LIQUEFIED NATURAL GAS
A GLOBAL PLAYER IN A GROWING MARKET

Gas is on course to become the number two fuel in the world energy mix by 2035, and LNG is the fastest growing hydrocarbon in the mix. Total today is one of the world’s leading players in the LNG sector with sound and diversified positions across the entire LNG value chain. LNG development is a key element of the Group’s strategy, and Total is strengthening its LNG portfolio investing in most major production zones and markets.

MORE THAN 40 YEARS OF LNG EXPERIENCE
1977 TO 2020

Aerial view of the LNG plant, Balhaf, Yemen.

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1 Mt/y: million tonnes per year

5.6 Mt/y = Production capacity

1 Mty: million tonnes per year

2 Interest through share of Qalhat LNG owned by Oman LNG.
A successful LNG business requires dedicated management and a good market overview. This means considerable and 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, commercial and taxation disciplines. For Total this is business as usual.

**Fully Proficient**

Total can draw upon the synergies between its Exploration & Production teams (developing reserves, building and operating LNG facilities) and Gas teams (finding markets for current and future production), their combined expertise is enabling the Total group to increase and sell its LNG production to around 20 million tonnes per year by 2020.

One of our main objectives is to expand our dedicated shipping fleet so as to increase flexibility and strengthen our ability to react in the marketplace, for example the spot market where LNG cargoes may need to divert in transit to new destinations. This will bring enhanced revenue opportunities.

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**Key figures**

LNG represents 20% of our production, but >30% of our upstream result. This is what Total’s LNG activity delivered in 2014.

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**2009**

- Yemen LNG, Yemen: 6.7 Mt/y (TOTAL Share: 39.62%)
- Angola LNG, Angola: 5.2 Mt/y (TOTAL Share: 13.6%)
- GLNG, Australia: 7.2 Mt/y (TOTAL Share: 27.5%)
- Ichthys LNG, Australia: 8.4 Mt/y
- Yamal LNG, Russia: 16.5 Mt/y
- Sabine Pass/ Cameron United States: 22/12 Mt/y
- Papua LNG, Papua New Guinea: > 5 Mt/y
- GLNG, Australia: 8.5 Mt/y
- Nigeria Train 7, Nigeria: 8.5 Mt/y

**2013**

**2015**

**2020+**

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*additional interest through our 18.6% ownership in operator Novatek

*The 40.1% is before the Papua New Guinea landholders in PRL 15 exercise their rights under the PNG Oil & Gas Act.
Production, processing, transportation and distribution, are all managed in-house: at Total we use the best available technologies, methods and practices throughout the entire LNG value chain. Utilizing our European & US marketing activities, Total is well equipped to commercialize this resource, and has become a yardstick in optimizing LNG flows on behalf of partners.

WE ARE CONTINUOUSLY IMPROVING OUR METHODS OF PRODUCTION AND PROCESSING

Improving energy efficiency is an everyday challenge for the LNG industry. The liquefaction process uses energy and being able to reduce this use results in much improved output yields. That is why Total is developing innovative technologies to improve energy efficiency, save costs and at the same time increase output. Integrating our refrigeration equipment to use heat recovered from flue gas turbines optimizes the energy balance. The excess flue gas heat is used to produce “cold” (reverse heat transfer) to both cool the turbine air inlet, and for the liquefaction process. Energy gains from this “optimization” could be as much as 30%, and have given liquefaction train capacity increases of up to 25% from the existing drive machinery.

FLNG (Floating Liquefied Natural Gas) for when an innovative solution is needed. Total is already a world leader in LNG, however with advanced expertise in subsea technologies and deep offshore oil and gas production utilizing FPSO (Floating Production, Storage and Offloading) vessels, the step to FLNG is a natural progression. Total already has FLNG capability.
Total has 11 operational liquefaction plants at its disposal. Two more are currently being built.

Environmental performance is critical today, and also part of our fundamental commitment to ensuring sustainable production. Creating value from flaring reduction is an ideal synergy.

