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SA OPERATIONS

GENERATING CLEAN ENERGY

BEATRIX METHANE CAPTURE AND DESTRUCTION PROJECT

FACT SHEET 2020

Sibanye-Stillwater's Beatrix operation, a deep-level gold mine in the Free State province of South Africa, intersects natural methane from underground sources as a result of its mining activities.

The methane is liberated into the underground mining haulages, working areas and general underground environment.

One tonne of methane has an equivalent greenhouse gas effect of 23 tonnes of carbon dioxide. In other words, on a tonne-for-tonne basis, the Global Warming Potential [1] (GWP) of methane is 23 while the GWP of CO_2 is 1. This means that the greenhouse effect of methane (i.e. the impact of methane on climate change) is 23 times worse than that of carbon dioxide.

A project to remove methane from underground workings was commissioned in June 2011 and has the capacity to extract and flare (on surface) 400 litres per second of methane gas (from identified sealed-off working areas) sourced from the Beatrix South section as well as from five surface exploration boreholes off the mine property.

Electricity generation (with an installed capacity of 1MW) from extracted mine methane not only destroys the methane, it also serves to reduce our relative carbon emissions from purchased electricity as the methane-generated electricity is consumed by the mine and proportionally displaces electricity purchased from Eskom, which primarily uses coal-fired power stations. In other words, while both methane and coal are carbon-based fuels, methane is a cleaner-burning fuel than coal and therefore produces relatively less carbon emissions when used to generate electricity.

"Harnessing methane to generate electricity"

[1] *The Global Warming Potential (GWP) is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide. The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period.*

Registration of the project

The Beatrix methane project was registered under the Verified Carbon Standard (VCS), formerly Voluntary Carbon Standard, in 2011. This VCS registration was an interim measure until the registration under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC) could be implemented.

Project registration under the CDM came into effect from 1 July 2011. In 2013, the project was extended to include generators that would use the extracted methane as a fuel source to produce electricity.

During the initial registration period, the project earned 9,643 verified carbon units (VCUs). The VCUs were held in a Markit Registry account and transferred to the VCU buyer's account on 7 November 2013. Sibanye-Stillwater received payment for the 9,643 VCUs on 13 November 2013.

The certified carbon credits from the Beatrix methane project are destined for sale and transfer to Mercuria Energy Trading SA, an energy trading company, in accordance with a purchase agreement that is in place. A second option, however, is to use the carbon credits in a South African carbon tax offset scheme. Investigations in this regard are underway and are expected to be concluded in 2021.

The project was not renewed as a CDM project post 30 June 2018 following uncertainty in the global carbon market. Notwithstanding this fact, methane-generated electricity continues to be produced by the project and consumed by the mine proportionally displacing electricity purchased from Eskom.

During 2019 and 2020, 2,964,238 normal cubic metres (Nm^3) of methane from the Beatrix South sealed-off section was removed. This generated approximately 3,747MWh and 2,157MWh of electricity respectively. Any excess methane not consumed by the electricity generators was combusted by the backup flare. In 2020, 1,096,326 normal cubic metres of methane was destroyed (2019: 1,867,911), resulting in 19,938 tonnes CO_2e emissions being averted. This emissions reduction is equivalent to approximately 10,923 tonnes of coal not being combusted. Cumulatively, from the inception of the project in 2011 to end 2020, a total of 416,853 tCO_2e has been averted, equating to 228,372 tonnes of coal not being combusted.

Terminology

- The Verified Carbon Standard (VCS) is a standard for certifying carbon emission reductions
- Verified carbon units (VCU) represents one tonne of carbon dioxide equivalent (CO_2e) emissions reduced
- Markit Registry allows its account holders to manage all their global carbon, water and biodiversity credits in a central financial markets-based registry system. It manages environmental portfolios and supports existing and emerging environmental programmes and markets.

METHANE is a colourless, odourless, potent greenhouse gas, which contributes to global warming and climate change at a rate 23 times higher than carbon dioxide. It cannot be detected without special electronic equipment.

Unlocked during mining activities and transported by air from sources deep underground, it is extremely dangerous as it is highly explosive and can displace oxygen so that people exposed to it are prone to suffocation.

A methane management system has been developed at Beatrix to control this risk. The mine standard requires a minimum of two flammable gas detection instruments at each stope panel and there must be at least one instrument at each development end when work is underway.

