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NOVEMBER 2019

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Integrating  
**Climate**  
Into Our Strategy





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# Total at a Glance

Active in more than **130 countries**, Total is a major energy operator, producing and marketing **fuels, natural gas** and **low-carbon electricity**.

Our **100,000 employees** are committed to energy that is more affordable, more reliable and cleaner. Our ambition is to become the responsible energy major.



The world's **No. 2** liquefied natural gas operator.  
A growing presence in the gas downstream.



A global **Top 10** refiner and petrochemical manufacturer.



**2.8** Mboe/d produced in 2018, of which approximately 50% gas.



**5** million customers for gas and power.



**3** GW of renewable power generation capacity (100% operated).



**\$1B** invested in R&D in 2018, of which 2/3 in digital and low-carbon technologies.



## PATRICK POUYANNÉ

Chairman and Chief Executive Officer, Total

“ At Total, we are pragmatically and sustainably diversifying our energy mix, with the conviction that pairing complementary forms of energy can yield synergies, create value and unleash technological advances. ”

### FOREWORD

# Complementary Energies to Reconcile Climate and Development

The COP21 Climate Conference held in Paris in 2015 generated heightened awareness of climate issues and was followed by two years of stable greenhouse gas emissions, prompting hopes that a trend reversal and future decline were on the horizon. Unfortunately, the opposite proved to be the case, as emissions climbed upward in 2017 and 2018, continuing the trend seen from 2000 to 2015.

Changes in the global energy mix since the start of the century have, in fact, hindered emissions reduction. While production of natural gas — the fossil fuel that generates the least greenhouse gases in power generation — has risen by more than 2% a year, the benefits have been largely offset by increased production of coal, which emits more greenhouse gases than any other fossil fuel and has seen growth of nearly 3% annually since 2000.

Steady growth in renewable energies, meanwhile, has not been enough to absorb the increase in energy demand worldwide (about 2% a year). As a result, fossil fuels continue to make up 81% of the global energy mix, unchanged from three decades ago.

Thus, we are still faced with the challenge of reducing greenhouse gas emissions. There is no silver bullet — we can only respond by looking at energy supply as a whole, rather than by pitting one form of energy against another. The growth of renewable energies will be central to the new energy mix, and natural gas is a necessary partner to both offset the variability of renewables and handle seasonal fluctuations in demand. That’s why at Total, we are pragmatically and sustainably diversifying our energy mix, with the conviction that pairing complementary forms of energy can yield synergies, create value and unleash technological advances. ▶

- ▶ The move toward this new mix — a combination of gas, low-carbon electricity and oil — needs to happen at a pace that is compatible with consumer demand and with development in the countries where we market our products. We need to strike the right balance between urgency and acceptability. Our customers are asking us to help reduce global greenhouse gas emissions while continuing to meet rising energy demand driven by economic and demographic growth. This entails reconciling two of the U.N.'s Sustainable Development Goals: ensuring universal access to energy and fighting climate change. Our ambition is to provide as many people as possible with energy that is cleaner, more reliable and more affordable.

The energy demand scenarios developed in our Total Energy Outlook 2018 demonstrate that the current trend in global greenhouse gas emissions diverges markedly from any scenario compatible with the Paris Agreement, including the International Energy Agency's Sustainable Development Scenario and our own Rupture scenario. Achieving a compatible situation would require major changes from nations, businesses and consumers.

Clearly, we need to take stronger action. We have grouped our initiatives around four strategic focuses. As you will see in the articles that follow, we have made substantial progress in each of these areas since the previous report.

## **NATURAL GAS – EXPANDING OUR PRESENCE ACROSS THE ENTIRE CHAIN**

Gas emits half the greenhouse gases of coal in power generation<sup>1</sup> and is a natural partner to renewable energies. Abundant and inexpensive, it posted the biggest growth of any primary energy source in 2018, at 4.6%, and offers the most immediate and practical solution for combating the rise in greenhouse gas emissions.

For these reasons, Total has continued to expand across the entire gas value chain, finalizing the acquisition of Engie's LNG assets and starting up multiple LNG projects, including Ichthys LNG in Australia, Cameron LNG in Louisiana and trains 2 and 3 of the Yamal LNG project in Russia. Building on Yamal LNG's success, a major new development — Arctic LNG 2 — was also launched in northern Russia, alongside Novatek. Lastly, Total has taken steps to prepare the future and strengthen our reserves by acquiring Anadarko's gas assets in Mozambique, with resources estimated at more than 60 trillion cubic feet (TCF) in the main block.

On the marketing side, we are pursuing an assertive policy to develop alternative fuels for transportation.

**// The move toward this new mix — a combination of gas, low-carbon electricity and oil — needs to happen at a pace that is compatible with development in the countries where we market our products. //**

Total has acquired a 25% stake in Clean Energy, a U.S. distributor of natural gas vehicle (NGV) fuel and biogas for road transportation, signed LNG bunkering contracts with CMA CGM and Pavilion Energy, and entered into a cooperation agreement with Adani in India covering regasification and gas distribution.

To fully play its role in the energy transition, the integrated natural gas value chain will need to reduce its emissions of methane, which has far greater warming potential than carbon dioxide. Total is leading the way in this area. In 2018, we set an objective of reducing methane emissions at our operated facilities<sup>2</sup> to less than 0.2% of the commercial gas produced by 2025. These emissions have already been cut by more than a quarter since 2010, thanks to our work on flaring and venting. We are pursuing our R&D initiatives, including a pilot project at our Lacq facility to test innovative technology for detecting and quantifying gas leaks.

## **LOW-CARBON ELECTRICITY – DEVELOPING AN INTEGRATED BUSINESS ON THE UNREGULATED PORTION OF THE VALUE CHAIN**

Success in curbing the world's carbon emissions is contingent on electrifying the economy. That process is under way: power consumption rose by an annual 4% in 2018, nearly twice the rate of growth in energy use. We are playing an instrumental role in that trend, investing USD 1.5 billion to USD 2 billion annually in low-carbon electricity, or more than 10% of our total capital expenditure — a figure unmatched by any other major. The cumulative impact of that investment, which is inherently more lasting than that of an oil or gas project, will exceed the actual share of investment over

1. Sources: "Life Cycle Assessment of Greenhouse Gas Emissions Associated with Natural Gas and Coal in Different Geographical Contexts," International Reference Centre for the Life Cycle of Products, Processes and Services, October 2016, and "Review of Life Cycle Analysis of Gas and Coal Supply and Power Generation from GHG and Air Quality Perspective," Imperial College London, 2017.

2. Exploration and production.

## FOUR CLIMATE-ORIENTED STRATEGIC FOCUSES



### NATURAL GAS

Expand our presence across the entire natural gas chain, reduce our methane emissions and make LNG more energy efficient.



### LOW-CARBON ELECTRICITY

Expand our operations in the non-regulated portion of the value chain (i.e., excluding power transmission), from power generation using renewables and natural gas to sales to end customers and energy storage (batteries and hydrogen).



### PETROLEUM PRODUCTS

Avoid expensive oil, reduce emissions at our facilities, and promote both sparing oil use and sustainable biofuels.



### CARBON NEUTRALITY

Develop businesses that will help achieve carbon neutrality through providing energy efficiency services to our customers and by investing in natural carbon sinks such as forests and wetlands, and in carbon capture, utilization and storage (CCUS).

time, with the result that low-carbon electricity projects could account for 15 to 20% of our energy mix by 2040.

Total saw sustained growth in our low-carbon electricity businesses in 2018-2019. In power generation, we have bolstered capacity with the acquisition of four combined-cycle gas power plants that, coupled with other ongoing projects, will lift our gas-fired power generation capacity to 2.8 GW by 2020.

Our portfolio has expanded in renewables as well. We have completed our acquisition of Direct Energie and its affiliate Quadran, respectively renamed Total Direct Energie and Total Quadran, raised our stake in Total Eren through the purchase of NovEnergie and, more recently, acquired wind power firm Vents d'Oc.

In marketing, in 2018 we created an organization devoted to electric mobility, Total EV Charge, after acquiring G2mobility, the French leader in smart charging solutions, and introduced a range of products designed especially for electric vehicles.

Lastly, in the area of batteries, Saft formed a joint venture in April 2019 with China's Tianneng to expand its international business in mobility and stationary energy storage.

### PETROLEUM PRODUCTS – AVOID EXPENSIVE OIL, REDUCE OUR EMISSIONS, AND PROMOTE BOTH SPARING OIL USE AND SUSTAINABLE BIOFUELS

Over the years, oil has demonstrated a number of qualities, including high energy density, exceptional stability (which makes it easier to ship) and affordable cost. However, the related CO<sub>2</sub> emissions are significant. At Total, we believe the right move is to save this energy for specific uses, such as aviation and certain types of transportation, and to avoid uses where oil can be easily replaced, for example in power generation.

With this in mind, we are anticipating flat or declining oil demand and concentrating on low breakeven assets. We do not develop oil projects in the Arctic sea ice, for example, and are no longer developing oil sands projects in Canada.

To sustainably reduce our emissions, we are taking action against CO<sub>2</sub>. A dedicated task force bringing together Total's different skill sets was formed in 2019 and emissions will be systematically displayed at the entrance to industrial facilities to further raise our teams' awareness and buy-in.





- ▶ We are also pursuing our efforts to sustainably improve energy efficiency at our production facilities. In 2018, we made significant advances in that area. In downstream operations, we launched a five-year, USD 300-million capital investment program to enhance energy efficiency at our plants, while in the upstream we have made further reductions in routine flaring (down 80% since 2010). Lastly, we have set a goal to cut greenhouse gas emissions at our operated oil and gas facilities<sup>1</sup> from 46 million tons of carbon dioxide equivalent (CO<sub>2</sub>e) in 2015 to less than 40 million tons in 2025; that includes new projects that will be started up in the interim. The Chairman and CEO's compensation and that of our top executives will be directly affected by this indicator.

Our efforts to promote sustainable biofuels are also helping to reduce the carbon impact of our petroleum products. In late 2018, we acquired new interests in Brazil, one of the world's leading biofuel markets, through our acquisition of Zema's retail network (280 service stations, with biofuels making up 30% of sales). We have also begun production at our La Mède site, France's first world-class biorefinery, with a production capacity of 500,000 tons of hydrotreated vegetable oil (HVO) a year. This oil can be incorporated directly into biojet fuel, where it plays a critical role in reducing aviation emissions. The International Air Transport Association has set a goal of stabilizing its emissions by 2020 and halving them between 2005 and 2050. That milestone will remain beyond reach without the extensive use of biofuels.

## CONTRIBUTING TO CARBON NEUTRALITY THROUGH ENERGY EFFICIENCY AND CARBON SINKS

Achieving carbon neutrality in the second half of this century will require first and foremost that we curb growth in energy consumption. In 2050, consumption levels will need to match those of a hundred years earlier, despite a population that is three to four times larger and a GDP that is at least ten times higher. With our acquisition of GreenFlex, an energy efficiency consultant, we can advise our customers on ways they can reduce their energy consumption and emissions.

Moreover, in 2019, we established a dedicated division for investing in natural carbon sinks (forests, mangroves, etc.) with an annual budget of USD 100 million as from 2020 and an annual sustainable storage capacity target of 5 million tons of carbon by 2030.

We have expanded our efforts in the area of carbon capture, utilization and storage (CCUS) by taking part in several major projects, one in Norway (Northern Lights) and the others in the U.K. (Clean Gas Project and Acorn). We are also intensifying our R&D investment through partnerships with the National Carbon Capture Center in the United States and French public research, innovation and training center IFP Énergies Nouvelles (IFPEN).

1. Scope 1 emissions (direct emissions) and Scope 2 emissions (indirect emissions from purchased energy).

Cameron LNG liquefaction terminal, Louisiana, U.S.A.





Development studies on a major upcoming project in Dunkirk and a project to produce methanol from CO<sub>2</sub> and hydrogen in Germany (E-CO<sub>2</sub>MET) have also been launched.

Lastly, Total's venture capital fund, renamed Total Carbon Neutrality Ventures, has been fully refocused on low-carbon projects and its investment volume has been increased, with a projected portfolio of around USD 400 million by 2023.

## SOLID RESULTS

These initiatives are paying off and have allowed us to significantly improve our climate-related indicators.

- Emissions from our operated oil and gas facilities declined from 46 million tons of CO<sub>2</sub>e in 2015 to 42 million tons in 2018, in line with our goal of bringing those emissions below 40 million tons by 2025 while continuing to grow our business.
- Our methane emissions are now among the lowest in the industry (methane intensity below 0.25% in relation to the commercial gas produced in 2018).

Lastly, the carbon intensity of the products used by our customers decreased by about 5% from 2015 to 2018. Here too, we are on track to meet our ambition of a 15% reduction between 2015 and 2030. We are supporting our customers in their efforts to decrease their carbon footprint by offering an energy mix with diminishing carbon intensity.

## WORKING TOGETHER

Of course, we at Total can only do so much on our own. Changes in demand spurred by public policies and consumer practices will play a decisive role in determining the speed of the energy transition. With this in mind, we are multiplying our efforts to forge partnerships with the public sector and consumers alike.

In our discussions with governments, we actively advocate for carbon pricing, an essential step, particularly if the world is to switch from coal to natural gas for power generation. By 2040, such a move could slash carbon emissions by 5 billion tons annually and bring global emissions nearly one third of the way to compliance with the International Energy Agency's 2°C scenario. But carbon must be priced fairly, with appropriate mechanisms, since consumers may lack the means to change their behavior and view a carbon price as unfair. For this reason, we support a proposal by the Climate Leadership Council (of which Total is a founding member) to establish a carbon dividend, which creates an incentive for consumers while redistributing resources to those with the lowest incomes.

SunPower Total solar power plant (Chile).



Lastly, Total is a member of numerous industry associations. In 2019, we decided to review the main associations' positions on climate change to confirm they coincide with our own. The vast majority of these organizations hold positions that are aligned with Total's, but in four cases we found points of concern or even diverging views. As a result, Total has chosen to withdraw from one of those organizations and to closely monitor developments at the other three while continuing to promote our own views as a member.

These actions, initiatives and commitments place us among the top oil and gas companies in terms of business readiness for a low-carbon transition, according to a November 2018 study by CDP.

Our clearly stated ambition is to become the responsible energy major. To do that, we are integrating the climate challenge into our strategy and our operations. This is not just an environmental challenge — it impacts business and strategy as well. There are risks ahead, obviously, because climate change calls for a more diversified business model, but it is also a fantastic source of opportunity. As an energy provider, we are in the best position to offer sustainable solutions that will ensure our own prosperity and that of the global community in the decades to come. Our transition must be dynamic and positive for our employees, our customers and our partners. ■

# A Board of Directors Committed to Climate Action



INTERVIEW WITH

## MARIA VAN DER HOEVEN,

Member of the Board of Directors of Total<sup>1</sup> and member of the Audit Committee

### What makes Total's approach to climate issues unique?

Total is one of the first majors to have developed an integrated vision of the emissions related to its operations and products. This has allowed it to formulate a consistent approach to integrating climate challenges in its strategy. Total walks the talk. It has developed an indicator to measure the carbon intensity of its products across their life cycle. This crucial tool makes it possible to track changes in the mix of energy products offered to customers, with the ambition of lowering their emissions by 15% between 2015 and 2030.

### How is the Board of Directors supporting Total in addressing climate change?

To start, by helping Total identify climate challenges and by making sure that they are integrated into its strategy. We had productive discussions throughout 2018 on

reducing greenhouse gas emissions from operated oil and gas facilities (Scopes 1 and 2) and on supporting customers as they reduce emissions and therefore on the carbon intensity of the energy products they use (Scopes 1, 2 and 3).

The Board of Directors closely reviews projects proposed by the Executive Committee and makes sure they are consistent with the Group's strategy. For example, we supported the One R&D project, which brings together Total's research and development resources, making it easier to focus them on tomorrow's low-carbon technologies.

