TECHNICAL APPLICATION GUIDELINES FOR THE PURPOSE OF IMPLEMENTING, MONITORING AND VERIFICATION OF REGULATIONS FOR MANDATORY DISPLAY AND SUBMISSION OF ENERGY PERFORMANCE CERTIFICATES FOR BUILDINGS

December 2023

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ACRONYMS AND ABBREVIATIONS

DMRE	Department of Mineral Resources and Energy
EPA	Energy Performance Assessment
EPC	Energy Performance Certificate
HVAC	Heating Ventilation Air Conditioning
I&V	Inspection and Verification
IB	Inspection Bodies
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
kWh	kilowatt-hour
MO&V	Monitoring and Verification
NBEPR	National Building Energy Performance Register
NGOs	Non-governmental Organization
PV	Photovoltaic
QAs	Quality Assurer
SANAS	South African National Accreditation System
SANEDI	South African National Energy Development Institute
SANS	South African National Standards
TAG	Technical Application Guidelines

DISCLAIMER

At the time of completing this Technical Application Guidelines, the development work of the DMRE and SANEDI on the Building Energy Performance Certification process was still ongoing. Consequently, the authors have included certain generic content in the relevant chapters, which may need to be supplemented or finalized upon the completion of the development process.

The Technical Application Guidelines are a product of the DMRE, authored by 3BTechnical Services as service contractors funded by the South African-German Energy Partnership. The findings, interpretations, and conclusions expressed in the Guidelines can be discussed with the DMRE.

EXECUTIVE SUMMARY

Energy “Performance Certificate” means a certificate issued by an accredited SANAS inspection body prior to 31 July 2024, and thereafter by a Registered Professional in respect of a building in accordance with the SANS 1544:2014 Energy Performance Certificates of buildings, published by the SABS in terms of the Standards Act, 2008, (Act No. 8 of 2008).[2]

Since 18th February 2021 when the first EPC was issued there have been 1908 EPCs issued to date (17th October 2023) [4] with an average rate of 636 EPCs per annum.

This low rate of the building certification prompted the South African Government to change the current legislation allowing large numbers of individual Registered Professionals and Quality Assurers (QAs) to be involved in the EPC process.

It is against this background that the South African - German Energy Partnership, on behalf of the DMRE appointed 3B Technical Services to develop the Technical Application Guidelines for the purpose of implementing, monitoring, and verification of Regulations for Mandatory Display and Submission of EPCs for buildings [1].

The Technical Application Guidelines describe the process that will be followed to conduct buildings' energy performance assessments in line with appropriate South African National Standards, monitoring, and verification of the EPCs being issued by SANAS Accredited Inspection Bodies and displayed by building owners. The Guidelines are applicable to the four classification of building categories namely: A1: Entertainment and public assembly; A2: Theatrical and indoor sport; A3: Places of instruction; and G1: Offices as stipulated in the Regulations [1].

The development of the EPC Technical Application Guidelines main objective is to support the implementation of the EPC process by delineating the principles for monitoring and verifying EPC regulations. This will be achieved through the creation of a comprehensive, step-by-step guidelines for EPC Inspection Bodies, Building Owners, SANEDI, and DMRE. The guidelines are intended to serve as a resource for the implementation, monitoring, and verification process of building energy performance assessments, as well as the issuance and display of EPCs for buildings. The guidelines offer detailed insights into the following aspects:

1. The essential structure for compliance monitoring and verification of issued and displayed EPCs.
2. The procedures and internal reviews for compliance monitoring and verification to be adhered to by DMRE and/or SANEDI.
3. The responsibilities of EPC Inspection Bodies (registered individual professional(s)) and Building Owners.
4. A step-by-step process for building registration, data collection, energy performance assessments, EPC issuance, and submission.
5. Pertinent considerations for all parties involved during the implementation, monitoring, and verification process, in relation to SANS 1544:2014 and SANS 10400-XA-2021.

1. THE ESSENTIAL STRUCTURE FOR COMPLIANCE MONITORING AND VERIFICATION OF ISSUED AND DISPLAYED ENERGY PERFORMANCE CERTIFICATES.

Energy Performance Certificate (EPC) means a certificate issued by a SANAS accredited Inspection Body (IB) prior to 31 July 2024, and thereafter by a registered individual professional in respect of a building in accordance with the SANS 1544:2014 Energy Performance Certificates of buildings, published by the SABS in terms of the Standards Act, 2008, (Act No. 8 of 2008).[2]

The energy performance certification process in South Africa was initiated by the South African Government to assist building owners in identifying areas to improve energy efficiency. This is in line with global best practices and will ensure that a building remains economically sustainable while also reducing its energy footprint.

1.1 Regulatory framework that governs energy performance certification for buildings and facilities.

The established framework is based on the Department of Mineral Resources and Energy (DMRE) pertinent legislations in compliance of the relevant South African National standards and with the involvement of South African National Energy Development Institute (SANEDI) [2],[3],[4].

The main points of the regulatory framework are:

- The current Regulations the Mandatory Display and Submission of Energy Performance Certificates for Buildings, 2019 were published by Government Gazette No. 43972 Notice No. 700 of 8 December 2020 [2], as amended by Government Notice No. 1461 of 25 November 2022 [2].
- The Regulations state that non-compliance will be in contravention of the National Energy ACT where the non-compliant entity will be convicted to a fine not exceeding five million rand and/or imprisonment for a period not exceeding five years [3].
- However, the Government decision to change the current regulatory framework for issuing EPC was based on the Regulation under section 19(1)(b) of the National

Energy Act, 1988 (Act No.34 of 2008)- Notice 1937, of 24 July 2023 [3]. The new process will be implemented as from 31st July 2024.

- The Minister of Mineral Resources and Energy has, in terms of section 19(1) (b) of the National Energy Act, 2008 (Act No. 34 of 2008), made the regulations as set out in the Schedule: Amendment of Regulation 4 of the Regulations for the Mandatory Display and Submission of Energy Performance Certificates for Buildings, 2023, and shall come into operation on a date proclaimed in the Gazette. [3].

The following definitions are hereby substituted/inserted for Regulation: Compulsory registration and submission of energy performance certificate [3]:

(1) **Accredited body** means the body accredited by the South African National Accreditation System.

(2) **Energy performance certificate** means a certificate issued by an accredited body prior to 31st July 2024, and thereafter by a registered professional in respect of a building in accordance with SANS1544:2014

(3) **Registered Professional** means an individual professional registered by the South African National Energy Development Institute.

The following regulation is hereby substituted for Regulation: Compulsory registration and submission of energy performance certificate [3]:

(1) The accounting officer of an organ of state or the owner of a building other than those owned, operated, or occupied by an organ of state must:

(a) register the type and size of a building in the National Building Energy Performance Register maintained by SANEDI, within 12 months of the promulgation of these regulations; and

(b) submit a certified copy of the energy performance certificate to SANEDI in respect of every building contemplated in regulation 3 within three calendar months of the date of issue of the certificate.

(2) SANEDI must maintain a National Building Energy Performance Register, which must include the particulars of all valid building energy performance certificates.

1.2Main actors and responsibilities in the current EPC process

The current Regulations as described in Section 1.1 includes the main participants and roles that is summarized in Figure 1-1.

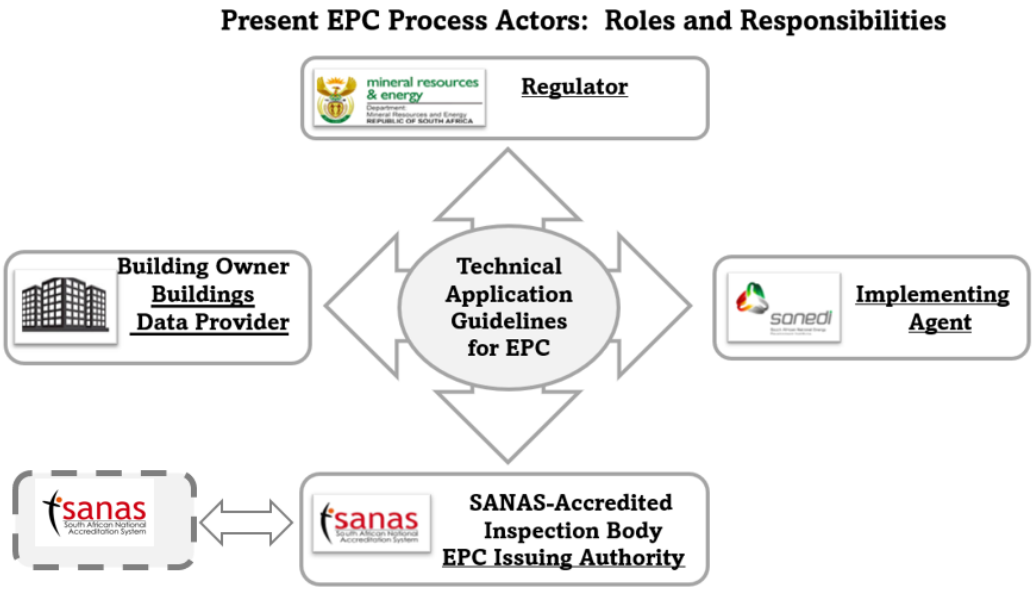

Figure 1-1 Present Main Role-players in EPC Process in South Africa

1.2.1 DMRE role in EPC process

DMRE is the REGULATOR of the EPC process as per Regulation under section 19(1) of the National Energy Act, 1988 (Act No.34 of 2008), as published in Notice 700, of December 2020. [2].

