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# Angola block 15/06 west hub project

July 2014

## eni in Angola

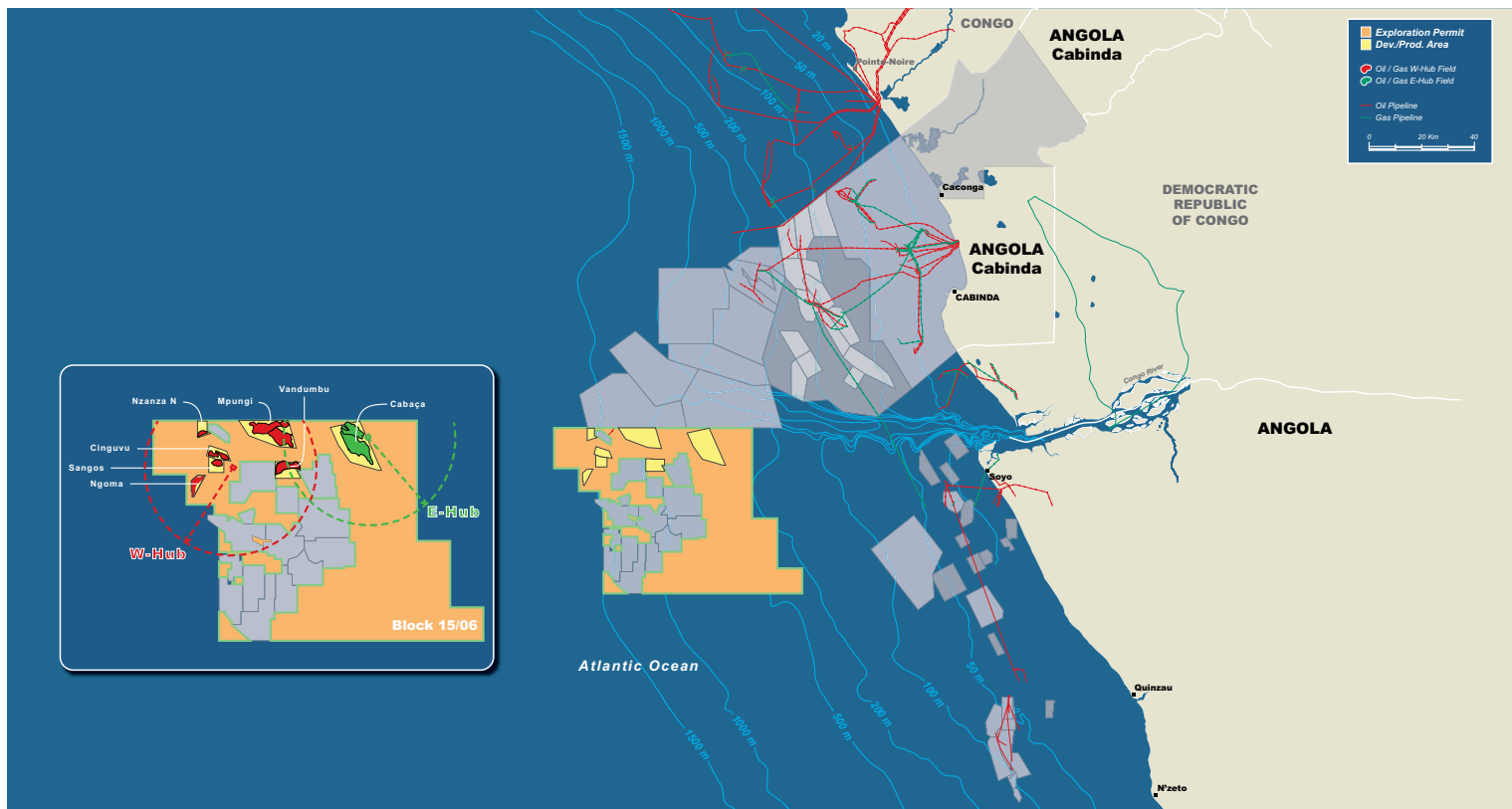
**eni** has been present in Angola since 1980. In 2013, **eni**'s production amounted to 87 kboe/d. **eni**'s activities are concentrated in the conventional and deep offshore, over a developed and undeveloped acreage of 21,489 square kilometers (4,443 square kilometers net to **eni**).

