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1. Introduction

This report is compiled to provide a comprehensive carbon footprint study of the Eskom Holdings SOC Ltd (Eskom) business for the 2022 calendar year. It aims to provide valuable insight not only into the sources and magnitude of Greenhouse Gas (GHG) emissions, but also as a basis for possible mitigation action and GHG offsetting measures.

A carbon footprint is an important tool for measuring and monitoring GHG emissions emanating from an organisation's activities. GHG emissions can result from a wide variety of activities, including electricity generation, transport, industry, agriculture, and waste processing.

For the information to be reliable and consistent, a carbon footprint needs to be based on high-quality data, which is collected and converted according to a recognised international GHG standard. Moreover, the information should be kept in a well-structured database that can provide graphical outputs useful for emissions reporting purposes.

Eskom contracted Brundtland Consulting to calculate the Carbon Footprint for 2022 using the Cloudbased GHG calculation tool called the Enterprise Performance and Carbon Management (EPCAM) tool. The last Carbon Footprint was calculated in 2021, internally and independently by Eskom's Climate Change and Sustainable Development Department (CCSD) on an excel-based EPCAM tool. While Eskom's financial year runs from April to March, the carbon footprint is based on the calendar year. This is to align with the reporting period used by National GHG Emission Reporting Regulations (NGER's).

A carbon footprint estimates the total GHG emissions caused by an organisation's activities. The carbon footprint is expressed in tonnes of carbon dioxide equivalent (tCO_2e). This provides insights into the sources and magnitude of GHG emissions and allows for better management of GHG emissions.

The results of the carbon footprint are published in the Integrated and Sustainability reports annually. They also form a basis for reporting climate activities for Carbon Disclosure Project (CDP) - an international body which provides a platform for the most complete source of self-reported corporate environmental data, in a uniform and comparable manner that is fully aligned with the Task Force on Climate-Related Financial Disclosures (TCFD). Reporting on the CDP improves a company's reputation and attracts investors.

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2. Supporting Clauses

Scope

Large organisations often have complex legal and organisational structures with varying degrees of ownership and control. This has implications for the consolidation of GHG emissions for the entities. Organisational boundaries of a carbon footprint determine the method of which GHG emissions from different business operations within the organisation are included in the carbon footprint. Eskom's organisational boundary considered for 2022 carbon footprint, is shown in Figure 1 below, excluding all Eskom subsidiaries. The business requested that the Carbon Footprint be calculated for each Division as well as the Eskom subsidiaries in the next report.



Figure 1: Eskom Carbon Footprint Organisational boundary (including Eskom subsidaries)

Purpose

This report will provide an updated carbon footprint, which estimates the total GHG emissions caused by Eskom activities, and the associated findings for the 2022 calendar year.

Applicability

This document shall apply throughout Eskom Holdings Limited Divisions, including Eskom subsidiaries.

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Effective date

01 March 2024

Normative/Informative References

The parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

Normative

- [1] Greenhouse Gas Protocol Corporate Accounting and Reporting Standard
- [2] Eskom Carbon Footprint Study, 2019
- [3] Eskom Carbon Footprint Study, 2020
- [4] Eskom Carbon Footprint Study, 2021
- [5] The Eskom Integrated Report, 31 March 2021

Informative

- [6] Department of Fisheries, Forestry and Environment (DFFE) National Greenhouse Gas Emissions (GHG) Reporting Regulations
- [7] Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines for National Greenhouse Gas Inventories
- [8] Climate Change Bill, 2018 (GG 41689, Notice 580)
- [9] Carbon Tax Act, No 15 of 2019

Definitions

- **Carbon Footprint** a term used to describe the amount of greenhouse gas (GHG) emissions (expressed in tCO₂e) caused by a particular activity or entity and thus a way for organisations and individuals to assess their contribution to climate change.
- **Carbon reduction** occurs as a result of reducing your gross greenhouse gas (GHG) emissions, this can be done through initiatives such as energy efficiency plans, transport efficiency programmes, fuel switch projects and process enhancement.
- **Carbon Offsetting** is the purchase of carbon credits to offset your carbon footprint. This can be done through various carbon markets such as the mandatory market or other voluntary markets.

