CLIMATE CHANGE IMPACT ASSESSMENT

H2 Energy Power Station and Associated Infrastructure

Scoping Report
November 2016

Prepared by:
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Details

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Prepared for:	Savannah Environmental (Pty) Ltd
Activity developer:	H2 Clean Energy (Pty) Ltd
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Country:	The Republic of South Africa
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1. Background

Blue World Carbon Asset Management (Pty) Ltd (BWC) was appointed by Savannah Environmental (Pty) Ltd to evaluate a climate change impact of the development of the 600MW H2 Energy Power Station and Associated Infrastructure proposed by H2 Clean Energy (Pty) Ltd. BWC is a team of experts in the field of climate change, Clean Development Mechanism (CDM), carbon footprint and offsets. BWC coordinates and manages more than 15 CDM projects in South Africa as well as 3 renewable energy CDM programmes (PoAs).

This scoping report was prepared by Mr. Ilya Goryashin (CV is attached as Appendix A), who has the relevant experience in the field of power generation and climate change. Ilya has a solid background in the power plant design and operation, he graduated from Arkhangelsk State Technical University (Russia) with a degree in Industrial Heat and Power Engineering (diploma with honours). Ilya has 9-years' experience in climate change and carbon management services, including Greenhouse Gas (GHG) inventory design, quantification of GHG emissions, Joint Implementation (JI) and Clean Development Mechanism (CDM). He was involved in quotation of GHG emissions for several fossil fuel-fired power plants, such as Elets CHP Plant (Russia), power plant of Ilim Group Branch in the town of Bratsk (Russia), gas-engine CHP Plant in Skopje (Macedonia), Yerevan TPP (Armenia). Since 2009 Mr. Ilya Goryashin has been heading a carbon project development at BWC. He was in charge of GHG emission reduction quantification for more than 25 CDM projects in South Africa, mainly in the energy sector. Carbon intensity of the South African national electricity grid was previously calculated by Ilya and audited by an independent team accredited by United Nations Framework Convention on Climate Change (UNFCCC).

The proposed activity is located approximately 9 km south of the town of KwaMhlanga, and approximately 1 km north of the Palesa Coal Mine in the Thembisile Hani Local Municipality of the Nkangala District in Mpumalanga Province of the Republic of South Africa.

The H2 Energy Power Station is proposed to make use of Supercritical (SC) or Ultra-supercritical (USC) Pulverised Coal (PC) or Circulating Fluidized Bed (CFB) boiler technology, and will include limestone injection in the case of CFB technology, Flue Gas Desulphurisation (FGD) technology in the case of PC technology; as well as either baghouses or electrostatic precipitators to reduce emissions. A direct or indirect dry cooling system utilizing air cooled coolers will be used. The power station will have a total generation capacity of up to 600 MW. Coal will be the only fuel source for the boilers. Diesel will be used for start-up as well as for emergency firefighting pumps and diesel generators.

Coal required for the operation of the activity will be sourced from the existing Palesa Coal Mine. It will be received via overland conveyor and stockpiled on site for up to 30 days, then transferred via a stacker-reclaimer to a coal crusher after which it will be discharged to the boiler feed bins. In the case of CFB technology, limestone and natural dry river sand will be received by road via tipper trucks and stockpiled on site in a covered area. Start-up and emergency fuel will be delivered by tank tracks.

Electricity generated by the project will feed into and supplement the national electricity grid. Power line route alternatives will be determined based on the final project layout and grid connection point.

Scope of Work

The Scope of Work during the scoping phase includes:

- Identification and description of the policies and legislation relevant to the activity;
- Identification, description and evaluation of the key issues to be addressed in the EIA phase; and
- Description of the methodology to be used in the EIA phase to assess impacts and recommend appropriate mitigation measures.

