmed its position as the number two player [1] in the LPG market, and in **India**.

Americas

In **retail**, the Group operates in several **Caribbean islands** with nearly 600 service stations at year-end 2016. In January 2016, TOTAL strengthened its position with the acquisition of a majority stake of 70% in the fuel marketing leader in the Dominican Republic, which operates a network of 130 service stations, commercial sales and lubricants activities.

In **lubricants and other specialty products**, TOTAL is pursuing in the overall region its strategy of growth, mainly in lubricants, aviation fuel and special fluids. To strengthen its special fluids business, the Group has built a special fluids production plant in Bayport, Texas, which has been operational since early 2016.

2.3.1.4. Products and services developments

The Group develops technologically advanced products, some of which are formulated for use in motor sports before being generally released on the market. In 2016, TOTAL continued its technical partnerships, in particular with Renault Sport Racing, the PSA group (WRC, WTCC and Rallycross) and Aston Martin Racing. These partnerships demonstrate TOTAL's technical excellence in the formulation of fuels and lubricants under extreme conditions and subject to requirements to reduce fuel consumption. At the end of 2016, TOTAL and PSA (Peugeot, Citroën and DS) renewed their partnership for five years in the areas of R&D, business relations with the three PSA brands and motor sports.

In order to respond to developments in world markets and prepare for tomorrow's growth opportunities, TOTAL develops products and services in collaboration with its customers that optimize their energy bills, such as the products under the Total Ecosolutions label, which include Excellium fuels and Fuel Economy lubricants (refer to point 2.3.4 of chapter 7). These solutions include a diversified range of energy supplies (fuels, gas, solar and wood pellets) as well as consumption auditing, monitoring and management services.

Looking beyond energy services, TOTAL also relies on digital innovations to develop new offers for its customers. This is how TOTAL enables money transfers and payment by smartphone in Africa, or online domestic heating oil orders in France. The Total Services mobile application has been deployed in 43 countries, and the customer relationship program uses a central tool to send personalized offers to over one million customers in 10 countries. For its professional customers, M&S has launched Bitume Online in France, a platform that offers bitumens at fixed rates, and a portal for lubricant distributors deployed in some 20 countries (including in the United Arab Emirates), among others.

For the longer term, TOTAL also supports the development of alternatives to traditional fuels, and M&S intends to expand in these segments:

- **Electro-mobility**: in 2016, TOTAL's European subsidiaries continued the developments and demonstrations of the distribution of electricity intended for electric vehicles. TOTAL will have in 2017 approximately 100 service stations equipped with higher power charging points in Belgium, the Netherlands, Luxembourg, France and Germany. Service stations on major routes in Europe are due to be fitted with super-fast charging stations over the coming years. In the short term, a new offering will be added to Total cards to give professional customers access to the largest public charging networks in Europe.
- **Gas for transport**: TOTAL has approximately 450 stations that deliver natural gas vehicles (NGV) in Asia, Africa and Europe, and intends to develop several hundred additional stations, mainly in Europe, over the coming years.
- **Hydrogen**: with its partners Air Liquide, Daimler, Linde, OMV and Shell, TOTAL created in 2015 the H2 Mobility Germany joint venture, which aims to deploy some 400 hydrogen stations in Germany, with a forecast of more than 250,000 fuel cell vehicles being in circulation by 2025. The majority of the hydrogen stations also developed through the Clean Energy Partnership in Germany (target of 50 stations in 2017, 13 of which are in the TOTAL network) will be incorporated into the H2 Mobility Germany joint venture.

2.3.2. New Energies

As part of its ambition to become the responsible energy major, the Group is developing its activities in low-carbon and renewable energies businesses. Facing the challenge of climate change, TOTAL positions itself on an energy mix, with decreasing carbon intensity that takes into account the 2°C scenario of the IEA.

(1) Company data.

The Group is active along the entire solar photovoltaic value chain, with SunPower and Total Solar, from the production of photovoltaic cells to the development of solar farms or installation of solar facilities in private households.

Over the longer term, it pursues a second axe of development with the transformation of biomass through biotechnology, which aims to develop new biosourced product solutions for transportation and chemicals.

TOTAL actively follows developments in other renewable energies. In this context, the Group owns a farm of four wind turbines (10 MW near Dunkirk, France) and a stake in marine energy (9.99% in the company Scotrenewables Tidal Power, Scotland).

The acquisition of Saft Groupe S.A. in 2016 is consistent with this ambition. The Group plans to pursue its investments in low-carbon businesses.

2.3.2.1. Solar energy

TOTAL acquired a majority share in SunPower in 2011. In addition, the Group develops and holds interests via Total Solar in solar farms and is pursuing R&D investments in the photovoltaic field through several industrial and academic partnerships.

The steady reduction in photovoltaic electricity costs opens an ever-growing number of markets. However, in some areas, achievement of the full potential of this technology requires the support of public programs.

SunPower

TOTAL holds 56.73% of SunPower as of December 31, 2016, an American company listed on NASDAQ and based in California. As an integrated player, SunPower operates over the entire solar power value chain. Upstream, it designs, manufactures and supplies cells as well as the highest-efficiency solar panels on the market. Downstream, SunPower is active in the design and construction of large turnkey power plants and in the marketing of integrated solar solutions for decentralized electricity generation.

Upstream, SunPower manufactures all its cells in Asia (Philippines, Malaysia) and has a nominal production capacity of approximately 1,050 MW/y at year-end 2016. Through its significant R&D program, the company is constantly optimizing its production process to reduce costs while maintaining its technological leadership. The cells are assembled into modules, or solar panels, in plants located mainly in Mexico and Europe.

To extend its commercial offering, from 2016 SunPower has marketed a new lower-priced modules range to target the most competitive market sectors while continuing to hold a technical edge over its competitors.

Downstream, SunPower markets its panels worldwide for applications ranging from residential and commercial roof tiles to large solar power plants. SunPower installed more than 1.3 GW in 2016 compared to 1.2 GW in 2015. As of December 31, 2016, SunPower holds a 36.53% stake in the company 8point3 Energy Partners, initially set up with First Solar. 8point3 Energy Partners, the purpose of which is to acquire and operate solar projects, was listed on NASDAQ in 2015. Additionally, in 2016 SunPower completed the construction in the United States of the solar farm Boulder Solar 1 (125 MWc) and the Henrietta farm (128 MWc). SunPower also completed construction of the Prieska farm (86 MWc) in South Africa.

SunPower is pursuing its development in residential and commercial markets, in particular in the United States, by increasing its service offerings for solar power production, management and financing. SunPower is also developing its Smart Energy activity to permit its residential and commercial customers to optimize their power consumption. Thus in 2016, SunPower launched a pilot project in New York State involving electricity production and consumption management with a storage offer in association with the local electricity provider.

The second half of 2016 was marked by a sharp deterioration of the global market, in a context of strong overcapacity of photovoltaic cells production. SunPower announced an adjustment plan to cope with this market deterioration. This plan is essentially based on a reduction of the company's operational costs and on the closure of a cells manufacturing unit in the Philippines.

In this context, TOTAL and SunPower decided to deepen their cooperation through several strategic initiatives. In particular, in November 2016, TOTAL concluded an agreement with SunPower to supply the panels required for retrofitting over the next five years 5,000 service stations and approximately 100 other sites across the world for an installed capacity of 200 MW. In addition, TOTAL undertook via Total Solar the acquisition of projects developed by SunPower in Japan, South-Africa and France.

Other solar assets

The Group holds a 20% stake in the solar power plant Shams 1, commissioned in 2013 in Abu Dhabi. With 109 MW of parabolic concentrated solar power, Shams 1 is the largest thermal parabolic concentrated solar power plant in the Middle East[(1)]. In addition, Total Solar co-developed and holds interests in the solar farms built by SunPower: Salvador in Chile and Prieska in South-Africa, as well as Nanao in Japan, which is under construction.

In line with its CSR approach, the Group continues to install solar solutions through its decentralized rural electrification projects in several countries, especially in South Africa via KES (Kwazulu Energy Services Company), in which TOTAL holds a 35% stake.

New solar technologies

In order to strengthen its technological leadership in the crystalline silicon value chain, and in addition to its cooperation with SunPower in the R&D field, New Energies partners with leading laboratories and international research institutes. This work consists of developing and optimizing the photovoltaic solar power chain (from silicon through to power systems and including wafers, cells and modules), reducing production costs and increasing the efficiency and reliability of components. The Group is also strengthening its expertise in solar resource evaluation and prediction.

Additionally, downstream, TOTAL is continuing its research efforts on new generations of energy management and control systems for residential and commercial applications in order to differentiate the Group entities' offer on the electric market and to lower the cost of energy consumed for customers.

(1) Company data.

2.3.2.2. Energy storage

Energy storage is one of the solutions that can offset the intermittent nature of renewable energies, thereby increasing their profitability and facilitating their development. The Group has invested in this area since 2009 via collaborative R&D programs with academic partners and minority stakes in start-ups, through among others Total Energy Ventures, a venture capital company (refer to point 2.3.5 of chapter 7).

The acquisition of 100% of the shares of Saft Groupe S.A. ("Saft"), completed in August 2016 following a successful voluntary takeover bid, is fully in line with TOTAL's goal to develop in the renewable energies and electricity businesses.

Saft is a French company founded in 1918 specializing in the design, manufacture and marketing of high technology batteries for industry. In 2016, Saft achieved sales of €738 million, including 75% on markets where it is the leader[(1)], such as nickel and primary lithium batteries for industrial infrastructure, transport and civil and military electronics applications. It also develops batteries for space and defense using its lithium-ion technologies, which are also deployed in the domains of energy storage, transport and telecommunications networks. Building on its technological expertise, the company is well positioned to benefit from growth in renewable energies beyond its current activities.

As of year-end 2016, Saft is present in 19 countries in the world (historically Europe and the United States) and has over 4,000 employees. It is achieving steady growth in emerging countries, in particular in Asia, South America and Russia, and has 14 production sites and approximately 30 sales offices.

2.3.2.3. Biotechnologies and the conversion of biomass

TOTAL has launched numerous collaborative R&D projects for the development of bio-sourced molecules with various academic partners (the Joint BioEnergy Institute in the United States, the University of Wageningen in the Netherlands) and industrial partners in Europe (the Toulouse White Biotechnology consortium) and in the United States (Amyris Inc., Novogy). Amyris Inc. is an American company listed on NASDAQ, in which TOTAL holds an interest of 23.51% as of December 31, 2016. It produces biojet fuel from farnesane, which has been used successfully in demonstration flights, notably with Air France, KLM and Cathay Pacific.

TOTAL is exploring a number of opportunities for developing biomass. In particular, TOTAL has invested in the start-up Renmatix, which is developing an innovative technology involving the deconstruction of lignocellulose into fermentable sugars. This is in addition to the action already initiated by the Group within the French consortium Futurol for the conversion of lignocellulose into ethanol.

In 2015 and 2016, TOTAL also acquired two new R&D platforms: one at Emeryville in California (United States) dedicated to the development of processes for fermenting and separating molecules from biotechnologies, and the other at Solaize (France) with the goal of developing new biocomponents by implementing predictive retrosynthesis methodologies.

In the longer term, the Group is also studying the potential for developing a cost-effective phototrophic process for producing biomolecules through microalgae bioengineering.

(1) Largest market share. Company data.

3. Investments

3.1. Major investments over the 2014-2016 period

Gross investments [a] (M$)	2016	2015	2014
Upstream	16,035	24,270	26,520
Refining & Chemicals	1,849	1,843	2,022
Marketing & Services	2,506	1,841	1,818
Corporate	140	79	149
Total	**20,530**	**28,033**	**30,509**

Net investments [b] (M$)	2016	2015	2014
Upstream	13,701	21,055	20,756
Refining & Chemicals	1,763	(1,645)	1,830
Marketing & Services	2,167	896	1,476
Corporate	126	54	78
Total	**17,757**	**20,360**	**24,140**

(M$)	2016	2015	2014
Acquisitions	2,033	3,441	2,539
including resource acquisitions	780	2,808	1,765
Divestments	1,864	5,968	4,650
Other operations with non-controlling interests	(104)	89	179

Organic investments [c] (M$)	2016	2015	2014
Upstream	14,316	20,508	22,959
Refining & Chemicals	1,636	827	1,944
Marketing & Services	1,432	1,569	1,424
Corporate	100	72	104
Total	**17,484**	**22,976**	**26,430**

(a) Including acquisitions and increases in non-current loans. The main acquisitions for the 2014-2016 period are detailed in Note 3 to the Consolidated Financial Statements (point 7 of chapter 10).
(b) Net investments = gross investments – divestments – repayment of non-current loans – other operations with non-controlling interests. The main divestments for the 2014-2016 period are detailed in Note 7 to the Consolidated Financial Statements (point 7 of chapter 10).
(c) Organic investments = net investments, excluding acquisitions, divestments and other operations with non-controlling interests.

In 2016, the Group's organic investments and resource acquisitions were $18.3 billion. The decrease in investments compared to 2015 follows the completion and start-up of nine major production growth projects in 2015 and five in 2016. The reduction also resulted from a successful capital efficiency program implemented in response to the fall in Brent prices.

In the Upstream segment, most of the investments were geared toward the development of new hydrocarbon production facilities, the maintenance of existing facilities and exploration activities. Development expenditures were mainly related to the five projects that started up in 2016 (Laggan-Tormore, Vega Pleyade, Incahuasi, Angola LNG and Kashagan) and to other major projects under construction and expected to start up in 2017 and 2018, including Moho North in the Republic of the Congo, Yamal LNG in Russia, Ichthys LNG in Australia, Kaombo in Angola and Egina in Nigeria.

In the Refining & Chemicals segment, investments were made in facilities maintenance and safety, as well as in projects aimed at improving the plants' competitiveness. In 2016, the Group progressed with the transformation of the La Mède refinery in France into a bio-refinery and the modernization of the Antwerp refinery in Belgium with the addition of a new heavy fuel oil conversion unit and another petrochemical unit, and reduced by 50% the capacity of the Lindsey oil refinery in the United Kingdom.

In the Marketing & Services segment, investments in 2016 mainly concerned retail networks in growth regions, logistics and specialty products production and storage facilities.

Acquisitions in 2016 totaled $2.0 billion, including $780 million of resource acquisitions, a 41% decrease compared to $3.4 billion in 2015.

The Group took advantage of favorable market conditions to expand its Upstream portfolio. The Group strengthened its position in the Middle East by entering the Al Shaheen field in Qatar, and in the US with the acquisition of shale gas assets. Resources acquisitions were $780 million in 2016, comprised mainly of the additional 75% interest in the Barnett shale gas field in the United States. The Group is preparing future growth with the signing of major deals in Brazil with Petrobras, in Uganda and in Iran on the giant South Pars 11 project.

As part of the development of profitable low-carbon businesses, the Group acquired Saft Groupe, a leader in energy storage solutions. In line with the strategy to expand its gas and power distribution activities, the Group also acquired Lampiris, a supplier of natural gas and energy services in Belgium and France. Finally, in the Marketing & Services segment, the Group announced the planned acquisition of a retail and supply terminal network in Kenya, Uganda and Tanzania to strengthen its marketing and supply activities in the region.

The Group also continued its divestment program of mature and non-core assets for a total of $1.9 billion in 2016, including the sale of a 15% stake in the Gina Krog field in Norway and a 20% stake in the Kharyaga field in Russia, as well as the sale of the FUKA pipeline system in the North Sea and a retail network in Turkey. The Group also finalized in January 2017 the sale of Atotech, a plating chemistry company, for $3.2 billion, which was announced in 2016.

The $10 billion asset sale program for 2015-2017 was around 80% complete following the closing of the Atotech sale in 2017.

Net investments were $17.8 billion in 2016, compared to $20.4 billion in 2015, a decrease of 13% essentially related to the decrease in organic investments.

3.2. Major planned investments

Investments are moving into the sustainable range needed to deliver profitable future growth and are expected to be between $16 and $17 billion in 2017 including resource acquisitions.

Investments in the Exploration & Production segment will be largely allocated to major development projects under construction, including Moho North in the Republic of the Congo, Yamal LNG in Russia, Ichthys LNG in Australia, Kaombo in Angola and Egina in Nigeria as well to a number of new projects expected to be launched this year. A portion of the funds will also be allocated to assets already in production, in particular for maintenance capital expenditures and in-fill wells.

In the Refining & Chemicals segment, the modernization of the Antwerp integrated platform and the transformation of the La Mède refinery to a bio-refinery will be among the major investments in 2017. The Group is also progressing plans for the construction of a side cracker at the Port Arthur refinery complex in the United States. A significant portion of the segment's budget will also be allocated to required maintenance and safety investments.

The Marketing & Services segment's investment budget will, finance, in particular, the service station network, logistics, specialty products production and storage facilities, particularly lubricants. Most of the Marketing & Services budget will be allocated to growth regions, notably Africa, the Middle East and Asia.

The Group will also continue investing to grow its Downstream gas and renewables businesses through the newly established Gas, Renewables and Power segment, as well as in R&D.

TOTAL self-finances most of its investments with cash flow from operating activities and occasionally accesses the bond market when financial market conditions are favorable. Investments for joint ventures between TOTAL and external partners are generally funded through specific project financing.

As part of certain project financing arrangements, TOTAL S.A. has provided guarantees. These guarantees ("Guarantees given on borrowings") as well as other information on the Group's off-balance sheet commitments and contractual obligations appear in Note13 to the Consolidated Financial Statements (point 7 of chapter 10). The Group currently believes that neither these guarantees nor the other off-balance sheet commitments of TOTAL S.A. or of any other Group company have, or could reasonably have in the future, a material effect on the Group's financial position, income and expenses, liquidity, investments or financial resources.

4. Research & Development

The Group's overall R&D investments were $1,050 million in 2016, compared to $980 million in 2015 and $1,245 million in 2014. There were 4,939 people dedicated to R&D activities in 2016 compared to 4,248 in 2015 and 4,596 in 2014 (1).

TOTAL invested $689 million in 2016 in innovation and R&D for its oil and gas activities (2). The expenses dedicated to these activities are expected to increase by 5% on average between 2015 and 2017.

R&D at TOTAL focuses on six major axes:

- developing knowledge, tools and technological expertise to discover and profitably produce complex oil and gas resources at a reduced cost to help meet the global demand for energy;
- developing, industrializing and improving competitive processes for the conversion of oil, gas and biomass resources to adapt to changes in resources and markets, improve reliability and safety, achieve better energy efficiency, reduce the environmental footprint and maintain profitability in the long term;
- developing and industrializing solar, biomass and carbon capture and storage technologies to help prepare for future energy needs in an economically competitive manner;
- developing practical, innovative and competitive materials and products that meet customers' specific needs, contribute to the emergence of new features and systems, enable current materials to be replaced by materials delivering higher performance to users, and address the challenges of improved energy efficiency, lower environmental impact and toxicity, better management of their life cycle and waste recovery;
- understanding and measuring the impacts of the Group's operations and products on ecosystems (water, soil, air, biodiversity) and recovering waste to improve environmental safety, as part of the regulation in place, and reduce their environmental footprint to endeavor to achieve sustainability in the Group's operations; and
- mastering and using innovative technologies such as biotechnologies, materials sciences, nanotechnologies, high-performance computing, information and communication technologies or new analytical techniques.

These issues are incorporated into the project portfolio to develop synergies. Different aspects may be looked at independently by different business segments, with high levels of interaction between R&D, technology and business unit teams.

Since 2009, Total Energy Ventures, which is in charge of developing small and medium-sized enterprises (SMEs) specialized in innovative energy technologies and clean technologies for the Group, manages a portfolio that has grown regularly. In addition, a loan facility was introduced for innovative SMEs that develop technologies of interest for the Group.

In 2016, a Group R&D Division was set up as part of the Group's new organization, "One Total" (refer to point 1.3 of this chapter). This new division is in charge of:

- constructing a consolidated view of all of the Group's R&D activities and putting in place an R&D roadmap taking into account the 2°C scenario of the IAE;
- launching and monitoring transversal studies on key subjects for the Group, such as CO_2 capture, use and storage, health, safety and the environment (HSE) and energy efficiency;
- increasing synergies between R&D teams by facilitating the sharing of tools, expertise and, when needed, resources, selecting and respecting good practices, and capitalizing on scientific expertise; and
- ensuring the transfer of technologies towards the Group's industrial and commercial activities.

4.1. Upstream

In Exploration & Production, the R&D project portfolio was reviewed in 2016 according to the impacts on reducing costs and the environmental footprint, and on improving safety and production. More than half of the R&D budget is focused on improving exploration (geological structures, seismic acquisition and imaging technologies), characterization of hydrocarbon reservoirs and simulation of field evolution during production. Enhancing oil recovery from mature reservoirs remains an active area of research, particularly in the Group's partnerships in the Middle East.