1.2.2 SANEDI role in EPC process

SANEDI is the Implementing Agent with the following main responsibilities:

- Review of Submissions and uploads to National Building Energy Performance Register (NBEPR) on behalf of the Regulator (DMRE)
- Data and Process Quality Control
- Monitoring and Verification Process

1.2.3 Building owner main roles and responsibilities

- **Supplying building's data**: Drawings and floor plans.
- **Supplying information** about tenants' profiles (if any).
- **Supply energy usage information**: Electricity bills, electricity usage produced by own generation, invoices for liquid and gaseous fuels.
- **Provide site access** to targeted building(s) to the IB and facilitates inspections and audits.
- **Submit a certified copy** of EPC to SANEDI.

1.2.4 SANAS-Accredited IBs main roles and responsibilities

- Perform building audits, measurements, and relevant building inspections.
- Gather and compile typical building information such as:
    - Building location zone /physical data including net floor area [m^2].
    - Energy carrier: Electricity (grid), Gas, PV, Other [kWh p.a.].
- Receive and validate the gathered building information /data from audits.
- Perform site inspection, verification of energy and building audits as well as on-site data validation.
- Issuing of EPC as annual energy usage [kWh/ m^2] to display on the building.

1.2.5 SANAS role in the EPC process

It should be noted that SANAS accreditation is the official recognition, by the authoritative third party, that an entity IB is competent to perform specific tasks and has a documented management system in place to ensure consistent implementation of its processes [8].

Any accredited IB for issuing of buildings EPCs has to demonstrate through formal assessment that:

- It is competent to perform the technical specific tasks for issuing of buildings EPC (SANS 1544:2014 and SANS 10400-XA-2021), and that the IB satisfies both national and international requirements for accreditation; and

- Has developed and applied a documented Quality Management System to ensure consistent implementation of its processes that comply with the Accreditation Standard (ISO/IEC 17020:2012).

1.3 Main actors and responsibilities in the new EPC process

The new process will be implemented as from 31st July 2024.[3] based on the New Regulation under section 19(1)(b) of the National Energy Act, 1988 (Act No.34 of 2008)- Notice 1937, of 24 July 2023. The main actors participating in the new EPC Process [5] are shown in Figure 1-2.

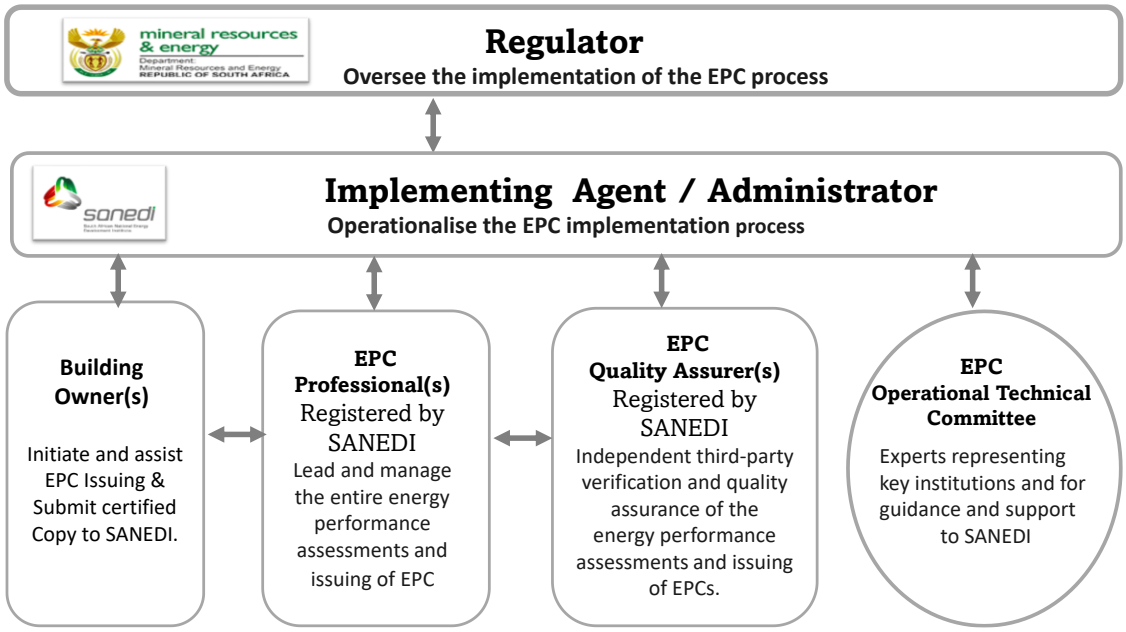

Figure 1-2 : New EPC Process Actors: Roles and Responsibilities [5].

1.3.1 DMRE role and main responsibilities in the new EPC process

The DMRE oversees and provides overall guidance of the EPC process, while ensuring compliance monitoring and reporting, and conducts impact assessment and review of the Regulations. Amongst other tasks, DMRE provides:

- Registration and competency assessment
- Access to EPC Tools and Software
- Access to upskilling and training
- Access to reporting templates

1.3.2 SANEDI role and main responsibilities in the new EPC process

SANEDI is the Implementing Agent / Administrator for Regulation under section 19(1)(b) of the National Energy Act, 1988 (Act No.34 of 2008)- Notice 1937, of 24 July 2023 [3] with main responsibilities:

- Maintain National Building Energy Performance Register (NBEPR).
- Registration of individual EPC Professional(s).
- Appointment and allocation of EPC Quality Assurer(s).
- Feedback on building registration and certification gaps/results.
- Qualification of EPC training providers.
- Coordination of EPC training.
- EPC communication and awareness.
- Establishment of EPC Technical Committee.
- Manage monitoring and verification process.

1.3.3 Building Owner main roles and responsibilities

- Registration of EPC complying buildings
- Appointment of EPC Registered Professional(s)
- EPC display and submission of final energy performance assessments data and results
- Submit certified copy of issued EPC to SANEDI.

1.3.4 EPC Technical Committee main role and responsibilities

This committee is composed of pertinent stakeholders with representatives from industry associations, industry experts and relevant institutions with the intention to support SANEDI in overseeing and providing guidance on the energy performance certification process and

provide the required recommendations for policy requirements and improvement of the performance ratings of buildings [5].

1.4 Process for compliance Monitoring and Verification of issued and displayed Energy Performance Certificates

The EPC process typically involves several steps to ensure that buildings and facilities meet energy performance standards and DMRE regulations. Here are the essential phases of this process:

1.4.1 Establish Regulatory Framework

The Regulatory Framework is founded on Regulations for the Mandatory Display and Submission of Energy Performance Certificates for Buildings published by Government Gazette No. 43972 Notice No. 700 of 8 December 2020, as amended by Government Notice No. 1461 of 25 November 2022 and Government Notice No. 1937 of 03 August 2023 [2], [3].

1.4.2 Regulatory Overview

The Regulatory Overview explained in detail in Section 1.1.1 is illustrated in Figure 1-3 where the major role players and their main responsibilities are given.

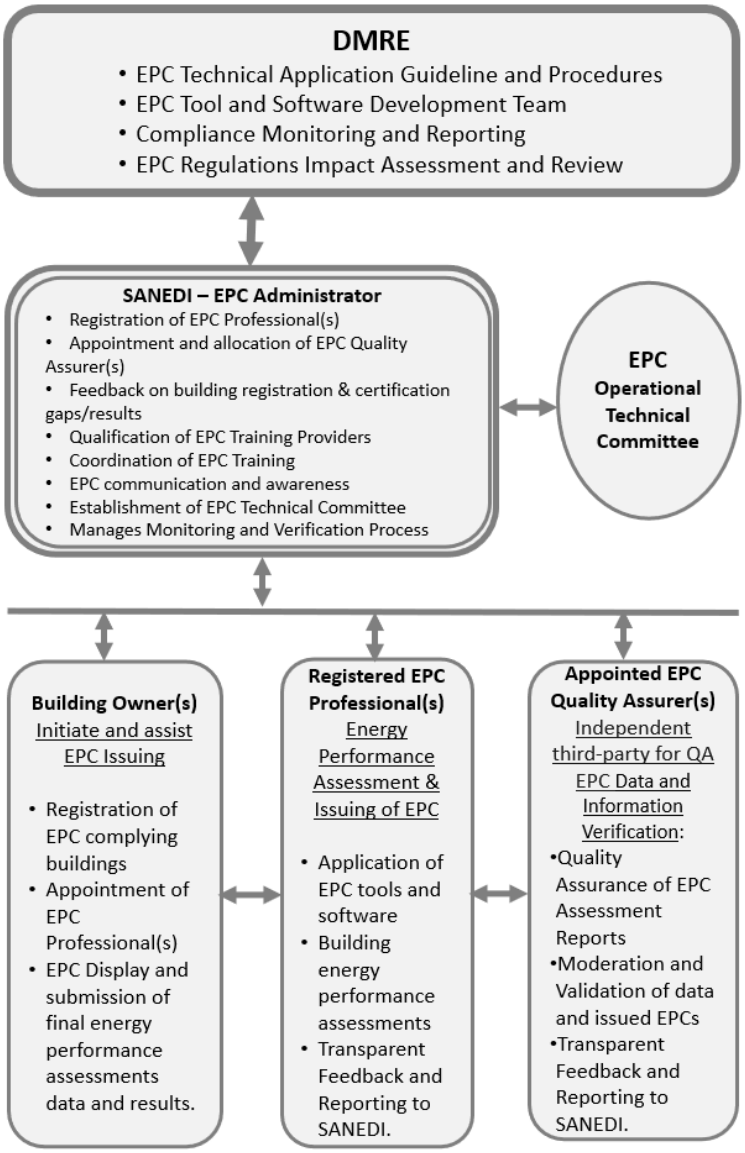

Figure 1-3 : EPC Regulatory Overview [5]

1.4.3 *Certification Issuance*

Building owners, manager or accounting offer obtain an Energy Performance Certification through SANAS-accredited IBs as per the current regulation and by a SANEDI-Registered Professional(s) as from 31st July 2024 in compliance with the standardized procedures and criteria as per SANS 1544:2014 [6] and SANS 10400-XA-2021 [7].