### What other major advances have been made over the last few years?

At its meeting on March 13, 2019, the Board of Directors decided to include a criterion concerning greenhouse gas emissions from operated oil and gas facilities (Scopes 1 and 2) in the calculation of variable compensation for Total's Chairman and senior executives.

Another important move was the presentation in February 2019 of macroeconomic scenarios in the Total Energy Outlook. The two scenarios – Momentum and Rupture (see pages 12 and 13) – provide a template that will help Total prepare the future more effectively.

Lastly, Total has shifted a portion of its portfolio toward low-carbon electricity generated from natural gas and renewables.

However, not all sectors will be ready for electrification right away. In the short and medium terms, energy efficiency remains the best solution for limiting greenhouse gas emissions. Total is firmly committed to promoting energy efficiency,

both at its own facilities and with consulting services for customers, for example through its GreenFlex affiliate.

### What are the key points looking forward?

Firstly, Total needs to pursue and step up cooperation with other players, notably public authorities and consumers. Working together is a prerequisite for accelerating the energy transition, and that means talking with stakeholders. In June, Patrick Pouyanné met with community and nonprofit organization representatives who had challenged Total so he could present the Group's initiatives to address climate change. The customer relationship is another important aspect, and we will have to develop marketing specific to low-carbon products and services.

Lastly, being a broad-based energy player with an integrated presence across its product lines is a considerable advantage for Total. This allows it to benefit from synergies among its businesses and leverage diverse energy sources instead of pitting them against each other. ■

## CLIMATE GIVEN GREATER WEIGHT IN THE CHAIRMAN AND CEO'S COMPENSATION

The Board of Directors' strong focus on climate issues is reflected, among other things, in changes in the Chairman and CEO's compensation. Climate has been given greater weight in compensation policy with regard to 2019. For the first time, the Board has introduced a quantitative criterion in the Chairman and CEO's annual variable compensation linked to trends in greenhouse gas emissions at operated oil and gas facilities (Scopes 1 and 2) representing up to 10% of his base salary. In 2018, the Board had already increased the weight of CSR performance<sup>1</sup> in the calculation, notably through the integration of climate in the Group's strategy, from 10% to 15% of base salary.

1. The CSR performance criterion also takes into account Total's reputation in the area of corporate social responsibility and its diversity policy in all its aspects.

# Shaping Tomorrow's Energy

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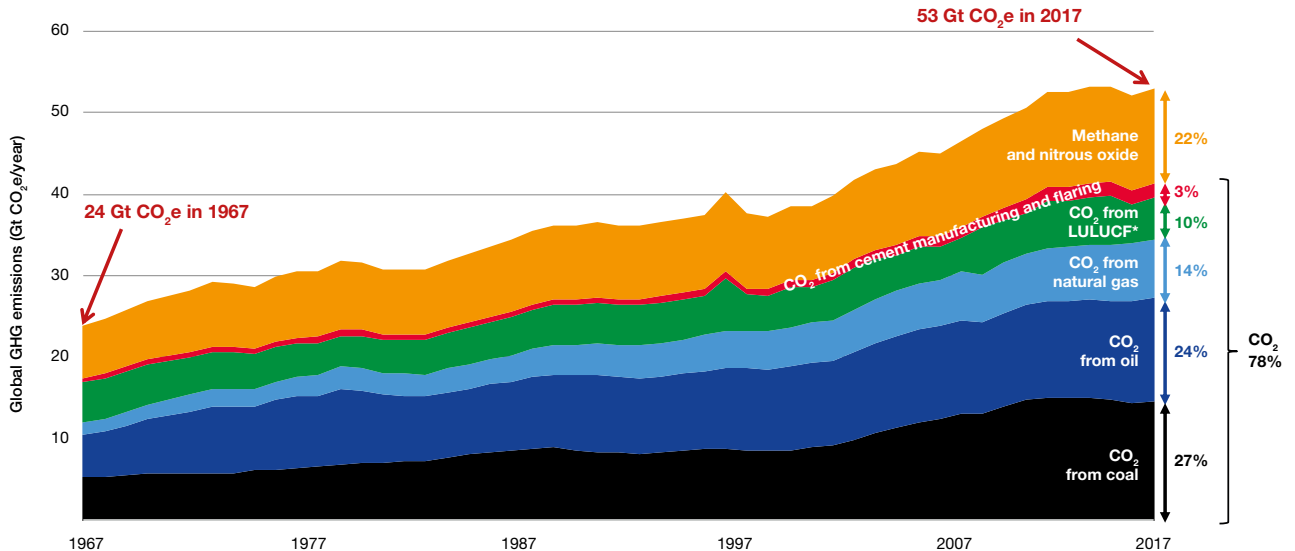
Energy is central to the challenges we face to keep the global average temperature rise below 2°C. What mechanisms can be put in place and what conditions favor success? We are helping to effect this change and are actively involved, both within our industry and in the broader international community, in shaping tomorrow's energy.

# Greenhouse Gas Emissions and Changes to the Energy Mix

If we are to keep the global temperature rise below 2°C, energy consumption – which accounts for more than 80% of global carbon emissions and about two-thirds of greenhouse gas (GHG) emissions – must be addressed as a key factor in the balancing act.

In 2017<sup>1</sup>, global greenhouse gas emissions totaled some 53 billion tons of CO<sub>2</sub>e, reflecting a 40% increase over the past two decades. According to the Intergovernmental Panel on Climate Change (IPCC), in the absence of far-reaching action, emissions will rise to around 80 billion tons of CO<sub>2</sub>e in 2040. Yet various forecasts indicate that this figure must be reduced to less than 40 billion tons in 2040 to prevent a temperature rise of 2°C or more from pre-industrial levels.

## Global Greenhouse Gas Emissions Related to Human Activity



\*Land use, land-use change, and forestry.

Source: Global Carbon Budget 2018 and the Fifth IPCC Report.

1. UNEP Emissions Gap Report 2018 (November 2018), p. 6: [https://wedocs.unep.org/bitstream/handle/20.500.11822/26879/EGR2018\\_ESEN.pdf?sequence=10](https://wedocs.unep.org/bitstream/handle/20.500.11822/26879/EGR2018_ESEN.pdf?sequence=10)

## AN ENERGY MIX THAT IS UP TO THE TASK

As we tried to define an energy mix that would meet the world’s energy needs while reducing emissions in line with the 2°C scenario, we analyzed the scenarios prepared by the International Energy Agency (IEA) and developed a long-term forecast of how energy demand is likely to change in our Total Energy Outlook 2040. Those projections highlight critical challenges and identify possible options for shifting the energy mix.

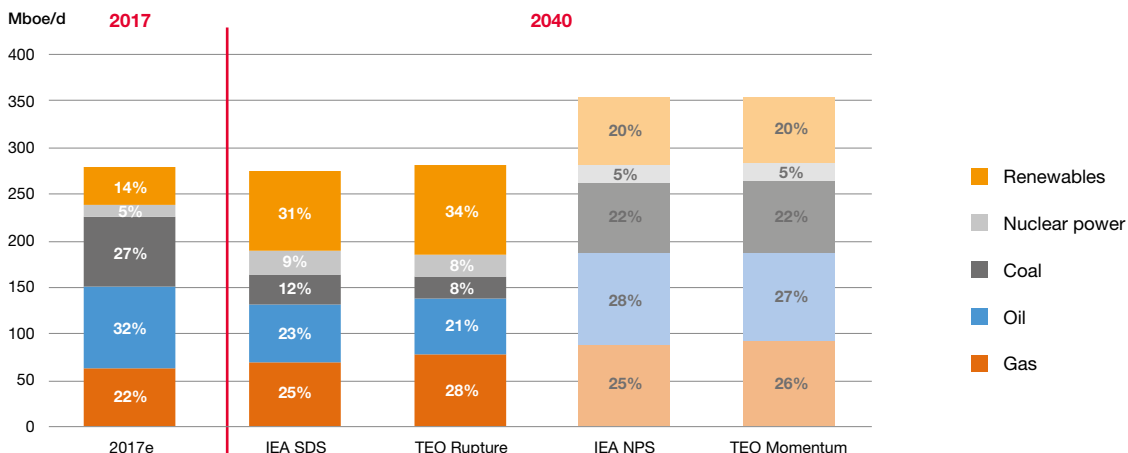
Under the IEA’s Sustainable Development Scenario (SDS) and the Total Energy Outlook’s Rupture scenario, the world’s primary energy demand mix will need to change substantially between now and 2040 to keep the temperature rise below 2°C.

Given that the world’s population is expected to exceed nine billion by 2040, we will need to make major strides in energy efficiency for energy demand to stabilize at close to current levels. Demand for electricity is expected to double by 2040 as energy end uses such as manufacturing, cooking, heating, air conditioning and transportation are electrified whenever possible. Oil, reserved primarily for transportation and petrochemicals, is slated to decline from 32% of the energy mix today to just over 20% in 2040. The share of renewables would rise sharply, from 14% to more than 30%. Fossil fuels, meanwhile, are not all equal: gas emits around half as much CO<sub>2</sub>e as coal when used for power generation. Consequently, coal’s share of the mix is expected to fall by two thirds between now and 2040, to less than 10%, while natural gas’s should continue to rise, to around 25%, under both scenarios. ■

### TOTAL ENERGY OUTLOOK SCENARIO ANALYSIS

In accordance with the Task Force on Climate-related Financial Disclosure (TCFD) recommendations, Total produced a scenario analysis in 2019. In addition to the Rupture analysis cited above, we drafted a Momentum scenario based on current trends: reliance on energy policies already in place or announced, but coupled with an upswing in certain advanced technologies, significant penetration of electric vehicles and a 2.2% annual reduction in the global economy’s energy intensity (versus around 1.6% a year since 2000). Unlike in the Rupture scenario, coal would still represent more than 20% of the energy mix in 2040, while oil’s share would shrink by about 5% and renewables would account for only 20%. The emissions associated with the Momentum scenario are well above the 2°C trajectory. Clearly, any scenario that addresses climate change must make much more ambitious assumptions: a true technological, economic and political break with the past that includes a wholesale switch to low-carbon energies.

### Global Primary Energy Demand



Source: IEA WEO 2018; Total Energy Outlook.

A CONVERSATION ABOUT

# Responding to Urgent Climate Issues



**HELLE KRISTOFFERSEN, TOTAL**



**JOHN M. REILLY, MIT**

**What assessment can we make of the climate issues we now face? How can we tackle the challenges on the horizon? What role can Total play?**

**Helle Kristoffersen, President, Strategy & Innovation, Total, talks with John M. Reilly, Co-Director of the Massachusetts Institute of Technology (MIT) Joint Program on the Science and Policy of Global Change, in which Total is a partner.**

**From a scientific standpoint, where is climate change heading?**

**John M. Reilly:** Global warming is very clearly caused by human activity. Seventy percent of greenhouse gases come from fossil fuels — coal, oil and gas. The other major sources of atmospheric carbon dioxide are deforestation, land degradation and cement manufacturing. Then you have the other greenhouse gases: methane and nitrous oxide, mainly from agriculture, and fluorocarbons.

There is already nearly enough greenhouse gas in the atmosphere to bring us to a 1.5°C rise in temperature, and staying below the only slightly higher target set in the Paris Agreement is an extreme challenge. Things are at a critical stage; we're already seeing a host of dramatic events linked to climate change, from droughts and fires to hurricanes and flooding.



**Helle Kristoffersen:** Here at Total, we don't claim to be climate experts. But we listen to climate scientists, and we believe we have a role to play in combating climate change and its effects. Our business is energy. It's a business we know well, because we conduct it in more than 130 countries. Plus, we can marshal substantial human and financial resources to carry out our projects, including in the areas of R&D, technology and innovation.

**John M. Reilly:** At MIT, too, we're mapping out scenarios that aren't just limited to energy and climate — we also incorporate issues related to water and food, among others. All of our scenarios reach the same conclusion as the International Energy Agency's: if we stay on the path we are on, and even if we achieve the short-term pledges of the Paris Agreement, the world will remain dependent on fossil fuels and emissions will continue to rise, albeit more slowly. But to curb global warming, we need to cut emissions sharply.

### What actions can be taken to reduce future global warming?

**John M. Reilly:** To keep the average global temperature rise below 2°C, then all options need to be on the table: wind and solar, nuclear, carbon storage, bioenergy and reforestation. We also need to target methane from rice and livestock, and find ways to produce food with less nitrous oxide emissions. Most economists recommend applying carbon pricing broadly to achieve the energy transition we need. We'll also need an array of solutions from R&D to help us eliminate greenhouse gases throughout the economy at the lowest possible cost.

### What role can businesses play alongside the public authorities and consumers?

**Helle Kristoffersen:** Businesses are innovating, investing and bringing new products and services to market, meaning they are playing a key role. But they can't do it alone. The practical steps we take to manage the energy transition, and how fast it happens, both depend on many other interested parties as well. Public authorities and consumers have an important role, too. By authorities, I don't just mean at the central level, but also local, especially municipalities, which are setting major forces in motion for the long term.

Total is taking tangible steps with all those stakeholders. We're working alongside our industry peers, through organizations like OGCI and, more broadly, as part of the United Nations Global Compact.

The issue of demand is a tricky one and only partly within our control, since it's dictated by consumer habits and decisions. After all, they buy what they want to. But we're supporting our customers as they move toward low-carbon, more efficient, economical forms of consumption. For example, our affiliate GreenFlex offers solutions to help businesses reduce and optimize their energy use.

**John M. Reilly:** As a rule, it's hard to get people to change their behavior. In a low-carbon world, most consumers would just adopt the latest green technology and infrastructure. To all appearances they would still be buying the same fuel and using the same outlets, but with, behind the scenes, energy companies that would have learned how to supply carbon emissions-free fuel and electricity at a competitive price

in relation to fossil fuels. Absent that progress, a strong price signal will be needed to get people to switch to new technologies or low-carbon solutions. To be sure, some consumers who want to protect the planet will pay for green technologies or products, but probably not enough to reduce emissions as much as is required. That's why it's important that we set a high carbon price worldwide.

### What role will energy companies play in particular?

**John M. Reilly:** The world will still be hungry for energy. Millions of people in many regions lack access to modern energy. So energy companies will continue to play an important role. We'll just have to wait and see whether large fossil energy companies will transform their business model or get left behind.

**Helle Kristoffersen:** We're constantly working on the possible changes in the global energy mix and on our own position with regard to those changes. One of the limitations of the International Energy Agency's Sustainable Development Scenario (SDS) is that it assumes there will be no growth in energy demand between 2015 and 2040.

For Total, the challenge is to control greenhouse gas emissions not by limiting growth, but by promoting economic development and energy access for those who don't have it. That's the meaning behind our ambition to become the responsible energy major, providing energy that is more affordable, more reliable and cleaner to as many people as possible. ▶



“We’re supporting our customers as they move toward low-carbon consumption or more efficient, autonomous forms of consumption.”

HELLE KRISTOFFERSEN

► **What actions is Total taking?**

**Helle Kristoffersen:** Total integrates the climate challenge into our four strategic focuses. First, we are expanding our operations in natural gas, the fossil energy with the lowest emissions. Second, we are growing our presence in low-carbon electricity. Third, for petroleum products, we are gradually withdrawing from certain types of oil, improving energy efficiency at our facilities and promoting sustainable biofuels. And fourth, we are developing businesses that contribute to carbon neutrality.

Speaking of carbon neutrality, in 2019 we decided to set up a business unit called Nature-Based Solutions that will be wholly focused on natural carbon sinks, with a sizable budget of \$100 million a year. This business unit will add to the work done over many years on carbon capture, utilization and storage (CCUS).

There’s no miracle solution, but rather a basket of solutions. And it’s not just the purview of experts at headquarters — it’s everyone’s business here at Total. Compliance with our emissions reductions targets is one of the factors we use to calculate executive variable compensation. Our goal is to reduce our Scope 1 and 2 greenhouse gas emissions from 46 million tons in 2015 to less than 40 million tons of carbon dioxide equivalent by 2025 across our operated oil and gas activities.