R&D activities in deep offshore aiming at greater distances for multiphase production transport have been increased further, which is fully in line with the goals of Exploration & Production and supports major technology-intensive assets such as Libra in Brazil.

Operations on wells, from drilling to closure, account for a significant share of Upstream costs; new R&D projects are under way to reduce these and further increase operational safety.

The monitoring phase of the oxy-combustion CO_2 capture and storage project in the depleted Rousse reservoir in Lacq (France) came to an end in 2016. The Group now has a strong command of the methods used to characterize reservoirs and their mechanical properties for this type of injection. New R&D projects are being identified in order to develop carbon capture, use and storage (CCUS) in the coming years.

A sustained effort to adapt mature technologies in order to reduce their costs has been implemented. In particular, new technologies addressing the management of water associated with hydrocarbon production are now available for new developments. This subject is part of a larger program dedicated to Sustainable Development. The increased use of digital technology also forms part of this cost-reduction program.

Finally, R&D programs prepare for the medium and long terms, whether for researching new exploration concepts, non-conventional resources or developing technologies, such as robotics, nanotechnologies or high-performance computing (notably, the Pangea supercomputer, a decision-support tool for exploration and field management).

Concerning the activities of Gas, the program to develop new technological acid gas treatment and LNG solutions is continuing.

(1) Figures for 2014 and 2015 concerning the Group's R&D investments and employees were restated to reflect the accounting reporting scope.
(2) Excluding R&D budgets of Atotech, Hutchinson, SunPower and Saft Groupe.

4.2. Refining & Chemicals

4.2.1. Refining & Chemicals (excluding specialty chemicals)

The aim of R&D is to support the medium and long-term development of Refining & Chemicals. In doing so, it contributes to the technological differentiation of this business through the development, implementation and promotion of effective R&D programs that pave the way for the industrialization of knowledge, processes and technologies.

In line with Refining & Chemicals' strategy, R&D places special emphasis on the following four major challenges: taking advantage of different types of feedstock; maximizing asset value; continuing to develop innovative products; and developing biosourced products. The medium-term strategy of the project portfolio and its deployment plan will facilitate Refining & Chemicals' technological differentiation.

To take advantage of different types of feedstock, R&D activities related to the processing of more diversified crudes have increased significantly through a clearer insight into the effect that feedstocks have on equipment and processes at the molecular level. R&D is launching ambitious new programs to develop various technologies for producing liquid fuels, monomers and intermediates from gas.

R&D is developing expertise and technologies with a view to maximizing asset value. Its efforts mainly involve programs focusing on the flexibility and availability of facilities. Advanced modeling of feedstocks and processes helps the units overcome processing-related constraints and operate while taking these constraints into account in real time. Research conducted on catalysts is helping to increase their resistance, improve catalytic stability and extend the cycle time at a lower cost. Programs are being set up to maximize the value of heavy residues. The new opportunities presented by digital technology are being examined to pave the way for the "plant of the future", which will provide an even safer working environment and increased productivity, while consuming less energy and producing less waste.

In line with the Group's low-carbon strategy, R&D is pioneering solutions to reduce greenhouse gas emissions through carbon capture and recovery by conversion. In addition, out of concern for the environmental footprint of Refining & Chemicals' activities, R&D is developing new technologies to improve the energy efficiency of facilities and reduce the impact of the activities on water, air, soil, etc.

The offer of innovative products is a key aspect of research on polymers. R&D draws on its knowledge of metallocenes and bimodality to develop different types of mass consumption polymers that have exceptional properties allowing them to replace heavier materials and compete with technical polymers. Value-added niche polymers are also being developed, whether in the form of blends or composites. Efforts to diversify into biosourced products are focused mainly on products endorsed by the market: biomonomers, biointermediates, and biopolymers. R&D is thus focusing on polylactic acid due to the new applications that can be envisaged as a result of its specific properties. For plastics recycling, R&D is designing technologies that will make it possible to recycle polymers under acceptable conditions in terms of end product quality, cost and environmental impact.

With regard to biofuels, R&D has directed its efforts towards gasification and coprocessing to produce liquid fuels from biomass. R&D is also particularly mindful of issues related to blends and product quality raised by the use of biomolecules.

The efficient use of resources is a major challenge for Sustainable Development. As a result, R&D is pioneering technologies enabling more efficient use of biosourced molecules to produce higher added-value chemical compounds, whether through biotechnologies or thermochemical processes.

4.2.2. Specialty chemicals

R&D is strategically important for specialty chemical products. It is closely linked to the needs of the subsidiaries and industrial customers.

For Hutchinson, R&D is an important factor in innovation and differentiation. The company is present along the entire value chain, from designing custom materials (*e.g.*, rubber, thermoplastics, composites) to incorporating connected solutions (*e.g.*, complex solutions, mechatronics, connected objects).

With a corporate research and innovation center, more than 25 technical centers and a number of university partnerships worldwide, Hutchinson is equipped to rise to the challenge of contributing to the safer, more comfortable, and more responsible mobility of the future.

Weight reduction, increased energy efficiency and improved diagnostic and control functionality are common preoccupations across all of Hutchinson's markets (*e.g.*, automotive, aerospace, defense, railways). Hutchinson designs innovative solutions to put its customers ahead of the game, and transposes those solutions between markets, adopting a cross-fertilization approach.

4.3. Marketing & Services

4.3.1. Marketing & Services

In 2016, the R&D activities of Marketing & Services continued to roll out its new roadmap in line with its ambitions.

The roadmap features two focal points: reducing the environmental footprint of products, particularly CO_2 emissions, and increasing energy efficiency by improving the durability of end users' equipment. These are broken down into a number of areas: energy savings for customers; competitive advantage and new solutions; anticipation of changes in legislation; and incorporation of biosourced molecules.

A new "Chemicals and biocomponent processes" department shared by the Marketing & Services and Refining & Chemicals segments opened in April 2016 on the Solaize site, with the aim of using a predictive approach to design components derived from renewable sources. This approach uses cheminformatics and digital tools to simulate, model and predict how the components will perform, in order to help chemists and formulators better identify ideal chemical structures.

The "Fuel Economy" range of lubricants continues to expand with many new products designed to comply with the specifications of manufacturers targeted by the Total Lubricants business line in all fields of application (automotive, marine and manufacturing). The key work is focused on the design and incorporation of breakthrough components in formulations. At the same time, more fundamental work has been started to anticipate the issues that manufacturers will face as a result of changes in engine technology and legislation. New contracts have been won with strategic manufacturers. In addition, the new marine lubricant for two-stroke engines that run on fuels with sulfur contents of 0 to 3.5% has been introduced onto the market. The International Maritime Organization's recent decision to limit the sulfur content of fuels to 0.5% by 2020 has led to the redefinition of marine lubricant development programs.

Launched in 2015, the project to synthesize new molecules for future generations of the "Total Excellium" fuel range is based on the areas of chemicals, methods & measurements and benchmarking. Alongside this, work to develop new products tailored to specific local requirements has been finalized, mainly for the African market.

In the field of refinery additives, research continued into understanding and developing new additives to improve the performance of distillates in cold temperatures.

With respect to bitumen, in order to meet the challenges of competitiveness, sustainable logistics, Sustainable Development and geographic expansion in the bitumen sector, researchers mainly concentrated on the prospect of transporting bitumen in solid form, establishing a program to reduce binder aging and developing Styrelf formulas for the international market.

The new "Bio Life" range of special fluids derived from renewable sources was put on the market. It is protected by several patent applications covering the production methods and applications of the fluids.

In Formula 1 racing, important work on understanding combustion and lubrication phenomena, in conjunction with closer technical ties with manufacturers, once again brought very significant improvements in engine performance in 2016. As a result of this collaboration, new skills have been acquired in-house that can be used in other areas (*e.g.*, production vehicles, electric engines).

The Asia-Pacific Technical Center based in Mumbai, India, increased its activities and skills, mainly in lubricants (particularly for textiles and two-wheeled vehicles), special fluids (including drilling fluids) and fuel additives.

The enlisting of French and international skills has increased in recent years, with a growing number of ties to academia, researchers seconded to universities in France, Italy, Switzerland and the United States, and international researchers recruited. R&D has also increased its activities relating to evaluating and selecting external technologies and partners with shared interests (SMEs, start-ups). These different approaches enhance the work necessary for the guided design and development of breakthrough products included in Marketing & Services' objectives.

4.3.2. New Energies

New Energies' R&D efforts are focused, on the one hand, on the solar value chain from silicon to photovoltaic electricity management systems, and, on the other hand, on the development of biotechnological methods of converting biomass into products of interest to the Group's markets.

In the field of solar energy, R&D is striving to improve SunPower's[1] methods of producing cells and modules in order to drive down costs while enhancing efficiency and reliability, with the aim of maintaining the company's global technological leadership and tailoring its offering to the different application markets, from solar farms to the residential sector. It is also preparing future generation photovoltaic cells within the framework of several strategic partnerships between TOTAL and renowned academic research institutes. In particular, TOTAL is the founding partner of the Ile-de-France Photovoltaic Institute, a research institute on the Paris-Saclay campus that has reached critical mass and offers a very high-quality technical platform and scientific support structure with the ambitious aim of identifying breakthrough technologies to produce highly efficient, low-cost panels.

Downstream in the solar value chain, R&D is monitoring the development of low-cost stationary storage technologies. At the same time, Saft Groupe's R&D teams are focusing on improving lithium-ion technologies, reducing costs and environmental impact, and developing management systems. This last activity provides a link to the R&D activities of New Energies, which is preparing solutions for supplying solar power and associated services to residential markets by developing software tools and algorithms for the intelligent management of domestic electricity production and consumption, and also by integrating and testing systems combining photovoltaics, storage, control of demand as well as pilots for assessing and improving systems and algorithms in contact with customers.

With regard to biotechnologies, the Group is developing methods for converting sugars into biofuels and molecules of interest for chemicals, as well as processes for the deconstruction of lignocellulose into sugars. To support its ambitions, the Group has set up laboratories, including one research center specializing in fermentation and another specializing in predictive approaches, a cutting-edge technology for anticipating the properties of components and providing a better response to future needs, with unprecedented performance levels. To this end, TOTAL's biotech research team heads up a network of partners including academic laboratories and start-ups in the United States and Europe.
The Group mainly works with Amyris[2], a company specializing in biotechnologies.

(1) American company listed on NASDAQ in which the Group holds a 56.73% interest as of December 31, 2016.
(2) American company listed on NASDAQ in which the Group holds a 23.51% interest as of December 31, 2016.

4.4. Environment

Environmental issues are important throughout the Group and are taken into account in all R&D projects. R&D's effort is to manage environmental risks more effectively, particularly with regard to:

– water management, especially by reducing the use of water from natural environments and lowering emissions in compliance with local, national and international regulations;
– reduction of greenhouse gas emissions by improving energy efficiency and monitoring carbon capture, use and storage of CO_2 and the potential effects of CO_2 on the natural environment;
– detection and reduction of discharges into the air and simulation of their dispersal;
– prevention of soil contamination and regulatory compliance with regard to historical aspects and the remediation of sites; and
– changes in the Group's different products and management of their life cycle, in particular in compliance with the Registration, Evaluation, Authorisation and Restriction of Chemicals regulation (REACH).

4.5. R&D Organization

The Group intends to increase R&D in all of its segments through cross-functional themes and technologies. Constant attention is paid to R&D synergies between business segments.

The Group has 18 R&D sites worldwide and has entered into approximately 1,000 partner agreements with other industrial groups and academic or highly specialized research institutes. TOTAL also has a permanently renewed network of scientific advisors worldwide that monitor and consult on matters of interest to the Group's R&D activities. Long-term partnerships with universities and academic laboratories considered to be of strategic importance in Europe, the United States, Japan and China, as well as innovative small businesses, are part of the Group's approach.

Each business segment is developing an active intellectual property activity aimed at protecting its innovations, allowing its activity to develop and promoting its technological assets among its partners. In 2016, more than 200 patent applications were filed by the Group.

5. Property, plant and equipment

The companies of the Group have freehold and leasehold interests in over 130 countries throughout the world. Operations in properties, oil and gas fields or any other industrial, commercial or administrative facility, as well as the production capacities and utilization rates of these facilities, are described in this chapter for each business segment (Upstream, Refining & Chemicals and Marketing & Services).

A summary of the Group's property, plant and equipment and their main related expenses (depreciation and impairment) is included in Note 7 to the Consolidated Financial Statements (point 7 of chapter 10).

Minimum royalties from finance lease agreements regarding properties, service stations, vessels and other equipment are presented in Note 13 to the Consolidated Financial Statements (point 7 of chapter 10).

Information about the objectives of the Company's environmental policy, in particular those related to the Group's industrial sites or facilities, is presented in chapter 7.

6. Group organization

6.1. Position of the Company within the Group

TOTAL S.A. is the Group's parent company.

The Group's businesses are organized in business segments, which receive assistance from the corporate functional divisions.

6.2. Company subsidiaries

A list of the major subsidiaries directly or indirectly held by the Company included in TOTAL S.A.'s scope of consolidation is presented in Note 18 to the Consolidated Financial Statements (refer to point 7 of chapter 10).

As of December 31, 2016, there were 934 consolidated companies, of which 839 were fully consolidated and 95 were accounted for under the equity method. The principles of consolidation are described in Note 1.1 to the Consolidated Financial Statements.

In addition, the table of subsidiaries and affiliates in point 5.1 of chapter 12 presents the Company's direct subsidiaries and shareholdings, and in particular those with a gross value exceeding 1% of the Company's share capital.

The decision of TOTAL S.A.'s subsidiaries to declare dividends is made by their relevant Shareholders' Meetings and is subject to the provisions of applicable local laws and regulations. As of December 31, 2016, there is no restriction under such provisions that would materially restrict the distribution to TOTAL S.A. of the dividends declared by those subsidiaries.

During the fiscal year 2016, TOTAL S.A. acquired 100% of the shares of Saft Group S.A. in August 2016 following a successful voluntary takeover bid. TOTAL S.A. did not acquire any other stakes in companies with registered offices in France representing more than one twentieth, one tenth, one fifth, one third or one half of the capital of these companies, nor took control of any such companies.

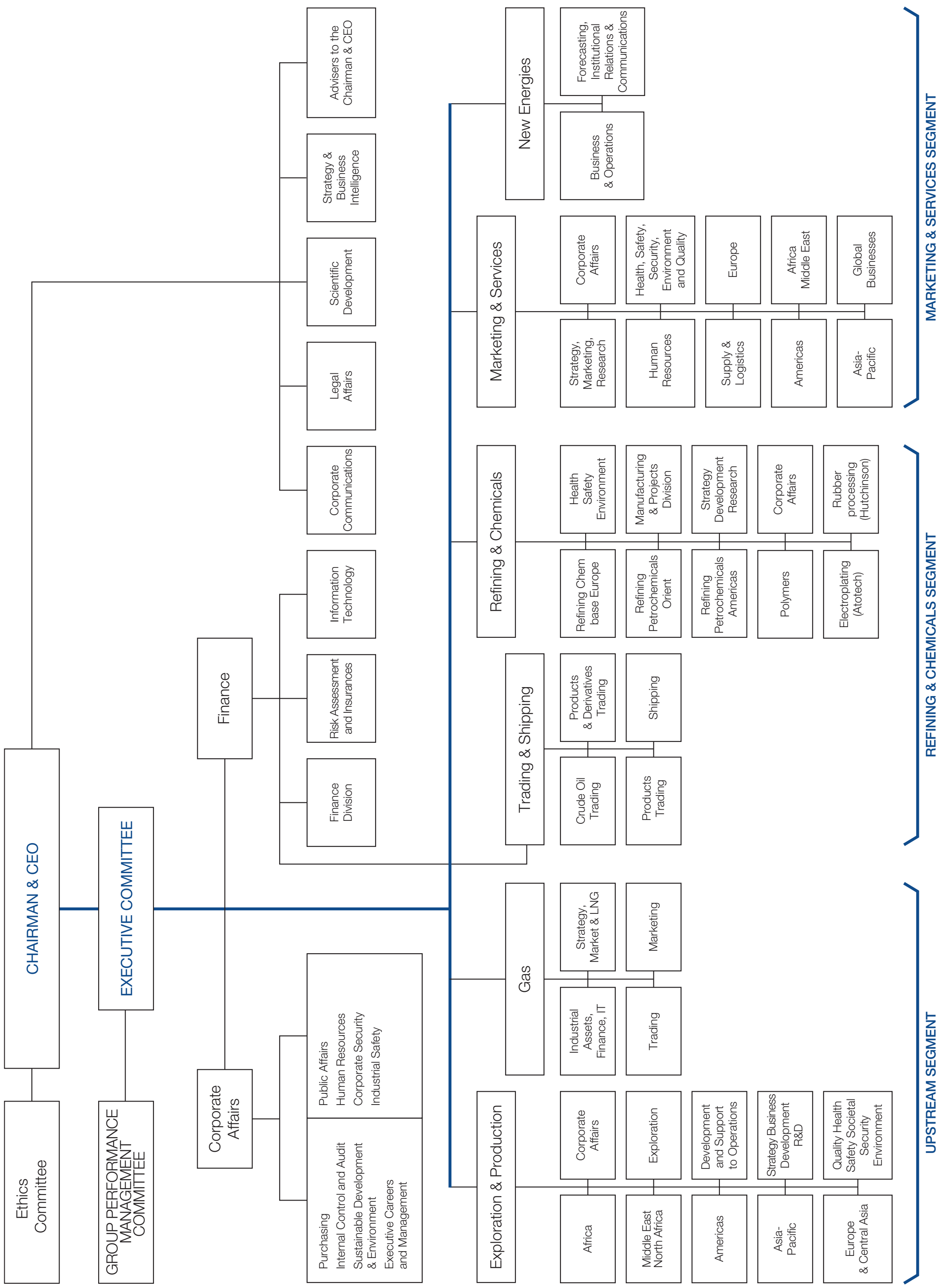
6.3. Group interests in publicly-traded companies

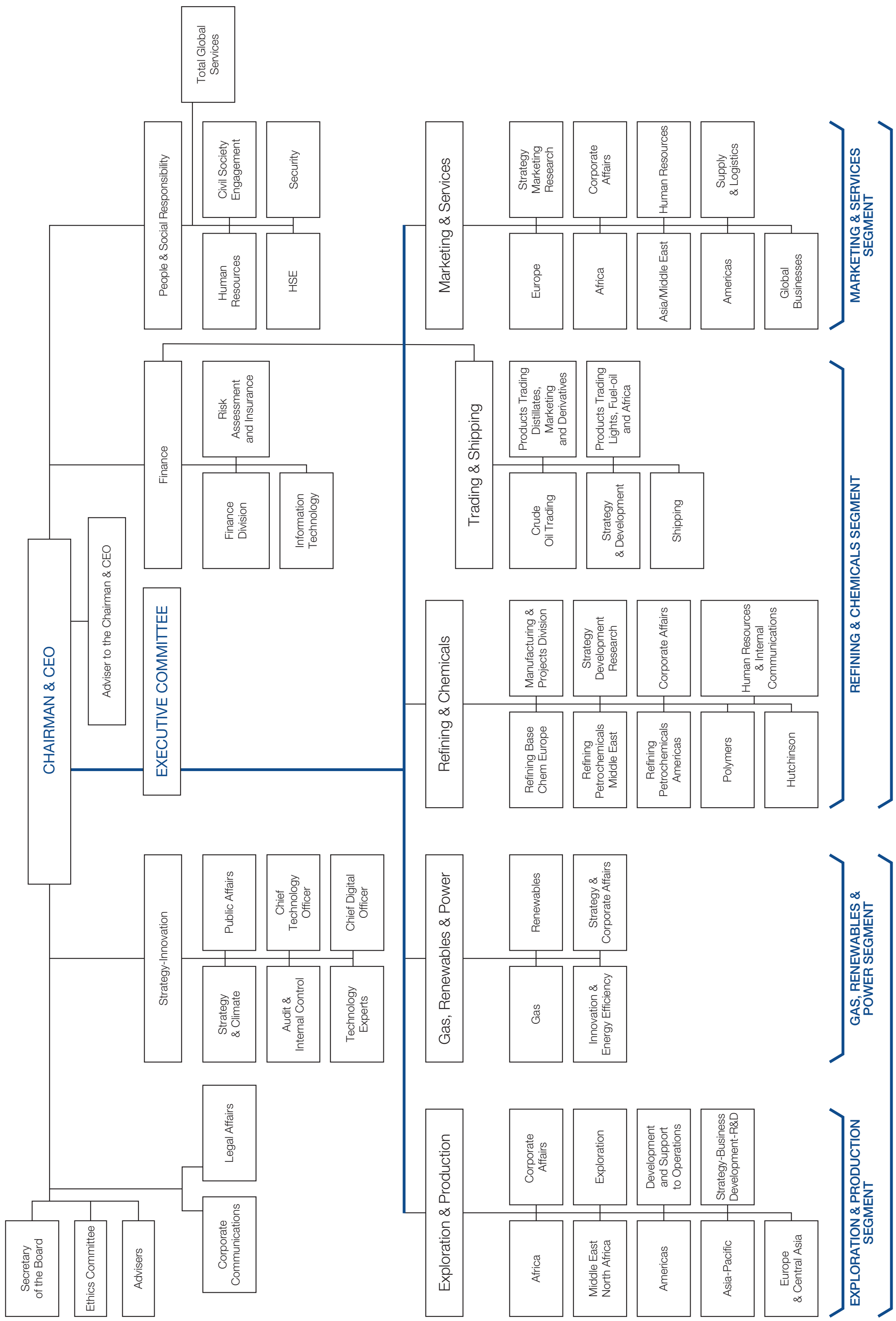
TOTAL holds stakes in a limited number of companies that issue publicly-traded financial instruments in France or abroad. These companies are mainly the Group's financing vehicles (Total Capital, Total Capital Canada Ltd., Total Capital International) or the operational subsidiaries in its business segments, in particular in Africa, such as Total Gabon[1].