1.4.4 Documentation and Data Collection

The relevant data and documentation related to the building's energy performance should include the following:

- Building physical characteristics including approved plans
- Detail on building occupancy classification (per tenant if applicable)
- Occupancy information (per tenant if applicable)
- Details on major electrical appliances
- Detail on any other major energy carriers
- Energy consumption data (from utility bills or from calibrated metering)
- Liquid, gas, or solid fuel invoices (record of purchase or record of use within the building)

This information is to be made available by the building owners, manager, or accounting officer for the purpose issuing of an EPC for their building. Clear documentation of the process, explicitly stating the procedures and templates to be used and the obligations of each party within the energy performance certification process is critical. DMRE is to provide technical guidelines and framework for compliance monitoring and reporting for the purpose of energy performance certification [5].

1.4.5 Assessment and Auditing

IBs (as per the current regulation) and Registered Professionals (as per the new regulation) should assess the building's energy performance using standardized methods and tools. The assessor should conduct a visual inspection and inventory of the building’s key elements with the site representatives. The key elements to be examined include:

- Construction details of the building’s envelope (e.g., walls, windows, doors, and related insulation)
- Sample measurement of building reported surface area
- Heating and colling systems (HVAC) capacities, control methods and rated efficiency
- Interior and exterior lighting systems and related controls
- Hot water systems
- Electrical apparatus

- On-site generation and sources (Renewable generation, back-up generation etc…)
- Alternative energy sources

The assessor ends the on-site visit by completing and handover of a copy of a Non-Conformance form, which clearly stipulates any outstanding matters (if any exist) that need to be addressed **(Standardised form to be provided by the regulator/SANEDI).** The on-site notes, data and findings are captured appropriately. Should there be any differences in opinion regarding any aspect, this should be recorded for further clarity from the regulator.

1.4.6 Certification Generation

Energy Performance Certification based on the assessment results should be generated once the assessment is completed. This certificate should clearly indicate the building's energy efficiency rating and compliance with established standards: SANS 1544:2014 [6] and SANS 10400-XA-2021 [7]. An online EPC generation tool hosted by SANEDI in compliance with the relevant standards is to be used by the IBs or registered professionals to generate the EPC based on the inspection findings [4].

1.4.7 Display Requirements

Establishes requirements for the public display of the Energy Performance Certification. This includes prominently placing the certificate in a visible location within the building or making it available in online databases.

1.4.8 *Submission of issued EPCs in buildings*

The building owners, manager, or accounting officer should, in the prescribed time frame, submit a certified copy of the issued certificate to SANEDI for keeping in the National Building Energy Performance Register (NBEPR). This should follow the below process:

- Once an EPC has been issued by the SANAS accredited IB or individual Registered Professional(s), the building owner is to get a copy of the issued EPC certified by a Commissioner of Oaths.

- The certified copy of the EPC is to be submitted to the SANEDI online database within 3 months from date of issue.
- The required building information is to be provided as indicated in the online form. The certified EPC must be in a PDF format and certified within 3 months by a Commissioner of Oaths.
- Submission outcome will be communicated by SANEDI within 2 to 3 working days electronically.

2 THE PROCEDURES AND INTERNAL REVIEWS FOR COMPLIANCE MONITORING AND VERIFICATION TO BE ADHERED TO BY DMRE AND / OR SANEDI

This section presents a general outline of the objectives, scope, and procedures of internal reviews for compliance monitoring and verification to be adhered to by DMRE and/or SANEDI. Compliance monitoring and verification are essential components of regulatory and governance frameworks designed to ensure that stakeholders/actors /entities participating in EPC processes and activities adhere to established rules, regulations, standards, and best practices. Monitoring ensures the continuous assessment of EPC processes and enables timely corrective actions, while the Verification confirms that implemented control measures by DMRE / SANEDI are functioning as intended and continue to be effective. The procedures and internal reviews for compliance monitoring and verification to be adhered to by DMRE and / or SANEDI follow two main domains:

1) Monitoring & Verification of energy performance certification data and validation of issued EPCs by the SANAS Accredited Inspection Bodies (IB) / EPC Individual Professional(s)registered by SANEDI. In the New Regulations [3] the activities in this area are normally executed by ***Quality Assurers*** being an independent third-part individual appointed by SANEDI for the verification of energy performance certification data and validation of issued EPCs [5].
2) Monitoring & Verification of the Overall EPC Process in South Africa. This domain is managed by SANEDI.

2.1 MONITORING & VERIFICATION OF ENERGY PERFORMANCE CERTIFICATION DATA AND VALIDATION OF ISSUED EPCS

This is a critical process aimed at ensuring that EPC issued to eligible buildings were issued according to established standards and guidelines. The objectives and scope of this process are multifaceted and involve several key aspects. These objectives incorporate a range of activities, processes, and entities.

2.1.1 Regulatory Framework and Guidelines

The identification of the relevant laws, regulations, and standards that govern compliance monitoring and verification in the EPC sector are outlined in Section 1.1.1.

2.1.2 *Objectives and Scope of compliance monitoring and verification*

Clearly define the objectives of compliance monitoring and verification, including the scope of activities, processes, and entities that need to be assessed.

2.1.3 The Primary / Generic objectives

- To confirm that entities are operating in accordance with applicable laws, standards, and regulations and,
- To identify and address any deviations or non-compliance promptly.

2.1.4 Specific Objectives

Energy Conservation:

- Reduce Energy Consumption: Encourage buildings to reduce energy consumption through efficient design, appliances, and systems.
- Promote Renewable Energy: Encourage the integration of renewable energy sources to decrease reliance on fossil fuels.

Environmental Impact:

- Carbon Emission Reduction: Reduce carbon emissions by promoting energy-efficient practices, thereby mitigating the impact of buildings on climate change.

- Resource Conservation: Conserve natural resources like water and electricity by encouraging sustainable building practices.

Consumer Awareness:

- Inform Consumers: Provide clear and accurate information to consumers about the energy performance of buildings, enabling them to make informed decisions.
- Encourage Energy-Efficient Choices: Encourage property owners and occupants to adopt energy-efficient technologies and behaviors.

Policy Evaluation:

- Policy Effectiveness: Evaluate the effectiveness of energy efficiency policies and regulations by analyzing the performance data of certified buildings.
- Policy Improvement: Use the data gathered to refine existing policies and develop new strategies for improved energy performance in buildings.

2.1.5 Scope

The scope of procedures and internal reviews for compliance monitoring and verification to be adhered to by DMRE and / or SANEDI is focused on the following main outputs:

1) **Provision of Independent third-party verification and quality assurance of the Energy Performance Certification Verification:**
    - **Compliance monitoring and verification of building energy performance data** and information to measure the effectiveness of the tools used and certification processes.
    - **Document Review:** Evaluate building documentation, including architectural plans, insulation details, HVAC systems, and any other major energy consuming appliances to ensure compliance with energy standards.
    - **Review for data integrity of energy usage information supplied**: energy bills, alternative generation, liquid, and gaseous fuels invoices.
    - **On-Site Inspections**: Conduct physical inspections to verify that the constructed building matches the approved plans and meets energy efficiency requirements.
    - **Assessments and issued EPCs**: procedure employed by the registered professional to assess the building energy performance to issue the EPC.

2) **Provision of quality control and checks on EPC data and information and Performance Monitoring:**
   - **Data collection techniques (Real-time Data Collection):** utilize smart meters and sensors to collect real-time data on energy usage, energy usage monthly bills, other energy types and other relevant parameters.
   - **Data Analysis:** Analyze collected data to assess the building's energy performance over time and identify areas for improvement.
3) **Occupant Behavior Analysis:**
   - **Surveys and Interviews:** Engage with building occupants to understand their energy usage behavior and identify opportunities for promoting energy conservation practices.
   - **Education and Outreach**: Conduct awareness programs to educate occupants about energy-efficient habits and technologies and EPC fundamentals.
4) **Periodic Audits:**
   - **Regular Audits**: Conduct periodic energy audits to ensure ongoing compliance with energy efficiency standards.
   - **Recommendations:** Provide recommendations for energy-saving measures based on audit findings to further improve the building's performance.
5) **Reporting on Certification Process:**
   - **Assessment of issued EPC:** Assessment on Issued EPCs that meet the required standards, indicating their level of energy efficiency.
   - **Public Disclosure:** Make certification information publicly accessible, allowing potential buyers or tenants to consider energy performance when choosing properties.
6) **Policy Feedback:**
   - **Data Sharing:** Share anonymized data and insights with policymakers and researchers to support evidence-based decision-making in energy efficiency policies.
   - **Policy Recommendations**: Provide recommendations to policymakers based on monitoring outcomes, suggesting changes or enhancements to existing regulations.

2.2 IDENTIFICATION OF METRICS /KEY PERFORMANCE INDICATORS

Determine the specific performance indicators or metrics that will be used to assess compliance with regulatory requirements and organizational standards.

2.2.1 Metrics for Monitoring & Verification of energy performance certification data and validation of issued EPCs.

When monitoring and verifying energy performance certification data and validating issued EPCs by entities, it is crucial to establish Key Performance Indicators (KPIs) to ensure accuracy, compliance, and effectiveness of the certification process. Here are some KPIs specific to this context:

1) Data Accuracy Rate: Measure the accuracy of the data submitted for energy performance certification. This can be calculated by comparing the certified data with actual data obtained after certification. Low discrepancies indicate high accuracy.
2) Validation Accuracy Rate: Determine the accuracy of validated Energy Performance Certificates (EPCs) by comparing them with the original data and certification standards. Validate a sample of issued EPCs periodically and calculate the accuracy rate.
3) Compliance Rate: Measure the percentage of issued EPCs that comply with the established standards and regulations (SANS 1544:2014 Energy Performance Certificates of buildings). Compliance can include factors like energy efficiency ratings, recommended improvements, or specific guidelines for different types of buildings.
4) Timeliness of Validation: Measure the time taken to validate issued EPCs after submission. Timely validation is essential for ensuring that buildings and stakeholders have access to accurate and validated energy performance information promptly.
5) Resolution Time for Discrepancies: If discrepancies are found during the validation process, measure the time taken to resolve these issues. Quick resolution ensures that accurate EPCs are available for stakeholders without unnecessary delays.
6) Customer Satisfaction: Implement surveys or feedback mechanisms to measure the satisfaction of building owners and stakeholders with the validation and certification process. High satisfaction scores indicate a well-managed and customer-focused validation system.

