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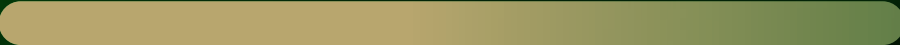
African Energy
Commission

African
Union



An Integrated, Prosperous
and Peaceful Africa

Comprehensive Capacity Building Programme for the African Energy Sector

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AFREC
African Energy
Commission



Comprehensive Capacity Building Programme for the African Energy Sector

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The African Energy Commission (AFREC) is a specialised energy agency of the African Union (AU), 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 a network of partners and experts from all Member States, AFREC has the capacity and expertise to ensure all energy initiatives across the AU respond to the future development of the African energy sector, in accordance with the AU's Agenda 2063 and the pursuit of building The Africa We Want.

Comments on this report are welcome and should be addressed to:

African Energy Commission (AFREC)

02 Rue Chenoua, BP791, Hydra, 16035, Algiers, Algeria

Tel: +213 23 45 9198

Fax: 213 23 45 9200

Email: Afrec@africa-union.org

www.au-afrec.org

Follow us on social media @African Energy Commission

Acknowledgement

The Comprehensive Capacity Building Programme for the African Energy Sector is a report by AFREC towards enhancing Africa's energy sector, made possible through the contributions of various stakeholders.

We acknowledge the critical role of regional nominees, whose expert insights significantly shaped the project's direction and success. Their expertise has been vital in addressing the challenges within Africa's energy landscape. We extend our gratitude to the governmental and non-governmental organizations, industry partners, and all other collaborators for their roles in this endeavour, ensuring an inclusive approach to capacity building. We also recognize the invaluable input from local communities and their leaders, which has been essential in ensuring the programme meets the needs of all stakeholders.

AFREC appreciates the expertise from the Extractive Resources Governance for Programme (ERGP) of the School of Public Policy of the University of Calgary.

This collaborative effort exemplifies the power of unity in the pursuit of a common goal. We eagerly anticipate building upon this foundation to foster sustainable and inclusive growth in the African energy sector.

The report was prepared under the general supervision of Mr. Rashid Ali Abdallah, Executive Director of the AFREC and coordinated by Mr. Yagouba Traore, Head of Policy, Planning and Strategy at AFREC, and Mr. Mehdi Khouili, Capacity Building & Country Support Principal Officer, with contributions from Member States and regional organisations.

We are grateful for all the contributions from key individuals associated with AFREC in all AU Member States as well as from colleagues in institutions across Africa working to promote the development of Africa's Energy Sector.

Foreword



It is my pleasure to introduce the report on AFREC's Comprehensive Capacity Building Programme for Africa's Energy Sector, which lays the foundation for our ambitious capacity building initiative, providing a detailed roadmap to enhance the skills and capabilities within the continent's Energy Sector.

Upon commencement of its implementation, this Programme will become the primary catalyst for capacity building in Africa's Energy Sector, surpassing initiatives by any African or non-African institution. It will position AFREC as a premier center of excellence and a Continental Capacity Building Hub. The programme aims to transform Africa's energy landscape by enhancing the skills and institutional capacities of stakeholders.

The Programme is designed to support countries and institutions in addressing key challenges to scaling up energy projects and enhancing African countries' efforts toward achieving just energy transition.

Based on the Capacity and Skills Gap Analysis conducted across five African regions, over 150 targeted training modules have been developed as part of the Programme, giving AFREC an opportunity to address Africa's capacity needs in the energy sector. The Programme further aims to foster expert partnerships across the continent, enhance knowledge dissemination, and connect interested countries and institutions with solution providers, partners, and countries that have successfully navigated similar challenges.

We look forward to the collaboration and participation of all AFREC is proud of this Programme and is committed to its implementation. By positioning AFREC as the central hub for capacity building, we are certain about driving significant progress in the African energy sector, promoting sustainable development and energy independence for the continent. Our vision is to create a resilient, dynamic, and self-sufficient energy sector that meets the needs of all Africans.

stakeholders to realize this vision. Together, we can harness the power of knowledge and innovation to build a brighter, more sustainable future for Africa.

Sincerely,
Rashid Ali Abdallah
Executive Director
African Energy Commission (AFREC)

Reading Note

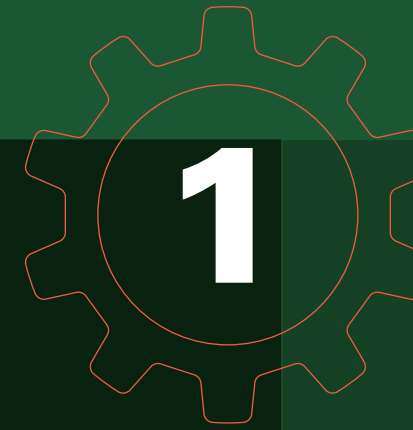
The macro-structure of this report reflects a consistent framework to ensure clarity and coherence. However, it is important to note that regional chapters within the report exhibit variations, reflecting the diverse contexts and focus areas unique to each set of contexts. Africa's vast and varied energy landscapes necessitate a tailored approach.

Differences in regional chapters are intentional and critical. These variations arise due to the diversity in datasets, the distinct needs of different areas, and the varied socio-economic and environmental contexts across the continent. This deliberate design choice ensures our analysis and recommendations are relevant and responsive to the specific challenges and opportunities in each region. We believe this approach enhances the report's applicability and effectiveness in addressing the unique aspects of Africa's energy sector.

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Executive Summary

AFREC is an AU Specialised Institution in charge of developing Africa's energy resources. This research reports on findings toward a Comprehensive Capacity Building Programme for the African Energy Sector, focusing on AU Member States, regional, and continental African institutions.

The project results include a capacity and skills gap assessment in the African Energy Sector, covering continental, regional, and national levels for both private and public sectors. The Capacity Building Programme is constituted through the proposal of targeted modules and training sessions based on the findings of this research. The Programme offers a roadmap which includes effective training plans for selected African and international institutions and training centers. This ensures they can provide training that addresses the skills needed by policymakers and energy experts of Member States, as well as regional, and continental institutions within the energy sector.

Methodologically, to execute the Project, a survey was conducted to gather data related to current capacity in the African Energy Sector. The survey data was comparatively reviewed alongside the results of existing studies, discussed, analysed, and complemented by the expert knowledge of the team. The combination of inputs and data synthesis produced a balanced picture of current capacity levels, existing gaps, and the training required to bridge these needs.



Next 5 years

Generally, a significant capacity improvement opportunity was identified in all five regions. Such topics as energy efficiency in infrastructure and practices, as well as regional and regulatory frameworks were identified in four regions. Issues on environmental impacts and climate resilience, community engagement, renewable energy integration, energy markets, investment and financing, hydropower generation, solar generation, and electricity grids were identified in three regions. Specific findings were made when the regions were considered separately. In such cases, national-level considerations appear to be relevant.

With the results from the assessment exercise, the Programme considers regional and national needs related to priority energy projects in the development pipeline for the next five years.

We need to prioritize collaborating with leading international institutions to train existing programme providers first. As new energy projects emerge, additional training programmes will be necessary. The proposed capacity-building programme is designed with this principle in mind.

In summary, the Programme offers a detailed roadmap that includes:



A Balanced Assessment: Our approach begins with a thorough evaluation of current capacity levels within the African Energy Sector. This involves identifying existing gaps and outlining training modules and resources required to bridge these gaps. By understanding our current position, the document provides a clear way forward, tailored to the challenges and opportunities of each region and institution.



Effective Training Plans: We have developed a comprehensive training plan that incorporates the expertise from both African and international institutions and training centers. This plan aims to equip energy sector professionals with the skills and knowledge needed to drive progress. The training ensures diversity and inclusivity, covering technical, managerial, and strategic aspects of energy sector development and project implementation.

For successful implementation, AFREC aims to become the central hub for energy capacity building across the continent. This will involve:



Capacity and Skills Gap Analysis: We will conduct regular systematic assessments and mappings of capacity and skills gap at the continental, regional, and national levels in both the public and private sectors for a comprehensive understanding of the needs across the energy ecosystem. By identifying these gaps, we can tailor our interventions to maximize impact.



Targeted Training Modules: The Programme will identify and continuously update training modules and sessions based on real-time data and lessons. This approach ensures our training remains relevant and effective, enabling stakeholders to replicate successful strategies and achieve sustainable progress.



Expert Partnerships: Engaging with key African and international institutions, we will build a network of experts to support the capacity and skill development of African stakeholders and institutions. Such partnerships will bring together leading minds in the energy sector, fostering a collaborative environment to freely share knowledge and best practices.



Knowledge Dissemination: High-level learnings and insights will be disseminated through online platforms, advocacy forums, and in-country advisory and implementation efforts for wider audience. This method will empower energy sector professionals with the tools and knowledge they need to succeed.



Matchmaking and Collaboration: We will facilitate connections between interested countries and institutions and solution providers, partners, and other countries that have successfully navigated similar challenges. By emphasizing intra-African knowledge exchange and cross-border learning, we aim to create a vibrant community where successes are shared and replicated across the continent.



2. Introduction

Despite Africa's abundant energy resources, the continent grapples with challenges, including energy inaccessibility and institutional capacity gaps, which affect optimal exploitation and utilization. With over 600 million people in need of electricity, and a significant populace reliant on natural resources and facilities, a comprehensive approach to address these challenges while capitalizing on the available energy resources is imperative. AFREC, therefore, conducted this study to realize the objective of a five-year programme targeting policymakers, energy planners, regulators, and technicians across AU Member States.

We focused on pivotal areas, including energy technologies, policy and regulatory frameworks, energy markets, and project development. We strived to create synergies, aligning capacity needs with institutions, and curating efficient, targeted, and harmonised capacity-building activities. An integral aspect of our approach has been the encouragement of cross-border learning, fostering a cooperative strategy that amplifies the exchange of knowledge and collaborative innovation.

2.1 Key Contexts in African Energy



Africa's energy landscape is characterized by abundant resources and significant access challenges. As the continent strives to address these challenges, several key contexts emerge in the discourse of Africa's energy development.

Energy commodities remain key to Africa's economic development. The commodity boom of the early 2000s led to a sustained growth for the Africa, with 5.5% increase in

GDP year-over-year from 2003-2013. From 2010-2020, Africa's adoption of renewable energies grew by 21% year-over-year. Despite declining demand for coal and oil, liquid natural gas (LNG) is projected to increase for the next two decades. As the global energy transition begins, Africa has unique role in the provision of both existing, cleaner non-renewable energy, while ramping up the commodities needed to fuel the energy transition within and beyond Africa.

The challenge of resource abundance versus access persists. Despite Africa's multiplicity of energy resources – coal, oil, natural gas, and renewable energy sources – which paints a picture of potential energy affluence, the continent faces significant challenges in translating this abundance into accessible energy for its population. Infrastructural inadequacies, policy inconsistencies, and financial constraints exacerbate these challenges, resulting in over 600 million Africans lacking access to electricity. Additionally, a significant portion of the population still relies on traditional, often unsustainable, energy sources for domestic use.

+
600
millions
Africans
lacking access
to electricity

We cannot overstate the effectiveness of policy and regulatory frameworks in shaping the energy sector's trajectory. In many African countries, the energy sector is governed by outdated policies, regulatory inconsistencies, and bureaucratic red tape. As such, the formulation and implementation of comprehensive, forward-looking, and inclusive policies and regulations is essential.

The integration of renewable energy is a central theme as Africa's renewable energy potential is vast – solar, wind, geothermal, and hydro. However, capacity building and skill development remain crucial as the energy sector's growth is often impeded by a lack of skilled manpower and technical expertise. Initiatives aimed at building capacity, from the policy-making level to technical execution, are essential for overcoming these challenges and fully leveraging Africa's renewable energy potential.

2.2 Capacity Building and Skills Development



Capacity building is not new to African development initiatives. Dating back three decades and spanning multiple regions and economic sectors, external funding, consultancy, training programmes, and other resources have been mobilized across the continent to initiate and maintain capacity development. However, the concept remains vague and overutilized.

Capacity exists at the global, institutional, organizational, and individual levels.

Firstly, a 2011 OECD study of capacity development of the environment and governance of the energy sector in the developing world defines capacity as “the ability of people, organisations, and society as a whole to manage their affairs successfully...whereby people, organisations, and society as a whole unleash, strengthen, create, adapt, and maintain capacity over time”. This definition identifies three levels of capacity as defined by the presence of:

- a. An enabling environment at the institutional and societal level to determine the “rules of the game;”**
- b. Organizational capacity; and**
- c. The capacity of the individuals who comprise organizations.**

Secondly, the World Bank similarly advocates a “nuanced and multi-layered approach” to distinguish different components, depending on the needs and logistics of the programme”. The World Bank understands capacity building efforts to span three main levels: individual, organizational, and institutional.

Thirdly, Krishnaveni and Sujatha define capacity as “the ability of institutions, organizations, and individuals to carry out their tasks with their fullest potential,” and identify micro perspectives (human resources) and macro perspectives (strategies for institutions). Their outlook reflects similar understandings of capacity by major development organizations, such as the OECD. Based on these definitions, we opine that capacity building entails attention to the scale of entities. Doing so allows planners to understand, from the high level, potential minute gaps and challenges. In turn, planning, execution, and follow-up evaluations will be more predictable. Put differently, upfront assessments matter as much as perceived gaps in the links between the levels of capacity.

In different capacity building projects, different scales require attention and resources. While many projects will transcend these scales, a given project will likely have more needs to focus on one level over another. Therefore, there is utility in applying the three-tier scale of capacity needs to better understand the unique needs of a project.

The goal in this, through the lens of the Comprehensive Capacity Building Programme for the African Energy Sector, is identifying the various gaps at each level and establishing a clearer categorization of where capacity gaps are and where they fit into the larger project objectives.

The concept that micro-level skills comprise the base for structural efficiency is relatively self-evident; however, it is important to stress that the capacity building agenda for an organization must identify the gaps between scales of the capacity building programme. Identifying the interlocation between scales helps to identify successful areas, while identifying challenge areas and gaps in capacity.



2.3 Best Practices in Capacity Building

2.3.1 Research and Practice Synergy

Hamed Al-Shidhani highlights the need for a robust synergy between research and practical evaluations of capacity building. By gathering facts and analysing surveys from sector-specific experts, it becomes possible to identify gaps and provide data that accurately reflect broader regional and national issues. However, this approach is not new, similar efforts have been made before, often resulting in another round of calls to address the skills gap. Although surveys have been conducted repeatedly, they have yielded only limited long-term benefits. To bridge the gap between research and practice, it is necessary to move beyond initial high-level analyses and focus on specific areas through detailed studies. By examining micro-level capacity challenges and producing measurable findings, it will be possible to pinpoint specific areas that require long-term, targeted skill development. This approach will lead to more effective and sustainable improvements in capacity building.

2.3.2 Knowledge Exchange

Developing best practices and extensive technical skills at the micro and meso levels within a multilateral organization does not follow the same timeline in every jurisdiction. This process is highly dependent on the unique social, political, economic, and cultural realities of each area.

This approach addresses a common critique of capacity building programmes: the failure of development agency ideas that are imposed by external consultants and do not account for the specific characteristics of regional governance, local stakeholders, bureaucracy, and other factors. By sharing experiences across jurisdictions, gaps can be filled more effectively. For instance, country “A” might successfully implement factor “x” but struggle with factor

“y,” while country “B” might excel in factor “y,” but face challenges with factor “x.” Through knowledge exchange, jurisdictions can learn from each other’s successes and challenges, leading to more comprehensive and systems-level capacity building.