TOTAL also holds a majority stake in SunPower (56.73% on December 31, 2016), an American company listed on NASDAQ, and minority interests in other companies, including PAO Novatek (18.9% on December 31, 2016), a Russian company listed on the Moscow Interbank Currency Exchange and the London Stock Exchange.

(1) Total Gabon is a company under Gabonese law, the shares of which are listed on Euronext Paris and owned by TOTAL (58.28%), the Republic of Gabon (25%) and the public (16.72%).

7. Organization charts




CHAIRMAN & CEO
Secretary of the Board
Ethics Committee
Advisers
Corporate Communications
Legal Affairs
Strategy-Innovation
Strategy & Climate
Public Affairs
Audit & Internal Control
Chief Technology Officer
Technology Experts
Chief Digital Officer
Adviser to the Chairman & CEO
EXECUTIVE COMMITTEE
Finance
Finance Division
Risk Assessment and Insurance
Information Technology
People & Social Responsibility
Human Resources
Civil Society Engagement
HSE
Security
Total Global Services
Exploration & Production
Africa
Corporate Affairs
Middle East North Africa
Exploration
Americas
Development and Support to Operations
Asia-Pacific
Strategy-Business Development-R&D
Europe & Central Asia
Gas, Renewables & Power
Gas
Renewables
Innovation & Energy Efficiency
Strategy & Corporate Affairs
Refining & Chemicals
Refining Base Chem Europe
Manufacturing & Projects Division
Refining Petrochemicals Middle East
Strategy Development Research
Refining Petrochemicals Americas
Corporate Affairs
Polymers
Human Resources & Internal Communications
Hutchinson
Trading & Shipping
Crude Oil Trading
Products Trading Distillates, Marketing and Derivatives
Strategy & Development
Products Trading Lights, Fuel-oil and Africa
Shipping
Marketing & Services
Europe
Strategy Marketing Research
Africa
Corporate Affairs
Asia/Middle East
Human Resources
Americas
Supply & Logistics
Global Businesses
EXPLORATION & PRODUCTION SEGMENT
GAS, RENEWABLES & POWER SEGMENT
UPSTREAM
REFINING & CHEMICALS SEGMENT
MARKETING & SERVICES SEGMENT
DOWNSTREAM

2016 results and outlook

The items presented in points 1 to 3 were approved by the Board of Directors on February 8, 2017 and have not been updated with subsequent events.

1. Summary of results and financial position

1.1. Overview of the 2016 fiscal year for TOTAL

After falling from 100 $/b in 2014 to 52 $/b on average in 2015, Brent prices were highly volatile in 2016, fluctuating between 27 $/b and 58 $/b, with an average of 44 $/b for the year. In this difficult environment, the Group demonstrated its resilience by generating adjusted net income of $8.3 billion and had the highest profitability among the majors due to the strength of its integrated model and commitment of its teams to reduce the breakeven.

The Group's resilience was supported by outstanding production growth over the past two years (14.3%, including 4.5% in 2016). In the Upstream, the Group strengthened its position in the Middle East by entering the Al Shaheen field in Qatar, and in the United States with the acquisition of shale gas assets. The Group is preparing future growth with the signing of major deals in Brazil with Petrobras, in Uganda and in Iran on the giant South Pars 11 project. The Group renewed its reserves with a replacement rate of 136% at constant prices and delivered promising exploration results, with two major discoveries in the United States (North Platte) and Nigeria (Owowo).

Despite lower refining margins, the Downstream[(1)] once again achieved its objectives and thereby demonstrated that its results are sustainable, with operating cash flow before working capital changes of $7 billion[(2)] and ROACE[(3)] above 30%, the highest among the majors. Results from the Refining & Chemicals segment were underpinned by the strong performance of its Asia and Middle East integrated platforms, while Marketing & Services results were driven by growth in retail and lubricants.

Financial discipline was successfully maintained across all business segments both for investments ($18.3 billion including resource acquisitions) and operating costs, with savings of $2.8 billion in 2016, exceeding the objective of $2.4 billion. Production costs were reduced to 5.9 $/boe in 2016, compared to 9.9 $/boe in 2014.

The $10 billion asset sale program is around 80% complete following the closing of the Atotech sale, and this contributed to the Group's financial strength with a net-debt-to-equity ratio at 27%, lower than it was in 2014.

In this context, the Board of Directors proposes to increase the dividend, despite the volatility of hydrocarbon prices, to 2.45 €/share, corresponding to a fourth quarter dividend of 0.62 €/share, a 1.6% increase compared to the previous three quarterly dividends. This demonstrates the Board's confidence in the strength of the Group's results and balance sheet as well as its prospects for cash flow growth.

(1) Refining & Chemicals and Marketing & Services segments, excluding New Energies.
(2) Operating cash flow before working capital changes, previously referred to as adjusted cash flow from operations, is defined as cash flow from operating activities before changes in working capital at replacement cost. Replacement cost is explained in Note 3 of the Consolidated Financial Statements (refer to point 7 of chapter 10).
(3) Based on adjusted net operating income and average capital employed at replacement cost.

1.2. 2016 Group results

Consolidated data in millions of dollars, except for earnings per share, dividends, number of shares and percentages.

(M$)	2016	2015	2014
Sales	149,743	165,357	236,122
Adjusted operating income from business segments (a)	8,928	12,672	21,604
Adjusted net operating income from business segments (a)	9,420	11,362	14,247
Net income (Group share)	6,196	5,087	4,244
Adjusted net income (Group share) (a)	8,287	10,518	12,837
Fully-diluted weighted-average shares (millions)	2,390	2,304	2,281
Adjusted fully-diluted earnings per share (dollars) (a) (b)	3.38	4.51	5.63
Dividend per share (euros) (c)	2.45	2.44	2.44
Net-debt-to-equity ratio (as of December 31)	27.1%	28.3%	31.3%
Return on average capital employed (ROACE) (d)	7.5%	9.4%	11.1%
Return on equity (ROE)	8.7%	11.5%	13.5%
Gross investments (e)	20,530	28,033	30,509
Divestments	2,877	7,584	6,190
Net investments (f)	17,757	20,360	24,140
Organic investments (g)	17,484	22,976	26,430
Operating cash flow before working capital changes (h)	16,988	19,376	24,597
Cash flow from operations	16,521	19,946	25,608

(a) Adjusted results are defined as income at replacement cost, excluding non-recurring items and excluding the impact of fair value changes.
(b) Based on fully-diluted weighted-average number of common shares outstanding during the period. In accordance with IFRS norms, adjusted fully-diluted earnings per share is calculated from the adjusted net income less the perpetual subordinated bond coupon.
(c) Dividend 2016 is subject to approval at the May 26, 2016 Annual Shareholders' Meeting.
(d) Based on adjusted net operating income and average capital employed at replacement cost.
(e) Including investments and increase in non-current loans.
(f) Net investments = gross investments – divestments – repayment of non-current loans – other operations with non-controlling interests.
(g) Organic investments = net investments excluding acquisitions, asset sales and other operations with non-controlling interests.
(h) Operating cash flow before working capital changes, previously referred to as adjusted cash flow from operations, is defined as cash flow from operating activities before changes in working capital at replacement cost. Replacement cost is explained in Note 3 of the Consolidated Financial Statements (refer to point 7 of chapter 10).

Market environment	2016	2015	2014
Exchange rate €-$	1.11	1.11	1.33
Brent ($/b)	43.7	52.4	99.0
European Refinery Margin Indicator (ERMI) (a) ($/t)	34.1	48.5	18.7

(a) ERMI is a Group indicator intended to represent the margin after variable costs for a hypothetical complex refinery located around Rotterdam in Northern Europe. The indicator margin may not be representative of the actual margins achieved by TOTAL in any period because of TOTAL's particular refinery configurations, product mix effects or other Company-specific operating conditions.

Adjustments to net income (a) (Group share) (M$)	2016	2015	2014
Special items affecting net income (Group share)	(2,567)	(4,675)	(6,165)
Gain (loss) on asset sales	267	1,810	1,209
Restructuring charges	(32)	(72)	(20)
Impairments	(2,097)	(5,447)	(7,063)
Other	(705)	(966)	(291)
Effect of changes in fair value	(3)	(9)	25
After-tax inventory effect (FIFO vs. replacement cost) (b)	479	(747)	(2,453)
Total adjustments affecting net income (Group share)	**(2,091)**	**(5,431)**	**(8,593)**

(a) For details on adjustments to operational income, refer to Note 3C of the Consolidated Financial Statements.
(b) Refer to Note 5.4.1 of the Consolidated Financial Statements.

1.2.1. Sales

Consolidated sales in 2016 were $149,743 million compared to $165,357 million in 2015, a decrease of 9%. The decrease in hydrocarbon prices and refining margins were partially offset by production growth and strong results for petrochemicals.

1.2.2. Operating income from business segments

The average Brent price was 44 $/b in 2016, a 17% decrease over one year. The Group's European Refining Margin Indicator ("ERMI") was 34 $/t in 2016, a 30% decrease compared to the high levels in 2015, in the context of high petroleum product stocks. The environment for petrochemicals remained favorable. The euro remained stable compared to the U.S. dollar, at 1.11 $/€ on average in 2016.

Given this less favorable environment than in 2015, adjusted net operating income from the business segments was $9,420 million in 2016, a decrease of 17% over one year.

The effective tax rate [1] for the business segments was 25.8% in 2016 compared to 33.9% in 2015, due to the relative weight and lower tax rates in the Upstream in a lower hydrocarbon price environment.

1.2.3. Net income (Group share)

Adjusted net income was $8,287 million in 2016 compared to $10,518 million in 2015, a decrease of 21%. Adjusted net income excludes the after-tax inventory effect, special items and the effect of changes in fair value.

Adjustment items had a negative impact on net income of $2,091 million in 2016, mainly due to the inventory effect and impairments on Gladstone LNG in Australia, Angola LNG, and Laggan-Tormore in the United Kingdom, reflecting the decrease in gas price assumptions for the coming years.

Given these items, net income (Group share) was $6,196 million in 2016 compared to $5,087 million in 2015, a 22% increase.

Adjusted fully-diluted earnings per share, based on 2,390 million fully-diluted weighted-average shares, was $3.38 in 2016 compared to $4.51 in 2015.

The number of fully-diluted shares was 2,436 million on December 31, 2016, compared to 2,336 million on December 31, 2015.

1.2.4. Investments – divestments

Asset sales were $1,864 million in 2016, mainly comprised of the sale of a 15% interest in the Gina Krog field in Norway, the FUKA gas pipeline network in the North Sea and the retail network in Turkey.

Acquisitions, including resource acquisitions were $2,033 million in 2016, mainly comprised of the additional 75% interest in the Barnett shale gas field in the United States, and the acquisitions of Saft Groupe, Lampiris and a retail network in the Dominican Republic.

Resource acquisitions were $780 million in 2016, comprised mainly of the additional 75% interest in the Barnett shale gas field in the United States. These acquisitions, at a cost of less than one dollar per barrel, enabled the Group to achieve its objective of adding one billion barrels of resources in 2016. Organic investments and resource acquisitions were $18,264 million in 2016.

1.2.5. Profitability

In 2016, the ROACE [2] was 7.5% and the ROE [3] was 8.7%.

1.3. Upstream segment results

Environment liquids and gas price realizations [a]	2016	2015	2014
Brent ($/b)	43.7	52.4	99.0
Average liquids price ($/b)	40.3	47.4	89.4
Average gas price ($/Mbtu)	3.56	4.75	6.57
Average hydrocarbon price ($/boe)	31.9	39.2	66.2

(a) Consolidated subsidiaries, excluding fixed margins.

Market conditions were less favorable in 2016 compared to 2015. The average realized price of liquids decreased by 15% and the average realized gas price by 25%.

Hydrocarbon production	2016	2015	2014
Liquids (kb/d)	1,271	1,237	1,034
Gas (Mcf/d)	6,447	6,054	6,063
Combined production (kboe/d)	2,452	2,347	2,146

In 2016, hydrocarbon production was 2,452 kboe/d, an increase of 4.5% compared to 2015, due to the following:

- +6% due to new start ups and ramp ups, notably Laggan-Tormore, Surmont Phase 2, Termokarstovoye, Gladstone LNG, Moho Phase 1b, Vega Pleyade and Incahuasi;
- -1.5% due to the security situation in Nigeria and Yemen, and wild fires in Canada;
- natural field decline was offset by PSC price effect and portfolio effects.

Results (M$)	2016	2015	2014
Adjusted operating income	2,737	4,925	17,156
Adjusted net operating income	3,633	4,774	10,504
Cash flow from operations	9,675	11,182	16,666
Operating cash flow before working capital changes	9,912	11,179	18,667
Investments	16,035	24,270	26,520
Divestments	2,331	3,215	5,764
Organic investments	14,316	20,508	22,959

Upstream adjusted net operating income was $3,633 million in 2016, a decrease of 24% compared to 2015. The increase in production combined with the decrease in operating costs as well as the lower effective tax rate partially offset the impact of lower hydrocarbon prices.

Technical costs for consolidated subsidiaries, calculated in accordance with ASC 932 [4], were reduced to 20.4 $/boe in 2016 compared to 23.0 $/boe in 2015. This decrease was essentially due to the reduction in operating costs from 7.4 $/boe in 2015 to 5.9 $/boe in 2016.

(1) Defined as: (tax on adjusted net operating income)/(adjusted net operating income – income from equity affiliates – dividends received from investments – impairment of goodwill + tax on adjusted net operating income).
(2) Based on adjusted net operating income and average capital employed at replacement cost.
(3) Based on adjusted net income and adjusted shareholders' equity for the period.
(4) FASB Accounting Standards Codification Topic 932, Extractive industries – Oil and Gas.

1.4. Refining & Chemicals results

Operational data [a]	2016	2015	2014
Total refinery throughput (kb/d)	1,965	2,023	1,775

(a) Includes share of TotalErg, as well as refineries in Africa and the French Antilles that are reported in the Marketing & Services segment. The condensate splitters at Port Arthur and Daesan are also included and 2015 figures have been restated accordingly.

Refinery throughput decreased by 3% for the full-year 2016 compared to 2015, notably due to shutdowns in Europe and the United States in the second quarter and the sale of the Schwedt refinery in Germany.

Results (M$)	2016	2015	2014
Adjusted operating income	4,373	5,649	2,739
Adjusted net operating income	4,201	4,889	2,489
including specialty chemicals	581	496	629
Investments	1,849	1,843	2,022
Divestments	86	3,488	192
Organic investments	1,636	827	1,944
Operating cash flow before working capital changes	4,878	5,785	4,028
Cash flow from operations	4,587	6,432	6,302

Refining & Chemicals adjusted net operating income was $4,201 million in 2016, a decrease of 14% compared to 2015, essentially due to the decrease in refining margins. Petrochemicals continued to generate good results, notably due to the strong contribution from the Group's major integrated platforms in Asia and the Middle East.

1.5. Marketing & Services results

Operational data [a]	2016	2015	2014
Refined products sales (kb/d)	1,793	1,818	1,769

(a) Excludes trading and bulk Refining sales, includes share of TotalErg.

In 2016, refined product sales decreased slightly compared to 2015, essentially due to the sale of the retail network in Turkey. Excluding portfolio effects, retail network sales increased by around 4%. Sales of land-based lubricants also increased by around 4%.

Results (M$)	2016	2015	2014
Sales	69,421	77,887	106,509
Adjusted operating income	1,818	2,098	1,709
Adjusted net operating income	1,586	1,699	1,254
including New Energies	26	108	10
Investments	2,506	1,841	1,818
Divestments	446	856	163
Organic investments	1,432	1,569	1,424
Operating cash flow before working capital changes	1,831	2,065	2,016
Cash flow from operations	1,623	2,323	2,721

Marketing & Services adjusted net operating income was $1,586 million in 2016, a 7% decrease compared to 2015. Excluding New Energies, which was particularly high in 2015 due to the delivery of the Quinto solar farm in the United States, net operating income was stable despite asset sales (retail network in Turkey).

1.6. TOTAL S.A. results in 2016

Net income for TOTAL S.A., the parent company, was €4,142 million in 2016 compared to €11,067 million in 2015. During 2015, a strong volume of dividends was paid by affiliates of TOTAL S.A. to the parent company.

1.7. Proposed dividend

The Board of Directors met on February 8, 2017 and decided to propose to the Combined Shareholders' Meeting, which will be held on May 26, 2017, an annual dividend of 2.45 €/share for 2016, an increase compared to 2015. Given the three previous 2016 interim quarterly dividends of 0.61 €/share, a fourth quarter 2016 dividend of 0.62 €/share is therefore proposed, representing an increase of 1.6% compared to the previous three interim dividends.

The Board of Directors also decided to propose to the Combined Shareholders' Meeting the alternative for shareholders to receive the fourth quarter 2016 dividend in cash or in new shares of the Company with a discount that will be set between 0% and 10%. Subject to approval at the Combined Shareholders' Meeting, the ex-dividend date for the fourth quarter dividend will be June 5, 2017, and the payment of the dividend in cash or the delivery of the shares issued in lieu of the dividend in cash is set for June 22, 2017.

2. Liquidity and capital resources

2.1. Long-term and short-term capital

Long-term capital As of December 31, (M$)	2016	2015	2014
Adjusted shareholders' equity [a]	99,993	93,864	91,845
Non-current financial debt	43,067	44,464	45,481
Hedging instruments of non-current financial debt	(908)	(1,219)	(1,319)
Total net non-current capital	**142,152**	**137,109**	**136,007**

(a) Based on a 2016 estimated dividend of €2.45 per share.

Short-term capital As of December 31, (M$)	2016	2015	2014
Current financial debt	13,920	12,488	10,942
Net current financial assets	(4,221)	(6,019)	(1,113)
Net current financial debt	**9,699**	**6,469**	**9,829**
Cash and cash equivalents	(24,597)	(23,269)	(25,181)

2.2. Cash flow

(M$)	2016	2015	2014
Cash flow from operating activities	16,521	19,946	25,608
Investments	(20,530)	(28,033)	(30,509)
Divestments	2,877	7,584	6,190
Other transactions with non-controlling interests	(104)	89	179
Net cash flow [a]	**(1,236)**	**(414)**	**(1,468)**
Dividends paid	(2,754)	(2,945)	(7,462)
Share buybacks	0	(237)	(289)
Net-debt-to-equity ratio at December 31	27%	28%	31%

(a) Net cash flow = cash flow from operating activities before working capital changes at replacement cost – net investments (including other transactions with non-controlling interests).

The Group's net cash flow was -$1,236 million in 2016 compared to -$414 million in 2015. This change is essentially due to the decrease in cash flow from operations as a result of lower hydrocarbon prices and refining margins, partially offset by the 15% decrease in net investments. The Group confirms its financial strength with a net-debt-to-equity ratio of 27% at end 2016, a decrease compared to 28% at end 2015.

