The International Energy Agency (IEA) Sustainable Development Scenario predicts that natural gas will make up 25% of the global energy mix by 2040, surpassing the share of coal. A fast growing market, LNG (Liquefied Natural Gas) will benefit from a 5% annual growth in demand between now and 2025, driven by Asia and notably China.

At Total today, we are one of the world’s leading players in the LNG sector with solid and diversified positions across the full value chain. LNG development is also a key element of our strategy to increase access to affordable and reliable energy while, at the same time, helping to limit the impact of climate change.

__MORE THAN 40 YEARS OF LNG EXPERIENCE__

<table>
<thead>
<tr>
<th>Year</th>
<th>Project</th>
<th>Country</th>
<th>Capacity (Mt/y)</th>
<th>Total Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>Adnoc LNG (Adgas)</td>
<td>Abu Dhabi</td>
<td>5.6</td>
<td>5%</td>
</tr>
<tr>
<td>1977</td>
<td>Qatargas 1</td>
<td>Qatar</td>
<td>10</td>
<td>10%</td>
</tr>
<tr>
<td>1999</td>
<td>Nigeria LNG T1-T6</td>
<td>Nigeria</td>
<td>22</td>
<td>15%</td>
</tr>
<tr>
<td>2000</td>
<td>Oman LNG</td>
<td>Oman</td>
<td>7.2</td>
<td>5.54%</td>
</tr>
<tr>
<td>2000</td>
<td>Qalhat LNG</td>
<td>Oman</td>
<td>3.7</td>
<td>2.04%</td>
</tr>
<tr>
<td>2005</td>
<td>Idku LNG</td>
<td>Egypt</td>
<td>3.6</td>
<td>5%</td>
</tr>
<tr>
<td>2005</td>
<td>Snøhvit LNG</td>
<td>Norway</td>
<td>4.2</td>
<td>18.4%</td>
</tr>
<tr>
<td>2009</td>
<td>Qatargas 2 Train 5</td>
<td>Qatar</td>
<td>7.8</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

* Subject to closing of the Engie LNG acquisition
MANAGING A COMPLEX VALUE CHAIN

A successful LNG business requires dedicated management, good market overview, and innovation. This means wide ranging human skills and technical inputs. Not only in the areas of exploration, production and logistics, but also from sophisticated trading teams operating in some of the world’s major financial centers, supported by the necessary legal, taxation and commercial disciplines. For us, this is business as usual.

GROWING INTEGRATED LNG BUSINESS

As an LNG pioneer, producing for over 40 years, we are today a global market player. We continue to develop an integrated business model as marketing downstream gas supports profitable upstream projects. To do this, we draw upon the synergies between our Exploration & Production teams (developing reserves, building and operating LNG plants) and our Gas teams (finding markets for current and future production, and developing new markets). Their combined expertise is enabling us to increase our LNG portfolio to more than 40 million tonnes per year by 2020¹, and is demonstrating our position as a portfolio supplier – not only an LNG producer. Leveraging our size and flexibility in an increasingly commoditized market we can call on our core strengths, for example, our ability to react to the spot market and divert the destination of an in transit cargo. To open new markets for LNG, we plan to invest in new regasification units and power plants. We are also progressively increasing our position in gas marketing, targeting suppliers in the residential and transport sectors.

Key figures

World LNG demand grew 10% in 2017

Read more online
Grow LNG as an energy of the future


Yemen LNG¹ Yemen 6.7 Mt/y TOTAL Share: 39.62%
Angola LNG Angola 5.2 Mt/y TOTAL Share: 13.6%
GLNG Australia 7.8 Mt/y TOTAL Share: 27.5%
Yamal LNG Russia 16.5 Mt/y TOTAL Share: 20%
Ichthys LNG Australia 8.9 Mt/y TOTAL Share: 30%
Cameron LNG¹ United States 12 Mt/y TOTAL Share: 16.6%
Papua LNG Papua New Guinea TOTAL Share: 40.1%¹
Nigeria Train 7 Nigeria TOTAL Share: 15%
Tellurian (Driftwood LNG) United States TOTAL Share: ¬20%