7) Audit Findings: from periodic Quality Assurance audits as part of the validation process, track the findings and their resolution. This ensures that any non-conformities are identified, addressed, and prevented from recurring.
8) Training and Competence of Registered EPC Individual Professional(s): Monitor the training levels and competence of the personnel involved in the validation process. Regular training and assessments ensure that professionals are equipped with the necessary skills and knowledge to perform their tasks effectively.
9) Number of Certifications Verified: Track the number of EPCs verified and validated over a specific period. This KPI provides insights into the workload of the validation entity and the demand for certification services.
10) Error Rate: Monitor the rate of errors or discrepancies identified during the validation process. Lower error rates indicate accuracy and attention to detail in the validation and certification process.
11) Cost Efficiency: Monitor the costs associated with the validation process. This includes operational costs, personnel costs, and other resources. Maintaining a balance between cost and quality ensures efficient resource utilization.
12) Feedback Loop Effectiveness: Measure how feedback from validation and certification results is utilized for process improvement. An effective feedback loop ensures continuous improvement and adaptation to changing requirements.

In summary, regularly monitoring the relevant KPIs helps ensure the accuracy, compliance, and efficiency of the energy performance certification and validation processes. It also enables continuous improvement and enhances the overall quality of services provided by the entities involved.

2.2.2 Metrics for Monitoring & Verification of the Overall EPC Process

The monitoring of the progress and success of the overall EPC process in South Africa requires a set of KPIs that reflect its goals, objectives, and overall impacts. Here are some general applicable metrics (KPIs):

1) EPC Process Completion Rate: The percentage of initiative tasks or milestones completed within the planned timeframe. This KPI indicates the progress.

2) Stakeholder Satisfaction: Measure stakeholder satisfaction through surveys or feedback mechanisms. This can include participants, beneficiaries, government entities, and other stakeholders.
3) Timeline Adherence: The percentage of project tasks completed on time. Timely completion of tasks is vital for overall project success.
4) Quality Assurance of Deliverables: Measure the quality of EPC process outputs or deliverables against predefined Standards and Regulations. This is focused on verification of energy performance certification data and validation of issued EPCs, EPCs quality assessments, Registered Professionals service evaluations, or other relevant metrics.
5) Resource Utilization: Measure the efficient use of resources such as manpower and relevant equipment. Assessing resource allocation and utilization helps in optimizing EPC process efficiency.
6) Risk Management: Monitor the identification, assessment, and mitigation of project risks. This can include tracking the number of identified risks, the severity of risks, and the effectiveness of risk mitigation strategies.
7) Impact on Beneficiaries: Measure the positive impact of the EPC Process as envisaged by DMRE. This can include improvements: Building's Energy Efficiency, Environmental benefits, changing of building occupants' behavior, related education /training, job creation, infrastructure improvements etc.
8) Partnership and Collaboration: Track the number and quality of partnerships and collaborations established during the project. Successful collaborations can enhance project reach and effectiveness.
9) Data Accuracy and Integrity: Ensure the accuracy and integrity of project data. This can include monitoring data collection methods, data entry accuracy, and the reliability of project-related information.
10) Sustainability: Measure the EPC process long-term sustainability. This can include the development of sustainable practices, and long-term maintenance and improvement actions for Energy Efficiency in buildings in South Africa.
11) Environmental Impacts: Measure the environmental impact of the EPC process.

12) Knowledge Transfer: Assess the effectiveness of knowledge transfer activities, such as training programs or workshops for all parties involved: building owners / occupants, Registered Professionals, Quality Assurers, SANEDI. DMRE, industry. This can involve evaluating the skills and knowledge gained by participants.
13) Transparency and Accountability: Measure the transparency and accountability of EPC process activities. This can include assessing the availability and accessibility of relevant information to the public.
14) Innovation and Creativity: Encourage and measure innovative approaches within the EPC process. This can involve tracking the implementation of new digital technologies, Artificial Intelligence (AI), electronic templates processes, or methodologies.
15) Social Inclusion: Measure the level of social inclusion achieved by the project especially addressing of marginalized or vulnerable groups (such as unemployed youth and women). This can include assessing the democratization of EPC-related activities.
16) Long-term Economic Impact: Measure the long-term economic impact of the EPC process. This can include tracking energy saved, job creation, or business development resulting from EPC activities.

In summary, these KPIs can be customized by SANEDI and based on the specific nature of the South African conditions, ensuring that they align with the DMRE objectives and contribute to its overall success and impact on country's transition to the decarbonization.

2.2.3 Risk Assessment

Building energy performance certification is essential for promoting energy efficiency and sustainability in the built environment sector. Non-compliance with certification standards and regulations can lead to various risks. Here are potential risks associated with non-compliance in building energy performance certification, along with established risk assessment criteria:

1) Legal and Regulatory Penalties:
   - **Risk:** Non-compliance can result in fines, legal actions, or penalties imposed by regulatory authorities.

- **Risk Assessment Criteria:** Evaluate the legal and regulatory requirements related to certification and ensure full compliance with applicable laws and standards. Inform regularly building owners for the existing EPC legislation.

2) Loss of Credibility:
   - **Risk:** Non-compliance can damage the credibility of certification by SANAS Accredited Inspection Bodies /Registered Professionals (especially after SANAS is no longer involved in entities accreditation), leading to a lack of trust among building owners and stakeholders.
   - **Risk Assessment Criteria**: Monitor customer feedback, satisfaction surveys, and industry reputation to gauge the credibility of the certification process.
3) Financial Loss:
   - **Risk:** Non-compliance might lead to financial losses due to legal penalties, re-certification costs, or loss of customers.
   - **Risk Assessment Criteria:** Estimate potential financial losses in case of non-compliance and establish a risk threshold. Regularly compare actual costs with estimated losses.
4) Inaccurate Energy Performance Data:
   - **Risk:** inaccurate energy performance data supplied by the building owners may result in non-compliance, leading to misguided decisions on energy efficiency improvements.
   - **Risk Assessment Criteria:** Appointed Quality Assures to regularly audit a sample of certified buildings to ensure the accuracy of energy performance data. Deviations from expected values could indicate a risk.
5) Reputational Damage:
   - **Risk:** Non-compliance can lead to negative publicity, damaging the reputation of the certification entity and the certified buildings.
   - **Risk Assessment Criteria:** Monitor media coverage and public perception. A sudden increase in negative publicity can indicate reputational damage.
6) Market Access Barriers:
   - **Risk:** Non-compliant buildings may face restrictions or barriers in the market, limiting their sale or lease potential.

- **Risk Assessment Criteria:** Stay updated on market trends and regulations. Identify any new regulations that might limit market access for non-compliant buildings.

7) Increased Energy Costs:
   - **Risk:** In the turbulent South African electricity supply environment, the non-compliant buildings might have higher energy consumption, leading to increased operational costs for owners.
   - **Risk Assessment Criteria**: Analyze energy consumption data of certified buildings. Significant deviations from energy efficiency norms could indicate non-compliance.
8) Lack of Environmental Sustainability:
   - **Risk:** Non-compliance can lead to increased carbon emissions and environmental impact due to inefficient buildings.
   - **Risk Assessment Criteria:** Evaluate the environmental impact of non-compliant buildings. Monitor indicators such as carbon emissions and resource consumption.

2.2.4 Risk Mitigation Strategies

1) Regular Audits and Inspections: Conduct regular audits of certified buildings to ensure ongoing compliance with energy performance standards.
2) Training and Awareness: SANEDI /DMRE to provide training programs [5] and awareness campaigns to building owners, contractors, Registered Professionals and Quality Assurers to enhance understanding and adherence to certification requirements. This should ensure that SANAS absence in EPC process keeps the high level of the process.
3) Continuous Monitoring: SANEDI to implement a robust monitoring system to continuously track certified buildings' energy performance, enabling early detection of deviations from standards.
4) Strict Enforcement: Enforce penalties and corrective actions for non-compliant buildings to deter future violations and ensure compliance.
5) Collaboration of stakeholders with Regulatory Authorities: Collaborate with regulatory bodies to align certification standards with national or regional energy efficiency regulations, ensuring consistency and legal compliance. Utilize the expertise and advisory potential of the Energy Performance Certification Technical Committee [5].

6) Transparency and Reporting: Ensure transparency in the certification process, providing stakeholders with clear information about certification standards, procedures, and outcomes. Regularly report compliance status to relevant authorities.
7) Engagement with Industry:
    - Compose the Stakeholders Energy Performance Certification Technical Committee with appropriate industry experts and relevant representative stakeholders.
    - Engage with industry associations, architects, builders, and other stakeholders to foster a culture of compliance and encourage best practices in energy-efficient construction.

In summary, by identifying these potential risks and implementing effective risk assessment criteria and mitigation strategies, South African Building Energy Performance Certification programs can enhance compliance, maintain credibility, and contribute significantly to energy efficiency and environmental sustainability initiatives aimed by the Government.

2.2.5 Resource Allocation

DMRE / SANEDI are to allocate necessary resources, including personnel, technology, and budget, to support the compliance monitoring and verification process [5]. DMRE and SANEDI to source the registered EPC individual Professional(s) and appointed EPC Quality Assurer(s) in support of the energy performance assessments and issuing of EPC in:

- Energy performance assessment procedures and verification protocols,
- EPC technical applications guidelines, standardized questionnaires, reporting templates, and software for digitization of the energy performance certification process.

