



EPC TOOL

EPC & THE PATH TO NET ZERO

**JO ANDERSON;
GBCSA HEAD OF RESEARCH**

2022.08



WE ARE A MEMBER
ORGANISATION THAT
TRANSFORMS
THE BUILT ENVIRONMENT
FOR PEOPLE
AND PLANET TO THRIVE.

OPERATIONILISING EPCS IN SOUTH AFRICA | A UK PACT FUNDED PROJECT



China



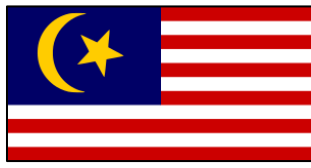
Indonesia



Columbia



Kenya



Malaysia



Mexico

- UK PACT (Partnering for Accelerated Climate Transitions) is a **£70m flagship programme under the International Climate Finance (ICF) portfolio** and forms a part of the UK's £11.6bn commitment to International Climate Finance by 2027 to tackle climate change.
- The current three-year programme (2018-2022) is **funded by BEIS**
- UK PACT works with partner countries, supporting them to **accelerate their clean growth transitions and to implement and increase for carbon emissions reductions in line with their NDCs**
- UK PACT **responds directly to demand** identified by partner governments by providing grants to implementing partners (such as NGOs, businesses and academia).



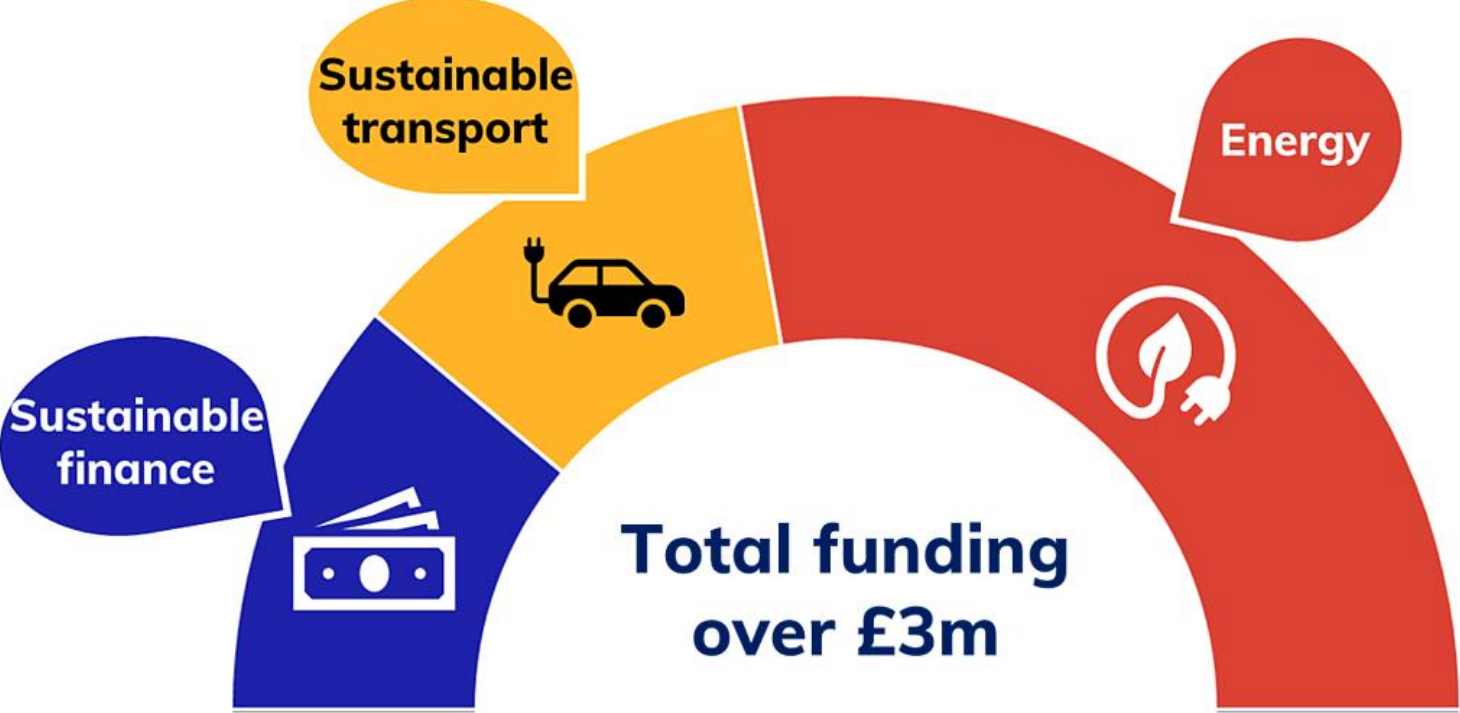
South Africa-UK PACT funding



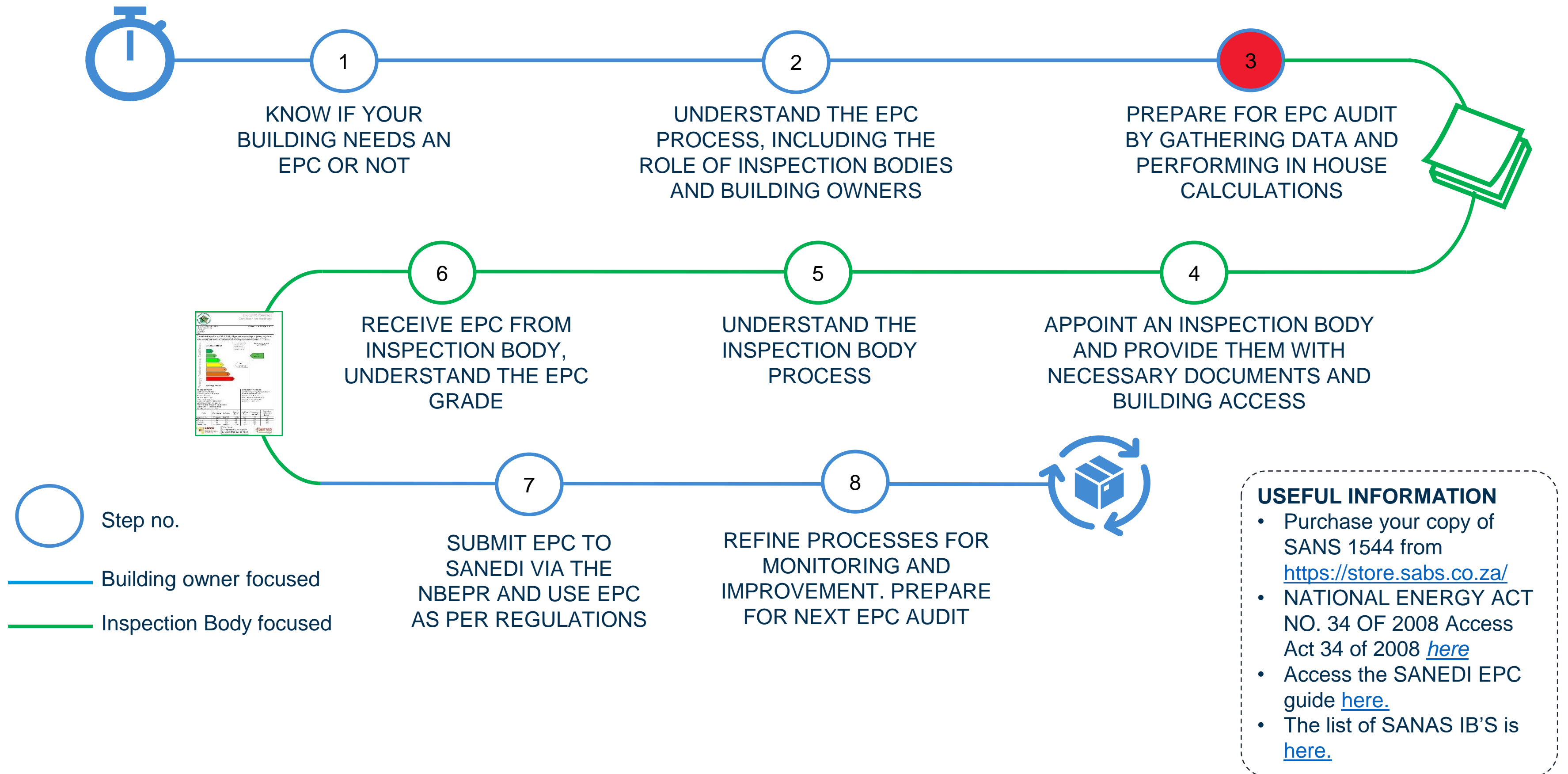
mineral resources & energy
 Department:
 Mineral Resources and Energy
 REPUBLIC OF SOUTH AFRICA