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- **Climate Change impact** arises due to the interaction of a climate-related hazard and the vulnerability or exposure of the natural or human system.
- **Emission** the release of GHG's into the atmosphere.
- Emissions factors are the average emission rate, measured in carbon equivalent (CO₂e) per unit of activity.
- **Operational boundaries** are governed by the concept of scopes. Scopes allow for different types of reporting methods and aim to avoid double counting by two separate companies. Scope 1 (direct emissions), Scope 2 (indirect electricity emissions) and Scope 3 (indirect emissions).
- Organisational boundaries businesses vary in legal and organisational structures; organisational boundaries state the organisational make-up. There are two distinct approaches for selecting organisational boundaries, the control approach (operational control or financial control) and the equity share approach.

(Source: Terra Firma Academy, Carbon Footprint Analyst Course Manual, 2019)

Abbreviation	Explanation
CCSD	Climate Change and Sustainable Development
CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide equivalent
DFFE	Department of Fisheries, Forestry and Environment
Dx	Distribution Division
EFs	Emission factors
GHG	Greenhouse gas
GWP	Global Warming Potential
Gx	Generation Division
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers
N ₂ O	Nitrous Oxide
NCVs	Net calorific values
NGERs	National Greenhouse Gas Emission Reporting Regulations
SF ₆	Sulphur Hexafluoride
tCO ₂ e	Tonnes of Carbon Dioxide equivalent
Тх	Transmission Division

Abbreviations

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Roles and Responsibilities

The table below provides the roles and responsibilities (RACI) for the Carbon Footprint.

Table 1: RACI (Table showing the Carbon Footprint roles and responsibilities)

Role	Responsible	Accountable	Consult	Inform
Data collection and consolidation (e.g., coal burnt, FO burnt, SF6 used, NCV calculation etc.)	Line Divisions (Dx, Tx, Gx) RT&D	Line Divisions (Dx, Tx, Gx) RT&D	CCSD	CCSD
Submission of consolidated Data	Data providers from line divisions (internal and external)	Data Providers from line divisions (internal and external)	CCSD	CCSD
Sign-off and verification of data	Line Divisions (Dx, Tx, Gx) Data providers (internal and external)	Line Divisions (Dx, Tx, Gx) Data providers (internal and external)	CCSD	CCSD RT&D
Input data into data collection system (EPCAM)	Line Divisions (Dx, Tx, Gx) Data providers (external users do not have access)	Line Divisions (Dx, Tx, Gx) RT&D	CCSD	CCSD
Calculation of GHG emissions using calculating tool (EPCAM)	CCSD	CCSD	Line Divisions (Dx, Tx, Gx) Data providers (internal and external)	Line Divisions (Dx, Tx, Gx) RT&D

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Role	Responsible	Accountable	Consult	Inform
Circulation of Carbon Footprint report and Co- ordination of comments	CCSD	CCSD	Line Divisions (Dx, Tx, Gx) Data providers (internal and external)	Line Divisions (Dx, Tx, Gx) Data providers (internal and external) RT&D Finance (Integrated Reporting team)
Preparation for publication and disclosure	CCSD	CCSD	Finance (Integrated Reporting team)	Line Divisions (Dx, Tx, Gx) RT&D External service providers Finance (Integrated Reporting team)
Disclosure in IR	Finance (Integrated Reporting team)	Finance (Integrated Reporting team)	CCSD	CCSD Data providers (internal and external)

Process for Monitoring

The data providers from the line divisions are responsible for collecting, managing, and maintaining updated data. External service providers are responsible for collating and providing required data annually. CCSD collates data from data providers, utilises EPCAM tool to calculate Eskom's carbon footprint and develop a report annually, monitor the annual carbon footprint findings and provide recommendations, where possible. For 2023 reporting data providers will upload their data onto the cloud based EPCAM tool, allowing data providers the ability to track and monitor their emissions.

Related/Supporting Documents

Eskom Carbon Footprint Study, 2019

Eskom Carbon Footprint Study, 2020

Eskom Carbon Footprint Study, 2021

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Carbon Footprint Study

This section deals with the further clarification of the scope of the study; it sets out the approach followed in calculating Eskom's carbon footprint and presents the actual footprint results. High-level analyses of the outcomes and assumptions are provided.

