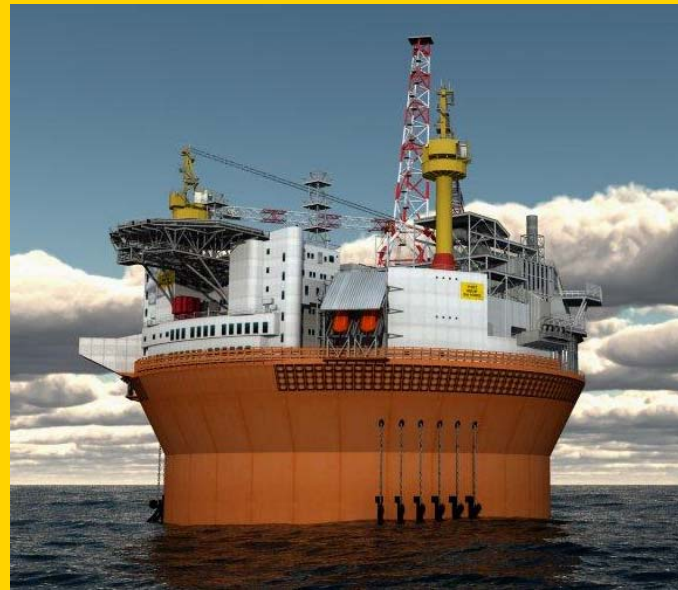


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# Goliat Field Trip



[eni.com](http://eni.com)

*Hammerfest,  
18-19 September 2015*

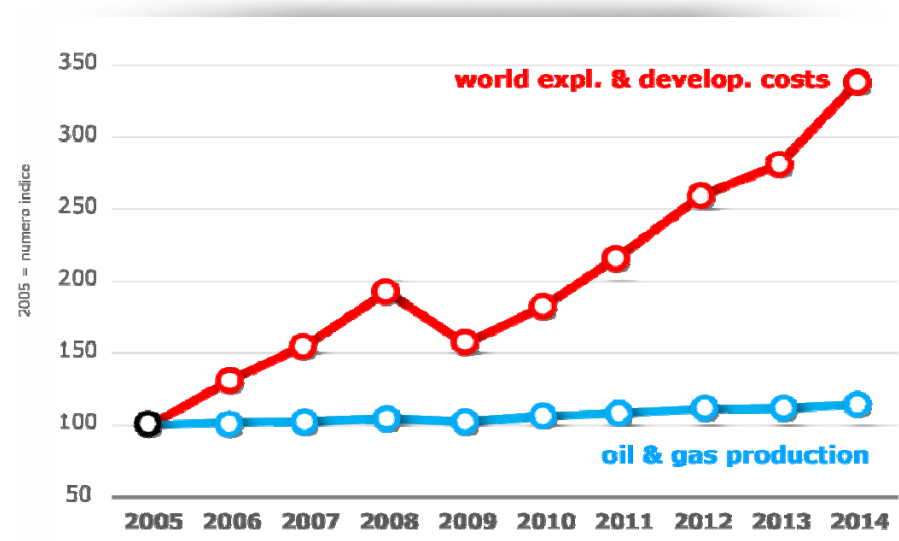
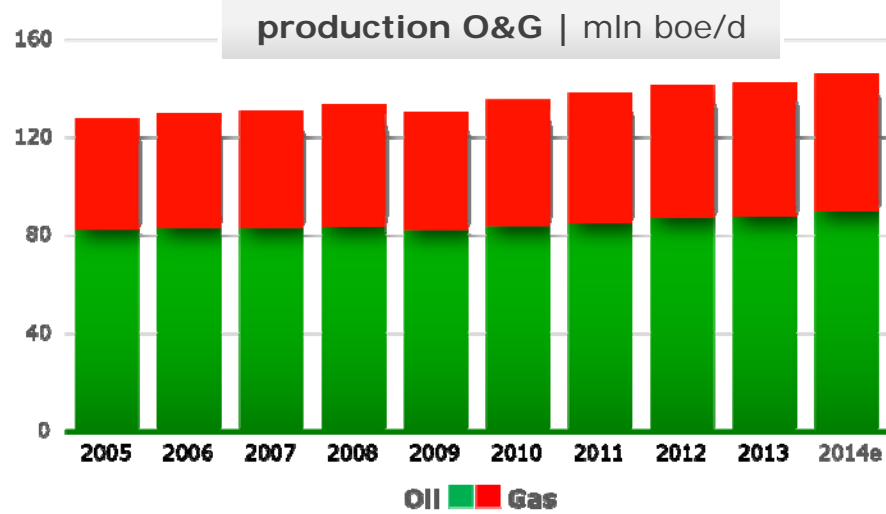
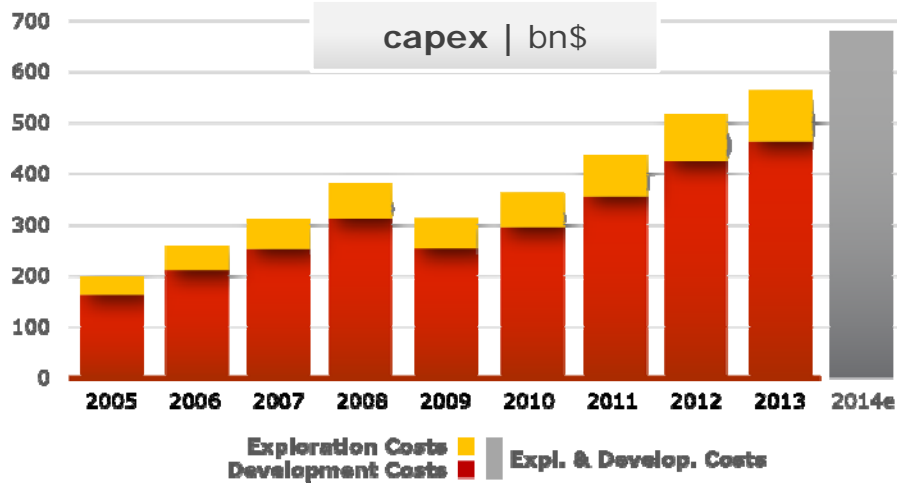
**introduction**

