



TOTAL
COMMITTED TO BETTER ENERGY

DEEP OFFSHORE

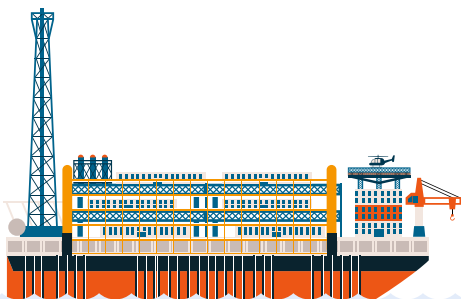
EXPERTISE & TECHNOLOGY



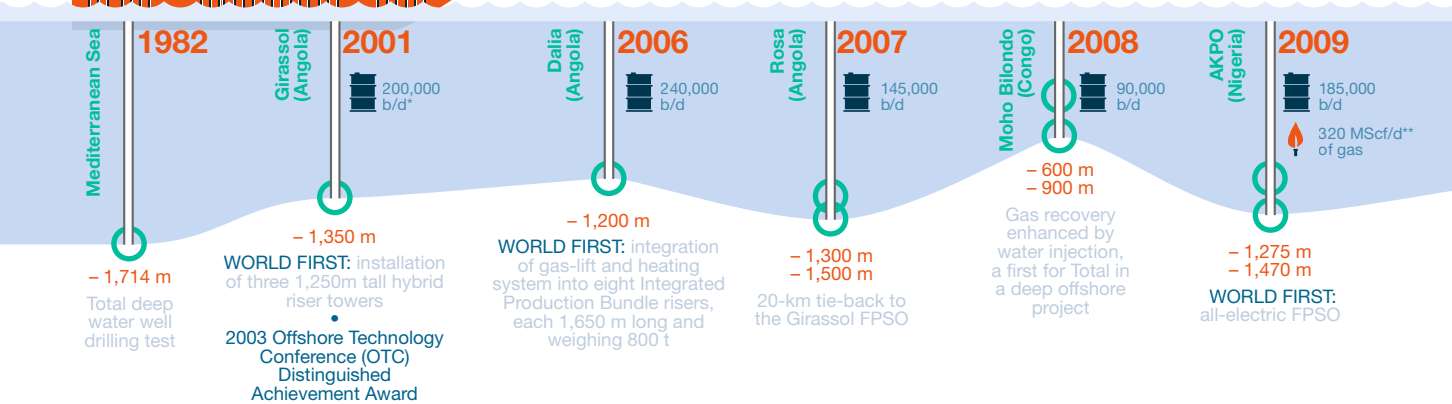
PIONEERING TO SERVE OUR ENERGY NEEDS

Deep offshore, northern North Sea, West of Shetland

DEEP OFFSHORE, at depths of over 500 meters, lies enough untapped oil and gas to satisfy world demand for the next 5 years. At Total, one of the world's largest operators in this area, we can operate in these and far greater depths and resources today, thanks mainly to decades of technological progress. Whilst still maintaining an ambitious exploration and development strategy, these projects are managed responsibly, respecting not only technical and economic constraints but also our own strict environmental standards.



TOTAL'S DECADES OF TECHNOLOGICAL PROGRESS



*b/d: barrel per day **MScf/d: million standard cubic feet per day



WORTH NOTING

By 2017, Total should be producing about 15% of the world's deep offshore crude oil.

INCREASINGLY COMPLEX CHALLENGES

More than a quarter of resources yet to be discovered, about 300 billion barrels, are located deep offshore in environments ever more difficult to access, always further from the shore and subject to extreme sea and weather. Meeting these challenges requires technical expertise, however this is made even more demanding with today's economic constraints where the control of costs is itself a fundamental challenge.



FPSO CLOV from the sky (Angola)