GHG Report Standard

While there are various internationally recognised GHG standards, the Eskom's carbon footprint has been calculated in line with the GHG Protocol Corporate Accounting and Reporting Standard (WRI, 2004).

Scopes of Emissions

In terms of GHG accounting and reporting, the standard identifies three different scopes of GHG emissions to differentiate between direct and indirect emissions:

- Scope 1 direct emissions
- Scope 2 indirect emissions
- Scope 3 indirect emissions (i.e., from activities not controlled by an organisation that occur up-and downstream in the supply chain).



Figure 2: GHG protocol concepts of scopes

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Electricity generation is Eskom's primary activity, Scope 2 emissions are in principle accounted for as Scope 1 emissions in accordance with the GHG Protocol. The carbon footprint for 2022 included purchased electricity from third party Independent Power Producers (IPPs). Purchased electricity is accounted for as Scope 3 emissions for the Generation division, because Eskom did not consume the electricity. However, the purchased electricity being transmitted and distributed along the Eskom infrastructure, incurs losses before reaching the end user. The network losses are therefore accounted as Scope 2 emissions for Transmission and Distribution.

Emission Factors and Global Warming Potentials

The carbon footprint study mainly relies on default emission factors (EFs) and net calorific values (NCVs) from the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories and global warming potentials (GWP) from the Fifth Assessment Report (AR5) of the IPCC. In circumstances where country-specific values were available and appropriate, for example, from the National GHG Reporting Regulations, these were applied. The NCV reported is an average of the monthly NCVs per station and per fuel. The GHG emissions are however calculated monthly, and the sum is reported at the end of the year. i.e., the NCV used is a monthly NCV. The total year to date (YTD) is an average of the monthly NCVs.

Categorisation

Table 2 shows the main source categories of GHG emissions in terms of applicability to Eskom's activities.

Scope	GHG Emission Categories
Scope 1 – Direct emissions	 Stationary Combustion: coal, fuel oil and diesel consumed in power stations, and diesel consumed by back-up generators at Eskom-owned sites. Mobile Combustion by Eskom Fleet: fuel consumption by corporate fleet, heavy trucks owned by Eskom, and Eskom aviation helicopters used for power line maintenance and inspections. Non-Combustion Product Use: lubricant and oil use Waste Disposal: solid waste and wastewater treatment sites owned by Eskom. Fugitive Emissions: SF₆ from gas-insulated switchgears, current transformers, and breakers.
Scope 2 – Indirect emissions	• Purchased electricity or heat: purchased electricity.

Table 2: Summar	y of GHG emission	n categories include	ed in the 2022 Carbor	n footprint study.
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Scope	GHG Emission Categories
Scope 3 – Indirect emissions	 Air Travel: kilometres flown in the economy or business class. Official Mileage: kilometres travelled by employees utilising their own vehicles (petrol or diesel). Vehicle Rental: kilometres travelled with rented vehicles (petrol or diesel). Coal Delivery to Site: kilometres driven by third party-owned heavy coal trucks. Rail Delivery to site: kilometres by third party train and tons of rail weight. Purchased electricity: MWh of purchased electricity from IPP's. Waste Generated: solid waste treated by third party, in a site not owned or operated by Eskom.

Data Collection

The process of collecting the necessary consumption and/or activity data per GHG emission category was initiated by contacting all relevant data providers within and outside the organisation to collect the relevant data.

Scope 1 emission data inputs were available and collected based on actual consumption data, such as fuels used. For the first time since the inception of the Eskom Carbon footprint reporting, Eskom included scope 2 emissions. Scope 3 data inputs were based on activity data from third party service providers; on which basis GHG emissions were derived using default EFs in the EPCAM model.

Data quality checks were performed and, in some cases, a further check with the data providers was conducted. However, in future, each data provider will be required to formally verify, sign-off the data submitted and upload data on the EPCAM cloud tool.

Results and Assessment

The results of the organisational carbon footprint are presented in Table 3. The total GHG emissions for 2022 was 198 879 449 tCO₂e, which is favourable compared to 2019 (base year). This indicates a decrease in Eskom's overall carbon footprint due to lower production and the shutting down of one power station, which reached end of life. Most of these emissions are a product of burning fossil fuels at power stations for the generation of electricity. Coal, fuel oil and diesel consumption contributed 97.12% of total GHG emissions.