**John M. Reilly:** Total is covering all the bases — it’s pledged to reduce its direct emissions, it’s focusing on energy sources and fuels that emit less carbon and it’s investing in R&D in a variety of areas. I don’t know if that’s enough. Total sees natural gas as a key energy source, particularly as a replacement for coal in power generation. However, to meet the very tough long-term

objectives in the Paris Agreement, natural gas can only serve as a transitional energy source, for the next 20 years at most. At that point, you’ll have to start shifting to less carbon-intensive energies. So, these long-term investments in natural gas infrastructure could lose their value by 2040. But Total’s commitment to reforestation is an excellent policy, and advocating a broad-based carbon price is critical to its strategy, since that will help the company expand in other forms of energy that offer alternatives to oil and gas.

**Helle Kristoffersen:** We’re much more optimistic about natural gas than you are. Gas can be used for power generation, heating, cooking and transportation and as a feedstock in manufacturing. The biggest challenge is to make the switch from coal in power generation. We all know that coal produces more greenhouse gases than any other fossil fuel. In the United States, thanks to the boom in shale gas, coal-fired power generation is on the decline, and emissions are falling too. Adopting a carbon tax is one way to accelerate that process, as we’ve seen in the United Kingdom. This creates opportunities to develop carbon neutrality businesses, an area in which we are substantially increasing our spending.

Not many people know it, but a large portion of renewable energy is lost when it can’t be fed into grids. That makes managing its variable and seasonal nature a key issue. Gas can be a good partner for renewable energies from this standpoint. We have already invested in five combined-cycle gas turbine power plants in Europe. Plus, we’re actively

developing new applications to replace petroleum products with natural gas in trucks, shipping and other areas.

Let's not forget that under the IEA's Sustainable Development Scenario, the world will still be consuming large volumes of hydrocarbons in 2040, and natural gas in particular. There are many ways to "make gas greener," for example by extending the life of existing infrastructure and using hydrogen and biogas.

### So there's reason for optimism, then?

**John M. Reilly:** Frankly, there are a lot of reasons to be pessimistic. Many countries may not achieve their near-term Paris commitments, and there's a big disconnect between the level of action happening and what we need to do to stabilize greenhouse gases in the atmosphere. We need to reduce global emissions sharply, by about 80% between now and 2050, with many calling for zero net emissions by then. That is a very short timeframe to transform our energy system completely.

The one optimistic note is the growing climate activism among young people. My generation, which accelerated those emissions, will at least have pointed toward the pathways needed. But the hard work is actually moving the world down that path.

**Helle Kristoffersen:** I agree and would even go further. What I find encouraging is that more and more people are becoming active at every level of society. That's encouraging, because this affects all of us as citizens and inhabitants of the same planet. We can all take positive steps. The fight against global warming isn't just an issue for the public

authorities or politicians. Total's commitment is part of this broader movement of fighting for our climate and reducing our emissions while contributing to economic and social development, which requires access to energy.

Another reason to be optimistic is the massive investment in sustainability R&D and innovation that's being deployed worldwide. Total allocates more than a third of its yearly R&D budget to low-carbon technology. I'm confident we'll get some welcome surprises on that front. Too often, we tend to view the future in linear terms; in fact, the future invariably has breakthroughs in store for us, offering technological progress that — we hope — will help us overcome the challenges we currently face. ■



“ A strong price signal will be needed to get people to switch to low-carbon solutions. ”

JOHN M. REILLY

# OGCI: Oil and Gas Producers Pool Their Efforts



**Total has teamed up with a dozen other oil and gas companies within the Oil and Gas Climate Initiative (OGCI), a cooperative effort to identify, support and accelerate the deployment of solutions for reducing greenhouse gas emissions. Rooted in the expertise of OGCI members, those solutions promise benefits beyond the energy industry.**

The OGCI was founded in 2014 by CEOs from major oil and gas firms, including Total, with an active interest in climate issues. Its goal is to support a collective commitment to climate, one of the first major expressions of which was on view at the COP21 climate conference in Paris. The OGCI maintains close ties with some 15 NGOs. Since its members include several national oil companies, the OGCI can act as a useful intermediary between the United Nations and numerous national governments.

## SPEARHEADING INDUSTRY INITIATIVES

The OGCI aims to promote industry best practices in reporting and to encourage oil and gas companies to adopt climate commitments, for example to reduce methane emissions. Thanks to its expertise and financial resources, it can fund research for breakthrough technological solutions in a wide array of climate-related fields. In 2019, the OGCI therefore launched a campaign to foster the emergence of a carbon capture and storage industry that can meet the needs of numerous sectors beyond oil and gas.

## FOSTERING THE EMERGENCE OF A CCUS INDUSTRY

Since 2017, through its OGCI Climate Investments fund, the OGCI has been supporting the Clean Gas Project<sup>1</sup> in the U.K., one of the first major commercial projects for industrial CCUS. The fund is also investing in start-ups such as U.K.-based Eonic Technologies<sup>2</sup> and the Canadian firm Inventys<sup>3</sup>. In May 2019, it pledged a commitment to Wabash Valley Resources, the largest CCUS initiative in the United States. This project aims to capture 1.5 million to 1.75 million tons of CO<sub>2</sub> annually from a co-located ammonia production plant. In 2019, the OGCI announced that it would lay out a roadmap for the development of a commercially viable, safe and environmentally responsible carbon capture, utilization and storage (CCUS) industry.

## EXPANDING THE INDUSTRY'S LEVERAGE

This oil industry collaboration is growing stronger each year. With the arrival of Chevron, ExxonMobil and Occidental Petroleum in 2018, the OGCI now has 13 members<sup>4</sup>, accounting for 30% of operated oil and gas production worldwide and more than 20% of primary energy consumed. Its scope of action is global. The OGCI Climate Investment fund (see sidebar), to which the organization's members contribute, now boasts an endowment in excess of USD 1 billion. In 2018, the OGCI's members confirmed a preliminary collective goal of reducing methane emissions to below 0.25%<sup>5</sup> by 2025 from 0.32% in 2017. They hope to achieve even further reductions if possible, with an ambition of 0.20%.

## SHARING UNIFORM REPORTING ON EMISSIONS

The OGCI has adopted a common methodology for reporting emissions. An independent third party (Ernst & Young) ensures that this anonymized aggregate data is consistent. New indicators for methane intensity and carbon intensity have been defined. By adopting uniform practices, OGCI member companies can set mutual targets and improve their individual and collective performance. ■

### INVESTMENTS IN 2018 BY OGCI CLIMATE INVESTMENTS

- **Eonic:** Incorporates CO<sub>2</sub> as feedstock in the manufacture of polyols<sup>6</sup>.
- **Clarke Valve:** A single, inexpensive control valve that practically eliminates fugitive methane emissions.
- **GHGSat:** Accurate, low-cost greenhouse gas monitoring data and services for facilities anywhere in the world.
- **Kairos Aerospace:** Actionable data on major sources of methane emissions from aerial surveys.

## 13

Number of oil and gas companies belonging to the OGCI as of September 2018.

## 0.25%

End-2025 methane intensity target for OGCI member firms' upstream operated oil and gas activities<sup>7</sup>

## USD 1 billion+

Endowment of the OGCI Climate Investments fund launched in 2016.

1. The first gas-fired power plant to offer carbon capture, transportation by pipeline and storage infrastructure.
2. Eonic Technologies incorporates CO<sub>2</sub> as feedstock in the manufacture of polyols, which are used in polyurethanes.
3. A pilot plant demonstration program that hopes to halve the cost of carbon capture.
4. BP, Chevron, CNPC, Eni, Equinor, ExxonMobil, Occidental Petroleum, Pemex, Petrobras, Repsol, Saudi Aramco, Shell and Total.
5. The rate is calculated in proportion to the quantity of gas sold by each OGCI member.
6. Polyols are used to manufacture polyurethane plastic, which has multiple applications.
7. <http://info.oilandgasclimateinitiative.com/blog/methodological-note-for-ogci-methane-intensity-target-and-ambition>



# Multiple Partnerships

Alongside our commitment to the Oil and Gas Climate Initiative, Total has forged ties with international organizations, business consortia, foundations and other partners to take action in multiple ways. Here are a few examples.



## SUSTAINABLE DEVELOPMENT GOALS: FOR GLOBAL COMMUNITY ENGAGEMENT

**What are they?** In 2015, the United Nations defined and adopted 17 Sustainable Development Goals (SDGs) for its member states. The U.N. called on the business community to mount a collective response to these critical challenges. We pledged our commitment to fulfilling the SDGs in 2016.

**Why?** All of the SDGs have some bearing on our operations. That said, we have identified those for which we can make a more significant contribution, such as SDG 13 on climate action, SDG 7 on affordable and clean energy and SDG 8 on decent working conditions around the world. We are using the SDGs as an opportunity to measure our contribution to society more effectively. We manage our operations and assess our performance based on the three touchstones of sustainable growth: financial results, value creation for all stakeholders and preservation of ecosystems. We also rely on an ongoing process of identifying risks.



## THE CLIMATE LEADERSHIP COUNCIL: FOR THE CREATION OF A CARBON TAX

**Who are they?** Founded in 2017 in the United States, the Climate Leadership Council (CLC) brings together multinational firms from a variety of business sectors, including energy companies like BP, ExxonMobil, Shell and Total (a founding member), as well as other global players such as Allianz, AT&T and PepsiCo. A number of non-governmental organizations (NGOs), such as the World Wildlife Fund and the World Resources Institute, are also CLC members.

**Why?** The goal of the CLC is to establish a carbon tax on fossil fuels. The tax would initially be set at USD 40 per ton and rise over time. The entire revenue generated by the tax would be evenly redistributed to U.S. consumers

in the form of dividends. The amount of the dividend would increase with the tax rate, providing an incentive for both businesses and consumers to choose less carbon-intensive forms of energy. Likewise, by targeting imports, the proposal would encourage America's trade partners to set up carbon pricing schemes of their own. The mechanism is inherently redistributive, from the wealthiest (high carbon consumers) to the poorest (those who consume the least).



## BREAKTHROUGH ENERGY COALITION: FOR FASTER SOLUTIONS

**Who are they?** In 2015, Bill Gates founded the Breakthrough Energy Coalition (BEC), a group of investors with the ability to provide long-term backing to new companies developing cutting-edge energy solutions.

**Why?** The goal of the BEC is to fund technologies that emit fewer greenhouse gases and to promote low-carbon energy production. The idea is to leverage funding from the BEC to move more quickly from the research phase to tangible applications. Total joined the BEC in 2017, offering our expertise in energy and sustainable solutions. The BEC has a USD 1 billion investment fund. ■



## THE ALLIANCE TO END PLASTIC WASTE: ELIMINATING PLASTIC POLLUTION

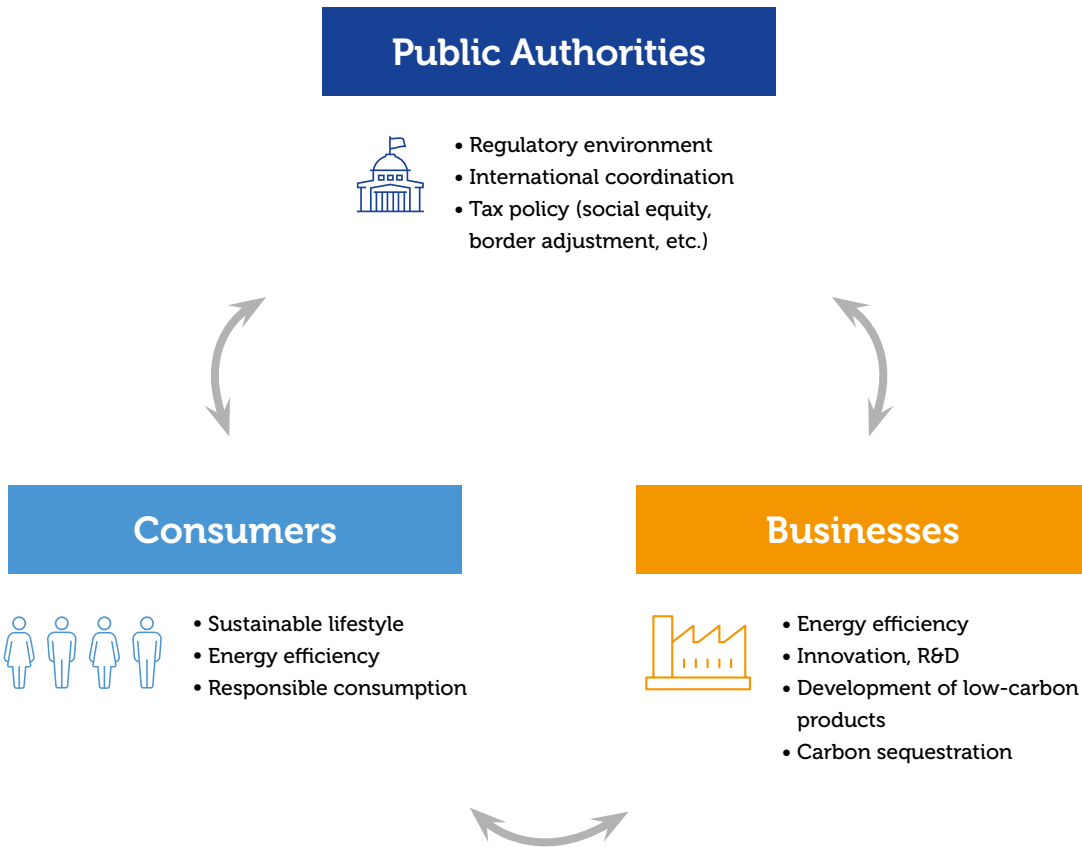
Established in 2019, the Alliance to End Plastic Waste includes companies from across the plastics and consumer goods value chain. Total was a founding member. The goal of the initiative is to offer solutions for eliminating plastic waste in the environment, particularly in the world's oceans, and to promote recycling of plastics as part of a circular economy.



# The Energy Transition: Mobilizing Every Stakeholder

The objectives for reducing greenhouse gas emissions will not be met unless everyone gets involved: the public authorities, businesses and consumers. For our part, at Total we are sharing our technological expertise, creating bridges and catalyzing solutions with them.

## Stakeholders



## SPOTLIGHT

# On the Front Lines on Carbon Pricing

**Carbon pricing is a major tool for reducing the carbon intensity of power generation and promoting technologies that emit less carbon. For more than a decade, Total has been calling for the adoption of a global price on carbon and applying an internal carbon price when evaluating its own projects.**

Carbon pricing, in which the price of energy reflects its carbon content, raises the cost of the most carbon-intensive energy sources. Putting a price on carbon provides an incentive for all stakeholders to move more quickly from coal to gas and renewable energies for power generation. Over time, it also helps to steer investment toward research into low-carbon technologies and carbon capture and storage.

Carbon tax and carbon trading projects are emerging and taking shape around the world, with several proposals moving forward in 2018. Canada, for example, has instituted a carbon tax of CAD 20 per ton that will gradually increase to CAD 50 per ton by 2022.

## AN INTERNAL CARBON PRICE

In our financial evaluations of our investments, we include:

- An internal carbon price of USD 30 to USD 40 per ton, depending on the price of oil.
- Or the current CO<sub>2</sub> price if it is higher in the country where the investment will be made.

In this way, we anticipate future regulatory measures for combating climate change that may have an impact on our projects.

Six other countries, including China and Mexico, are adopting some form of pricing mechanism, while the European Union has reformed its Emissions Trading System (ETS) in a bid to raise the price of carbon (see opposite). In all, according to the Carbon Pricing Leadership Coalition (CPLC), 46 national and 28 subnational jurisdictions have adopted carbon pricing<sup>1</sup>.

## TOWARD A BALANCED INTERNATIONAL MECHANISM

Since 2014, the United Nations Global Compact has encouraged companies to voice public support for carbon pricing by promoting regulatory mechanisms appropriate to the local situation. In May 2015, Total and five other global oil and gas companies — BG, BP, Eni, Equinor, and Shell — addressed a joint letter to the United Nations Framework Convention on Climate Change (UNFCCC) Executive Secretary and the President of the COP21, calling for the introduction of carbon pricing systems.