2.2.6 Documentation and Record Keeping

SANEDI is to develop a system for documenting all relevant information, including compliance data, audit trials, and verification records [5].

2.2.7 Monitoring and Data Collection

SANEDI is to implement ongoing monitoring processes to collect data related to compliance. This may involve regular inspections, data gathering from stakeholders, and automated data collection systems.

2.2.8 Auditing and Verification

SANEDI is to conduct internal audits and verification activities to assess compliance with the established KPIs and regulatory requirements. This step may include on-site inspections, document reviews, and interviews with relevant personnel (Registered Professionals and Quality Assurers) [5].

2.2.9 Reporting

Prepare regular reports that summarize the findings of compliance monitoring and verification activities. These reports should include identified issues, deviations from standards, and recommendations for improvement.

2.2.10 Corrective Actions

SANEDI is to implement corrective actions based on the findings of compliance audits and verifications. Also, ensure that any non-compliance issues are addressed promptly, timely and effectively.

2.2.11 Continuous Improvement

SANEDI is to establish a process for continuous improvement by reviewing the effectiveness of compliance monitoring and verification procedures and making necessary adjustments.

2.2.12 External Review (if applicable)

Depending on the regulatory requirements, there may be a need for external audits or reviews by regulatory authorities or third-party organizations.

2.2.13 Documentation and Compliance Records Maintenance

SANEDI is to maintain comprehensive records of all compliance monitoring and verification activities for reference and potential regulatory audits.

2.2.14 Training and Awareness

SANEDI is to ensure that personnel involved in compliance monitoring and verification are adequately trained and aware of their roles and responsibilities [5].

2.2.15 Review and Update

SANEDI is to periodically review and update the compliance monitoring and verification procedures to reflect changes in regulations, standards, or organizational needs.

2.2.16 Communication

SANEDI is to maintain open communication channels with relevant stakeholders, including regulatory agencies (SABS), to stay informed about changes in compliance requirements and expectations.

In summary, it is essential to tailor these steps to the specific recent requirements and goals of DMRE [2],[3] and SANEDI [4] while keeping in mind the dynamic nature of compliance monitoring and verification in the energy sector. Regularly reviewing and adapting the process is crucial to ensure ongoing effectiveness and alignment with evolving regulations and industry standards.

3 FURTHER RESPONSIBILITIES OF KEY PLAYERS IN THE EPC PROCESS

3.1 BUILDING OWNERS

The responsibilities of building owners regarding EPCs typically include:

3.1.1 Compliance with Regulations

Building owners are generally required to comply with local, regional, or national regulations that mandate energy performance certification for certain types of buildings. This may involve ensuring that the building meets specific energy efficiency standards and that it undergoes certification assessments at the required intervals. As per DMRE EPC regulations [2] and with reference to Figure 1-2. the building owners' main responsibilities amongst the others include:

- Registration of EPC complying buildings
- Appointment of Individual EPC Professional(s) (RP)

- EPC Display and submission of final energy performance assessments data and results
- Submit a Certified Copy of issued EPC to SANEDI.

This is illustrated in Figure 3-1.

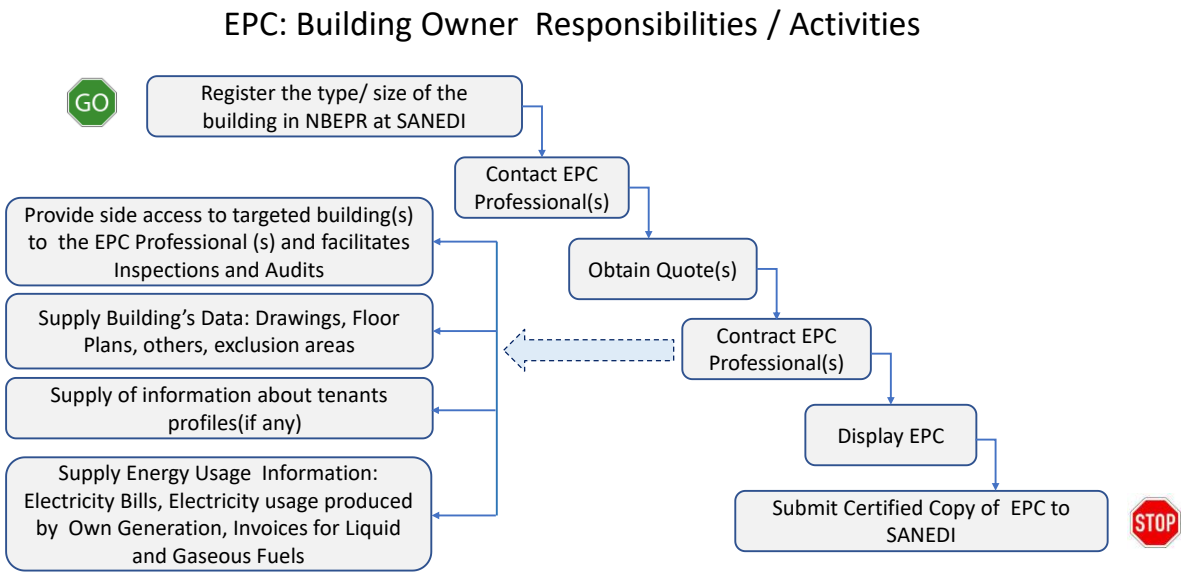

Figure 3-1 : Building Owner Responsibilities / Activities in the EPC process EPC

3.1.2 *Engaging Registered Professionals / Assessors*

Building owners are responsible for hiring SANEDI registered individual EPC professionals who can evaluate the energy performance of their building. These professionals will conduct inspections, collect data, and perform energy simulations to determine the building's energy efficiency.

3.1.3 Providing Access and Information

Owners must grant energy assessors access to the building and provide them with all necessary information and documentation related to the building's energy systems and usage. This may include building plans, utility bills (utility bills, alternative fuels, own generation) and maintenance records.

3.1.4 Implementing Recommendations

After the energy assessment is complete, building owners should review the recommendations provided by the assessors and, if feasible, might take steps to implement energy-efficient improvements. This may involve upgrading HVAC systems, insulation, lighting, or other energy-consuming components of the building. It is strongly recommended that DMRE /SANEDI develop standard uniform templates to capture the row energy usage information supplied by the building owners and electricity suppliers.

In addition, a standardized template for the area of the buildings should be developed to avoid deviation in approaches by the Registered Professionals issuing EPCs.

3.1.5 Documentation and Record-Keeping

Building owners should maintain records of the energy performance certification process, including assessment reports, improvement actions taken, and any relevant documentation. These records may be required for regulatory compliance and future audits.

3.1.6 Displaying Energy Performance Certificates

Building owners are obligated by law to display Energy Performance Certificates in a visible location within the building, such as the lobby or entrance, to inform occupants and visitors about the building's energy efficiency. Building owners have to submit a certified copy of issued EPC to SANEDI withing the prescribed time frames.

3.1.7 Renewal and Recertification

Depending on DMRE Regulations, building owners may need to ensure that their building undergoes periodic recertification to demonstrate ongoing compliance with energy efficiency standards. This may involve scheduling regular assessments and maintaining the building's energy-efficient features.

3.1.8 Compliance Reporting

In some cases, building owners may be required to report their building's energy performance data to relevant authorities or agencies as part of regulatory requirements.

3.1.9 Education and Awareness

Building owners can also play a role in raising awareness among occupants and tenants about energy conservation practices and the importance of energy efficiency in reducing environmental impact and operational costs. Registered Professionals may play an essential role in these activities. SANEDI may organize awareness and information forums where building owners and occupants will be targeted. The latter is very relevant to the Government-owned buildings where the EPC process is lagging considerably when compared with EPCs of privately-owned counterparts.

In summary, it is important to note that the specific responsibilities of building owners /occupants regarding energy performance certification can vary depending on DMRE Regulations and the type of building in question. Therefore, it is essential for building owners to stay informed about the applicable laws and requirements in their jurisdiction and seek professional guidance when necessary to ensure compliance.

3.2 RESPONSIBILITIES OF EPC INSPECTION BODIES /REGISTERED PROFESSIONALS

The responsibilities of EPC Inspection Bodies/Registered Professionals, typically include the following:

3.2.1 Assessment and Evaluation

Inspection Bodies (currently mandatory accredited by SANAS) / Registered Professionals by SANEDI after 13th July 2024 are responsible for assessing and evaluating the energy performance of buildings and systems. This involves conducting thorough inspections to determine the energy efficiency and overall performance of a building.

Eligibility criteria for registration to be an individual EPC Registered Professional(s) [5] are:

- The energy performance assessments and issuing of EPCs for buildings, in according with SANS 1544 [6] shall only be for individual EPC Registered Professional(s) that meet the minimum experience, qualification and knowledge as stipulated in the DMRE regulations [5].
- For professionals to be eligible to conduct energy performance assessments of a building and issue an EPC, they will need to go through a *two-stage registration process* managed by SANEDI [5].
- However, individual EPC Registered Professional(s) should take note of the nature of procurement system in South Africa that requires legal entities and competitive bidding process through an open, fair, and transparent tender process, and tax compliance requirements by the South African Revenue Service (SARS) [5].
- Once registered, the individual EPC Professional(s) are expected to attend the compulsory EPC Professional Training in the field of energy performance assessment or energy audits, or energy management facilitated by training providers appointed and qualified by SANEDI [5].

3.2.2 Certification

Registered Professional(s) issue EPCs or ratings based on their evaluations. These certificates provide information on the energy efficiency of a building or system, allowing property owners and potential buyers or renters to make informed decisions.

3.2.3 Compliance Verification

Inspection Bodies/ Registered Professionals ensure that buildings and systems comply with relevant South African energy performance standards [6] and DMRE regulations [2], [3].