In 2022 delivery to site by rail was incorporated, it was the second highest source of emissions, followed by purchased electricity (network losses) from IPP's as the third highest source of emissions. There has been a noted improvement in reporting and data collation, which has resulted in significant increase in emissions from waste disposal and non-combustion product use.

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The carbon footprint for 2022 included purchased electricity from third party Independent Power Producers (IPPs). Purchased electricity is accounted for as Scope 3 emissions, this prevents Eskom and IPP's from double counting and due to the fact, that as an organisation Eskom does not consume the electricity purchased. However, the purchased electricity being transmitted and distributed along Eskom infrastructure, incurs some losses before reaching the end user. These losses are therefore accounted as Scope 2 emissions.

Table 3: Eskom Carbon Footprint Summary by Scope and Category, from base year

	2022	2021	2020	2019
Source	GHG emissions (tCO ₂ e)	GHG emissions (tCO ₂ e)	GHG emissions (tCO ₂ e)	GHG emissions (tCO ₂ e)
	Scope1			
Stationary combustion	193 157 386	207 230 321	201 260 329	212 192 077
Eskom Fleet	71 623	78 138	37 810	81 797
Fugitive emissions	65 712	52 841	73 904	36 212
Waste disposal	81 972	3 366	3 820	3 468
Non- combustion product use	9 689	3	12	9
	Scope 2			
Purchased Electricity (Tx & Dx Grid losses)	85 171	-	-	-

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	2022	2021	2020	2019
Source	GHG emissions (tCO ₂ e)			
	Scope 3			
Purchased Electricity	49 4263	-	-	-
Coal Delivery to site: Road	264 993	252 743	238 338	269 963
Coal Delivery to site: Rail	4 635 759	-	-	-
Official mileage	8 598	6 003	6 669	12 627
Air travel	3 621	937	1 008	3 368
Vehicle rental	627	1 216	2 225	1 903
Waste generation	35	-	-	-
Total	198 879 449	207 625 568	201 624 115	212 601 425

¹ As electricity generation is Eskom's main activity, Scope 2 indirect emissions are in principle accounted for as Scope 1 direct emissions as per the GHG Protocol

For further analysis the 2022 emissions data has been categorised into divisional groups:

- Generation
- Transmission
- Distribution
- Corporate

Grouping of emissions data, provides each division with overall performance for 2022, which can initiate discussions about potential mitigation efforts and enable the divisions to set emissions reduction targets, for activities both inside and outside their direct control. The below graph displays percentage of each division's contribution towards Eskom's GHG emissions for 2022; Generation division contributed the highest emissions, due to the nature of the business.

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Figure 3: Divisional emissions for 2022

Generation emissions

The Generation division's main source of emissions is stationary combustion, which mainly includes the burning of coal at Eskom power stations to generate baseload electricity and is by far the largest source of GHG emissions from the organisation 97.12%. To a lesser extent, it includes the consumption of diesel and kerosene used in peaking stations. Heavy fuel oil and diesel are also used for start-up and backup/auxiliary processes. The coal, fuel oil, and diesel consumption data are externally audited and internally reviewed by Eskom to ensure that the figures are reliable and accurate. Koeberg is the only nuclear-fuelled power plant in the Eskom portfolio, which uses some fossil fuels (diesel) for auxiliary and backup processes with GHG emissions associated with it. The Kusile and Medupi power stations' GHG emissions are expected to rise in the coming years as construction is completed and all units come online.

To align with the GHG Protocol, the results of the Generation carbon footprint are presented in table 4 as per the main scope of emissions.

Table 4: Overview of Stationary Combustion

Total GHG emissions	193 157 057	tCO ₂ e
Total GWh sent out	196 808.5	GWh

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The below graph displays the overall emissions produced by the Generation division for the 2022 calendar year.