2. Policies and legislation relevant to the activity

Climate change is already a measurable reality appearing as a long-term change in weather patterns, including increased average temperatures, and the associated knock-on effects on climate and weather systems. It is caused by the rising concentration of GHGs in the atmosphere due to anthropogenic activities. The Republic of South Africa is vulnerable to climate change impacts, particularly in respect of water and food security, as well as impacts on health, human settlements, and infrastructure and ecosystem services.

The world community is concerned about global warming and is looking for ways to tackle it. In 2015 the world leaders reached an agreement at the 21st Conference of the Parties (COP 21) to the UNFCCC in Paris (Paris Agreement) to keep the global average temperature increase to well below 2°C and pursue efforts to hold the increase to 1.5°C. South Africa ratified this agreement on 01 November 2016. The Paris Agreement entered into force on November 4, 2016. It encourages all countries to make individual, voluntary commitments to contribute to this global goal through their Intended Nationally Determined Contributions (INDCs). The Republic of South Africa is committed to work with other nations and has formulated its climate change response policy in a context of the environmental right set out in section 24 of the Constitution and National Development Plan (NDP, 2012), taking into account and emphasizing its priority to address poverty and inequality as well as historical development pathway of its energy sector. The country is currently heavily dependent on coal, with a fleet of old and inefficient coal-fired power plants that are nearing, but not yet at, the end of their design lifecycles. Although the Integrated Resource Plan (IRP) for the country provides for a shift towards renewable energy as the main source of power generation, the need for baseload power generation from coal-based technologies remains a reality.

In 2007, a “peak, plateau and decline” trajectory for South African GHG emissions was suggested in the Long-Term Mitigation Scenarios (LTMS, 2007). At COP 15, in 2009, the President of South Africa announced the voluntary commitment of the country to reduce its GHG emissions by around 34% by 2020 and 42% by 2025 from the business-as-usual growth trajectory. Finally, in 2011 the National Climate Change Response Policy (NCCRP, 2011) was adopted. The NCCRP elaborates on the South African GHG emissions trajectory and sets up vision for:

- A fair contribution to the global effort to stabilise GHG concentrations;
- Effective management of unavoidable impacts through interventions that build and sustain South Africa’s social, economic and environmental resilience and emergency response capacity; and
- Long-term transition to a climate-resilient, low-carbon economy and society.

It is proposed that South Africa’s GHG emissions peak in the period 2020 to 2025, plateau for up to ten years after the peak and decline from 2036 onwards. This will be achieved through increasing the share of Renewable Energy (RE) and nuclear in South Africa’s energy mix, as highlighted in the IRP.

The implementation of the NCCRP is also linked to the following policies, which can be relevant to the proposed activity:

- Industrial Policy Action Plan (IPAP, 2014), which recognises that climate change will have an impact on country’s economic landscape. It notes that, in the export market, there is a growing threat of increasing ‘eco-protectionism’ from advanced industrial countries in the form of tariff and non-tariff measures, such as border carbon adjustments and standards that could be viewed as restrictive;

- New Growth Path (NGP, 2010), which identifies possible changes to the structure and character of production with a view to generating a more inclusive and greener economy over the medium to long term;
- National Sustainable Development Strategy (NSDS, 2011), which highlights ways to respond to climate change;
- Integrated Resource Plan (IRP, 2010), which is aimed at ensuring new electricity generation capacity for the country for the period 2010 to 2030, including total coal-fired generating capacity in 2030 of 41,071 MW (45.9%);
- Energy Security Master Plans and the Integrated Energy Plan (IEP, 2003), which highlights the importance to diversify energy resources to include other energy forms, such as natural gas and renewable sources of energy while coal remains the largest indigenous energy resource currently available.

It is also worth mentioning other policies under development, but not yet adopted, which can affect the establishment of the proposed activity:

- National Climate Change Adaptation Strategy and Plan;
- Carbon Tax;
- Desired Emission Reduction Outcomes (DEROs) for sectors;
- Company level carbon budgets; and
- Regulatory standards and controls for specifically identified GHG pollutants and emitters.

