



Apache Energy Limited (Apache), on behalf of the Van Gogh joint venture participants, is proposing to develop an oilfield, known as Van Gogh, off the Exmouth coast.

This fact sheet provides at-a-glance technical information about the Van Gogh Field Development.

Van Gogh Location

- Exploration permit WA-155-P(1) - Apache will seek approval for a production licence.
- Exmouth Sub-basin (Commonwealth waters), part of the Carnarvon Basin on the North West Shelf (NWS).
- Water depth in development area varies between 340 – 370 m.
- 30 km from Ningaloo Marine Park boundary.
- 35 km from Muiron Islands Marine Management Area.
- 42 km from Muiron Island South.
- 45 km from Ningaloo Reef proper.
- 45 km NNW from North West Cape.
- 53 km NNW from Exmouth.

Development Cost

- Construction costs over AUD \$1 billion.

Drilling

- Using the 'Stena Clyde' semi-submersible drill rig.
- Drilling of nine dual lateral wells and one single well, two water injection wells and one gas injection well from two drill centres.
- Drilling fluid proposed is water-based mud (WBM) – minimal environmental impact.
- Long horizontal well laterals of ~ 1,500 m are planned to ensure adequate drainage of the reservoir to maximise recovery rates.
- Wells to have sand screen liners (to prevent sand accumulation in the Separators on the FPSO)
- Installation of well heads (well control valving).
- Drilling to take a year (estimated 363 days)

Installation Activities

- Installation of two subsea manifolds (manifolds #1 and #2 over the two drill centres), connecting all the production well heads to the manifolds.
- Installation of anchors for the disconnectable turret mooring (DTM). Nine anchors each 15 tonne high holding power stevshark each rated at 400 tonne holding capacity.
- Installation of two corrosion resistant alloy (CRA) flexible crude product flowlines between the two manifolds and the turret (technically flowlines end on seabed, then risers connect to turret).

- Installation of a flexible CRA gas injection flowline between the two manifolds and the turret.
- Installation of a CRA flexible water flowline between the turret and manifold #1.
- Installation of electrical and hydraulic umbilicals (small bore pipe) between the two manifolds and the turret.
- Connection of CRA risers from the base of the ends of the flowlines to near the sea surface.
- Hook-up of a floating production, storage and offtake (FPSO) vessel to the DTM. The FPSO will be a converted oil tanker.
- Construction activities to take an estimated 90 days

Operations

- Production fluids will be gathered via subsea production manifolds delivering produced fluids into dual 254 mm (10") production flowlines and dynamic risers.
- Reservoir pressure maintenance will be achieved by gas injection. Gas lift will be provided to each well to assist with the recovery of production fluids.
- Subsea and well facilities will be designed for a 20 year life.
- Dual flexible flowlines and risers will transport production fluids from the subsea manifolds to the FPSO turret manifold.
- Additional flexible flowlines will provide for water injection and gas injection/gas lift services.
- The development is expected to have a production life of about 12-15 years.
- Initial peak daily production of 10,000 kL/day (63,000 bbls/day)
- 25,000 ML (160 MMbbl) of oil in place in the reservoir
- All process treatment of the production fluids will occur onboard the FPSO. The topsides facilities will process reservoir fluids to export quality specifications for storage and offloading, produced water for re-injection into the subsea aquifer and gas for fuel and re-injection into the reservoir.
- Gas re-injection and gas lift will be via a bi-directional 203 mm (8") flowline and 254 mm (10") riser.
- Water re-injection will be via a 254 mm (10") flowline and riser to the first water injector well.
- Produced formation water (PFW) will be injected back to the reservoir for most of the operating time (aiming for ~90% of the operating time under normal operating conditions).
- Surplus gas will be routinely re-injected to the reservoir (~ 90% of the operating time under normal operating conditions), except during commissioning, process upsets, production re-starts and planned maintenance, where some flaring may be necessary.
- Crude oil will be exported from the FPSO to an offloading tanker about once every 6-10 days initially, decreasing in frequency as the field production declines.
- Injection of scale inhibitor in sub-sea well trees, demulsifier in manifolds points and methanol on start-up. Biocide injected into sea chest on FPSO.
- Decommissioning will occur at the end of the project life, in line with decommissioning standards of the day.