sanedi
 South African National Energy
 Development Institute.

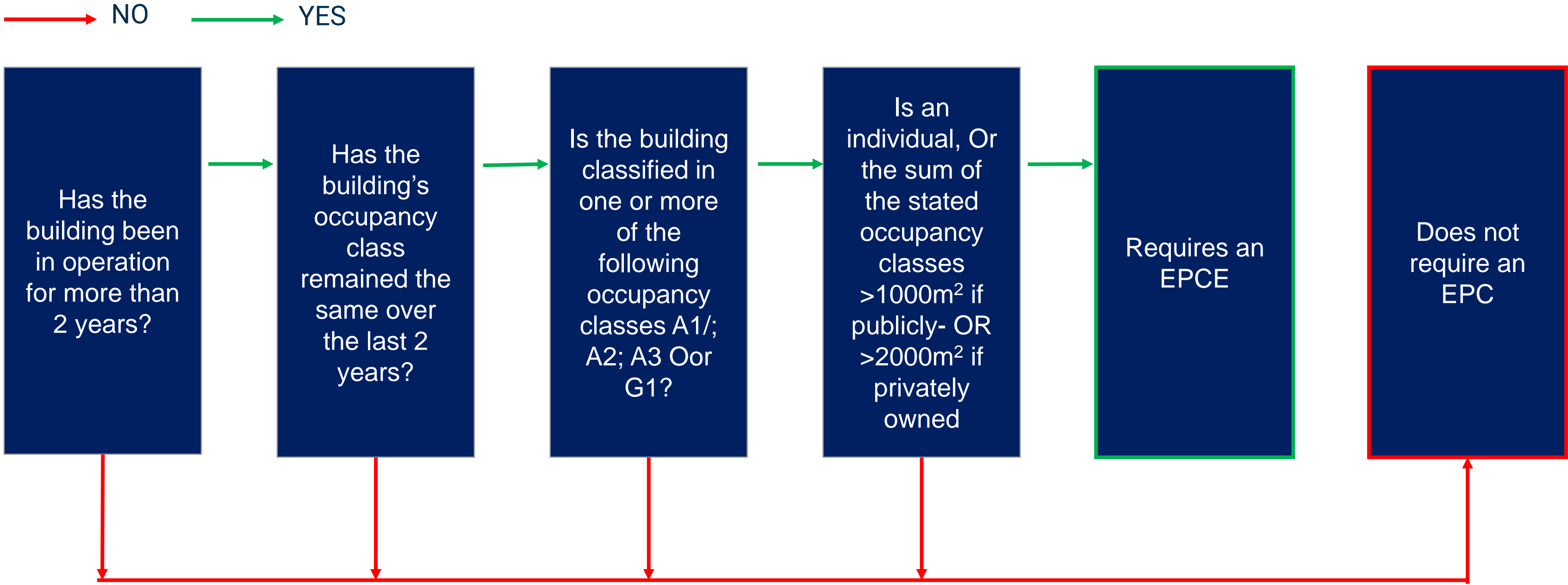


THE EPC ROADMAP FOR BUILDING OWNERS CONSISTS OF 8 KEY STEPS



KNOWING WHEN AN EPC IS REQUIRED IS THE STARTING POINT

Building size, age and occupancy class are the primary factors in determining whether a building requires an EPC or not