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Key figures

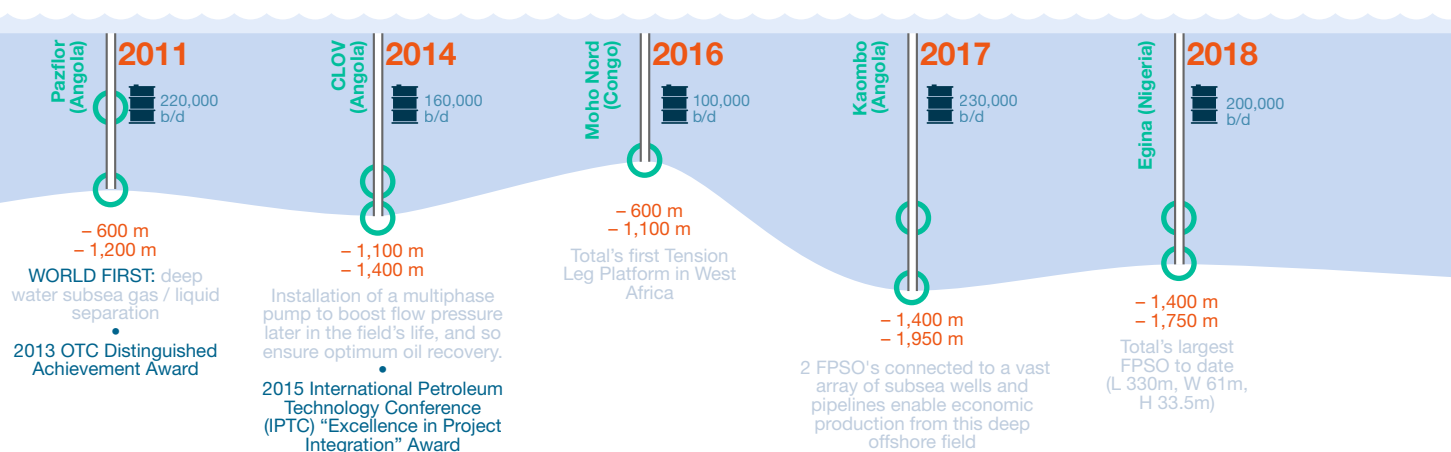
>10%
of Total's production comes from deep offshore, representing

>25%
of our upstream result in 2014.

BUILDING ON OUR TECHNICAL EXPERTISE

At Total we have fine tuned our risk management policy enabling us to explore resources in ultra-deep offshore locations (at depths of over 1,500m). We use our state of the art geoscience toolkit with "Pangea", one of the world's super-computers, to enhance the speed and precision of subsurface mapping. This allows us to save time and

money when selecting optimal drilling locations. Total is also addressing the 4 main challenges of greater distance from shore, deeper water, whilst still controlling costs and maintaining safety. The main objective of our subsea facilities is to undertake on the sea bed all the necessary processing usually carried out at the surface, so as to deliver export-ready products directly onshore for refining or use.





CONSTANTLY ANTICIPATING AND INNOVATING

Diagram of the development of Pazflor (Angola)

Our R&D strategy focuses on addressing all the technological, environmental, safety and cost control challenges inherent in deep offshore operations. A significant part of our R&D budget, which has increased by 10% every year since 2007, is to develop technologies that allow the economic development of reserves ever more difficult to access.

ENSURING THE FLUIDS KEEP FLOWING

We use cutting edge solutions to assess risk and ensure fluid flow. This task is made all the more complex when dealing not only with the pressures and temperatures encountered on the ocean floor, but also when long pipelines and tie-backs used in our projects. We are continually developing new technologies.

▶ In partnership with ConocoPhillips and SINTEF¹, we have developed a new multiphase flow software model called **LedaFlow**[®]. This model makes it possible to simulate complex flows and, therefore to determine the optimum size of our facilities.

▶ In Angola, Pazflor was the first offshore development to perform gas / liquid separation at depths of 800m coupled with large scale liquid activation. It opened the way for economic production of heavy and viscous oils lying at greater depths.

▶ Another world first that we wish to replicate in deep offshore is the electric heating of transport lines, tested in the Islay Field in the British North Sea, to prevent the formation of hydrate plugs.

¹ SINTEF is one of the largest independent research organisations in Scandanavia.



Key figures

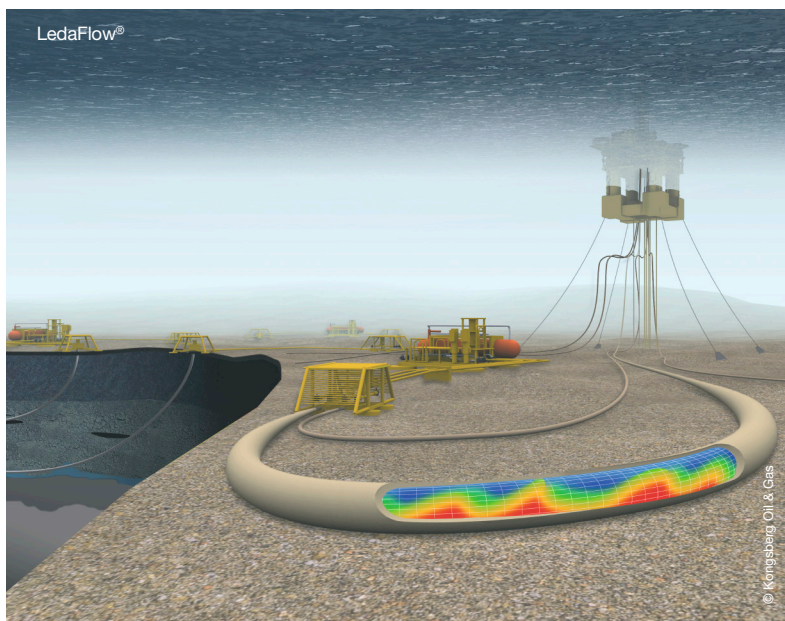
Today, Deep Offshore represents:

50%

of Total's exploration potential

40%

of our operated production



WE ARE DEVELOPING THE SUBSEA TECHNOLOGIES OF TOMORROW

To reach resources that are located in ever more complex environments, we have chosen the path of "full subsea". However, this concept can only be made possible with the advent of all-electric technology, the only efficient technology able to meet the challenges of long tie-backs. That is why, in 2014, we launched an all-electric pilot well, production from which is due to start in 2016 from the K5F gas field (Dutch North Sea): an industry first! Other developments are under way:

► **SPRINGS®** (Subsea PProcess and Injection Gear for Seawater), subsea technology, uses nano-filtration membranes to eliminate sulphates found in seawater. An innovative process that enables water to be treated directly on the seabed before injecting it into the wells. A "Subsea Test Unit" in real operating conditions was installed at a depth of 500m using the FPU (Floating Production Unit) Alima in the Congo for a 6-month pilot test.

► **DEPTH®** (Deep Export & Production Treatment Hub), an autonomous integrated subsea factory concept that, by 2030, should ensure the production, treatment and export of fluids ready to be refined.

► The **AUV** (Autonomous Underwater Vehicle), a smart submarine robot capable of inspecting well heads and pipelines at depths of 3,000m in order to guarantee asset integrity; it should be available by the end of 2016.



OUR COMMITMENT, A BEDROCK FOR YOUR TRUST

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Operators working on
GirPi project (Angola)

Total is the leading deep offshore producer in West Africa. We will be operating more than 450 subsea wells by the beginning of 2017. In Angola, a third of the oil production is operated by the Total Group within a framework of dialogue and long term partnership with all stakeholders. The launch of the Moho Nord project in the Republic of the Congo continues our conquest of deep waters and more difficult to produce oils. It is a major milestone in an historical partnership that unites Total with the country.

PAZFLOR (Angola), A GIANT AT THE FOREFRONT OF STATE-OF-THE-ART TECHNOLOGIES

With 590 million barrels of proven and probable reserves, Pazflor is a true "elephant"² operated by Total with a 40% interest. After being delivered on time and within budget, Pazflor deployed its Subsea gas / liquid Separation Units (SSU): a world first rewarded by an OTC (Offshore Technology Conference) Award in 2013. At 325 meters long, 62 meters wide and weighing 120,000 tons, FPSO (Floating Production, Storage and Offloading Unit) Pazflor is a giant of the seas capable of storing 1.9 million barrels of oil.

As part of our agreement with Sonangol (Sociedade Nacional de Combustiveis de Angola), we committed ourselves right from the start to creating jobs, buying locally, training technicians and sharing technologies. Up to 4,500 people, on four different continents were mobilized on this project at the same time, totalling 32 million man hours (of which 3.6 million were in Angola) and a financial investment of 9 billion dollars.

² A giant field of more than 500 million barrels of recoverable reserves



WORTH NOTING

We are the first deep offshore producer in West Africa.

By 2018, Total will be operating 10 FPSOs with a production capacity of approximately 1.7Mboe/day.

GirRI (Angola), A MAJOR “BROWNFIELD” PROJECT

With GirRI (Girassol Resources Initiatives), the first Block 17 brownfield project in Angola, Total has confirmed itself as a worldwide leader in deep offshore technologies. The goal is to increase production by extending production plateaus in the Girassol, Rosa and Jasmim fields. The global reserves for these fields are estimated at 132 million barrels. Some infill wells started production in 2011. Another enhancement brought to this field is the implementation of high-boost subsea multiphase pumps that will reduce the pressure differential between the reservoir and topsides by 70%, thus, increasing reserve recovery by 20%.



Trainees raising questions at Paenal yard

© Laurent PASCAL / Total

MOHO NORD (Congo), PROMOTING SAFETY CULTURE

Operated by Total with a 53.5% interest, this project is the first deep offshore development to involve two floating plants dealing with two different geological conditions: an FPU connected to 17 wells to operate the Miocene turbidites and a TLP (Tension Leg Platform), a first for the Group in West Africa, with 17 topside wellheads to produce the carbonate reservoirs. The environmental impact of these facilities is reduced to the minimum through a zero gas-flaring policy and re-injection of produced water. IMPACTS (Improvement and Acts Together for Safety) brings together more than 200 members, associates and subcontractors within the same safety culture. It promotes a safe work environment with zero accidents and encourages respect for the environment. All the project team members must lead by example and its ambassadors commit themselves to promoting safety at every level of the company. This initiative is monitored and appraised so as to build an enduring methodology that can be applied to future E&P projects.

“As long term partners, Total and Sonangol work hand-in-hand to encourage growth and increase profits for both parties.”

Francisca Silva,
Sonangol Block 17 chairman.



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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.



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Share capital: 5,963,168,812.50 euros
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