**our approach to development**

**focus on Zohr**

**Goliat field**

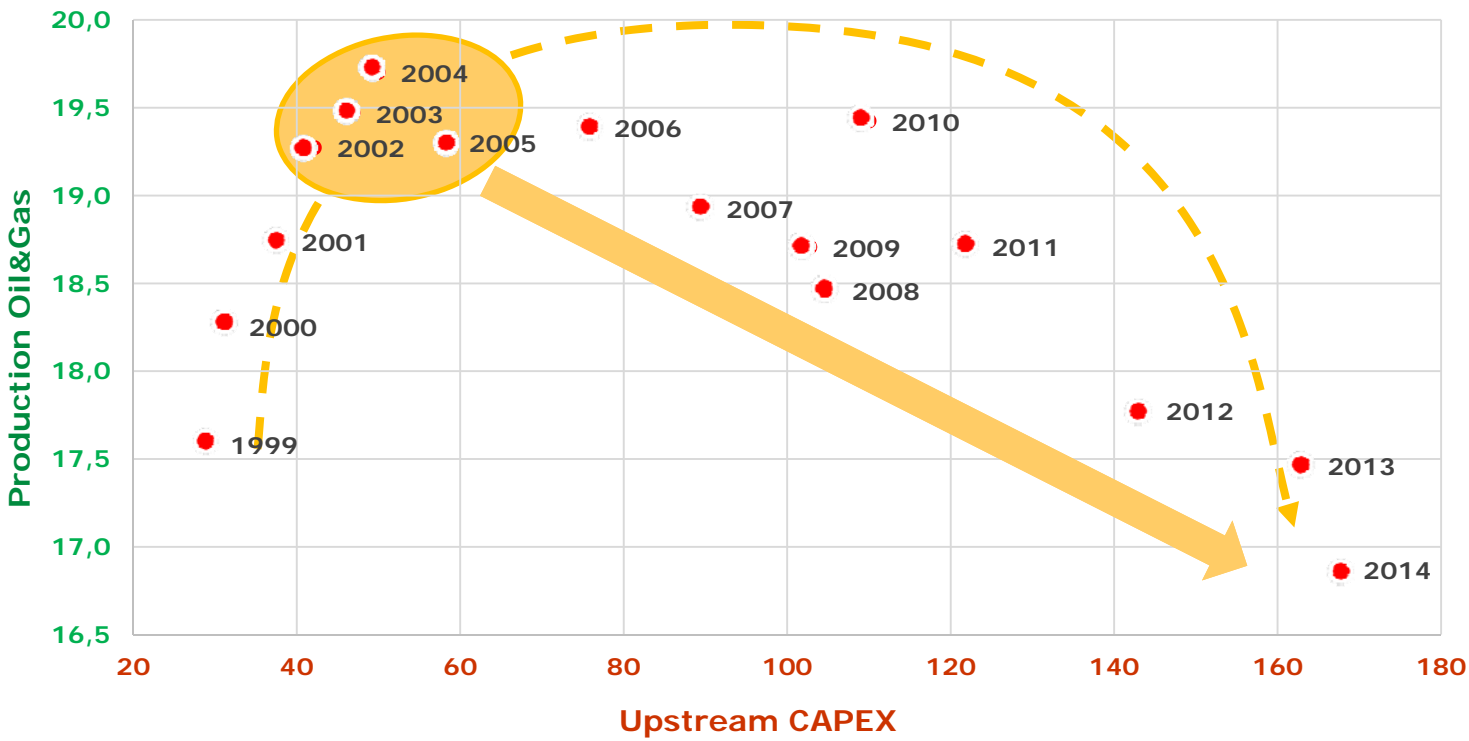
# Upstream capex and production since 2005



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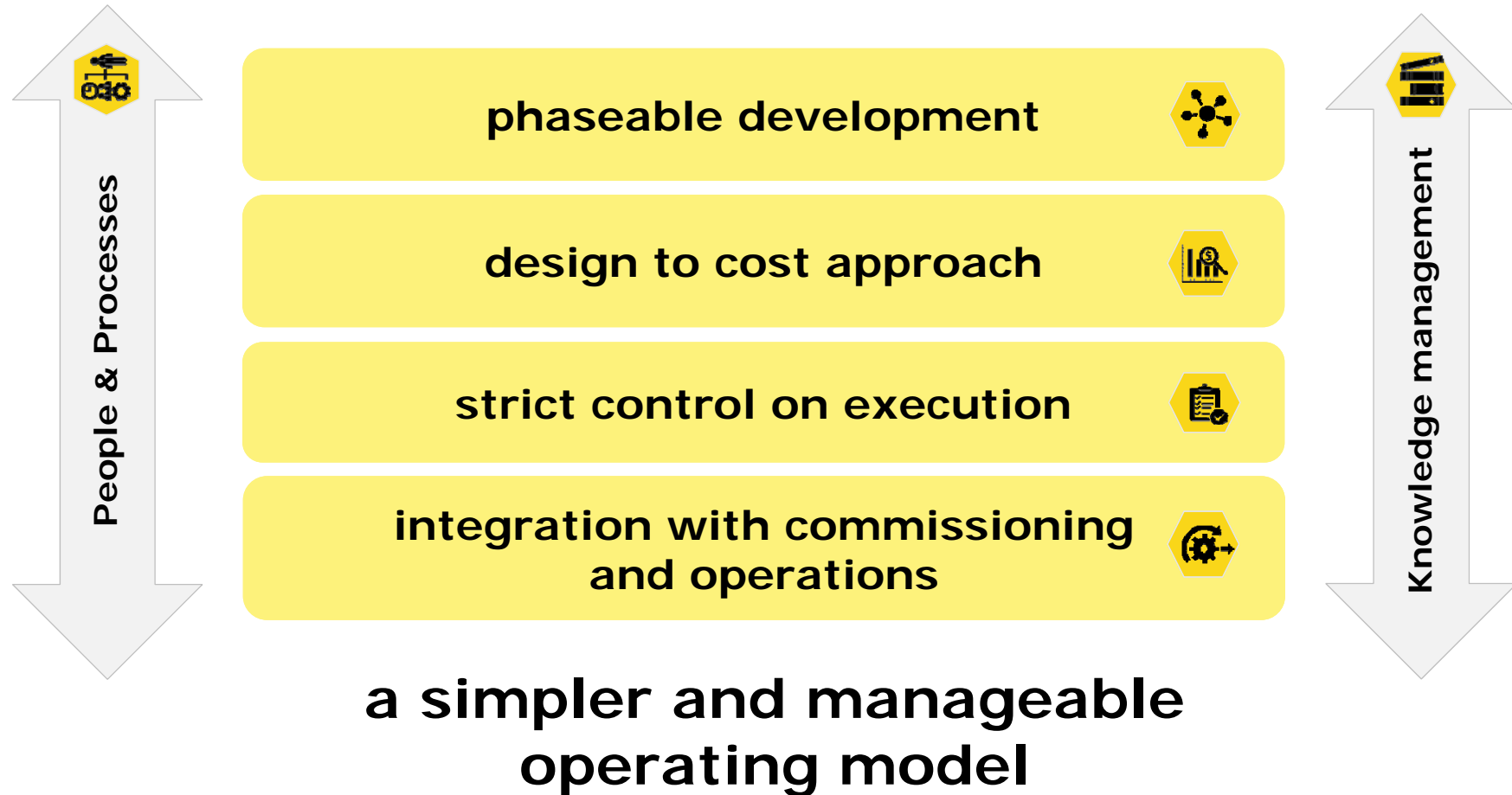
# Majors performance

Capex Upstream | Bln \$ vs O&G Production | Mln boe/g



# Our development model

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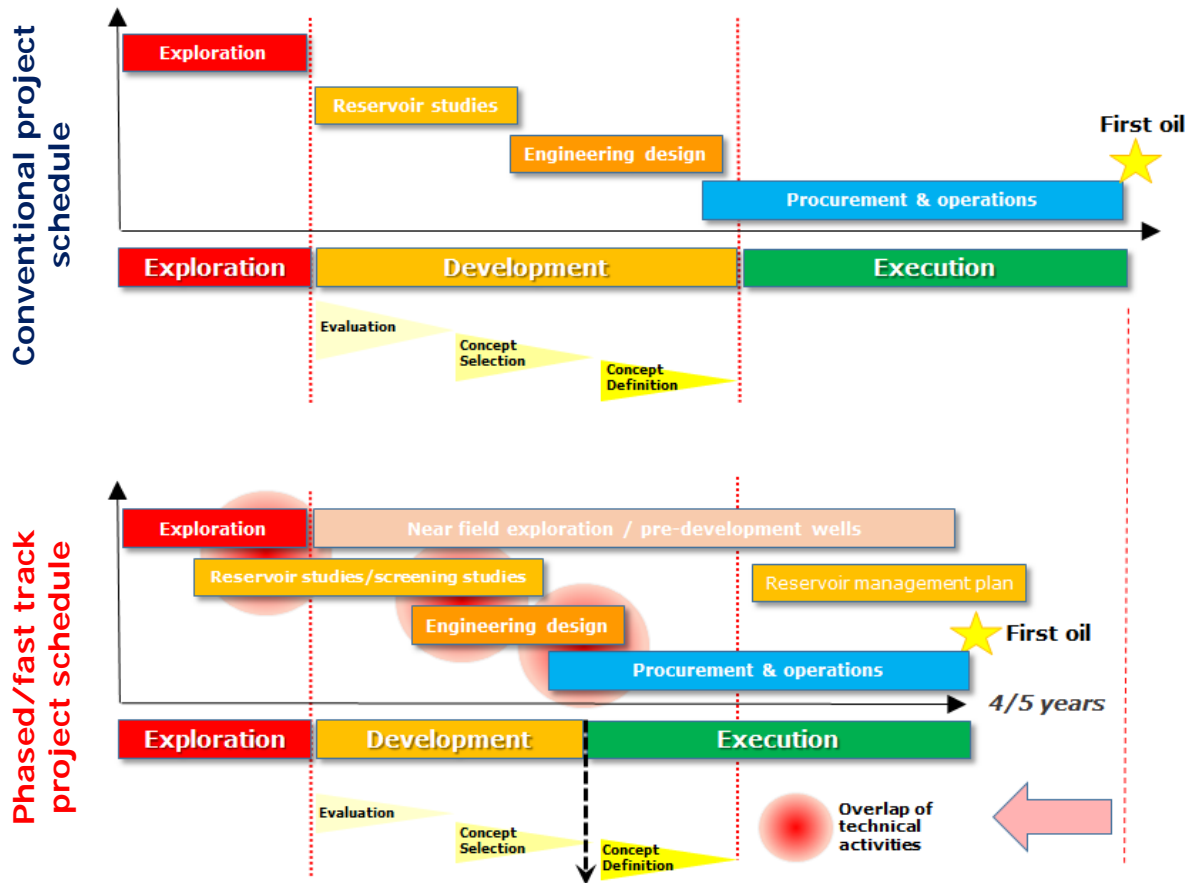