¹ Due to the security conditions in the vicinity of Balhaf, Yemen LNG declared force majeure to its various stakeholders in 2015. The plant is in a preservation mode.
² Total’s net working interests after government back-in: 31.1%.
Production, liquefaction, transportation and distribution are all managed in-house. At Total we use the best available technologies and practices across the entire LNG value chain, continuously improving our methods of production and processing, innovating to reduce costs and lead times, and ensuring best logistics and delivery to our customers.

**Using innovative, competitive & individually tailored solutions**

Total employs the most up to date technologies, and adapts to all situations, forcing costs down, but never compromising on safety.

- The locating of an LNG project can have major cost implications, perhaps in terms of needing special site preparation or the requirement for protective structures, such as breakwaters. At Total, we think “outside the box” and are able to suggest alternative project architectures. On a coastline, for example, a potentially complicated configuration might be better served with a nearshore LNG plant, that may be less expensive than onshore facilities.

- On offshore gas fields, the alternative of deploying a floating liquefaction natural gas unit (FLNG) could provide a more cost-effective solution, avoiding the costs of building a sea to shore pipeline. Already a world leader in LNG, with advanced expertise in subsea technologies and FPSOs (floating production, storage and offloading), the step to FLNG is a natural progression. We have FLNG capability ready to deploy, and this “all in one” approach could be an ideal solution if required.
WORTH NOTING

MARKET DELIVERY WHEREVER REQUIRED

➢ “Fit for purpose” solutions, better tailored to meet needs, is another way of minimizing costs. An alternative approach to reduce costs could be through the use of new architectures in development and construction, such as modularized mid-scale units.
➢ In regions of extreme cold, the choice of modular, pre-fabricated construction – including pre-assembled pipe racks – minimizes worker exposure. At Yamal, APP units have been built on more than 60,000 piles for protection of the permafrost, this ensures structure stability. Winterization has been a huge challenge and our expertise in harsh weather management was one of our main technical contributions to the project.

➢ We are expanding our global LNG trading and shipping operation, and our dedicated fleet, enabling us to increase flexibility and seize market opportunities. We have introduced two new charter LNG carriers, SK Audace and SK Resolute, since 2017 and we expect to significantly grow this further with the acquisition of Engie’s upstream LNG business.
➢ Yamal LNG will also be equipped with 15 icebreaker tankers (a world first!). Thanks to their extreme winter performance, these icebreaking vessels make it possible to carry LNG through the Arctic “North-East Passage” route.
➢ Our global regasification network ensures that our partners have reliable access to gas, wherever they are. With significant regasification capacity, Total is present in the three global LNG zones of: South America, Europe & Asia. To allow new countries to gain access gas quickly, economically and flexibly, we are developing floating storage regasification units, or FSRUs.

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REDUCING ENVIRONMENTAL IMPACTS

Reducing costs, developing new technologies, rethinking designs, opening new markets and ensuring safety... but not forgetting our continued commitment to the environment.

➢ At Total, we are convinced that gas, which is abundant and competitive, is the key energy resource for fast climate action. It emits lower greenhouse gas emissions than any other fossil fuel, especially when compared to coal in power generation. Gas, and LNG, are therefore at the heart of our ambition to be the responsible energy major.
➢ Investigating and limiting methane emissions is an environmental priority for us. Total’s methane emissions specifically associated with gas production represent less than 0.5% of our marketed operated gas production.
➢ Improving energy efficiency is another challenge. Up to 10% of gas entering the liquefaction train is used in the process itself. Being able to reduce this results in much improved output yields. Integrating refrigeration equipment to use heat recovered from flue gas turbines improves energy balances, reduces loss, and gives greater yields. The excess flue gas heat is used to produce “cold” (reverse heat transfer) to both cool the turbine air inlet and in the liquefaction process itself. Energy gains from this optimization could be as much as 30%, and have given liquefaction train capacity increases of up to 30% from the existing drive machinery.