The main producing blocks with **eni**'s participation are:

- Block 0 in Cabinda (**eni**'s interest 9.8%), North of the Angolan coast;
- development Areas in the Block 3-05 (**eni**'s interest 12%) in the offshore of the Congo Basin;
- development Areas in the Block 14 (**eni**'s interest 20%) in the deep offshore West of Block 0;

- development Areas in the Block 15 (**eni**'s interest 20%) in the deep offshore of the Congo Basin;
- Block 15/06 (**eni** operator with a 35% interest) with ongoing development activities.

**eni** retains interests in other non-producing concessions, particularly the Lianzi Development Area (Block 14K/A Imi Unit Area - **eni**'s interest 10%), Block 35/11 (**eni** operator with a 30% interest) and in Block 3/05-A (**eni**'s interest 12%), onshore Cabinda North (**eni**'s interest 15%) and the Open Areas of Block 2 awarded to the Gas Project (**eni**'s interest 20%).



## west hub project history

**eni angola** acquired the operatorship of Block 15/06 during the bid round of 2006 and Production Sharing Agreement was effective from 1<sup>st</sup> December 2006. In 2008 the first discovery well, Sangos-1, was drilled in about 1,350 m of water depth, followed by Cinguvu-1 in 2009 and Mpungi-1 in 2010.

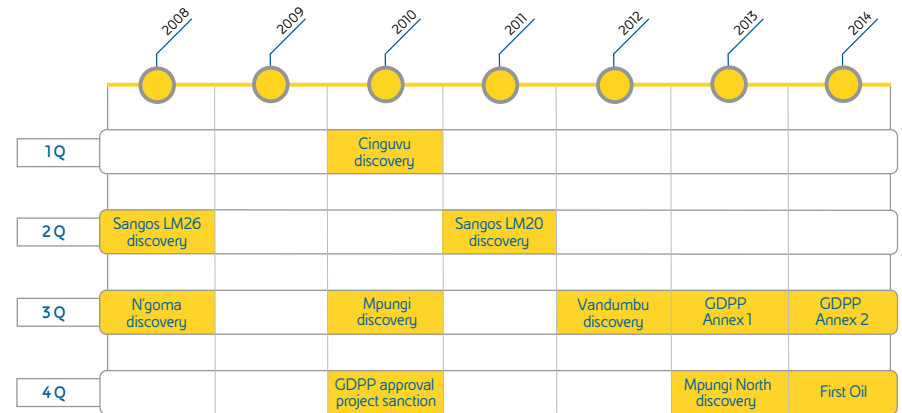
In December 2010 the General Development and Production Plan (GDPP) for the West Hub project (Sangos, Cinguvu and N'goma fields) was approved by Joint Venture Partners and presented to the Concessionaire.

In 2013 the Annex-1 to GDPP was issued in order to develop also Mpungi field thus allowing reserves production anticipation exploiting several synergies related to system engineering, equipment standardization, offshore installation operations and optimization of the use of Floating Production, Storage and Offloading (FPSO) facilities.

The optimized development plan now consists of three Development Areas (DAs) including the fields of Sangos, Cinguvu and Mpungi and it envisages 21 subsea wells grouped in clusters and connected to the N'goma FPSO moored in about 1,250 m water depth in Sangos area.

In the near future the discoveries of Mpungi North and Vandumbu will be also integrated in the West Hub development with the objective to maintain the overall production plateau as long as practicable.

It is worth noting that West Hub is the first development that exploits reserves in one of the blocks which were awarded in 2006 licensing round.





## joint venture

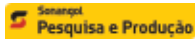
The Contractor Group of Block 15/06 includes **eni angola** (Operator), Sonangol P&P, Sonangol Sinopec International and Falcon Oil Holding Angola S.A.



Concessionaire



Operator



## main contractors

Main Contractors working on the West Hub project are: SBM Offshore (FPSO), GE (SPS), Aker (Umbilicals), Technip (Risers&Flowlines and Transport&Installation), Saipem (Drilling&Completion) with Scarabeo 9 semi-submersible drilling rig and Ocean Rig (Drilling &Completion) with Poseidon Drillship.