Flaring has been a significant historical contributor to greenhouse gas emissions. Capturing this gas for LNG production is a perfectly logical approach to reducing emissions and creating value. Total’s LNG operations in West Africa provide excellent examples, and such innovative solutions have helped the Group reduce its flaring by half between 2005 and 2014, and also helped to set a target of zero operational flaring by 2030.

Market delivery means gas when and where required.

Our global regasification network ensures that our partners have reliable access to gas. Total is present in 4 regasification terminals in the 3 global LNG zones: Americas, Europe & Asia. A 5th terminal is currently under construction in France. Our trading desks in London, Houston and Singapore are ideally located in the LNG hubs for these markets. Our trading portfolio will double from today’s 7 Mt to 15 Mt by 2020, keeping us among the LNG leaders.

We have to adapt to all environments.

Regions of extreme cold make up a large part of the world’s gas resources. Yamal LNG has ordered 15 “icebreaker tankers”, each with a capacity of 170,000 m³. The tankers are being constructed by South Korean shipyard, DSME. Their “extreme winter” performance will make it possible to carry out operations and serve new markets all year round, even with sea ice for 7 to 9 months a year.

At Yamal LNG, air temperatures drop below -50°C. To keep outdoor working to a minimum and thus protect workers from extreme cold we use modular pre-fabricated construction. Erecting these accommodation units raised on stilts, isolates the buildings and occupants from the permafrost below.
When we are considering launching an LNG project, we rely on our skilled analyst teams to provide us with a yearly “world gas balance”, outlining worldwide supply and demand curves for the following twenty years. This approach allows the development of the most ambitious projects.

**YAMAL LNG, THE FIRST ARCTIC LNG PROJECT IN RUSSIA**

TOTAL has a 20% direct stake in Yamal LNG (Novatek operator) which is building a liquefaction plant above the Arctic Circle with sea access all year round. Launched in December 2013, Yamal LNG is expected to drill more than 200 wells, construct 3 LNG Trains with a capacity of 5.5 Mt each, an accompanying LNG terminal for transshipment operations and to commission 15 ice-breaker tankers each with a capacity of 170,000 m³ – a World First! This fleet will give all year round access to markets in both the East and the West. To complement our industrial activity and to re-invest in the community, we are backing several educational, health and cultural programs with, for example, the construction of a school in Narian-Mar and an administrative centre in the Nenets Autonomous Region, plus an ongoing cooperation with Murmansk Technical University.
With production start-up scheduled for 2017, Ichthys LNG, operated by INPEX, and in which Total has 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 processing platform, a floating production storage and offloading unit (FPSO) and a 900-km gas pipeline to the liquefaction site. At its production peak, Ichthys LNG is expected to produce 8.4Mt/year of LNG, 1.6Mt/year of LPG and 100kb/d of condensates, commercialized on the Asian market.

In particular at Ichthys LNG, stakeholder engagement has been essential: it contributes to sustainability and operational success. Engagement with local traditional communities is particularly strong, and more than 600 Aboriginal people have been employed since construction began.

“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

Sabine Pass – USA

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SABINE PASS (US), A NOVEL APPROACH TO GAIN MAXIMUM MARKET FLEXIBILITY

Sabine Pass is different from other integrated LNG projects. Usually a liquefaction plant sources gas from dedicated fields. In the case of Sabine Pass however the gas is purchased on the domestic market at the Henry Hub price, taking advantage of the shale gas revolution in the United States.

To add further flexibility, in 2012 we signed a 20-year sale and purchase agreement allowing us to purchase gas “free on board” (FOB) without a fixed destination enabling us to ship to the best priced market. This agreement will cover an additional 2 million tons per year of LNG once Train 5 commences operations in 2019.
Energy drives progress where it is readily available. Two of the biggest challenges in building a responsible energy future are ensuring access for all and using energy wisely.

This is the environment in which we conduct our business. With operations in more than 130 countries, we are a leading international oil and gas company. We produce, refine and market oil, manufacture petrochemicals. We are also a world-class natural gas operator and rank second in solar energy with SunPower. Demonstrating their commitment to better energy, our 100,000 employees help supply our customers worldwide with safer, cleaner, more efficient and more innovative products that are accessible to as many people as possible. We work alongside our stakeholders to ensure that our operations consistently deliver economic, social and environmental benefits.