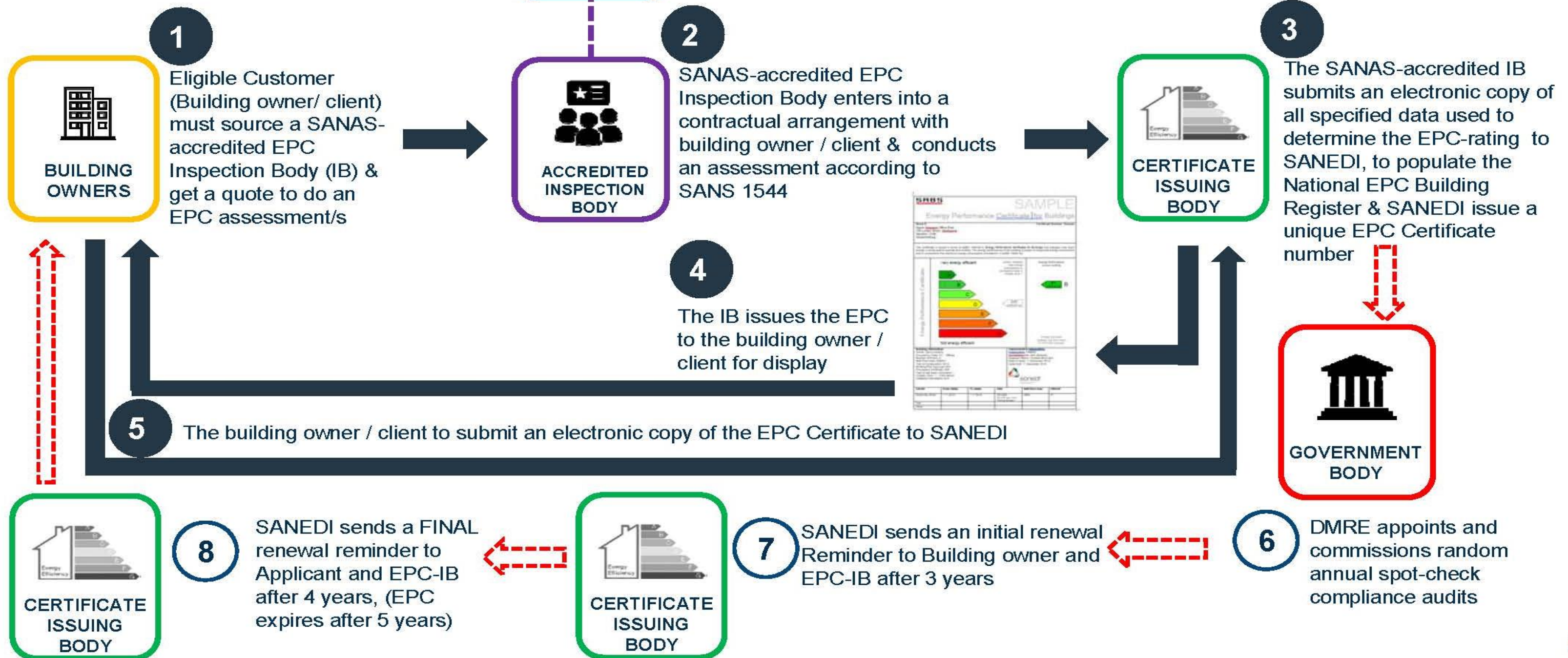


BUILDING OWNERS SHOULD FAMILIARISE THEMSELVES WITH THE EPC PROCESS AND ROLES/RESPONSIBILITIES OF STAKEHOLDERS

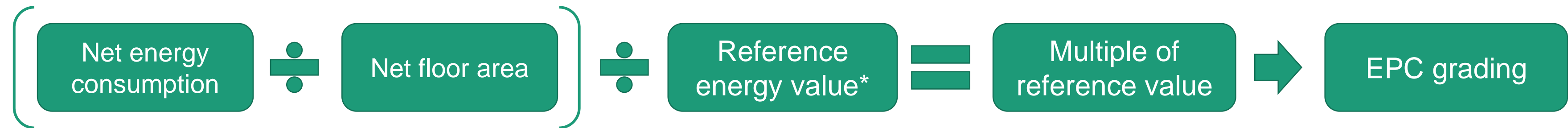
EPC application process & actors



Part of the Department of Trade, Industry & Competition (DTIC), SANAS is a Technical Infrastructure (TI) Institute responsible for standards, quality assurance, accreditation and metrology activities. The national government body is responsible for carrying out accreditations of institutions and organisations that will be required to submit an EPC on behalf of building owners and managers.



The EPC grading reflects the difference between measured energy performance of a building and maximum energy consumption defined by SANS 10400-XA



Measured energy performance, kWh/m2/annum

The measured energy performance of a building is simply the annual energy consumption per m2 (i.e. kWh/m2), for all floor areas included in the EPC calculation and for all sources of energy consumed by the building

The reference energy value, or E_r , is obtained from SANS10400XA and defines the maximum energy consumption (kWh/m2/annum) allowed for new buildings**, by occupancy class and geography

Dividing measured energy performance by the reference energy value indicates if a building's energy performance is better (<1) or worse (>1) than the SANS10400XA standard

Multiple of ref. value (MRV)	EPC grading
MRV<0.3	A
0.3=<MRV<0.6	B
0.6=<MRV<0.9	C
0.9=<MRV<1.1	D
1.1=<MRV<1.4	E
1.4=<MRV<1.7	F
MRV>=1.7	G

*Determining the Reference Energy Value for multiple occupancy class buildings:

- For single occupancy class buildings, the Reference Energy Value, E_r , is taken straight from SANS10400XA
- For multiple occupancy class buildings where one occupancy class makes up >90% of the net floor area, the dominant occupancy class is used in the EPC calculation
- In cases where no occupancy class makes up >90% of the net floor area, the midpoint Reference Energy Value must be calculated by: determining the fractional contribution of each occupancy class to the net floor area (i.e. the sum of fractions must be 1); multiplying each fraction by the reference energy value for the specific occupancy class; and summing each of the resulting numbers. This provides a weighted Reference Energy Value for multiple occupancy class buildings.

*SANS10400XA applies to new buildings only, however, for the purpose of EPCs, the reference values contained in the standard are used for all buildings subject to EPC regulations, no matter their age

EPC calculation tool_FINAL_V3 - Excel

File Home Insert Page Layout Formulas Data Review View Developer ACROBAT Tell me what you want to do...

Clipboard Font Alignment Number Styles Cells

L21

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1		WORKBOOK TABS						CELL COLOURS						SUPPORTING DOCUMENTATION										
2																								
3		Instructions						Input cells, can be left blank if not applicable						<p>SANS1544:2014 - Energy performance certificates for buildings - this is the standard for calculating EPC ratings, and which this tool is based on. It is recommended that all building owners purchase a copy of the standard for reference purposes. It can be Purchase SANS1544:2014 here</p> <p>SANS10400XA - The application of the National Building Regulations; Part X: Environmental sustainability; Part XA: Energy usage in buildings - the building standards to which SANS1544 is linked, specifically in relation to Energy Reference values that are used in the final EPC calculation. The 2021 version can be purchased at the below Purchase SANS 10400-XA:2021 here</p>										
4		Please complete/review each of the applicable tabs, as below:						Supporting evidence required, if applicable																
5								No text/input required																
6		Definitions																						
7		Provides key definitions for metrics required for EPC rating calculations, as per SANS1544 and SANS10400-XA. Please review these before completing the																						
8		SANAS IB and Building information																						
9		Provide information for the SANAS accredited IB undertaking the assessment, and for the building owners, location, and building itself																						
10		Data input tabs																						
11		Provide all required data in these tabs to enable EPC calculations, as per questions contained in the tabs																						
12		SANS10400 reference tables																						
13		These tables contain maximum energy consumption																						

Instructions Definitions SANAS accred IB Building Information Energy Consumed Net Floor Area Excluded Energy Occupancy & Prorated Flo ...

BUILDING INFORMATION

- Building location & owner information
- EPC assessment period
- Building information
- Building floor area

AREA DATA REQUIRED

- As built plans that clearly indicate room locations and areas and/or
- An area schedule

1

Building and building owner information	
Building location and contact details	
Name of building owner	Siyabonga Properties
Name of Building	The Energy Building
Street address	58 Energy Street
Suburb	Hillbrow
Town/City	Johannesburg
Postal code	2193
Province	Gauteng
ERF no	12345RE
Climatic zone, as per SANS10400-XA	1 - Cold interior - JHB, Bloemfontein
Google maps location weblink	[paste weblink]
Building coordinates (decimal degrees)	-29.353, 30.598
Contact person (Name & surname)	
Contact person (mobile)	
Contact person (email)	

2

EPC assessment period

Start date	Wednesday, 07 July 2021
End date	Wednesday, 06 July 2022

NOTE: SANS1544 states that the energy performance assessment period shall be one year in respect of the data for the preceding year. However 2020 is regarded as an exceptional year, and 2019 data may be used so long as motivation is provided for this.