Operations Summary

Element	Capacity
Total fluids processing capacity/day	23,840 kl/d (150,000 bpd)
Oil processing capacity/day	10,000 kl/d (63,000 bpd)
Oil storage: at 100% capacity	103,000 m ³ (649,883 bbls)
Total slops capacity (at 100%)	8,257 m ³ (51,930 bbls)
PFW re-injection/day	23,840 kl/d (150,000 bpd)
Total gas re-injection/day	2,265 ksm ³ /d (80 MMSCFD)
Total gas lift capacity/day	850 ksm ³ /d (30 MMSCFD) (included in total gas re-injection rate)

FPSO Specifications

- Classed requirements certified by independent 3rd party (Lloyds Register)
- "Aframax" size trading tanker ("Kudam") which will be converted into an FPSO in Singapore or South American shipyard
- Originally built in 1981
- Length 244m, Breadth 41.6m with a maximum draft of 15.276m
- Deadweight Tonnage once converted will be 101,603 tonnes (Fully Loaded)
- Six storage cargo tanks, one void tank (for DTM), 2 slops tanks and 18 segregated ballast tanks
- The FPSO vessel, with a double-sided hull (but no double bottom), will receive reservoir fluids (oil and water) and associated gas.
- Production will be in the order of 23.8 ML (150,000 bbls) fluid per day.
- The FPSO will be designed for a 15 year life period without docking, commencing at the time of sail away from the conversion shipyard.
- The DTM will hold the FPSO on location, and allow it to disconnect and sail away to safe harbour prior to the onset of a cyclone or other adverse weather. It has been designed to allow the FPSO to weathervane.
- Topsides include transfer hose and hawser reels; accommodation and helideck; steam boilers, turbines and generators; overside crane and laydown area; chemical storage; gas compression; hydrocarbon separation and stabilisation; dehydration; flare knock out drums; high and low pressure flare; inert gas vents; DTM; anchor equipment
- Corrosion systems include painting systems, anodes and impressed current systems
- Accommodation for 40 person. Normal operational crew numbers are 26 persons
- Helideck able to take a Sikorsky S-92
- Combination of fresh water and sea water cooling systems
- Primary fuel is treated natural gas for power generation, compressors and main topside engines. Diesel used for main vessel engine, shipping pumps and emergency power generator
- Onboard sewage treatment plant to handle black and grey water
- Evaporators to treat salt water to produce potable water
- Two 100% capacity totally enclosed self propelled lifeboats on each side of the vessel as well as life rafts (2 x 100%) and a 6 man fast rescue boat
- Fire and gas detection, fusible loop fire detection and deluge piping for fire safety

Other Exmouth Sub-basin Operators

Proponent/ Operator	Project	Permit Area	Status	Distance from Van Gogh pool
BHP Billiton	Griffin oil and gas project	WA-10-L	Producing since 1994	70 km northeast
	Stybarrow Field Development	WA-255-P(2)	Under development	25 km west-southwest
	Pyrenees Development	WA-12-R	Under review	11 km east-southeast
Woodside	Laverda and Vincent Field Development	WA-28-L	Under development	4 km southwest
	Enfield Oil Development	WA-28-L	Producing since 2006	10 km southwest

Van Gogh Oil Properties

Parameter	Theo-1 Oil Sample
Reservoir temperature (C)	65
Oil surface gravity: Deg API grams/cm ³	17.0
	0.953
Flash point (C)	>100
Pour point (C)	-15
Wax content (% weight)	0.0
H ₂ S content	0-200 ppm
CO ₂ content	1.8 mole %