To date the Republic of South Africa does not have any legislation or guidelines in place that provide rules and procedures for the assessment of a climate change impact.

3. Key issues associated with the proposed project

The important part of the transition to a low-carbon economy is a complete transformation of the South African energy mix. It is critical to replace an inefficient fleet of ageing Eskom's coal-fired power plants with clean and high efficiency technologies, such as nuclear, renewable energy, combined-cycle gas turbine, more efficient Clean Coal technologies and others. Coal will still play a significant role in the South African energy mix, but its share is proposed to decline from about 90% to 45.9% by 2030.

Although Clean Coal is given a space in the future energy mix, the carbon intensity of the electricity supplied by the 600 MW H2 Energy Power Station shall be calculated and compared with the current carbon intensity of Eskom's coal-fired power plants.

The operation of the activity will lead to the combustion of a maximum of 9,050 tons of coal per day, which in turn will significantly contribute to GHG emissions and thus to global climate change. The power station is likely to become a large contributor to the South African carbon footprint. The carbon footprint of the construction and operation of the proposed project shall be quantified. Its impact on the carbon footprint of the Republic of South Africa and county's GHG emission reduction target shall be evaluated. This will be considered in the context of energy planning for the country and the planned decommissioning of old power stations by Eskom. The carbon intensity of the electricity supplied by the 600 MW H2 Energy Power Station to the grid with likely be lower than the current carbon intensity of Eskom's coal-fired power plants.

Appropriate mitigation options shall be proposed in the EIA phase. GHG emission reduction potential of each option shall be evaluated.

The table below summarises potential impacts on climate change associated with the construction and operation of the project:

<table>
<tr><td colspan="4">Impact
Impact on climate change
Desktop Sensitivity Analysis of the Site:
The project will affect the concentration of GHGs in the atmosphere of the Earth in general. It will not be possible to identify the direct project impact on a certain area of the planet.</td></tr>
<tr><td>Issues</td><td>Nature of Impact</td><td>Extent of Impact</td><td>No-Go Area</td></tr>
<tr><td>Loss of indigenous natural vegetation may occur as a result of global average temperature increase.</td><td>The operation of the activity will lead to the combustion of a maximum of 9,050 tons of coal per day, which in turn will significantly contribute to GHG emissions and thus to global climate change.</td><td>International</td><td>Not applicable</td></tr>
<tr><td colspan="4">Description of expected significance of impact
The project will have a high long term impact on climate change with moderate magnitude.
The probability of occurrence is definite.
The project impact on climate change can be mitigated.</td></tr>
<tr><td colspan="4">Gaps on knowledge & recommendations for further study
Appropriate mitigation options shall be elaborated and proposed in the EIA phase, such as carbon capture and storage, co-combustion of coal and biomass; integration with a concentrated solar power plant, or photovoltaics solar system to generate power for the auxiliaries.</td></tr>
</table>

4. Methodology to be used in the EIA phase

The following methodology will be applied:

Stage 1: Collection of data on the activity

The following information will be collected and analyzed:

- Data on all primary and secondary facilities of the activity, basic technological schemes, energy and mass balances, including fossil fuel consumption, power generation and distribution, features of fossil fuels, feedstock and fuel delivery arrangements;
- Data on expected on-site fossil fuel and electricity consumption during the construction phase, delivery arrangements for facilities, equipment, materials, machineries etc.

Stage 2: GHG inventory design and development

General requirements of ISO 14064-1:2006 will be used to quantify the carbon footprint of the activity. This standard is applicable for the design, development, management, reporting and verification of an organization's GHG inventory.

The following tasks will be completed:

- Establishment of the activity organisational boundaries;
- Establishment of the activity operational boundaries;
- Identification of sources of GHG emissions associated with organisation's operations;
- Categorization of GHG emissions into direct emissions, energy indirect emissions and other indirect emissions;
- Choice of GHG emissions which will be quantified.