3

Building information

Year of Construction	2008			
Number of Floors (incl or excl basements & parking)	8			
Does the building have a single or multiple occupancies. Note rule of 90% - see definitions.	Multiple			
For single occupancy class buildings, state occupancy class (see Definitions)	A1 - i			
For multiple occupancies, state applicable occupancy classes (see Definitions and not to the right)				
Year of last major renovation	2011			
Was there a major renovation within the last 2 years?	Yes			
If yes, provide details				
Occupancy certificate date of issue	2009/02/03			
Has the occupancy class changed in the last 2 years?	Yes			
If yes, provide details				
Building plan approval date	2008/08/08			

NOTE: The EPC regulations currently only apply to 4 occupancy classes:
G1 - Offices; A1 Entertainment & public assembly; A2 Theatrical & indoor sport; A3 Places of instruction. In the adjacent cells,
Copy of occupancy certificate

4

Building floor area

Gross floor area	
Gross floor area confirmed by (e.g. original building plans; emergency plans; etc) If other, describe	
Net floor area	3000
Net floor area confirmed by (e.g. original building plans; emergency plans; etc) If other, describe	

ENERGY CONSUMED

- Energy Consumption data for 12 months
- All sources of energy consumed: grid electricity / solar / LPG / other
- Building information
- Building floor area

ENERGY DATA REQUIRED

- 12 months of electricity bills
- Metered data linked to calibration certificates
- Diesel consumption
- Solar PV output
- other

1

Energy consumed calculations

Electricity consumption			
Question no	Question	Answer	Evidence required, if applicable
1	Enter total grid electricity consumption for 12 month period based on utility bills/ 'at the fence' internal bulk meter (kWh)	100 000,00	Copies of all monthly utility bills
2	Is this building submetered?	Yes	
2	If yes , refer to note below and enter total energy consumption for 12 month period for net floor area (kWh)	90 000,00	Submeter energy readings (12 months) and associated coverage

NOTE: WHETHER A BUILDING IS SUBMETERED OR NOT, IT IS EXPECTED THAT AT LEAST SOME FLOOR AREAS WILL NEED TO BE EXCLUDED FROM THE EPC CALCULATION. ENERGY USE OF THESE EXCLUDED AREAS IS CALCULATED IN THE 'EXCLUDED ENERGY' TAB AND THE FLOOR AREA OF THESE EXLUDED AREAS IS CAPTURED IN THE 'NET FLOOR AREA' TAB

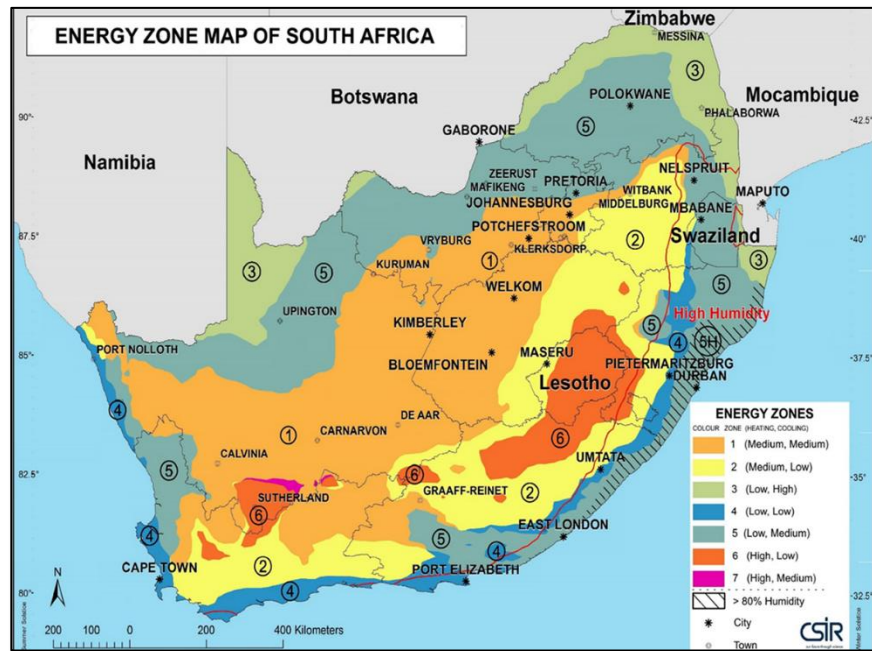
2

Other sources of electricity			
Diesel:			
3	Does this building have a backup diesel generator?	Yes	
4	If yes , what was the volume of diesel consumed in the period? (litres)	4 000,00	Monthly meter readings or tank volume readings, or diesel delivery invoices/receipts
6	Is the total output of the diesel generator consumed by the building?	No	
7	If no , provide an estimate for the percentage of electricity produced by the generator that is used by the building (%)	70%	Description of methodology used, and associated calculations
8	Is this electricity used by the building captured by submetering systems?	No	
9	If partly , provide an estimate for the percentage of electricity produced not captured by submetering systems (%)	0%	Description of methodology used, and associated calculations
Gas (LPG):			
10	Does this building have a backup LPG generator, or use LPG for heating	Yes	
11	If yes , what was the volume of LPG consumed in the period? (kilogrammes)		Monthly meter readings or tank volume readings, or diesel delivery invoices/receipts
12	Is the total energy output of LPG burned consumed by the building?	No	
13	If no , provide an estimate for the percentage of energy produced from LPG that is used by the building	0%	Description of methodology used, and associated calculations
14	If electricity produced from an LPG generator, is the electricity consumed by the building captured by submetering	No	
15	If partly , provide an estimate for the percentage of electricity produced not captured by submetering systems (%)	0%	Description of methodology used, and associated calculations

Solar:			
16	Does this building have a rooftop solar installation?	Yes	
17	If yes , what was the total output of the solar installation for the period (kWh/annum)?		Monthly meter/ system readings
18	Is the total output of the solar installation consumed by the building?	Yes	
19	If no , provide an estimate for the percentage of electricity produced by solar that is used by the building	0%	Description of methodology used, and associated calculations
20	Is this electricity used by the building captured by submetering systems?	No	
21	If partly , provide an estimate for the percentage of electricity used by the building and not captured by submetering systems (%)	0%	Description of methodology used, and associated calculations
Other:			
22	Does this building use electricity or heat that is generated from a source other than those listed above (e.g. LNG, coal, wood, hydrogen)?	Yes	
23	If yes , please define the fuel source and measurement unit:	Wood, kilogrammes	
24	Provide the ratio for volume of fuel to kWh		Source of ratio
25	If yes , provide the total volume of fuel consumed in the period (as per the unit provided)		Monthly meter readings, or fuel delivery invoice/receipts
26	Is the total energy output of other fuel burned consumed by the building?	No	
27	If no , provide an estimate for the percentage of energy produced from other fuel that is used by the building	0%	Description of methodology used, and associated calculations
28	If other fuel is used to produce electricity, is the electricity consumed by the building captured by submetering systems?	Partly	
29	If partly , provide an estimate for the percentage of electricity produced not captured by submetering systems (%)	0%	Description of methodology used, and associated calculations

NETT FLOOR AREA / EXCLUDED AREAS

- Building energy zone
- Excluded areas



1

Net floor area calculations

IMPORTANT NOTE:

Both single and multiple occupancy buildings are required to complete these tables. Note the final '% contribution of occupancy class to EPC net floor area' outputs; if no single occupancy class is 10% or greater of the net floor area, the building must be considered a single occupancy class building, and all floor area information must be entered into the dominant occupancy class section of the below tables.

Net floor area of all occupancy classes (m2)	3000
Is the net floor area of each occupancy class of the building known? This should be exclusive of garages, car parks, storerooms, verandahs, stairwells, lift shafts, and other vertical intrusions.	Yes - complete cells in row 27 only
Building climatic zone (refer to SANS10400 2021XA)	5H



2

	Offices G1-i	Offices G1-ii
Known net floor area for each occupancy class (m2)	1000	
Excluded category/building features for each occupancy class	Total floor area covered by feature/s (m2)	Total floor area covered by feature/s (m2)
Garages		
Car parks		
Storerooms	120	
Verandahs		
Stairwells		
Liftshafts	235	
Other vertical intrusions		
Other 1 (describe here)*		
Other 2 (describe here)*		
Other 3 (describe here)*		
*If this building contains features that the building owner feels should be excluded from net floor area (as per SANS1544), other than those listed, please describe here.		