# Phaseable development: reservoir valorization and uncertainty quantification (1/3)



## Processes & Workflows

*quickly translating resources into reserves*



- Strong discipline **integration** from exploration to start-up: the reservoir key role
- Moving from a **sequential to a more parallel approach**
- **Project phasing** to reduce subsurface risks based on **subsurface uncertainty** quantification
- **3D reservoir models available before exploration well** for critical projects

Start pre-FID expenditures according with project phasing



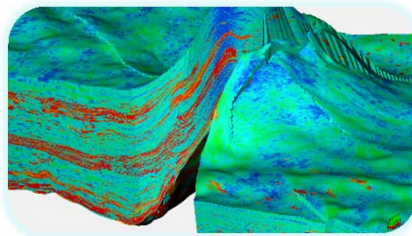
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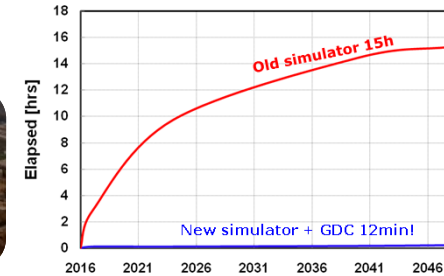
## Advanced tools & technologies *empowering people & promoting technical excellence*

- Deployment of **best in class simulation tools** to achieve **accuracy** (multi million cell models) and **speed** (from days to minutes)

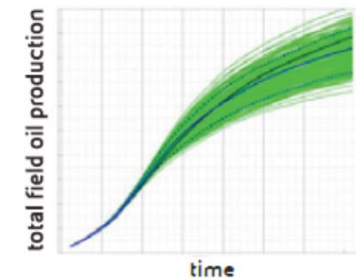
hundred million cell models



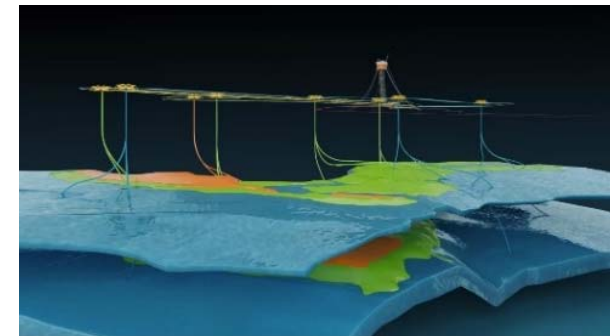
eni's HPC2  
(Green Data Center)



- Multiple models** to take into account **uncertainties and mitigate risks**



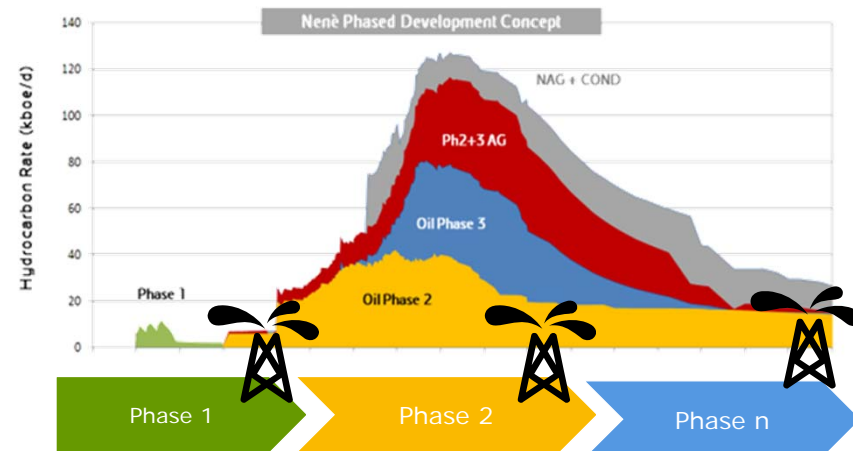
- Deployment of latest **technologies to improve production and recovery**
- Fully **integrated asset modelling** to take into account facility constraints
- New **competence hubs** for complex themes (advanced production optimisation, deepwater, tight, carbonates, EOR)





## improving time to market and project value accelerating start-up and ramp-up

- **phased/fast track vs conventional approach**
- capture **market opportunities** including **rental** and **synergy with available facilities**
- **Time-to-Market: ~6 yrs** (average)
- **champions:** West Hub (~6 yrs), Perla (~ 5 yrs), Nenè Ph 1 (~1yr)



## early engineering maturation of development concepts through competence hubs

- **engineering integrated model:** integration of **roles and responsibilities** among different engineering hubs
- **increase in flexibility** in evaluating cases and scenarios







## Design to cost approach



### capture available market opportunities

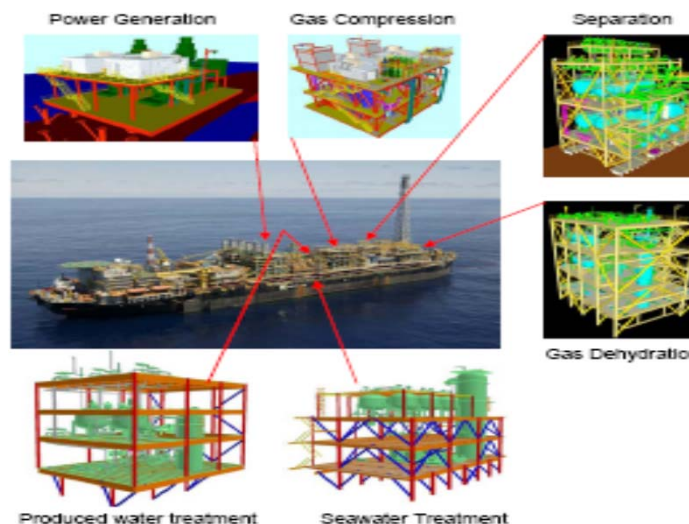
- Use of refurbished and/or rental options whenever possible
- Synergies with available facilities



### engineering modularization

**6 Modules** (cover >40% of offshore topsides)

- power generation
- gas compression
- separation
- gas dehydration
- produced water treatment
- sea water treatment