2.3.3 International Best Practices in Capacity Building

The United Nations Development Assistance Framework (UNDAF) identifies six crucial steps for the successful implementation of a capacity building programme. These steps are designed to move from theoretical components to practical applications:

- a. Engagement: Involving stakeholders and ensuring their participation.**
- b. Assessment: Evaluating the current capacities and identifying gaps.**
- c. Definition of Goals: Setting clear, achievable objectives.**
- d. Formulation of programme: Designing a comprehensive plan to address the identified needs.**
- e. Implementation of programmes and Projects: Executing the planned activities.**
- f. Evaluation of Capacity Development: Assessing the outcomes and effectiveness of the programmes.**

The International Labour Organization (ILO)

In 2022, the ILO held a technical meeting focusing on the future of work in the oil and gas industry. One of the key goals was to identify regional disparities in oil & gas sector investments and to create capacity-building initiatives aimed at improving sectoral best practices. This included addressing skills gaps and promoting sustainable practices within the industry.

Paris Agreement

Under the Paris Agreement, signatories are required to support capacity-building efforts in various countries, particularly in technical aspects of reducing greenhouse gas (GHG) emissions. This includes providing assistance for improved reporting on progress or challenges related to meeting the agreement’s targets.

World Bank

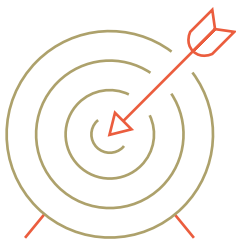
The World Bank has invested millions of dollars over the years to support oil and gas-producing countries. These investments aim to develop sector-specific skills such as:

- a. Establishing vocational training institutes to build technical expertise.**
- b. Creating financial planning and reporting frameworks for government agencies.**
- c. Enhancing environmental monitoring capabilities for environmental protection agencies.**



3. Project Overview

3.1 General and Specific Objectives



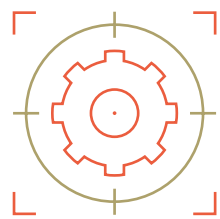
The main objective of this project is to invest in Africa’s human resources by designing a comprehensive 5-year capacity building programme for AU Member States, regional economic communities (RECs), regional power pools, centers for renewable energy and energy efficiency, and other relevant stakeholders supporting the sustainability of the African Energy Sector.

The specific outcomes of the report are:

1. Needs assessment on the capacity and skill gaps within Africa’s energy sector at the regional and national levels for both the private and public sectors;
2. Identification of key African and international institutions with the expertise to build the capacity and skills of African stakeholders;
3. Training curricula/syllabus to fill the skill gap in several key areas;
4. Matching the capacity needs with institutions that could provide training, as a basis of coordination and harmonisation of capacity building activity implementation for efficiency;
5. Required financial resources to implement capacity building and skill development activities;
6. Recommendation of best practices to enhance capacity building and skill development for African energy decision-makers, accordingly, based on the results of skill gap analysis;
7. Recommendation of a cooperation framework that encourages cross-border learning and exchange of knowledge between AU Member States and regional and continental institutions;
8. Development of a framework for building long-term collaboration among AU Member States, international partners, regional and continental institutions on research and innovation in the energy sector.



3.2 Project Scope and References



Several perspectives exist on how to identify the scope of the project. The most evident considerations, in terms of the scope, are the geographic area and the temporal considerations for the study.

Geographically, the project covered the entire African continent. However, to ensure that the information and analysis were manageable, the unit of study was focused on the regional level.

Regarding temporal considerations, two elements were taken into account. The first element involved the literature reviewed by the consulting group, which included information published in the last 10 years to ensure the data remained current. The second element was the proposal for the capacity building programme, which is planned for the next five years, covering the period from 2024 to 2029. This timeframe establishes a clear, forward-looking vision for the programme’s implementation.

3.2.1 Sectoral Considerations and Key Energy Themes

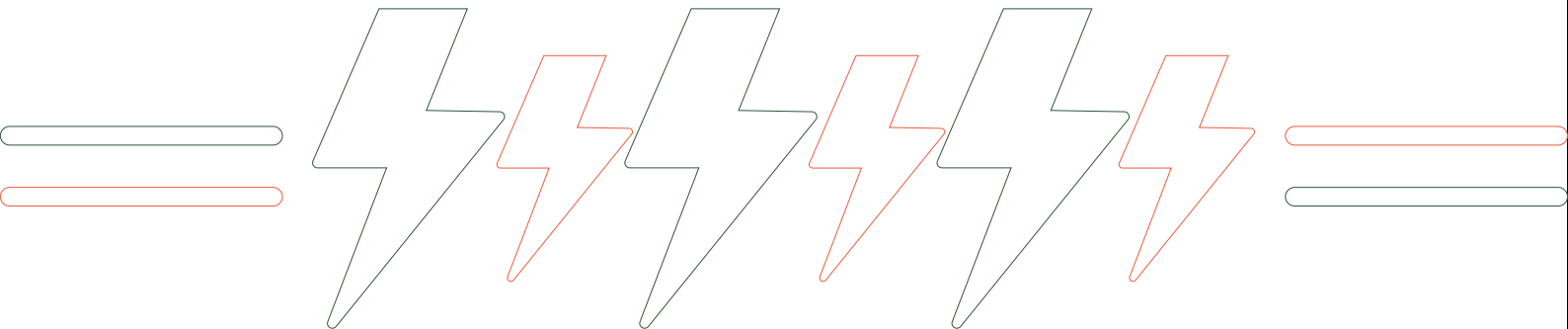
Table 1 presents all the areas of knowledge, or key energy themes, that were identified and considered within each main process of the value chain.

Number	Areas of Knowledge	Energy Sub-sector in the Value Chain
1.0	Energy Market and Economies	Energy Planning and Public Policy
1.1	Energy and Economic Development	
1.2	Drivers of Energy Demand	
1.3	Economic Growth and Energy Demand	
1.4	Prices and Costs of Energy	
1.5	Investment in Energy	
1.6	Financial Sources and Instruments	
1.7	Water-Food-Energy Nexus	
2.0	Energy Policies and Regulatory Frameworks	
2.1	Sustainable Energy	
2.2	Government Policy, Strategy and Approach	
2.3	Development in Legislation or Regulation	
2.4	Changes in Laws or Regulations	
2.5	Energy and Environmental Policy	
2.6	Energy Planning	
3.0	Energy Project Development	
3.1	Business Analysis and Plan Development	
3.2	Commissioning	
3.3	Public Consultation	
3.4	Mobilizing and Structuring Investment	
3.5	Energy Project Management	
3.6	Energy Project Structuring and Financing	
3.7	Climate Finance for Energy Sector Projects	



Number	Areas of Knowledge	Energy Sub-sector in the Value Chain
4.0	Energy Technologies (Non-Renewable)	Energy Technologies Implementation
4.1	Coal	
4.2	Brown Hydrogen	
4.3	Oil	
4.4	Natural Gas	
4.5	Grey Hydrogen	
4.6	Blue Hydrogen	
5.0	Nuclear	
5.1	Nuclear	
6.0	Energy Technologies (Renewable)	
6.1	Hydropower	
6.2	Geothermal	
6.3	Solar	
6.4	Wind	
6.5	Green Hydrogen	
6.6	Bioenergy	
7.0	Electricity Transmission and Distribution	Energy Planning and Public Policy
7.1	On-Grid	
7.2	Mini Grid	
7.3	Off-Grid	
7.4	Grid Flexibility and Power Systems Planning	
7.5	Smart Grids	
8.0	Technical Processes	
8.1	Operation and Maintenance of Energy Facilities	
9.0	HSE and Community Relation Processes	
9.1	Health and Safety Standards	
9.2	Environmental Management	
9.3	Emergency Response and Contingency Plans	
9.4	Community Relations	

Table 1: Areas of knowledge per energy sub-sector in the value chain. Source: AFREC



3.2.2 Audience and Impact

The Capacity Building Programme was designed with the following stakeholders as the target audience in Africa:



✓

1. Policymakers

✓

2. Energy Planners

✓

3. Energy Regulators

✓

4. Regional Economic Communities (REC)

✓

5. Regional Power Pools (RPP)

✓

6. Centers for Renewable Energy and Energy Efficiency

✓

7. Experts and Technicians from AU Member States

✓

8. Continental-Focused Institutions

✓

9. Other Relevant Stakeholders

3.2.3 References and Frameworks

To support the demands of the Project, our team included reference to key regional, continental, and international frameworks in the production of the report. They are as follows:



1. The Paris Agreement

2. AU Agenda 2063 Goals (including African Continental Free Trade Area (AfCFTA))

3. UN Sustainable Development Goals (national electrification plans)

4. African Energy Transition Programme (AETP) and African Common Position on Energy Access and Energy Transition

5. Africa Single Electricity Market (AfSEM)

6. Africa Bioenergy Policy Framework and Guidelines

7. African Energy Information System (AEIS)

8. African Union Commission (AUC) Programmes

9. African Development Bank (AfDB) Programmes

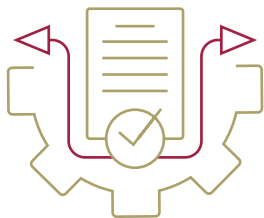
10. African Development Agency (AUDA-NEPAD) Programmes



4

Project Methodology

The project underwent three phases. In Phase I, we reviewed all applicable frameworks and assessed current capacities in Africa's energy sector. Phase II focused on a capacity gaps analysis, considering the ideal situation to be reached in the next five years. In Phase III, all efforts were dedicated to developing the capacity building plan, which included identifying potential training providers and outlining the steps necessary to bridge the identified gaps.



4.1 Phase I: Capacity Identification and Framework Requirements

4.1.1 Survey Design and Deployment

The project employed a mixed-methods model for balanced and relevant dataset. The blend of quantitative and qualitative data offered a more holistic view of the current state and challenges of the African energy sector and the opportunity for respondents to engage fully with the exercise.

The survey had the following sections: Demographics; Core Energy Topics; Frameworks, Themes, and Applications; Sectoral Priorities; Institutional Capacities; and Challenges.

4.1.2 Current Capacities Analytical Design

To determine the current level of capacities in the target institutions, a combined analysis was done, incorporating the results of the survey, literature review, and the expert knowledge of our local and regional consultants.

Regarding the survey results, a quantitative estimation of the capacity levels was performed. Each survey question was formulated to assess the level of knowledge and/or understanding of a specific topic, with responses categorized by institution type. The capacity levels were evaluated through a qualitative scale of five groups: i) No Expertise, ii) Basic Knowledge, iii) Intermediate Knowledge, iv) Strong Knowledge, and; v) Subject Matter Expert. Table 2 provides an example of the survey results.

Area of Knowledge	Current Level of Expertise	Energy Planning Institution
Energy and economic development	No Expertise	20.0%
	Basic Knowledge	20.0%
	Intermediate Knowledge	20.0%
	Strong Knowledge	40.0%
	Subject Matter Expert	0.0%

Table 2: Example of survey results for one area of knowledge in energy planning institutions of an African region. Source: AFREC



4.2 Phase II: Gap Analysis

The gap analysis assessed the current conditions under which the energy sector functions, comparing it to a proposed improved state, representing the ideal condition to be achieved after the implementation of the programme. This comparison highlights the differences between the existing conditions and the desired future outcomes, helping to identify the specific areas where improvements are needed.

4.2.1 Analysis of the Desired Capacity Levels

Drawing on survey data, a desired profile matrix was developed to determine the optimal capacity levels after the implementation of the programme. The consulting team leveraged their extensive expertise to analyse the appropriate capacity levels for different roles within institutions.

The numbers and colours in the matrix represent the levels of desired capacity under optimal conditions, essentially indicating the level of expertise we aim to achieve in key subject areas. This is represented on a qualitative scale as follows:

1. Basic Knowledge, 2. Novice, 3. Intermediate Knowledge, 4. Advanced Knowledge, and 5. Subject Matter Expert.

Sub-Areas	Capacities	Policy Makers				
		Assistant/Coordinator	Technologist	Analyst/Developer	Specialist/Consultant/Auditor	Director/Manager/Advisor
Energy Policies and Regulatory Frameworks	Sustainable Energy	3	4	4	5	4
	Government Policy, Strategy and Approach	3	4	4	5	4
	Development in Legislation or Regulation	1	2	2	3	3
	Changes in Laws or Regulations	1	2	2	3	3
	Energy and Environmental Policy	3	4	4	5	4
	Energy Planning	3	4	4	5	4

Figure 1: One section of the desired profile matrix for Policymakers in one region. Source: AFREC

4.2.2 Identification and Interpretation of Capacities Gaps

With both the current capacity level from the survey and the desired profile assessment from the consulting group, a calculation was needed to corroborate both datasets. Since the survey results were obtained in percentages, it was imperative to translate the desired profile matrix in percentages, too.

To achieve this, an estimate of a common structure in any operational unit was done, where the following assumption was used: for every Director/Manager/Advisor, there are two Specialists/Consultants/Auditors, and in every lower-level, the number of staff duplicates, resulting in an operational unit with 31 people, according to Figure 2.

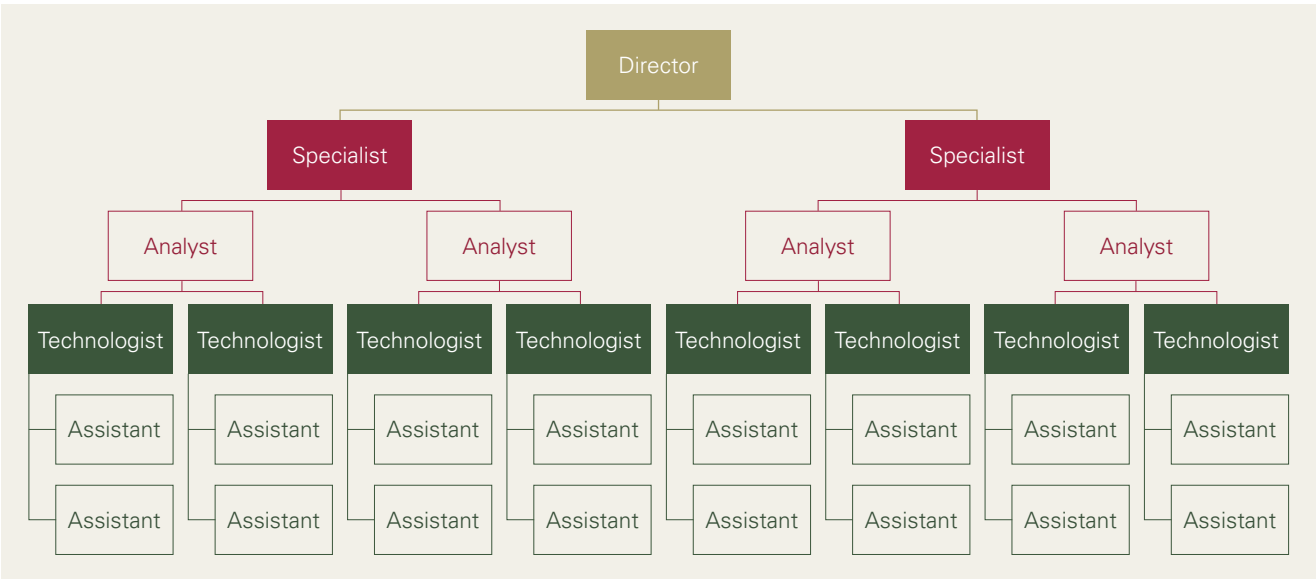


Figure 2: Example of a common structure in any operational unit. Source: AFREC

The Director represents 3% of the staff, the Specialists represent 6%, the Analysts represent 13%, the Technologists represent 26%, and the Assistants represent 52%. Using these numbers and the reported levels in the desired profile matrix, it was possible to obtain the percentage of desired capacity per group of knowledge/understanding in respect to a subject area.

When this was determined, it was easy to estimate the capacity gaps in percentage, as Figure 3 indicates.