3.2.4 Data Collection and Reporting

They collect and maintain data related to energy performance assessments and certifications. This data may be used for research, policy development, and monitoring trends in energy efficiency and building upgrades for improved energy efficiency performance.

3.2.5 Technical Expertise

Inspection Bodies / Registered Professionals normally possess expertise in engineering, building science, energy efficiency, and relevant technologies. DMRE and SANEDI are driving this process [5]. These experts are responsible for conducting accurate assessments and staying up to date with industry and technology advancements.

3.2.6 Quality Assurance

They establish and maintain quality assurance processes to ensure the accuracy and reliability of their assessments and certifications. This may involve regular audits and adherence to established standards and protocols. One of the main requirements of SANAS was for the IBs to develop and observe a Quality Management System as per ISO/IEC 17020: 2012[6].

In the absence of SANAS in the new EPC regulations [3],[5] there should be provisions for the SANAS Inspection Bodies and individual Registered EPC Professional(s) to develop and follow a standardized quality assurance policies by observing the basic requirements in their inspection activities as required by ISO/IEC 17020: 2012.[9]. Optimally, there should be

standardized templates / Instruction Manuals developed by DMRE/SANEDI to assist the newly Registered Professionals and streamline the amended new process.

ISO/IEC 17020 [9] is an international standard that specifies the requirements for the competence of entities performing inspection and for the impartiality and consistency of their inspection activities. A Quality Management System (QMS) based on ISO/IEC 17020 is crucial for inspection EPC activities for several reasons:

1) Ensuring Competence: ISO/IEC 17020 sets the criteria for the competence of inspection entities. Implementing a QMS based on this standard ensures that the personnel involved in inspection processes are qualified and capable, thereby ensuring accurate and reliable inspection results.
2) Impartiality and Independence: One of the key principles of ISO/IEC 17020 is impartiality. A QMS helps in identifying and mitigating any potential conflicts of interest, ensuring that inspections are conducted objectively and independently. This impartiality is essential for maintaining trust in the inspection results.
3) Consistency and Reliability: A QMS provides a systematic approach to EPC inspection processes. Standardizing procedures and methods ensure consistency in inspection activities. Consistent inspections lead to reliable results, which are essential for making informed decisions based on the inspection outcomes.
4) Customer Confidence: Implementing ISO/IEC 17020 enhances the credibility of an IB. When customers know that an IB operates according to relevant standards, they have more confidence in the inspection results and the decisions based on those results.
5) Legal and Regulatory Compliance: Adhering to ISO/IEC 17020 helps inspection entities comply with legal and regulatory requirements related to inspections. [3,4] It ensures that the EPC inspections are conducted in accordance with applicable laws and regulations [2],[3].
6) Continuous Improvement: A QMS based on ISO/IEC 17020 includes a focus on continual improvement. Inspection entities regularly assess their processes, learn from past experiences, and make necessary improvements. This cycle of improvement ensures that the inspection processes stay effective and efficient over time.

In summary, implementing a Quality Management System based on ISO/IEC 17020 is essential for individual EPC Registered Professional(s) to demonstrate their competence, maintain impartiality and transparency, ensure consistency, gain customer trust, comply with regulations, foster continuous improvement, and achieve global recognition. This will allow individual EPC Registered Professional(s) to keep standards of the New EPC Regulations [2], [3] when compared with the initial SANAS accredited process which is operating at present.

3.2.7 Client Education

Inspection Bodies / Registered Professionals often provide guidance and recommendations to clients on how to improve energy efficiency in their buildings. This may include suggesting energy-efficient upgrades or modifications. This is very important for implementation of the New DMRE Regulations (Notice 1937, of 24 July 2023) [3].

3.2.8 Regulatory Compliance

Inspection Bodies / Registered Professionals must stay informed about changes in energy performance regulations and standards, adapting their practices to remain in compliance and meet evolving requirements.

3.2.9 Record-Keeping

Keeping comprehensive records of assessments, certifications, and related documents is crucial for transparency, accountability, and future reference.

3.2.10 Professional Development

Registered by SANEDI professionals may be required to undergo continuous training and professional development to stay current with industry best practices and emerging technologies.

3.2.11 Environmental Impact Consideration

In some cases, Registered Professionals may be responsible for assessing and reporting on the environmental impact of a building's energy performance, including its carbon emissions

and resource consumption. The DMRE included the Measurement and Verification (M&V) standard SANS 50010:2018 [11] to facilitate the EPC process in this regard [5].

In summary, the professional execution of the responsibilities of the Inspection Bodies / Registered Professionals is crucial in contributing to the promotion of energy efficiency and sustainability in buildings, which is essential for reducing energy consumption, greenhouse gas emissions, and the overall environmental impact of the built environment.

3.3 RESPONSIBILITIES OF EPC QUALITY ASSURERS

Quality Assurers (QAs) are normally [5] an independent third-part individuals appointed by SANEDI for the verification of energy performance certification data and validation of issued EPCs. QAs act as independent moderators for quality assurance, and consistency on the application of guidelines, tools, and standards, as well as to provide guidance and transparent feedback to DMRE and SANEDI on energy performance certification and validity of the data and information [5].

The quality assurance practitioners will play a crucial role in the building's energy performance certification process. Here are their key roles and responsibilities in this context:

3.3.1 Quality Assurance

- Review Documentation: Quality Assures review all the documentation submitted for energy performance certification. This includes building architectural plans, utility bills (alternative fuels, own generation) and maintenance records.
- Compliance Check: They ensure that the building designs and implemented systems comply with the energy efficiency standards and regulations set by the relevant authorities.
- Data Accuracy: Quality Assures validate the accuracy of data related to energy usage, materials used, and construction techniques. Any discrepancies or errors are identified and rectified.
- Audit Trails: They establish and maintain audit trails, ensuring that all the changes made during the certification process are documented and can be traced back for verification purposes.

3.3.2 On-Site Inspections

QA(s) may conduct on-site inspections to verify that the actual construction matches the certified plans. This includes checking main energy usage carriers, insulation, HVAC installations, lighting systems, and other energy-related components. This is one of the main concerns at present since the electricity/energy bills are issued in various formats and languages at the different provinces in South Africa.

3.3.3 Data Analysis and Reporting

- Energy Modeling Verification: Quality Assures review energy modeling reports of the Registered Professionals to ensure that they accurately represent the building's energy usage. They validate the modeling assumptions and calculations against the building's architectural plans.
- Report Generation: They generate detailed reports outlining the findings of their inspections and validations. These reports are often submitted to certification authorities and the building owners, highlighting compliance, or suggesting necessary improvements.

3.3.4 Communication

- Stakeholder Communication: Quality Assures communication with various stakeholders, including architects, engineers, contractors, and building owners. They provide feedback and guidance on how to enhance the building's energy efficiency.
- Educational Support: They might conduct workshops or training sessions to educate stakeholders about energy-efficient construction practices and the importance of compliance with certification standards.

3.3.5 Continuous Improvement

- Process Enhancement: Quality Assures work on improving the certification process continually. They identify bottlenecks, inefficiencies, or areas where the certification guidelines need clarification and work towards streamlining the process.
- Stay Updated: Quality Assures stay informed about the latest advancements in energy-efficient technologies and construction methods. This knowledge helps them assess newer buildings effectively and ensure they meet the most current standards.

In summary, quality assurance practitioners play a vital role in verifying the accuracy, compliance, and efficiency of building designs and installations, ensuring that certified buildings are truly energy-efficient and environmentally friendly. SANEDI makes provisions in ensuring that there are enough and properly qualified Registered Professionals) and independent EPC Quality Assurer(s) to manage the expected volumes of buildings that will require compliance.[5]

4 A STEP- BY -STEP PROCESS FOR BUILDING REGISTRATION, DATA COLLECTION, ENERGY PERFORMANCE ASSESSMENTS, EPC ISSUANCE, AND SUBMISSION

A typical building's EPS process is illustrated on Figure 4-1 below:

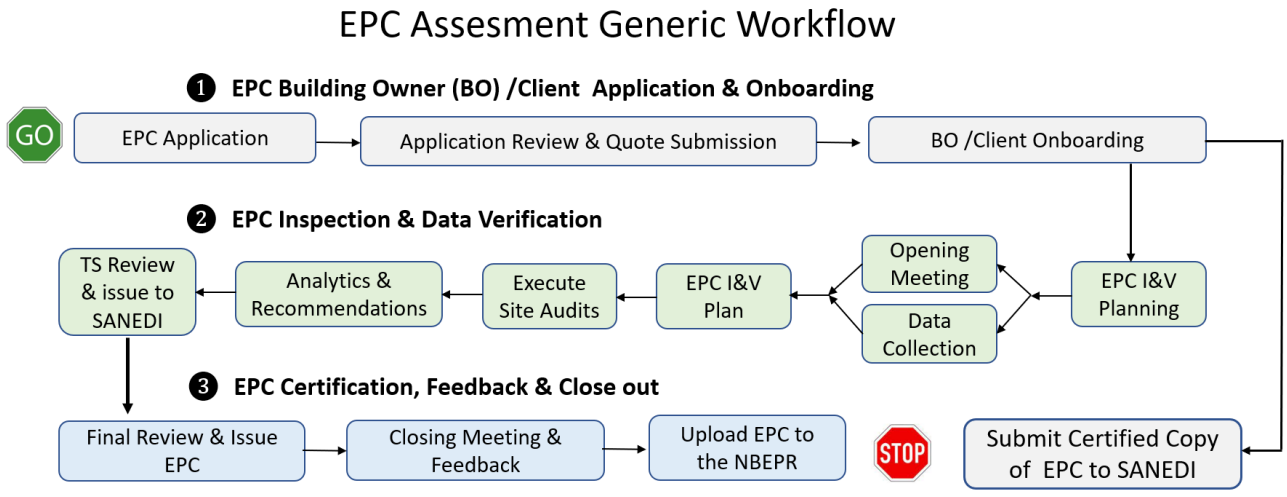

Figure 4-1 : EPC Assessment Generic Workflow

4.1 INITIATION AND PLANNING

The EPC regulation specify that it is mandatory for privately owned buildings with a net floor area $\geq 2000\, m^2$ and government owned buildings with a net floor area $\geq 1000\, m^2$ to be issued with an EPC. This is, however, restricted to the building occupancy classes as identified in Section **Error! Reference source not found.**. The building owner (private building), or accounting officer (public building) must identify the eligibility of their building for issuance of an EPC [1],[2].