2.3. Borrowing requirements and funding structure

The Group's policy consists of incurring long-term debt at a floating rate or at a fixed rate depending on the interest rates at the time of issue. Debt is incurred in dollars or euros depending on the Group's general corporate needs. Long-term interest rate and currency swaps may be used to hedge bonds at their issuance in order to create a variable or fixed rate synthetic debt. In order to partially modify the interest rate structure of long-term debt, TOTAL may also enter into long-term interest rate swaps.

The non-current financial debt is generally raised by the corporate treasury entities either directly in dollars or euros or in other currencies which are then exchanged for dollars or euros through swap issues to appropriately match general corporate needs.

As of December 31, 2016, the Group's long-term debt, after taking into account the effect of currency and interest rate swaps, was 95% in dollars and 72% at floating rates. In 2015, these ratios were 93% and 82% respectively.

In addition to its bond issuance programs, in 2015 and 2016 TOTAL S.A. issued perpetual subordinated notes in several tranches:

– February 19, 2015, €5 billion in two tranches;
– May 11, 2016, €1.75 billion in one tranche; and
– September 29, 2016, €2.5 billion in two tranches.

In accordance with IAS 32 provisions "Financial instruments - presentation", given the nature of these notes, they have been recognized in the accounts as equity.

Furthermore, on November 25, 2015, TOTAL S.A. issued a $1.2 billion bond combining cash-settled convertible bonds indexed to TOTAL's share performance and the purchase of stock options to hedge the risk of additional costs related to this indexation. This combination creates a non-dilutive synthetic instrument equivalent to a standard bond. At maturity, all transactions are made in cash and limited to the nominal amount.

The Group has established standards for market transactions under which bank counterparties must be approved in advance, based on an assessment of the counterparty's financial soundness (multi-criteria analysis including a review of the market capitalization and of the Credit Default Swap (CDS), its ratings with Standard & Poor's and Moody's, which must be of high quality, and its overall financial condition).

An overall authorized credit limit is set for each bank and is allocated among the subsidiaries and the Group's central treasury entities according to their needs.

To reduce the market values risk on its commitments, in particular for swaps set as part of bonds issuance, the Group also entered into margin call contracts with its significant counterparties.

2.4. External financing available

As of December 31, 2016, the aggregate amount of the major confirmed credit facilities granted by international banks to the Group's companies (including TOTAL S.A.) was $11,164 million (compared to $11,225 million on December 31, 2015), of which $10,724 million were unused (compared to $11,225 million unused on December 31, 2015).

TOTAL S.A. has confirmed lines of credit granted by international banks, which are calculated to allow it to manage its short-term liquidity needs as required. As of December 31, 2016, these credit facilities amounted to $10,076 million (compared to $10,675 million on December 31, 2015), of which $10,076 million were unused (compared to $10,675 million unused on December 31, 2015).

The agreements for the lines of credit granted to TOTAL S.A. do not contain conditions related to the Company's financial ratios, to its financial ratings from specialized agencies, or to the occurrence of events that could have a material adverse effect on its financial position.

Credit facilities granted to Group companies other than TOTAL S.A. are not intended to finance the Group's general needs; they are intended to finance either the general needs of the borrowing affiliate or a specific project.

As of December 31, 2016, no restrictions applied to the use of the Group companies' capital (including TOTAL S.A.) that could significantly impact the Group's activities, directly or indirectly.

2.5. Anticipated sources of financing

Investments, working capital and dividend payments are financed essentially by cash flow from operations, asset disposals and, if necessary, by net borrowings.

For the coming years and based on the current financing conditions, the Company intends to maintain this method of financing the Group's investments and activities.

3. Trends and outlook

3.1. Outlook

Brent increased following the announced production cuts agreed by OPEC and non-OPEC countries, including Russia. However, inventory levels are high and prices are likely to remain volatile. In this context, the Group is continuing to cut costs with the objective of achieving $3.5 billion of cost savings in 2017 and bringing production costs down to 5.5 $/boe for the year. Investments are moving into the sustainable range needed to deliver profitable future growth and are expected to be between $16 and $17 billion in 2017 including resource acquisitions.

In the Upstream, production is set to grow by more than 4% in 2017, supporting the objective of increasing production on average by 5% per year from 2014 to 2020. As a result of this growth, the sensitivity of the portfolio to Brent increases to $2.5 billion for a 10 $/b change in Brent in 2017. The Group plans to take advantage of the favorable cost environment by launching around 10 projects over the next 18 months and adding attractive resources to the portfolio.

In 2017, the Downstream is expected to continue generating stable operating cash flow before working capital changes of around $7 billion thanks to its diverse portfolio of activities. Refining & Chemicals' performance has been strengthened by the restructuring and the segment will continue to benefit from the quality of its integrated platforms, notably in Antwerp, in the United States, in Asia and in the Middle East. The final investment decision to launch the Port Arthur side-cracker is expected to be made in 2017. The Marketing & Services segment is pursuing its cash generation growth strategy by leveraging its strong position in high-potential retail and lubricant markets.

In 2017, the Group expects its breakeven will continue to fall, reaching less than 40 $/b pre-dividend. Cash flow from operations is expected to cover investments and the cash portion of the dividend at 50 $/b. TOTAL confirms its medium-term objective to achieve a net-debt-to-equity ratio of 20%.

The Group is committed to maintaining attractive returns for its shareholders and will eliminate the discount on the scrip dividend with Brent at 60 $/b.

3.2. Risks and uncertainties

Due to the nature of its business, the Group's activities remain subject to the usual market risks (sensitivity to the environmental parameters of the oil and financial markets), industrial and environmental risks related to its operations, and to political or geopolitical risks stemming from the global presence of most of its activities.

Detailed information is given in the Risk Factors section (point 1 of chapter 4) of this Registration Document. For more information, also refer to the Chairman's report in point 4 of chapter 4.

4. Significant changes

Except for the events mentioned above in the Management Report (chapter 3), in the Business overview (chapter 2), and in the description of legal and arbitration procedures (point 2 of chapter 4), no significant changes to the Group's financial or commercial situation have occurred since December 31, 2016, the end of the last fiscal year for which audited financial statements have been published by the Company.

Risks and control

1. Risk Factors

The Group conducts its activities in an ever-changing environment and is exposed to risks that, if they were to occur, could have a material adverse effect on its business, financial condition, including its operating income and cash flow, reputation or outlook.

The Group employs a continuous process of identifying and analyzing risks in order to determine those that could prevent it from achieving its objectives. This chapter presents the significant risks to which the Group believes it is exposed as of the date of this Registration Document. However, as of such date, the Group may not be aware of other risks that could, or other risks may not have been considered by the Group as being likely to, have a material adverse impact on the Group, its business, financial condition, including its operating income and cash flow, reputation or outlook.

The main internal control and risk management procedures, which are part of the report of the Chairman of the Board of Directors prepared pursuant to Article L. 225-37 of the French Commercial Code, are described in point 4 of this chapter.

1.1. Risks related to market environment and other financial risks

The financial performance of TOTAL is sensitive to a number of market environmentrelated factors, the most significant being hydrocarbon prices, refining margins and exchange rates.

Generally, a decline in hydrocarbon prices has a negative effect on the Group's results due to a decrease in revenues from oil and gas production. Conversely, a rise in hydrocarbon prices increases the Group's results.

In 2016, crude oil prices reached their lowest point in January and then strengthened progressively, notably due to the OPEC/non-OPEC agreement concluded in November 2016, while remaining low. The market remains highly volatile.

For the year 2017, according to the scenarios retained below, the Group estimates that an increase of $10 per barrel in the price of Brent crude would increase annual adjusted net operating income[1] by approximately $2 billion and cash flow from operations by approximately $2.5 billion. Conversely, a decrease of $10 per barrel in the price of Brent crude would decrease annual adjusted net operating income by approximately $2 billion and cash flow from operations by approximately $2.5 billion.

The impact of changes in crude oil and gas prices on downstream operations depends upon the speed at which the prices of finished products adjust to reflect these changes. The Group estimates that a decrease in its European Refining Margin Indicator ("ERMI") of $10 per ton would decrease annual adjusted net operating income by approximately $0.5 billion and cash flow from operations by approximately $0.6 billion. Conversely, an increase in its ERMI of $10 per ton would increase annual adjusted net operating income by approximately $0.5 billion and cash flow from operations by approximately $0.6 billion.

All of the Group's activities are, for various reasons and to varying degrees, sensitive to fluctuations in the dollar/euro exchange rate. The Group estimates that a decrease of $0.10 per euro (strengthening of the dollar versus the euro) would increase adjusted net operating income by approximately $0.1 billion and have a limited impact on cash flow from operations. Conversely, an increase of $0.10 per euro (weakening of the dollar versus the euro) would decrease adjusted net operating income by approximately $0.1 billion and have a limited impact on cash flow from operations.

Market impact environment 2017 [a]	Scenario retained	Change	Estimated impact on adjusted net operating income	Estimated impact on cash flow from operations
Brent	50 $/b	+10 $/b	+2 B$	+2.5 B$
European Refining Margin Indicator (ERMI)	35 $/t	-10 $/t	-0.5 B$	-0.6 B$
$/€	1.1 $/€	-0.1 $ per €	+0.1 B$	≈0 B$

(a) Sensitivities revised once per year upon publication of the previous year's fourth quarter results. Indicated sensitivities are approximate and based upon TOTAL's current view of its 2017 portfolio. Results may differ significantly from the estimates implied by the application of these sensitivities. The impact of the $/€ sensitivity on adjusted net operating income is primarily attributable to the Refining & Chemicals segment.

In addition to the adverse effect on the Group's revenues, margins and profitability, a prolonged period of low oil and natural gas prices could lead the Group to review its projects and the evaluation of its assets and oil and natural gas reserves.

Prices for oil and natural gas may fluctuate widely due to many factors over which TOTAL has no control. These factors include:

- variations in global and regional supply of and demand for energy;
- global and regional economic and political developments in natural resource-producing regions, particularly in the Middle East, Africa and South America, as well as in Russia;
- the ability of the Organization of the Petroleum Exporting Countries (OPEC) and other producing nations to influence global production levels and prices;
- prices of unconventional energies as well as evolving approaches for developing oil sands and shale oil, which may affect the Group's realized prices, notably under its long-term gas sales contracts and asset valuations, particularly in North America;
- cost and availability of new technology;
- regulations and governmental actions;
- global economic and financial market conditions;

(1) Adjusted results are defined as income at replacement cost, excluding non-recurring items and the impact of fair value changes.

– the security situation in certain regions, the magnitude of international terrorist threats, war or other conflicts;
– changes in demographics, including population growth rates and consumer preferences; and
– adverse weather conditions that can disrupt supplies or interrupt operations of the Group's facilities.

Prolonged periods of low oil and natural gas prices may reduce the economic viability of projects in production or in development, and reduce the Group's liquidity, thereby decreasing its ability to finance capital expenditures and/or causing it to cancel or postpone investment projects.

If TOTAL were unable to finance its investment projects, the Group's opportunities for future revenue and profitability growth would be reduced, which could materially impact the Group's financial condition, including its operating income and cash flow.

Prolonged periods of low oil and natural gas prices may reduce the Group's reported reserves and cause the Group to revise the price assumptions upon which asset impairment tests are based that could have a significant adverse effect on the Group's results in the period in which it occurs. For additional information on impairments recognized on the Group's assets, refer to Note 3 to the Consolidated Financial Statements (point 7 of chapter 10).

Conversely, in a high oil and gas price environment, the Group can experience significant increases in cost and government take, and, under some production-sharing contracts, the Group's production rights could be reduced. Higher prices can also reduce demand for the Group's products.

The Group's earnings from its Refining & Chemicals and Marketing & Services segments are primarily dependent upon the supply and demand for petroleum products and the associated margins on sales of these products, with the impact of changes in oil and gas prices on earnings on these segments being dependent upon the speed at which the prices of petroleum products adjust to reflect movements in oil and gas prices. In 2016, the negative effects of lower oil and gas prices on the Group's results were partially offset by the results of the Refining & Chemicals segment. During 2016, the Group's refining margins, while remaining at a good level, fluctuated throughout the year. In 2017, there can be no assurance that the Group's refining margins will remain at such level.

The activities of Trading & Shipping (oil, gas and power trading and shipping activities) are particularly sensitive to market risk and more specifically to price risk as a consequence of the volatility of oil and gas prices, to liquidity risk (inability to buy or sell cargoes at market prices) and to counterparty risk (when a counterparty does not fulfill its contractual obligations). The Group uses various energy derivative instruments and freight-rates instruments to adjust its exposure to price fluctuations of crude oil, petroleum products, natural gas, power and freight-rates. Although TOTAL believes it has established appropriate risk management procedures, large market fluctuations may adversely affect the Group's activities and financial condition, including its operating income and cash flow.

For more detailed information on the impact of the lower oil and gas prices on the Group's 2016 results, financial condition (including impairments, significant reductions to capital expenditures and operating costs, and divestments completed under the Group's asset sale program) and outlook, refer to chapter 3.

TOTAL is exposed to other financial risks related to its financing and cash management activities.

The Group is exposed to changes in interest rates and foreign exchange rates. Even though the Group generally seeks to minimize the currency exposure of each entity to its functional currency (primarily the dollar, the euro, the pound sterling and the Norwegian krone), the Group's financial condition, including its operating income and cash flow, could be impacted by a significant change in the value of these currencies. In addition, as TOTAL mostly turns to financial markets for its financing, its financial condition and operations could be materially impacted if access to those markets were to become more difficult. For further information on financial risks, refer to Notes 15 and 16 to the Consolidated Financial Statements (point 7 of chapter 10).

1.2. Industrial and environmental risks and risks related to climate issues

TOTAL is exposed to risks related to the safety and security of its operations.

The Group's activities involve a wide range of operational risks, such as explosions, fires, accidents, equipment failures, leakage of toxic products, emissions or discharges into the air, water or soil, that can potentially cause death or injury, or impact natural resources and ecosystems.

The industrial event that could have the most significant impact is a major industrial accident, *e.g.*, blow out, explosion, fire, leakage of highly toxic products or massive leakage, resulting in death or injury and/or accidental pollution on a large-scale or at an environmentally sensitive site.

Acts of terrorism or malicious acts against the Group's employees, plants, sites, pipelines and transportation or computer systems could also disrupt the Group's business activities and could cause harm or damage to people, property and the environment.

Certain activities of the Group face specific additional risks. TOTAL's Upstream segment is exposed to risks related to the physical characteristics of oil and gas fields, particularly during drilling operations, which can cause blow outs, explosions, fires or other damage, in particular to the environment, and lead to a disruption of the Group's operations or reduce its production. In addition to the risks of explosions and fires, the activities of the Refining & Chemicals and Marketing & Services business segments entail risks related to the overall life cycle of the products manufactured, as well as the materials used. With regard to transportation, the likelihood of an operational accident depends not only on the hazardous nature of the products transported, but also on the volumes involved and the sensitivity of the regions through which they are transported (quality of infrastructure, population density, environmental considerations).

TOTAL's workforce and the public are exposed to risks inherent to the Group's operations, which could lead to legal proceedings against the Group's entities and legal representatives, notably in cases of death, injury and property and environmental damage. Such proceedings could also damage the Group's reputation. In addition, like most industrial groups, TOTAL is affected by reports of occupational illnesses, particularly those caused by past exposure of Group employees to asbestos.

To manage the operational risks to which it is exposed, the Group has adopted a preventive and remedial approach by putting in place centralized HSE (healty, safety and environment) and security management systems that seek to take all necessary measures to reduce the related risks (refer to point 4.3.1 of this chapter). In addition, the Group maintains worldwide third-party liability insurance coverage for all its subsidiaries. TOTAL also has insurance to protect against the risk of damage to Group property and/or business interruption at its main refining and petrochemical sites. TOTAL's insurance and risk management policies are described in point 3 of this chapter. However, the Group is not insured against all potential risks. In certain cases, such as a major environmental disaster, TOTAL's liability may exceed the maximum coverage provided by its third-party liability insurance. The Group cannot guarantee that it will not suffer any uninsured loss and there can be no guarantee, particularly in the event of a major environmental disaster or industrial accident, that such loss would not have a material adverse effect on the Group's financial condition, including its operating income and cash flow, and its reputation.

Crisis management systems are necessary to effectively respond to emergencies, avoid potential disruptions to TOTAL's business and operations and minimize impacts on third parties or the environment.

TOTAL has crisis management plans in place to deal with emergencies (refer to point 4 of this chapter). However, these plans cannot exclude the risk that the Group's business and operations may be severely disrupted in a crisis situation or ensure the absence of impacts on third parties or the environment. TOTAL has also implemented business continuity plans to continue or resume operations following a shutdown or incident. An inability for the Group to resume its activities in a timely manner could prolong the impact of any disruption and thus could have a material adverse effect on its financial condition, including its operating income and cash flow.

TOTAL is subject to increasingly stringent environmental, health and safety laws and regulations in numerous countries and may incur material related compliance costs.

The Group's activities are subject to numerous laws and regulations pertaining to the environment, health and safety. In most countries where the Group operates, particularly in Europe and the United States, sites and products are subject to increasingly strict laws governing the protection of the environment (*e.g.*, water, air, soil, noise, protection of nature, waste management, impact assessments), health (*e.g.*, occupational safety, chemical product risk), and the safety of personnel and residents.

Product quality and consumer protection are also subject to increasingly strict regulations. The Group's entities ensure that their products meet applicable specifications and abide by all applicable consumer protection laws. Failure to do so could lead to personal injury, property damage, environmental harm and loss of customers, which could negatively impact the Group's financial condition, including its operating income and cash flow, and its reputation.

TOTAL incurs, and will continue to incur, substantial expenditures to comply with increasingly complex laws and regulations aimed at protecting health, safety and the environment. Such expenditures could have a material adverse effect on the Group's financial condition.

The introduction of new laws and regulations could compel the Group to curtail, modify or cease certain operations or implement temporary shutdowns of facilities, which could diminish its productivity and have a material adverse impact on its financial condition.

Moreover, most of the Group's activities will eventually, at site closure, require decommissioning followed by environmental remediation after operations are discontinued, in compliance with applicable regulations. Costs related to such activities may materially exceed the Group's provisions and adversely impact its operating results. With regard to the permanent shutdown of an activity, the Group's environmental contingencies and asset retirement obligations are addressed in the "Asset retirement obligations" and "Provisions for environmental contingencies" sections of the Group's consolidated balance sheet (refer to Note 12 to the Consolidated Financial Statements, point 7 of chapter 10). Future expenditures related to asset retirement obligations are accounted for in accordance with the accounting principles described in the same Note.

Laws and regulations related to climate change may adversely affect the Group's business and financial condition.

Growing public concern over greenhouse gas ("GHG") emissions and climate change, which notably led to the signature of the Paris Agreement on December 12, 2015 as part of the United Nations Climate Change Conference (COP 21), is likely to continue to lead to further regulation in these areas. These additional regulatory requirements could lead the Group to curtail, change or cease certain of its operations, and submit the Group's facilities to additional compliance obligations, which could adversely affect the Group's businesses and financial condition, including its operating income and cash flow.

Regulations designed to gradually limit fossil fuel use may, depending on the GHG emission limits and time horizons set, negatively and significantly affect the development of projects, as well as the economic value of certain of the Group's assets. Internal studies conducted by TOTAL have shown that a long term CO_2 price of $40/t[(1)] applied worldwide would have an impact of around 5% on the discounted present value of the Group's assets (upstream and downstream)[(2)]. In response to these possible developments, natural gas, which is the fossil energy that emits the least amount of GHG, represented nearly 48% of TOTAL's production in 2016, compared to approximately 35% in 2005, and the Group's objective is to grow this percentage over the long term with the expected growth of gas markets. In addition, the Group ceased its coal production activities and is developing its activities in the realms of solar energy production and energy from biomass (renewable energies).

In Europe, the regulations concerning the market for CO_2 emission allowances, the EU Emissions Trading System (EU-ETS), entered a third phase on January 1, 2013. This phase marks the end of the overall free allocation of emission allowances: certain emissions, such as those related to electricity production, no longer benefit from free allowances, while for others free allowances have been significantly reduced. Free allocations are now established based on the emission level of the top-performing plants (*i.e.*, the least GHG-emitting) within the same sector ("top 10 benchmark"). Lower-performing plants must purchase, at market price, the

(1) As from 2021 or the current price in a given country.
(2) Sensitivity calculated for a crude oil price of $60/80/b compared to a reference scenario that takes into account a CO_2 price in the regions already covered by a carbon pricing system.

necessary allowances to cover their emissions over these free allocations. The plants also need to indirectly bear the cost of allowances for all electricity consumed (including electricity generated internally at the facilities).

