AFRICAN ENERGY COMMISSION (AFREC)

DEVELOPMENT OF THE NATIONAL ENERGY INFORMATION SYSTEM (NEIS) AND CAPACITY BUILDING PROJECT

DIAGNOSTIC REPORT AND ACTION PLAN OCTOBER 2022

Prepared for the Ministry of Minerals and Energy of Botswana
DEVELOPMENT OF THE NATIONAL ENERGY INFORMATION SYSTEM (NEIS) AND CAPACITY BUILDING PROJECT

DIAGNOSTIC REPORT AND ACTION PLAN
OCTOBER 2022
I am delighted to present the Diagnostic Report and Action Plan for the development of Botswana National Energy Information System (NEIS) and Capacity Building Project. The report is a result of the assessment conducted by the African Energy Commission (AFREC) to standardise the current National Energy Information Systems (NEIS) of African Union (AU) Member States with the objective to improve the quality of energy data supplied to the African Energy Information System (AEIS), and adherence to energy data collection, reporting and adaptation to country needs in alignment with international standards.

The Diagnostic Report reveals several challenges such as insufficient data for generation of the energy balance, poor data quality or non-existence, lack of skilled human resource capacity to process data and inadequate technology infrastructure to maintain systems to mention just a few. Hence, this report is profound as it cultivates a route to the establishment of Botswana National Energy Information System (NEIS).

The Ministry is cognisant of the need to improve energy data collection methods by setting up systems which respond to the country’s data needs to include all sectors of the economy and address energy data quality and coverage. The development of Botswana NEIS is a necessary and critical step in achieving this goal, which can enable us as a country to effectively conduct energy programming, improve government efforts for better planning, policy making and make informed decisions related to the country’s energy sector transformation.

In the process of transforming the energy sector, it is also important to provide a direction towards social justice and ensure that Botswana have access to clean and affordable energy, quality data forms an integral part of that process. Hence, not discounting the challenges and impacts of climate change, which continue to pose significant threats to economic and social development across the world, Botswana’s energy resources can and shall continue to contribute towards socio-economic development and social justice of our people. However, this can only be achieved if project design, policies and strategies are informed by high-quality and reliable energy data and provide a realistic diagnosis for human and economic needs.

As a Ministry, we believe that AFREC’s support on the development of the NEIS will help Botswana Government enhance the quality of energy statistics processes, which are critical for designing good energy strategies for investment. The capacity building programme which forms part of the NEIS development will also provide us with insights necessary for strengthening capacities at national level, which will further prepare us to manage the system effectively and address national, regional and continental needs. Effective implementation of the NEIS Action Plan requires financial resources which my Ministry commits to source. Monitoring of the adapted and adopted processes and tools will also be carried out to ensure continued work and incremental benefits of the NEIS tool.

Lefoko M. Moagi
Minister of Minerals and Energy
Africa through the African Union is intensifying efforts to achieve universal access to affordable reliable electricity and to chart its pathway to cleaner and greener energy as set out in Africa’s Agenda 2063 & the UN Sustainable Development Goal-7. This ambition is fulfilled through our commitment by improving Africa’s energy data systems and reducing skills deficit in the area of energy statistics to improve energy data quality and accessibility across the continent so that quality and reliable data remains the backbone of Africa’s energy sector development and transformation.

As a Commission, we firmly believe that data driven strategies and policies provides a clear understanding of energy uses for our continent, promotes efficiency of energy systems, provides opportunities for better output and use, to address climate change and identify cost effective steps which have the ability to model the future.

Hence, the African Energy Commission (AFREC) together with its African Union (AU) Member States, have been working to harmonise energy data on the continent to ensure Africa have a hosting environment for Africa's energy data. At the continental level, AFREC has developed the continental energy data hub - the African Energy Information System (AEIS), which is comprised of raw data collected form member states and reflects a true representation of the actual energy performance in African Countries. The establishment of the AEIS has led to the decision to establish and/or improve member states national Energy Information Systems (NEIS) to ensure the AEIS and NEIS information is interfaced and that countries are able to access other’s data and a full technical capacity building programme is enhanced.