At Total, we advocate a balanced, phased-in international agreement that does not distort industrial or regional markets. We encourage the adoption of a global price per ton of carbon emitted that also ensures fair treatment for sectors subject to carbon leakage.

1. "State and Trends of Carbon Pricing 2019," World Bank, Washington, D.C., June 2019.  
<https://openknowledge.worldbank.org/bitstream/handle/10986/31755/211435KeyFigures.pdf?sequence=5&isAllowed=y>

## THE EU-ETS: EFFECTIVE REFORMS

To shore up the collapsing price of carbon, which fell to €4.40 a ton in May 2017, the European Union adopted structural reforms to its Emissions Trading System (ETS). The announcement in 2018 that quotas would be reduced via the Market Stability Reserve helped to drive carbon prices higher, to about €25 per ton. That trend is expected to continue and could push prices above €30 per ton by 2030. We also support the adoption of a floor price of €20 to €25 per ton.

# 20%

GHG emissions covered by carbon pricing (ETS or taxes)<sup>4</sup> by 2020

# USD 44 billion

Revenues for jurisdictions using carbon pricing in 2018, up 33% from the previous year<sup>4</sup>

## SETTING AN ACCEPTABLE PRICE

We believe that acceptability is a critical component of a carbon pricing system. As a member of the Climate Leadership Council since 2017, we support the creation of a carbon dividend, in which tax collected on fossil fuel consumption is equitably redistributed to consumers. That idea is gaining ground: it is currently included in several policy proposals in the United States<sup>1</sup> and has been incorporated into Canada's carbon pricing systems<sup>2</sup>. The French government's Economic Advisory Council<sup>3</sup> has examined the idea as well. ■



### 2008

We begin factoring a carbon price of €25 per ton into our investment decisions.

### 2015

Paying for Carbon: Total and five other leading oil and gas companies call on the international community to implement carbon pricing mechanisms.

### 2016

We help deploy the World Bank's Carbon Pricing Leadership Coalition. We review our internal carbon price, setting it at between USD 30 and USD 40 per ton, depending on the price of oil.

### 2017

We become a founding member of the Climate Leadership Council in the United States.

1. "Baker proposal" and "Deutch proposal," described in "A Comparison of the Bipartisan Energy Innovation and Carbon Dividend Act with Other Carbon Tax Proposals," Working Paper, 2018, Center on Global Energy Policy [https://energypolicy.columbia.edu/sites/default/files/pictures/DeutchCarbonTax-CGEP\\_Commentary\\_NEW.pdf](https://energypolicy.columbia.edu/sites/default/files/pictures/DeutchCarbonTax-CGEP_Commentary_NEW.pdf).  
 2. <https://www.ourwindsor.ca/news-story/9392640-carbon-tax-rebate-claimed-by-97-per-cent-of-eligible-families-so-far-this-year-canada-revenue-agency-says/>  
 3. <http://www.cae-eco.fr/IMG/pdf/cae-note050v2.pdf>  
 4. State and Trends of Carbon Pricing 2019," World Bank, Washington, D.C., June 2019. <https://openknowledge.worldbank.org/bitstream/handle/10986/31755/211435KeyFigures.pdf?sequence=5&isAllowed=y>

## FOUR QUESTIONS FOR



**DIRK FORRISTER,**  
CEO and President, IETA

**The nonprofit International Emissions Trading Association (IETA) serves businesses engaged in market solutions to tackle climate change. Its mission is to enable business to engage in climate action consistent with the objectives of the United Nations Framework Convention on Climate Change (UNFCCC) and to establish effective market-based trading systems for greenhouse gas emissions that are fair, open, efficient, accountable and consistent across national boundaries.**

**Where do you stand on the implementation of an international carbon market or various international markets?**

We need global markets to pull businesses around the world into the global effort to tackle climate change and to ensure fair competition through a common carbon price. We currently support regional markets, such as the European Union

Emissions Trading System (EU ETS) or the Western Climate Initiative, Inc. in the United States, but we would like to see them evolve toward an international market. That is the only viable path to achieve the massive level of emission reductions needed without disrupting the global economy.

**What is required to ensure the success of these markets?**

The first metric will be whether emissions are reduced to levels commensurate with a better than 2°C goal. The caps need to be effective to achieve tighter and tighter reductions over time. The second metric is the pricing signal sent to businesses as they plan their future investments. Because they will be in a position to anticipate carbon prices in the market or through a tax system, they will have the information they need to adopt effective plans.

Achieving our targets will also require greater use of other kinds of tradeable units not currently available, such as natural climate solutions, for instance sequestration in forests and soil or carbon capture and storage underground.

**What does a business association like IETA do in the fight against climate change?**

We're deeply involved in advocacy in carbon markets in jurisdictions — countries, federal states, cities and others — that are either already using them or are interested in setting up new systems. We are also bringing together experts from Total, BP, Shell and other industrial companies that are members of our organization to share insights and build business relationships.

When we go to governments with our proposals and our suggested improvements for their carbon pricing systems, they know IETA speaks from experience, because we are a coalition of businesses that are active in carbon markets or tax-and-offset systems, for example. We help those governments understand what market dynamics they will create with their policy choices.

**How do you work with the private sector, including companies like Total, to deliver a successful outcome?**

IETA is focused on getting a policy infrastructure in place at national, regional, and international levels so that companies like Total understand what the rules are going to be to inform their investment strategies.

We are also involved in a series of carbon forums that allow businesses to meet each other, share their success stories and showcase some of the model initiatives they have undertaken on their own journey to address climate change.

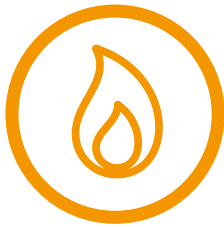
For example, Total is stepping forward on things like natural climate solutions — CCS, biofuels and sustainable aviation fuels, to name just a few — and can also offer renewable energy solutions. In other words, it can use its know-how and financial power to help governments achieve their goals in a way that meets the Paris Agreement targets, but also enables economic growth. ■

# Our Initiatives

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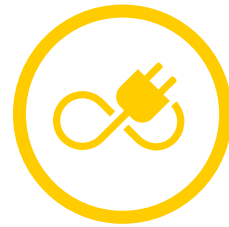
**Our initiatives are guided by four strategic focuses: growing our natural gas business while reducing methane emissions, developing businesses in low-carbon electricity, curbing emissions at our facilities and promoting sustainable biofuels, and contributing to carbon neutrality by investing in carbon sinks and energy efficiency. In the following pages, we take a look at where we stand in addressing these focuses and achieving our objectives.**

# FOUR CLIMA STRATEGIC



## NATURAL GAS

Expand our presence across the entire natural gas chain, reduce our methane emissions and make LNG more energy efficient.



## LOW-CARBON ELECTRICITY

Expand our operations in the non-regulated portion of the value chain (i.e., excluding power transmission), from power generation using renewables and natural gas to sales to end customers and energy storage (batteries and hydrogen).



# TE-ORIENTED FOCUSES



## **PETROLEUM PRODUCTS**

Avoid expensive oil, reduce emissions at our facilities, and promote both sparing oil use and sustainable biofuels.



## **CARBON NEUTRALITY**

Develop businesses that will help achieve carbon neutrality through providing energy efficiency services to our customers and by investing in natural carbon sinks such as forests and wetlands, and in carbon capture, utilization and storage (CCUS).



# Natural Gas, A Key Energy Source

**Natural gas is a cornerstone of our energy mix and our strategy. As the fossil fuel with the least carbon emissions, it offers an excellent alternative to coal for power generation and can serve as a flexible, inexpensive partner to intermittent, seasonal renewable energies.**

According to the IEA's Sustainable Development Scenario, gas consumption will soar between now and 2040, when it is expected to meet one-quarter of global energy demand. In emerging markets, which still rely heavily on coal and where most of that growth will occur, natural gas could be used for heating, transportation and power generation. In this last area, its flexibility makes gas a vital partner for renewable energy sources, including solar and wind, which are intermittent and seasonal by nature.

To do that, we are investing heavily in exploration projects with controlled costs, including Yamal LNG in Russia, Ichthys LNG in Australia and our 2019 acquisition of Anadarko's gas assets in Africa<sup>1</sup>. With regard to liquefied natural gas (LNG), we are investing in every major market and production region. In a market growing by 5% annually, we are now the world's second-largest producer of LNG, thanks to our acquisition of Engie's LNG assets and the start-up of production at our current projects.

## SUSTAINED INVESTMENT UPSTREAM

In 2018, natural gas accounted for 50% of our hydrocarbon production, compared to around 35% in 2005. Our ambition is to increase the share of gas to 60% by 2035.

1. 1.2 billion barrels of proved and probable reserves, of which 70% is gas, as well as  
2 billion barrels of oil equivalent of long-term natural gas resources in Mozambique.



Yamal LNG plant in Russia.

## LIQUEFACTION FOR EASIER GAS TRANSMISSION

LNG has been a boon to the natural gas market, which in the past was limited by the need for pipelines. Today, ships carry LNG worldwide from liquefaction plants to regasification terminals, supplying gas to regions that lie far from production hubs. With our multiple sources of supply and international delivery points, we can guarantee flexible, competitive services for our customers.

Those plants, which already provide 1.6 GW of capacity, are expected to virtually double in number by 2020 with the acquisition of two additional power plants<sup>3</sup> and the construction of a plant in Landivisiau, France. Together, these moves will lift our gas-fired power generation capacity to 2.8 GW.

## A RESPONSIBLE MAJOR PLAYER

Providing the energy the world needs for the energy transition is an opportunity, but also a responsibility, for Total, a major energy player. We are committed to reducing methane emissions from natural gas production and distribution across our operated scope<sup>4</sup>. We are also pursuing that goal as a member of the OGCI, which aims to identify, fund and deploy solutions to reduce greenhouse gas emissions (see pages 20-21). ■

## RAPID DEPLOYMENT DOWNSTREAM

We also continue to invest downstream in the gas value chain. We're contributing to several initiatives that involve floating storage and regasification units. Those facilities, known as FSRUs, provide additional countries with fast and flexible access to natural gas without the need to spend heavily on infrastructure. We are also committed to promoting natural gas fuel for trucks and transcontinental container ships (LNG bunker fuel). Buoyed by strong organic growth and strategic acquisitions (combined-cycle gas power plants, Direct Energie, etc.), we are expanding our production and distribution of low-carbon electricity and gas to the end customer. We have also signed a partnership agreement with Adani, India's largest energy and gas infrastructure conglomerate, with the goal of developing the country's natural gas market.

## COMBINED-CYCLE GAS-FIRED POWER PLANTS, AN EFFECTIVE PRODUCTION RESOURCE

Studies have shown that, in terms of carbon emissions, natural gas is cleaner than coal for power generation<sup>1</sup>. Life cycle assessments conducted across the entire chain established that natural gas produces half the greenhouse gas emissions of coal on average. Replacing coal with natural gas in power plants would cut global carbon emissions by 5 billion tons per year, or around 10%.

Using natural gas for power generation offers an additional advantage over coal in that it gives power plants greater operating flexibility. Gas-fired plants have a much faster restart time and can build up to full capacity twice as fast as their coal-fired counterparts. In 2018, we significantly boosted our gas-fired power generation capacity with the acquisition of four combined-cycle gas power plants<sup>2</sup>.

## TOWARD GREENER GAS

The growth of natural gas will see a constantly increasing proportion of greener gas, such as hydrogen or biogas, to reduce greenhouse gas emissions. An extensive infrastructure network is a considerable asset in this area. Maintaining that infrastructure right to the end customer is therefore critical.

**500 kg CO<sub>2</sub>e/MWh**

Median greenhouse gas emissions across the gas value chain (compared to about 1,000 kg CO<sub>2</sub>e/MWh for coal)<sup>5</sup>

**320 kg CO<sub>2</sub>e/MWh**

Emissions from the highest-efficiency combined-cycle gas turbine (CCGT) plants, versus 500 kg CO<sub>2</sub>e/MWh for recent open-cycle gas turbine (OCGT) plants, 550 kg CO<sub>2</sub>e/MWh for OCGT plants more than 10 years old and 800 kg CO<sub>2</sub>e/MWh for a modern supercritical coal-fired power plant<sup>6</sup>

1. "Life Cycle Assessment of Greenhouse Gas Emissions Associated with Natural Gas and Coal in Different Geographical Contexts," International Reference Centre for the Life Cycle of Products, Processes and Services, October 2016, and "Review of Life Cycle Analysis of Gas and Coal Supply and Power Generation from GHG and Air Quality Perspective," Imperial College London, 2017.
2. Two through our acquisition of Direct Energie and two other plants (in Toul and Pont-sur-Sambre, France) purchased from the U.S. investment firm KKR.
3. From Germany's Uniper, announced in late 2018.
4. In 2018, Total's methane emissions were less than 0.25% of the commercial gas produced.
5. "Review of Life Cycle Analysis of Gas and Coal Supply and Power Generation from GHG and Air Quality Perspective," Imperial College London, 2017.
6. "Main Technical Principles of OCGT and CCGT," GRP, February 2019.



# Controlling Methane Emissions

**Whether operational or fugitive, methane emissions play a role in global warming. With natural gas operations spanning production to distribution, Total has reduced those emissions by more than 25% since 2010. We are also involved within the industry and at the global level in efforts to learn more about methane emissions and promote best practices in the gas value chain.**

Methane is a powerful greenhouse gas. According to the fourth IPCC report, its global warming potential (GWP) is 25 times greater than that of carbon dioxide over 100 years. Methane emissions are responsible for one-quarter of our current warming<sup>2</sup>. Rapid reductions in methane emissions are vital to slow the warming process and ensure that gas can continue to play a key role in combating climate change.

## A PRIORITY FOR TOTAL

Over the past three decades, we have been taking steps to reduce and account for our methane emissions in complete transparency, using a detailed methodology<sup>2</sup> in which Total is classified as an expert according to the United Nations-supported Principles for Responsible Investment<sup>3</sup>.

Our performance in reducing methane emissions is among the industry's best. As part of our inspection and maintenance programs, we identify and analyze leaks, make repairs and document our follow-up reviews. We have substantially reduced flaring at our facilities and are limiting sources of process-related venting.

As a result, we succeeded in reducing our methane emissions in 2018 to less than 0.25% of the commercial gas we produce. We intend to continue that trend by sustainably bringing emissions below the 0.2% level by 2025.

## AN INDUSTRY-WIDE DRIVE

We are involved in international partnerships and industry initiatives to improve and widely disseminate knowledge about methane emissions and methods to detect, measure and reduce those emissions.

As a member of the Oil and Gas Climate Initiative, which has made reducing methane emissions a priority, we provide technical and financial support to international research such as the Oil and Gas Methane Science Studies jointly funded by UN Environment, the European Commission and the Environmental Defense Fund. This research will allow us to focus investments where they can yield the most sizable improvements.

In 2017, Total also became a signatory to the Guiding Principles on Reducing Methane Emissions Across the Natural Gas Value Chain.

## BUSINESSES, PUBLIC AUTHORITIES AND NGOS

Through the Climate & Clean Air Coalition (CCAC), we are participating in the Oil & Gas Methane Partnership (OGMP), which brings together oil companies, public authorities and NGOs to promote more effective measurement, mitigation and reporting of methane emissions and the sharing of best practices. At the Climate Action Summit 2019, the U.N. called on the world community to address this issue more forcefully. The industry will be mobilizing its expertise within the OGCI and OGMP to help governments incorporate methane emissions reductions into their greenhouse gas reduction targets.

1. Fifth IPCC report: The Physical Science Basis, Chapter 8, pages 697-698.

2. Methodology presented to the Society of Petroleum Engineers (SPE), document 179288-MS: "How to Establish a Methane Reporting in Line with the UNEP-CCAC-OGMP (United Nations Environment Program, Climate and Clean Air Coalition, Oil & Gas Methane Partnership) within an Oil & Gas Company" (S. Plisson-Sauné, E. Pirrone, N. Musset, W. Brown, J. Miné, Total Exploration & Production). <https://www.onepetro.org/conference-paper/SPE-179288-MS>.