The 2014 update to the EU-ETS list of sectors exposed to carbon leakage confirmed that refining activities in Europe are an exposed sector and should continue to benefit from free allocations partially covering its deficits. Based on available information, the Group has estimated that approximately 25% of its emissions subject to the EU-ETS will not be covered by free allowances during the period 2013-2020 and at least 30% during the period 2021-2030. The financial risk related to the foreseeable purchase of CO_2 emission allowances on the market is expected to rise due to the effects of the ongoing reform of the EU-ETS. At year-end 2016, the price of CO_2 emission allowances stood at approximately €6/t CO_2. The forecast for 2020 indicates that the price could rise to approximately €20/t[1] CO_2 due to the combined effects of backloading[2] (having removed 900 Mt from phase 3 allowance auctions), of the foreseeable cancellation of quotas and the establishment of a "market stability reserve" at the end of this phase. The Group believes that the price of CO_2 emission allowances could rise to at least €30/t during phase 4 (2021-2030).

The physical effects of climate change may adversely affect the Group's business.

TOTAL's businesses operate in varied locales where the potential physical impacts of climate change, including changes in weather patterns, are highly uncertain and may adversely impact the results of the Group's operations.

Climate change potentially has multiple effects that could harm the Group's operations. The increasing scarcity of water resources may negatively affect the Group's operations in some regions of the world, high sea levels may harm certain coastal activities, and the multiplication of extreme weather events may damage offshore and onshore facilities. These climate risk factors are continually assessed in TOTAL's management and risk management plans.

The Group believes that it is impossible to guarantee that the contingencies or liabilities related to the matters mentioned in point 1.2 of this chapter will not have a material adverse impact on its business, financial condition, including its operating income and cash flow, reputation or outlook.

1.3. Risks related to critical IT systems security

Disruption to or breaches of TOTAL's critical IT services or information security systems could adversely affect the Group's operations.

The Group's activities depend heavily on the reliability and security of its information technology (IT) systems. If the integrity of its IT systems were compromised due to, for example, technical failure, cyber attack, viruses and computer intrusions, power or network outages or natural disasters, the Group's activities and assets could sustain serious damage, material intellectual property could be divulged and, in some cases, personal injury, property damage, environmental harm and regulatory violations could occur, potentially having a material adverse effect on the Group's financial condition, including its operating income and cash flow.

1.4. Risks related to the development of major projects and reserves

The Group's production growth and profitability depend on the delivery of its major development projects.

Growth of production and profitability of the Group rely heavily on the successful execution of its major development projects that are increasingly complex and capital-intensive. These major projects may face a number of difficulties, including, in particular, those related to:

– economic or political risks, including threats specific to a certain country or region, such as terrorism, social unrest or other conflicts (refer to point 1.6 of this chapter);
– negotiations with partners, governments, local communities, suppliers, customers and other parties;
– obtaining project financing;
– controlling capital and operating costs;
– earning an adequate return in a low oil and/or gas price environment;
– adhering to project schedules; and
– the timely issuance or renewal of permits and licenses by public agencies.

Poor delivery of any major project that underpins production or production growth could adversely affect the Group's financial condition, including its operating income and cash flow.

The Group's long-term profitability depends on cost-effective discovery, acquisition and development of economically viable new reserves; if the Group is unsuccessful, its financial condition, including its operating income and cash flow, would be materially and adversely affected.

A large portion of the Group's revenues and operating results are derived from the sale of oil and gas that the Group extracts from underground reserves developed as part of its Exploration & Production activities. The development of oil and gas fields, the construction of facilities and the drilling of production or injection wells is capital intensive and requires advanced technology. Due to constantly changing market conditions and environmental challenges, cost projections can be uncertain. For TOTAL's Exploration & Production activities to continue to be profitable, the Group needs to replace its reserves with new proved reserves that can be developed and produced in an economically viable manner.

(1) Company data.
(2) Backloading: authorization given to the European Commission to intervene at its own discretion in the CO_2 allowance auction calendar.

In addition, TOTAL's ability to discover or acquire and develop new reserves successfully is uncertain and can be negatively affected by a number of factors, including:

- the geological nature of oil and gas fields, notably unexpected drilling conditions including pressure or unexpected heterogeneities in geological formations;
- the risk of dry holes or failure to find expected commercial quantities of hydrocarbons;
- equipment failures, fires, blow-outs or accidents;
- shortages or delays in the availability or delivery of appropriate equipment;
- the Group's inability to develop or implement new technologies that enable access to previously inaccessible fields;
- the Group's inability to anticipate market changes in a timely manner;
- adverse weather conditions;
- the inability of the Group's partners to execute or finance projects in which the Group holds an interest or to meet their contractual obligations;
- the inability of service companies to deliver contracted services on time and on budget;
- compliance with both anticipated and unanticipated governmental requirements, including U.S. and EU regulations that may give a competitive advantage to companies not subject to such regulations;
- economic or political risks, including threats specific to a certain country or region, such as terrorism, social unrest or other conflicts (refer to point 1.6 of this chapter);
- competition from oil and gas companies for the acquisition and development of assets and licenses (refer to point 1.7 of this chapter);
- increased taxes and royalties, including retroactive claims and changes in regulations and tax reassesments;
- disputes related to property titles.

These factors could lead to cost overruns and could impair the Group's ability to complete a development project or make production economical. Some of these factors may also affect the Group's projects and facilities further down the oil and gas chain.

If TOTAL fails to develop new reserves cost-effectively and in sufficient quantities, the Group's financial condition, including its operating income and cash flow, could be materially affected.

The Group's oil and gas reserves data are estimates only and subsequent downward adjustments are possible. If actual production from such reserves proves to be lower than current estimates indicate, the Group's financial condition, including its operating income and cash flow, could be negatively impacted.

The Group's proved reserves figures are estimates prepared in accordance with SEC rules. Proved reserves are those reserves which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically recoverable – from a given date forward, from known reservoirs and under existing economic conditions, operating methods and government regulations – prior to the time at which contracts providing the right to operate expire, unless evidence indicates that renewal is reasonably certain, regardless of whether deterministic or probabilistic methods are used for the estimation. Reserves are estimated by teams of qualified, experienced and trained geoscientists, petroleum engineers and project engineers, who rigorously review and analyze in detail all available geoscience and engineering data (*e.g.*, seismic data, electrical logs, cores, fluids, pressures, flow rates, facilities parameters). This process involves making subjective judgments, including with respect to the estimate of hydrocarbons initially in place, initial production rates and recovery efficiency, based on available geological, technical and economic data. Consequently, estimates of reserves are not exact measurements and are subject to revision.

A variety of factors that are beyond the Group's control could cause such estimates to be adjusted downward in the future, or cause the Group's actual production to be lower than its currently reported proved reserves indicate. Such factors include:

- a prolonged period of low prices of oil or gas, making reserves no longer economically viable to exploit and therefore not classifiable as proved;
- an increase in the price of oil or gas, which may reduce the reserves to which the Group is entitled under production sharing and risked service contracts and other contractual terms;
- changes in tax rules and other regulations that make reserves no longer economically viable to exploit; and
- the actual production performance of the Group's deposits.

The Group's reserves estimates may therefore require substantial downward revisions should its subjective judgments prove not to have been conservative enough based on the available geoscience and engineering data, or the Group's assumptions regarding factors or variables that are beyond its control prove to be incorrect over time. Any downward adjustment could indicate lower future production amounts, which could adversely affect the Group's financial condition, including its operating income and cash flow.

1.5. Risks related to equity affiliates and management of assets operated by third parties

Many of the Group's projects are conducted by equity affiliates or are operated by third parties. For these projects, the Group's degree of control, as well as its ability to identify and manage risks, may be reduced.

A significant number of the Group's projects are conducted by equity affiliates. In cases where the Group's company is not the operator, such company may have limited influence over, and control of, the behavior, performance and costs of the partnership, its ability to manage risks may be limited and it may, nevertheless, be prosecuted by regulators or claimants in the event of an incident.

For additional information, refer to Note 8 ("Equity affiliates, other titles and related parties") to the Consolidated Financial Statements (point 7 of chapter 10).

Additionally, the partners of the Group may not be able to meet their financial or other obligations to the projects, which may threaten the viability of a given project. These partners may also not have the financial capacity to fully indemnify the Group or third parties in the event of an incident.

With respect to joint ventures, contractual terms generally provide that the operator, whether an entity of the Group or a third party, assumes full liability for damages caused by its gross negligence or willful misconduct.

In the absence of the operator's gross negligence or willful misconduct, other liabilities are generally borne by the joint venture and the cost thereof is assumed by the partners of the joint venture in proportion to their respective ownership interests.

With respect to third-party providers of goods and services, the amount and nature of the liability assumed by the third party depends on the context and may be limited by contract. Contracts may also contain obligations to indemnify TOTAL or for TOTAL to indemnify co-contracting parties or third parties.

1.6. Risks related to political or economic factors

TOTAL has significant production and reserves located in politically, economically and socially unstable areas, where the likelihood of material disruption of the Group's operations is relatively high.

A significant portion of TOTAL's oil and gas production and reserves is located in countries that are not part of the Organisation for Economic Co-operation and Development (OECD). In recent years, a number of these countries have experienced varying degrees of one or more of the following: economic or political instability, civil war, violent conflict, social unrest, actions of terrorist groups and the application of international economic sanctions. Any of these conditions alone or in combination could disrupt the Group's operations in any of these regions, causing substantial declines in production or revisions to reserves estimates.

In Africa, which represented 26% [1] of the Group's 2016 combined liquids and gas production, certain of the countries in which the Group has production have recently suffered from some of these conditions, including Nigeria, which is one of the main contributing countries to the Group's production of hydrocarbons, and Libya (refer to point 2.1.1.8 of chapter 2).

The Middle East, which represented 21% [2] of the Group's 2016 combined liquids and gas production, has in recent years suffered increased political volatility in connection with violent conflict and social unrest, including Syria, where European Union (EU) and U.S. economic sanctions have prohibited TOTAL from producing oil and gas since 2011. In Yemen, the deterioration of security conditions in the vicinity of Balhaf caused the company Yemen LNG, in which the Group holds a stake of 39.62%, to stop its commercial production and export of LNG and to declare *force majeure* to its various stakeholders in 2015. The plant has been put in preservation mode. In Iran, following the suspension on January 16, 2016 of UN economic sanctions, most U.S. secondary sanctions and most EU economic sanctions, the Group has engaged in certain activities. However, sanctions could be reinstated unilaterally in the event of a dispute over Iran's compliance with its nuclear commitments or in certain other cases. For additional information, refer to points 1.9.1 and 1.9.2 of this chapter.

In South America, which represented 6% of the Group's 2016, combined liquids and gas production, certain of the countries in which TOTAL has production have recently suffered from some of the above-mentioned conditions, including Argentina, Brazil and Venezuela.

Since July 2014, international economic sanctions have been adopted against certain Russian persons and entities, including various entities operating in the financial, energy and defense sectors. As of December 31, 2016, TOTAL held nearly 21% of its proved reserves in Russia, where from the Group had 14% of its combined oil and gas production in 2016. For additional information, refer to point 1.9.1 of this chapter.

Furthermore, in addition to current production, TOTAL is also exploring for and developing new reserves in other regions of the world that are historically characterized by political, social and economic instability, such as the Caspian Sea region where TOTAL has large projects currently underway.

The occurrence and magnitude of incidents related to economic, social and political instability are unpredictable. It is possible that they could have a material adverse impact on the Group's production and operations in the future and/or cause certain investors to reduce their holdings of TOTAL's securities.

TOTAL, like other major international energy companies, has a geographically diverse portfolio of reserves and operational sites, which allows it to conduct its business and financial affairs so as to reduce its exposure to political and economic risks. However, there can be no assurance that such events will not have a material adverse impact on the Group.

Intervention by host country authorities can adversely affect the Group's activities and its operating results.

TOTAL has significant exploration and production activities, and in some cases refining, marketing or chemicals operations, in countries whose governmental and regulatory framework is subject to unexpected change and where the enforcement of contractual rights is uncertain. The legal framework of TOTAL's exploration and production activities, established through concessions, licenses, permits and contracts granted by or entered into with a government entity, a state-owned company or, sometimes, private owners, is subject to risks of renegotiation that, in certain cases, can reduce or challenge the protections offered by the initial legal framework and/or the economic benefit to TOTAL.

In addition, the Group's exploration and production activities in such countries are often undertaken in conjunction with state-owned entities, for example as part of a joint venture in which the state has a significant degree of control. In recent years, in various regions globally, TOTAL has observed governments and state-owned enterprises impose more stringent conditions on companies pursuing exploration and production activities in their respective countries, increasing the costs and uncertainties of the Group's business operations. TOTAL expects this trend to continue.

Potential increasing intervention by governments in such countries can take a wide variety of forms, including:

- the award or denial of exploration and production interests;
- the imposition of specific drilling obligations;
- price and/or production quota controls and export limits;
- nationalization or expropriation of assets;
- unilateral cancellation or modification of license or contract rights;
- increases in taxes and royalties, including retroactive claims and changes in regulations and tax reassesments;

(1) Excluding North Africa.
(2) Including North Africa.

- the renegotiation of contracts;
- the imposition of increased local content requirements;
- payment delays; and
- currency exchange restrictions or currency devaluation.

If a host government were to intervene in one of these forms in a country where TOTAL has substantial operations, including exploration, the Group could incur material costs or the Group's production or asset value could decrease, which could potentially have a material adverse effect on its financial condition, including its operating income and cash flow.

For example, the Nigerian government has been contemplating new legislation to govern the petroleum industry which, if passed into law, could have an impact on the existing and future activities of the Group in that country through increased taxes and/or operating costs and could adversely affect financial returns from projects in that country.

1.7. Risks related to competition and lack of innovation

The Group operates in a highly competitive environment. Its competitiveness could be adversely impacted if the Group's level of innovation lagged behind its competitors.

TOTAL's main competitors are comprised of national and international oil companies. The evolution of the energy sector has opened the door to new competitors and increased market price volatility.

TOTAL is subject to competition in the acquisition of assets and licenses for the exploration and production of oil and natural gas as well as for the sale of manufactured products based on crude and refined oil. In the gas sector, major producers increasingly compete in the downstream value chain with established distribution companies. Increased competitive pressure could have a significant negative effect on the prices, margins and market shares of the Group's companies.

The pursuit of unconventional gas development, particularly in the United States, has contributed to falling market prices and a marked difference between spot and long-term contract prices. The competitiveness of long-term contracts indexed to oil prices could be affected if this discrepancy persists and if it should prove difficult to invoke price revision clauses.

The Group's activities are carried out in a constantly changing environment with new products and technologies continuously emerging. The Group may not be able to anticipate these changes, identify and integrate technological developments in order to maintain its competitiveness, maintain a high level of performance and operational excellence, and best meet the needs and demands of its customers. The Group's innovation policy requires significant investment, notably in R&D, of which the expected impact cannot be guaranteed.

In the field of R&D, the multiplication of research partnerships, in particular in related technical fields, may make it difficult for the Group to track technical information exchanged with research partners and monitor related contractual restrictions (*e.g.*, confidentiality, limited use). New and increasingly complex digital technologies as well as the multiplication of partnerships are all likely to increase contamination risks, which could, as a result, limit TOTAL's ability to exploit innovations.

1.8. Ethical misconduct and non-compliance risks

Ethical misconduct or breaches of applicable laws by employees of the Group could expose TOTAL to criminal and civil penalties and be damaging to TOTAL's reputation and shareholder value.

The Group's Code of Conduct, which applies to all of its employees, defines TOTAL's commitment to business integrity and compliance with all applicable legal requirements and high ethical standards. This commitment is supported by a "zero tolerance" principle. Ethical misconduct (notably with respect to human rights) or non-compliance with applicable laws and regulations (including corruption, fraud and competition laws) by TOTAL or any third party acting on its behalf could expose TOTAL and/or its employees to criminal and civil penalties and could be damaging to TOTAL's reputation and shareholder value.

In addition, such misconduct or non-compliance may lead the competent authorities to impose other measures, such as the appointment of an independent monitor in charge of assessing the Group's compliance and internal control procedures and, if need be, recommending improvements. For an overview of the settlements between TOTAL, the SEC and the Department of Justice (DoJ) providing for the appointment of an independent monitor, refer to point 4.3 of this chapter and point 3.7 of chapter 7.

Generally, entities of the Group could potentially be subject to administrative, judicial or arbitration proceedings that could have a material adverse impact on the Group's financial condition and reputation (refer to point 2 of this chapter).

1.9. Countries targeted by economic sanctions

TOTAL has activities in certain countries targeted by economic sanctions. If the Group's activities are not conducted in accordance with applicable laws and regulations, TOTAL could be sanctioned.

Various members of the international community have targeted certain countries, including Iran and Syria, as well as certain economic sectors in Russia, with economic sanctions and other restrictive measures. U.S. and European restrictions relevant to the Group and certain disclosure concerning the Group's limited activities or presence in certain targeted countries are outlined below in points 1.9.1 and 1.9.2, respectively.

1.9.1. U.S. and European legal restrictions

TOTAL continues to closely monitor the possible impacts of international economic sanctions regimes on its activities. The Group does not believe that its activities in targeted countries are in violation of applicable economic sanctions administered by the United States, the European Union ("EU") and other members of the international community. However, the Group cannot assure that current or future regulations or developments related to economic sanctions will not have a negative impact on its business, financial condition or reputation. A violation by the Group of applicable laws or regulations could result in criminal, civil and/or material financial penalties.

Restrictions against Iran

On July 14, 2015, the EU, China, France, Russia, the United Kingdom, the United States and Germany reached an agreement with Iran, known as the Joint Comprehensive Plan of Action (the "JCPOA"), regarding limits on Iran's nuclear activities and relief under certain U.S., EU and UN economic sanctions regarding Iran. On January 16, 2016, the International Atomic Energy Agency ("IAEA") confirmed that Iran had met its initial nuclear compliance commitments under the JCPOA. Therefore, as from that date, UN economic sanctions, most U.S. secondary sanctions (*i.e.*, those covering non-U.S. persons[1]) and most EU economic sanctions were suspended[2]). Sanctions could, however, be reinstated unilaterally by any participant in the event of a dispute over Iran's compliance with its nuclear commitments or in certain other cases. TOTAL is closely monitoring developments in this regard.

With respect to the Group's activities conducted under the sanctions framework that was in place prior to the JCPOA sanctions relief, the U.S. Department of State made a determination on September 30, 2010 that certain historical activities would not be deemed sanctionable and that, so long as TOTAL acts in accordance with its commitments related to this determination, it will not be regarded as a company of concern for its past Iran-related activities. Since 2011, TOTAL has had no production in Iran.

Certain U.S. states have adopted legislation with respect to Iran requiring, in certain conditions, state pension funds to divest securities in any company with active business operations in Iran and state contracts not to be awarded to such companies. State regulators have adopted similar initiatives relating to investments by insurance companies. These measures are generally still in effect despite the JCPOA sanctions relief. If TOTAL's activities in Iran were determined to fall within the scope of these prohibitions, and in the absence of any available exemptions, certain U.S. institutions holding interests in TOTAL may be required to sell their interests.

On November 8, 2016, TOTAL signed a heads of agreement ("HOA") with the National Iranian Oil Company ("NIOC"), which was removed on January 16, 2016 from the U.S. and EU sanctions designation lists. The HOA contemplates that the parties will negotiate an agreement for the development of phase 11 of South Pars gas field in Iran. For additional information regarding this HOA, refer to point 1.9.2, below.

TOTAL believes that its current activities in Iran or involving Iranian persons comply with the EU and U.S. sanctions that remain in force in respect of Iran.

Restrictions against Syria

The EU adopted measures in 2011 regarding trade with and investment in Syria that are applicable to European persons and to entities constituted under the laws of an EU Member State, including, notably, a prohibition on the purchase, import or transportation from Syria of crude oil and petroleum products. The United States also has adopted comprehensive measures that broadly prohibit trade and investment in Syria. Since 2011, the Group has ceased activities that contribute to oil and gas production in Syria and has not purchased hydrocarbons from Syria.

Restrictions against Russia

Since July 2014, international economic sanctions have been adopted against certain Russian persons and entities, including various entities operating in the financial, energy and defense sectors.

The economic sanctions adopted by the EU since 2014 do not materially affect TOTAL's activities in Russia. TOTAL has been formally authorized by the French government, which is the competent authority for granting authorization under the EU sanctions regime, to continue all its activities in Russia (on the Kharyaga and Termokarstovoye fields and the Yamal LNG project).