The AEIS and NEIS will provide comprehensive and timely energy statistics which enhances data dissemination and inform debates whilst improving the countries’ ability to produce energy statistics, and strengthen capacity through technical support. Africa’s Common Position on energy access and just transition also asserts that energy transition cannot simply be about decarbonization alone. But importantly, it must be catalyst to bridge energy access gap and encourage productive uses, thereby creating new competitive industrial clusters.

Thus, this report is a true reflection of our actions going forward, to ensure energy data collection processed at member states level is done in an effective and collaborative manner, to help Africa improve data modeling, develop impactful energy projects, mobilise resources for investment in energy projects as well as monitor how countries are addressing climate change challenges. I do hope that this report will assist African countries to take decisive actions to build the NEIS as advised in this report for the benefit of the sector transformation and economic advancement of our people.

H.E Dr Amani Abou-Zeid
Commissioner for Infrastructure and Energy
African Union Commission.
Summary

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The African Energy Commission (AFREC) has launched the programme on «Improving the National Energy Information System & Capacity Building» to assess and standardise the current National Energy Information Systems (NEIS) of the African Union (AU) Member States with the objective of improving the quality of content supplied to the African Energy Information System (AEIS), adhere to energy data collection and reporting as per international standards as well as adapt to the data needs of Member States.

In this context, AFREC has signed a consultancy contract with the consultant (Innovation Energie Développement (IED)) on December 13th 2021, to support eleven (11) AU member countries to establish and/or improve the National Energy Information System (NEIS) with main objective is to increase the quality of data collected at the national and regional level (notably through the AEIS coordinated by AFREC); expand the coverage of NEIS to include more energy indicators; and improve member states’ capacity to manage and use data as a decision-making tool for policy, investment and strategy in the energy sector.

The specific objectives of the project are threefold:

• To build capacity and improve the systems used to collect, compile, validate and disseminate energy statistics;
• To reinforce the adoption of AFREC’s methodology and questionnaires in line with international best practice and the IRES standards;
• To harmonize and streamline energy statistics across member states, to allow for regular update of the AEIS and comparability across the region.

The NEIS & Capacity Building project is currently at the pilot stage, with a targeted rollout to eleven AU Member States. AFREC envisages to extend the project to other countries in order to reinforce statistical capacity across all AU Member States. Thus, a secondary objective of this project is therefore to provide comprehensive feedback regarding the structure and activities of the project in order to contribute to the pilot evaluation and any future adjustments to the program structure. The phase two of this project is already planned by AFREC for 2023 targeting more additional member states.

The selection of the of participating countries in the first phase of the project was based on the expression of interest of those countries to the support offered from AFREC. The participating countries are representing different African regions, energy sector characteristics, mature and advancement of energy statistics and NEIS development. The 10 countries are:

1. Algeria
2. Botswana
3. Burkina Faso
4. Congo
5. Gabon
6. Kenya
7. Nigeria
8. Lesotho
9. Namibia
10. Zimbabwe

Participating countries
Key achievements

The project lasted 12 months, from January 2022 to December 2022. Based on stakeholders’ interviews and supported by continual analysis of data and documentation shared by country focal points, the key achievements of the project are the following:

- **Diagnostic Report** for each country, which provides a comprehensive view on the status, systems and resources in place to support energy statistics, as well as key challenges or gaps that must be addressed to improve national energy statistics and align with the International Recommendations for Energy Statistics (IRES) standards. The diagnostic report is delivered together with the action plan for each country.
- **Action Plan** for each country, which defines a strategy and a five-year roadmap to improve or establish a NEIS, and identifies the necessary human, financial and technical resources to support the strategy, with specific, costed solutions.
- **Training sessions** designed to address common themes identified in the diagnostic phase and to fill specific skill gaps for National Focal Points to facilitate the implementation of the strategy and action plan to establish or reinforce a NEIS. The online training courses were held in English and in French and trained in total 32 experts from focused countries. Recordings can be made accessible upon request.
- **Technical validation workshop** held in Addis Ababa, Ethiopia in September 2022, gathering representatives from each participating country, to provide technical validation and peer feedback on the diagnoses and action plans. This workshop also allowed to consolidate a community of practice and networking opportunities.
- **A Ministerial Meeting**, plan for the beginning of 2023, with the aim to discuss the implementation of the action plans and highlight the gaps and shortfalls which need to be addressed, including financing and to discuss the role of support from AFREC and other international organization to effectively improve the NEIS.

Key findings and perspectives

The diagnostic process revealed several common challenges faced by almost all focused countries with varying degrees:

- Biomass and energy end-uses (in particular for oil products), are the two key areas where focal points struggle to obtain sufficient data for energy balances.
- Energy efficiency statistics are often at a nascent stage or non-existent.
- Financial, material and human resources are often lacking.
- Energy statistics systems are often dependent on the knowledge of one or several core staff members with no or few measures in place to help manage turnover in the team or onboard new hires.
- Stakeholder sensitization and data governance clarification is required to improve data collection and working relationships with partner institutions.
- Sustainability of IT systems/hardware is a key risk for NEIS, given limited internal capacity and resources to maintain IT systems over the long run.
- Limited dissemination of energy statistics mainly due to limited knowledge on data analysis, lack of resources, and lack of clear request for analysis from decisionmakers.

In light of these outcomes, recommendations and action plans for the 10 participating countries were gathered in a “Diagnostic Report and Action Plan”. As the full report contains sensitive data, this report, made for public dissemination, summaries each country’s diagnostic and action plan to serve as a prospectus for fund-raising or consensus building to reinforce or establish the NEIS.
The Republic of Botswana is a Southern African country that covers 581,000 km² and is populated by 2.3 million people as of 2022. Botswana is a member of the African Union since 1966.

Botswana has a vibrant mining sector and the country is one of the largest producers of diamonds. Other minerals mined are copper-nickel, coal, soda ash, gold, copper-silver, semi-precious stones, and granite. GDP per capita increased consistently between 1970 and 2010, reaching the value of 8,020 USD in 2019, one of the highest in Africa.

Botswana’s most recent energy balance statistics date from 2018. In 2018, the total primary energy supply for Botswana was 2.48 Mtoe while the final energy consumption is 2.09 Mtoe. According to the African Energy Information System statistics, energy production in Botswana is dominated by coal and biomass. Botswana has an estimated 212.8 billion metric tonnes of coal reserves found in various locations, although currently only the reserves at Morupule are being mined for electricity generation. In 2018, Botswana produced 1400 kt of hard coal, of which slightly over 10% (144 kt) was exported.

Final consumption on the other hand is dominated by oil products, nearly all of which are imported from South Africa, with some marginal volumes imported from Namibia. This share is very high relative to peer countries, and may result from a lack of sufficient data on petroleum products and, most importantly, on consumption of biomass in the residential sector. Regarding electricity, generation has been dominated by a high dependence on coal as a primary source of energy, largely because of its abundance and alleged cost-effectiveness. Coal generation capacity is complemented by two diesel-fired plants, while solar PV is currently only used in off-grid contexts.

From a sectoral perspective, Botswana’s energy statistics show a strong share of transportation and industry in final consumption. Residential consumption, by contrast, is very low with respect to peer countries, likely also as a result of limited data collection on biomass consumption in households and partial or estimated data on petroleum end uses.

The National Energy Information System (NEIS) Diagnostic Report and Action Plan was developed with the support of AFREC and in close collaboration with the AFREC National Focal Points (NFPs) and the Department of Energy Statistics Section in the Ministry of Minerals and Energy of Botswana.