### enhance supply chain through framework agreements and long term commitment with key suppliers

- Agreements in place: 84



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# Strict control on execution



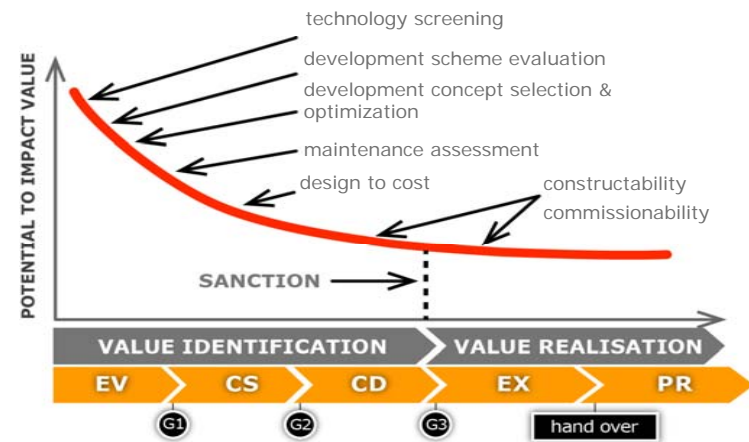
critical wells (DW, HP/HT, etc.) strictly monitored

authorities/partners early engagement

- early stakeholder engagement during pre-FID phases in order to timely assess and promptly answer to observations/change requests

design freeze

- introduction of new milestones:
  - freeze the design development concept before the FID
  - freeze technical requirements and expectation at early stage of detailed engineering design
  - FID after tender exercise



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## operational readiness

- **Training for operating personnel** from early project phases
- Dedicated **operational resources** deployed in the project team
- **Integrated commissioning team**
- **Contracting plan** for maintenance, logistic and service contracts available **before start-up**



## reservoir management plan

- Availability of dedicated **reservoir management plan before Gate 3**
- **Performance monitoring** and **reservoir study revision** within 1 year from production start-up





## organization and process improvements

- **organizational structure revision** to integrate the new business lines including upstream, downstream and midstream
- **workflows and processes revision** in order to make them simpler and effective for being deployed in all business lines (upstream, downstream and midstream)
- adhere to strict staffing discipline with dedicated centralized high level project staffing structure

## our people: the enabling factor

- excellence **competence hubs** in all core disciplines (engineering, reservoir, drilling...)
- **entrepreneurial skills** development through strong **professional families role**
- **competence sharing** - capture opportunities coming from a **fully integrated company**
- **dedicated training programmes**





# Knowledge management

## NEED

capitalize experience in the shortest time disseminating knowledge within the professional families at all levels

## TARGET

collectively embedding our knowledge in delivery towards performance excellence



effective process to centrally prioritize and validate Lesson Learned and Best Practices



clear communication and promote adoption



boost infrastructural projects to further improve performance



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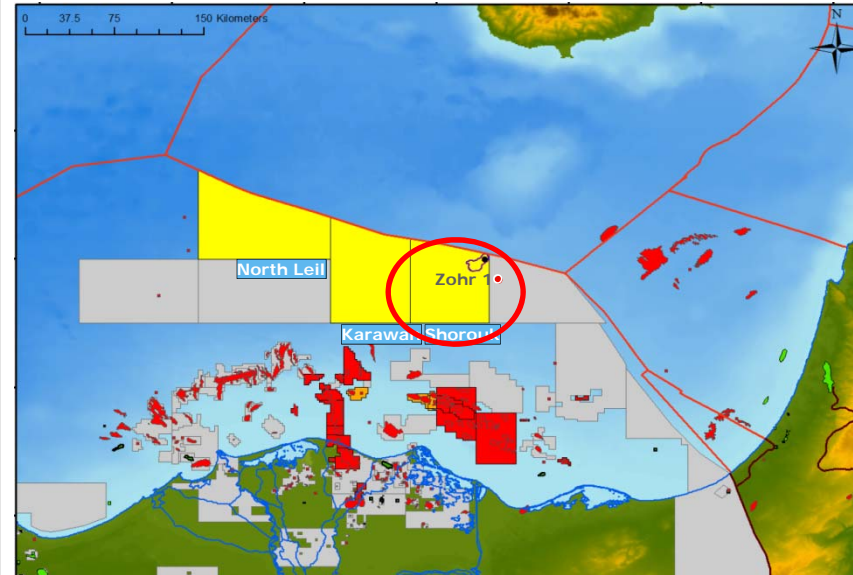
# Focus on Zohr

# Shorouk Block – Main Facts

## Key Facts

- Shorouk JV: **IEOC 100%**
- Basin: **Nile Delta DW**
- Water depth: **1,200- 1,700 m**
- Total Area: **3,752 km<sup>2</sup>**
- Awarded: **30<sup>th</sup> January 2014**
- Exploration periods: **3+3+2 years**
  - **First Expl. Period expiry date 29/01/2017**
  - **Min. work commitment: 2,650 km<sup>2</sup> 3D seismic (fulfilled), financial comm. 30M\$**
- **2,942 km<sup>2</sup> of 3D Seismic** acquired between June and July 2015
- First Commitment well originally foreseen in the 2<sup>nd</sup> exploration period (2017-2020) drilled with Saipem 10k drilling ship, **3 years ahead of schedule**
- Total Investment in the Block as of August 2015 **107 M\$**

## Shorouk Location



The Egyptian DW and UDW was extensively explored between 2006 and 2011 in the NEMED Block by the previous operator with a massive 2D/3D seismic campaign and the drilling of 9 exploration wells targeting the extension of the classical tertiary clastic play.

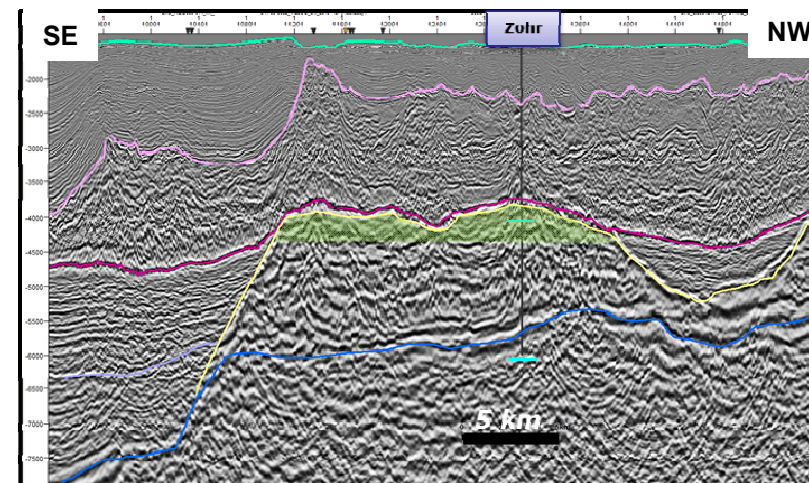
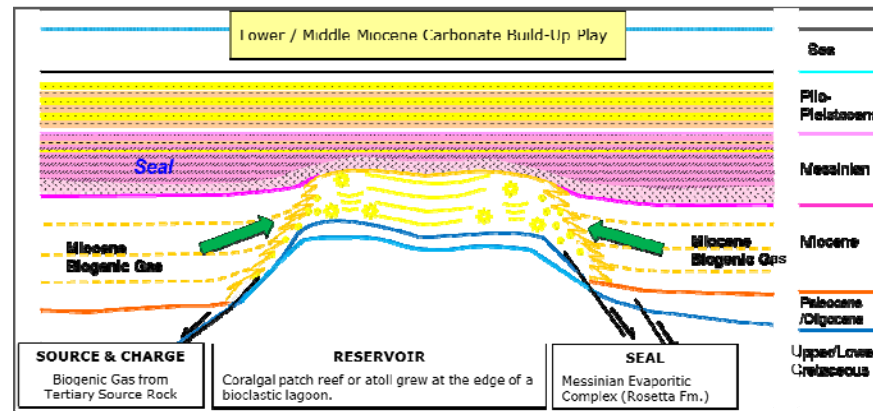
The play proved not to be commercial.