4.1.1 Scope, building type, size and purpose

The EPC acts as an indication of energy consumption but will eventually drive energy efficiency in existing buildings and contribute to the transition for a low carbon economy. The energy consumption indicated in the EPC is normalized to the net floor area per annum. The following building classes are required to be assessed and issued with an EPC [6], [7]:

A1: Entertainment and Public Assembly: Occupancy where persons gather to eat drink, dance, and participate in other recreation.

A2: Theatrical and Indoor Sports: Occupancy where people gather for viewing of choral, theatrical or sport performance.

A3: Places of Instruction: Occupancy where school children or students assemble for the purpose of learning.

G1: Offices: Large multi-story or stand-alone office buildings, banks, and consulting rooms.

Buildings within the specified classification with net floor area as specified in section 1.1 and that have been occupied for a period longer than 2 years or has not undergone a major renovation within the last 2 years shall be assessed and issued with an EPC as indicated in the regulation.

4.1.2 Regulatory requirements and standards applicable to energy performance assessments

The EPC process follows the South African National Standard (SANS) as reference and guidance to establish the requirement of what is to be measured to issue and EPC for the applicable buildings. The primary applicable standards are [5]:

SANS 10400-XA:2021 - Technical requirement that new building must meet in order to comply with the energy-related parts of the National Building regulation [7].

SANS 1544:2014 - The requirements for producing energy performance certificate and the specification for the format of the EPC [6].

Additional standards that might be applicable include:

SANS 50002 - specifies the process requirements for carrying out an energy audit in relation to energy performance [13]

SANS 50010 – process for Measurement and Verification of energy savings [11].

These standards can be purchased from the SANAS website (https://www.sanas.co.za/) [10].

4.2 REGISTRATION AND DOCUMENTATION

4.2.1 Registration on the National Building Energy Performance Register (NBEPR)

Should the building owner or accounting officer determine that their building is eligible for the mandatory issuance of an EPC, the building owner or accounting officer must register the building(s) on the NBEPR on SANEDI website (https://epc.sanedi.org.za/client/dashboard) [4].

The registration requires the following information:

- The registered and trading name of the building owner,
- The building physical location,
- The building authorised representative (including contact details of the representative),
- The building classification and nett floor area.

4.2.2 Required documentation for issuing an EPC

The building owner or accounting officer must gather all necessary documentation necessary to issue an EPC for the building. The regulation places the responsibility on the building owner or accounting officer to gather all the data needed for the assessment of their building while the EPC Professional is responsible for the assessment and determination of energy performance. The assessment data should include the following:

- Energy zone (refer to **SANS 10400-XA:2021**) [9] and net floor area of the building.
- Building design including “as built” and approved architectural plans.
- Detail on building occupancy classification (per tenant if applicable)
- Occupancy information (per tenant if applicable)
- Building energy services including electricity from the utility, diesel generation, renewable generation (Solar thermal, Solar PV, biomass…) and any other gaseous or solid energy sources in use in the building.
- Evidence of energy use in the building per energy source for a minimum of 12 consecutive months in form of electricity bills (and/or gas bills where applicable), diesel fuel invoices or backup generator maintenance logbook indicating fuel consumption and/or operating times, gaseous or solid fuel invoices and monthly energy generation data (from calibrated metering) of renewable energy sources where applicable.
- Major energy consumption appliances (HVAC, Water heater, boiler etc.)
- Building occupancy profile including type and any indication of vacant or unoccupied sections.

4.3 DATA COLLECTION AND ANALYSIS

4.3.1 Appointment of an EPC Registered Professional

An individual EPC Registered Professional would be appointed by the building owner or accounting officer after registration of the building to the NBEPR. This appointment process will be determined as per SANEDI’s defined procedures. [5]. The assigned EPC Professional

should be provided with the detailed data prepared by the building owner or accounting officer as specified in section 2.2.

4.3.2 EPC Data Screening

The appointed EPC Professional would conduct an initial screening by reviewing all information provided. Should incomplete or ambiguous detail be provided, the EPC Professional reverts to the applicant advising on areas to complete/elaborate on. Should all details be in order, this should be communicated to the building owner or accounting officer. The appointed EPC Professional should also assess various potential risks and operational aspects that would determine any impartiality issues, limitations with respect to resource availability and location of the professional to determine whether the EPC Professional should proceed to the next stage or that an alternative EPC Professional should be assigned/appointed for the assessment.

4.3.3 Inspection and Verification

The EPC Registered Professional should review the information in further detail and proceeds to compile the inspection and verification (I&V) Audit Plan, including a preliminary energy use evaluation, the inspection methods, and procedures. This plan should include the scope, objectives, and I&V activities to ensure that an effective I&V audit is done. A template of the I&V Audit plant report would be made available on SANEDI website. [4]

The building owner or accounting officer must sign off on the I&V Audit Plan as acceptance and return the signed plan to the EPC Registered Professional prior to the audit start date. Should the building owner or accounting officer be dissatisfied with any aspect of the I&V Audit Plan, the areas of dissatisfaction should be provided in writing for amendments prior to the audit start date.

The EPC Registered Professional(s) should plan and execute an I&V Audit on-site with the building representatives where a visual inspection and inventory of the building's key elements is conducted following the accepted EPC I&V Audit Plan. The I&V Audit establishes and confirms both where and how energy is being used, and includes a walk- through survey,

review of energy using systems and an analysis of energy usage. The key elements to be examined include:

- Sample measurement of building reported surface area.
- Heating and colling systems (HVAC) capacities, control methods and rated efficiency
- Interior and exterior lighting systems and related controls
- Hot water systems
- Electrical apparatus
- On-site generation and sources (Renewable generation, back-up generation etc…)
- Alternative energy sources (gaseous, solid, etc.)
- Building's occupancy patterns and operating hours.

The EPC Registered Professional concludes the on-site visit by completing and handover of a copy of a site visit completion form, which clearly stipulates any outstanding matters that need to be addressed prior to the I&V report being compiled (standardised form to be provided by SANEDI). [4]

The on-site notes, data and findings should be dated and captured appropriately. Should there be any differences in opinion regarding any aspect, this should be recorded for further clarity from the regulator.

4.4 Energy Performance Assessment

A comprehensive energy performance assessment (EPA) using the collected data should be undertaken by the EPC Professional. The definitions and procedures for determining energy performance are outlined in SANS 1544:2014 [6] and SANS 10400-XA-2021 [7].

These additional procedures are to be followed:

- **Data integrity checks**: performed to validate the quality of the data supplied by the building owner or accounting officer. This includes validation of the source of the supplied information including the meters conditions and specifications (calibration and accuracy certificates if any).

- **Utility Cost Analysis**: the data obtained for the energy carriers indicating energy bills and consumption, peak demands, energy use patterns and weather effects.
- **Assessment period:** the energy performance assessment period is for one year in respect of the data for the preceding year.
- **Temporary Unoccupied Area**: the possibility of limited, intermittent, or temporary occupation of the floor area more likely for the assessment period, hence a time-occupied normalisation method must be used to determine the useable net floor area. Proof of inoccupancy must be obtained such as clocking systems, affidavits, registers and the historical building usage can be used to reconcile.

The data collect would assist in the evaluation of the building's energy efficiency and would facilitate the identification of potential improvements.

4.4.1 Performance assessment

The operational energy performance of the assessed building will be expressed at the measured annual net energy consumption in kWh per square meter per annum of the net floor area. This would be obtained according to the following steps:

- Identification of the building energy zone (SANS 10400-XA-2021) [7]. This will determine the maximum annual energy consumption per building classification as this is subject to the energy zone.
- Determination of the building occupancy type. The occupied and unoccupied floor area in the building need to be determined and prorated where necessary.
- Determination of the net floor area. This is the sum of all the area between the building wall or partitions, excluding garages, car parks and storerooms (SANS 1544:2014) [6]. Normalisation should be used to account for unoccupied floor area.
- Identify the building energy services including HVAC, Lighting, generators etc.

- Determine additional energy source used in the building during the assessment period, e.g., diesel fuel, gas, coal, solar PV or thermal generation etc.
- Determine the total energy used in the building during the assessment as the sum of all the energy sources identified within the assessed period.
- Compare the building's energy performance against relevant benchmarks and standards (SANS 1544:2014 and SANS 10400-XA-2021.).

Appropriate proration should be employed should the building be used for more than one occupancy type. The proration methods are clearly described in the SANS 1544:2014.

4.4.2 EPC Preparation

It is the EPC Registered Professional's responsibility to prepare and submit the copies of all data used to perform the energy performance assessment and to arrive at its findings. This should include all relevant information such as energy consumption data, occupancy type, net floor area, energy ratings, and recommendations for improvement. The submission format should comply with the existing relevant regulations and standards.

4.4.3 Review and Verification

After submission of all the relevant EPC documents to SANEDI, it is verified for accuracy and completeness. This should include a verification that the assessment and calculations are based on accurate data and analytics as recommended by the regulation. SANEDI will use the provided data to populate the National EPC Building Register and issue a unique EPC certificate number.

4.4.4 EPC Issuance

Once the EPC document is finalised and verified, and a unique number has been provided, the registered professional issue the certificate. The EPC should be dated and signed by the energy assessor and contain all the information as prescribed by the regulation. An online template for issuing the certificate is available on SANEDI website.