This report summaries (1) the diagnostic of energy statistics in Botswana, (2) specific recommendations to improve energy statistics and reinforce or establish a NEIS, (3) top priority short- and long-term actions, and (3) a high-level action plan with the resources and timelines required for implementation of the recommended actions.
1. Results of the diagnostic

Botswana does not currently have a NEIS, but regularly produces energy statistics covering the coal, power and petroleum products sub-sectors, and has a team, tools and processes to generate these statistics in place. The table below describes the primary characteristics of Botswana’s energy statistics program as identified during the diagnostic assessment.

<table>
<thead>
<tr>
<th>Item</th>
<th>Diagnostic results</th>
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<tbody>
<tr>
<td>Institutions and legal environment</td>
<td>• Department of Energy (DoE) is mandated to collect energy information by the National Energy Policy 2020 but no specific legal framework is in place&lt;br&gt;• Collaboration with other stakeholders organized informally through appointed focal points and a Working Group which convenes to review and validate statistics outputs</td>
</tr>
<tr>
<td>Human and material resources</td>
<td>• Team is stable and well trained, comprising 4 full-time-equivalent members with a background in statistics/social sciences&lt;br&gt;• Additional training is required to reinforce capacity on the oil and biomass sub-sectors, data management, and energy economics and analysis&lt;br&gt;• Material resources are sufficient given improvements to the internet connection</td>
</tr>
<tr>
<td>Data collection</td>
<td>• Secondary data collected through focal points in Botswana Power Corporation, Morupule Coal Mine, Statistics Botswana and others, with no primary data collection&lt;br&gt;• Data quality is limited for petroleum products&lt;br&gt;• No biomass data is collected or estimated</td>
</tr>
<tr>
<td>Data processing</td>
<td>• Data is processed using two structured Excel files, one covering power and coal and the other covering power, coal and petroleum products&lt;br&gt;• Statistical infrastructure presents limitations in user interface with limited automations, does not allow for the generation of all required indicators, and does not cover all relevant energy sub-sectors</td>
</tr>
<tr>
<td>Quality assurance and validation</td>
<td>• Internal checks in the statistics infrastructure, meetings with key data sources, and validation meetings with the Working Group are in place&lt;br&gt;• Additional checks required to monitor compliance with international standards and verify/track the validity of estimated values&lt;br&gt;• Limited reference metadata tracked</td>
</tr>
<tr>
<td>Dissemination and analysis</td>
<td>• Annual report prepared for internal distribution and relevant stakeholders&lt;br&gt;• No public dissemination of data leads to time-consuming ad hoc data requests</td>
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Summary of the main results of the diagnostic assessment

A dedicated, stable team and strong relations with stakeholder organizations constitute the major strengths of the energy statistics program. The team and the data it generates are also generally well-integrated into projects and policy analysis within the DoE, constituting another core strength on which the team can build. The existing Annual Energy Accounts Technical Report, which is currently prepared for internal distribution at the national level and to the World Bank, provides an opportunity to easily strengthen dissemination, if it is adapted for regular publication and wider distribution. Another strength are the quality check procedures with specific data providers in the coal and electricity sub-sectors that are well established and appear to be working.
The primary weaknesses highlighted in the diagnostic relate to the quality and availability of biomass and petroleum products data, which poses a threat to the accuracy of the energy balance statistics as a whole by presenting a biased vision of the country’s energy system. Currently, for example, supply and demand data for biomass or LPG is not tracked at all, and data for other petroleum products is only partially tracked, with no specific data on sales or stocks. As a consequence, in Botswana’s current energy balance as represented in the AEIS, biomass represents a much smaller share of consumption than in peer countries. However, DoE recently announced plans to carry out a National Energy Use Survey (NEUS) which is expected to make a substantial contribution to the improvement of data quality and coverage.