# An innovative geological model

## Exploration Highlights

- Zohr prospect: interpreted as a Lower - Middle Miocene Carbonate Build-Up potentially charged by Biogenic gas from Tertiary source rock and sealed by Messinian Evaporitic complex (Rosetta Formation)
- Completely innovative "Play" not considered in previous exploration campaigns in the Egyptian DW and UDW
- First test of the "Play" in Offshore Egypt and in the Mediterranean sea
- Eni developed "Zohr play concept" using its expertise in the successful exploration of similar plays in other basins (Perla Field in Venezuela, Kashagan Field in Kazakhstan)
- Promising seismic imaging of "Zohr High" was obtained through the use of proprietary seismic imaging technology that allowed to drill the NFW on re-processed aged 2D seismic Dataset
- New 3D seismic acquisition completed in July simultaneously with the well drilling; will be available timely for the appraisal Campaign

## Zohr Geological Model

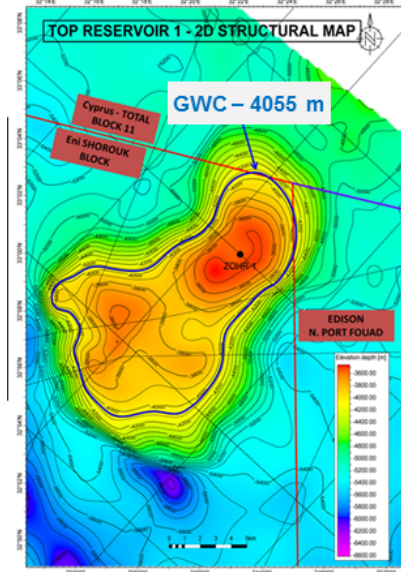


Source: IHS



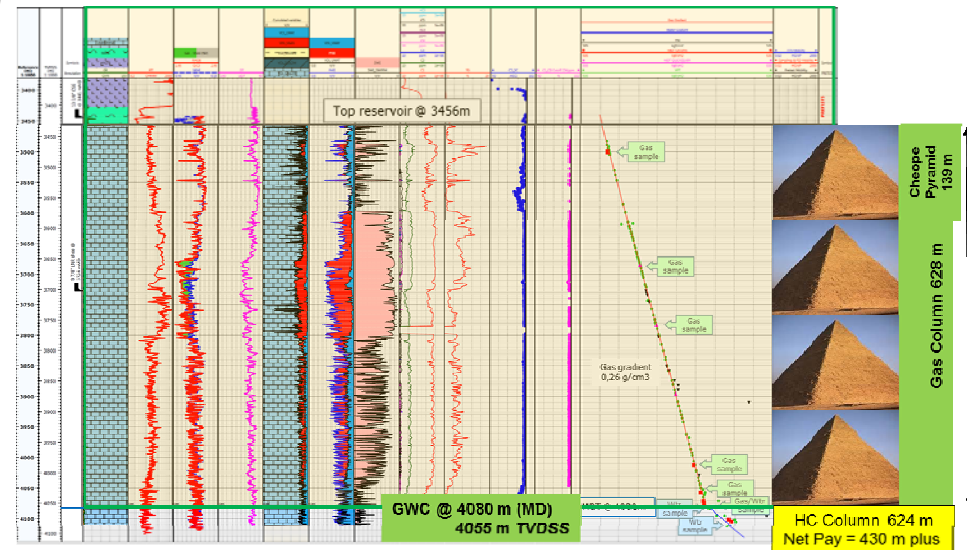
# Shorouk Block Exploration – Zohr 1 NFW – Main Results

## Exploration Highlights



- Giant/supergiant biogenic gas accumulation in Miocenic reef complex extending in excess of 100 sqkm in the DW of the Nile Delta at the border with the Cyprus waters
- Existing maps show that the whole gas accumulation is contained in Egyptian EEZ waters
- World Class Resource Base with reservoir potential preliminary estimated up to 30 Tcf GIIP

## Zohr Reservoir



- Miocene carbonatic reservoir with excellent petrophysical characteristic.
- 628 meters plus of Unique Hydrocarbon Column with 430 meters plus of net reservoir pay
- Reservoir fluid is a lean biogenic gas
- 2,700 mmscf/d for 20 year plateau



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# Goliat field



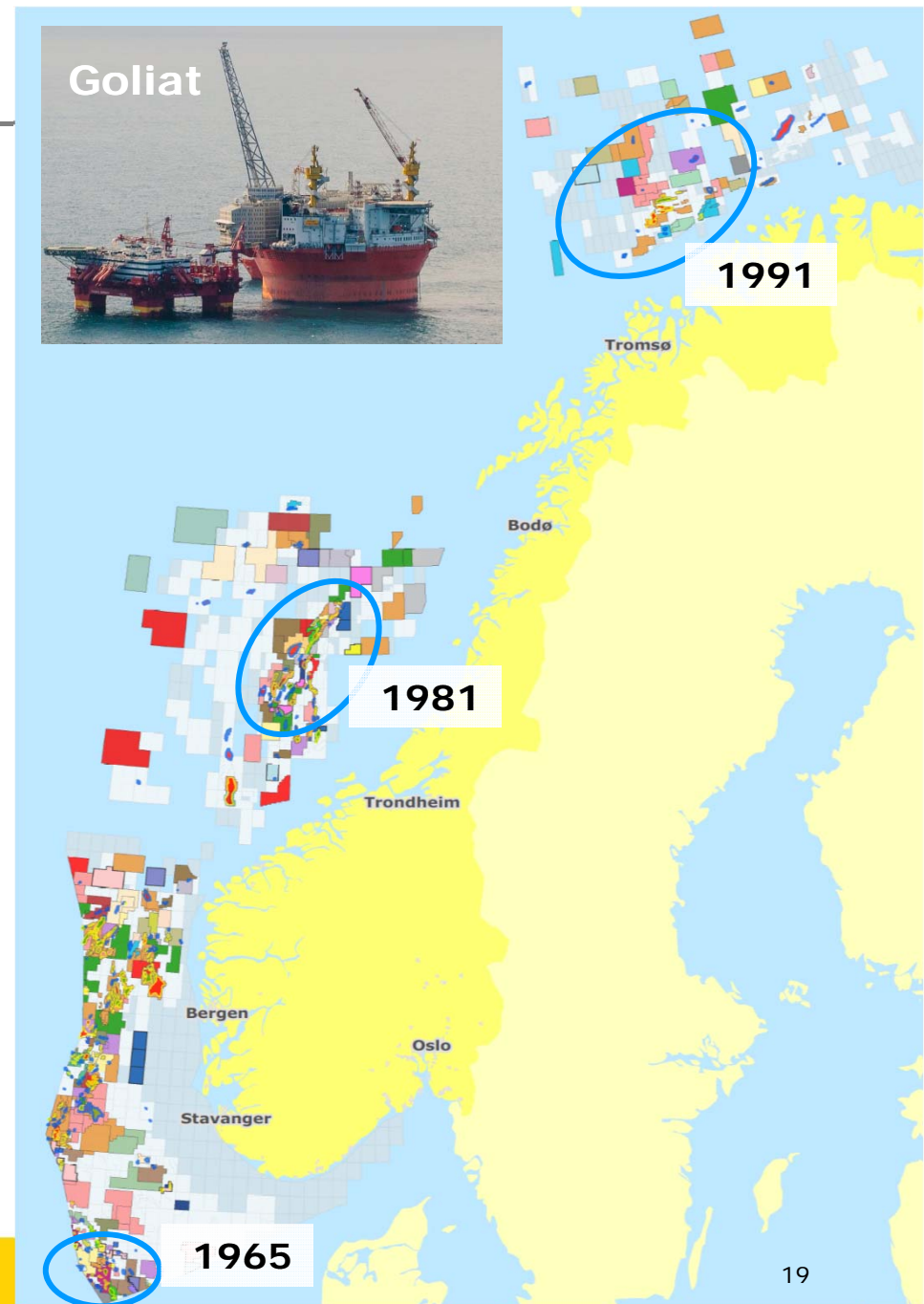
[eni.com](http://eni.com)