4.4.5 Submission and Compliance

The registered professional is to submit the EPC to the building owner or accounting officer for further submission of a certified copy of the certificate to SANEDI, following their specific submission guidelines and requirements by DMRE in addition to any additional reporting or documentation requirements as mandated by SANEDI.

4.4.6 Post-Assessment Follow-Up

To ensure continued compliance with the regulation, monitoring and tracking the building's energy performance over time to ensure compliance with the EPC recommendations is to be done under the quality assurance process. This might result in a renewal or update of the EPC as required by DMRE regulations or when significant changes to the building occur.

4.4.7 Documentation and Record Keeping

Detailed records of all data employed to issue EPCs need to be maintained for quality assurance and compliance purposes. The following documents record are to be maintained:

- EPC Professional appointment documentation
- All original notes, observations and calculations taken by the EPC Professional during inspection procedures.
- Original copies of photographs.
- Computer data files and/or software programmes.
- Reports on tests and measurements activity.
- Facilities and equipment used for each inspection activity and having a significant influence on the inspection results.
- Copies of the draft and finalised EPC I&V Reports and Certificate and record of its distribution.
- All discussion with building owner or accounting officer during or after the inspection that are relevant to the contracted work.

The Inspection Records are maintained electronically. Where possible, physical copies (building plans and energy bills etc) are digitised for ease of retrieval and storage.

In summary, it is important to note that the specific steps and requirements may vary depending on the type of building being assessed. Always consult with relevant authorities and

experts in energy performance assessments to ensure full compliance with applicable laws and standards.

5 PERTINENT CONSIDERATIONS FOR ALL PARTIES INVOLVED DURING THE IMPLEMENTATION, MONITORING, AND VERIFICATION PROCESS OF ENERGY PERFORMANCE CERTIFICATION OF BUILDINGS, IN RELATION TO SANS 1544:2014 AND SANS 10400-XA-2021.

Pertinent considerations for all parties involved during the implementation, monitoring, and verification process of Energy Performance Certification of Buildings, in relation to SANS 1544:2014 [6]and SANS 10400-XA-2021,[7] SANS 50002:2014 [13], SANS 50010:2018 [8] include:

5.1 Regulatory Compliance

Ensure that all relevant latest DMRE regulations and South African standards, are followed meticulously throughout the certification process.

5.2 Documentation and Record-Keeping

Maintain comprehensive records of all data, calculations, and documentation related to energy performance certification. Proper record-keeping is essential for both compliance and future reference.

5.3 Registered Professionals

Engage individual and qualified Registered Professional(s) who are registered by SANEDI for the energy performance certification process. Their expertise is critical to conducting accurate assessments and verifications.

5.4 Registered professional training

Once registered, the individual EPC Registered Professional(s) are expected to attend the compulsory EPC Professional Training in the field of energy performance assessment or energy audits, or energy management facilitated by training providers appointed and qualified by SANEDI [5].

5.5 Data Accuracy and Precision

Ensure that all data collected for the assessment is accurate, reliable, and up to date. Any inaccuracies can lead to incorrect energy performance ratings.

5.6 Transparency and Communication

Foster clear and open communication among all parties involved, including building owners, assessors, DMRE, SANEDI, and tenants. Transparency helps address concerns and ensures everyone understands the process.

5.7 Occupant Behavior

Consider the influence of occupant behavior on energy consumption. Educate building occupants about energy-saving practices to maximize the building's energy efficiency.

5.8 Building Design and Construction

Review the building's design and construction plans to identify potential areas for energy improvement. Early intervention can result in more efficient buildings.

5.9 Energy Efficiency Measures

Identify and implement cost-effective energy efficiency measures that can improve the building's energy performance. These may include insulation, lighting upgrades, HVAC system improvements, water heating, and renewable energy installations.

5.10 Data Validation

Implement robust data validation procedures to verify the accuracy of collected data. Further, cross-check data points and perform quality assurance checks to prevent errors.

5.11 Regular Monitoring

Continuously monitor the building's energy performance to ensure it meets or exceeds the required standards. Regular assessments help identify areas for improvement.

5.12 Compliance Reporting

Submit compliance reports to the relevant authorities (SANEDI) in compliance with SANS 1544:2014 [6] and SANS 10400-XA-2021 [7]. Ensure that all necessary documentation is complete and accurate.

5.13 Benchmarking

Compare the building's energy performance against industry benchmarks [4] to assess its relative efficiency and identify areas where improvements can be made.

5.14 Cost-Benefit Analysis

Consider the cost-effectiveness of energy efficiency measures. Prioritize improvements that offer the best return on investment and long-term energy savings.

5.15 Certification

Ensure that the building displays the EPC in a visible location for public awareness and recognition.

5.16 Continual Improvement

Encourage a culture of continual improvement in energy efficiency. Regularly review and update energy management plans and strategies to adapt to changing technologies and regulations.

5.17 Public Awareness

Educate the public and building occupants about the importance of energy performance certification and its benefits for sustainability and cost savings.

In conclusion, by addressing these considerations, all parties involved in EPC process can contribute to the successful implementation, monitoring, and verification of energy performance certification of buildings in accordance with SANS 1544:2014 [6] and SANS 10400-XA-2021 [7] and considering SANS 50002:2014 [13], SANS 50010:2018 [11], ultimately promoting energy efficiency and sustainability in the built environment in South Africa.

6 RECOMMENDATIONS

The developed Technical Application Guidelines are intended to support the implementation, monitoring, and verification of the Regulations for the Mandatory Display and Submission of EPCs for buildings in South Africa. Moreover, after the new regulations of DMRE the Technical Application Guidelines are expected to streamline the EPC process to achieve the desired volumes of the certified building as envisaged by the South African Government.

The Technical Application Guidelines will provide direction to EPC Inspection Bodies, Registered Professionals, Quality Assurers, Building Owners, SANEDI, and DMRE on the implementation, monitoring, and verification process for building energy performance assessments, issuing, and display of EPCs for buildings.

Implementing the Technical Application Guidelines for Implementation, Monitoring, and Verification of the Regulations for Mandatory Display and Submission of Energy Performance Certificates for Buildings in South Africa requires careful planning by SANEDI and adherence to specific strategies and legislations. Here are some recommendations for the implementation, monitoring, and verification of these regulations:

6.1 Awareness and Training

Public Awareness Campaigns: Launch public awareness campaigns to inform the stakeholders: building owners, developers, industry, and the general public about the new regulations and the importance of building energy efficiency.

Training Programs: DMRE and SANEDI to develop and implement [5]:

- Eligibility Criteria for registering as an individual EPC Registered Professional(s) and independent EPC Quality Assurer(s)
- Required systems and procedures in support of the registration of Individual EPC Professional(s) and independent EPC Quality Assurer(s) that are interested and eligible to participate in the energy performance assessments and issuing of EPCs as stipulated in the Regulations.

6.2 Regulatory Framework

Clear Guidelines: Endorsement of the developed Technical Application Guidelines by all relevant stakeholders and the Energy Performance Certification Technical Committee to achieve clear, concise, and easy-to-understand outlines of the process of obtaining, displaying, and submitting EPCs.

Regular Updates: Keep the guidelines updated based on feedback, technological advancements, and changing of relevant standards.

6.3 Implementation Process

Streamlined Procedures: Utilize and update the online platform for easy submission and verification of EPCs, reducing paperwork and bureaucracy.

Third-Party Verification: Implement the new system for third-party verification of submitted EPCs to ensure accuracy and reliability of the independent EPC Quality Assurer(s) [5].

Compliance Checks: Regularly audit a sample of submitted EPCs to ensure compliance and accuracy. Non-compliance should result in penalties.

6.4 Incentives and Recognition

Incentives: Offer tax incentives, rebates, or other financial benefits to building owners who achieve high energy performance ratings. This will be an important contribution for the EPC process sustainability.

Recognition: Recognize and publicize buildings with exceptional energy performance, encouraging healthy competition among builders.

6.5 Capacity Building

Professional Development: Invest in the continuous professional development of energy assessors and professionals involved in the certification process [5].

Research and Development: Support research and development in the field of energy-efficient technologies and practices. Develop and introduce new digitalized templates for energy auditing, data procession and reporting, cloud computing, Artificial Intelligence and quality assurance to unify and facilitate the entities and third parties involved in the EPC.

6.6 Monitoring and Evaluation

Regular Audits: Conduct regular audits of a random selection of buildings to verify the accuracy of EPCs and to deter fraudulent practices.

Data Analysis: Analyze the data collected through EPCs to identify trends, bottlenecks, successes to assess the effectiveness of the EPC program, and make necessary improvements.

6.7 Public Engagement

Stakeholder Collaboration: Utilize the potential of the *Energy Performance Certification Technical Committee* to liaise and collaborate with other stakeholders, NGOs, and community groups to gather input, address concerns, and ensure a smooth implementation EPC process.

Feedback Mechanism: Establish a system for feedback from building owners, Registered Professional(s) and Independent EPC Quality Assurer(s), and other stakeholders. Use this feedback to make necessary adjustments to the guidelines and implementation process.

6.8 International Best Practices

Benchmarking: Benchmark South Africa's implementation efforts against successful international programs. Learn from their best practices and avoid their drawbacks.

Collaboration: Collaborate with international organizations such as GIZ and others and with leading relevant experts to gain insights and expertise in the field of building's energy efficiency and certification.

6.9 Regular Review and Adaptation

Continuous Improvement: Regularly review the implementation process and guidelines. Adapt them based on changing technology, new research findings, and the effectiveness of the current strategies and Regulations and standards in the field.

By following these recommendations, South Africa can effectively implement, monitor, and verify the regulations for mandatory display and submission of EPCs for buildings, leading to significant energy savings and a more sustainable built environment.

7 REFERENCES

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