Area of Knowledge	Level of Knowledge	Energy Planning Institution		
		Current Capacity	Desired	Capacity GAP
Energy project structuring and financing	No Expertise	50.0%	0%	-50.0%
	Basic Knowledge	50.0%	0%	-50.0%
	Intermeiate Knowledge	0.0%	78%	78.0%
	Strong Knowledge	0.0%	16%	16.0%
	Subject Matter Expert	0.0%	6%	6.0%

Figure 3: Example of numeric estimate of capacity gap for an area of knowledge in Energy Planning Institutions in one region. Source: AFREC

In this example, ‘No Expertise’ had 50%, and ‘Basic Knowledge’ also had 50%. However, from the desired profile matrix, it would be desirable to have 78% of the staff with an Intermediate Level of knowledge, 16% with Strong Knowledge, and 6% being Subject Matter Experts. Evidently, a large gap exists among people who should have an intermediate knowledge (highlighted in red) and a small gap in people who should have strong and expert-level knowledge (highlighted in green).

4.2.3 Literature Review and Expert Analysis

AFREC’s team explored academic literature, including peer-reviewed articles, journals, and publications, for insights, theories, and findings on the energy sector and capacity development in Africa. The team further explored such energy sector resources as industry reports, white papers, case studies, and policy documents to capture the dynamic and multifaceted nature of energy development, management, and policy implications.

4.3 Phase III: Capacity Plan Development

4.3.1 Capacity Plan Design and Requirements

Several steps were taken in designing the capacity development plan, which are described as follows and evidenced in the Capacity Building Table.

1. Training Provider Selection

Firstly, based on the capacity gap assessment, AFREC charged local consultants to identify possible training providers. Where existing programmes were not on offer, the process was based on the analysis of their installed capacity to design the new required training and develop the curricula.

2. Training Plan Construction

An Excel template was created for the capacity building programme.

All programmes were proposed with a regional focus, however, in certain cases, the need existed to identify and/or propose national specific programmes. In such cases, we included the name of the country where national specific programmes were proposed.

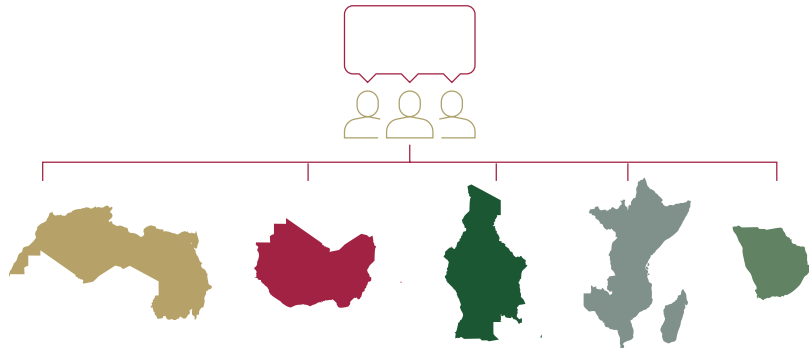
Another consideration for the capacity building programme was the language of instructions. Here, such languages as Arabic, Portuguese, and Spanish were added to English and/or French to reflect the official languages of most countries.

The combined institutional and individual capacity needs to reach the goal of improving the continent’s energy sector. Individual capacity gaps were assessed through the survey results, the desired profile matrix, previous studies, and the knowledge/expertise of our local consultants.

The programme considered the appropriate balance between policy, planning, regulation, and technical and operational capacity needs. Emphasis given was dependent on the results of the combined gap analysis exercise, however, generally, both types of instruction were included.

Concerning the programme style, depending on subject matter areas and expected levels of efficient learning, the most appropriate formats for each programme were chosen – seminar, workshop, course, or webinar.

For each element of the programme, a continental, regional, or national scope was determined. Inter-regional interaction allowed for the identification of programmes applicable to different regions. Where applicable, opportunities for jurisdictional regional collaboration were identified. A training programme was proposed to a region or country based on existing energy resources and projects.



Target institutional audience was identified in line with the results of the capacity gap analysis, thematic areas, and the specific contents of the proposed programme.

Additionally, the level of study (**fundamental**, **intermediate**, **advanced**) was defined according to the results of the capacity gap analysis and considering the projected target audience, the applicable level of the proposed training was indicated.

Applicable delivery formats were proposed to meet the requirements of the subject matter area and the content to be delivered, including in-person and online formats. In-person delivery was prioritized for programmes that required inter-personal dynamics, field and/or lab practices. Online synchronous delivery was prioritized for programmes that involved conceptual/theoretical knowledge but required direct instructor-trainee interaction. Again, on-line asynchronous delivery was instituted for programmes that involved conceptual/theoretical knowledge but required no direct instructor-trainee interaction. For certain specific programmes, hybrid delivery models were considered.

Each programme had a basic description, including a brief description of the training, programme objectives, learning outcomes and suggested textbooks, readings, and any other reference materials. The programme duration (in hours of instruction, 80 hours maximum) and a brief detail of the modules or sections are also included.

Global, continental, and regional framework capacity needs versus energy sector development capacity needs were identified. In general, applicable frameworks were considered to be cross-cutting themes in relation to content proposal for training programmes on energy sector development capacity needs.

The 5-year implementation timeline was informed by the following prioritization scheme:

- **Priority for Year 1:** existing training programmes in which gaps have been identified in topics aligned with energy projects under implementation.
- **Priority for Year 2:** existing training programmes in which larger gaps have been identified in topics aligned with new energy projects.
- **Priority for Year 3:** existing training programmes in which medium-sized gaps have been identified in topics on new energy projects in the pipeline and brand-new programmes targeted at potential trainers, employing the train the trainer approach.
- **Priority for Year 4:** existing training programmes in which small gaps have been identified in topics on new energy projects under development and brand-new programmes to cover larger gaps.
- **Priority for Year 5:** brand-new training programmes in which medium-sized and small gaps have been identified in topics on new energy projects under development.

This capacity building programme forms part of AFREC’s request to produce a SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) roadmap, because:

S M A R T	S: Data in the desired profile matrix considered specific capacity areas per role within organizations and estimated specific gaps were identified based on the specific data.
	M: We proposed the use of a simple indicator for the programme to measure its implementation. This indicator is the number of courses implemented and/or total planned courses.
	A: We considered existing capacity needs and the list of providers sourced for the regions to make the programme achievable.
	R: The programme was based on capacity gaps assessment at a regional level, making it relevant for the proposed target institutions.
	T: AFREC had yearly priorities for the implementation period.



5. **Key Findings** **and Considerations:** **Summaries** **by Region**



North Africa is home to over 200 million people, with a predominantly young and steadily growing population. Urbanization and industrialization are rapidly transforming the large coastal cities, while agriculture remains vital in rural areas. The region's economy is diverse, encompassing agriculture, oil and gas, and tourism in select areas.

The region's strategic location between Africa, Europe, and the Middle East positions it as a potential significant player for capacity enhancement in the Energy Sector in the continent. However, despite its economic and social potential, various challenges impede the region's strategic positioning.

North Africa's energy potential surpasses its domestic oil and gas requirements, providing an opportunity to leverage its renewable resources and expedite the transition to cleaner energy sources. The region remains one of the world's most climate-sensitive regions, and the energy transition is an imperative for diversifying the energy mix and enhancing resilience to the impacts of climate change. It is in this context that the region has adopted energy transition strategies that reflect respective countries' national programmes for achieving the United Nations' Sustainable Development Goals. North Africa should leverage its natural resources while prioritizing green growth. Governments in North Africa, foreign and domestic private investors, multilateral development banks, development financing institutions, and the private sector should continue to invest in the region's green growth.

Considering the opportunities and challenges associated with the development and diversification of energy sources in North Africa, this report recommends actions for capacity building in energy-related sectors. The recommendations are the outcome of a comprehensive analysis, of national strategies, stakeholder survey responses, and an examination of recent training initiatives by agencies and centers of expertise targeted at institutions and individuals.

5.1.1 Primary Capacity Needs

Conclusions on capacity development in the energy sector considered, firstly, certain high priorities, including:

1. Policymaking Capacity:

- Human Resource Development
- Regional Collaboration
- Education and Research & Innovations
- Governance and Public Administration

2. Energy Projects Management:

- Energy Technology Implementation and Applications (Technical Expertise)
- Energy Infrastructure Operations

5.1.2 Secondary Capacity Needs

Secondary capacity needs concern aspects of ongoing or future projects and new technologies. It is essential to be updated with latest trends, policies, and technological advancements in energy-related sectors. These needs include:

- Electricity Transmission and Distribution
- Electromobility
- Power-to-X (P2X)
- Desalination
- Energy Infrastructure Operations
- Energy Market & Economics

These training programmes should be implemented by local institutions and centers in collaboration with recognized international organizations to empower educators (train the trainer) online or in person. Some of these institutions have experience in similar capacity development programmes.



The organizations include:

- GIZ, Germany (<https://www.giz.de>)
- IRENA (<https://www.irena.org>)
- Green Climate Funds (<https://www.greenclimate.fund>)
- Regional Center for Renewable Energy and Energy Efficiency (RCREEE), Egypt (<https://rcreee.org>)
- Green Energy Park, Morocco (<https://www.greenenergypark.ma>)
- Centre de Développement des Energies Renouvelables, Algeria, <https://www.cder.dz>
- Centre de Recherches et des Technologies de l’Energie (CRTE), Tunisia (<http://www.crten.rnrt.tn>)

5.1.3 Challenges and Opportunities

The transition to clean energy presents North Africa with opportunities to renovate its energy infrastructure, addressing the increasing energy demand while creating jobs, supporting socio-economic development, diversifying economies, and enhancing climate resilience.

The transition is a shift toward low-carbon, sustainable, and inclusive economic growth that aligns with the long-term economic development and climate policy objectives outlined in the respective countries’ nationally-determined contributions (NDCs) and the United Nations’ SDG 7 and the AU’s Agenda 2063. Decarbonization pathways enable North Africa to attain its climate and economic development aspirations, necessitating a transformative approach to how energy is produced and consumed.

To achieve this, the region must adopt the principle of institutional and individual capacity development in **i)** legal framework restructure and governance, **ii)** public policy reconfiguration in the sector by addressing interconnected policies conceived and developed in silos, and **iii)** reliance on broad citizen engagement to mobilize and connect energy transition to local development challenges.



6.2.1 Primary Capacity Needs

1. Specialised training programmes on renewable energy financing
2. Policy development expertise on the implementation and monitoring of infrastructural projects
3. Establishment of knowledge transfer programmes
4. Public policy and planning
5. Technical training and upskilling across all energy resources and climate finance topics
6. Research and development

6.2.2 Secondary Capacity Needs

1. Skilled workforce in Energy Efficiency and Energy Management
2. Harmonization of standards
3. Regulatory frameworks for new technologies
4. Grid flexibility and power systems planning, operation, and maintenance

6.2.3 Challenges and Opportunities

Western Africa is marked by dynamic growth and immense potential. The region is experiencing rapid population growth and urbanization, leading to a surge in energy demand. Meeting the growing energy need in a sustainable and resilient manner is essential for the region’s future. However, the region faces several challenges and opportunities in the energy sector. General challenges include political will and training infrastructure.

More specifically, the capacity building needs for the Western Africa region involves addressing various challenges and opportunities across geopolitical, technological, and socio-economic factors:

- 1. Foreign Investment and Dependency
- 2. Cross-border Energy Projects
- 3. Energy as a Socioeconomic Catalyst
- 4. Resource Competition and Energy Diplomacy
- 5. Regional Energy Cooperation
- 6. Renewable Energy Expertise
- 7. Grid Management and Integration
- 8. Energy Efficiency Practices
- 9. Electrification in Underserved Areas
- 10. Technological Innovation and Research
- 11. Effective Regulatory Frameworks
- 12. Climate Resilience and Adaptation
- 13. Energy Data Management and Analytics

Western Africa’s energy sector is at a critical juncture, with the potential for growth and transformation. Addressing its capacity building needs and overcoming challenges will enable the region to achieve sustainable, reliable, and inclusive energy access, directly impacting its economic development and the well-being of its citizens. Therefore, the path to a sustainable and resilient energy future must be navigated with diligence and foresight.

As the region embarks on this transformative journey, it should recognize that capacity building is an ongoing process. Regular assessments, curricula updates, and collaboration with global experts are crucial.

With substantial capacity building needs and vast energy potential, Western Africa can, through the right strategies, investments, and partnerships, harness its energy resources, improve energy access, reduce environmental impact, and stimulate economic growth. This will secure a brighter energy future and contribute to the global energy transition.

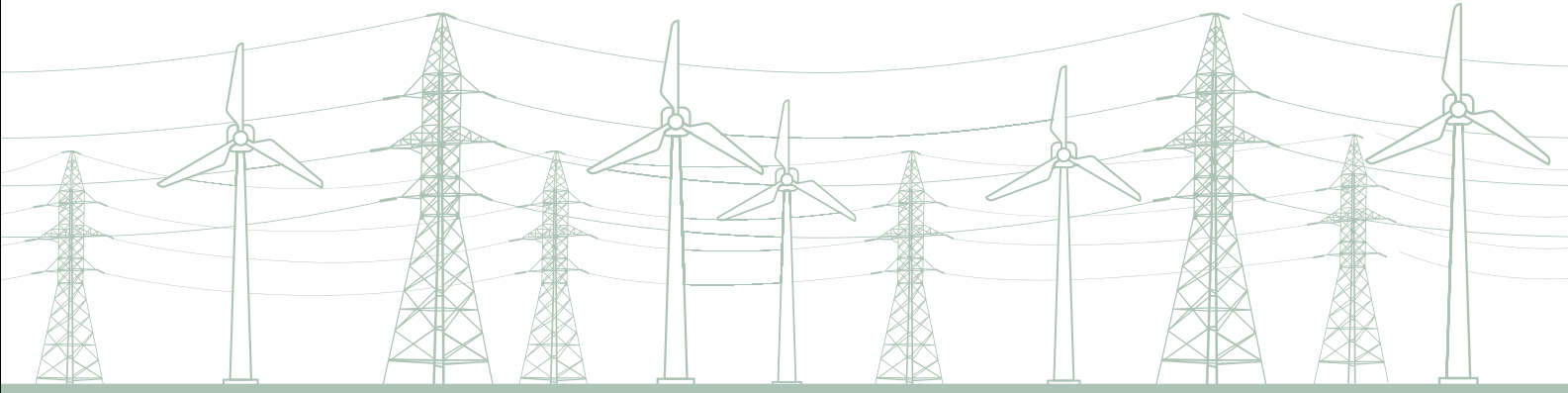
In pursuit of a sustainable energy future for Western Africa, governments, businesses, and civil society must recognize the transformative potential of addressing capacity building needs in the sector. Investments in renewable energy, grid resilience, energy efficiency, and climate adaptation will enhance Western Africa’s access to energy and safeguard its environment.

Moreover, as Western Africa aligns its energy goals with global sustainability initiatives, such as the SDGs and the Paris Agreement, it becomes part of a broader movement toward a cleaner and more equitable world. These global initiatives emphasize the urgency of sustainable energy access and climate action. Western Africa has a unique opportunity to position itself as a proactive participant in these global initiatives.

This requires regional collaboration to leverage the collective strengths to overcome shared challenges. Such initiatives as the West African Power Pool (WAPP) demonstrate the potential for cross-border cooperation in energy infrastructure development and electricity trade and to bolster energy security and drive economic integration.

Additionally, empowering the region’s youth through capacity building is an investment in innovation and resilience. Young minds hold the key to unlocking novel solutions to complex energy challenges. Specialised education programmes, entrepreneurship support, and innovation competitions can foster a culture of energy innovation and entrepreneurship. It is crucial to underscore that the journey toward energy sustainability is ongoing. Regular assessments and curricula updates, as well as collaboration with global experts, will ensure Western Africa remains at the forefront of energy innovation and sustainability.

In summary, Western Africa stands on the threshold of a profound energy transformation. The path ahead may be demanding, however, by addressing capacity building needs, overcoming challenges, and embracing opportunities, the region can achieve a future characterized by lasting energy security, economic prosperity, and environmental stewardship.





5.3.1 Primary Capacity Needs

The development of regional integrated energy markets, particularly for electricity, will improve the quality and security of supply across the region, allow private investments in the sector, and create trading opportunities for countries with overcapacity. Regional electricity market integration can only be realized through the development of regional markets and energy infrastructure. This calls for regional policies, legislations, regulatory and institutional frameworks, as well as sound planning processes for low-cost development of existing resources.