Project Schedule

- April 2007 – ongoing Comm. Consultation
- May – June 2007 Exploration Drilling (Theo-2H & -3H)
- July 2007 Submission of Draft PER
- July/Aug/Sep 2007 Drilling
- April 2008 Expect Govt. Env. Approval
- Sept-Dec 2008 Installation
- Jan – Feb 2009 Commissioning
- March 2009 First Oil Production

Van Gogh Environmental Approvals

- Appraisal drilling referral submitted to the Commonwealth Department of Environment and Water Resources (DEW) November 2006 - declared 'not a controlled action' in December 2006.
- FPSO development (excluding drilling) referral submitted to DEWR January 2007 - declared 'controlled action' in January 2007. Triggered potential impacts to Commonwealth threatened species, marine area, and migratory species.
- Preliminary information submitted to DEWR February 2007 – triggers decision on level of environmental assessment.

- DEW determined level of assessment as a Public Environment Report (PER) in May 2007.
- Currently waiting on PER draft guidelines (expected late May 2007).
- Drilling Environment Plan (EP) currently in preparation. Anticipate submission to the WA Department of Industry and Resources (DoIR) in June 2007.
- Draft PER currently in preparation. It will be available for public comment once published, anticipated for Q3 2007.
- Apache NWS Oil Spill Contingency Plan will be update prior to operations.

Van Gogh Environmental Studies

Study	Consultant	Status	Results
Drill cuttings & muds modelling (preliminary)	Asia-Pacific Applied Science Associates (APASA)	Completed – Dec 2006	WBM will disperse widely with prevailing currents. Heavier cuttings will accumulate close to drill locations
Bathymetry	TriSurv Geomatics	Completed – Jan 2007	Gently sloping seabed
Geomorphology	Benthic Geotech	Completed – Feb 2007	Seabed suitable for proposed anchors
Benthic sampling	Benthic Geotech/ Enesar Consulting	Completed – Feb 2007	Benthic infauna abundance is low, richness is high
Seabed ROV	iTech ⁷ / Enesar Consulting	Completed – Feb 2007	All sandy seabed, no reef, no species of concern noted
Oil weathering	Leeder Consulting	Underway	N/A
Oil spill, drill cuttings, drill muds, PFW dispersion	Global Environmental Modelling Systems (GEMS)	Underway	Preliminary information suggests <1% risk of any oil spill reaching shorelines
Leak frequency assessment – subsea and topsides	Vanguard Solutions	Subsea completed – May 2007 Topsides - underway	Major potential leak locations are production wellheads, oil flowlines and gas injection well. Very low likelihood of leaks
Visual assessment	Yet to be appointed	N/A	N/A
Underwater noise	To be determined	N/A	N/A

Van Gogh Environmental Specifications

- All PFW will be re-injected below the seabed, except during commissioning, process upsets, production re-starts and planned maintenance, where some overboard discharge will be necessary. Discharge will meet legislative requirements of < 30 ppm oil-in-water content.
- All natural gas extracted will be re-injected below the seabed, except for that used for fuel, and except during commissioning, process upsets, production re-starts and planned maintenance, where some flaring may be necessary.
- Gas re-injection minimises greenhouse gas (GHG) emissions by reducing emissions of nitrous oxides (NOx) and sulphur oxides (SOx), which are more damaging than carbon dioxide (CO₂).
- The FPSO is not likely to be clearly visible from coastline.
- The FPSO will have a double-sided hull.
- Drainage system will be separated into clean and contaminated streams. Contaminated stream will be cleaned prior to discharge.
- Ballast water tanks to be segregated from fuel and crude oil to avoid risk of contamination.
- Ballast water will be exchanged in deep Commonwealth waters in line with AQIS requirements.
- Annual reporting for facility re:
 - GHG emissions.
 - National Pollution Inventory (NPI) substances (up to 90 chemical substances).
 - Energy Efficiency.
 - Achievements measured against Operations EP.

More Information

For more information about Apache's activities in the region, please contact:

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