# Eni in Norway

- **Eni Norge established in 1965**
  - 4 years before Ekofisk discovery
- **Extensive shares in key assets**
  - North Sea: Ekofisk and Eldfisk
  - Norwegian Sea: Asgard area
- **Production of 110 kboed in 2015**
- **Offices in Stavanger and Hammerfest**
  - ca. 460 employees



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## eni in the Norwegian Barents Sea

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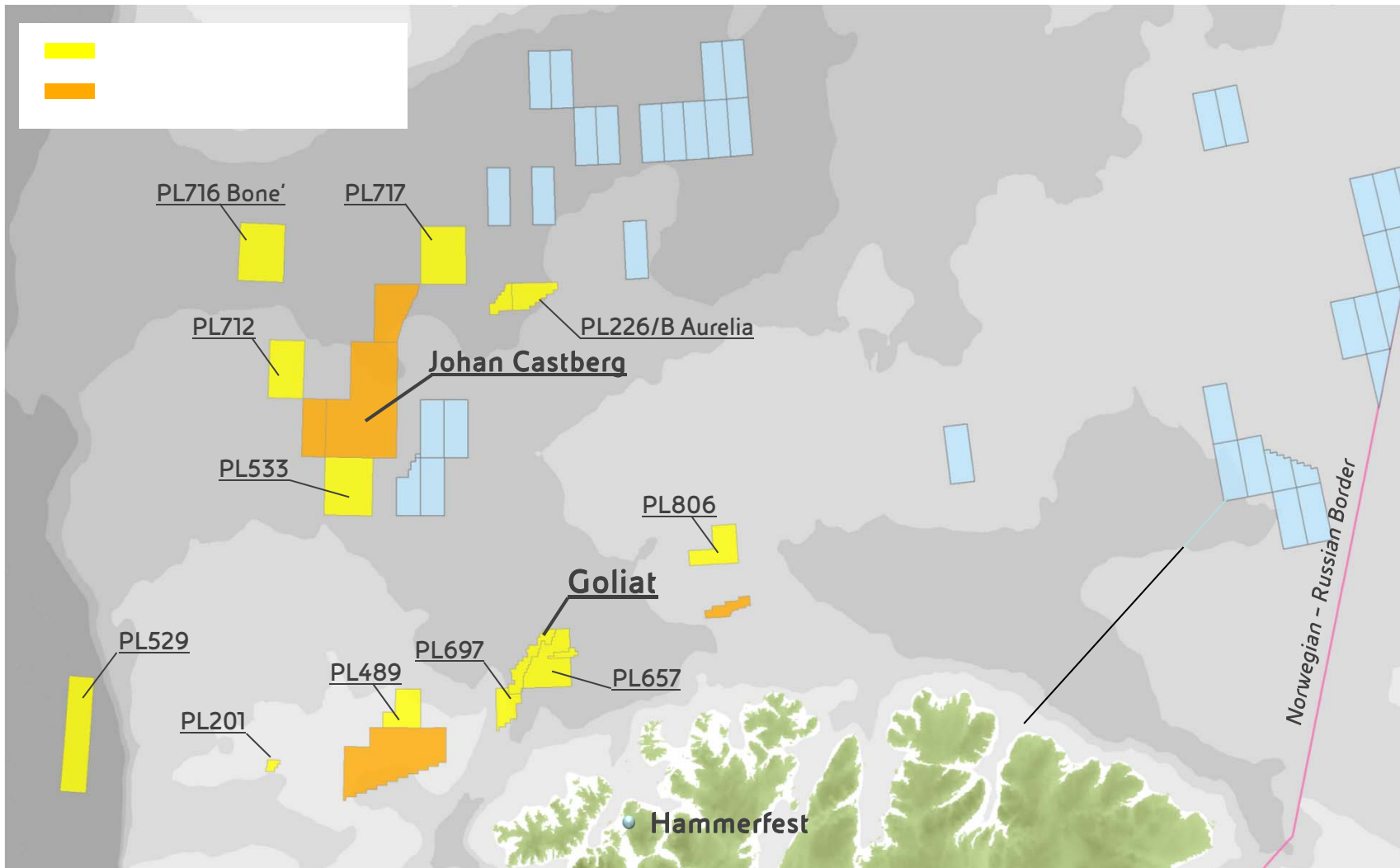
1980	Start of exploration drilling in Barents Sea
<b>1991</b>	<b>Beginning of eni activity in Barents Sea</b>
1997	Barents Sea Program: record 40 applications <i>award of PL 229 (Goliat) to eni as Operator</i>
2000	Goliat discovery well
2001-07	Further explo/appraisal: resource growth
2009	Goliat PDO approved by Norwegian Parliament
2011-12	Skrugard & Havis (Johan Castberg) discovered
2015	Goliat production starting

**23** (11 operated) **expl. wells drilled from 1991 to 2015**

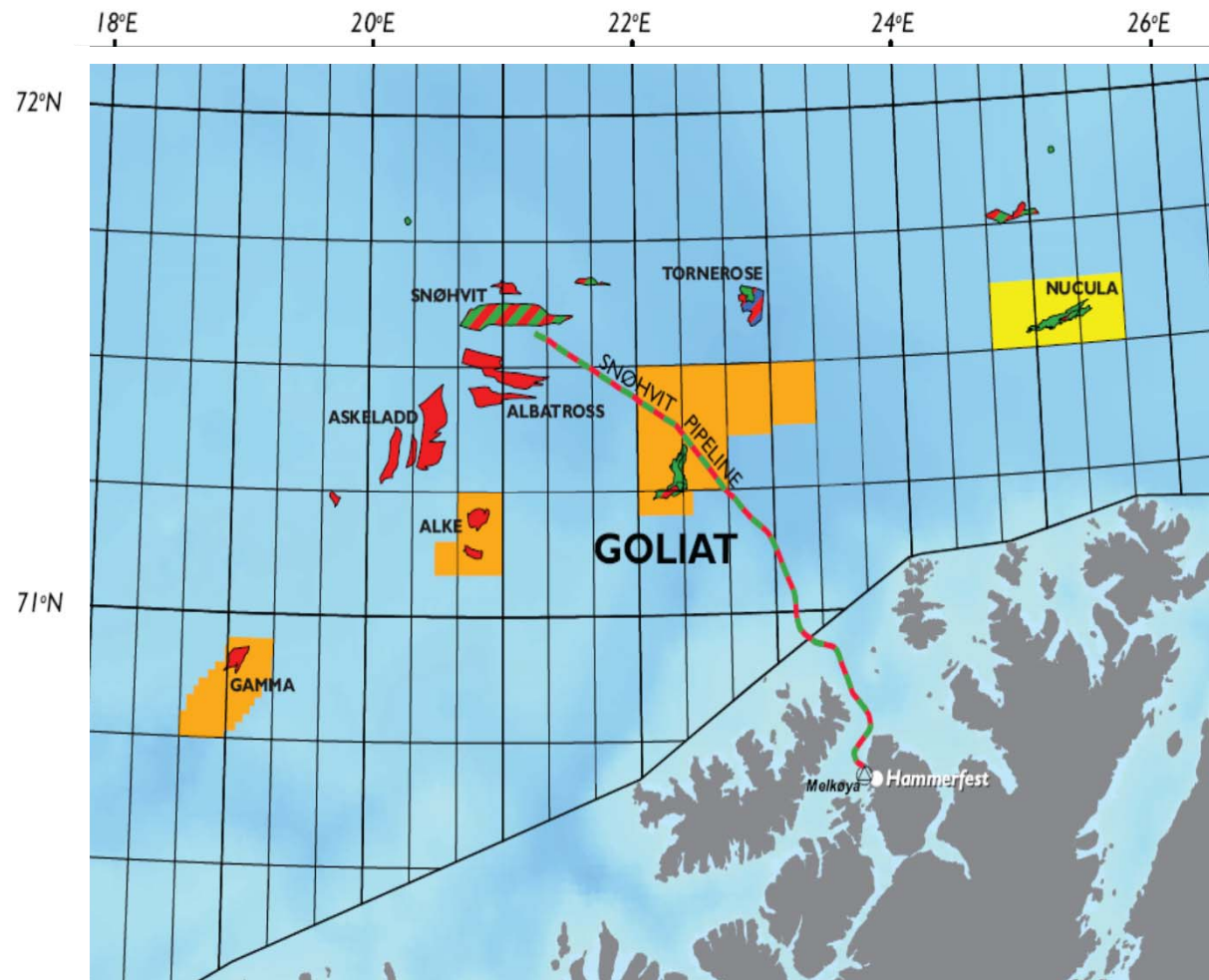
**6** (5 operated) **expl. wells planned in 2016-2019**