An enabling environment is the region's primary capacity need in four main areas:

1. **Regional Planning,** 2. **Policies, Laws and Regulations,** 3. **Regional Market Design,** and 4. **Regional Market Integration and Road-Mapping.**

These needs aim for straightforward harmonization to create a high-performing sector, taking into account the latest innovations implemented by a consortium in Year 1 and Year 2.

5.3.2 Secondary Capacity Needs

The development of a regional energy infrastructure is crucial to addressing capacity gaps in generation, transmission, and distribution that hinder effective regional electricity market integration. Sector-wide orchestration and road-mapping, programming, and project planning can bridge these gaps and build a robust regional power infrastructure.

1. Sector orchestration and road-mapping capacity involves strategic planning, management capacity, and multilevel governance.
2. Programme organisation capacity refers to the ability to organize and manage initiatives by programmes.
3. Project planning capacity refers to the ability to organize and manage initiatives by projects.

The secondary capacity needs focus on harmonizing energy infrastructure development governance and procedures. This should be done with reference to a high-performing sector, considering the latest innovations, and implemented by a consortium over Year 3 to 5.

5.3.3 Tertiary Capacity Needs

To address Central Africa's fragmented and inefficient power systems, adopting a supply chain perspective can contribute to bridging crucial operations capacity gaps.

1. Infrastructure Operations Planning Capacity
2. Infrastructure Operations and Continuous Improvement Capacity

The tertiary capacity needs are for the standardization of energy supply chain operations, planning and continuous improvement, as well as clean fuel and cooking technologies in reference to a performing sector, and implemented by a consortium (Year 3 to Year 5).

5.3.4 Challenges and Opportunities

Central Africa has several untapped energy resources, including hydropower, solar, wind, geothermal, and natural gas. In 2023, the region was considered a small energy desert as the Central African Power Pool (CAPP) had less than 5000km of high-voltage lines, fewer than three interconnections with neighbouring systems, and an installed electricity generation capacity of around 13000MW, which intermittently supplies only 30% to 50% of the population. Nearly 100 million inhabitants lack access to affordable, reliable, and sustainable electricity due to gaps in generation, transmission, distribution, and especially governance (policies, regulations, planning, legal, institutions). Institutional and individual capacities are interrelated concepts essential for the effective functioning and development of the sector.

around
13000
MW
of installed
Electricity
generation
capacity

Nevertheless, CAPP offers a prospect for promoting cooperation within the region to pool the vast energy resources. Several initiatives are underway at national, regional, and continental levels to improve energy access. Applying the Paris Agreement to reduce GHG emissions provides financing opportunities for sustainable energy projects. Through the Programme for Infrastructure in Africa (PIDA), the New Partnership for Africa's Development (NEPAD) focuses on developing the continent's energy resources, improving energy efficiency and expanding infrastructure. The African Single Energy Market (AfSEM) aims to establish an African energy market to attract the public and private investments necessary for system expansion. The energy programmes of the World Bank and the AfDB aim to increase electricity access in Central Africa. Additionally, such programmes as the Africa Energy Transition Programme (AETP) seek to promote renewable energy and capacity development. The list of ongoing energy projects in the region demonstrates a commitment to developing and improving CAPP.

Furthermore, these projects include a variety of energy sources and interconnections that aim to strengthen electricity supply, improve energy efficiency, and encourage economic development. One major project is the development of the Grand Inga hydroelectric site, which has a potential capacity of 40000MW. This site will have with lines connected to the Southern African Power Pool, the North African Power System, and the West African Power Pool, creating decisive electricity highways throughout the continent. These projects, announced with a high expectation, demonstrate Central Africa’s collaborative intention to meet the growing energy demand, improve access to electricity through physical integration, and promote sustainable economic development in the region.

Unfortunately, the conditions for implementing these projects have never been met. To unlock Central Africa’s energy potential, the region must have workable governance structures—laws, regulations, plans, and institutions—in place. However, the harmonization of the legal, regulatory, and institutional frameworks at the regional level remains unachieved. Therefore, a faster approach is necessary for the regional market to emerge as a prerequisite for massive public and private investment.

Despite the various initiatives undertaken, the energy desert in Central Africa will persist until 2030. Recurring delays and blockages have resulted in a lack of precise data on the distance of network, interconnections, power stations, installed megawatts, and the rate of access to electricity that will be achieved by 2030. This highlights the magnitude of the challenge to be address. It underscores the importance of linking continental, regional, and national efforts to coordinate all initiatives aimed at bridging the gaps in generation, transmission, interconnections, distribution, and creating an enabling environment for a multi-level sectoral governance. IRENA has identified a generation capacity gap of 25000MW to be covered by 2030.



5.4 Eastern Africa

5.4.1 Primary Capacity Needs

Energy Market and Economies

Framework	Target institution	Suggested Courses
Economic growth and energy demand • Content development for key power market principles and applications • Market Design • Market rules such as market enabling methodologies	Centers for Renewable Energy Continental Institutions Policymaking Institutions Regulatory Institutions Regional Economic Communities Energy Planning Institutions Regional Power Pools Other Energy Stakeholders	Energy Project Financing
Water-Food-Energy Nexus	Centers for Renewable Energy Policymaking Institutions Experts or Technical Institutions	Energy Economics LNG Business Fundamentals
Financial sources and instruments	Policymaking Institutions Continental Institutions	
Investment in energy	Regional Economic Communities Energy Planning Institutions Regional Power Pools	

Table 3: Primary capacity needs associated with the Energy Market and Economies area in Eastern Africa. Source: AFREC Regional Consulting Team

Energy Technology Implementation

Frameworks	Target institutions	Suggested Courses
Hydropower Development • Off-grid mini-hydropower development • Feasibility studies for hydropower energy infrastructure • Investment strategies in research, regional power share, and market co-ordination Solar Energy Development • Feasibility studies on solar site selection • Application for solar panel setup in large development plans • Solar energy development distribution strategies High Focus Countries: Somalia, Djibouti, South Sudan, Madagascar, Eritrea	Energy Planning Institutions Experts or Technical Institutions Centers for Renewable Energy Regional Power Pools	Oil and Gas Technology Hydrogen Economy (Beginner) Installation and Maintenance of PV systems Natural gas liquefaction Principles of PV systems Gas conditioning and processing Nuclear Power production
Nuclear, Grey Hydrogen, and Blue Hydrogen energy • Nuclear energy development plans • Nuclear energy finance and cost • Grey and Blue Hydrogen energy development High Focus Countries: Ethiopia, Kenya, Rwanda, Tanzania, Uganda	Continental Institutions Experts and Technical Institutions Centers for Renewable Energy Regulatory Institutions	
Wind and Geothermal • Feasibility studies on wind energy site selection • De-risking of geothermal projects • Policy and regulation regime development • Awareness on geothermal and wind potential High Focus Countries: Rwanda, Djibouti, Ethiopia, Uganda	Experts or Technical Institutions Centers for Renewable Energy Continental Institutions Regional Power Pools Policymaking Institutions	
Bioenergy • Biomass briquettes and pellet formation as alternative to wood and charcoal • Production of biogas from organic waste • Research development on biofuel from algae • Alternative energy saving jikos	Policymaking Institutions Energy Planning Institutions Experts or Technical Institutions Regional Economic Communities	
Oil and Gas • Marketing strategies • Regional oil and gas policy harmonization on inter-trade agreements High Focus Countries: Uganda, Kenya, South Sudan, Sudan	Continental Institutions Regulatory Institutions Regional Economic Communities	

Table 4: Primary capacity needs associated with the Energy Technology Implementation area in Eastern Africa. Source: AFREC Regional Consulting Team

Energy Policy and Regulations

Frameworks	Target institutions	Suggested Courses
Government policy, strategy, and approach • Non-renewable energy regulations • Energy regulation development	Policymaking Institutions Centers for Renewable Energy and Energy Efficiency Regulatory Institutions Continental Institutions	Energy Policy and Regulations (all levels) Policy development, communication, and enforcement
Changes in laws or regulation • Conflict resolution strategies and policies	Regulatory Institutions Policymaking Institutions Regional Economic Communities	Regulatory mechanisms Fight against corruption
Sustainable Energy Policy Development	Policymaking Institutions Energy Planning Institutions Centers for Renewable Energy	

Table 5: Primary capacity needs associated with the Energy Policy and Regulations area in Eastern Africa. Source: AFREC Regional Consulting Team

Continental Energy Frameworks

Frameworks	Target institutions
Africa Energy Transition Program Africa Single Electricity Market Africa Energy Information Systems African Development Bank: Energy Program Southern African Development Community (SADC) program	Energy Planning Institutions Centers for Renewable Energy Regional Economic Communities Regional Power Pools Continental Institutions

Table 6: Primary capacity needs associated with the Continental Energy Frameworks area in Eastern Africa. Source: AFREC Regional Consulting Team

Institutional Capacity

Energy institutions within the region require high levels of capacity in defining of human resource needs and hiring qualified personnel in energy departments. This would enhance the proficiency in energy development and operations.

Frameworks	Target institutions	Suggested Courses
Major areas for capacity building: • Mobilizing and Structuring Investment • Energy Project Management • Commissioning of Energy Infrastructure • Public Consultation	Continental Institutions Regional Power Pools Policymaking Institutions Experts or Technical Institutions	Power Infrastructure Planning Project Management Energy Infrastructure Development

Table 7: Primary capacity needs associated with the Energy Project and Infrastructure Development area in Eastern Africa. Source: AFREC Regional Consulting Team

Energy Infrastructure and Operations

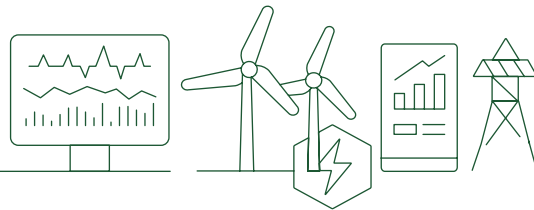
Frameworks	Target institutions	Suggested Courses
Main areas for capacity building: • Operation and Maintenance of Energy Facilities • Community Relations • Energy Response and Contingency Plans	Regional Power Pools Experts or Technical Institutions Energy Planning Institutions Regional Economic Communities	Infrastructure Development and Maintenance (Advance)

Table 8: Primary capacity needs associated with the Energy Infrastructure and Operations area in Eastern Africa. Source: AFREC Regional Consulting Team

Electricity Transmission and Industrial Technology Applications

Frameworks	Target institutions	Suggested Courses
Capacity building focus area: Mini-grid Transmission Off-grid Transmission Networks	Regional Power Pools Experts or Technical Institutions Energy Planning Institutions	Power System Flexibility
Electro-Mobility • Awareness of Electro-mobility as Alternative Transport Energy Needs • Charging Station Development and Operations	Energy Planning Institutions Experts and Technical Institutions	

Table 9: Primary capacity needs associated with the Electricity Transmission and Industrial Technology Applications area in Eastern Africa. Source: AFREC Regional Consulting Team



5.4.2 Secondary Capacity Needs

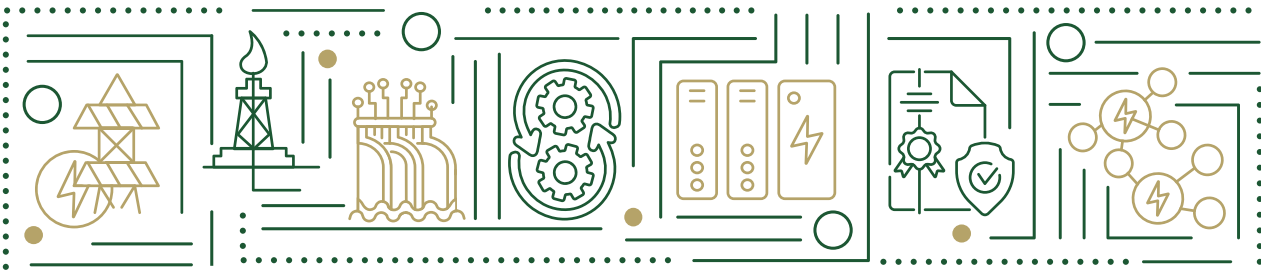
Frameworks	Target institutions	Suggested Courses
Energy Markets and Economies • Energy Pricing and Cost • Drivers of Energy Demand • Energy Economic Development High Focus Countries: Kenya, Comoros, Madagascar Tanzania	Centers for Renewable Energy Policy Making Institutions Regulatory Institutions	
Energy Technology Implementation • Green Hydrogen • Brown Hydrogen • Coal	Experts or Technical Institutions Centers for Renewable Energy	
Energy Policies and Regulations • Energy Planning • Energy and Environmental Policy	Centers for Renewable Energy Policy Making Institutions Regulatory Institutions	Climate Change and Energy Nexus
Energy Projects and Infrastructure Development • Climate Finance for Energy Sector Projects • Energy Project Structuring • Business Analysis: Plan Development	Experts or Technical Institutions Energy Planning Institutions Policy Making Institutions	
Electricity Transmission & Industrial Technology Applications • Smart Grid • Grid Flexibility • Power-to-X	Policymaking Institutions Experts or Technical Institutions	Power System Flexibility
Energy Infrastructure Operations • Health and Safety Standards • Environmental Management	Energy Planning Institutions Policymaking Institutions	
Continental Energy Frameworks • Paris Agreement for Net Zero • Agenda 2063 • AUDA-NEPAD	Policymaking Institutions Center for Renewable Energy Regulatory Institutions	

Table 10: Secondary capacity needs in the energy sector in Eastern Africa. Source: AFREC Regional Consulting Team

5.4.3 Tertiary Capacity Needs

Frameworks	Target institutions	Suggested Courses
Energy Project Evaluation Strategies	Polymaking Institutions Regulatory Institutions Energy Planning Institutions	Project Monitoring and Evaluation
Energy Audits and Accountability Measures	Continental Institutions Regulatory Institutions Experts or Technical Institutions Regional Power Pools Regional Economic Communities	
International Energy Investment Collaboration Policy Development	Polymaking Institutions Continental Institutions Regional Power Pools Regional Economic Communities	
Future Continental, Regional, and National Political Interests	Continental Institutions Regional Power Pools Polymaking Institutions	

Table 11: Tertiary capacity needs in the energy sector in Eastern Africa. Source: AFREC Regional Consulting Team



5.4.4 Challenges and Opportunities

Challenges

Lack of political will: Despite the formulation of regional energy programmes, implementation depends heavily on the leadership and political will of member states, influenced by their political affiliations and economic status. Policy harmonization requires national agreements, which are often challenging to secure.

Lack of finance: Certain energy infrastructure projects, such as geothermal energy, are capital-intensive and require substantial financing for exploration and set-up. This financial burden discourages source countries from developing such projects.

Lack of skilled staff: There is a shortage of professional staff in critical areas of energy, including budgeting, planning, management, and operations. This deficiency hinders progress and increases operational cost when external staff must be outsourced.

High debt rate: Some countries have high debt rates relative to their GDP, making it difficult for them to secure loans for energy development. This financial constraint impedes progress on regional projects.

Opportunities for Capacity Building

Renewable Energy Development: East Africa’s potential in renewable resources presents a significant opportunity to achieve sustainable clean energy for all, in line with the UN Agenda 2030.

Available Training Institutions: Several institutions, such as the Energy Regulation Center for Excellence (ERCE), offer specialised energy training courses. These institutions can play a crucial role in training key regional energy stakeholders.

Policy harmonization: There are opportunities to harmonize policies to align with continental and regional power programmes. This alignment can promote energy trade and facilitate joint regional power projects, such as grid interconnections.