Floating Production, Storage and Offloading (FPSO)



Subsea Production System (SPS)



Subsea Umbilicals, Risers&Flowlines (SURF)



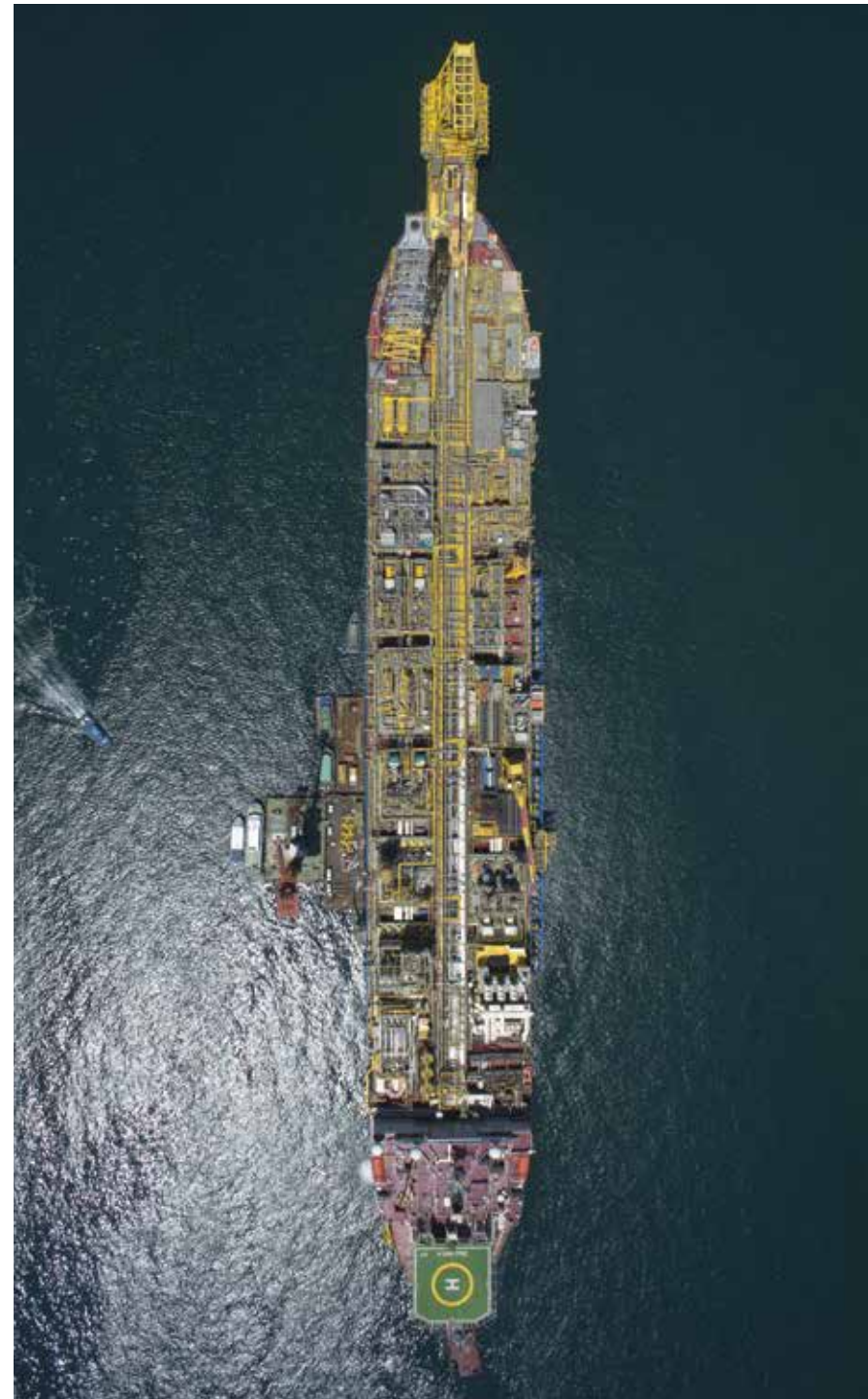
Transport&Installation (T&I)



Drilling&Completion (D&C)



Drilling&Completion (D&C)



## health, safety and environment

**eni** operates in different and challenging conditions with people from more than seventy countries active on our projects worldwide.