3. An Investor's Guide to Methane, UNPRI.

AUSEA project: Drone equipped with a greenhouse gas sensor. Test conducted with SeekOps.



Since 2017, through our contributions to the OGCI Climate Investments fund (see pages 20-21), we have been supporting the development of technologies to detect and reduce methane emissions. In 2018, we began operating our own Transverse Anomaly Detection Infrastructure (TADI) facility, where we test emissions monitoring technology and conduct an array of research programs (see below).

**<0.25%**

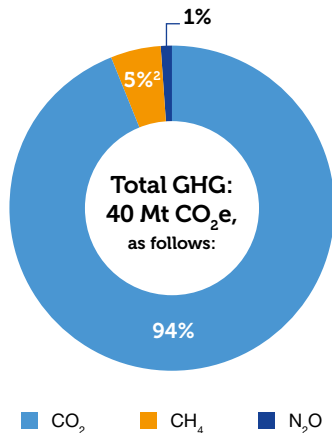
Methane intensity of the commercial gas produced in 2018<sup>1</sup>

**SPEEDING THE DEVELOPMENT OF EMISSIONS MONITORING AND DETECTION TECHNOLOGY**

At our Lacq Research Center in southwestern France, we are using pipes, valves, tanks, columns, wellheads and other equipment from our former plant at the site to test and evaluate innovative technologies to detect and measure gas leaks. This Transverse Anomaly Detection Infrastructure (or TADI) can simulate methane and carbon leaks across a wide range of flow rates. It is the only facility of its kind in Europe. We make it available to suppliers interested in testing their own solutions and to the broader scientific community.

Another Total innovation is the Airborne Ultra-light Spectrometer for Environmental Application, or AUSEA, which we are developing in partnership with France’s National Center for Scientific Research (CNRS). AUSEA is a miniaturized sensor, fitted onto a commercial drone, that can detect methane and carbon dioxide. This emerging technology will make it possible to measure greenhouse gases, estimate their path and use models to trace them back to their source. Testing has been conducted at TADI and our industrial sites, with deployment scheduled for 2020.

**Total’s 2018 Scope 1 GHG Emissions (operated scope)**

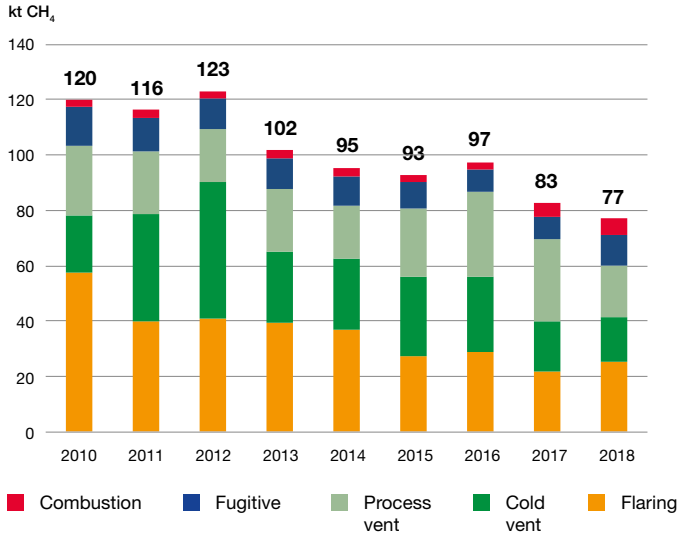


Total’s methane emissions across our operated scope stood at 78,500 tons in 2018. Ninety-eight percent of those emissions were generated by our upstream operations, while 2% were attributable to Refining & Chemicals.

1. Methane emissions from operated upstream oil and gas assets as a percentage of the volume of gas produced and sold.  
 2. Global warming potential of 25 over 100 years (fourth IPCC report).



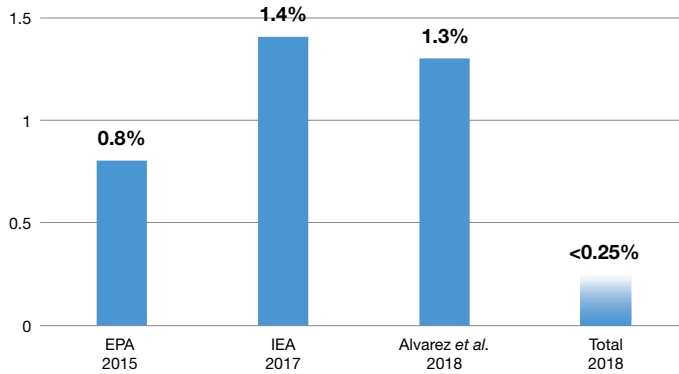
► EMISSIONS SOURCES — UPSTREAM



In 2018, methane emissions were the result of:

- Incomplete combustion of gases flared, estimated on a standard basis at 2% (Flaring): 33%.
- Installation degassing (Cold vent): 21%.
- Certain units and equipment, including water treatment, oil and gas loading and unloading, glycol dehydration and gas-powered pneumatic devices (Process vent): 24%.
- Leaks from valves, flanges and couplings (Fugitive): 14%.
- Incomplete gas combustion, particularly in turbines, furnaces, steam generators and heaters, estimated at 0.5 to 1% depending on the equipment (Combustion): 8%.

METHANE EMISSIONS INTENSITY — UPSTREAM



A comparison of Total's methane emissions intensity in its exploration and production operations with the intensity levels reported by the U.S. Environmental Protection Agency (EPA), the International Energy Agency (World Energy Outlook 2017) and "Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain," published in 2018 by Alvarez *et al.* ■





# Low-Carbon Electricity at the Center of Our Strategy

**In order to meet rising electricity demand responsibly, we are solidifying our integrated growth model for low-carbon electricity. From upstream to downstream, across solar, wind and hydropower, we continue to seize new opportunities for investment.**

Under the IEA's Sustainable Development Scenario, renewable energies would account for around 30% of the world's energy mix in 2040. To stake out a position in that market, and bearing in mind the intermittent, seasonal nature of solar and wind energy, we are investing in power generation and storage technologies.

## EXPANDING OUR GENERATION CAPACITY

In addition to investing in gas-fired power generation, we are leveraging our affiliates to expand our commitment to renewable energies. Total Direct Energie produces and supplies electricity and natural gas. Its Total Quadran affiliate operates a portfolio of 213 wind, solar, hydropower and biogas facilities in France. It is also developing a range of renewable power projects at various stages of maturity and in 2019 acquired Vents d'Oc, primarily active in wind power. Total Quadran's operated installed capacity of 700 MW is 100% renewable energy.

Through its Méthanergy affiliate, Total Quadran is also active in three biomass recovery processes — landfill biogas from waste disposal facilities, biogas from methanation and biomass cogeneration (using wood, agricultural waste, wood waste, etc.) — with the aim of utilizing the biogas for power generation, as well as for heating and cooling. At end-2018, Méthanergy operated 10 biogas recovery units with total capacity of 12 MW at non-hazardous waste storage facilities.

## TOTAL EREN: DEDICATED TO RENEWABLE ENERGY (SOLAR, WIND AND HYDROPOWER)

Total Eren was founded in 2017, following Total's acquisition of a stake in EREN Renewable Energy. The affiliate develops energy projects in countries and regions where renewable energy offers an economically viable way to meet growing energy demand. In the Asia-Pacific region, Africa and Latin America, Total Eren maintains a diversified range of assets in wind, solar and hydropower. Its assets worldwide, operated or under construction, represent gross installed capacity of around 1.3 GW. Total Eren intends to boost installed capacity to nearly 5 GW by 2022. ▶

## 3 GW

Installed power generation capacity from renewable sources in 2019 (100% operated).

## >25 GW

Target for installed power generation capacity from renewable sources in 2025 (100% operated).<sup>1</sup>

1. [https://publications.total.com/investorDay2019/Strategy-and-Outlook-Presentation-2019\\_securise.pdf](https://publications.total.com/investorDay2019/Strategy-and-Outlook-Presentation-2019_securise.pdf)



Saft battery plant and wind farm in the Faroe Islands.

► In 2018 Total Eren acquired NovEnergia, an independent renewable power producer that operates primarily in southern Europe. NovEnergia’s diversified portfolio, comprising solar and wind farms along with mini hydropower plants, offers net installed capacity of 657 MW from 47 operated assets.

In 2019, Total Eren formed a joint venture with Petrobras to develop onshore wind and solar power projects in Brazil. It established an affiliate in São Paulo in 2013 and had installed gross capacity of 140 MW in operation or under construction in the country at end-2018.

## TOTAL AND RENEWABLE ENERGIES

### 2011

SunPower joins Total, creating a new global leader in the solar industry.

### 2016

Acquisition of Saft, specialized in the design, manufacturing and marketing of advanced technology battery solutions for industrial applications.

Acquisition of Lampiris, Belgium’s third-ranked supplier of gas and power to residential customers.

### 2017

Acquisition of an interest in Eren Renewable Energy, renamed Total Eren, to accelerate growth in renewable power generation.

### 2018

Creation of Total Solar to generate and market solar energy to industrial and commercial customers and to the grid.

Acquisition of French electricity supplier Direct Energie and its affiliate Quadran, which operates and develops renewable energy projects (wind, solar, hydropower and biogas).

## A GLOBAL PRESENCE IN SOLAR POWER

Our solar power operations are conducted through Total Solar, an affiliate that sells distributed photovoltaic systems for industrial and commercial customers. Total Solar is also developing ground-based solar arrays in Europe, the Middle East, Japan and South Africa. In addition, through our stake in California-based SunPower, Total markets solar panels around the world. SunPower's photovoltaic cells are used on commercial and residential rooftops and in the construction of solar power plants. In 2018, the company installed more than 1.5 GW of new capacity, compared to 1.4 GW in 2017 and 1.3 GW in 2016.

## ELECTRICAL ENERGY STORAGE

Solar and wind energy are inherently intermittent. If they are to be integrated into the electrical grids of the future, large-scale storage of the surplus electricity they produce will be essential. Total is investing in stationary energy storage capacity. Our Saft affiliate specializes in the design, production and marketing of high-tech batteries<sup>1</sup> for industry. The company is active in such areas as transportation, telecommunications, industrial infrastructure, civil and military electronics, aerospace and defense.

In 2018, Saft teamed up with European partners<sup>2</sup> on an ambitious R&D campaign to develop the next generation of batteries: lithium-ion batteries (Gen 3A and Gen 3B) and solid-state battery lithium technology. In April 2019, Saft created a joint venture with China's Tianneng Energy Technology (TET)<sup>3</sup> as part of its plans to move toward large-scale production. Their goal will be to improve on current technology<sup>4</sup> at a lower cost, thanks to TET's cell production capacity<sup>5</sup>.

## GROWING OUR DISTRIBUTION OF LOW-CARBON ELECTRICITY

Having provided natural gas to industrial customers for several decades, we are now expanding our offering in a number of European countries to include low-carbon electricity. We are a leader in the residential market, thanks to our 2016 acquisition of Lampiris, the 2017 launch of Total Spring and the 2018 acquisition of Direct Energie. In 2018, we delivered 133 TWh of gas and electricity to more than 5 million customer sites. Our aim is to capture 15% of the French and Belgian residential markets within five years. We're also expanding our distribution operations to include the U.K., Spain, Germany and the Netherlands. ■

1. Primary lithium, lithium-ion and nickel-cadmium.

2. Siemens, Umicore, Manz and Solvay.

3. One of the world's leading lead-acid battery manufacturers.

4. Lithium-ion batteries with a liquid electrolyte in an organic solvent (primarily used in electric bicycles and vehicles) and energy storage solutions.

5. 3.5 GWh already in operation, for a potential of 5.5 GWh.



# Alternatives for Transportation: Natural Gas and Electricity Lead the Way

Faced with climate challenges and changes in technology and usage, transportation is going through a decisive period of transformation. Total is developing and proposing tangible solutions for light vehicles, trucks, shipping and air transportation.

## TRUCKS: IMPROVING PERFORMANCE AND PROMOTING NATURAL GAS

European Union regulations for new trucks call for a 30% decline in CO<sub>2</sub> emissions from 2019 levels by 2030.

Natural gas vehicle (NGV) fuel, one of the fossil fuels with the least emissions, could contribute to achieving this objective. There are two types of NGV fuel: compressed natural gas (CNG), which is suitable for all types of mobility from light cars to trucks, and liquefied natural gas (LNG), which is an attractive solution for long-haul trucking.

In 2017, Total acquired PitPoint B.V., a provider of new energies for mobility in Europe with leading-edge NGV fuel technology. Total's worldwide NGV fuel network comprises 360 service stations in Asia, Africa and Europe. In the United States, Total is the main shareholder in Clean Energy, a leading supplier of NGV fuel and renewable natural gas for the transportation industry in North America. Lastly, Total has developed an NGV biofuel offering, with the amount of biofuel blended in adjusted to the consumer's needs.

Another challenge involves improving the fuel efficiency of the huge number of diesel vehicles still on the road. Total is participating in the FALCON collaborative project's Optifuel Lab 3<sup>1</sup>, which aims to develop a full-scale demonstrator to achieve a 13% reduction in fuel consumption.

1. Optifuel Lab 3 is a laboratory vehicle developed as part of the FALCON (Flexible & Aerodynamic Truck for Low CONsumption) program led by Renault Trucks with a consortium of partners from a variety of backgrounds, such as Faurecia, Michelin and the Ecole Centrale de Lyon engineering school.

2. Launched in 2015 with partners that include Air Liquide, Daimler, Linde, OMV and Shell.

## STEPPING UP THE DEVELOPMENT OF HYDROGEN

Hydrogen is a high-potential energy carrier, especially for heavy-duty vehicles, that can be used to produce energy and store electricity. Used as a fuel, it generates zero carbon emissions. Total is a member of the Hydrogen Council alongside 12 leading companies in energy, transportation and industry. Their goal is to unite their forces to put hydrogen at the forefront of the world's future energy mix. At the same time, we are continuing to deploy hydrogen filling stations as part of the H2 Mobility Germany joint venture<sup>2</sup>, which aims to install a network of 100 hydrogen stations in Germany by end-2019. Our first hydrogen station in France will open in early 2020 in Le Mans.

## SHIPPING: THE POTENTIAL OF LNG

The sulfur content of marine fuels will be capped at 0.5% in 2020 compared with 3.5% today. In response, Total Marine Fuels Global Solutions, the affiliate responsible for marketing marine fuel worldwide, is offering a number of solutions, including LNG. Total has signed several major agreements with shipping companies. Among them, forefront global shipping firm CMA CGM has selected Total to supply its first nine LNG-powered containerships, which are scheduled for delivery starting in 2020. Total has also formed a partnership with Brittany Ferries to supply LNG bunker fuel to the *Honfleur*, which sails the Ouistreham-Portsmouth route, as from 2019.



## ELECTRIC VEHICLES: FAST CHARGING SOLUTIONS

Although they accounted for just 0.5% of cars and trucks on the road (2 million vehicles) and 2% of sales at December 31, 2018, electric vehicles (EVs) could represent nearly a third of all vehicles and half of all sales worldwide by 2040 (based on our estimates)<sup>1</sup>. If that boom is to materialize, however, the number of charging points will need to increase dramatically. In 2018, Total acquired G2mobility, the French leader in smart charging solutions, and went on to create a business devoted entirely to electric mobility. Total EV Charge offers charging solutions for every type of customer, from businesses and consumers to municipalities, in all kinds of locations (streets, public parking areas, service stations, office buildings, private homes, and more).

Drawing on our extensive network of service stations, we plan to install fast charging points (i.e., a 175 kW charger giving 100 kilometers of range in around ten minutes) on major roadways every 150 kilometers. Our goal is to install 300 charging stations across Europe by 2022 with a total of more than 1,000 charging points. And by 2023, Amsterdam will have 10,000 charging points with a maximum capacity of 17 kW each.