5.5.1 Primary Capacity Needs

1. Capacity to Supply Energy to Rural Areas
2. Capacity to Provide Appropriate Training
3. Capacity to Support a Just Energy Transition

5.5.2 Secondary Capacity Needs

1. Capacity to Support a Green Hydrogen Sector
2. Capacity to Support the Operation and Expansion of National and Regional Energy Grids

Strengthening the Southern African regional institutions, specifically the Southern African Power Pool (SAPP) and the Regional Energy Regulators Association (RERA), is crucial for the integration of electricity transmission and distribution networks as well as the creation of an appropriate regulatory environment. The following are SAPP's major goals to develop a competitive regional electricity market and to supply each SAPP member with consistent and reasonably-priced electricity supply:

- Provide a forum for the development of a world-class, robust, efficient, reliable, and stable interconnected electrical system;
- Coordinate and enforce common regional standards of quality of supply, measurement, and monitoring of system performance;
- Facilitate the development of regional expertise;
- Increase power accessibility in rural communities.

In accordance with its statutory documents, the SADC founded RERA to harmonize the region's regulatory policies, laws, standards, and practices. The Association's main goals encompass the following domains:

- Capacity building and information sharing
- Facilitation of policy, legislation, and regulation
- Regulatory cooperation

In line with its goals, RERA has actively engaged in crucial technical studies that have shaped the regulatory landscape and improved regional regulatory decision-making. To improve the overall capacity of members, RERA arranges training courses in such fields as energy efficiency, renewable energy, regulatory economics, and economic regulation.

The main findings of this report indicate that the efforts of the SAPP and RERA to integrate and create an effective power pool in the region have been hindered by a lack of capacity for the development of high-level skills in strategy, governance, and finance; expert-level skills in engineering design and project management; and intermediate-level skills in construction and operations. Inadequate investment and insufficient executive power have also prevented the organizations from creating policy and regulatory frameworks.

5.5.3 Tertiary Capacity Needs

As gas produces less GHG per unit of energy than coal, it is often regarded as a transition fuel, ideal for providing power during peaks in demand or troughs in the supply of solar or wind energy. Recently, Mozambique began exporting gas from its Rovuma Basin. Additionally, while South Africa and Namibia have made several discoveries, exploration is ongoing in Botswana and Zimbabwe.

To maximise local benefit from these fortunes, capacity development is required across the entire core value chain: from upstream (petroleum geology, geophysics, and reservoir engineering), midstream (refining and petrochemicals) to downstream (marketing, distribution, retail). Skills are also needed in fields such as environmental impact assessment and monitoring, and engagement with local communities. However, the supply of skills should match demand. This should be assessed on a country-by-country basis in consultation with the statutory and license-issuing agency, the national oil company, and licensees. This necessitates training in strategy, planning, finance, and regulation.

5.5.4 Challenges and Opportunities

Southern Africa has uneven levels of development, both among countries and within countries. For example, South Africa has one of the highest Gini coefficients in the world. Consequently, the proportion of citizens pursuing STEM education (Science, Technology, Engineering, Mathematics) at the tertiary level, which is crucial for the energy sector, is low. Many energy sector practitioners have lower levels of training and experience compared to their counterparts in the developed world. Addressing these challenges will take decades, making it imperative to initiate significant changes now.



The region has several opportunities to improve the capacity of its current and future workforce through targeted interventions. For example, South Africa has implemented a payroll tax and uses the proceeds to fund Sectoral Education and Training Authorities (SETAs) that survey industry trends, assess skill gaps, and initiate and support training programmes. Training levels include artisan, technician, practitioner, and expert. Short courses, considered an essential component, are included. Similarly, other countries have established training centers or courses that focus on their specific needs. For example, the Namibian Uranium Institute deals with radioactive substances, the Kafue Gorge Regional Training Center in Zambia deals with hydropower and electricity grids, and institutions in Angola and Mozambique handle oil and gas.

Southern Africa is endowed with sunlight, wind, biomass, metals, and minerals, forming the basis of the renewable energy sector. The region’s energy transition provides an opportunity to establish a local renewable energy sector to create jobs and wealth, while reducing GHG. For example, a 2019 COBENEFITS study by the Council for Scientific and Industrial Research (CSIR) and the German-based Institute for Advanced Sustainability Studies (IASS) estimates that up to 1.6 million jobs can be created in South Africa through energy-sector transformative capacity building by 2050.

Regarding climate change, there are opportunities to tap into global sources of funding to ameliorate GHG emissions. For example, Namibia is accessing European funding to support the development of a green hydrogen sector, and South Africa has secured support for the Just Energy Transition Investment Plan (JET-IP) to transition from coal to renewables. Drawing inspiration from these two countries, others could seek similar opportunities.



6 Proposed Capacity Building Programme

The proposed capacity building programme is presented in Table 12.

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Regional Energy Sector Planning (NOR_01)	Energy Regulation	Year 3	Northern Africa	Medium	Policymaking	36 Hours	1. International energy Agency (IEA) 2. International Renewable Energy Agency (IRENA) 3. National Renewable Energy Laboratory (NREL) 4. Extractive Resource Governance Program (ERGP)-UCalgary (www.ergp.ca)	*New*
Energy Markets Design (NOR_02)	Energy Market & Economics	Year 3	Northern Africa	High	Regional Power Pools	36 Hours	Florence School of Regulation, National Economic Research Association (NERA) Economic Consulting, or well-established energy regulatory institutions and Energy Markets Operators (https://fsr.eui.eu/) ERGP-UCalgary (www.ergp.ca)	*New*
Energy Technologies Implementation for Planners (NOR_03)	Energy Technology Implementation	Year 1	Northern Africa	Medium	Energy Planning	30 Hours	1. Mohammed VI Polytechnic University (Executive programs), Morocco (www.um6p.ma); 2. Regional Center for Renewable Energy and Energy Efficiency (RCREEE) (https://rcreee.org)	Existing
Energy Technologies Implementation for Technical Staff (NOR_04)	Energy Technology Implementation	Year 3	Northern Africa	Medium	Expert/Technical Institutions	30 Hours	1. RCREEE (https://rcreee.org); 2. Green Energy Park (https://www.greenenergypark.ma)	*New*
Energy Infrastructure Operations (NOR_05)	Energy Technology Operations	Year 1	Northern Africa	High	Expert/Technical Institutions	60 Hours	1. GIZ, Germany (https://www.giz.de) 2. IRENA (https://www.irena.org) 3. Green Climate Funds (https://www.greenclimate.fund)	Existing
Industrial Technologies: Electromobility (NOR_06)	Electromobility	Year 3	Northern Africa	Low	Energy Planning	30 Hours	1. DNV (https://www.dnv.com); 2. Paris Tech, France (https://paristech.fr/en/institute-sustainable-mobility-imd), 3. Regional Center for Renewable Energy and Energy Efficiency (RCREEE), Egypt	Existing
Green Buildings Engineering and Energy Efficiency (Green BEEE) (NOR_07)	Energy Efficiency	Year 4	Northern Africa	Low	Expert/Technical Institutions	70 Hours	1. Renewable Energy Institute (Email: training@renewableinstitute.org); 2. Mohammed VI Polytechnic University (Executive programs), Morocco (www.um6p.ma); 3. RCREEE (https://rcreee.org)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Electrical Engineering for Renewable Energies (NOR_08)	Electricity Transmission & Distribution	Year 2	Northern Africa	Medium	Expert/Technical Institutions	30 Hours	1. Renewable Energy Institute (Email: training@renewableinstitute.org); 2. Mohammed VI Polytechnic University (Executive programs), Morocco (www.um6p.ma); 3. RCREEE (https://rcreee.org); 4. Centre de Développement des Energies Renouvelables, Algeria (www.cder.dz); 5. Mediterranean Institute of Technology, Tunisia (https://www.smu.tn/)	Existing
CS/SCADA Cybersecurity for Energy Systems (NOR_09)	Cybersecurity	Year 3	Northern Africa	Low	Expert/Technical Institutions	30 Hours	1. Mohammed VI Polytechnic University (Executive programs), Morocco (www.um6p.ma); 2. EC Council (https://www.eccouncil.org);	Existing
Green Hydrogen and Renewable Power-To-X (NOR_10)	New Technologies	Year 4	Northern Africa	Low	Expert/Technical Institutions	60 Hours	The Renewables Academy (RENAC) (https://www.renac.de); Morocco-Germany	Existing
Nuclear Energy (NOR_11)	New Technologies	Year 5	Northern Africa	Low	Expert/Technical Institutions	40 Hours	1. Mohammed VI Polytechnic University (Executive programs), Morocco (www.um6p.ma); 2. RCREEE (https://rcreee.org); 3. Centre National de l'Energie, des Sciences et des Techniques Nucléaires (https://www.linkedin.com/company/cnesten/?originalSubdomain=ma)	*New*
Energy Governance and Public Administration (NOR_12)	Governance and Public Administration	Year 3	Northern Africa	High	Multiple	30 Hours	ERGP (ergp.ca)	*New*
HR Development for the Energy Sector (NOR_13)	HR Development	Year 4	Northern Africa	High	Multiple	20 Hours	ERGP (ergp.ca)	*New*
Education and Research and Innovations for Energy Development (NOR_14)	Education and Research and Innovations	Year 4	Northern Africa	High	Multiple	20 Hours	Strategy and Innovation Management Specialists and Consultancy firms (e.g. https://www.sis.ma/secteurs/education/) ERGP-UCalgary (www.ergp.ca)	*New*