Figure 4: Generation GHG emissions for 2022

The Generation division has the highest scope 1 emissions in the organisation, due to the heavy reliance on fossil fuels. Eskom fleet vehicles, non-combustion product use (lubricants) waste disposal from Eskom owned land fill sites and wastewater treatment plants contributed 0.05% of scope 1 emissions. Generation has no scope 2 emissions to report. However, the electricity purchased from IPP's is recorded as scope 3 emissions with other activities procured from third parties such as, Delivery to site (road and rail) waste generated and business travel (air, vehicle rental and employee's vehicles) which accounts for 2% of Generations total emissions.

Rail delivery to site was the second highest emission source, after combustion of fossil fuels. The pie chart below displays Generations emission contribution to Eskom's total carbon footprint per scope.

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Figure 5: Generation emissions by scope (NB: Generation does not contribute any scope 2 emissions)

Transmission emissions

The Transmission division has the third highest emissions in the organisation, with most of these emissions emanating from scope 1. Transmission has two sources of scope 1 emissions, fugitive emissions (leakage of Sulphur Hexafluoride (SF₆)) from circuit breakers and emissions from fleet vehicles, with the former recording the highest emissions. This is due to the heavy reliance of SF₆ gas as an insulator in circuit breakers. Top-up data is gathered from all grids within the division, the top-up data is used to calculate total SF₆ emissions per annum and then converted tons of CO₂ equivalent (tCO₂e). The below graph displays the overall emissions produced by the Transmission division for the 2022 calendar year.



Figure 6: Transmission GHG emissions for 2022

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Scope 1 emissions account for 74% of overall emissions across all three scopes for the Transmission division. Eskom procures electricity from IPP's to be transmitted through Eskom infrastructure to end users. The Transmission division therefore has Scope 2 emissions, accounting for network losses that occur in the transmission of electricity, received from the IPP's. Network losses (purchased electricity) is the second highest source of emissions for the division, contributing 22.5%. Network losses emissions are shared by Transmission 20% and Distribution 80% principal based on average network emissions factors calculation.

Scope 3 emissions emanate from services procured from third parties. In 2022 Transmission's main source of scope 3 emissions arose from business travel (air travel, car rental and employee vehicles) accounting for 3.9% of the total divisional emissions. The below graph depicts Transmission's 2022 emissions per scope.



Figure 7: Transmission emissions by scope

Distribution emissions

The Distribution division has the second highest overall emissions in the organisation, with most of these emissions emanating from scope 1. Distribution has three sources of scope 1 emissions: stationary combustion, fugitive emissions (leakages of Sulphur Hexafluoride (SF₆)) from circuit breakers and emissions from fleet vehicles, with the latter recording the highest emissions. This is due to the division's nature of work, including driving to communities to interact with customers. Stationary combustion refers to back-up generators located in the various operating units (OU's) contributes the least emissions (this could be due low data submission) SF₆ is the second highest source of scope 1 emissions. The below graph displays the overall emissions produced by the Distribution division for the 2022 calendar year.

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Figure 8: Distribution GHG emissions for 2022

Scope 1 emissions account for 49% of overall emissions across all three scopes for the Distribution division. Distribution division has Scope 2 emissions, accounting for network losses that occur in the distribution of electricity, received from the IPP's. Network losses (purchased electricity) is the highest source of emissions for the division, contributing 47%. Network losses emissions are shared by Transmission (20%) and Distribution (80%) principal based on average network emissions factors calculation.

Scope 3 emissions emanate from services procured from third parties. In 2022 Distribution's main source of scope 3 emissions arose from business travel (air travel, car rental and employee vehicles) accounting for 4.3% of the total divisional emissions.

The below graph depicts Distribution's 2022 emissions per scope.

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Figure 9: Distribution emissions by scope

Corporate emissions

The Corporate function contributes the least of overall emissions in the organisation, particularly due to the nature of the business undertaken as functional leads for the organisation. There is only one source of scope 1 emissions for Corporate, which emanates from the use of back-up generators. During data collation it was noted that there has been an increase in fuel consumption by backup generators, this could be attributed to the increase in loadshedding, therefore requiring the utilisation of backup generators.

Corporate does not contribute any scope 2 emissions. However, scope 3 emissions account for 76% of total emissions as a group. All scope 3 emissions emanate from business travel, including air travel, car rentals and employee vehicles (kilometres claimed for business travel). It is to be noted that 76% of the corporate emissions emanate from business travel, however emissions contributed to this category are significantly lower compared to other divisions. The below graph displays all the corporate emissions.