1 CLASS OF OCCUPANCY	2 Energy zones							
	1	2	3	4	5	5H	6	7
A1: Entertainment and public assembly Occupancy where persons gather to eat, drink, dance or participate in other recreation.	75	75	95	70	95	95	80	80
A2: Theatrical and indoor sport Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographic or sport performances.	95	95	110	90	110	110	105	105
A3: Places of instruction Occupancy other than primary or secondary schools, where students or other persons assemble for the purpose of tuition or learning.	110	155	110	125	140	140	120	120
A3: Places of instruction Occupancy where school children assemble for the purpose of tuition or learning	60	65	55	60	55	60	65	65
G1: Offices Large multi-storey office buildings, banks, consulting rooms and similar uses with lifts and energy consuming services that operate on a typical daytime occupancy.	90	105	110	95	110	95	100	100
G1: Offices Stand-alone blocks and / or campus of buildings that form an office park but operate separately	70	150	190	145	180	165	75	75

1

EXCLUDED ENERGY

- Input excluded areas
- Input excluded energy

- Supply calculation method and raw data

Excluded energy calculations

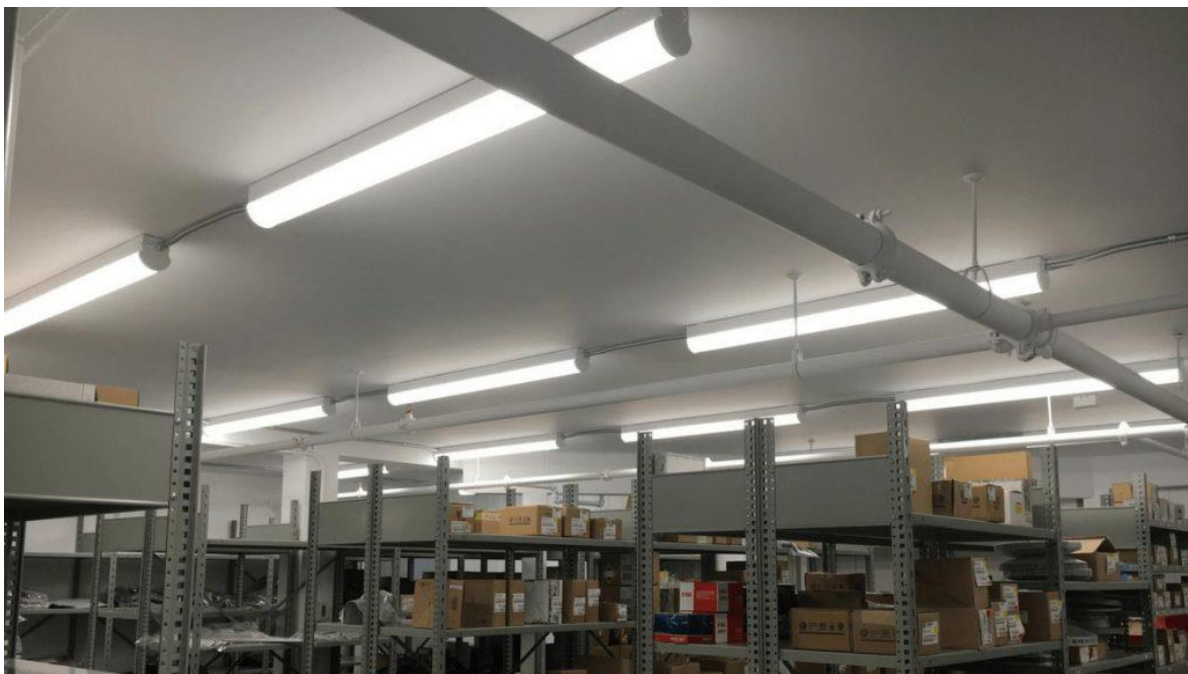
Instructions

FOR ALL BUILDINGS:
 NB: This tab is only to be completed if excluded energy is likely to exceed 10% of total energy consumption, as per sample sized based estimate that must be calculated. Where total excluded energy is likely to be less than 10% of total consumption, it is included in the

For buildings that are not submetered:
 Complete the tables below for all floor areas that are excluded from the EPC calculation

For buildings that are submetered:
 Complete the tables for floor areas that are included in sub meter readings provided in Energy Consumed tab, but are excluded from the EPC calculation

		Exclusion 1	Exclusion 2	Exclusion 3	Exclusion 4	Excl
	Area classification	Storeroom	Garage	Storeroom		
	Description	2nd floor	Service garage	3rd floor storeroom		
	Floor area (m2)	50	300	75		
Lights*	Calculated estimation for % of the year which lights were switched on	25,00%	40,00%	40,00%		
	Number of lights of a specific wattage	60	10	60		
	Wattage of lights specified in the above cell (W)	15	30	15		
	Number of lights of a specific wattage	50	10	50		
	Wattage of lights specified in the above cell (W)	20	20	20		
	Number of lights of a specific wattage					
	Wattage of lights specified in the above cell (W)					
	Number of lights of a specific wattage					
Wattage of lights specified in the above cell (W)						
Plugs	Number of plugs					



LUMENS

	220+	400+	700+	900+	1300+
STANDARD	25W	40W	60W	75W	100W
HALOGEN	18W	28W	42W	53W	70W
CFL	6W	9W	12W	15W	20W
LED	4W	6W	10W	13W	18W

1

OCCUPANCY / VACANCY EXCLUSIONS

- Calculate occupancy

- Supply calculation method and raw data

Occupied floor area calculations

Calculating prorated occupied floor area

The prorated occupied floor area must be calculated for each floor area/section of a building that experienced differing occupancy rates in the course of the measurement period. I.e. if a building is occupied by two tenants, and tenant A was present in the building for 100% of the 12 month period, but tenant B closed their office for 6 months of the year, the prorated floor area for the 2 parts of the building must first be calculated, before determining the overall prorated occupied floor area, as per the example calculation below.

Example calculation

Calculating the % of a year for which a space was occupied:

Description:
A space is considered occupied if it is in active use, regardless of the capacity at which it is operating. I.e. if only 50% of staff are working in the space for a given period, it is considered occupied for the period in which staff were in that space. A space is only considered unoccupied if it is not in use, i.e. it is vacant. For offices, a given space must be considered 100% occupied if it is in normal use, with this being 8 hours a day, 5 days a week, 52 weeks a year. 'Normal use' for non-office spaces (e.g. theatres, indoor sports venues, stadiums, conference centres) is calculated for that specific space on a case by case basis.