# eni licenses in the Barents Sea



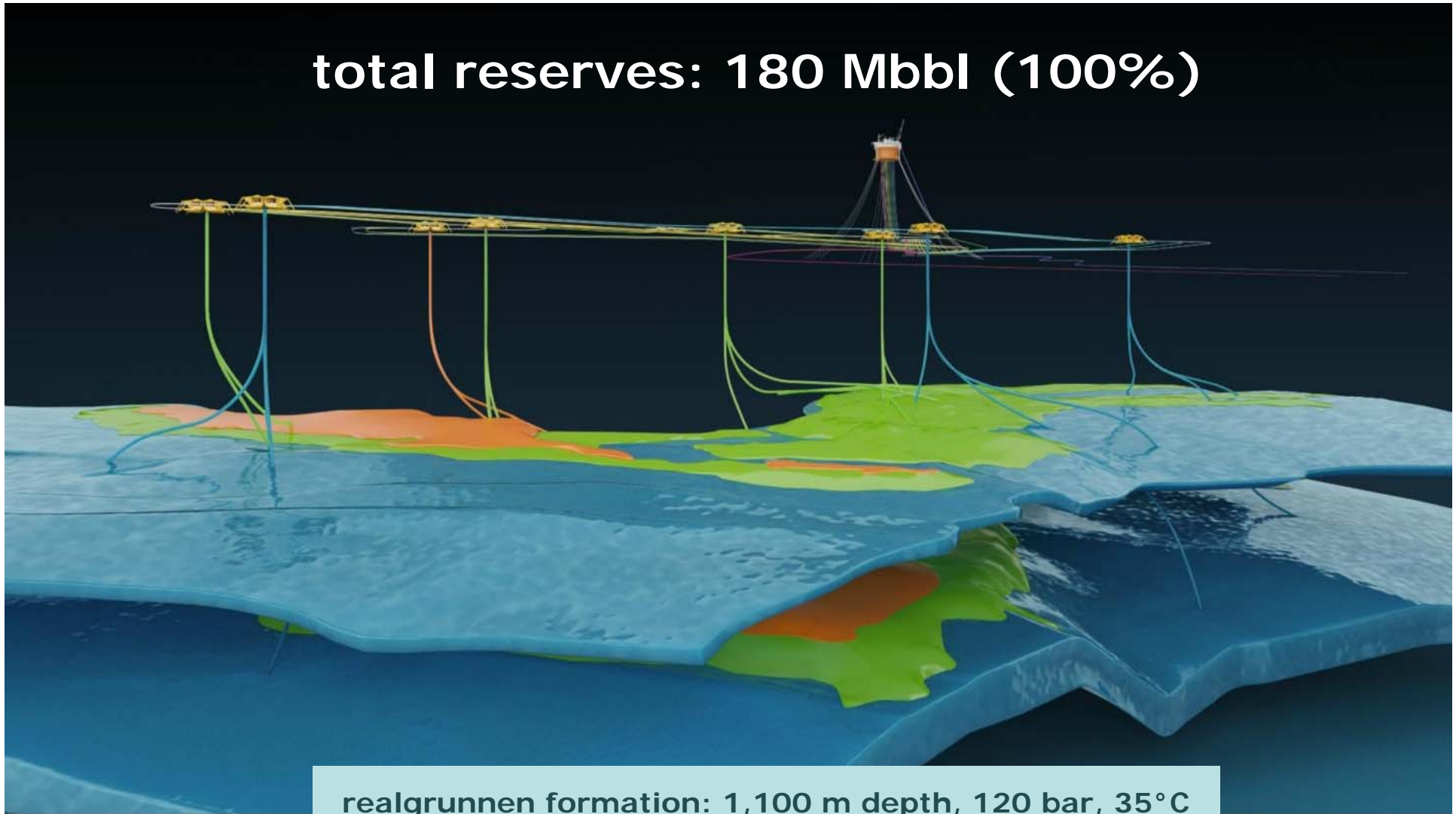
# The Goliat project



- **Goliat license:**  
PL229, eni 65% (operator), Statoil 35%
- **80km from shore**
- **ice-free area,**  
south of the 10°C summer isotherm
- **closest port:**  
Hammerfest,  
already hosting the Snøhvit LNG plant

# Goliat Reservoir

**total reserves: 180 Mbbbl (100%)**



realgrunnen formation: 1,100 m depth, 120 bar, 35°C  
kobbe formation: 1,800 m depth, 190 bar, 50°C