Beatrix mining units 1 and 2 have an installed telemetry system with strategically placed flammable gas and velocity sensors, critical fans and carbon monoxide sensors. Environmental conditions are monitored on a 24-hour basis in the central control room at mining unit 1, located at Beatrix 3 shaft. Clear call-out procedures are followed in the event of an emergency.

Where elevated concentrations of flammable gas are constantly present in the general atmosphere, a location is declared hazardous, based on the results of risk assessments. Hazardous locations require special operating conditions, such as explosion-protected apparatus, telemetry monitoring, strict adherence to mine standards and awareness training for all employees. A hazardous locations meeting is held monthly, involving all related disciplines, such as mining, engineering and environmental engineering to ensure that the risk of a flammable gas ignition is managed.

To ensure proper supervision at all working places, the mine has developed a workplace management system: documents with special instructions, hazard identification, risk assessments, Department of Mineral Resources and Energy recommendations, a flammable gas register and hand-over notes are stored in the mine overseers' offices. The system is also used during the induction of new employees or when people are moved from one mining section to another.

In addition to flammable gas induction training, the mine has regular safety awareness sessions, such as safety news flashes which highlight any related incidents and lessons learnt and special awareness drives, including the methane awareness month in May each year and the monthly Methane Emergency Preparedness Safety and Health (MESH) days where specific methane safety-related topics are discussed. These are general awareness days that involve all mine employees.

CARBON CREDITS

While it was registered as a CDM project, the period for which extended from 1 July 2011 to 30 June 2018, the Beatrix Methane Project accrued 289,246 carbon credits (alternatively known as Certified Emissions Reductions – CERs). These were achieved by generating electricity from mine methane using a 1MW installed capacity generating plant, as well as through flaring. Some 31% of the CERs, totalling 89,246 credits, have been independently verified, with the verification of the remaining 69%, totalling 200,000 CERs currently underway.

The volume of methane gas destroyed between 1 July 2011 and 31 December 2018 was approximately 13 million cubic metres. During this period, a total of 214,383t CO_2e emissions was also averted. This is equivalent to a reduction of 725,000 tonnes of coal being combusted. The carbon credits/CERs accrued during this period have been split into three batches for verification purposes. The first two batches of carbon credits have been verified. Epic Sustainability (Epic) has been appointed as the designated operating entity (DOE [2]) to oversee the verification process of all three batches of carbon credits.

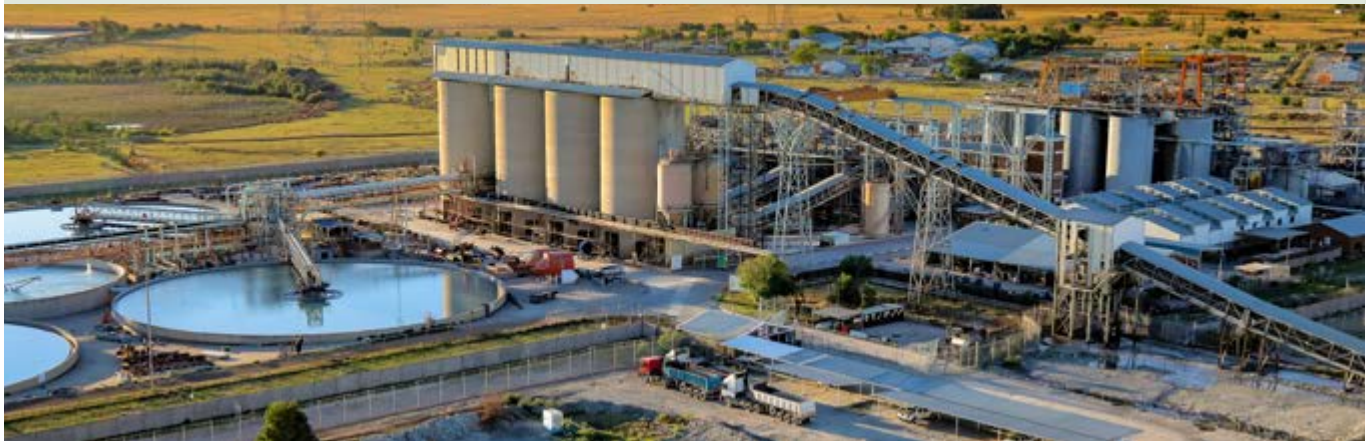
[2] A DOE is a designated operating entity accredited by the UNFCCC CDM to validate project proposals or verify implemented projects in terms of achievement of planned greenhouse gas emission reductions.