Calculation:

Scenario:
The office building in question contains the following 3 areas:
A: 300m² reception area that was occupied 16 hours a day, 5 days a week, for the entire 12 month period
B: 1000m² office space that was occupied 8 hours a day, 5 days a week, for the entire 12 month period
C: 800m² meeting room that was occupied 6 hours a day, 4 days a week, for the entire 12 month period

A: 300m²
B: 1000m²
C: 800m²

Calculation table:

	Standard hours/year (=8*5*52)	Actual hours of occupation (daily hours of occupation * days occupied per week * weeks occupied per year)	Occupancy % of area (Actual hours of occupation/standard hours per year)	Floor area (m2)	Prorated occupied floor area (product of Occupancy % & Floor area)
Occupancy of A:	2080	4160	200%	300	600
Occupancy of B:	2080	1560	75%	1000	750
Occupancy of C:	2080	1920	92%	800	738

Prorated occupied floor area (m2) (sum of all prorated floor areas):	2088
--	-------------


Data entry table

	Description	Floor area (m2) (sum of all below floor areas must equal the net floor area used for EPC calculation)	Daily hours of occupation	Days occupied per week	Weeks occupied per year	Evidence required
Example	Office A	200	6	5	50	
Floor area 1		200	6	5	50	
Floor area 2		400	8	5	52	
Floor area 3		500	6	4	50	

EPC certificate information and EPC grade

Building information	
Building name	The Energy Building
Street address	58 Energy Street
Suburb	Hillbrow
Town/city	Johannesburg
Post code	2193
Province	Gauteng
Building coordinator	-29.353, 30.598
Owner	Siyabonga Properties
Occupancy class/es	A1-i
Number of floors	8
Net floor area (with EPC exclusion)	2045
Year of construction	2008
Building plan approval	2008/08/08
Occupancy certificate	2009/02/03
Year of last major renovation	2011
Climate zone	1- Cold interior - JHB, Bloemfontein
Cadastral information	12345RE
Energy consumption	
Prepared floor area	1132,69
Calculated total energy consumption (kWh)	99 240,00
Total energy consumption for EPC calculation (kWh) (accounting for excluded energy, if greater than 10% of total)	86 669,40
Grid electricity consumption	100 000,00
Diesel energy consumption	9 240,00
LPG energy consumption	-
Solar electricity consumption	-
Other energy consumption	-
EPC calculation (SANS10400-XA 2021 reference values)	
Reference energy performance E_r (kWh/m ²) - single	N/A
Reference energy performance E_r (kWh/m ²) - multiple	
Occupancy	95
Measured overall energy performance (kWh/m ²)	76,52
Variance	18,48
Multiple of variance	0,81
EPC grade - SANS10400XA 2021	C
SANAS accredited IB	
Accredited Body	Energy Auditors Inc
Accreditation number	SANAS 123456
Assessor name	AN Assessor
Date of EPC issue	Friday, 09 July 2021
Valid until	Wednesday, 08 July 2026

- **Grade A :** Energy performance < 0,30Er
- **Grade B :** 0,3Er < energy performance < 0,6Er
- **Grade C :** 0,6Er < energy performance < 0,9Er
- **Grade D :** 0,9Er < energy performance < 1,1Er
(midpoint = Er)
- **Grade E :** 1,1Er < energy performance < 1,4Er
- **Grade F :** 1,4Er < energy performance < 1,7Er
- **Grade G :** Energy performance greater than 1,7Er



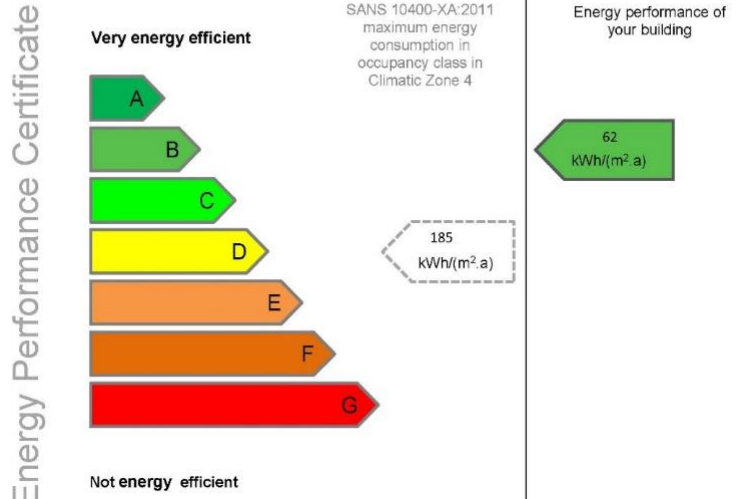
Energy Performance Certificate for Buildings

Omni Forum Municipal Building
94 Van Riebeeck Road
Kuls River
Cape Town
7580

Certificate Number: EPC-SA 0012-2021

This certificate is issued in terms of SANS 1544:2014, Energy performance certificates for buildings, and indicates how much energy is being used to operate this building. The energy performance of the building is based on measured energy performance and is compared to maximum energy consumption provided in SANS 10400 XA.

Energy Performance Certificate



SANS 10400-XA:2011 maximum energy consumption in occupancy class in Climatic Zone 4

Energy performance of your building

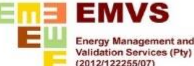
62 kWh/m² a

185 kWh/m² a

Building Information:
Owner: City of Cape Town
Occupancy Class/es: G1- Offices
Number of Floors: 4
Net Floor area: 2711 m²
Year of construction: 1975
Building plan approval: Not available
Occupancy certificate: Not available
Year of last major renovation: Not applicable
Climatic zone: 4 - Temperate coastal
Cadastral information: Erf 1158


Administration Information:
Accredited body: Energy Management and Validation Services (Pty) Ltd
Assessor name: A Jakoef
Date of Issue: 06 September 2021
Valid until: 05 September 2026
Record nr: 701R0815 - 1.1

Carrier	From (date)	To (date)	Energy [kWh]	Net Floor Area	Performance [kWh/m ²]	Exclusions Performance [kWh/m ²]
Electricity (grid)	2019/01/01	2019/12/31	101 109	2 711	37	1
Gas	N/A	N/A	N/A	N/A	N/A	N/A
Solid Fuel	N/A	N/A	N/A	N/A	N/A	N/A
Liquid Fuel	N/A	N/A	N/A	N/A	N/A	N/A
Electricity (PV)	2019/01/01	2019/12/31	68 209	2 711	25	0



Energy Management and Validation Services (Pty) Ltd
(2012/12255/07)

Technical Signatory
Digitally signed by Adiel Jakoef
Date: 2021.09.06 13:24:56 +02'00'



Inspection Body
EPC001

Advancing Net Zero

A World Green Building Council global project



WorldGBC definition:
A net zero carbon building is highly energy efficient with all remaining energy from on-site and/or off-site renewable sources

100% of buildings must operate at net zero carbon

2050

2030

All new buildings must operate at net zero carbon

GOVERNMENT ENGAGEMENT

TRAINING & EDUCATION

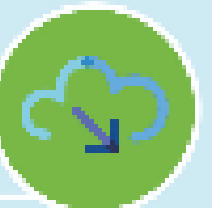
CORPORATE ENGAGEMENT

CERTIFICATION

Key Principles

1. Measure and disclose carbon

Carbon is the ultimate metric to track, and buildings must achieve an annual operational net zero carbon emissions balance based on metered data



2. Reduce energy demand

Prioritise energy efficiency to ensure that buildings are performing as efficiently as possible, and not wasting energy



3. Generate balance from renewables

Supply remaining demand from renewable energy sources, preferably on-site followed by off-site, or from offsets