The other major weaknesses relate to the statistical Excel infrastructure which is currently designed only to handle electricity and coal data, and is geared toward producing only energy accounts. Limited automations in the tool also generate substantial repetitive work for the team, reducing the time they can spend on analytical tasks, and may lead to the introduction of errors into the statistics as a result of manual data manipulations or versioning errors.

While DoE has an institutional mandate to generate energy statistics, and relationships with other institutions generally function quite well, there is no clear distribution of roles between the DoE and Statistics Botswana, and no mandatory provision of data to either organization by state or private sector stakeholders. The establishment of the Technical Working Group provides a forum and institutional focal points to ease the collection of data, provide feedback and validate any required assumptions. However, there remains a need to continue to actively engage the Technical Working Group focal points to ensure their effective participation, as well as to increase engagement with institutions that currently do not participate in the Technical Working Group to support the continued development of statistics particularly where petroleum products end uses, LPG imports and sales data, energy efficiency statistics, and biomass data are concerned.

In addition to support from AFREC on improving energy data and statistics, strong government support and potential funding for statistics development at DoE in framework of the Mineral and Energy Sectors Statistics Strategic Plan 2022-2026 constitutes a major opportunity for Botswana to address priority issues.
2. Recommendations

The diagnostic assessment concludes with four recommendations to reinforce energy statistics in Botswana to align with international recommendations and establish a NEIS:

1. **Improve data quality and coverage**
   - **Improve critical sub-sector data for biomass and petroleum**, through training, outreach to new stakeholders to improve secondary data collection, as well as investments in consumption surveys.
   - **Develop data inputs for energy efficiency analysis** in collaboration with the Energy Efficiency Section in DoE.
   - **Reinforce data collection from existing sources** by working closely with Statistics Botswana and other key data providers to expand the data shared with DoE or to introduce low-cost changes to their collection methods.
   - **Improve and expand quality checks** to include stakeholders in the biomass and petroleum sub-sectors in validation processes, and employ more advanced data quality checks to verify estimations and ensure alignment with international standards.

2. **Adapt Statistical Tools to the Requirements of a NEIS**
   - **Develop capacity on data management** through training of designated focal points and 1-2 members for more in-depth training on database management and tools in order to anticipate potential changes in the statistical infrastructure.
   - **Redesign the existing “Energy Accounts” statistical infrastructure** to (1) reduce repetitive work as much as possible for team members (2) integrate data for all relevant energy sub-sectors in Botswana, including petroleum products and biomass and (3) provide energy balance tables and other key indicators as an output, in addition to the energy accounts supply and use tables generated currently.

3. **Structure and facilitate data dissemination**
   - **Publish an annual report and dataset** for public dissemination building on the internal reporting already in place, as a «first-step» opportunity for building out a more ambitious program of data dissemination focused on the publication of an annual analytical report and a standard dataset for public consumption.
   - **Build capacity on energy economics and data analysis** to expand the analytical output of the team over the longer term in support of policy making or public debate outside of contribution to specific DoE projects.

4. **Perpetuate and formalize energy statistics processes**
   - **Formalize the DoE’s energy statistics mandate** with a specific decree or a formal arrangement with partner institutions and formal terms of reference for the Technical Working Group.
   - **Ensure continuity in statistics activities** with written processes and user manuals as training materials for potential new hires.
   - **Review and evaluate** statistics processes, outputs, and training needs on a regular basis.
3. Priority actions

The action plan covers a period of five years to achieve the recommendations and establish a fully functional NEIS aligned to the extent possible with international recommendations and best practice. The plan comprises of 36 prioritized actions spread across four implementation phases over the period 2022-2026.