Stage 3: Quantification of GHG emissions

Default values of GHG emission factor for combustion of fossil fuel will be sourced from 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Carbon intensity of the grid electricity to be consumed during the construction phase will be assessed based on the latest public available information.

The following tasks will be completed:

- Identification and categorization of GHG sources;
- Selection and justification of quantification methodology for each GHG source;
- Selection or development of GHG emission factors;
- Selection of data required for calculation of GHG emissions;
- Verification and processing of data required for calculation of GHG emissions;
- Quantification of the carbon footprint of the activity in tCO_2-eq as well as the carbon intensity of the electricity supplied by the 600 MW H2 Energy Power Station to the grid in tCO_2-eq/MWh.

Stage 4: GHG baseline study

The following tasks will be completed:

- Collection and analysis of the existing public available information on the carbon footprint of the Republic of South Africa;
- Quantification and projection of the annual South African GHG emissions;

- Collection and analysis of existing publicly available information on the operation of Eskom's coal-fired power plants, including fossil fuel type, fossil fuel consumption, net power generation;
- Quantification of the current carbon intensity of Eskom's coal-fired power plants in tCO_2-eq/MWh.

Default values of GHG emission factor for combustion of coal will be sourced from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Stage 5: Impact assessment

The following tasks will be completed:

- Comparison of the carbon footprint of the activity with the projected annual South African GHG emissions;
- Comparison of the carbon intensity of the electricity supplied by the 600 MW H2 Energy Power Station to the grid with the current carbon intensity of Eskom's coal-fired power plants. This will take into consideration the fact that electricity generated by the proposed project could be used to replace electricity generated by some of Eskom's older power stations which will be decommissioned;
- Evaluation of the activity impact on climate change in terms of significance using the formula: $S = (E + D + M) \times P$;
- Assessment of the cumulative impacts.

Stage 6: GHG emission mitigation options

The following tasks will be completed:

- Suggestion of the appropriate mitigation options;
- Quantification of the GHG emission saving potential of each mitigation option and the subsequent impact thereof compared to the pre-mitigation scenario.

Appendix A – CV of Ilya Goryashin

Date of birth: 17th August, 1983
Mob. phone: +7 911 562 6941 (Russia)
+27 79 090 8139 (South Africa)
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EDUCATION:

2008-2011 (Hons) All-Russian State Distance Institute of Finance and Economics. Speciality "Finances and Credit". Qualification – Financial Management

2000-2005 (Hons) Arkhangelsk State Technical University. Heat Power Engineering Faculty. Qualification – engineer with the specialty "Industrial Heat and Power Engineering"

OTHER TRAINING:

2005-2008 Arkhangelsk State Technical University (Post-graduate course). Speciality "Heat Power Engineering"

LANGUAGES: Russian - mother tongue, English – fluent

OTHER SKILLS: User of PC with the basic knowledge of AutoCAD, Kompas-3D, and CFX. Flexibility mechanisms of the Kyoto Protocol, carbon mapping, development of JI and CDM projects, GHG emissions inventories, energy analysis of building heating systems

PROFESSIONAL EXPERIENCE:

Since 2009 BWC, Head of Operations

2008-2009 CCGS LLC, Principal Specialist, Department of Project Development

2007-2008 Camco International Ltd, JI Specialist

2005-2007 Arkhangelsk State Technical University, Assistant lecturer of Heat engineering department

2004-2005 Arkhangelsk State Technical University, Energy saving center, Engineer of chief power man department

SPECIFIC EXPERIENCE IN THE REGIONS:

Country	Date
Russian Federation	2004-2009
The Republic of Macedonia	2008
The Republic of South Africa	Since 2009 ongoing

KEY QUALIFICATIONS:

Name of the project	Project status	Activity
	CDM	
Construction of a new gas-engine combined heat and power plant in Skopje, Republic of Macedonia	Registered by the CDM Executive Board, Ref. number: 2437 **The first CDM project registered in Macedonia**	PDD development, project support during the validation process
Neusberg Grid Connected Hydroelectric Power Plant, South Africa	Registered by UNFCCC, Ref. number: 7536 **The first REIPPPP hydropower project registered in South Africa under CDM**	Supervision of PDD preparation. Project support during the validation process
De Aar Grid Connected 10 MW Solar Park, South Africa	Registered by UNFCCC, Ref. number: 7607 **The first solar power project registered in South Africa under CDM**	Supervision of PDD preparation. Project support during the validation process
Small-scale solar electrical programme, South Africa	Registered by UNFCCC, Ref. number: 7484 **The only PoA with combination of AMS-I.D. and AMS.-I.F. in the RSA**	Supervision of the PoA-DD, CPA Template and Specific CPA-DD preparation, programme support during the validation process
Kathu Grid Connected 100 MW Solar Park, South Africa	Registered by UNFCCC, Ref. number: 7531	Supervision of PDD preparation. Project support during the validation process
Prieska Grid Connected 20 MW Solar Park, South Africa	Registered by UNFCCC, Ref. number: 7492	Supervision of PDD preparation. Project support during the validation process
South African Grid Connected Wind Farm Programme	Registered by UNFCCC, Ref. number: 7849	Supervision of the PoA-DD, CPA Template and Specific CPA-DD preparation, programme support during the validation process
South African Large Scale Grid Connected Solar Park Programme	Registered by UNFCCC, Ref. number: 9296	Supervision of the PoA-DD, CPA Template and Specific CPA-DD preparation, programme support during the validation process
Amakhala Emoyeni Grid Connected 138.6 MW Wind Farm, Phase 1, South Africa	Registered by UNFCCC, Ref. number: 7576	Supervision of PDD preparation. Project support during the validation process
De Aar Grid Connected 100.5 MW Wind Farm, South Africa	Positive validation by DOE, Ref. number: 7608	Supervision of PDD preparation. Project support during the validation process
Springbok Grid Connected 55.5 MW Wind Farm, South Africa	Positive validation by DOE, Ref. number: 6181	Supervision of PDD preparation. Project support during the validation process

Waste energy to electricity at ArcelorMittal's Vanderbijlpark Steel, South Africa	PIN developed, PDD developed and is being validated	Supervision of the PIN and PDD preparation, project support during the validation process
Gouda Grid Connected 120 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Deep River Grid Connected 70 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Exxaro West Coast Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Sishen Grid Connected 100 MW Solar Park, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Waste heat recovery for electricity generation at Ulco cement plant, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Waste heat to electricity at ArcelorMittal's Vanderbijlpark Steel, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Wagnbiekiespan Grid Connected 25 MW Solar Park, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Namaqualand Grid Connected 49.5 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Coega Grid Connected 10 MW Solar Park, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Richards Bay Grid Connected 80 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Hluhluwe Grid Connected 60 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Happy Valley Grid Connected 40 MW Wind Farm, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
Use of kiln dust as a feed material for the Ulco cement plant, South Africa	PIN developed, PDD developed	Supervision of the PIN and PDD preparation
JI		
Biomass wastes to energy at OJSC "Ilim Group" Branch in the town of Bratsk	Registered by UNFCCC, ITL ID: RU1000233 **The first registered biomass waste to energy JI project in Russia**	PDD development, project support during the determination process
Wood waste to energy in Severoonezhsk, the Arkhangelsk Region, the Russian Federation	Registered by UNFCCC, ITL ID: RU1000270 **The first registered small-scale JI project in Russia**	PDD development, project support during the determination process
Technical re-equipment of Elets CHP plant with installation of Combined-Cycle Unit of 52 MW	PDD developed Positive determination by AIE	PDD development, project support during the determination process
Energy switch to renewables in Novoshakhtinsk, Russia	PDD developed	PDD development