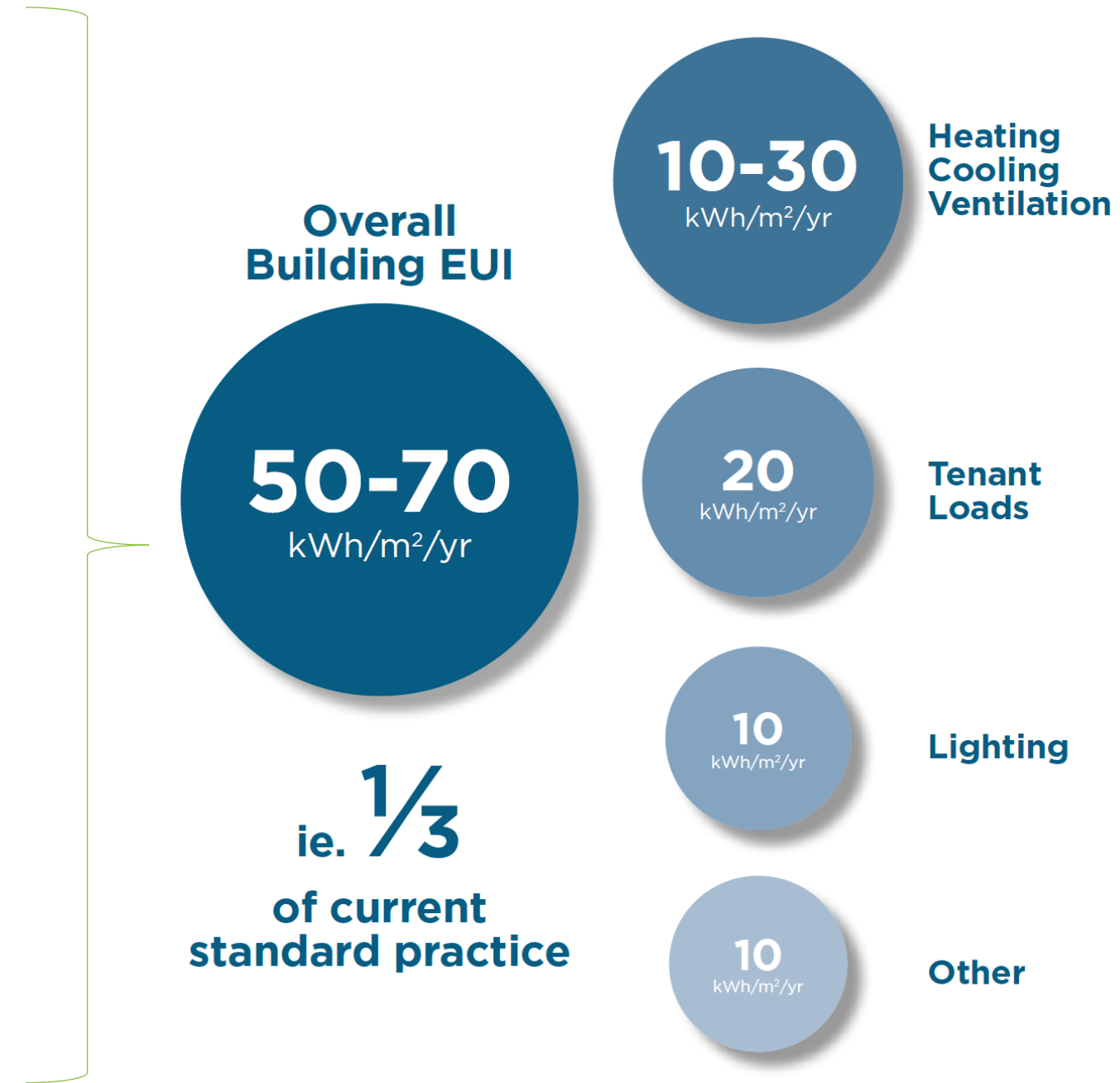
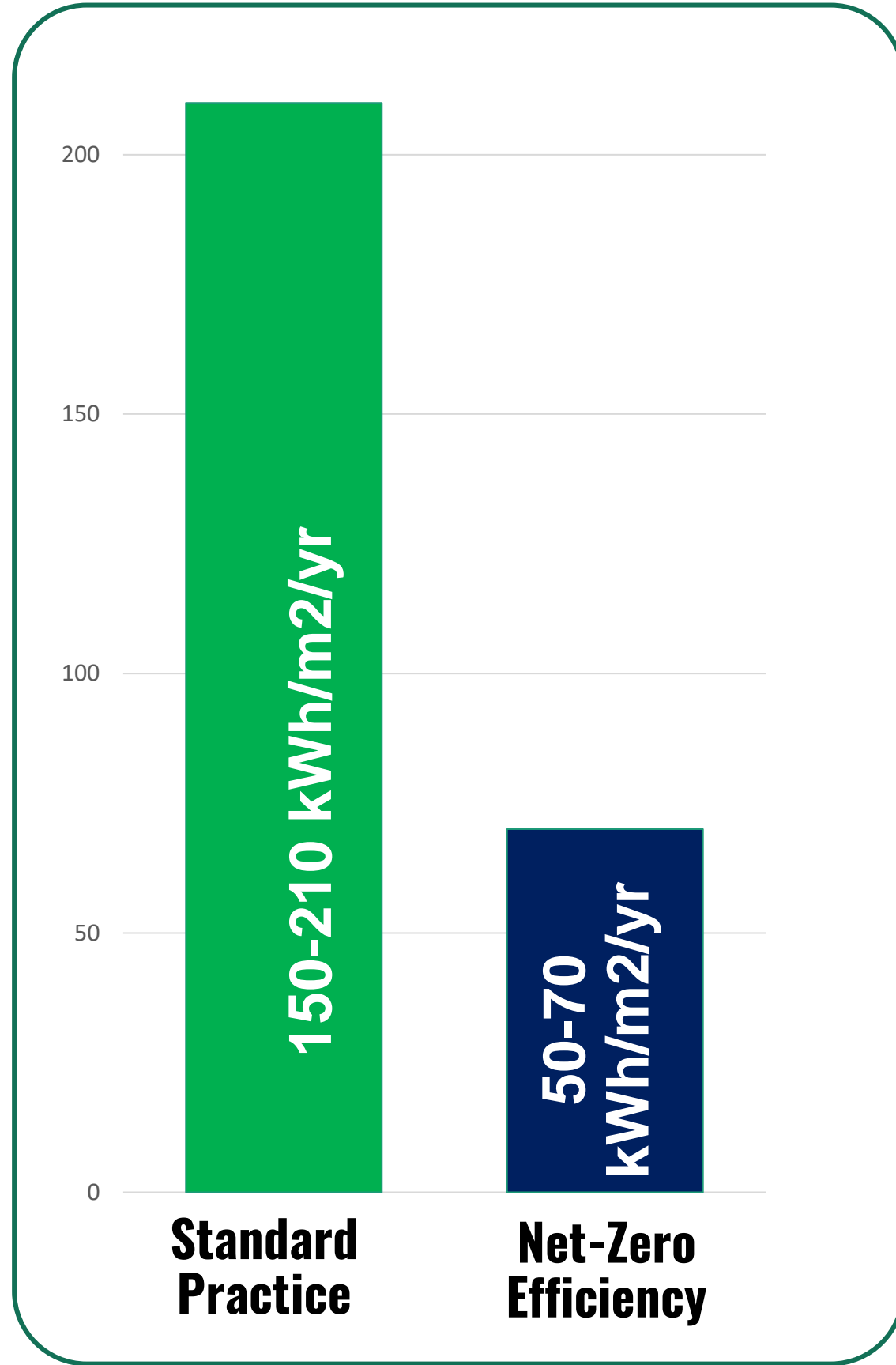
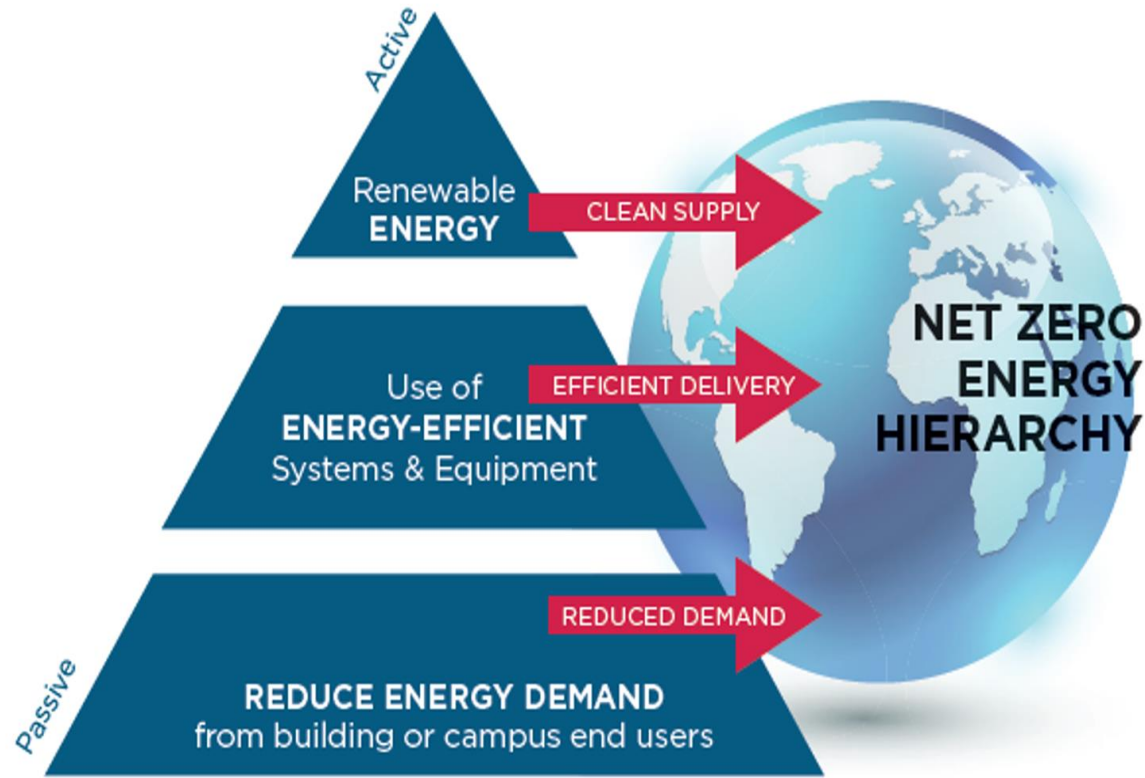
4. Improve verification and rigour