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Regional Collaboration for Energy Development (NOR_15)	Regional Collaboration	Year 4	Northern Africa	High	Multiple	10 Hours	1. IEA 2. IRENA 3. EU Energy Institutions 4. ERGP (www.ergp.ca)	*New*
Certified Energy Manager (WES_01)	Energy Management and Sustainability. Efficient and Responsible use of Energy Resources	Year 1	Western Africa	Medium	Polycymaking	40 Hours Class 15 Days E-learning	1. Association of Energy Engineers- Nigerian Chapter (Stratagem EMC), Nigeria 2. Institute of Energy Professionals Africa, South Africa 3. National Centre for Energy Efficiency and Conservation, Nigeria	Existing
Certified Energy Auditor (WES_02)	Energy Efficiency and Sustainability. Energy Audits, Identification of Energy-saving Opportunities. Strategic and Efficient use of Energy Resources	Year 1	Western Africa	Medium	Polycymaking	40 Hours Class 15 Days E-learning	1. Association of Energy Engineers Nigerian Chapter (Stratagem EMC), Nigeria 2. Institute of Energy Professionals Africa, South Africa 3. National Centre for Energy Efficiency and Conservation, Nigeria	Existing
Certified Renewable Energy Professional (WES_03)	Integration and Sustainable Development of Renewable Energy. Complexities of Renewable Energy Projects. Policy Development. Clean Energy Solutions	Year 1	Western Africa	Low	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. Association of Energy Engineers, Nigeria 2. Institute of Energy Professionals Africa, South Africa	Existing
Energy Policy and Regulation (WES_04)	Shaping, Implementing, and Adhering to Energy Policies and Regulations. Complex Energy Landscape. Regulatory Compliance. Sustainable and Efficient Energy Systems	Year 4	Western Africa	Medium	Regulatory	40 Hours Class 15 Days E-learning	1. Centre for Petroleum, Energy, Economics and Law, Nigeria 2. ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) 3. University of Energy and Natural Resources, Ghana 4. IRENA 5. ERGP (www.ergp.ca)	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Renewable Energy Installation and Maintenance (WES_05)	Deployment, Operation, and Maintenance of Renewable Energy Systems. Efficient and Sustainable Performance of Renewable Energy Installations	Year 3	Western Africa	Medium	Expert/Technical Institutions	80 Hours Class 25 Days E-learning	1. National Power Training Institution of Nigeria 2. National Centre for Energy Efficiency and Conservation	*New*
Grid Integration and Management (WES_06)	Planning, Operation, and Management of Integrated Energy Grids. Complexities of Modern Energy Systems, Ensuring Stability, Reliability, and Sustainability	Year 3	Western Africa	High	Regional Power Pools	80 Hours Class 15 Days E-learning	1. National Power Training Institution of Nigeria 2. National Centre for Energy Efficiency and Conservation, Nigeria 3. GIZ Nigerian Energy Support Programme, Nigeria 4. Canadian Institute for Energy Training	*New*
Electromobility (WES_07)	Electric Vehicles (EVs) and Related Infrastructure. Complexities of Integrating Electromobility into the Energy Sector	Year 5	Western Africa	Medium	Policymaking	80 Hours Class 25 Days E-learning	1. National Automotive Design and Development Council 2. National Centre for Energy Efficiency and Conservation 3. ECREEE 4. IRENA	*New*
Energy Finance and Investment (WES_08)	Financing and Investment Aspects of Energy Projects. Complex Landscape of Securing Funding, Managing Financial Aspects, and Ensuring the Economic Viability of Energy Initiatives	Year 5	Western Africa	High	Energy Planning	40 Hours Class 15 Days E-learning	1. ECREEE 2. University of Energy and Natural Resources (UENR), Ghana 3. IRENA 4. African Development Bank (AfDB) 5. ERGP (www.ergp.ca)	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Energy Efficiency and Management (WES_09)	Optimizing Energy Use, Reducing Waste, and Promoting Sustainable Practices. Energy Efficiency	Year 5	Western Africa	High	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. National Centre for Energy Efficiency and Conservation, Nigeria 2. GIZ Nigerian Energy Support Programme, Nigeria 3. Canadian Institute for Energy Training	*New*
Off-Grid Electrification Solutions (WES_10)	Bringing Sustainable and Reliable Electricity to Remote and Underserved Communities. Planning, Implementing, and Managing Off-grid Electrification Projects	Year 3	Western Africa	Low	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. National Power Training Institution of Nigeria 2. National Centre for Energy Efficiency and Conservation	*New*
Oil Wells Drilling and Operation Control (WES_11)	Exploration, Drilling, and Operational Management of Oil Wells. Ensure the Safe, Efficient, and Environmentally-responsible Extraction of Oil Resources	Year 5	Western Africa	Low	Expert/Technical Institutions	80 Hours	1. Regional Maritime University (RMU) – Ghana (Seaweld Oil and Gas Industry Capacity Training) 2. ECREEE 3. UENR	*New*
Energy and Environmental Sustainability (WES_12)	Convergence of Energy Development and Environmental Responsibility. Balance Energy Generation with Environmental Conservation, Fostering Sustainability	Year 1	Western Africa	Low	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. ECREEE 2. UENR 3. IRENA 4. AfDB	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Ethics and Corporate Governance in Energy Sector (WES_13)	Ethical Considerations, Transparency, and Responsible Governance within the Energy Industry.	Year 5	Western Africa	High	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. Institute of Energy Security (IES)- Ghana 2. Energy Commission of Nigeria (ECN) 3. Centre for Energy, Petroleum, and Mineral Law and Policy (CEPMLP) - University of Dundee, Ghana Campus 4. Lagos Business School (LBS)- Nigeria 5. ERGP (www.ergp.ca)	*New*
Energy Policy and Regulatory Dispensations (WES_14)	Development, Implementation, and Compliance with Energy Policies and Regulatory Frameworks. Complex Landscape of Energy Policy, Contribute to Regulatory Frameworks, and ensure the Alignment of Energy Projects with National and Regional Goals	Year 1	Western Africa	High	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. Centre for Energy, Environment, and Sustainable Development (CEESD)- University of Energy and Natural Resources, Ghana 2. ECREEE 3. UENR 4. Nigerian Energy Studies and Research Group (NESRG)- University of Ibadan, Nigeria 5. ERGP (www.ergp.ca)	Existing
Construction Contracts and Power Purchase Agreements (WES_15)	Legal, Contractual, and Financial Aspects of Energy Projects. Complexities of Construction Contracts, Negotiate Robust PPAs, and ensure the Successful Implementation of Energy Projects	Year 1	Western Africa	High	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. African Centre of Excellence in Energy for Sustainable Development (ACEESD) - University of Cape Coast, Ghana 2. Nigerian Institute of Advanced Legal Studies (NIALS)- Nigeria 3. CEESD 4. CEPMLP	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Data Management and Analytical Skills (WES_16)	Collection, Analysis, and Utilization of Data within the Energy Industry. Leverage Data for Strategic Decision-making, Operational Efficiency, and Innovation	Year 4	Western Africa	Low	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. IRENA 2. West African Institute for Financial and Economic Management (WAIFEM) 3. African Institute for Mathematical Sciences (AIMS) 4. Energy Commission of Nigeria	Existing
Energy Sector Tariff Setting and Cost Recovery, Environmental and Social, Stakeholder Engagement (WES_17)	Economic, Environmental, and Social Dimensions of Energy Projects. Tariff Setting, ensure Cost Recovery, and engage Stakeholders Responsibly	Year 5	Western Africa	Low	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. International Finance Corporation (IFC), a member of the World Bank Group 2. WAIFEM 3. AIMS 4. Energy Commission of Nigeria 5. ERGP (www.ergp.ca)	*New*
Local Manufacturing Development for Energy Sector (WES_18)	Establishment and Growth of Local Manufacturing Capabilities to Support the Energy Industry. Supply Chain Resilience, and Economic Development	Year 5	Western Africa	Low	Regional Economic Communities	80 Hours Class 15 Days E-learning	1. Université Félix Houphouët-Boigny (UFHB)- Côte d'Ivoire 2. Universidade de Cabo Verde- Cape Verde 3. Kwame Nkrumah University of Science and Technology (KNUST) - Ghana 4. Federal University of Petroleum Resources (FUPRE)- Nigeria	*New*
Planning Renewable Energy Projects (WES_19)	Strategic Planning, Development, and Implementation of Renewable Energy Initiatives; Fostering Sustainability and Resilience	Year 2	Western Africa	Medium	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. ECREEE 2. UENR 3. IRENA 4. AfDB	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Smart Grid Technology Overview (WES_20)	Integration of Smart Grid Technologies into the Energy Infrastructure; Fostering a more Efficient, Resilient, and Sustainable Energy Grid	Year 1	Western Africa	Medium	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. ECREEE 2. UENR 3. IRENA 4. AfDB	Existing
Hydrogen in the Energy System (WES_21)	Understanding, Integration, and Utilization of Hydrogen as a Clean and Versatile Energy Carrier; Fostering Sustainable and Innovative Energy Solutions	Year 1	Western Africa	Low	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) 2. ECREEE 3. African Center for Renewable Energy and Sustainable Technologies (ACREST)- Burkina Faso 4. IRENA- Regional Office for Africa	Existing
Local Manufacturing Development for Energy Sector (WES_18)	Establishment and Growth of Local Manufacturing Capabilities to Support the Energy Industry. Supply Chain Resilience, and Economic Development	Year 5	Western Africa	Low	Regional Economic Communities	80 Hours Class 15 Days E-learning	1. Université Félix Houphouët-Boigny (UFHB)- Côte d'Ivoire 2. Universidade de Cabo Verde- Cape Verde 3. Kwame Nkrumah University of Science and Technology (KNUST) - Ghana 4. Federal University of Petroleum Resources (FUPRE)- Nigeria	*New*
Hydro & Ocean Energy (WES_22)	Harnessing of Energy from Hydro-power and Ocean Sources; Fostering Renewable Energy Diversification	Year 5	Western Africa	Medium	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. WASCAL 2. ECREEE 3. ACREST 4. IRENA- Regional Office for Africa	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Introduction to Biogas Technology (WES_23)	Understanding and Application of Biogas as a Renewable and Sustainable Source for Energy Production, Waste Management, and Environmental Sustainability	Year 1	Western Africa	Medium	Expert/Technical Institutions	80 Hours Class 15 Days E-learning	1. WASCAL 2. ECREEE 3. ACREST 4. Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)	Existing
Renewable Energy Distributed Generation (WES_24)	Planning, Implementation, and Management of Distributed Generation Systems Powered by Renewable Energy Sources Foster Decentralized and Sustainable Energy Solutions	Year 1	Western Africa	Medium	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. WASCAL 2. ECREEE 3. ACREST 4. IRENA- Regional Office for Africa	Existing
Green Hydrogen Project Engineering (WES_25)	Planning, Design, and Implementation of Green Hydrogen Projects, ensuring Environmental Sustainability and Energy Transition	Year 3	Western Africa	Low	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. WASCAL 2. ECREEE 3. ACREST 4. IRENA- Regional Office for Africa	*New*
Solar Thermal Energy Systems (WES_26)	Planning, Design, and Implementation of Solar Thermal Systems to harness Solar Thermal Energy for Electricity Generation and Industrial Processes	Year 1	Western Africa	Medium	Expert/Technical Institutions	40 Hours Class 15 Days E-learning	1. WASCAL 2. ECREEE 3. ACREST 4. IRENA- Regional Office for Africa	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implemen- tation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Exist- ing Course
Regional Energy Planning Framework (CEN_01)	Enabling Environ- mental Gap	Year 3	Central Africa	Medium	Energy Planning	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + An international regional institu- tion serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Policy Frame- work (CEN_02)	Enabling Environ- mental Gap	Year 3	Central Africa	Medium	Energy Policy	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + An international regional insti- tution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Regulatory Framework (CEN_03)	Enabling Environ- mental Gap	Year 4	Central Africa	Medium	Energy Policy	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + An international regional insti- tution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Regulatory Framework (CEN_03)	Enabling Environ- mental Gap	Year 4	Central Africa	Medium	Regulatory	80 hours	UCalgary + National universities covering the 4 regional official languages active in the domain + USAID + A major consulting firm	*New*
Energy Regulations' Harmo- nization across Central Africa (CEN_04)	Enabling Environ- mental Gap	Year 2	Central Africa	Low	Regulatory/Policy	80 hours	European Union Technical Assistance Facility/Economic Com- mission for Central African States (ECCAS)	Existing
Energy Planning Harmonization across Central Africa (CEN_05)	Enabling Environ- ment Gap	Year 1	Central Africa		Planning/ CAPP/ Countries	80 hours	IRENA/Central African Power Pool (CAPP)	Existing
Regional Energy Projects Design (CEN_06)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 3	Central Africa	Medium	Regional Power Pools	80 hours	UCalgary + National universities covering the 4 regional official languages active in the domain + USAID + A major consulting firm	*New*
Regional Energy Projects Plan- ning (CEN_07)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 3	Central Africa	Low	Regional Power Pools	80 hours	UCalgary + National universities covering the 4 regional official languages active in the domain + AfDB + International institu- tions active in the domain + A major consulting firm	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implemen- tation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Exist- ing Course
Regional Energy Projects Pro- curement (CEN_08)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 4	Central Africa	Low	Regional Power Pools	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + USAID + A major consulting firm	*New*
Regional Energy Projects Fi- nancing (CEN_09)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 4	Central Africa	Low	Regional Power Pools	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + An international regional insti- tution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Projects Agree- ments (CEN_10)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 5	Central Africa	Low	Regional Power Pools	80 Hours	UCalgary + National universities covering the 4 regional official languages active in the domain + An international regional insti- tution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy System Digital Twin (CEN_11)	Energy Infrastruc- ture Operations	Year 5	Central Africa	Low	Regional Power Pools/Countries	80 hours	IDEP + National universities covering the 4 regional official lan- guages active in the domain + An international regional institu- tion serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Sector Projecti- zation (CEN_12)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 3	Central Africa	Medium	Regional Econom- ic Communities/ Policy/Planning	80 hours	UCAC + National universities covering the 4 regional official languages active in the domain + An international regional insti- tution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Supply Chain Enabling Environment (CEN_13)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 3	Central Africa	Low	Regional Power Pools	80 hours	UCalgary + National universities covering the 4 regional official languages active in the domain + USAID + A major consulting firm	*New*
Regional Energy Supply Chain Operations Planning (CEN_14)	Infrastructure Operations Gap	Year 4	Central Africa	Low	Planning/Expert/ Technical Institu- tions	80 hours	CAPP + National universities covering the 4 regional official lan- guages active in the domain + AfDB + International institutions active in the domain + A major consulting firm	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implemen- tation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Exist- ing Course
Energy Supply Chain Operations (CEN_15)	Infrastructure Op- erations Gap	Year 3	Central Africa	High	Expert/Technical Institutions	80 Hours	CAPP + National universities covering the 4 regional official lan- guages active in the domain + AfDB + International institutions ac- tive in the domain + A major consulting firm	*New*
Energy Supply Chain Continu- ous Improvement (CEN_16)	Infrastructure Operations Gap	Year 5	Central Africa	Medium	Expert/Technical Institutions	80 Hours	University of Yaoundé I + National universities covering the 4 re- gional official languages active in the domain + An international regional institution serving as benchmark + International institu- tions active in the domain + A major consulting firm	*New*
Regional Energy Market Design (CEN_17)	Enabling Environ- ment Gap	Year 4	Central Africa	Medium	Power Pools/Regu- latory/Expert/Tech- nical Institutions	80 Hours	CAPP + National universities covering the 4 regional official lan- guages active in the domain + An international regional institu- tion serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Market Integra- tion and Roadmapping (CEN_18)	Enabling Environ- mental Gap	Year 5	Central Africa		Power Pools/Regu- latory/Expert/Tech- nical Institutions	80 hours	Institute for Economic Development and Planning (IDEP) + Na- tional universities covering the 4 regional official languages ac- tive in the domain + An international regional institution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Multi-level Governance in the Energy Sector (CEN_19)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 4	Central Africa		Regional Econom- ic Communities/ Policy/Planning	80 hours	UCalgary + National universities covering the 4 regional official languages active in the domain + CAPP + International institu- tions active in the domain + A major consulting firm	*New*
Regional Energy Sector Or- chestration & Roadmapping (CEN_20)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 3	Central Africa	Low	Regional Economic Communities/Plan- ning/Policy	80 hours	IDEP + National universities covering the 4 regional official lan- guages active in the domain + An international regional institu- tion serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Regional Energy Sector Pro- grammification (CEN_21)	Energy Infrastruc- ture Development (Generation Gap, Transmission Gap, Distribution Gap)	Year 5	Central Africa	Medium	Regulatory/Power Pools/Countries	80 hours	African Virtual University (AVU) + National universities covering the 4 regional official languages active in the domain + An inter- national regional institution serving as benchmark + Internation- al institutions active in the domain + A major consulting firm	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Regional Energy Sector Portfolio-ization (CEN_22)	Energy Infrastructure Development (generation gap, transmission gap, distribution gap)	Year 5	Central Africa	Medium	Regional Economic Communities/Planning/Power Pools/Regulatory	80 Hours	IDEP + National universities covering the 4 regional official languages active in the domain + An international regional institution serving as benchmark + International institutions active in the domain + A major consulting firm	*New*
Cooking Energy Technologies Supply Chain Operations (CEN_23)	Infrastructure Operations Gap	Year 3	Central Africa	Low	Expert/Technical Institutions	80 Hours	University of Yaoundé I + National universities covering the 4 regional official languages active in the domain + An international regional institution serving as benchmark + International institutions Active in the domain + A major consulting firm	*New*
Introduction to Regional Wholesale Electricity Markets (EAS_01)	Economic growth and Energy demand: Market rules such as Market enabling methodologies, Market design	Year 1	Eastern Africa	Low	Centers for Renewable Energy Continental Institutions Policymaking Institutions Regulatory Institutions Regional Economic Communities Energy Planning Institutions Regional Power Pools Other Energy Stakeholders	50 hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org) Kipya Africa Limited, Kenya (https://kipya-africa.com) UCalgary-ERGP (https://ergp.ca/lines-of-work/training-and-education/) ergp@ucalgary.ca (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=70053725)	Existing
Energy Management (EAS_02)	Energy Projects and Infrastructure Development: Energy Project Management	Year 1	Eastern Africa	Medium	Continental Institutions Regional Power Pools Policymaking Institutions Expert/Technical Institutions	30 hours	Strathmore University: Energy Research Centre, Kenya (https://serc.strathmore.edu/programmes) Renewable Energy Technology Centre, Tanzania (https://www.retc.co.tz) Kipya Africa Limited, Kenya (https://kipya-africa.com)	Existing
Optimized Solar PV Stand Alone System (EAS_03)	Energy Technology Implementation: Solar Energy Development	Year 1	Eastern Africa	Low	Expert/Technical Institutions Centers for Renewable Energy Regulatory Institutions	40 Hours Class 120 hrs E-learning	Strathmore University: Energy Research Centre, Kenya (https://serc.strathmore.edu/programmes) Makerere University, Centre for Research in Energy & Energy Conservation (CREEC), Uganda (www.creec.or.ug) UCalgary (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=67142)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Fundamentals of Geothermal Projects Development (EAS_04)	Energy Technology Implementation: Geothermal	Year 1	Eastern Africa	Low	Expert/Technical Institutions Centers for Renewable Energy Continental Institutions Regional Power Pools Policymaking Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Geothermal Center of Excellence, Kenya (www.gdc.co.ke/gce)	Existing
Fundamentals of Hydrogen Energy Projects (EAS_05)	Energy Technology Implementation: Green hydrogen energy	Year 3	Eastern Africa	Low	Continental Institutions Expert/Technical Institutions Centers for Renewable Energy Regulatory Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org) Kipya Africa Limited, Kenya (https://kipya-africa.com) The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers)	Existing
Electrical Distribution Equipment Operation & Maintenance (EAS_06)	Energy Infrastructure and Operations: Operation and Maintenance of Energy Facilities	Year 1	Eastern Africa	Low	Regional Power Pools Expert/Technical Institutions Energy Planning Institutions Regional Economic Communities	40 Hours	GLOMACS Training and Consultancy, United Arab Emirates (https://glomacs.com/about-us) The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org) Kipya Africa Limited, Kenya (https://kipya-africa.com)	Existing
Renewable Energy Technologies (EAS_07)	Energy Technology Implementation: Renewable Energy Technologies	Year 1	Eastern Africa	High	Energy Planning Institutions Expert/Technical Institutions Centers for Renewable Energy Regional Power Pools	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org) Kipya Africa Limited, Kenya (https://kipya-africa.com) UCalgary, Canada (https://conted.ualgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=67142) RES4Africa Foundation (https://res4africa.org/)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Energy Project Financial Modelling (EAS_08)	Energy Market and Economies: Financial Sources and Instruments, Investment in Energy	Year 1	Eastern Africa	Medium	Polycymaking Institutions Continental Institutions Regional Economic Communities Energy Planning Institutions Regional Power Pool	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) UCalgary-ERGP (https://ergp.ca/lines-of-work/training-and-education) East Africa Centre of Execellence for Renewable Energy & Efficiency (https://www.eacreee.org)	Existing
Smart Grid for Non-Engineers Concepts and Components of a Smart Grid and its Relevance with Renewable Energy (EAS_09)	Electricity Transmission & Industrial Technology Applications: Smart-grid, Grid-flexibility	Year 3	Eastern Africa		Expert/Technical Institutions	40 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Nakawa Vocational Training College, Uganda (www.nakawavtc.ac.ug) Renewable Energy Technology Centre, Tanzania (www.retc.co.tz) Technical University of Seychelles (www.sit.sc) Mauritius Institute of Training and Development, Mauritius (www.mitd.mu)	Existing
Energy Efficiency Policy and Regulation (EAS_10)	Energy Policy and Regulation Capacity: Government Policy Strategy and Approach	Year 3	Eastern Africa	Medium	Polycymaking Institutions Centers for Renewable Development Regulatory Institutions Continental Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) East Africa Centre of Execellence for Renewable Energy & Efficiency (www.eacreee.org) UCalgary-ERGP (https://ergp.ca/lines-of-work/training-and-education)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
T3 Solar GridTie (EAS_11)	Electricity Transmission & Industrial Technology Applications: Grid-flexibility	Year 2	Eastern Africa		Polycymaking Institutions Expert/Technical Institutions	40 Hours Class 120 hrs E-learning	Strathmore University: Energy Research Centre, Kenya (https://serc.strathmore.edu/programmes/) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Selam David Roeschli Technical and Vocational (www.selamchildenvillage.org/Short%20Term%20Training) University of Comoros (http://univ-comores.km/)	Existing
Energy Project Management Foundations (EAS_12)	Energy Projects and Infrastructure Development: Energy Project Management	Year 2	Eastern Africa	High	Continental Institutions Regional Power Pools Polycymaking Institutions Expert/Technical Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) University of Comoros (https://univ-comores.km) University of Djibouti University Institute of Industrial Technology, Djibouti (https://www.univ.edu.dj) The Renewable Energy Institute, Eritrea (https://www.renewableinstitute.org) Addis Ababa University, Center for Energy & Technology Ethiopia (http://www.aau.edu.et/aait/academics/center-for-energy-and-technology/)	Existing
Power Strategic and Business Planning (EAS_13)	Energy Projects and Infrastructure Development: Business Analysis Plan Development	Year 2	Eastern Africa	Low	Expert/Technical Institutions Energy Planning Institutions Polycymaking Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) ERGP-UCalgary (www.ergp.ca)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Fuel Quality Monitoring (EAS_14)	Energy Technology Implementation: Oil and Gas	Year 2	Eastern Africa	High	Continental Institutions Regulatory Institutions Regional Economic Communities	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Institute of Energy Studies and Research (serc.strathmore.edu) UCalgary (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=6882005) Somali Natural Resources Research Center (SONRREC) (https://sonrrec.org/about-us) University Of Juba (https://uoj.edu.ss/about-us/)	Existing
Mini-Grids Development and Regulation (EAS_15)	Electricity Transmission and Industrial Technology Applications: Mini-grid Transmission	Year 2	Eastern Africa		Regional Power Pools Expert/Technical Institutions Energy Planning Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Nakawa Vocational Training College, Uganda (www.nakawavtc.ac.ug) Sudan International University, Sudan (http://www.siu-sd.com/academics/program-desc.aspx?id=13) Seychelles Institute of Distance and Open Learning, Seychelles (http://www.sidol.edu.sc/) Integrated Polytechnic Regional College Tumba (https://www.iprctumba.rp.ac.rw/1/academics-1/short-courses)	Existing
Nuclear Power Energy Fundamentals (EAS_16)	Energy Technology Implementation; Nuclear Energy	Year 2	Eastern Africa	Low	Continental Institutions Expert/Technical Institutions Centers for Renewable Energy Regulatory Institutions	40 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Nuclear Power and Energy Agency (Nupea), Kenya (https://www.nuclear.co.ke) Tanzania Atomic Energy Commission TAEC (https://www.taec.go.tz/)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Fundamentals of Battery Storage	Energy Technology Implementation: Oil and Gas	Year 2	Eastern Africa	Low	Expert/Technical Institutions Centers for Renewable Energy Regulatory Institutions	40 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) Strathmore University: Energy Research Centre, Kenya (https://serc.strathmore.edu/programmes) Makerere University, Centre for Research in Energy & Energy Conservation (CREEC), Uganda (www.creec.or.ug) UCalgary (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=67142)	*New*
Pico/Micro Hydro-Power Design and Installation (EAS_18)	Energy Technology Implementation: Hydropower Development	Year 3	Eastern Africa	Low	Energy Planning Institutions Expert/Technical Institutions Centers for Renewable Energy Regional Power Pools	40 Hours	CREEC (https://www.creec.or.ug/picomicro-hydropower-design-and-installation) Kikuletwa Renewable Energy Training and Research Centre, Tanzania (https://www.kretrc.ac.tz/) Institute of Energy Studies and Research, Kenya (https://www.iesr.ac.ke/) Kipya Africa Limited, Kenya (https://kipya-africa.com/)	Existing
Fundamentals of Wind Energy (EAS_19)	Energy Technology Implementation: Wind Energy	Year 3	Eastern Africa	Medium	Expert/Technical Institutions Centers for Renewable Energy Continental Institutions Regional Power Pools Policymaking Institutions	80 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) Institute of Energy Studies and Research (https://www.iesr.ac.ke/) UCalgary (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=67142) Kikuletwa Renewable Energy Training and Research Centre (https://www.kretrc.ac.tz/) The Wind Power Association of Uganda (WPAU) (https://unreeea.org/unreeea-members/about-wpau/#w-paumembers)	*New*