# Goliat field layout

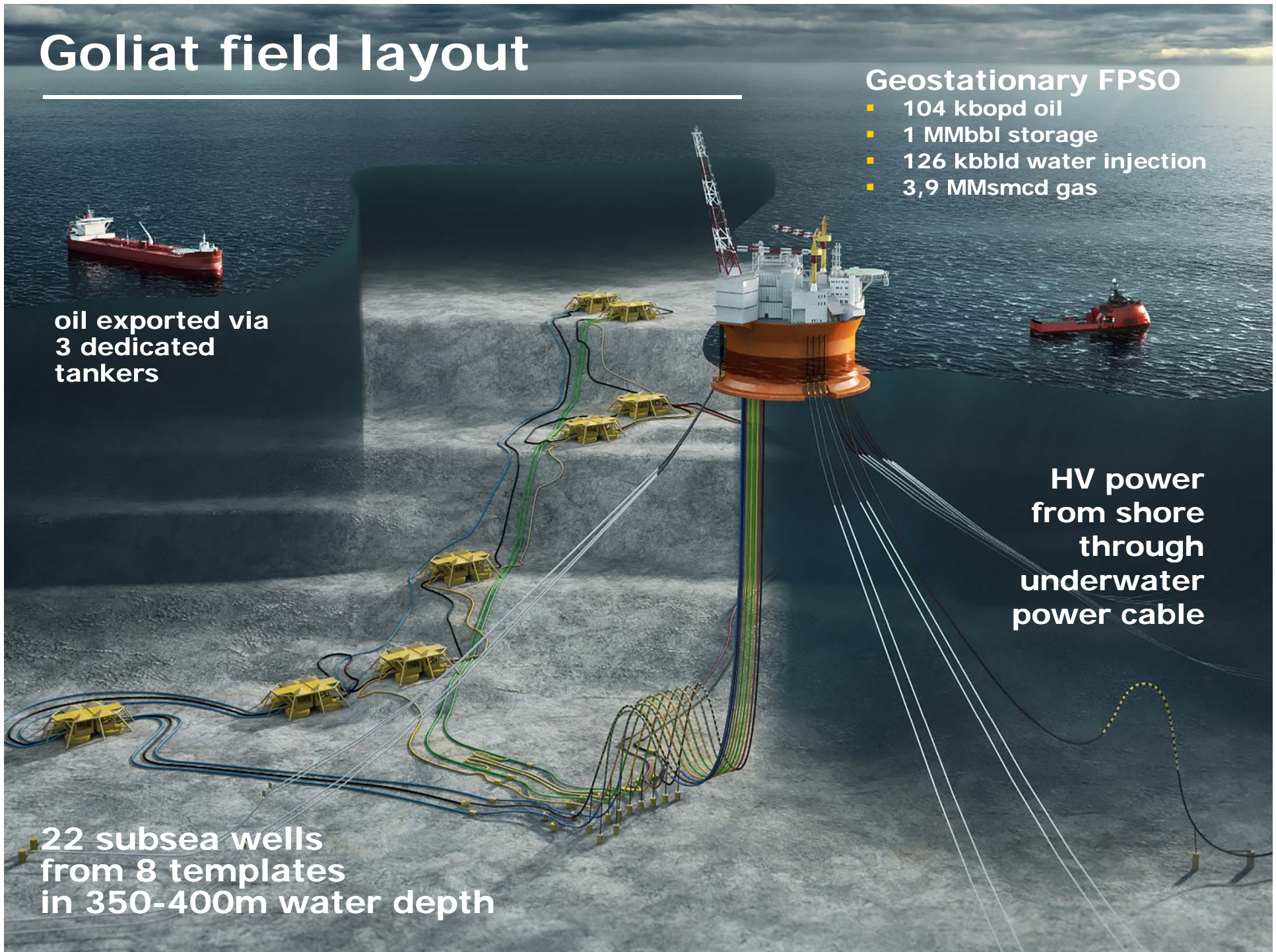
## Geostationary FPSO

- 104 kbopd oil
- 1 MMbbl storage
- 126 kbbl/d water injection
- 3,9 MMsmcd gas

oil exported via  
3 dedicated  
tankers

HV power  
from shore  
through  
underwater  
power cable

22 subsea wells  
from 8 templates  
in 350-400m water depth





# Drilling

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## Subsea work installation examples

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### Laydown of power cable (2014)

- 105 km
- AC at 110 kV, 75 MW
- 6,000 tonnes

### Laydown of suction anchors (2013)

- Diameter 7m, height 15,5 m
- Weight 155 tonnes
- Bottom Chain: 156 mm



# the Goliat FPSO

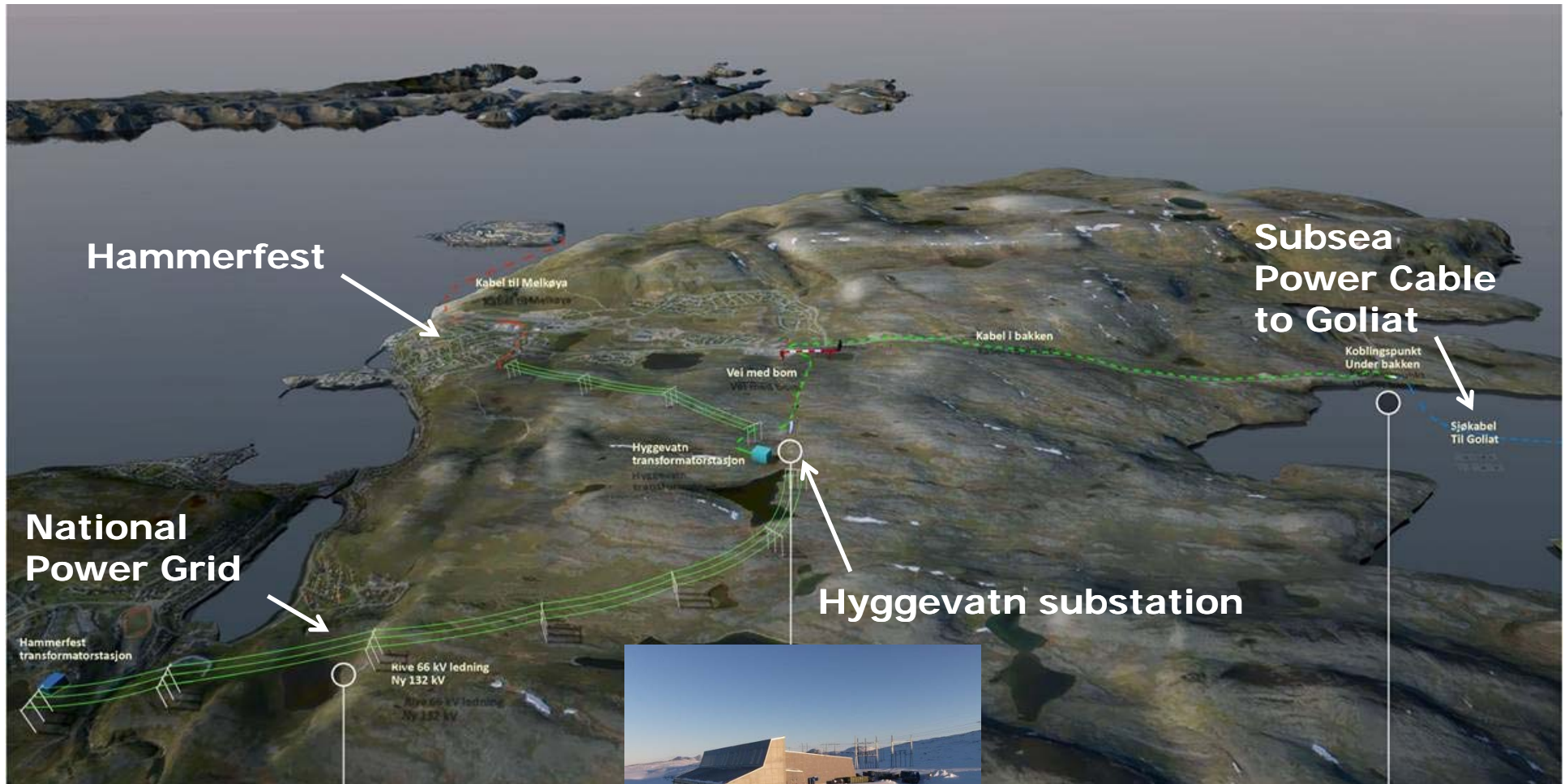


- largest cylindrical FPSO in the world
- 64000 tons, 115m wide, 100m tall
- built in Hyundai Offshore yards in Ulsan, Korea
- transported to Hammerfest with Dockwise Vanguard (15,600nm, 63 days)

# Offshore activities since arrival in Hammerfest



# Power from shore: 50% reduction of CO2 emissions



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# Oil spill preparedness: risk reduction and monitoring



eni

# Oil spill preparedness: involvement of local fishing community



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## Goliat firsts

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- **First oil project in the Barents Sea**
- **Northernmost offshore production facility in the world**
- **Largest cylindrical FPSO in the world, fully winterized**
- **Longest subsea power cable to offshore installation**  
(75MW cable, 110 km)
- **Minimal impact on environment**
  - reinjection of produced water into reservoir
  - no gas flaring
- **New technology for Offloading System:**
  - offloading hose reeled-out and in at each oil export operation
  - dedicated shuttle tankers (DP3, winterized)
- **Extensive provisions for operations in Polar Night**
- **A reference case in Norway for oil spill preparedness**
- **A reference case in Norway for sustainability and collaboration with hosting territory («ripple effects»)**