Over time, progress to include embodied carbon and other impact areas such as zero water and zero waste



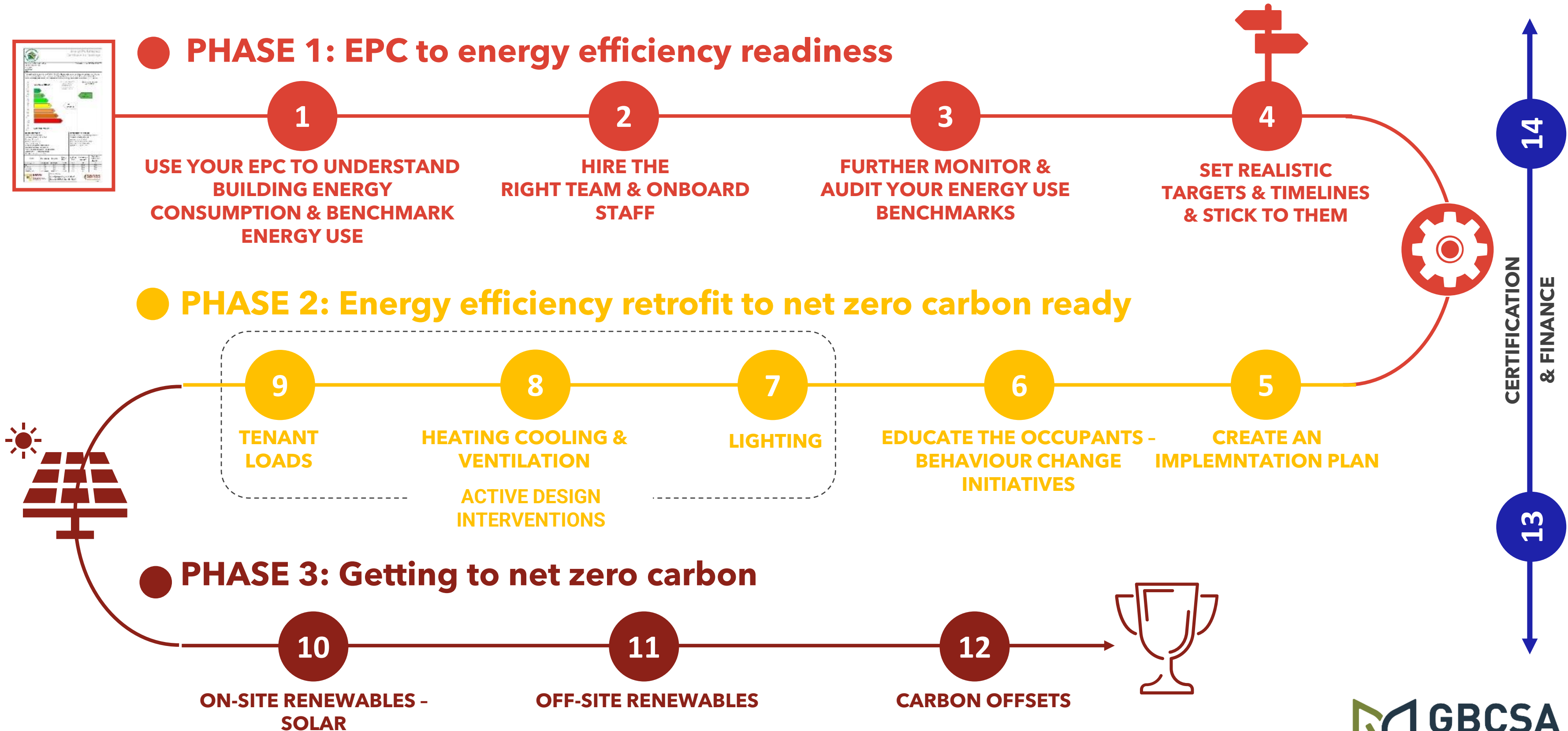
WHERE WE NEED TO BE

THE ENERGY HIERARCHY - BEAHR'S ELP



EPC TO NET ZERO CARBON (NZC) ROADMAP FOR EXISTING OFFICE BUILDINGS

THIS ROADMAP IS A STEP BY STEP GUIDE AIMED AT GETTING A TYPICAL OFFICE BUILDING TO NET ZERO CARBON OPERATIONAL ENERGY.





THANK YOU

Jo.anderson@gbcsa.org.za