In early 2019, we introduced a line of fluids especially designed for electric and hybrid vehicles. These new products address the specific problems posed by powertrains and transmissions rotating at high speeds and help manage heat exchange in the vehicle's components, particularly its batteries.



Fast charging point for electric vehicles at a Total service station in France.

## TOTAL ATTENDS THE ELECTRIC VEHICLES SYMPOSIUM

In May 2019, Total made its first-ever appearance at the International Electric Vehicle Symposium, held in Lyon, France — an international industry event for electric mobility. We presented our turnkey charging solutions, which include power supply, charging station operation and management, energy storage and optimization of consumption, as well as our range of fluids and lubricants for electric vehicles, at this 32nd symposium.

## AIR TRANSPORTATION: BIOJET FUEL, A FORWARD-LOOKING SOLUTION

The air transportation industry has set a goal of halving its net greenhouse gas emissions from the 2005 baseline by 2050. Biojet fuel — also known as biokerosene — will play a pivotal role in achieving this objective. Total has already marked several major milestones in this area, notably with the Lab'line for the Future project in 2016, in which one Air France flight a week between Toulouse and Paris was powered by biojet fuel. Total has also signed green growth commitments with the Ministry of Ecology and Inclusive Transition and the Ministry of Transportation in France. As part of these commitments, five key players in French biojet fuel (Air France, Airbus, Safran, Suez and Total) are currently conducting a study to define the optimal conditions for producing and marketing clean fuels for air transportation. ■

**360**

The number of NGV fuel stations in Asia, Africa and Europe.

**1,000**

Number of fast charging points (175 kW) at 300 Total service stations by 2022 in Europe.

**150,000**

Number of Level 2 (22 kW) charging points in public and private parking facilities by 2025.



# Curtailing Emissions From Our Sites

**Consuming less energy at our operated facilities is the first key driver for reducing greenhouse gas emissions. For that reason, we are taking steps to improve energy efficiency at our sites.**

Moho Nord in the Republic of the Congo: A Total-operated site designed for zero routine flaring.



Total uses our Group Energy Efficiency Index (GEEI) to evaluate our performance. Since 2010, we have improved energy efficiency at our facilities by more than 10%, and we are continuing our efforts to maintain that rate of improvement.

We set a goal of reducing routine flaring at our operated facilities by 80% between 2010 and 2020 — a target that we met in 2017. Our current objective is to eliminate flaring by 2030.

In 2013, we defined formal standards to be implemented at our approximately 40 operated sites that consume more than 50,000 tons of oil equivalent (toe) of primary energy per year. By end-2018, all the facilities concerned were in compliance or had initiated the necessary actions. Our goal is to see all of these sites adopt an auditable energy management system by the end of 2020, such as the ISO 50001 standard for energy management (see opposite). In addition, several sites that are less

energy-intensive have voluntarily taken steps to obtain ISO 50001 certification.

We can draw on innovative architectures and equipment to improve energy efficiency at our sites. For example, we have installed systems to recover heat from gas turbines on our offshore production barges, offshore platforms and onshore facilities, thereby eliminating the need for heaters or steam generators.

## PURSuing EXPLORATION AND DEVELOPMENT ON A MORE SELECTIVE BASIS

According to the IEA's Sustainable Development Scenario<sup>1</sup>, more than one-third of oil and gas demand to 2040 will need to be met from fields that have not yet been developed or, in some cases, discovered.

1. Assuming a natural decline at oil and gas fields of about 3% annually.

These fields could offer better environmental and economic profiles than some of the fields in operation today. To meet the global population’s energy needs, oil exploration and production will need to continue for several decades, with careful attention to the ecological, environmental and social conditions under which fields are developed and brought on stream.

We are focusing on production and processing assets with competitive costs while respecting the highest safety and environmental standards.

With that in mind, we apply a long-term carbon price when conducting economic evaluations of our investments. That price ranges from USD 30 to USD 40 per ton, depending on the oil price scenario, or corresponds to the actual price of carbon if it is higher in a given country. This internal carbon price reflects our desire to increase the share of gas in our hydrocarbon production and devote more investment to research into low-carbon technologies.

**THE RELIABILITY OF OUR FACILITIES**

In our quest for energy efficiency, we never compromise safety and reliability. We make every effort to ensure our facilities can withstand natural disasters. The IPCC anticipates increasingly significant natural impacts over the coming decades in several regions of the world. We assess the vulnerability of our sites to weather and seismic hazards, and take them into account when designing industrial facilities. To date, our internal studies have not identified any facilities that cannot withstand the currently known consequences of climate change. ■

**A NEW TARGET FOR EMISSIONS REDUCTION IN ABSOLUTE TERMS**

Energy efficiency is a vital tool for reducing both Scope 1 (direct greenhouse gas emissions) and Scope 2 emissions (indirect emissions resulting from purchased energy). Our goal is to reduce greenhouse gas emissions (Scopes 1 and 2) at operated oil and gas facilities to less than 40 million tons of CO<sub>2</sub>e in 2025 from 46 million tons of CO<sub>2</sub>e in 2015.

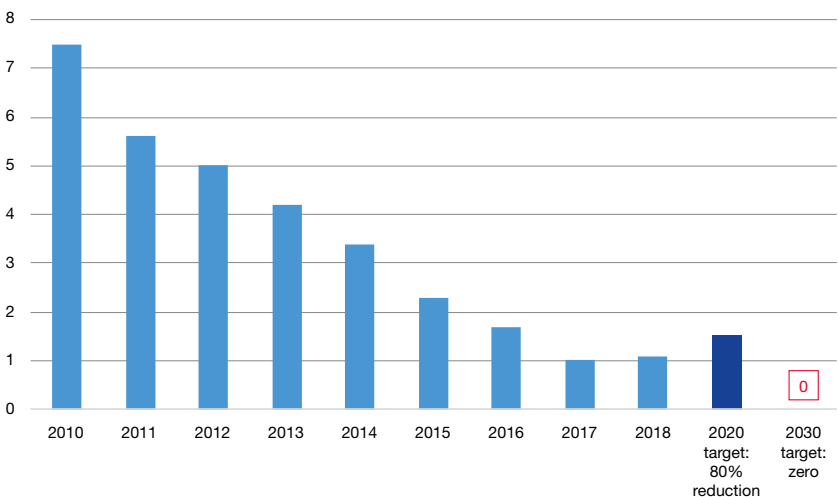
**25%**

Reduction in greenhouse gas emissions from our operated activities since 2010. We met this objective in part by reducing the use of flaring and improving energy efficiency.

**ISO 50001 STANDARD**

Like the ISO 9001 and ISO 14001 standards, the ISO 50001 standard for energy management is based on continuous improvement. It relies on a methodology for using energy more efficiently, setting incremental targets based on detailed audits and measuring results over time. The standard is designed for every business sector and for companies of all sizes.

**Routine flaring (Mcu. m/day)**





# Promoting Sustainable Biofuels

**To comply with European Union standards, biofuels must emit across their life cycle less than half the CO<sub>2</sub> equivalent of fossil fuel equivalents. Biofuels are made from renewable raw materials or waste materials. For more than 20 years, we have been a leader in biofuels research, production and distribution, constantly working to provide more sustainable, high-performance products.**

In 2018, Total blended 2.4 million tons of sustainable biofuel into our products in Europe, distributing a total volume of 3.2 million tons worldwide. In late 2018, we acquired Zema, a Brazilian distributor that operates a network of 280 service stations and markets some 900,000 cubic meters of fuel. Of this, around 30% is biofuel, including 135,000 cubic meters of pure ethanol. In June 2019, work was completed on transforming the La Mède refinery in France into a biorefinery. The complex can produce 0.5 million tons of hydrotreated vegetable oil (HVO). It can also produce biojet fuel (HEFA<sup>1</sup>) for aviation. La Mède will produce high-quality biofuels that can be used individually or in blended form into traditional fossil fuels.

## 100% CERTIFIED-SUSTAINABLE OIL

The biofuels produced at La Mède since June 2019 incorporate a wide array of vegetable oils, including rapeseed, distiller corn, palm, soybean, sunflower and carinata, that are certified sustainable per European Union criteria, as well as residues (such as paper mill waste), used cooking oil and animal fat.

In 2018, we created a dedicated organization for our supplier vetting process to ensure that the oils sourced for the La Mède refinery are sustainable<sup>2</sup>. In this way, we supplement the European Union's mandatory certification with our own rigorous supplier management process. We select a limited number of responsible partners so we can work with them to define and monitor improvement plans. These partners are required to join the Roundtable on Sustainable Palm Oil (RSPO)<sup>3</sup> and agree to help the sector improve its use of sustainable palm oil. In particular, they must sign Total's Fundamental Principles of Purchasing and appoint a dedicated sustainability audit team.

## 250

The number of jobs maintained at La Mède through conversion of the refinery.

## Less than 50%

Biofuels that comply with European Union standards emit less than half the greenhouse gases produced by equivalent fossil fuels<sup>4</sup>.

1. Hydroprocessed Esters and Fatty Acids.

2. All of the oils we purchase are certified sustainable in accordance with the E.U. criteria (on carbon footprint, non-deforestation, appropriate land use and respect for human rights) defined in the Renewable Energy Directive (RED).

3. A voluntary system, recognized as valid by the European Commission in its Decision (EU) 2019/1175 of July 9, 2019.

4. Calculated using a Life Cycle Assessment (LCA).



## TOWARD SECOND-GENERATION BIOFUELS

We are actively working to develop second-generation, or advanced, biofuels, which pose a number of challenges in terms of availability, collection and technology. These fuels will supplement, rather than replace, first-generation biofuels in helping to reduce greenhouse gas emissions. Today, 97% of the biofuels produced worldwide are first-generation. In the last decade, Total has spent more than €500 million on advanced biofuel R&D, examining all possible biomass conversion pathways — thermochemical conversion, biotechnology, algae, etc. — both in our own laboratories and through R&D partnerships with manufacturers, start-ups, universities and private laboratories. In the BioTfuel project<sup>1</sup>, for example, thermochemistry is being used to convert lignocellulosic biomass such as straw, forest waste and dedicated crops into biofuels that can be used in all types of diesel and jet engines. We are likewise exploring biotechnology, studying microalgae over the last ten years, with the goal of producing oils without the need for arable land. ■

### A USEFUL ROLE FOR LA MÈDE

The La Mède refinery has been chosen as a site for the European Union's BIO4A research project, which is designed to demonstrate that Europe has the industrial capability to produce sustainable biofuels for aviation that comply with the ASTM<sup>2</sup> standard. Launched in May 2018 and expected to run until 2022, BIO4A is led by a consortium of partners that includes Total's Refining & Chemicals business.

1. At our Dunkirk site with our partners: Axens, the French Alternative Energies and Atomic Energy Commission (CEA), IFP Energies Nouvelles, Avril and ThyssenKrupp Industrial Solutions.

2. ASTM International, formerly the American Society for Testing and Materials.

Hydrotreated vegetable oil (HVO) processing unit at the La Mède biorefinery in France.





# Natural Carbon Sinks: USD 100 Million a Year to Capture and Store Carbon

**Natural carbon sinks are an effective means of capturing carbon dioxide. In June 2019, we created our new Nature-Based Solutions business unit to fund, develop and manage operations for sequestering carbon or preventing carbon emissions.**

Carbon sinks, which can take multiple forms in the course of a natural cycle, work by absorption and emission. The mechanisms at play, including photosynthesis and sedimentation, can be enhanced through practices for conserving and cultivating natural areas. These practices maintain and increase the amount of carbon contained in biomass and living soil.

## CUSTOMIZED SOLUTIONS

In the field, advanced techniques in forestry, farming and aquatic resource development, coupled with conservation practices for remarkable natural areas, can preserve and even augment the effects of natural carbon sinks. Those practices include replanting open or degraded areas and protecting environments that already store significant quantities of carbon, as well as agroforestry, permaculture, regenerative agriculture, silvopasture, certified forestry and more. All of these solutions can be tailored to local and regional resources and weather conditions.

## USD 100 million

Annual budget of Nature-Based Solutions in 2020.

## 5 million tons of CO<sub>2</sub> per year

Target for sustainable CO<sub>2</sub> storage capacity in 2030.

## TOTAL FOUNDATION PLEDGES SUPPORT FOR FORESTS

The Total Foundation program groups together the citizenship initiatives conducted by Total's sites, affiliates and corporate foundation. Under the banner of Forests and Climate, Total Foundation forged three new partnerships in 2018 to help preserve sensitive ecosystems in France. In the first, it joined forces with France's National Forestry Board (ONF) to protect the country's forests against natural hazards. It also partnered with the coastal conservancy Conservatoire du Littoral to find natural solutions for combating the effects of climate change on France's coastlines. And Total Foundation is lending financial support to help the Port-Cros National Park restore fire-ravaged Mediterranean forests in France using nature-based solutions.

## SUSTAINABLE LAND USE

The needs and practices of local residents serve as the starting point for these types of projects. Campaigns conducted in harmony with natural regeneration of resources will yield social, financial and environmental benefits for local communities at the same time. We intend to invest USD 100 million annually in natural carbon sinks after 2020. This substantial, patient investment will help us build these value chains and ensure they are maintained on a lasting basis. Total is aiming for sustainable CO<sub>2</sub> storage capacity of 5 million tons by 2030. ■

# Preparing for Industrial Deployment of CCUS

**We are pursuing our commitment to commercial development of carbon capture, utilization and storage (CCUS), an essential plank of our strategy.**

While carbon emissions need to be reduced, they are unlikely to be eliminated entirely. Aside from transportation and power generation, several industrial sectors that are key to the economy, such as cement and steel manufacturing, will most likely continue to emit carbon dioxide through their operations for several decades to come. By helping to make those industries less carbon-intensive, CCUS offers a promising opportunity in the battle against climate change. It also opens the door to low-carbon electricity from natural gas and could thereby help to offset the inherently intermittent nature of renewable energies. With that in mind, we are allocating 10% of our R&D budget to CCUS technology and helping to develop the first industrial hubs for commercial CCUS.

## NORTHERN LIGHTS

Northern Lights is a large-scale project underway in Norway, developed in partnership with Equinor and Shell. The first phase involves building a carbon capture, transportation and storage network able to handle 1.5 million tons of carbon a year. The project includes options for future expansion that could spur the development of new commercial-scale carbon capture solutions in Norway and elsewhere in Europe. One of the innovative aspects of Northern Lights is that it could become the world's first storage site to take delivery of carbon from industry sources in several countries. We are currently in talks with Norwegian officials to define the contractual framework for the project, which is likely to take the form of a partnership between public (mainly governments) and private players.

## 2.4 billion tons

Projected volume of CO<sub>2</sub> from fossil energies captured and stored in 2040 under the International Energy Agency's Sustainable Development Scenario.

## 10%

Share of Total's R&D budget allocated to CCUS.

## CLEAN GAS PROJECT

Alongside the OGCI Climate Investments fund, Total is also a partner in the Clean Gas Project located in Tees Valley in northeastern England. That project — the first of its kind in the United Kingdom, particularly for gas-fired power plants — is set to capture carbon emissions from an entire industrial region. Meanwhile, in May 2019, OGCI Climate Investments (of which Total is a founding member) embarked on the largest carbon capture and sequestration project in the United States. The Wabash Valley Resources CCUS project will capture 1.5 million to 1.75 million tons of CO<sub>2</sub> annually from a co-located ammonia production plant, drastically shrinking its carbon footprint. This world first has major implications for fertilizer manufacturers, who account for 2% of the world's carbon emissions<sup>1</sup>. ■

1. Source: Oil and Gas Climate Initiative website, "OGCI Climate Investments, the Oil and Gas Climate Initiative's investment arm, announces a new investment in carbon capture and sequestration (CCS) project to create the world's first ammonia produced with near zero carbon footprint" (<https://oilandgasclimateinitiative.com/ogci-climate-investments-announces-a-new-investment-in-wabash-valley-resources-carbon-capture-and-sequestration-project/>).