While many actions can be achieved by the existing team with few additional resources, the implementation of the full action plan is expected to require approximately US$180,000 in financial resources to implement (Assuming the National Energy Use Survey is fully funded and covers all biomass and energy end use data requirements). These costs are primarily service costs to make improvements to the statistical infrastructure and tools. The plan also identifies approximately US$2500 in annual recurring costs, primarily to cover the cost of holding annual data validation and dissemination/sensitization workshops, as well as printing costs to support dissemination. No additional human resources are expected to be required to support the development of a NEIS in Botswana.

Within the action plan, Botswana has identified a number of actions as top priority for implementation. The following “quick win” actions as top priority for implementation over the coming 12 months:

- **Train the statistics team** on data management, and data requirements and estimation methodologies for biomass data and energy efficiency indicators (Actions 1A.1, 21.1, 2B.1). This activity is expected to be carried out on the basis of available online or pre-funded training opportunities, however it is recommended that specific subject matter focal points receive more in-depth training.

- **Expand data validation and stakeholder outreach activities** to cover petroleum products, biomass, and energy efficiency secondary data sources (Actions 1A.2, 1A.3, 1A.4). This action is expected to require approximately US$1,000 annually to support stakeholder sensitization and data validation workshops.

- **Launch dissemination activities**, by generating and publishing an annual standard dataset and report that can be launched with a public workshop. This action is expected to require about US$1,500 annually to support limited report printing, web publishing and launch activities (Actions 3A.1; 3A.2, 3A.3).

These actions will further contribute to the top-priority structuring projects that were identified for the country, notably:

- **Integrate primary data on biomass and other energy end uses collected in the framework of the NEUS** into the national energy statistics processes (Actions 1A.5, 1A.6). The NEUS is currently being implemented, however statistics officers may require training in data processing and consolidation, as well as specific tools, in order to permit primary data to be integrated into existing statistics outputs.

- **Re-design the statistics infrastructure** to meet the requirements of a NEIS and cover all sub-sectors and required outputs (Actions 2B.2, 2B.3). This activity is expected to require about US$120,000 for development and infrastructure, in addition to approximately US$40,000 in consulting fees should the team require technical assistance in developing the user requirement specifications for the tool prior to development.
4. Five-year action plan to establish a NEIS

**PHASE 1:**
*Plan finalization & preliminary adaptations (H2 2022)*
- Finalization and dissemination of the action plan
- Participation in the AFREC training program
- Implementation of initial «quick win» actions to improve data collection on biomass, petroleum products and energy efficiency
- Launch of National Energy Use Survey

**PHASE 2:**
*Consolidation of quick wins and preparation of long-term projects (H1 - H2 2023)*
- Formalization of collaboration with new stakeholders on biomass, petroleum or EE data
- Launch of dissemination activities
- Planning and resourcing for the re-design of the energy statistics infrastructure

**PHASE 3:**
*Implementation of long-term projects (H1 2024-H2 2025)*
- Infrastructure re-design
- Full integration of improved data from National Energy Use Survey
- In-depth training on data management and energy economics for team focal points
- Full adoption of updated processes and infrastructure

**PHASE 4:**
*Monitoring and update (H1 2026 and beyond)*
- Monitoring the effectiveness of adopted processes and tools
- Adaptation and update where required
- Expansion of dissemination activities
- Implementation of remaining opportunistic improvements

*Action plan overview with phases and primary activities*
NEIS & Capacity Building for 11 Member States
Executive Summary of the Diagnostic Report and Action Plan for Botswana

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AFREC is a specialised energy agency of the African Union mandated to develop the African energy sector by coordinating, harmonising, protecting, conserving, developing and promoting rational exploitation, commercialization and integration of energy resources in Africa. Working with African Union member states with a broad network of experts and partners in all the 55 African countries, we ensure all energy initiatives responds to the future development of the African energy sector, in our pursuit to build ‘the Africa We Want’.

Comments on the report are welcome and can be sent to:

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Minergy Coal Mine (Masama Coal Mine) in Southern Botswana

Morupule B Coal Power Plant (600 MW) in Palapye

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