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Hydrogen Industry Fundamentals Emerging Technologies and Expanding Market Opportunities (EAS_20)	Energy Technology Implementation: Hydrogen Energy/Energy Market and Economies	Year 5	Eastern Africa	Low	Regional Power Pools Continental Institutions Expert/Technical Institutions Centers for Renewable Energy Regulatory Institutions	40 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) RES4Africa Neelain Institute for Engineering, Technology and Computer Researches (NIETCR), Sudan (https://www.neelain.edu.sd/CenterDetails/69) UCalgary (https://conted.ucalgary.ca/search/publicCourseSearchDetails.do?method=load&courseId=76018516)	*New*
Fundamentals of Energy and Utility Regulation (EAS_21)	Energy Policy and Regulations Capacity: Energy Regulation Development	Year 4	Eastern Africa	Low	Polymaking Institutions Centers for Renewable Development Regulatory Institutions Continental Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) ERGP- (www.ergp.ca)	Existing
Executive Training on Energy Leadership (EAS_22)	Energy Infrastructure and Operations: Community Relations, Energy Response and Contingency Plans	Year 4	Eastern Africa	High	Regional Power Pools Expert/Technical Institutions Energy Planning Institutions Regional Economic Communities	30 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) ERGP (www.ergp.ca)	Existing
Dispute Management & Avoidance in the Energy Sector (EAS_23)	Energy Policy and Regulations Capacity: Corruption Mitigation Policies and Regulations, Conflict Resolution Strategies and Policies	Year 4	Eastern Africa	Low	Regional Power Pools Regulatory Institutions Polymaking Institutions Regional Economic Communities	40 Hours	GLOMACS Training and Consultancy, United Arabs Emirates (https://glomacs.com/about-us) The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) ERGP (www.ergp.ca)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Communication Skills and Energy Reporting (EAS_24)	Energy Infrastructure and Operations: Energy Response and Contingency Plans, Community Relations	Year 4	Eastern Africa	High	Regional Power Pools Expert/Technical Institutions Energy Planning Institutions Regional Economic Communities	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Somali Natural Resources Research Center (SONRREC) (https://sonrrec.org/about-us/) Institute of Energy Studies and Research (https://www.iesr.ac.ke/) ERGP (www.ergp.ca)	Existing
Carbon Capture, Utilization and Storage (CCUS) An Operations Guide to Reaching Net Zero Emissions Target with Enhanced Oil Recovery (EOR) Implementation (EAS_25)	Climate Finance for Energy Sector Projects, Energy and Environmental Policy	Year 5	Eastern Africa	Low	Regional Economic Communities Centers for Renewable Energy Policymaking Institutions Regulatory Institutions	40 Hours	The Energy Training Centre, Abu Dhabi (https://energytraining.ae/course/smart-grid-for-non-engineers) ERGP (https://ergp.ca/lines-of-work/training-and-education/) ergp@ucalgary.ca Kipya Africa Limited, Kenya (https://kipya-africa.com/) SONRREC (https://sonrrec.org/about-us/) Institute of Energy Studies and Research (https://www.iesr.ac.ke/)	*New*
Coal Surface and Underground Mining Safety (EAS_26)	Energy Technology Implementation: Coal	Year 3	Eastern Africa	Low	Regional Economic Communities Centers for Renewable Energy Policymaking Institutions Regulatory Institutions Expert/Technical Institutions	30 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Water-Food-Energy Nexus Approach (EAS_27)	Energy Market and Economies: Water-Food-Energy Nexus	Year 1	Eastern Africa	Low	Centers for Renewable Energy Policymaking Institutions Expert/Technical Institutions	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/)	Existing
Petroleum Pipelines: Construction, Regulation, and Operation (EAS_28)	Energy Project and Infrastructure Development: Oil Pipeline	Year 2	Eastern Africa	Low	Expert/Technical Institutions Continental Institutions Regulatory Institutions Regional Economic Communities	40 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/) Nakawa Vocational Training College, Uganda (www.nakawavtc.ac.ug)	*New*
Coal Surface and Underground Mining Safety (EAS_26)	Energy Technology Implementation: Coal	Year 3	Eastern Africa	Low	Regional Economic Communities Centers for Renewable Energy Policymaking Institutions Regulatory Institutions Expert/Technical Institutions	30 Hours	The Energy Regulation Center of Excellence, Tanzania (https://erce.energyregulators.org/) Kipya Africa Limited, Kenya (https://kipya-africa.com/)	Existing
NEBOSH International General Certificate in Occupational Health and Safety (SOU_01)	Support an Emergent Gas Sector	Year 2	Southern Africa	Low	Expert/Technical Institutions	65 Hours	Center of Studies in Oil and Gas Engineering and Technology (CS-OGET) of the Eduardo Mondlane University (UEM), Mozambique	Existing
NEBOSH International Technical Certificate in Oil and Gas Operational Safety (SOU_02)	Support an Emergent Gas Sector	Year 2	Southern Africa	Low	Expert/Technical Institutions	55 Hours	CS-OGET - UEM	Existing
Oil Well Drilling and Operation Control (SOU_03)	Support an Emergent Gas Sector	Year 3	Southern Africa	Low	Expert/Technical Institutions	80 Hours	CS-OGET - UEM	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Integrated Energy Systems (SOU_04)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition	Year 1	Southern Africa	Medium	Energy Planning	80 Hours	University of Cape Town, South Africa (https://ebe.uct.ac.za/cpd/events/integrated-energy-systems)	Existing
Energy Value Chains (SOU_05)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support a Green Hydrogen Sector	Year 1	Southern Africa	High	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing
Energy Geography, Geopolitics and Macroeconomics (SOU_06)	Supply Energy to Rural Areas; Support a Just Energy Transition; Awareness of Corruption and Incompetence in the Energy Sector.	Year 3	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing
Energy and Environmental Sustainability (SOU_08)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support a Green Hydrogen Sector	Year 2	Southern Africa	High	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing
Energy Finance, Business Strategy, and Investment (SOU_09)	Support a Just Energy Transition; Support a Green Hydrogen Sector; Support the Operation and Expansion of National and Regional Energy Grids; Awareness of Corruption and Incompetence in the Energy Sector.	Year 1	Southern Africa	High	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Ethics and Corporate Governance in the Energy Sector (SOU_10)	Soft Skills for the Energy Sector; Awareness of Corruption and Incompetence in the Energy Sector.	Year 1	Southern Africa	High	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing
Energy Policy and Regulatory Dispensations (SOU_11)	Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids; Awareness of Corruption and Incompetence in the Energy Sector.	Year 3	Southern Africa	High	Expert/Technical Institutions	40 Hours	University of the Witwatersrand, Johannesburg, South Africa (https://africanenergycentre.ac.za/) (https://africanenergycentre.ac.za/mmel/) ERGP (https://ergp.ca)	Existing
Power Quality and System Stability (SOU_12)	Supply Energy to Rural Areas; Support the Operation and Expansion of National and Regional Energy Grids.	Year 1	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Kafue Gorge Regional Training Centre (KGRTC) (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/26)	Existing
Construction Contracts and Power Purchase Agreements (SOU_13)	Supply Energy to Rural Areas; Support the Operation and Expansion of National and Regional Energy Grids.	Year 1	Southern Africa	High	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/29)	Existing
High-Voltage Substation Operations and Maintenance (SOU_14)	Supply Energy to Rural Areas; Support the Operation and Expansion of National and Regional Energy Grids.	Year 2	Southern Africa	Low	Expert/Technical Institutions	80 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/courses/substation-operations-and-maintenance)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Off-Grid Solar System Design and Installation (SOU_15)	Supply Energy to Rural Areas; Support a Just Energy Transition.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/34)	Existing
Financial Modelling for Renewable Energy Projects (SOU_16)	Supply Energy to Rural Areas; Support a Just Energy Transition.	Year 1	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/28)	Existing
Occupational Health and Safety Management in The Energy Sector (SOU_17)	Supply Energy to Rural Areas; Provide Appropriate Training; Soft skills for the Energy Sector.	Year 4	Southern Africa	High	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/23)	Existing
Business Planning for Independent Power Producers (SOU_18)	Supply Energy to Rural Areas; Provide Appropriate Training; Soft skills for the Energy Sector; Awareness of Corruption and Incompetence in the Energy Sector.	Year 1	Southern Africa	Low	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/27)	Existing
Root Cause Analysis for the Energy Sector (SOU_19)	Supply Energy to Rural Areas; Provide Appropriate Training; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/courses/root-cause-analysis)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Design and Optimization of Power Lines (SOU_20)	Supply Energy to Rural Areas; Provide Appropriate Training; Support the Operation and Expansion of National and Regional Energy Grids.	Year 1	Southern Africa	Low	Expert/Technical Institutions	80 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/courses/design-and-optimization-power-lines)	Existing
Planning Renewable Energy Projects (SOU_21)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	year 2	Southern Africa	High	Expert/Technical Institutions	40 Hours	KGRTC (https://www.kgrtc.org.zm/courses) (https://www.kgrtc.org.zm/node/32)	Existing
Smart Grid Technology Overview (SOU_22)	Supply Energy to Rural Areas; Provide Appropriate Training; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Smart_Grid_Technology_Overview_brochure.pdf)	Existing
Power System Analysis (SOU_23)	Supply Energy to Rural Areas; Provide Appropriate Training; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	High	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Power_System_Analysis_brochure.pdf)	Existing
Hydrogen in the Energy System (SOU_24)	Support a Just Energy Transition; Support a Green Hydrogen Sector.	Year 2	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Power_System_Analysis_brochure.pdf)	Existing

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Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Advanced Photovoltaic Systems (SOU_25)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Advanced_PV_Systems_brochure.pdf)	Existing
Wind Energy (SOU_26)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Wind_Energy_brochure.pdf)	Existing
Energy Storage Systems (SOU_27)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 2	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Energy_Storage_Systems_brochure.pdf)	Existing
Solar Thermal Energy Systems (SOU_28)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 3	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Solar_Thermal_Energy_Systems_brochure.pdf)	Existing
Smart Grid Communication (SOU_29)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 3	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Smart_Grid_Communication_brochure.pdf)	Existing