One aspect unites all of us in **eni**: we have a common passion for looking after our people's safety and health.

- our goal is zero injuries, and to be the obvious choice because we set the highest industry standards;
- today most of injuries and fatalities at the workplace are human behaviour related;
- **eni** wants to develop safety leaders who are passionate and courageous in creating a culture where safety is a driving value. Everyday. Everywhere;
- **eni** operates applying the highest safety standards and working conditions enabling everyone to go home safe and sound;
- **eni's** seven safety leadership expectations that lay out the best practices for safety leaders are:

1. creating the safety vision
2. maintaining safety focus
3. motivating and inspiring others
4. being credible and trustworthy
5. being team oriented

6. communicating effectively
7. giving feedback and recognition.

These expectations are strictly connected with the motivation to spread the culture of safety in **eni**.

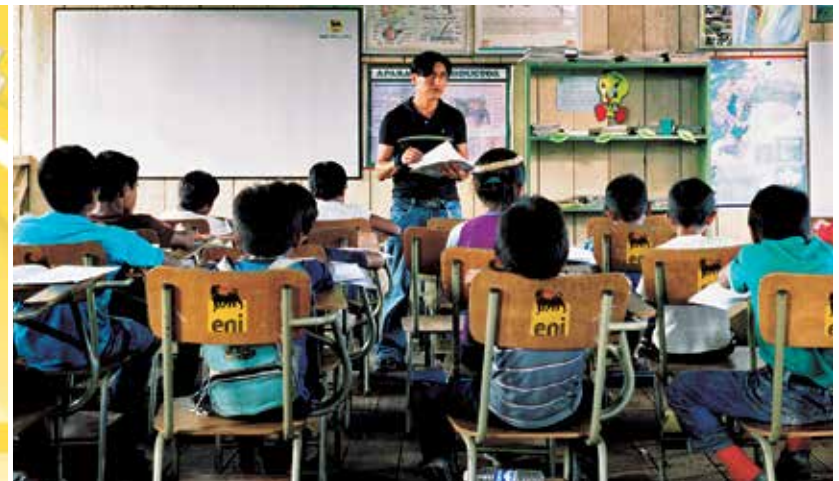
Regarding to environmental actions, **eni angola**:

- is targeting, in line with **eni** standards, a zero flaring approach;
- is working a zero cuttings discharge practice since April 2011;
- has zero oil spills since the beginning of the Block 15/06 operations.

## community relations and development

Being sustainable means creating value for stakeholders and using resources in such a way as to avoid compromising the needs of future generations, respecting the individual, the environment and society as a whole. **eni's** activities are inspired by principles of correctness, transparency, honesty and integrity and adopts the highest standards and international guidelines in the management of its activities

different locations,  
different cultures;  
the same passion  
for safety and  
well-being



in all the contexts in which it operates. In cooperation with the local territories, **eni** is committed to provide concrete response to problems and needs of the Countries where it operates, in synergy with the development strategies of these Countries and with reference to the Millennium Development Goals.

Similarly in Angola, **eni** collaborates with authorities in order to align its programs with the Country's development priorities, defining sustainable solutions based on local needs to improve the wellbeing of the communities.

**eni** ensures an appropriate and effective engagement with relevant groups of stakeholders throughout all the phases of the activities.

## human resources

For **eni angola**, people are the most important asset; the commitment and the expertise of its human resources is a key factor for achieving the objectives of the company.

Therefore **eni angola** concentrates his energy on:

- developing the potential and personal skills;
- enhancing motivation, passion and commitment of staff;
- enhancing team work;
- training new technical professional profiles;
- promoting young talents and improving and valorizing experience.

**eni** assesses the impact of its activities, maintains an open dialogue with its shareholders, contributing to sustainable growth of communities

In **eni angola**, we believe in creating value, on hiring Angolan people with experience on technical and staff areas, on training and develop Angolan young graduates and at the same time ensuring construction and maintenance of friendly relations with the people and communities who are directly involved in our business.