The United States has notably adopted economic sanctions targeting PAO Novatek[3] ("Novatek"), as well as entities in which Novatek (individually or with other similarly targeted persons or entities collectively) owns an interest of at least 50%, including OAO Yamal LNG[4] ("Yamal LNG") and Terneftegas[5]. These sanctions prohibit U.S. persons from transacting in, providing financing for or otherwise dealing in debt issued by these entities after July 16, 2014 of greater than 90 days maturity. Consequently, the use of the U.S. dollar for such financing, including for Yamal LNG, is effectively prohibited.

The Yamal LNG project's financing was finalized in successive steps in 2016 in compliance with applicable regulations.

(1) For purposes of this chapter, "U.S. person" means any U.S. citizen and permanent resident alien wherever they are in the world, entity organized under the laws of the United States or any jurisdiction within the United States, including foreign branches, or any person or entity located in the United States.
(2) Certain limited U.S. and EU human rights-related and terrorism-related sanctions remain in force.
(3) A Russian company listed on the Moscow and London stock exchanges and in which the Group held an interest of 18.9% as of December 31, 2016.
(4) A company jointly owned by PAO Novatek (50.1%), Total E&P Yamal (20%), CNODC (20%), a subsidiary of China National Petroleum Corporation ("CNPC") and Silk Road Fund (9.9%).
(5) A company jointly owned by PAO Novatek (51%) and Total Termokarstovoye BV (49%).

TOTAL's activities in Russia are also not materially affected by restrictive measures adopted by the United States in August 2015 imposing export controls and restrictions relating to the export of certain goods, services, and technologies destined for projects located in Russia in the field of oil exploration.

As of December 31, 2016, TOTAL held nearly 21% of its proved reserves in Russia, where from the Group had 14% of its combined oil and gas production in 2016.

TOTAL continues to closely monitor the different international sanctions regimes targeting certain sectors of the economy of Russia, and in particular, it closely monitors the potential imposition of additional sanctions.

1.9.2. Information concerning certain limited activities in Iran and Syria

Provided in this section is certain information concerning TOTAL's activities related to Iran that took place in 2016 that is required to be disclosed pursuant to Section 13(r) of the Securities Exchange Act of 1934, as amended ("U.S. Exchange Act"). In addition, information for 2016 is provided concerning the various types of payments made by Group affiliates to the government of any country identified by the United States as a state sponsor of terrorism (currently, Iran, Syria and Sudan[1]) or any entity controlled by those governments. TOTAL believes that these activities are not sanctionable and has not been informed that it is at risk of possible imposition of sanctions for activities previously disclosed. For more information on certain U.S. and EU restrictions relevant to TOTAL in these jurisdictions, see point 1.9.1 above.

Iran

The Iran Threat Reduction and Syria Human Rights Act of 2012 ("ITRA") added Section 13(r) to the U.S. Exchange Act, which requires TOTAL to disclose whether it or any of its affiliates has engaged during the calendar year in certain Iran-related activities, including those targeted under ISA, without regard to whether such activities are sanctionable under ISA, and any transaction or dealing with the Government of Iran that is not conducted pursuant to a specific authorization of the U.S. government. While neither TOTAL S.A. nor any of its affiliates have engaged in any activity that would be required to be disclosed pursuant to subparagraphs (A), (B) or (C) of Section 13(r) (1), affiliates of the Company may be deemed to have engaged in certain transactions or dealings with the government of Iran that would require disclosure pursuant to Section 13(r) (1) (D), as discussed below.

Upstream

Following the suspension of certain international economic sanctions against Iran on January 16, 2016 (as described in point 1.9.1 of this chapter), the Group commenced various business development activities in Iran. TOTAL entered into a memorandum of understanding ("MOU") with the National Iranian Oil Company ("NIOC"), pursuant to which NIOC provided technical data on certain oil and gas projects so that TOTAL could assess potential developments in Iran in compliance with the remaining applicable international economic sanctions. TOTAL subsequently proposed to develop and operate the South Pars Phase 11 gas field offshore Iran in the Persian Gulf along the international border with Qatar. This resulted in the negotiation and signing, on November 8, 2016, of a heads of agreement ("HOA") for the development and operation of the field. The parties to the HOA are NIOC, Total E&P South Pars S.A.S. (a wholly owned affiliate of TOTAL S.A.), CNPC International Ltd. (a wholly owned affiliate of China National Petroleum Company) and Petropars Ltd. (a wholly owned affiliate of NIOC). The HOA contains the key principles and commercial terms that will be adopted in a definitive contract for the development and operation of South Pars Phase 11, should such definitive contract be finally agreed. The project is expected to have a production capacity of 370,000 boe/d and the produced gas will be fed into Iran's gas network. TOTAL is expected to operate the project with a 50.1% interest alongside Petropars (19.9%) and CNPC (30%). The required investment is expected to be approximately $4 billion, of which TOTAL would finance 50.1%, with all equity contributions and payments in non-U.S. currency. In preparation for the South Pars Phase 11 project, TOTAL commenced engineering and reservoir studies, which were presented in part to Pars Oil & Gas Company (a NIOC affiliate) in 2016 during a technical workshop. In the event of new or reinstated international economic sanctions, if such sanctions were to prevent the Group from performing under the anticipated contract for South Pars Phase 11, TOTAL expects to be able to terminate the contract and recover its past costs from NIOC (unless prevented by sanctions).

Regarding other potential oil and gas projects covered by the aforementioned MOU, TOTAL held technical meetings in 2016 with representatives of NIOC and its affiliated companies and carried out a technical review of the South Azadegan oil field in Iran as well as the Iran LNG Project (a project contemplating a 10 Mt/y LNG production facility at Tombak Port on Iran's Persian Gulf coast), the results of which were partially disclosed to NIOC and relevant affiliated companies.

In addition, in connection with anticipated activities under the aforementioned MOU and HOA, TOTAL attended meetings in 2016 with the Iranian oil and gas ministry and several Iranian companies with ties to the government of Iran.

Also in 2016, TOTAL was selected, along with other international oil and gas companies, to form an advisory group to the oil and gas ministries of Iran and Oman concerning a possible future gas pipeline between the two countries. In that regard, TOTAL entered into a confidentiality agreement and attended meetings with these companies and ministries.

In addition, TOTAL registered in 2016 a branch office of a new entity, Total Iran B.V., a wholly-owned affiliate of TOTAL S.A., the purpose of which is to serve as the representation office for the Group in Iran. This entity replaces Total E&P Iran, which previously served the same purpose, but only for Exploration & Production.

Neither revenues nor profits were recognized from any of the aforementioned activities in 2016, and the Group expects to conduct similar business development activities in 2017.

Some payments are yet to be reimbursed to the Group with respect to past expenditures and remuneration under buyback contracts entered into between 1997 and 1999 with NIOC for the development of the South Pars 2&3 and Dorood fields. With respect to these contracts, development operations were completed in 2010 and the Group is no longer involved in the operation of these fields.

(1) Since the independence of the Republic of South Sudan on July 9, 2011, TOTAL is no longer present in Sudan.

Concerning payments to Iranian entities in 2016, Total E&P Iran (100%), Elf Petroleum Iran (99.8%), Total Sirri (100%) and Total South Pars (99.8%) collectively made payments of approximately IRR 3 billion (approximately $0.1 million[(1)]) to (i) the Iranian administration for taxes and social security contributions concerning the personnel of the aforementioned local office and residual buyback contract-related obligations, and (ii) Iranian public entities for payments with respect to the maintenance of the aforementioned local office (*e.g.*, utilities, telecommunications). TOTAL expects similar types of payments to be made by these affiliates in 2017 albeit in higher amounts due to increased business development activity in Iran. Neither revenues nor profits were recognized from the aforementioned activities in 2016.

Furthermore, Total E&P UK Limited ("TEP UK"), a wholly-owned affiliate of TOTAL, holds a 43.25% interest in a joint venture at the Bruce field in the UK with BP Exploration Operating Company Limited (37.5%, operator), BHP Billiton Petroleum Great Britain Ltd (16%) and Marubeni Oil & Gas (North Sea) Limited (3.75%). This joint venture is party to an agreement (the "Bruce Rhum Agreement") governing certain transportation, processing and operation services provided to a joint venture at the Rhum field in the UK that is co-owned by BP (50%, operator) and the Iranian Oil Company UK Ltd ("IOC"), a subsidiary of NIOC (50%) (together, the "Rhum Owners"). TEP UK owned and operated the pipeline of the Frigg UK Association and the St Fergus Gas Terminal and was party to an agreement governing provision of transportation and processing services to the Rhum Owners (the "Rhum FUKA Agreement") (the Bruce Rhum Agreement and the Rhum FUKA Agreement being referred to collectively as the "Rhum Agreements"). On August 27, 2015, TEP UK signed a sale and purchase agreement to divest its entire interest in the Frigg UK Association pipeline and St Fergus Gas Terminal to NSMP Operations Limited ("NSMP"). On March 15, 2016, the divestment was completed and TEP UK's interest in the Rhum FUKA Agreement was novated to NSMP. As from this date, TEP UK's only interest in the Rhum FUKA Agreement is in relation to the settlement of historical *force majeure* claims with the Rhum Owners relating to the period when the Rhum field was shut down. To TOTAL's knowledge, provision of all services under the Rhum Agreements was initially suspended in November 2010, when the Rhum field stopped production following the adoption of EU sanctions, other than critical safety-related services (*i.e.*, monitoring and marine inspection of the Rhum facilities), which were permitted by EU sanctions regulations. On October 22, 2013, the UK government notified IOC of its decision to apply a temporary management scheme to IOC's interest in the Rhum field within the meaning of UK Regulations 3 and 5 of the Hydrocarbons (Temporary Management Scheme) Regulations 2013 (the "Hydrocarbons Regulations"). From October 22, 2013 until the termination of the temporary management scheme on March 16, 2016 (as further explained below), all correspondence by TEP UK in respect of IOC's interest in the Rhum Agreements was with the UK government in its capacity as temporary manager of IOC's interests. On December 6, 2013, the UK government authorized TEP UK, among others, under Article 43a of EU Regulation 267/2012, as amended by 1263/2012 and under Regulation 9 of the Hydrocarbons Regulations, to carry out activities in relation to the operation and production of the Rhum field. In addition, on September 4, 2013, the U.S. Treasury Department issued a license to BP authorizing BP and certain others to engage in various activities relating to the operation and production of the Rhum field. Following receipt of all necessary authorizations, the Rhum field resumed production on October 26, 2014 with IOC's interest in the Rhum field and the Rhum Agreements subject to the UK government's temporary management pursuant to the Hydrocarbons Regulations. Services were provided by TEP UK under the Rhum Agreements from October 26, 2014 and TEP UK received tariff income and revenues from BP and the UK government (in its capacity as temporary manager of IOC's interest in the Rhum field) in accordance with the terms of the Rhum Agreements until the termination of the temporary management scheme in March 2016. As IOC ceased to be a listed person within the meaning of the Hydrocarbons Regulations on January 16, 2016, the UK government gave notice to IOC on January 22, 2016 of the termination of the temporary management scheme with effect from March 16, 2016 in accordance with regulation 26(1)(a) and 27(1)(a) of the Hydrocarbons Regulations. As a result, since March 16, 2016, TEP UK has liaised directly with IOC concerning its interest in the Bruce Rhum Agreement, and services have been provided by TEP UK under the Bruce Rhum Agreement to IOC as Rhum Owner. In 2016, these activities generated for TEP UK gross revenue of approximately £8 million (approximately $9.8 million) and net profit of approximately £0.20 million (approximately $0.25 million). Subject to the foregoing, TEP UK intends to continue such activities so long as they continue to be permissible under UK and EU law and not be in breach of remaining applicable international economic sanctions.

Downstream

The Group does not own or operate any refineries or chemicals plants in Iran and did not purchase Iranian hydrocarbons when prohibited by applicable EU and U.S. economic and financial sanctions (refer to point 1.9.1, above).

The Group resumed its trading activities with Iran in February 2016 via its wholly-owned affiliates Totsa Total Oil Trading S.A. and Total Trading Asia Pte Ltd. During 2016, approximately 50 Mb of crude oil from Iran were purchased for nearly €1.8 billion (nearly $1.9 billion) pursuant to a mix of spot and term contracts. Most of this crude oil was used to supply the Group's refineries and, therefore, it is not possible to estimate the related gross revenue and net profit. However, approximately 1.4 Mb of this crude oil were sold to entities outside of the Group. In addition, in 2016 approximately 11 Mb of petroleum products were bought from/sold to entities with ties to the government of Iran. These operations generated gross revenue of nearly €374 million (nearly $394 million) and net profit of approximately €2.7 million (approximately $2.8 million). The affiliates expect to continue these activities in 2017.

Saft Groupe S.A. ("Saft"), a wholly-owned affiliate of the Group, in 2016 sold signaling and backup battery systems for metros and railways as well as products for the utilities and oil and gas sectors to companies in Iran, including some having direct or indirect ties with the Iranian government. In 2016, this activity generated gross revenue of approximately €5.6 million (approximately $5.9 million) and net profit of approximately €0.80 million (approximately $0.84 million). Saft expects to continue this activity in 2017.

(1) Unless otherwise indicated, all non-USD currencies presented in this point 1.9.2 were converted to USD using the prevailing exchange rates available on February 28, 2017.

Saft also attended the Iran Oil Show in 2016, where it discussed business opportunities with Iranian customers, including those with direct or indirect ties with the Iranian government. Saft expects to conduct similar business development activities in 2017.

Total Solar (formerly named Total Énergie Développement), a wholly-owned affiliate of the Group, had preliminary discussions in 2016 regarding the potential development of solar projects with companies in Iran, including some having direct or indirect ties with the Iranian government. Neither revenues nor profits were recognized from this activity in 2016, and Total Solar expects to continue this activity in 2017.

TOTAL S.A. signed in 2016 a non-binding memorandum of understanding with the National Petrochemical Company, a company owned by the government of Iran, to consider a project for the construction in Iran of a steamcracker and polyethylene production lines. In relation to the early stages of this project, several visits to Iran were conducted in 2016. TOTAL S.A. recognized no revenue or profit from this activity in 2016 and similar activities are expected to continue in 2017.

Representatives of the companies Le Joint Français (a subsidiary of Hutchinson SA) and Hutchinson SNC, wholly-owned affiliates of the Group, conducted multiple visits to Iran in 2016 to discuss business opportunities in the car industry sector with several companies, including some having direct or indirect ties with the Iranian government. These companies recognized no revenue or profit from this activity in 2016 and expect to continue such discussions in the future.

Hutchinson Gmbh, a wholly-owned affiliate of the Group, sold plastic tubing for automobiles in 2016 to Ikco, an affiliate of Iran Khodro, a company in which the government of Iran holds a 20% interest and which is supervised by Iran's Industrial Management Organization. In 2016, these activities generated gross revenue of approximately €1.05 million (approximately $1.11 million) and net profit of approximately €150,000 (approximately $158,000). This company expects to continue this activity in 2017.

Hanwha Total Petrochemicals ("HTC"), a joint venture in which Total Holdings UK Limited (a wholly-owned affiliate of TOTAL) holds a 50% interest and Hanwha General Chemicals holds a 50% interest, purchased nearly 25 Mb of condensates from NIOC for approximately KRW 1,300 billion (approximately $1,1 billion). These condensates are used as raw material for certain of the Group's steamcrackers. HTC expects to continue this activity in 2017.

Total Research & Technology Feluy ("TRTF"), a wholly-owned affiliate of TOTAL, commenced in 2016 the process to file a patent in Iran concerning metallocene technology. Related to this process, TRTF had contacts with Iranian government officials, but no fees were paid. TRTF expects to continue the patent filing process in 2017.

Until December 2012, at which time it sold its entire interest, the Group held a 50% interest in the lubricants retail company Beh Total (now named Beh Tam) along with Behran Oil (50%), a company controlled by entities with ties to the government of Iran. As part of the sale of the Group's interest in Beh Tam, TOTAL S.A. agreed to license the trademark "Total" to Beh Tam for an initial 3-year period for the sale by Beh Tam of lubricants to domestic consumers in Iran. In 2014, Total E&P Iran ("TEPI"), a wholly-owned affiliate of TOTAL S.A., received, on behalf of TOTAL S.A., royalty payments of approximately IRR 24 billion (nearly $1 million[(1)]) from Beh Tam for such license. These payments were based on Beh Tam's sales of lubricants during the previous calendar year. In 2015, royalty payments were suspended due to a procedure brought by the Iranian tax authorities against TEPI. At the end of 2016, this procedure was still pending and no royalty payments had been received since 2015. Representatives of Total Outre Mer, a wholly-owned affiliate of the Group, made several visits to Beh Tam and Behran Oil during 2016 regarding the possible purchase of shares of Beh Tam. Subsequent to an internal reorganization, the matter was transferred to Total Oil Asia-Pacific Ltd, another wholly-owned affiliate of the Group, which had several exchanges with representatives of Behran Oil. As of the end of 2016, no agreement had been reached, no money was paid or received by either company. Similar discussions may take place in the future.

Total Marketing Middle East FZE ("TMME"), a wholly-owned affiliate of the Group, sold lubricants to Beh Tam in 2016. The sale in 2016 of approximately 54 t of lubricants and special fluids generated gross revenue of approximately AED 420,000 (approximately $114,000) and net profit of approximately AED 360,000 (approximately $98,000). TMME expects to continue this activity in 2017.

Total Marketing France ("TMF"), a company wholly-owned by Total Marketing & Services ("TMS"), itself a company wholly-owned by TOTAL S.A. and six Group employees, provided in 2016 fuel payment cards to the Iranian embassy in France for use in the Group's service stations. In 2016, these activities generated gross revenue of nearly €22,000 (approximately $23,000) and net profit of nearly €900 (nearly $950). TMF expects to continue this activity in 2017.

TMF also sold jet fuel in 2016 to Iran Air as part of its airplane refueling activities at Paris Orly airport in France. The sale of approximately 2.8 million liters of jet fuel generated gross revenue of approximately €982,000 (approximately $1.03 million) and net profit of approximately €10,000 (approximately $11,000). TMF expects to continue this activity in 2017.

Air Total International ("ATI"), a wholly-owned affiliate of the Group, on two occasions in 2016 sold jet fuel to a broker based at Le Bourget airport near Paris that was destined for the refueling of an Iranian government airplane (official presidential/ministerial visits). These sales generated gross revenue of approximately €8,000 (approximately $8,400) and net profit of approximately €1,600 (approximately $1,700). ATI may conduct similar activities in 2017.

Total Belgium ("TB"), a company wholly-owned by the Group, provided in 2016 fuel payment cards to the Iranian embassy in Brussels (Belgium) for use in the Group's service stations. In 2016, these activities generated gross revenue of approximately €1,500 (approximately $1,600) and net profit of approximately €300 (approximately $320). TB expects to continue this activity in 2017.

Proxifuel, a company wholly-owned by the Group, sold in 2016 heating oil to the Iranian embassy in Brussels. In 2016, these activities generated gross revenue of approximately €200 (approximately $210) and net profit of approximately €80 (approximately $85). Proxifuel expects to continue this activity in 2017.

Caldeo, a company wholly-owned by TMS, sold in 2016 approximately 3 m^3 of domestic heating oil to the Iranian embassy in France, which generated gross revenue of nearly €435 (nearly $460) and net profit of nearly €115 (approximately $120). Caldeo expects to continue this activity in 2017.

(1) Based on an average daily exchange rate of $1 = IRR 0.000039 during 2014, as published by Bloomberg.

Total Namibia (PTY) Ltd ("TN"), a wholly-owned affiliate of Total South Africa (PTY) Ltd (of which the Group holds 50.1%), sold petroleum products and services during 2016 to Rössing Uranium Limited, a company in which the Iranian Foreign Investment Co. holds an interest of 15.3%. In 2016, these activities generated gross revenue of nearly N$249 million (approximately $19 million) and net profit of approximately N$8 million (approximately $0.6 million). TN expects to continue this activity in 2017.

Syria

Since early December 2011, TOTAL has ceased its activities that contribute to oil and gas production in Syria and maintains a local office solely for non-operational functions. In late 2014, the Group initiated a downsizing of its Damascus office and reduced its staff to a few employees. In 2016, TOTAL made payments of nearly SYP 500,000 (approximately $2,300) to Syrian government agencies in the form of taxes and contributions for public services rendered in relation to the maintenance of the aforementioned office and its personnel.

2. Legal and arbitration proceedings

There are no governmental, legal or arbitration proceedings, including any proceeding of which the Company is aware that are pending or threatened against the Company, that could have, or could have had during the last 12 months, a material impact on the Group's financial situation or profitability.

Described below are the main administrative, legal and arbitration proceedings in which the Company and the other entities of the Group are involved.