1 Subject to closing of the Engie LNG acquisition
When we are considering launching an LNG project, we rely on our skilled teams of analysts to provide with worldwide gas supply and demand curves for the upcoming twenty years. Our approach leads to the development of the most ambitious projects on all continents.

Yamal LNG, the first Arctic LNG project in Russia

We have a 20% direct stake in Yamal LNG (Novatek 50.1%, CNPC 20% and Silk Road Fund 9.9%) located 600 kilometers north of the Arctic Circle, a region frozen 7 to 9 months a year. Gas reserves are estimated at 4 billion barrels of oil equivalent. Launched in 2013, the project started production in December 2017. At Yamal LNG, together with our partners, we have drilled more than 200 wells, built and shipped 142 modules from 10 yards across Asia, 60,000 piles specially drilled into the permafrost – up to 25 meters deep, and constructed three liquefaction trains with a capacity of 5.5 Mt each, plus four full containment LNG tanks and an accompanying LNG terminal for transshipment operations equipped with key transport facilities. Yamal LNG is also commissioning a fleet of 15 ice-class Arc 7 LNG carriers (with capacities between 155,000 and 174,000 m³), that will give all year round access to markets in both the East and the West.
ICHTHYS LNG, GATEWAY TO THE ASIAN MARKET

With production start-up scheduled for 2018, Ichthys LNG, operated by INPEX and in which we have a 30% interest, is the second largest resource project in Australia’s history. Located off the north-west coast, its development includes a subsea production network, a floating central processing platform (CPF), a floating production storage and offloading unit (FPSO) and a 900-km gas pipeline to the liquefaction site near Darwin. At its production peak, Ichthys LNG is expected to produce 8.9 Mt/year of LNG, 1.6 Mt/year of LPG and 70 kb/d of condensates, commercialized on the fast growing Asian market. LNG has already been sold, mainly under long-term contracts. Stakeholder engagement has been essential at Ichthys LNG; it contributes to sustainability and operational success. Engagement with local traditional communities is particularly strong.

QATARGAS, ACCESS TO THE MOST COMPETITIVE LNG IN THE WORLD

In Qatar, we are involved in the production, processing and exporting of gas from the North Field, supplying Qatargas 1 and Qatargas 2 liquefaction plants where we partner the State-owned company Qatar Petroleum. Starting-up in 2009, Qatargas 2 has been the first integrated LNG project in the world, combining with the South Hook re-gasification terminal located in Milford Haven, in the United Kingdom. It was acknowledged within the industry as one of the most daring in terms of size, technology and for its integration of production, transport and re-gasification. Building on this successful partnership developed in Qatargas 1, we have cemented our commitment to the LNG industry in Qatar, representing another significant milestone in the long history of our relationship with the country, where we have been active for more than 80 years.

“The Ichthys LNG project is the most high-profile partnership between Total and INPEX to date, but our relationship actually dates back to the 1960s. At INPEX, we value Total’s project management expertise, which will help bring this project to fruition.”

Hitoshi Okawa, Director Corporate Coordination for INPEX
Total is a major energy player committed to supplying affordable energy to a growing population, addressing climate change and meeting new customer expectations.

Those commitments guide what we do. With operations in more than 130 countries, we are a global integrated energy producer and provider, a leading international oil and gas company, and a major player in low-carbon energies. We explore for, produce, transform, market and distribute energy in a variety of forms, to serve the end customer.

Our 98,000 employees are committed to better energy that is safer, cleaner, more efficient, more innovative and accessible to as many people as possible. As a responsible corporate citizen, we focus on ensuring that our operations worldwide consistently deliver economic, social and environmental benefits.

Our ambition is to become the responsible energy major.