## local content

**eni** contributes to the sustainable development of the Countries in which it operates, creating opportunities for people and local businesses. **eni** believes in maximizing the local content - the procurement of local goods and services needed for the implementation of the activities - starting from an evaluation of the local potential of the Countries where it operates.

In Angola, realizing a high level of local content for "Block 15/06 West Hub development" is one of the project's key objectives.

In line with the objective, Block 15/06 West Hub development project is implementing a local content plan based on the following principles:

- angolanisation: the objective is to cover company positions by Angolan resources and capacity building of local employees through training;
- local content: the objective is to maximize the use of local manufactures and service providers to support the growth of local industry, thus creating new business and job opportunities.

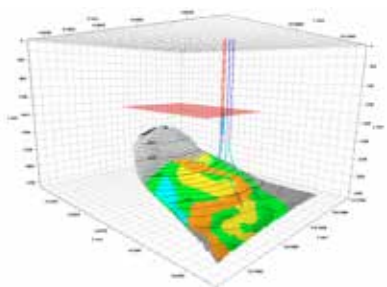


## N'goma FPSO

The N'goma Floating Production, Storage and Offloading unit (FPSO) left Singapore's Keppel shipyard on May 6<sup>th</sup>, 2014, after major revamping including the process modules and topside, and reached Angola (Port Amboim) on June 14<sup>th</sup>, 2014.

Two new modules - sulphate removal package and hot-oil pumping system, both built in Angola at Paenal yard in Port Amboim - were installed and integrated on board to handle the characteristics of the fields being developed.

Then N'goma FPSO will be transferred to its offshore site and it will be moored and connected to the subsea facilities. First Oil Production from the West Hub is expected within year end 2014.



	lower miocene	middle miocene
Water depth	1,000-1,300 m	1,000-1,100 m
Reservoir depth	2,500-3,100 m	1,900-2,400 m
Reservoir pressure	3,900-4,250 psia	2,900-3,600 psia
API degree	24-33°	27.4-32°
Temperature	70-85 °C	62-75 °C
Gas Oil Ratio (GOR)	450-800 scf/stb	400-500 scf/stb

## geology, geophysics and reservoir

### Angola block 15/06 - lower and middle miocene development fields in west hub

West Hub development is focused on Lower Miocene and Middle Miocene reservoirs that lie at a depth of about 2,500-3,100 m with an average water depth of 1,200 m.

The reservoirs are represented by weakly confined, deepwater turbiditic channel complexes with high porosity and high permeability characteristics. The trap mechanism is provided by a combination of stratigraphic and structural component, which are very often related to the salt induced tectonics of the Lower Congo Basin.

The developed fields have an oil quality range between 24 to 34° API with normal pressure and temperature. Depletion strategy includes pressure support via water injection and WAG (Water Alternate Gas) injection. Good quality of 3D seismic has greatly assisted to drill highly deviated development wells targeting "sweet spots" in the channel bodies with an optimum well count whilst subsea well head locations are clustered into manifolds wherever possible.





## facilities engineering

The West Hub project includes the Sangos, Cinguvu and Mpungi fields and involves the drilling of 21 subsea wells of which 12 producers, 4 alternate water and gas injectors and 5 water injectors. Water depth is ranging between 1,000 and 1,500 m.

The subsea wells are grouped in clusters that are connected via flexible and rigid lines to the FPSO, where produced hydrocarbons will be treated, stabilized and stored before exporting by shuttle tankers. FPSO is equipped also with facilities to monitor and control subsea production system via a multiplex electro hydraulic integrated control system.