Alitalia

In the Marketing & Services segment, a civil proceeding was initiated in Italy, in 2013, against TOTAL S.A. and its subsidiary Total Aviazione Italia Srl before the competent Italian civil court. The plaintiff claims against TOTAL S.A., its subsidiary and other third parties, damages that it estimates to be nearly €908 million. This proceeding follows practices that had been condemned by the Italian competition authority in 2006. The parties have exchanged preliminary findings. The existence and the assessment of the alleged damages in this procedure involving multiple defendants remain contested.

Blue Rapid and the Russian Olympic Committee – Russian regions and Interneft

Blue Rapid, a Panamanian company, and the Russian Olympic Committee filed a claim for damages with the Paris Commercial Court against Elf Aquitaine, alleging a so-called non-completion by a former subsidiary of Elf Aquitaine of a contract related to an exploration and production project in Russia negotiated in the early 1990s. Elf Aquitaine believed this claim to be unfounded and opposed it. On January 12, 2009, the Commercial Court of Paris rejected Blue Rapid's claim against Elf Aquitaine and found that the Russian Olympic Committee did not have standing in the matter. On June 30, 2011, the Court of Appeal of Paris dismissed as inadmissible the claim of Blue Rapid and the Russian Olympic Committee against Elf Aquitaine, notably on the grounds of the contract having lapsed. The judgment of the Court of Appeal of Paris is now final and binding following two decisions issued on February 18, 2016 by the French Supreme Court to put an end to this proceeding.

In connection with the same facts, and 15 years after the aforementioned exploration and production contract was rendered null and void ("*caduc*"), a Russian company, which was held not to be the contracting party to the contract, and two regions of the Russian Federation that were not even parties to the contract, launched an arbitration procedure against the aforementioned former subsidiary of Elf Aquitaine that was liquidated in 2005, claiming alleged damages of $22.4 billion. For the same reasons as those successfully adjudicated by Elf Aquitaine against Blue Rapid and the Russian Olympic Committee, the Group considers this claim to be unfounded as a matter of law and fact.

The Group has lodged a criminal complaint to denounce the fraudulent claim of which the Group believes it is a victim and, has taken and reserved its rights to take all actions and measures to defend its interests.

FERC

The Office of Enforcement of the U.S. Federal Energy Regulatory Commission (FERC) began in 2015 an investigation in connection with the natural gas trading activities in the United States of Total Gas & Power North America, Inc. (TGPNA), a U.S. subsidiary of the Group. The investigation covered transactions made by TGPNA between June 2009 and June 2012 on the natural gas market. TGPNA received a Notice of Alleged Violations from FERC on September 21, 2015. On April 28, 2016, FERC issued an order to show cause to TGPNA and two of its former employees, and to TOTAL S.A. and Total Gas & Power Ltd., regarding the same facts. A class action has been launched to seek damages from these three companies.

TGPNA has cooperated in the investigation with the U.S. authorities and contests the claims brought against it.

Grande Paroisse

On September 21, 2001, an explosion occurred at the industrial site of Grande Paroisse (a former subsidiary of Atofina which became a subsidiary of Elf Aquitaine Fertilisants on December 31, 2004), in a stockpile of ammonium nitrate pellets. The explosion caused the death of thirty-one people, including twenty-one workers at the site, injured many others and caused significant damage on the site and to property in the city of Toulouse.

Grande Paroisse donated the former site of the plant to the greater agglomeration of Toulouse. A €10 million endowment was also granted to the InNaBioSanté research foundation as part of the setting up of a cancer research center at the site.

After many years, the investigating magistrate brought charges against Grande Paroisse and the former Plant Manager before the Toulouse Criminal Court. TOTAL S.A. and the CEO at the time of the event were summoned to appear in Court pursuant to a request by a victims association.

On November 19, 2009, the Toulouse Criminal Court acquitted both the former Plant Manager and Grande Paroisse due to the lack of reliable evidence for the explosion. The Court declared Grande Paroisse civilly liable for the damages caused by the explosion to the victims in its capacity as custodian and operator of the plant. The Court also ruled that the summonses were inadmissible.

On September 24, 2012, the Court of Appeal convicted the former Plant Manager and Grande Paroisse. The summonses were determined to be inadmissible.

On January 13, 2015, the French Supreme Court (*Cour de cassation*) fully quashed the decision of September 24, 2012. The French Supreme Court ruled that the Court of Appeal impartiality was questionable and that the application of the law on which the conviction was partially based was improper. The case has been referred back to the Court of Appeal of Paris for a new criminal trial, which began in January 2017.

A compensation mechanism for victims was set up immediately following the explosion. €2.3 billion was paid for the compensation of claims and related expenses amounts. A €4.7 million reserve remains booked in the Group's Consolidated Financial Statements as of December 31, 2016.

Iran

In 2003, the Securities and Exchange Commission (SEC) followed by the Department of Justice (DoJ) issued a formal order directing an investigation against TOTAL, and others oil companies, for alleged violations of the Foreign Corrupt Practices Act (FCPA) and the Company's accounting obligations in connection with the pursuit of business in Iran in the 1990s.

In late May 2013, and after several years of discussions, TOTAL reached settlements with the U.S. authorities (a Deferred Prosecution Agreement with the DoJ and a Cease and Desist Order with the SEC). These settlements, which put an end to these investigations, were concluded without admission of guilt and in exchange for TOTAL respecting a number of obligations, including the payment of a fine and civil compensation for an aggregate amount of $398.2 million. By virtue of these settlements, TOTAL also accepted the appointment of an independent compliance monitor to review the Group's compliance program and to recommend possible improvements.

In July 2016, the monitor submitted his third and final report, in which he certified that TOTAL had devised and implemented an appropriate compliance program. As a result of this certification, the U.S. authorities, after having reviewed the monitor's report, concluded that TOTAL had fulfilled all of its obligations, thus bringing an end to the monitoring process. As a result, a court in the State of Virginia granted a motion to dismiss on November 9, 2016, thereby terminating the procedure directed at the Company, which can no longer be pursued in the United States for these same facts.

With respect to the same facts, TOTAL was placed under formal investigation in France in 2012. In October 2014, the investigating magistrate decided to refer the case to trial.

Italy

As part of an investigation led by the Public Prosecutor of the Potenza Court in 2007, Total Italia and also certain Group employees were the subjects of an investigation related to alleged irregularities in connection with the purchase of lands and the award of calls for tenders in relation to the preparation and development of an oil field located in the south of Italy.

Pursuant to a judgment issued on April 4, 2016, the Potenza Criminal Court found four employees to be guilty of corruption, with two of these employees also being found guilty of misappropriation in connection with the purchase of land. The procedure with respect to Total Italia was sent back to the public prosecutor due to the imprecision of the terms of prosecution. The four employees decided to challenge the judgment before the Court of Appeal.

Oil-for-Food Program

Several countries have launched investigations concerning possible violations of the UN resolutions relating to the Iraqi Oil-for-Food Program implemented as from 1996.

Pursuant to a French criminal investigation, certain current or former Group employees were placed under formal criminal investigation for possible charges as aiding and abetting the misappropriation of corporate assets and/or as aiding and abetting the corruption of foreign public agents. In 2010, TOTAL S.A. was indicted on bribery charges as well as aiding and abetting and concealing the influence peddling.

On July 8, 2013, TOTAL S.A. and the persons who were prosecuted were cleared of all charges by the Paris Criminal Court, which found that none of the offenses for which they had been prosecuted was established. The Prosecutor's office appealed the parts of the Criminal Court's decision acquitting TOTAL S.A. for corruption of foreign public agents. On February 26, 2016, the Court of Appeal of Paris overturned the Criminal Court's decision and TOTAL S.A. was convicted and ordered to pay a fine of €750,000. The Company has decided to appeal this decision before the French Supreme Court (*Cour de cassation*).

3. Insurance and risk management

3.1. Organization

TOTAL has its own reinsurance company, Omnium Reinsurance Company (ORC). ORC is integrated within the Group's insurance management and is used as a centralized global operations tool for covering the Group companies' insurable risks. It allows the Group's worldwide insurance program to be implemented in compliance with the specific requirements of local regulations applicable in the countries where the Group operates.

Some countries may require the purchase of insurance from a local insurance company. If the local insurer accepts to cover the subsidiary of the Group in compliance with its worldwide insurance program, ORC negotiates a retrocession of the covered risks from the local insurer. As a result, ORC enters into reinsurance contracts with the subsidiaries' local insurance companies, which transfer most of the risk to ORC.

At the same time, ORC negotiates a reinsurance program at the Group level with oil industry mutual insurance companies and commercial reinsurance markets. ORC allows the Group to better manage price variations in the insurance market by taking on a greater or lesser amount of risk corresponding to the price trends in the insurance market.

In 2016, the net amount of risk retained by ORC after reinsurance was, on the one hand, a maximum of $70 million per onshore or offshore third-party liability insurance claim and, on the other hand, $75 million per property damage and/or business interruption insurance claim. Accordingly, in the event of any loss giving rise to an aggregate insurance claim, the effect on ORC would be limited to its maximum retention of $145 million per occurrence.

3.2. Risk and insurance management policy

In this context, the Group risk and insurance management policy is to work with the relevant internal department of each subsidiary to:

- define scenarios of major disaster risks (estimated maximum loss);
- assess the potential financial impact on the Group should a catastrophic event occur;
- help implement measures to limit the probability that a catastrophic event occurs and the financial consequences if such event should occur; and
- manage the level of financial risk from such events to be either covered internally by the Group or transferred to the insurance market.

3.3. Insurance policy

The Group has worldwide property insurance and third-party liability coverage for all its subsidiaries. These programs are contracted with first-class insurers (or reinsurers and oil and gas industry mutual insurance companies through ORC).

The amounts insured depend on the financial risks defined in the disaster scenarios and the coverage terms offered by the market (available capacities and price conditions).

More specifically for:

- third-party liability: since the maximum financial risk cannot be evaluated by a systematic approach, the amounts insured are based on market conditions and oil and gas industry practice. In 2016, the Group's third-party liability insurance for any liability (including potential accidental environmental liabilities) was capped at $900 million (onshore) and $850 million (offshore). In addition, the Group adopts, where appropriate, the necessary means to manage the compensation of victims in the event of an industrial accident for which it is liable; and
- property damage and business interruption: the amounts insured vary by sector and by site and are based on the estimated cost and scenarios of reconstruction under maximum loss situations and on insurance market conditions. The Group subscribed for business interruption coverage in 2016 for its main refining and petrochemical sites.

For example, for the Group's highest risks (North Sea platforms and main refineries or petrochemical plants), in 2016 the insurance limit for the Group share of the installations was approximately $1.75 billion for the Refining & Chemicals segment and approximately $2.15 billion for the Upstream segment.

Deductibles for property damage and third-party liability fluctuate between €0.1 and €10 million depending on the level of risk and liability, and are borne by the relevant subsidiaries. For business interruption, coverage is triggered 60 days after the occurrence giving rise to the interruption. In addition, the main refineries and petrochemical plants bear a combined retention for property damage and business interruption of $75 million per insurance claim.

Other insurance contracts are bought by the Group in addition to property damage and third-party liability coverage, mainly in connection with car fleets, credit insurance and employee benefits. These risks are mostly underwritten by outside insurance companies.

The above-described policy is given as an example of a situation as of a given date and cannot be considered as representative of future conditions. The Group's insurance policy may be changed at any time depending on the market conditions, specific circumstances and on General Management's assessment of the risks incurred and the adequacy of their coverage.

TOTAL believes that its insurance coverage is in line with industry practice and sufficient to cover normal risks in its operations. However, the Group is not insured against all potential risks. In the event of a major environmental disaster, for example, TOTAL's liability may exceed the maximum coverage provided by its third-party liability insurance. The loss TOTAL could suffer in the event of such disaster would depend on all the facts and circumstances of the event and would be subject to a whole range of uncertainties, including legal uncertainty as to the scope of liability for consequential damages, which may include economic damage not directly connected to the disaster. The Group cannot guarantee that it will not suffer any uninsured loss and there can be no guarantee, particularly in the event of a major environmental disaster or industrial accident, that such loss would not have a material adverse effect on the Group.

4. Internal control and risk management procedures (Article L. 225-37 of the French Commercial Code)

The information related to the internal control and risk management procedures implemented within the Group presented hereafter forms part of the Report of the Chairman of the Board of Directors prepared pursuant to Article L. 225-37 of the French Commercial Code (refer to the cross-reference list specific to the Report of the Chairman of the Board of Directors, page 381 of this Registration Document).

The information contained in the Report of the Chairman of the Board of Directors was prepared with the assistance of several of the Company's functional departments, including in particular the Legal, Finance and Audit & Internal Control Divisions. After the sections relevant to their respective duties were reviewed by the Governance and Ethics Committee, the Compensation Committee and the Audit Committee, the information was approved by the Board of Directors.

4.1. Basic elements of internal control

The Group is structured around business segments to which the Group's operational entities report. The business segments' management are responsible, within their area of responsibility, for ensuring that operations are carried out in accordance with the strategic objectives defined by the Board of Directors and General Management. The functional departments at the Holding level help General Management define norms and standards, oversee their application and monitor activities. They also lend their expertise to the operational divisions.

The Group's internal control and risk management systems are structured around this three-level organization – Holding level, business segments, operational entities – where each level is directly involved and accountable in line with the level of delegation determined by General Management.

General Management constantly strives to maintain an efficient internal control system across the Group, based on the framework of the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In this framework, internal control is a process intended to provide reasonable assurance that the objectives related to operations, reporting and compliance with applicable laws and regulations are achieved. As for any internal control system, it cannot provide an absolute guarantee that all risks are completely controlled or eliminated. The COSO framework is considered equivalent to the reference framework of the French Financial Markets Authority (*Autorité des marchés financiers*). The Group has also chosen to rely on this framework as part of its obligations under the Sarbanes-Oxley Act.

The Group's internal control and risk management systems are therefore based on the five components of this framework: control environment, risk assessment, control activities, monitoring and information, and communication.

The Group's risk management system draws on the main international standards (COSO Enterprise Risk Management integrated framework, ISO 31000: 2009 – Risk management) as well as on French standards (Reference framework of the French Financial Markets Authority). The internal Risk Management, Internal Control and Audit Charter forms the common framework on which the Group relies to ensure control of its activities.

The Group's internal control and risk management systems cover the processes of the fully consolidated entities and the most important equity affiliates.

Under these internal control principles, which are part of the corporate governance organization, the Audit Committee is responsible for monitoring the efficiency of internal control and risk management systems, assisted by the Corporate Audit & Internal Control Division and the internal control teams from the business segments. These rules are particularly designed to allow the Board of Directors to ensure that internal control is effective and that published information available to shareholders and financial markets is reliable.

Approximately 400 employees monitor the internal control systems within the Group. The assessment of the internal control and risk management system is mainly overseen by the Corporate Audit & Internal Control Division, which employed 77 people in 2016 and carried out more than 165 internal audits.

4.2. Control environment

TOTAL's control environment is based primarily on its Code of Conduct, which, in addition to safety, sets forth its core values (respect, responsibility and exemplary conduct) and business principles in terms of safety, security, health, protection of the environment, integrity and respect for human rights. This Code of Conduct builds trust between TOTAL and both its employees and stakeholders.

Integrity and ethics

The Group's values and business principles are set out in its Code of Conduct (revised in 2014), its Business Integrity Guide and its Human Rights Guide (revised in 2015). These documents are distributed to all employees and are available on the intranet. They also set out the rules of individual behavior expected of all employees in the countries where the Group has a presence. The Group has pledged its adherence to recognized international standards related to human rights and, in particular, the core conventions of the International Labour Organization (ILO), the voluntary principles on security and human rights and the United Nations guiding principles on business and human rights.

The Financial Code of Ethics, which also refers to the Code of Conduct, sets forth specific rules for the Chairman and Chief Executive Officer, the Chief Financial Officer, the Vice President of the Corporate Accounting Division and the financial and accounting officers of the principal Group activities.

As a priority of General Management, the Group deploys ethics and compliance policies and programs, including in particular programs for the prevention of corruption, fraud and competition law infringement. These include awareness and training activities as well as compliance audits and ethical assessments (refer to point 3.7 of chapter 7). The Group also relies on the Ethics Committee, the role of which is to listen and provide assistance in these areas.

The relationship between the Group and its service providers is also based on adherence to the principles set forth in the Code of Conduct and on the Fundamental Principles of Purchasing attached to contracts. Suppliers and service providers are required to apply standards equivalent to those of the Group, particularly with respect to their employees, and to make every effort to encourage their own suppliers and subcontractors in turn to respect these principles (for further information about relations between the Group and its suppliers, refer to point 3.6 of chapter 7).

Structure, authority and responsibility

General Management ensures that the organizational structure and reporting lines plan, execute, control and periodically assess the Group's activities. General Management regularly reviews the relevance of the organizational structures so as to be able to adapt them quickly to changes in the activities and in the environment in which they are carried out.

The Group has also defined central responsibilities that cover the three lines of defense of internal control: (1) operational management, which is responsible for implementing internal control, (2) support functions (such as Finance, Legal, Human Resources, etc.), which prescribe the internal control systems, verify their implementation and effectiveness and assist operational employees, and (3) internal auditors who, through their internal control reports, provide recommendations to improve the effectiveness of the system.

In addition, an accountability system is defined and formalized at all levels of the organization, through organization notes, organization charts, appointment notes, job descriptions and delegations of powers. Each business segment has established clear rules applicable to its specific scope by directly integrating the Group's instructions.

Policies and procedures

TOTAL incorporates the values, fundamental principles, strategic options and respective requirements of the businesses, at all levels of the organization, into a normative framework, supplemented by a set of practical recommendations and feedback. Like the Group's organization, this framework has a three-level structure: a Group level, with the REFLEX Group framework and the technical framework set out by the Corporate Technology Group, frameworks for each business segment; and a specific framework for each significant operational entity.

A document known as the governance framework details the relationship between these frameworks and describes their respective scope, the way in which the standards differ from one another (by adaptation, clarification or stricter requirements relative to higher level standards), exemption processes, if any, standards development processes and the monitoring system put in place.

The main procedures regarding financial controls established at the corporate level cover acquisitions and sales, capital expenditure, financing and cash management, budget control and financial reporting. Disclosure controls and procedures are in place (refer to point 4.3.2 below). At the operating levels, these procedures mainly pertain to directives, rules and recommendations regarding health, safety, industrial safety, IT security and the environment, as well as integrity and fraud and corruption prevention.

These documents, all of which are published on the Group's intranet, are reviewed regularly and their implementation is monitored.

At the business segment or operational entity levels, control activities are organized around the main operational processes: exploration and reserves, procurement, capital expenditure, production, sales, oil and gas trading, inventories, human resources, financing and cash management, and account closing process.

Commitment to competence

The Group's human resources policy sets out rules and practices that reflect its commitment in terms of social responsibility and its expectations of employees, particularly in terms of competencies. Descriptions of jobs within the Group's various entities define the competencies and expertise required for employees to carry out their functions effectively.

In addition, the Human Resources function shapes and regularly updates policies aimed at attracting new talents, including employee training, assessment and retention policies (annual appraisals, training programs, compensation policies and career management – refer to point 1 of chapter 7).

Accountability

The Board of Directors, with the support of the Audit Committee, ensures that the internal control functions are operating properly. The Audit Committee ensures that General Management implements internal control and risk management procedures based on the risks identified, such that the Group's objectives are achieved.

The general managements of the business segments and operational entities are responsible for designing and deploying specific components of this internal control and risk management system within their area of responsibility. A representation letter process deployed at the various levels of the organization reinforces the effectiveness of the internal control system, particularly over financial reporting.

The Internal Control Department has pursued a process aimed at strengthening the assessment of the role and involvement of all employees in terms of internal control. Training initiatives tailored to the various stakeholders involved in the internal control process are regularly launched within the Group. In 2016, an internal control seminar brought together over 100 Group employees in addition to online participants.

Control activities and assessment

The Group regularly examines and assesses the design and effectiveness of the key operational, financial and information technology controls related to internal control over financial reporting, pursuant to Section 404 of the Sarbanes-Oxley Act. In 2016, this assessment was performed with the assistance of the Group's main entities and the Corporate Audit & Internal Control Division. The system used covers:

– the most significant entities, which assess the key operational controls of their significant processes and respond to a Group questionnaire for assessing the internal control system; and
– other less significant entities, which respond only to the Group questionnaire for assessing the internal control system.

These two categories of entities account for approximately 80% and 10%, respectively, of the financial aggregates in the Group's Consolidated Financial Statements.