## INTEGRAL TO OUR R&D OBJECTIVES

Total devotes 10% of our R&D budget to CCUS. Several new R&D partnerships have shaped 2019:

- In the United States, we joined the National Carbon Capture Center (NCCC). This facility tests carbon capture technology on a pilot scale (10 tons of CO<sub>2</sub> per day) with the goal of reducing carbon emissions from fossil fuel-based power plants. Through its evaluation of some 60 technologies, the NCCC has already reduced the projected cost of carbon capture by one third.
- In France, we launched the 3D Project (for DMX™ Demonstration in Dunkirk) as part of the European Union's Horizon 2020 research and innovation program. The project has three objectives:
  - Demonstrate the greater efficiency and cost-effectiveness of the DMX™ process on a pilot industrial scale by capturing 0.5 tons of CO<sub>2</sub> per hour at an ArcelorMittal site.
  - Prepare the rollout of a first industrial unit at the ArcelorMittal site, which could be operational starting in 2025. The unit is expected to capture more than 125 tons of CO<sub>2</sub> an hour, or more than 1 million tons of CO<sub>2</sub> a year.
  - Design the future European Dunkirk North Sea cluster, able to capture, process, transport and store 10 million tons of CO<sub>2</sub> a year. The cluster is expected to be operational by 2035.
- Also in France, Total signed a strategic, five-year R&D partnership with IFP Énergies Nouvelles (IFPEN) that focuses in particular on CCUS. The objective is to reduce the cost of infrastructure and improve energy efficiency across the value chain so that CCUS solutions can be deployed on a wide scale.
- In Germany, Total is participating in the E-CO2MET project at the Leuna refinery with start-up Sunfire, the Fraunhofer Center for Chemical-Biotechnological Process (CBP) and the Fraunhofer Institute for Microstructure of Materials and Systems (IMWS). The project's objective is to demonstrate the industrial-scale feasibility of producing methanol from CO<sub>2</sub> and hydrogen obtained through high-temperature electrolysis using electricity generated by renewable sources.

# Energy Efficiency: Supporting Our Customers As They Reduce Their Emissions

As we improve energy efficiency at our sites, we are also introducing a range of services to support our customers as they shrink their carbon footprint. They include our Total Ecosolutions label, the energy efficiency solutions available from GreenFlex and the steps we have taken to promote recycled polymers.

## TOTAL ECOSOLUTIONS: TRANSPARENCY AND DEMANDING STANDARDS

The Total Ecosolutions label marked its tenth anniversary in 2019. During that time, it has consistently pursued one objective: offer innovative solutions that deliver better environmental performance than the leading products in the market. Among the criteria used to award the label is whether a product or service reduces carbon emissions. Other factors play a role as well, such as whether the solution uses water and non-renewable resources more efficiently or has a reduced impact on natural ecosystems. As of end-2018, nearly 100 Total products and services bore the Total Ecosolutions label, ranging from Excellium fuels and lubricants to SunPower solar panels and selected plastics. Twelve million tons of carbon emissions have been avoided over the past decade thanks to Total Ecosolutions products.

From the outset, one of the strengths of our Total Ecosolutions label has been its transparency. That extends to the process we use to evaluate products, which complies with the ISO 14021 standard governing self-declared environmental claims and declarations. The award process is transparent as well: in addition to certifying new solutions, we can withdraw the label from products that no longer offer the best performance in the market. As a result, the array of products and services bearing the label may change over time. We constantly reevaluate the label to ensure it remains relevant.

To keep in step with expectations among our customers and civil society, Total Ecosolutions enlists the help of outside stakeholders. Researchers from academia,

research institutions and independent experts have all contributed to the award process by helping to oversee the program since April 2019.

## GREENFLEX: CONSULTANTS DESIGNING ENERGY EFFICIENCY SOLUTIONS

Total Ecosolutions relies on the specialized knowledge available at GreenFlex, which Total acquired in 2017. GreenFlex has built extensive know-how in energy and environmental efficiency and advises more than 700 customers throughout Europe. Formerly separate Total affiliates such as BHC Energy in France and Tenag in Germany now operate under the GreenFlex banner. GreenFlex's array of strategic and operational consulting services ranges from energy audits to solutions for improving energy efficiency and reducing environmental impact. GreenFlex can also develop action plans and assist customers in carrying them out. The affiliate draws on digital technology designed to make optimal use of customer data. ▶

## 75,000 tons per year

Volume of PLA (a biopolymer) produced by Total.

## 97

Number of products bearing the Total Ecosolutions label.



- ▶ In 2019, GreenFlex introduced a new integrated range of services called Total Carbon Neutral Solutions (TCNS) that customers can use to:
  - **Define** a low-carbon trajectory by identifying their objectives, timetable and feasible solutions.
  - **Measure**, analyze and manage their emissions in order to make the right decisions.
  - **Reduce** their emissions to the bare minimum (i.e., only those cannot be eliminated).
  - **Offset** those residual emissions using carbon capture projects, such as those devised by Total's Nature-Based Solutions (NBS) business unit.

### HUTCHINSON: LIGHTER-WEIGHT VEHICLES, LOWER EMISSIONS

Total's extensive experience in producing and marketing high-performance plastics is also a springboard to smaller carbon footprints for our customers. In particular, we're developing the transportation solutions of the future, not just for cars, but for air travel and rail as well.

By using lighter-weight plastic, we can reduce fuel consumption and, by extension, carbon emissions from an array of transportation options. Hutchinson, a wholly owned Total affiliate, specializes in elastomer processing. Its spare parts, used by several major automakers, plus its products designed for the Airbus A330 are helping to usher in a sustainable future for transportation.



Hutchinson's active damper systems make cylinder deactivation possible in certain car models, thereby helping to reduce their CO<sub>2</sub> emissions.

Moreover, thanks to its expertise in fields such as vehicle weight reduction and the heat balance of engines, Hutchinson is making a major contribution to vehicle electrification for both passenger cars and commercial vehicles. The company draws on its R&D network to ensure continuous innovation, operating a research center and 25 techcenters and partnering with universities around the world.

### POLYMERS: RECYCLING AND BIOPLASTIC

Plastics recycling likewise offers opportunities for Total's future, as our acquisition of Synova indicates (see sidebar). Our Circular Compounds<sup>®</sup> polypropylene and polyethylene grades of plastic contain at least 50% recycled materials and offer the same properties as virgin polymers. We have also joined forces with Citeo, Saint-Gobain and Syndifrais to establish a polystyrene recycling channel in France by 2020. We will be testing the feasibility of large-scale production at our industrial sites in Carling, France, and Feluy, Belgium.

Plastic can also be made from natural elements, as biomass can be converted into biobased polymers. As part of a joint venture with Corbion that started up in December 2018, we have opened a new facility in Thailand that can produce 75,000 tons of polylactic acid (PLA) per year. Made from sugar cane, PLA is a recyclable, biodegradable biopolymer suitable for various types of packaging. ■

### EXPANDING THE USE OF RECYCLED POLYPROPYLENE

In 2019, we acquired Synova, France's leading producer of recycled polypropylene for the automobile industry. The company uses industrial waste to produce 20,000 tons of polypropylene that meets the highest quality standards of automakers and original equipment manufacturers. By combining Synova's expertise with our own know-how in polymers, this acquisition is expanding the possibilities for recycled polypropylene. Offering performance equivalent to that of virgin polymers, the recycled variety will be used to manufacture lighter-weight vehicles that generate fewer carbon emissions.



# An Indicator That Monitors Customer Demand for a Smaller Carbon Footprint

**Emissions at sites related to our operations (Scope 1 and 2 emissions) are within our control, and as a result we can take the necessary steps to reduce them. But emissions related to the use of our products by Total customers (Scope 3 emissions) depend primarily on the choices they make. We closely monitor customer demand and consumption habits as part of our desire to help customers generate fewer carbon emissions across the life cycle of the products they use.**

**To this end, we have developed a carbon intensity indicator that evaluates the average greenhouse gas emissions for the energy products used by our customers. It lets us track customer demand for lower-carbon products and keep tabs on the pace of the energy transition.**

Our strategy is leading us into fast-growing low-carbon markets. As a result, we can offer our customers an increasingly decarbonized energy mix including natural gas, renewable power, solar panels, batteries, electric vehicle charging and more. These new products generate fewer greenhouse gas emissions during use. If our customers change their habits in tandem with the changes in our offering, we will together contribute to achieving the targets set out in the Paris Agreement.

## ANALYZING EACH PRODUCT'S LIFE CYCLE

Our carbon intensity indicator can be used to identify the overall emissions associated with an energy product used by Total customers. It represents the average of our products' greenhouse gas emissions per unit of energy across their entire life cycle, from the time they are produced to their end use.

We calculate the indicator as the quotient of two values:

- For the numerator:
  - Emissions related to producing and processing the energy products used by our customers, calculated on the basis of Total's average emission rates.
  - Emissions related to our customers' use of those energy products, calculated by applying stoichiometric emissions factors per product to obtain a quantity of emissions. Non-energy products (asphalt and bitumen, lubricants, plastics, etc.) are not accounted for.
  - Negative emissions stored using CCUS and in natural carbon sinks.
- For the denominator: The quantity of energy sold. Average load factor and efficiency are used to obtain equivalents for electricity generated from fossil fuels and other sources.

In accordance with IPIECA<sup>1</sup> recommendations, when the nature of a value chain within an integrated company requires trade-offs, the maximum flows from that value chain are used for calculation purposes. ►

1. The global oil and gas industry association for environmental and social issues.

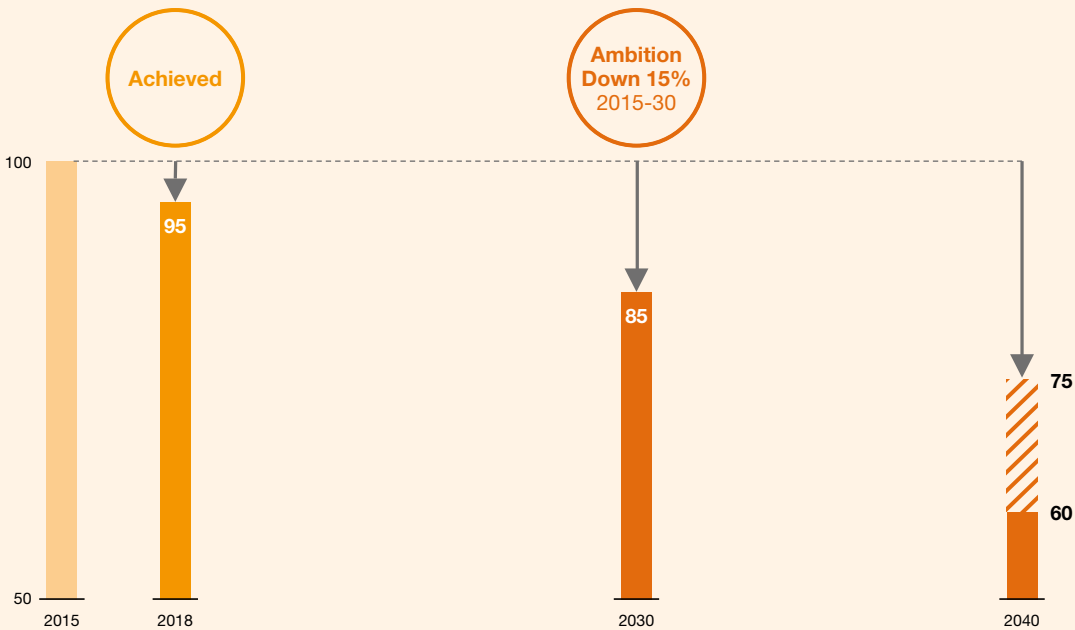
► **MAKING THE MOVE TO LOWER-CARBON ENERGY PRODUCTS**

Total’s ambition is to reduce that carbon intensity by 15% between 2015 — the year of the Paris Agreement — and 2030. In the longer term, beyond 2030, our ambition is to maintain or even accelerate this rate of reduction, depending on developments in technology and public incentive policies. That would add up to a total decrease of 25 to 40% by 2040.

The carbon intensity of the products used by Total customers has already fallen from 75 to 71 grams of CO<sub>2</sub>e per kBtu since 2015 — a 5% decrease. Since energy with

a lower carbon intensity (natural gas and electricity) now makes up more of our sales, we can offer a lower-carbon energy mix. Through our acquisitions of Direct Energie and Engie’s LNG business in 2018, gas and electricity have come to represent a substantially larger proportion of our sales mix, and our SunPower affiliate (solar panels) is accounting for a rising share of Total’s sales as well. Alongside this change in our product portfolio, improved energy efficiency at our oil and gas facilities is yielding further reductions in the carbon intensity of the products our customers use. ■

**Carbon intensity of the energy products sold to our customers**  
**Base 100 in 2015 (75 gCO<sub>2</sub>e/kBtu)**



**Possible sales mix in 2040 depending on consumer behavior**

- Natural gas: 45 to 55%
- Oil (including biofuels): 30 to 40%
- Low-carbon electricity: 15 to 20%

This indicator’s decline will depend on changes in consumption patterns and public policies deployed to help consumers transition. As a result of these changes, Total’s sales mix in 2040 could shift as follows: gas (45 to 55%), petroleum products (30 to 40%, including biofuels) and low-carbon electricity (15 to 20%).

# Total

## and Industry Associations

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Total is a member of many industry associations, and we have published a list of our affiliations since 2016. We typically cooperate with these organizations on technical or scientific matters, but some of these groups also take public stances on climate issues. In 2019, we decided to review how their positions aligned with our own.

# Reviewing to Work Better Together

**Total is a member of many industry associations, and we have published a list of our affiliations since 2016. We typically cooperate with those organizations on technical matters, but some of those groups take public stances on other issues, such as the climate. We verify that those organizations hold positions aligned with our own, and in 2019 we decided to review each organization's stance on climate issues. One association holds views that diverge markedly from our own; therefore, we have chosen not to renew our membership in 2020.**

## TOTAL AND INDUSTRY ASSOCIATIONS

Total joins national and international business and industry associations when we believe that collective action will be more effective than isolated steps. Through those organizations, we can help to define technical standards, for example, and also make our voice heard with regard to government regulations or policies related to our business.

In most cases, an organization's leadership will move to adopt positions that reflect a consensus view among its members, and accordingly may not reflect the views of every member. Total's representatives make it their priority to support, defend and promote our position within those organizations. If there is disagreement, our representatives reaffirm Total's stance and advocate changes in the organization's position. They may even propose that Total withdraw if the organization's position does not change.

We believe this pragmatic approach is the best way to ensure that our participation in industry organizations furthers our own stated positions.

Acknowledging and responding to climate change is a major topic on the current agenda for public authorities, consumers and businesses. Industry organizations have an important role to play in any discussion of how the goals in the Paris Agreement can be met. For example, through our membership in associations calling for carbon pricing mechanisms, we have helped to spur wider recognition of the value those solutions can offer.

## A REVIEW OF OUR INDUSTRY AFFILIATIONS

In 2019, we examined the most significant industry associations to which Total belongs to review their stance on climate issues.

For those with a stated public position, we examined whether it was aligned with our own, based on six criteria:

1. **The scientific position:** Total considers the link between human activity and climate change is an established fact.
2. **The Paris Agreement:** Total recognizes that the Paris Agreement is a major advance in the fight against climate change and supports the initiatives of the implementing States to fulfill its aims.
3. **Carbon pricing:** Total believes that it is necessary to implement carbon pricing to encourage energy efficiency, support low-carbon technology and develop carbon sinks, all critical to achieve carbon neutrality.
4. **The role of natural gas:** Total considers that natural gas is a key component in the energy transition, specifically as an alternative to coal. The Group supports policies to reduce methane emissions from natural gas production and consumption and, in particular, campaigns to reduce the use of flaring (such as the World Bank's Zero Routine Flaring by 2030 Initiative).
5. **Development of renewable energies:** Total supports policies, initiatives and technologies to promote growth in renewable energies. The Group also supports the development of sustainable biofuels.