Floating Production, Storage and Offloading (FPSO)	Subsea Production System (SPS)	Umbilicals, Risers&Flowlines (URF)
Dimension [m]: 366x52x26	21 Christmas Trees (XT)	85 km of Flexibles Lines
Storage capacity: 1,500,000 bbls	5 Production Manifolds	42 km of Umbilicals
Process capability: oil 100,000 bopd	2 Water Alternate Gas (WAG) Manifolds	56 km of Rigid Flowlines
Liquids: 125,000 blpd	1 X-over Manifold	
Water: 120,000 bwpd	1 gas lift Manifold	
Gas: 115 mmscfd	9 Subsea Distribution Units (SDU)	

## well operations

Drilling campaign started in 2Q 2013 and to date 18 wells out of 21 have been pre-drilled. The drilling campaign is still being executed by Saipem Scarabeo 9 and Ocean Rig Poseidon, all dynamic positioning system rigs. Well architecture is standardized for all West Hub wells. West Hub development is being carried out with zero discharge policy. Currently **eni angola** is the only operator in the Country to bring all drilling cuttings onshore for treatment. Slim bore with light casing profile has been adopted to reduce oil based cutting production and reduce well cost. All the wells are drilled with Dual Casing Technique®, **eni** patented technology for the surface section, to reduce execution time and guarantee well head verticality. All the reservoir sections are drilled with solid free inverted emulsion drilling mud to prevent formation damage and eliminate mud cake in the reservoir section. **eni** Continuous Circulation Device®, **eni** patented technology for continuous circulation, has been adopted during the pre-drilling campaign to drill challenging high deviation or horizontal well without changing the light well architecture.

Sand control is performed through Open Hole Gravel Pack for all the producers and stand-alone screen with natural sand packing for injector wells. Upper completion foresees down hole gas lift and chemical injection. One injector will be completed with an intelligent completion in order to optimize the water injection in different reservoir layers.







## west hub development architecture

N'goma turret moored FPSO with related West Hub subsea layout.

The configuration foresees 21 clustered wells, 56 km of rigid lines of which 16 km of pipe in pipe (PiP) and 86 km of flexible lines along Sangos, Cinguvu and Mpungi fields.



### Manifold

used to gather the flow from adjacent subsea wells into flowline headers, for onwards connection to export flowlines



### XT

installed over the wellhead, Christmas Tree (XT) ensures oil production and injection of water and gas



### PLET

Pipe-Line End Termination is a subsea structure used to connect rigid pipelines to another subsea structure (i.e. XT, manifold, other PLET, etc.)