In addition, any activity, process or management system may be the subject of an internal audit conducted by Group Audit, in accordance with the international internal audit framework and its Code of Ethics. The Corporate Audit & Internal Control Division also conducts joint audits with third-party auditors and provides assistance (advice, analysis, input regarding methodology). The audit plan, which is based on an analysis of the risks and risk management systems, is submitted annually to the Executive Committee and the Audit Committee for approval. The statutory auditors also review the internal controls that they deem necessary as part of their certification of the financial statements. In 2016, they reviewed the implementation of the Group's internal control framework and the design and effectiveness of key internal controls at its main entities regarding financial reporting. Based on their review, the statutory auditors stated that they had no remarks on the information and statements presented in this present Report of the Chairman of the Board of Directors on internal control and risk management procedures.

The reports on the work performed by the Group Audit and statutory auditors are periodically summarized and presented to the Audit Committee and, thereby, to the Board of Directors. The Senior Vice President, Audit & Internal Control attended all Audit Committee meetings held in 2016. The Audit Committee also interviews the statutory auditors at least once a year without any Company representatives present.

If areas of improvement are identified by these internal audits and operational controls, then corrective action plans are drawn up and shared with operational management, who along with the Corporate Audit & Internal Control Division, monitor them closely.

Based on the internal reviews, General Management has reasonable assurance of the effectiveness of the Group's internal control.

4.3. Risk assessment and management

To implement its strategy, General Management ensures that clear and precise objectives are defined at the various levels of the organization with regard to operations, reporting and compliance.

Operational objectives focus on the definition and efficient use of human, financial and technical resources. In particular, they are defined during the budgetary processes and in the long-term plan, and are regularly monitored as part of the self-assessment process.

The monitoring of operational objectives (financial and non-financial) helps in decision-making and monitoring performance of activities at each level of the organization.

TOTAL has set up an ongoing process to identify and analyze risks that may affect its employees, assets and environment, and preclude the achievement of its objectives. The Group takes into account risks at all levels of the organization and in all its entities, and examines factors that influence the severity, probability of occurrence of risks or the loss of its assets and the potential impact on operations, reporting (financial and non-financial) and compliance with applicable laws and regulations.

The Group has developed a control framework in line with the risk assessments performed and implements initiatives necessary for addressing specific risks by enforcing Group-wide rules. These initiatives must reduce the probability of occurrence of risks and their possible impact. They also cover the main processes outsourced via subcontracting agreements.

TOTAL also identifies changes that could have a significant impact on its internal control system, particularly changes related to assets consolidated by the business segments. To this end, the Group relies on governance bodies adapted to its various activities and capable of making and implementing decisions necessary for quickly responding to material changes that the Group must deal with.

The risk-mapping activities carried out by the Group's entities as part of a regular risk assessment process help identify and analyze key ongoing or foreseeable changes.

4.3.1. Monitoring of risk management systems

The Executive Committee, with the assistance of the Group Risk Management Committee created in 2011, is responsible for identifying and analyzing internal and external risks that could impact TOTAL's performance. The main responsibilities of the Group Risk Management Committee include ensuring that the Group has an up-to-date map of the risks to which it is exposed and that efficient risk management systems are in place.

The Group Risk Management Committee relies on the work carried out by the business segments and functional departments, which concurrently establish their own risk mapping. These maps are drawn up according to a methodological framework developed by the Group. The activities of the Group Risk Management Committee, the major risks identified by the Group and the risk mappings of the business segments are regularly reported to the Audit Committee.

The Group's business segments and entities are responsible for defining and implementing a risk management policy suited to their specific activities. However, the handling of certain transverse risks is more closely coordinated by the respective functional departments.

General Management exercises operational control over TOTAL's activities through the Executive Committee's approval of investments and commitments for projects based on defined thresholds. The Risk Committee (CORISK) is tasked with reviewing these projects in advance and informing the Executive Committee of its findings. As part of this review, the CORISK verifies the analysis of the various project-related risks.

The Group strives to implement effective control systems for the main risks identified.

Financial risks

The management and conditions procedures for using financial instruments are governed by strict rules that are defined by the Group's General Management, and which provide for centralization by the Treasury Division of liquidity, interest exchange rate positions, management of financial instruments and access to capital markets.

The Group's financing policy consists of incurring long-term debt at a floating rate or at a fixed rate depending on interest rates. Debt is mainly incurred in dollars or euros according to the Group's general corporate needs.

The Group's cash balances, which mainly consist of dollars and euros, are managed to maintain liquidity based on daily interest rates in the given currency. Maximum amounts are set for transactions exceeding one month, with placements not to exceed 12 months. TOTAL S.A. also has confirmed credit facilities granted by international banks. These credit facilities, along with the Group's net cash position, allow it to continually maintain a high level of liquidity in accordance with targets set by General Management.

In terms of counterparty risk in financial transactions, the Group adheres to a cautious policy, and only makes commitments with institutions featuring a high degree of financial soundness, as based on a multi-criteria analysis. An overall credit limit is set for each authorized financial counterparty and allocated among the Group's subsidiaries. In addition, to reduce market value risk on its commitments, the Treasury Division has entered into margin call contracts with its significant counterparties.

The Group seeks to minimize its currency exposure, on the one hand by financing its long-term assets in the functional currency of the entity to which they belong and, on the other hand, by systematically hedging the currency exposure generated by commercial activity. These risks are managed centrally by the Treasury Department, which operates within a set of limits defined by General Management.

The policy for managing risks related to financing and cash management activities as well as the Group's currency exposure and interest rate risks is described in detail in Note 15 to the Consolidated Financial Statements (point 7 of chapter 10).

Industrial and environmental risks and risks related to climate issues

The Group has developed a Safety Health Environment Quality Charter that sets out the basic principles applicable to the protection of people, property and the environment and also covers the aspects of safety and health (H3SEQ). This Charter is implemented at several levels within the Group through its management systems.

Along these lines, TOTAL implements management systems such as the internal management system MAESTRO, which meets all of the requirements of the standards ISO 14001, ISO 9001 and OHSAS 18001, as well as the future ISO 45001. The Group performs regular assessments, following various procedures, of the risks and impacts of its activities in the areas of industrial safety (particularly process safety), the environment and the protection of workers and local residents:

- prior to approving new investment, acquisition and disposal projects;
- during operations (safety studies, environmental impact assessments, health impact studies); and
- prior to releasing new substances on the market (toxicological and ecotoxicological studies and life cycle analyses).

These assessments incorporate the regulatory requirements of the countries where the Group's activities are carried out and generally accepted professional practices.

In countries where prior administrative authorization and supervision is required, projects are not undertaken without the authorization of the relevant authorities based on the studies provided to them.

In particular, TOTAL has developed a common methodology for analyzing technological risks that is being gradually applied to all activities carried out by the companies of the Group (refer to point 2.2.2 of chapter 7). TOTAL develops risk management measures based on risk and impact assessments. These measures involve facility and structure design, the reinforcement of safety devices and environmental remediation.

In addition to developing management systems as described above, the Group strives to minimize industrial, safety and environmental risks inherent in its operations by conducting thorough inspections and audits, training personnel and raising awareness among all those involved.

In addition, performance indicators (particularly in the areas of HSE) and risk monitoring have been put in place, objectives have been set and action plans have been implemented to achieve these objectives (refer to point 2 of chapter 7).

Although the emphasis is on preventing risks, TOTAL takes regular steps to prepare for crisis management based on identified risk scenarios. The Group has a crisis management process that relies on a permanent on-call system, regular drills, training courses in crisis management and a set of tools. The organization set up in the event of a crisis is deployed at two closely coordinated levels:

- at the local level (country, site or entities), a crisis unit is responsible for ensuring operational management and implementing emergency plans; and
- at the head office level, a crisis unit consisting of a multidisciplinary team is tasked with assessing the situation and overseeing crisis management. This central unit provides the necessary expertise and mobilizes additional resources to assist the local crisis unit when necessary and intervene directly when the situation cannot be handled locally.

Concerning the area of security, the Group has put in place the means to monitor and analyze threats and risks at a central level in order to anticipate and take all necessary preventive measures so as to diminish its exposure to security risks in the countries where it operates.

In addition, TOTAL has developed emergency plans and procedures to respond to an oil spill or leak. These plans and procedures are specific to each subsidiary and adapted to its organization, activities and environment, and are consistent with the Group's anti-pollution plan. They are reviewed regularly and tested through drills (refer to point 2.2.3 of chapter 7).

At the Group level, TOTAL has set up an organization structured around the Plan to Mobilize Resources Against Pollution (PARAPOL) alert scheme to facilitate crisis management and provide assistance regardless of geographical restrictions in the event of pollution of marine, coastal or inland waters. Its main objective is to facilitate access to internal and external experts and physical response resources (FOST, Cedre, OSRL).

With regard to risks related to climate issues, TOTAL is committed to managing its energy consumption and develops processes to improve its energy performance and that of its customers, in accordance with its Safety Health Environment Quality Charter.

In its decision-making process, the risks and associated climate issues (flaring, greenhouse gas emissions, CO_2 price sensitivity) are assessed prior to the presentation of the projects to the Executive Committee.

In order to ensure the viability of its projects and long-term strategy in light of the challenges raised by climate change, the Group integrates, into the financial evaluation of investments presented to the Executive Committee, either a long-term CO_2 price of $30 to $40 per ton (depending on the price of crude), or the actual price of CO_2 in a given country if higher. The Group performs sensitivity tests to assess the ability of its asset portfolio to withstand an increase in the price per ton of CO_2.

In addition, TOTAL takes into account the 2°C scenario of the International Agency for Energy (IAE) in its analysis of changes in energy markets (notably that of hydrocarbons) and its development strategy. As a result, the Group is prioritizing its projects and focusing on hydrocarbon assets with moderate production and processing costs that meet the highest environmental and safety standards.

Finally, the Group assesses the vulnerability of its facilities to climatic events so that their consequences do not affect the integrity of the facilities or the safety of individuals. More generally, natural hazards (climate-related risks as well as seismic, tsunami, soil strength and other risks) are taken into account in the conception of industrial facilities, which are designed to withstand both normal and extreme conditions. The Group carries out a systematic assessment of the possible repercussions of climate change on its future projects. These analyses include a review by type of risk (*e.g.*, sea level, storms, temperature, permafrost) and take into account the life span of the projects and their capacity to gradually adapt. These studies have not identified any facilities that cannot withstand the consequences of climate change known today.

Risks related to information systems

TOTAL's IT Department has developed and distributed governance and security rules that describe the recommended infrastructure, organization and procedures in order to maintain information systems that are appropriate to the organization's needs and the risks associated with information systems and their data. These rules are implemented across the Group under the responsibility of the various business segments.

The Group has also developed control activities at various levels of the organization relating to areas where information systems cover all or part of the processes. Information Technology General Controls aim to guarantee that information systems function and are available as required, and that data integrity is guaranteed and changes controlled.

Information Technology Automated Controls aim to ensure the integrity of data generated or supported by business applications, particularly those that impact financial flows.

The outsourcing of some components of the Group's IT infrastructure to service providers poses specific risks and requires the selection and development of additional controls of the completeness, accuracy and validity of the information supplied and received from such service providers. Accordingly, to ensure continuous improvement, the Group assesses whether suitable controls are implemented by the service providers concerned and what controls are necessary within its own organization to maintain these risks at an acceptable level.

In addition, in light of increasing legal risks (such as document retention, personal data protection or copyright) and security risks (such as loss of information, external and internal threats or fraud), the Group deploys information protection, document retention and personal data protection policies. In order to reduce these risks, the Group has employed an Operational Security Center to detect and analyze IT system security events.

Risks related to the protection of intellectual assets

To mitigate the risks of third parties infringing its intellectual proprety and the leak of know-how, TOTAL protects its rights under research partnership agreements negotiated by the Group's intellectual property specialists, the terms and conditions of which are consistent with the Group's industrial and commercial strategy. The Group has a policy of filing and maintaining patents, it monitors technological developments in terms of freedom of use, and it takes, when necessary, all appropriate measures to ensure the protection of its rights.

In addition, since some of its employees have access to confidential documents while performing their duties, TOTAL adopted internal rules concerning the management of confidential information. The Group's intellectual proprety specialists also carry out awareness-raising activities with the R&D teams so that the teams are better informed about restrictions that may apply to the use of information and data.

Ethical misconduct and non-compliance risks

Fraud prevention

The Group deploys an anti-fraud and fraud prevention program and has implemented a range of procedures and programs that help to prevent, detect and limit different types of fraud. This effort is supported by the business principles and values of individual behavior described in the Group's Code of Conduct and other standards applied by the Group's business segments.

The Group has issued a directive for handling incidents of fraud that has been widely distributed to employees, and has created an alert system that employees can use to report acts including those that may constitute fraud.

In 2015, a large campaign on fraud risks to raise awareness of all Group employees was launched. A guide on "Prevention and Fight Against Fraud", which highlights the different actions conducted through the anti-fraud program, was distributed. A map of fraud risks in the Group was finalized in late 2015, allowing priority actions to be defined for 2016. A guide to the different types of fraud risk, with descriptions of the main risks, was distributed in 2016. Fraud risk analyses are carried out in the subsidiaries. An awareness campaign relating to the four major fraud risks was launched at the end of 2016, particularly by means of videos widely distributed within the Group.

The deployment of the anti-fraud and fraud prevention program relies on the network of fraud risks coordinators within the business segments and operational entities.

Prevention of corruption risks

General Management constantly reiterates the principle of zero tolerance with regard to corruption. The Corruption Prevention Policy was updated in 2016, thus reaffirming the Group's commitment to the matter. Internal rules have been published since 2011 in this area. They cover various areas where particular risks of exposure to corruption may exist (business partnerships, representatives dealing with public officials, procurement and sales, donations, acquisitions, joint ventures, human resources, gifts and invitations, etc.) in an effort to detect, assess and address risks at a very early stage through an appropriate due diligence process.

To support this program, awareness campaigns aimed at all employees are conducted and training is regularly given to those in positions with the greatest risk of exposure. For more information, refer to point 3.7 of chapter 7.

In addition, more than 370 Compliance Officers have been appointed and trained within the business segments and operational entities. Their role is to ensure that the program is implemented at the local level.

Finally, under the settlements reached in 2013 between TOTAL, the U.S. Securities and Exchange Commission and the U.S. Department of Justice, an independent monitor had been appointed for three years to conduct a review of anti-corruption compliance and related internal control procedures implemented by the Group and to recommend improvements, where necessary. In July 2016, the monitor submitted his third and final report, in which he certified that TOTAL had devised and implemented an appropriate compliance program. As a result of this certification, the U.S. authorities concluded, after having reviewed the monitor's report, that TOTAL had fulfilled all of its obligations, thus bringing an end to the monitoring process. As a result, a court in the State of Virginia granted a motion to dismiss on November 9, 2016, thereby terminating the procedure directed at the Company, which can no longer be pursued in the United States for these same facts. The mobililization of the entire Group and its efforts in this area continue with the goal of ensuring the durability, evolution and continuous improvment of this compliance program.

Prevention of competition law infringement

A Group policy aimed at ensuring compliance with, and preventing infringement of, competition law has been in place since 2014 and is a follow-up to the various measures previously implemented by the business segments. Its deployment is based, in particular, on management and staff involvement, training courses that include an e-learning module and an organization responsible for implementing the program.

Prevention of market abuse and conflict of interests

The Group implements a policy to prevent market abuse linked to trading on the financial markets that is based, in particular, on internal ethics rules that are updated on a regular basis and widely distributed to employees. In addition, the Group's senior executives and certain employees, in light of their positions, are asked to refrain from carrying out any transactions, including hedging transactions, on TOTAL shares or ADRs and in collective investment plans (FCPE) invested primarily in TOTAL shares (as well as derivatives related to such shares) on the day on which the Company discloses its periodic results publications (quarterly, interim and annual) as well as during the 30 calendar-day period preceding such date. An annual campaign specifies the applicable "blackout" periods.

To prevent conflicts of interest, each of the Group's senior executives completes an annual statement declaring any conflicts of interest to which they may be subject. By completing this declaration, each senior executive also agrees to report to their supervisor any conflict of interest that he or she has had or of which he or she is aware in performing his or her duties. An internal rule named "Conflicts of Interests", published in 2015, reminds all employees of their obligation to report to their supervisor any situation that might give rise to a conflict of interests.

4.3.2. Internal control procedures related to the preparation and processing of accounting and financial information

Accounting information

The Group's Accounting Department, which reports to the Group's Chief Financial Officer, draws up the Group's Consolidated Financial Statements according to IFRS standards based on the reporting packages prepared quarterly by the consolidated entities, as well as the statutory financial statements of TOTAL S.A. as parent company and those of certain French entities. Each quarter, the Consolidated Financial Statements and statutory financial statements of TOTAL S.A. are reviewed by the Audit Committee and the Board of Directors.

The Consolidated Financial Statements are prepared based on the following principles:

– homogeneity of the accounting framework and standards; to this end, the interpretation of accounting standards applicable to the Consolidated Financial Statements is centralized by the Group's Accounting Department, which also distributes these standards through formal procedures and an internal financial reporting manual. The department monitors the effective implementation of these standards through periodic formal communication with managers of the business segments; and

- a supervised account closing process based mainly on formalization of economic assumptions, judgments and estimates, treatment of complex accounting transactions and on respect of established timetables announced through Group instructions disclosed to each entity.

Off-balance sheet commitments, which are valued according to the financial reporting manual are reported on a quarterly basis to the Audit Committee.

Internal control of accounting information is mainly focused around the following areas:

- a monthly financial report is formalized by Group and business segment control panels. This report and the Consolidated Financial Statements use the same framework and standards. In addition, the quarterly closing schedule is the same for preparing the Consolidated Financial Statements and financial reporting;
- a detailed analysis of differences as part of the quarterly reconciliation between the Consolidated Financial Statements and financial reporting is supervised by the Accounting and Budget-Controlling Divisions, which are part of the Finance Division;
- a detailed analysis of differences between actual amounts and the yearly budget established on a monthly basis is realized at each level of the organization;
- an annual reconciliation between the parent company financial statements and the financial statements based on IFRS standards is performed by entity;
- periodic controls are designed to ensure the reliability of accounting information and mainly concern the processes for preparing aggregated financial items;
- a regular process for the signature of representation letters is deployed at each level of the organization; and
- the Disclosure Committee ensures the application of the procedures in place.

Because of the important contribution of the equity affiliates to the Group's aggregated financial items, an annual review of the control on these companies' financial statements is implemented based on a detailed questionnaire completed by each entity. This system is integrated into the Group's internal control framework.

Other financial information

Proved oil and gas reserves are evaluated annually by the relevant entities. They are reviewed by the Reserves Committee, approved by Exploration & Production's senior management and then validated by the Group's General Management. They are also presented to the Audit Committee each year.

The internal control process related to estimating reserves is formalized in a special procedure described in detail in point 2.1.1.2 of chapter 2. The reserves evaluation and the related internal control processes are audited periodically.

The strategic outlook published by the Group is prepared, in particular, according to the long-term plans drawn up at the business segment and Group levels, and on the work carried out at each relevant level of the organization. The Board of Directors reviews the strategic outlook each year.

Disclosure control

The external communication of material information concerning the Group's performance is prepared for shareholders, financial analysts, business partners, regulators, government entities and other stakeholders as part of formal internal procedures, including in particular disclosure controls and procedures. The aim of these procedures is to confirm the quality and accuracy of external communications intended for financial markets.

The Disclosure Committee ensures that these procedures are followed and meets before press releases on results are submitted to the Audit Committee and Board of Directors.

In addition, a specific process is in place for reporting any information related to the Group's accounting procedures, internal control and auditing. This process is available to any shareholder, employee or third party.

The Group's General Management is responsible for implementing and assessing the internal control system for financial disclosure. In this context, the implementation of the Group's internal control framework, based on the various components of the COSO framework, is assessed internally at regular intervals within the Group's main entities.

Pursuant to the requirements introduced by Section 302 of the Sarbanes-Oxley Act, the Chairman and Chief Executive Officer and the Chief Financial Officer of the Company have conducted, with the assistance of members of several departments of the Group (*e.g.*, Legal, Audit & Internal Control and Corporate Communications), an evaluation of the effectiveness of the disclosure controls and procedures, over the period covered by the annual report on Form 20-F. For fiscal year 2016, the Chairman and Chief Executive Officer and the Chief Financial Officer concluded that the disclosure controls and procedures were effective.

The statutory auditors also perform those internal control audits that they deem necessary as part of their mission to certify the Financial Statements.

Refer to point 4.2 above (Control activities and assessment).