Batch (period)	Carbon credits/ CERs [3]	Status
First batch: (1 July 2011 to 31 March 2012)	**35,290**	Verification complete
Second batch: (1 April 2012 to 30 April 2013)	**53,956**	Verification complete
Third batch: (1 May 2013 to 30 June 2018)	**200,000**	Verification underway

[3] A CER equates to one tonne less of carbon dioxide equivalent (CO_2e) emissions emitted

The secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) has not approved the issuance of the third and final batch of carbon credits owing to technicalities relating to the electricity generation engines used by the project (specifically relating to the number and operability of flowmeters in the system).

In October 2020, a decision was taken to apply for a permanent deviation from the original CDM project charter (in terms of the methodology) in order to re-submit to the CDM Office for approval. The permanent deviation application entails a change from the current actual monitoring/flow-metering methodology, to a mass-balance approach where calculations are done to determine the number of carbon credits. This method is equally acceptable to the UNFCCC, hence the application for a permanent deviation from what was originally intended. It is expected that the permanent deviation application process, including approvals from the UNFCCC of the third batch of carbon credits, will be concluded in 2021.



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BEATRIX METHANE CAPTURE AND DESTRUCTION PROJECT: TIMELINE

28 JULY 2006
R54 million Beatrix methane capture and destruction project officially starts in agreement with Promethium Carbon (carbon and climate change advisor) for administration and approvals

2011
Beatrix eligible to register under Clean Development Mechanism of the Kyoto Protocol to UNFCCC to earn certified emission reductions (CER) or carbon credits

21 MAY 2011
Flare commissioned with capacity to extract initial 400 litres per second of methane gas from identified sealed-off working areas at Beatrix South section

2013
- Issuance process begins to earn 35,290 CERs (from 1 July 2011 to 31 March 2012)
- Processing of second batch of Beatrix CERs began for period from 1 April 2012 to 30 April 2013

5 SEPTEMBER 2013
9,643 VCUs issued and held in Markit Registry account (R323,084)

7 NOVEMBER 2013
VCUs transferred to buyer's account

17 OCTOBER 2014
Verification of first batch of carbon credits under CDM completed and 35,290 CER credits issued

31 DECEMBER 2014
- 195 litres per second of methane gas extracted from underground and flared
- Volume of methane destroyed since commissioning the project (including main flare and borehole flares): 10.9 million cubic metres until 31 December 2014

JULY 2011-END DECEMBER 2014
Total of 175,336 tonnes carbon dioxide equivalent (CO_2e) destroyed

20 FEBRUARY 2015
Verification process of second batch of carbon credits for period from 1 April 2012 to 30 April 2013 began

2018
- First crediting period of CDM project that started on 1 July 2011 ends on 30 June 2018
- Epic appointed as designated operating entity for verification of third batch of carbon credits (for period from 1 May 2013 to 30 June 2018) while Carbon Check continues with verification of second batch of carbon credits
- Secondary sealing completed and results in fugitive mine methane emission reduction of 198,522t CO_2e

2019
- 25 July 2019 - Verification of second batch of carbon credits completed and 53,956 CER credits issued
- 59.2 litres per second of methane gas were extracted from underground
- Since commissioning the project, 14.9 million cubic metres of methane have been destroyed (including main flare and borehole flames)
- A total of 396,915 tCO_2e emissions was averted from 2011 to 2019. This is equivalent to a reduction of 916,873 tonnes of coal being combusted

2020 UPDATE
- In 2020, 1,096,326 normal cubic metres of methane was destroyed (2019: 1,867,911), resulting in 19,938 tonnes CO_2e emissions being averted
- December 2019 – Initial application for verification of third batch of carbon credits made to the UNFCCC
- March 2020 – withdrawal of the third monitoring report due to findings raised by the UNFCCC, related to the permanent nature of the requested post-registration changes
- October 2020 – Sibanye-Stillwater started the process to apply for a permanent deviation of the approved methodology
- October 2020 – Appointment of Epic to assist in the verification process of carbon credits

2021 – EVENTS EXPECTED
- May 2021 – Submission of post-registration changes to the UNFCCC
- August 2021 – Re-initiation of the application for verification of third batch of carbon credits
- October 2021 – Application for verification of third batch of carbon credits made to the UNFCCC, on approval of the requested post registration changes
- January 2022 – Indicative date for issuance of third batch of carbon credits

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