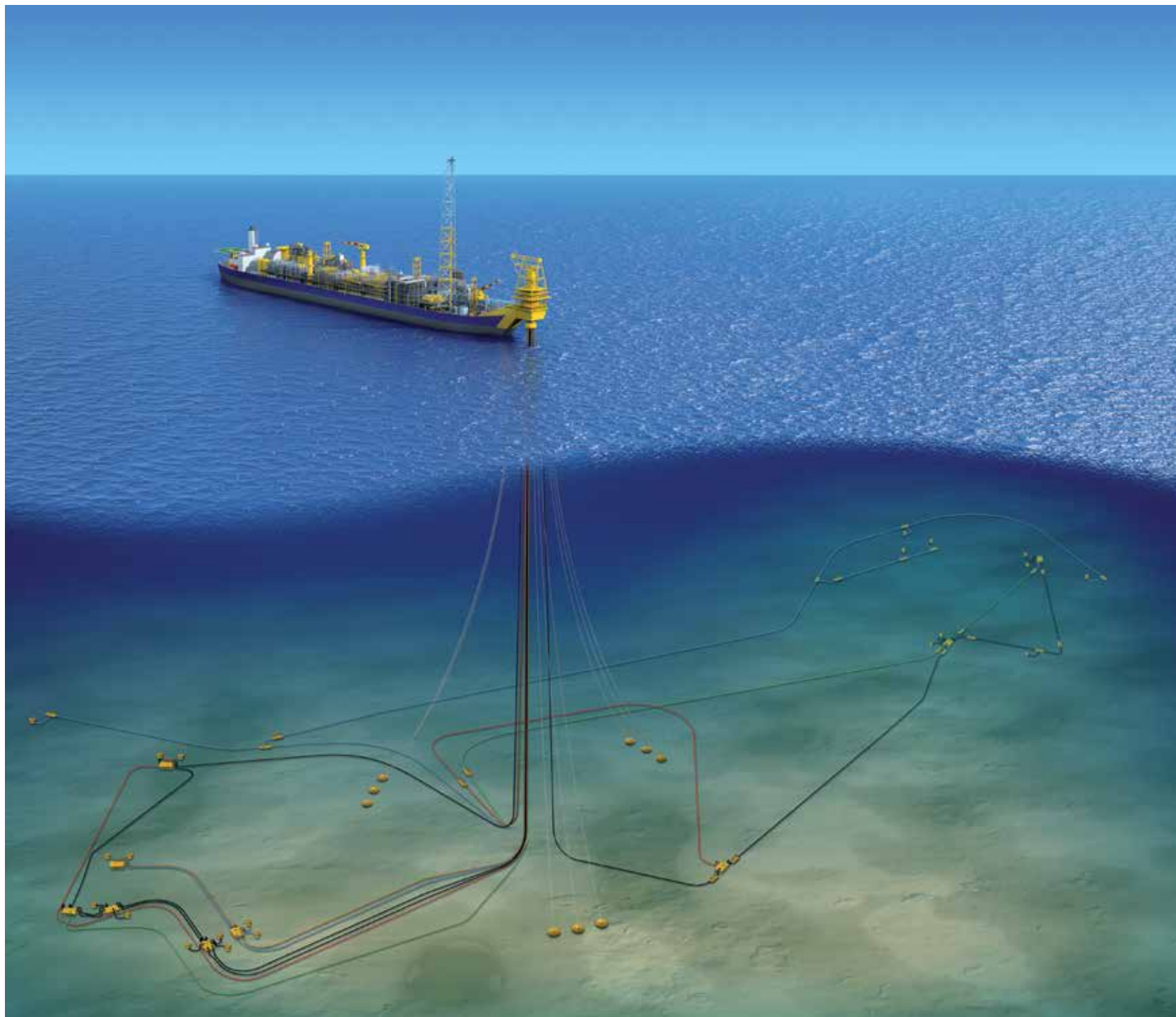
oil production

water injection

gas injection

gas lift

service line





Since 2010 **eni** has been communicating with talented young people from all over the world in various disciplines.

The cover art for this brochure was created by Riccardo Guasco, a young Italian illustrator, cartoonist and painter.

"It was a real challenge to paint a unique picture combining both tradition and current development of Angola using two so different subjects. The choice was to represent Mpungi, a traditional wind instrument, as a support to sustain the people of Angola watching far away in the sky, while the ship looks after the subsea."

Riccardo Guasco

## eni at a glance

**eni** is an integrated company engaged in all the energy supply chain, active in 85 Countries with more than 82,000 employees.

**eni** engages in oil and natural gas exploration, field development and production, as well as in the supply, trading and shipping of natural gas, LNG, electricity, fuels and chemical products.

Through refineries and chemical plants, **eni** processes crude oil and other oil-based feedstock to produce fuels, lubricants and chemical products that are supplied to wholesalers or through retail networks or distributors.

**eni** operates in engineering, oilfield services and construction both offshore and onshore, focusing on the execution of technologically-advanced mega-projects mainly located in frontier areas.

**eni's** strategies, resource allocation processes and conducting of day-by-day operations underpin the delivery of sustainable value to all of our stakeholders, respecting the Countries where the company operates and the people who work for and with **eni**. Our way of doing business, based on operational excellence, focus on health, safety and the environment, is committed to preventing and mitigating operational risks.

When implementing its strategy and running its day-to-day operations, **eni's** efforts are inspired by these key drivers: cooperation, integration, innovation, excellence, inclusion and responsibility. In 2013 **eni** confirmed its presence in the Dow Jones Sustainability Indices and in the FTSE4Good index.

## main figures for 2013

- Net profit: € 5,160 million
- Cash flow from operations: € 10,969 million
- Dividends paid to shareholders: € 3,949 million
- Net borrowings: € 15,428 million
- Leverage: 0.25
- Hydrocarbon reserves: 6.54 billion boe
- Hydrocarbon production: 1,619 kboe/d
- Worldwide gas sale: 93.17 bcm
- Retail sales in Europe: 9.69 mmt tonnes
- Service stations in Europe: 6,386



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