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Figure 10: Corporate GHG emissions for 2022 (*Corporate does not contribute any scope 2 emissions)



Figure 11: Corporate Emissions by scope

Eskom divisional summary of emissions

This 2022 report divided the reporting into the specific divisional sources and scopes, to assist with better management of emissions and enable divisions to monitor their divisional footprint going forward. The below table displays each divisions' emissions by scope and category.

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Table 5: Divisional emissions by scope and category

2022 Emissions (tCO2e)	Generation	Transmission	Distribution	Corporate
		SCOPE 1		
Stationary Combustion	193 157 057	0	47	282
Eskom Fleet	8 771	5 138	57 714	0
Fugitive (SF ₆) Emissions	0	52 064	13 648	0
Waste Disposal	81 972	0	0	0
Non-combustion product use	9 689	0	0	0
		SCOPE 2	'	
Purchased Electricity IPP (Tx & Dx network losses)	0	17 034	68 137	0
		SCOPE 3		
Purchased Electricity – IPP's (Avon and Dedisa)	494 263	0	0	0
Delivery to Site – Road	264 993	0	0	0
Delivery to Site – Rail	4 635 759	0	0	0
Waste Generation	35	0	0	0
Business Travel - Air	1 237	976	785	622
Business Travel - Land – employee vehicle	1 304	1 881	5 166	247
Business Travel - Land – vehicle rental	95	137	377	18
Total	198 655 175	77 230	145 874	1 169

The below table indicates the total emissions per division by scope.

Table 6: Divisional Carbon Footprint Scopes and Emissions

Scopes	Generation (tCO2e)	Transmission (tCO2e)	Distribution (tCO2e)	Corporate (tCO2e)
Scope 1	193 257 489	57 202	71 409	282
Scope 2	0	17 034	68 137	0
Scope 3	5 397 686	2994	6 328	887

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This study made considerable progress on data collection, however, there are areas of improvement to be addressed.

Areas of improvement

The Climate Change and Sustainable Development (CCSD) department has updated the carbon footprint calculating tool, as per previous year's recommendations, to calculate a separate carbon footprint per line Division (Generation, Transmission, Distribution) as well as include data sources from rail transportation of coal and purchased electricity. This tool will also enable future reporting for subsidiaries once on-boarded. Additionally, the new tool is cloud-based, allowing data providers access to the tool, to monitor and track divisional emissions. Data providers and their respective business unit leads will be provided with login credentials to upload and report 2023 emissions.

The below areas have been identified for improvement for future reporting per division:

- Generation:
 - Wastewater: previously only three sites contributed, (more sites to provide data).
 - Include SF₆ top-up data.
- Transmission:
 - Include backup generators fuel consumption data.
 - Waste data (treated by third party).
 - Network losses (generation electricity).
- Distribution:
 - Back-up Generators: two OU's provided fuel consumption data, improve on backup generators data collation.
 - Waste data (treated by third party).
 - Network losses (generation electricity).
- Corporate
 - Include waste data (treated by third party).

It is imperative that divisions report their emissions data and inform CCSD on any changes that may impact the calculation of Eskom's carbon footprint.

Conclusion

As an organisation Eskom strives to adhere to best practice for accounting and monitoring the magnitude of GHG emissions. This report will provide a platform for the organisation to continue being transparent in declaring GHG emissions and evaluate areas of improvement, which will aid in addressing emission reduction targets in future.

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Acceptance

This document has been seen and accepted by:

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Revisions

Date	Rev.	Compiler	Remarks
August 2021	1	Noella Molefe	2020 Carbon Footprint report for the Eskom business
August 2022	2	Noella Molefe	2021 Carbon Footprint report for the Eskom business
May 2024	3	Michelle Magazi	2022 Carbon Footprint report for Eskom business

Development Team

The following people were involved in the development of this document:

• Michelle Magazi, Climate Change and Sustainable Development, Risk and Sustainability Division

Acknowledgements

Brundtland previously known as EcoMetrix Africa (Pty) Ltd

CONTROLLED DISCLOSURE