## 6. Development of Carbon Capture, Utilization

**and Storage (CCUS):** Total supports the development of CCUS, which is critical to achieve carbon neutrality by the second half of the century, the aim of the Paris Agreement.

For each criterion, public positions opposed to our own were considered to be “Not Aligned” and ambiguous positions were considered to be “Partially Aligned.” Concerning the first two criteria (scientific position and support for the Paris Agreement), the absence of a public position was interpreted as partial alignment. For the other criteria, the absence of a position was not taken into account in this review.

Once we had completed our analysis, we assigned each association to one of three categories, based on its alignment with Total’s positions: “Not Aligned” (at least one criterion with a “Not Aligned” position), “Partially Aligned” (one or more criteria with “Partially Aligned” positions), or “Aligned” (for all of the criteria addressed by the association, the stated positions were in line with Total’s).

Out of all the associations we examined, 30 were considered high-priority. Those associations were selected on the basis of their impact and reputation and the attention they receive from investors and NGOs. The vast majority (26 out of 30) were deemed “Aligned.” Three were found to be “Partially Aligned” (American Chemistry Council, American Petroleum Institute and Canadian Association of Petroleum Producers), and one was found to be “Not Aligned” (American Fuel & Petrochemical Manufacturers).

Regarding the latter, we have opted not to renew our membership for 2020.

As for the three “Partially Aligned” associations, we have chosen to advocate internally for changes in their positions, especially the API’s support for the rollback of U.S. regulations on methane emissions. We will reevaluate each association’s position in the future. ■

## TOTAL’S LOBBYING ETHICS CHARTER

With operations in more than 130 countries and a workforce of more than 100,000 employees, Total is a major economic force worldwide. Governments and civil society understandably have strong expectations about the world’s climate. Our lobbying activities are rooted in the values defined in our Code of Conduct. Since 2016, those activities have also been governed by our Lobbying Ethics Charter. Among other things, the charter requires that our website include a list of the industry associations to which Total belongs. It also ensures that our publicly stated positions are consistent with those conveyed through our lobbying conducted directly or indirectly through professional organizations or associations. In cases where those positions diverge, the charter stipulates that Total’s position shall take precedence.

## 26/30

Number of associations whose climate commitment was deemed “Aligned” with that of Total (out of the 30 high-priority associations reviewed in 2019).

## 1

Association in which Total will not renew its membership for 2020 because of a diverging commitment to the climate (American Fuel & Petrochemical Manufacturers).

## RESULTS OF OUR REVIEW OF EACH ASSOCIATION'S POSITION ON THE CLIMATE

<p>American Fuel &amp; Petrochemical Manufacturers (AFPM)</p>	<p><b>Not Aligned</b></p> <p>Our analysis reveals divergent positions with AFPM on the following criteria:</p> <ul style="list-style-type: none"> <li>- The Paris Agreement (partially aligned).</li> <li>- Carbon pricing (not aligned).</li> <li>- Developing renewable energies (partially aligned).</li> </ul> <p>Total will not be renewing its membership for 2020.</p>
<p>American Chemistry Council (ACC)  American Petroleum Institute (API)  Canadian Association of Petroleum Producers (CAPP)</p>	<p><b>Partially Aligned</b></p> <p>Our analysis indicates that these associations are partially aligned with Total on one or more of the following criteria:</p> <ul style="list-style-type: none"> <li>- The Paris Agreement (API, CAPP).</li> <li>- Carbon pricing (API, CAPP).</li> <li>- Developing renewable energies (API, ACC).</li> <li>- The role of natural gas (API). In particular, API's recent support for the rollback of U.S. regulations on methane emissions raises questions for Total.</li> </ul> <p>Our policy with these associations is as follows:</p> <ul style="list-style-type: none"> <li>- Express the points on which we disagree.</li> <li>- Maintain our commitment to promoting our position.</li> <li>- Reevaluate our alignment in the future and reassess our membership if necessary.</li> </ul>
<p>Association Française des Entreprises Privées (AFEP, French Association of Private Enterprises)  Association Française du Gaz (AFG, French Gas Association)  Assomineraria (Italian Petroleum and Mining Industry Association)  Australian Petroleum Production &amp; Exploration Association (APPEA)  Belgian Petroleum Federation (BPF)  BusinessEurope  European Chemical Industry Council (CEFIC)  Danish Shipping (DS)/Essenscia/Eurogas  European Round Table of Industrialists (ERT)  France Chimie/FuelsEurope  International Air Transport Association (IATA)  International Association of Oil &amp; Gas Producers (IOGP)  International Emissions Trading Association (IETA)  IPIECA/MEDEF/Mineralölwirtschaftsverband (MWW)  Norsk Olje og Gass (NOROG)  Oil &amp; Gas Denmark (OGD)/Oil &amp; Gas UK (OGUK)  UK Petroleum Industry Association (UKPIA)  Union Française de l'Électricité (UFE, French Electricity Association)  Union Française des industries du Pétrole (UFIP, French Oil Industry Association)  World Business Council for Sustainable Development (WBCSD)</p>	<p><b>Aligned</b></p> <p>Our analysis indicates that these associations are aligned with Total on the criteria selected for this review.</p> <p>We will maintain our membership in these associations in order to promote our positions on the climate and other issues.</p>



# Our Figures

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As part of our continuous improvement process, we report and are accountable for our results. We rely on best reporting practices that make it easier for stakeholders to assess our performance.

# Reporting Framework

## Key

**CR** = Total Climate Report 2019

**CDP** = Total's 2019 response to the CDP Climate Change questionnaire (available at total.com)

**RD** = Total's 2018 Registration Document

Topic	Recommendations of the Task Force on Climate-related Financial Disclosures	Location of This Information in Total's Reports
<p><b>GOVERNANCE</b></p> <p>Disclose the organization's governance around climate-related risks and opportunities.</p>	<p>a) Describe the board's oversight of climate-related risks and opportunities.</p>	<p>2018 RD – 5.6.1 CR – p. 10 CDP – C1.1</p>
	<p>b) Describe management's role in assessing and managing climate-related risks and opportunities.</p>	<p>2018 RD – 5.6.1 CR – p. 5-9 CDP – C1.2</p>
<p><b>STRATEGY</b></p> <p>Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.</p>	<p>a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.</p>	<p>2018 RD – 5.6.2 CDP – C2</p>
	<p>b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.</p>	<p>2018 RD – 5.6.2 CDP – C2.5, 2.6</p>
	<p>c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.</p>	<p>2018 RD – 5.6.2 CR – p. 38-39</p>

Topic	Recommendations of the Task Force on Climate-related Financial Disclosures	Location of This Information in Total's Reports
<b>RISK MANAGEMENT</b> Disclose how the organization identifies, assesses, and manages climate-related risks.	a) Describe the organization's processes for identifying and assessing climate-related risks.	2018 RD – 5.6.3 CDP – C2.2
	b) Describe the organization's processes for managing climate-related risks.	2018 RD – 5.6.3 CDP – C2.2d
	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	2018 RD – 5.6.3 CDP – C3.1
<b>METRICS AND TARGETS</b> Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	2018 RD – 5.6.4 CR – p. 56 CDP – C6, C10
	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	2018 RD – 5.6.4 CR – p. 56 CDP – C6, C10
	c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	2018 RD – 5.6.4 CR – p. 30-32, 38-39, 47-48 CDP – C4.1, C4.2

# Indicators

		2010	2015	2016	2017	2018
<b>SCOPE 1</b>						
Absolute direct greenhouse gas emissions (operated scope)	MtCO <sub>2</sub> e	52	42	41	38	40
<b>BREAKDOWN BY SEGMENT</b>						
Exploration & Production (E1–C3) <sup>1</sup>	MtCO <sub>2</sub> e	26	19	19	17	18
Gas, Renewables & Power (E1–C3)	MtCO <sub>2</sub> e	-	-	0	0	2
Refining & Chemicals (E1–C3)	MtCO <sub>2</sub> e	25	22	22	21	21
Marketing & Services (E1–C3)	MtCO <sub>2</sub> e	<1	<1	<1	<1	<1
<b>BREAKDOWN BY REGION</b>						
Europe (E1–C3)	MtCO <sub>2</sub> e	26	22	21	20	24
Africa (E1–C3)	MtCO <sub>2</sub> e	16	12	12	10	11
Americas (E1–C3)	MtCO <sub>2</sub> e	4	4	4	4	4
CIS and Asia (E1–C3)	MtCO <sub>2</sub> e	4	3	3	3	<1
Middle East (E1–C3)	MtCO <sub>2</sub> e	2	1	1	1	1
<b>BREAKDOWN BY TYPE OF GREENHOUSE GAS (EXCLUDING HFCs)</b>						
CO <sub>2</sub> (E1–C1)	MtCO <sub>2</sub> e	48	39	38	35	38
Methane – CH <sub>4</sub> (E1–C1)	MtCO <sub>2</sub> e	3	2	2	2	2
N <sub>2</sub> O (E1–C1)	MtCO <sub>2</sub> e	1	<1	<1	<1	<1
<b>SCOPE 1</b>						
Direct greenhouse gas emissions based on equity share	MtCO <sub>2</sub> e	59	50	51	50	54
<b>SCOPE 2</b>						
Indirect emissions (E1–S1)	MtCO <sub>2</sub> e	5	4	4	4	4
Greenhouse gas emissions (Scopes 1 & 2) from operated oil and gas facilities	MtCO <sub>2</sub> e	57	46	45	41	42
<b>SCOPE 3<sup>2</sup></b>						
Other indirect emissions – Use by customers of products sold for end use (E1–S2)	MtCO <sub>2</sub> e	440	410	420	400	400
Net primary energy consumption (operated scope) (E2–C1)	TWh	157	153	150	142	143 <sup>3</sup>
Group Energy Efficiency Indicator	Base 100 in 2010	100	90.8	91.0	85.7	88.4
Total daily volume of flaring (operated scope) (E4–C1) (includes routine, start-up, operational and safety flaring)	Mcu.m/d	14.5	7.2	7.1	5.4	6.5
Of which routine flaring	Mcu.m/d	7.5	2.3 <sup>4</sup>	1.7 <sup>5</sup>	1.0	1.1
<b>Carbon intensity of energy products used by Total customers</b>	g CO <sub>2</sub> e/ kBtu	-	75 <sup>6</sup>	74	73	71

1. The references provided in parentheses refer to the 2015 edition of the Oil and Gas Industry Guidance on Voluntary Sustainability Reporting published by IPIECA, API and IOGP. E(x) refers to an environmental indicator. C(x) refers to a common reporting element. S(x) refers to a supplemental reporting element.

2. We comply with the petroleum industry value chain methodologies published by IPIECA, which are consistent with those in the Greenhouse Gas Protocol. In this document, only Category 11 of Scope 3 (Use of sold products), which is the most material, is reported. Emissions for this category are calculated based on sales of finished products for subsequent end use, i.e., combustion of the products to obtain energy. A stoichiometric emissions factor (oxidation of molecules into carbon dioxide) is applied to those sales to obtain a volume of emissions.

3. Excluding primary energy consumption by Direct Énergie's gas-fired power plants.

4. Volumes estimated based on historical data.

5. Volume estimated at end-2016 based on the new definition of routine flaring published in June 2016 by the Global Gas Flaring Reduction Partnership.

6. Indicator calculated in 2018 using 2015 as the baseline year.

# Glossary

## Units of Measurement

<b>b</b>	barrel
<b>B or G</b>	billion
<b>boe</b>	barrel of oil equivalent
<b>Btu</b>	British thermal unit
<b>CO<sub>2</sub>e</b>	CO <sub>2</sub> equivalent
<b>eq</b>	equivalent
<b>Gt</b>	billion tons
<b>GW</b>	gigawatt
<b>k</b>	thousand
<b>M</b>	million
<b>Mboe/d</b>	million barrels of oil equivalent per day
<b>Mcu.m</b>	million cubic meters
<b>MMSCFD</b>	million standard cubic feet per day
<b>MWh</b>	megawatt-hour
<b>t</b>	metric ton
<b>toe</b>	ton of oil equivalent
<b>TWh</b>	terawatt-hour

## Definitions

**Greenhouse gases:** The six gases named in the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF<sub>6</sub>), with their respective Global Warming Potential (GWP), as described in the 2007 IPCC report.

**Life Cycle Assessment (LCA):** A standardized method for assessing and quantifying the environmental impact of a product or service. A life cycle analysis is used to identify and quantify the physical flows of matter and energy associated with human activity at every stage of the product's life, evaluating the potential impact of those flows and interpreting the results. In particular, it can be used to compare two products for an identical service.

**Non-routine flaring:** Flaring other than routine flaring or safety flaring associated with oil production and occurring primarily during occasional or intermittent events.

**Operated oil and gas facilities:** Facilities operated in Total's Exploration & Production, Refining & Chemicals and Marketing & Services segments.

## Acronyms

<b>CAD</b>	Canadian dollar
<b>CCUS</b>	Carbon Capture, Utilization and Storage
<b>CSR</b>	Corporate Social Responsibility
<b>FSRU</b>	Floating Storage and Regasification Unit
<b>GHG</b>	Greenhouse gas
<b>IEA</b>	International Energy Agency
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LNG</b>	Liquefied Natural Gas
<b>NGV Fuel</b>	Natural Gas Vehicle Fuel
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OGCI</b>	Oil and Gas Climate Initiative
<b>R&amp;D</b>	Research and Development
<b>TEO</b>	Total Energy Outlook
<b>USD</b>	United States dollar

**Operated scope:** Reporting on environmental or climate change-related indicators covers all the activities, sites and industrial assets in which Total S.A., or one of the companies it controls, is the operator, i.e. either operates or contractually manages the operations ("operated domain").

**Routine flaring:** Flaring during normal production operations in the absence of sufficient facilities or adequate geological conditions permitting the reinjection, onsite utilization or commercialization of produced gas (as defined by the working group Global Gas Flaring Reduction program as part of the World Bank's Zero Routine Flaring Initiative). Routine flaring does not include safety flaring.

**Safety flaring:** Flaring to ensure safe performance of operations conducted at the production sites (emergency shutdown, safety-related operations, etc.).

# More

**Total offers a sustainability reporting and information process outlining our corporate social responsibility. In addition to the Registration Document, all reporting information on this topic is now available on our Sustainable Performance website. All of our publications and the latest news and reports can still be found on our corporate website, total.com.**



## Registration Document

The 2018 Registration Document presents our activities and the financial statements for the 2018 financial year.

<https://www.total.com/en/media/media>



## Total and Biodiversity

Through the act4nature initiative, Total has reaffirmed and broadened its commitment to biodiversity. We adhere to the initiative's 10 undertakings, and have added six specific commitments of our own. We marked the occasion by publishing our first brochure on biodiversity, setting out our commitments and describing our initiatives.

<https://www.total.com/en/media/media>



## Sustainable Performance

In May 2016, Total launched a dedicated website to provide transparent information on our CSR challenges. The website, regularly updated, introduces the company's policies, commitments and performance on all sustainability issues relevant to Total, particularly safety, climate, environmental stewardship, business ethics, human rights and community engagement. It also publicly discloses Total's response to environmental, social and governance (ESG) reporting standards and indexes.

[www.sustainable-performance.total.com](http://www.sustainable-performance.total.com)



## Printing

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This document was printed with vegetable ink on 100% recycled Nautilus paper, produced from recycled FSC-certified pulp, reducing pressure on the world's forests. The E.U. Ecolabel-certified paper was produced in an ISO 14001- and FSC-certified paper mill. The printer is certified as complying with Imprim'Vert, the French printing industry's environmental initiative. No. FSC/C124913. The Print Time to Market® concept adopted means that only copies actually distributed are printed. With Citeo, Total is encouraging paper recycling. Sort your trash, protect the environment. [www.citeo.com](http://www.citeo.com)



## Illustrations

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## Design and Production

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## Disclaimer

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Total is a major energy player that produces and markets fuel, natural gas and low-carbon electricity. Our 100,000 employees are committed to better energy that is safer, more affordable, cleaner and accessible to as many people as possible. Active in more than 130 countries, our ambition is to become the responsible energy major.



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