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Bioenergy (SOU_30)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 5	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Bioenergy_brochure.pdf)	Existing
Hydro & Ocean Energy (SOU_31)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	year 5	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Hydro_Ocean_Energy_brochure.pdf)	Existing
Renewable Energy Systems (SOU_32)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 2	Southern Africa	High	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Renewable_Energy_Systems_brochure.pdf)	Existing
Green Hydrogen Technology (SOU_33)	Support a Just Energy Transition; Support a Green Hydrogen Sector.	Year 4	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Green_Hydrogen_Technology.pdf)	Existing
Power System Data Analytics (SOU_34)	Provide Appropriate Training; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Power_System_Data_Analytics_brochure.pdf)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Long-Term Power Systems Planning (SOU_35)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 2	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Long-term_Power_System_Planning_brochure.pdf)	Existing
Distribution Customer Concepts (SOU_36)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 2	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Distribution_Customer_Concepts_brochure.pdf)	Existing
Distribution Network Planning and Operations (SOU_37)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 3	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Distribution_Network_Planning_and_Operations_brochure.pdf)	Existing
Power System Operations (SOU_38)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	High	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Power_System_Operations_brochure.pdf)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Power System Flexible Operation (SOU_39)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/PSFO_UCT.pdf)	Existing
Green Hydrogen Project Engineering (SOU_40)	Support a Just Energy Transition; Support a Green Hydrogen Sector.	Year 4	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Stellenbosch University, South Africa (https://www.crses.sun.ac.za/) (https://www.crses.sun.ac.za/downloads/Green_Hydrogen_Project_Engineering.pdf)	Existing
Global Wind Organization (GWO) Basic Technical Training (SOU_41)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Low	Expert/Technical Institutions	40 Hours	The South African Renewable Energy Technology Centre (https://www.saretec.org.za/online-training/) (https://www.saretec.org.za/wind/global-wind-organisation-gwo/)	Existing
Solar PV Installer Course (SOU_42)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Low	Expert/Technical Institutions	40 Hours	The South African Renewable Energy Technology Centre (https://www.saretec.org.za/online-training/) (https://www.saretec.org.za/solar/saretec-solar-pv-installer-course2/)	Existing
PV Green Card Assessment (SOU_43)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Low	Expert/Technical Institutions	16 Hours	The South African Renewable Energy Technology Centre (https://www.saretec.org.za/online-training/) (https://www.saretec.org.za/solar/pv-greencard-assessment/)	Existing
Solar Online Training (SOU_44)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 1	Southern Africa	Medium	Expert/Technical Institutions	40 Hours	The South African Renewable Energy Technology Centre (https://www.saretec.org.za/online-training/) (https://www.saretec.org.za/wind/solar2/)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Radiation Safety Officer Course - Part 1 (SOU_45)	Provide Appropriate Training.	Year 1	Southern Africa	Low	Expert/Technical Institutions	48 Hours	Namibia Uranium Institute (https://www.namibianuranium.org/training/) (https://www.namibianuranium.org/wp-content/uploads/2023/07/Radiation-Training-Courses-VO-Consulting-20230714.pdf)	Existing
Radiation Safety Officer Course - Part II (SOU_46)	Provide Appropriate Training.	Year 2	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Namibia Uranium Institute (https://www.namibianuranium.org/training/) (https://www.namibianuranium.org/wp-content/uploads/2023/07/Radiation-Training-Courses-VO-Consulting-20230714.pdf)	Existing
Radiation Safety Officer Course - Part III (SOU_47)	Provide Appropriate Training.	Year 3	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Namibia Uranium Institute (https://www.namibianuranium.org/training/) (https://www.namibianuranium.org/wp-content/uploads/2023/07/Radiation-Training-Courses-VO-Consulting-20230714.pdf)	Existing
Radiation Safety Technician Course (SOU_48)	Provide Appropriate Training.	Year 1	Southern Africa	Low	Expert/Technical Institutions	40 Hours	Namibia Uranium Institute (https://www.namibianuranium.org/training/) (https://www.namibianuranium.org/wp-content/uploads/2023/07/Radiation-Training-Courses-VO-Consulting-20230714.pdf)	Existing
Renewable Energy: Distributed Generation (SOU_49)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 3	Southern Africa	Medium	Expert/Technical Institutions	32 Hours	University of Pretoria, South Africa (https://www.enterprises.up.ac.za/) (https://www.enterprises.up.ac.za/renewable-energy-distributed-generation-7)	Existing
Power System Protection in Smart Grid Environments (SOU_50)	Supply Energy to Rural Areas; Support a Just Energy Transition; Support the Operation and Expansion of National and Regional Energy Grids.	Year 4	Southern Africa	Low	Expert/Technical Institutions	24 Hours	University of Pretoria, South Africa (https://www.enterprises.up.ac.za/) (https://www.enterprises.up.ac.za/info-brochure/Power%20System%20Protection%20in%20Smart%20Grid%20Environments.pdf)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Green Building Institutional Arrangements (SOU_51)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	year 5	Southern Africa	Low	Expert/Technical Institutions	40 Hours	University of Johannesburg, South Africa (https://www.uj.ac.za/about/sdg-impact/sdg-17-partnerships-for-the-goals/17-4-2-courses-and-programmes-on-the-sdgs-and-sustainability/) (https://www.uj.ac.za/wp-content/uploads/2021/11/uj_febe_green_building_legislation_slp_brochure.pdf)	Existing
Applied Green Building (SOU_52)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 5	Southern Africa	Low	Expert/Technical Institutions	40 Hours	University of Johannesburg, South Africa (https://www.uj.ac.za/about/sdg-impact/sdg-17-partnerships-for-the-goals/17-4-2-courses-and-programmes-on-the-sdgs-and-sustainability/) (https://www.uj.ac.za/wp-content/uploads/2021/11/applied-green-building-slp.pdf)	Existing
Applied Renewable Energy (SOU_53)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	80 Hours	University of Johannesburg, South Africa (https://www.uj.ac.za/about/sdg-impact/sdg-17-partnerships-for-the-goals/17-4-2-courses-and-programmes-on-the-sdgs-and-sustainability/) (https://www.uj.ac.za/wp-content/uploads/2021/11/applied_renewable_energy_slp.pdf)	Existing
Introduction to Biogas Technology (SOU_54)	Supply Energy to Rural Areas; Provide Appropriate Training; Support a Just Energy Transition.	Year 4	Southern Africa	Medium	Expert/Technical Institutions	80 Hours	University of Johannesburg, South Africa (https://www.uj.ac.za/about/sdg-impact/sdg-17-partnerships-for-the-goals/17-4-2-courses-and-programmes-on-the-sdgs-and-sustainability/) (https://www.uj.ac.za/wp-content/uploads/2021/09/biogas-slp_ewseta.pdf)	Existing
Women and Gender in Energy (CON_01)	Women's Leadership	Year 1	Continental	High	Diverse Personnel	40 Hours	1. African Women in Energy and Power (AWEaP) (https://aweap.africa/) 2. Energia (https://energia.org/) 3. Natural Resource Governance Institute (https://resourcegovernance.org/) 4. USAID Partnerships (https://www.usaid.gov/powerafrica/nigeria/energy-sector-womens-leadership-initiative)	*New*

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP

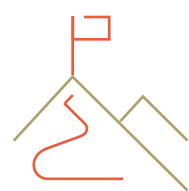
Programme Name or Topic	Capacity Need Addressed	Suggested Implementation Year	Focus Region	Potential for Continental Delivery	Target Institutional Group	Programme Duration	Potential Training Institutions	New/Existing Course
Youth Training and Energy Mentorship (CON_02)	Platforms for Young People	Year 1	Continental	High	Diverse Personnel	40 Hours	1. Enel Foundation (https://www.enelfoundation.org/) 2. SEforALL (https://www.seforall.org/) 3. Extractive Resource Governance Program (www.ergp.ca)	*New*
Youth Empowerment in Sustainable Energy (YESE) (CON_03)	Platforms for Young People	Year 1	Continental	High	Diverse Personnel	40 Hours	1. SEforALL (https://www.seforall.org/) 2. Res4Africa (https://res4africa.org/programmes/res4africa-academy/) 3. The Energy and Resources Institute (TERI) Africa (https://www.teriin.org/index.php)	*New*
Women's Leadership in Energy Finance and Investment (CON_04)	Women's Leadership	Year 1	Continental	High	Diverse Personnel	80 Hours	1. Strathmore Business School, Kenya (https://sbs.strathmore.edu/) 2. European University Institute, Ghana (https://www.eui.eu/ghana) 3. Energy and Finance Institute (https://www.energyandfinanceinstitute.com/)	Existing

Table 12: Capacity building programme for the African Energy sector. Source: AFREC-ERGP



7. Concluding Remarks

This chapter presents conclusions and recommendations that arose during the execution of the project and the development of this report.

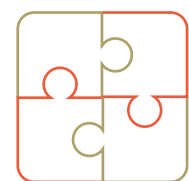


7.1 Best Practices to Enhance Capacity Building

Discussions on capacity building require synergies between research and practice, in addition to training aimed at developing and improving capacities. Establishing coordination mechanisms with energy stakeholders is crucial to support the teaching and learning processes with research projects and practical applications of knowledge. This necessitates AFREC to promote additional initiatives beyond the 150 training events included in the capacity building programme, encouraging knowledge exchange and shared experiences.

Regarding international best practices in capacity building, it is recommended to adopt standards and procedures from international organisations. For example, the United Nations Development Programme (UNDP) employs a six-step process for capacity building: initial engagement activities, assessment of current conditions, definition of capacity building goals, formulation of the programme, implementation, and evaluation of increased capacity through systematic processes.

The International Labor Organization (ILO) employs a macroeconomic strategy and industrial policies tailored to the specific realities of each region or country, necessitating a detailed study of local conditions for a better implementation. Additionally, the World Bank has invested in the creation of vocational training institutes and financial planning and reporting frameworks, requiring proponents to align with all policies and safeguards to obtain project financing. Such strategies, considered international best practices in capacity building, could be analysed and, if appropriate, replicated by AFREC.



7.2 Cooperation for Cross-Border Learning

To create a conducive environment for the exchange of experts, promoting collaboration, and contributing to the overall development of participating countries, it is imperative to facilitate the exchange of experts between African countries and regional and international institutions.

Implementing such exchange activities requires several crucial actions, including the establishment of bilateral or multilateral agreements between countries and institutions to formalise the commitment to exchange experts. Furthermore, collaboration with international organizations, NGOs, and academic institutions is pivotal in facilitating and supporting these exchange programmes.

Energy technology implementation at a regional level can further promote professional exchange, enhancing the collective expertise and capacity of the region.

The location of training institutions must be considered. Different centers for renewable energy and energy efficiency exist in all the five regions of the continent, allowing member countries to benefit from centers close to their area. For example, Madagascar can benefit from South African experts to help bridge the country's capacity needs.

Professionals working in expert and technical institutions from Southern Region could collaborate with countries in the Arab Maghreb Union (AMU)—Algeria, Libya, Mauritania, Morocco, and Tunisia—that have achieved 100% electrification. These AMU countries have managed to achieve complete urban and rural electrification using a combinations of non-renewable energy sources (coal, oil, and natural gas) and renewable sources (hydro, solar, and wind).

Several institutions and training programmes have been launched in Southern Africa based on recent government- and NGO-sponsored studies sector trends and analysis of existing and projected skill gaps. Reputable training organisations now offer more than 200 short courses, covering topics from policy and planning to project management and operations. These institutions serve as hubs for training professionals, who can be certified and become trainers in their respective countries and regions. The exchange of professionals in the train the trainers programmes ensures the quality of current offerings, expands the range of courses, and increases learners' throughput.

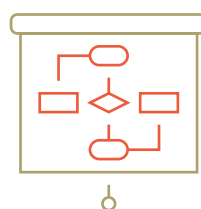
Professionals from countries and regions committed to advancing their energy transition programmes can benefit from visiting and learning from experts in countries that are further along in implementing solar and wind power generation. This strategy could be easily applied, particularly between Egypt, South Africa, Kenya, Tunisia, Ghana, and Morocco.

A group of countries are already working, or have plans to work, on the implementation of green hydrogen programmes. Inter-regional collaboration is recommended among Mauritania, Namibia, South Africa, Egypt, Morocco, and Djibouti.

SAPP is recognized as the most advanced power pool in Africa, having established the continent's only active electricity market. There are plans to construct several to interconnections, including Botswana–South Africa, Mozambique–Zambia, Mozambique–Tanzania, and Zambia–Tanzania. Initiatives are underway to interconnect SAPP and EAPP through Tanzania and Zambia. Considering this, it is recommended that professionals (both technical and non-technical) from the Maghreb Electricity Committee (COMLEC), West African Power Pool (WAPP), Eastern African Power Pool (EAPP), and CAPP visit and learn from professionals working in SAPP.

The Energy Regulators Association of East Africa (EREA) is a well-organised institution that has contributed to the harmonisation of energy regulatory frameworks, sustainable capacity building, and information sharing among the regulators in the region. EREA's key objective is to promote the independence of national regulators and support the establishment of a robust East African energy union. Therefore, it is recommended that professionals from national and regional institutions in Southern Africa, including the Regional Electricity Regulators Association (RERA), visit and learn from EREA professionals.

Finally, it is recommended that professionals working in Southern African expert technical institutions and research centers embark on professional exchange programmes in the largest gas-producing countries in Africa – Algeria, Egypt, and Nigeria. Such collaborative efforts could create appropriate frameworks for building long-term partnerships in all cases.



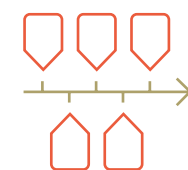
7.3 Cross-Cutting Themes: Frameworks, Risks, Community, Youth, and Women

For the implementation of the capacity building programme, applicable frameworks (global, continental, and regional) must be considered as cross-cutting themes. This approach is more effective than the delivery of independent courses focused specifically on those frameworks.

For example, instead of the developing and delivering of a specific training on the Paris Agreement, it is recommended that the Paris Agreement be included as a cross-cutting theme in specialised trainings oriented towards the reduction of GHG to mitigate climate change. Similarly, rather than preparing and delivering a course solely on SDG 7, it is recommended to incorporate that framework as a cross-cutting theme in courses related to the improvement of transmission and distribution systems as part of a national electrification programme. This same approach can be applied to all courses in the capacity building programme.

On the other hand, such cross-cutting themes as environmental management, risk assessment, community engagement, and the participation of women and youth, are suitable for the development and delivery of specific courses. In such cases, implementation could even be done at a continental level.

In the capacity building programme, it is noted that gender inclusivity is not only an ethical imperative but also a strategic advantage for the energy sector.



7.4 Integrated Approach to Capacity Development

The application of an integrated approach to capacity development is always recommended. This can be achieved by imposing a cooperative framework affecting individuals, organizations, and markets. The idea of this approach is to appropriately combine diverse sets of experiences, sources, and procedures in development of new training courses.

This approach is particularly relevant for the Central Africa region, where the proposal is to blend institutional and individual capacities with innovation specific to the energy sector. Addressing capacity needs through on-the-job training designed by a consortium of international and local universities, major consulting firms, and an international institution, based on benchmarks from a well-performing region, will serve as a target and guide the process.



7.5 Train-the-Trainer as a Capacity Development Strategy

The train the trainer approach is not only a good practice in capacity building but also a sound strategy for optimising and maximising the benefits of a capacity building programme. This project demonstrates the application of this approach in two main instances.

Firstly, the train-the-trainer concept was incorporated into the design of the SMART roadmap for the implementing the capacity building programme. It was suggested that new courses should be developed in Year 3. These courses would initially be delivered to potential trainers, who would then replicate the knowledge and content in Year 4 and Year 5, covering more specific jurisdictions at the local level.

Secondly, the train-the-trainer approach is also highlighted as an effective strategy for cross-border learning cooperation. This is particularly beneficial when collaboration involves a more experienced country aiding a less experienced one in similar subjects or areas of knowledge, as previously described.

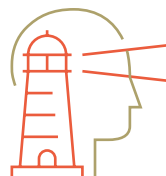


7.6 Capacity Building Information System

AFREC currently manages a continental energy database that includes information on energy balance and energy efficiency for the residential, industrial, transportation, and services sectors. Energy-related indicators in this database include energy prices, taxes, CO2 emissions, and electrification plans, all updated continuously through an online data collection system.

AFREC's experience with the energy information system could serve as a strong foundation for implementing a capacity building information system. This proposal includes several components—a continental database of current capacities and needs to track existing capacities and identify areas requiring development; an inter-continental and continental database of training providers; an official website to communicate all registered training programmes offered in-person; and a platform to offer online courses, adopting a learning management system hosted either by AFREC or through an existing external platform. For example, the Bank of Development of Latin America (CAF) uses MiríadaX, and the Inter-American Development Bank (IADB) uses edX.

The capacity building programme, the main product of this project, could serve as the starting point for generating the required database and designing the proposed capacity building information system. In addition, this new information system could become a framework for building long-term collaboration with training providers and other stakeholders, supporting the capacity-building process.



7.7 Brain Drain and the Key Issues of Talent Retention

Brain drain, the emigration of highly-skilled and educated professionals in search of better opportunities, poses a significant challenge to Africa's socio-economic development, particularly within the energy sector. This phenomenon not only depletes the continent's human capital but also hampers growth and innovation in such vital industries as energy.

Understanding the root causes of brain drain in Africa's energy sector is essential for formulating effective counter measures. Economically, the allure of better-paid positions and more stable career opportunities overseas is a major draw. Educationally, the lack of advanced training facilities and specialised programmes in energy-related fields in Africa limits the professional growth of aspiring individuals. Addressing these multifaceted issues requires a holistic approach that encompasses economic, educational, and political reforms.



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