

Developing Institutional Framework for the Energy Efficiency Act and Regulations targeting energy intensive sector in Nigeria

Deliverable 4

**Activity 4.3: Report on Development of
certification procedures for energy
managers and auditors in Nigeria**

December 2024

To,

Climate Technology Centre and Network (CTCN)

Dear Sir/ Madam,

Subject: Project Report for “Developing Institutional Framework for the Energy Efficiency Act and Regulations targeting energy intensive sector in Nigeria”

We sincerely thank you for giving us the opportunity to undertake the assignment "Developing Institutional Framework for the Energy Efficiency Act and Regulations Targeting the Energy-Intensive Sector in Nigeria."

We have prepared a report on the **development of certification procedures for energy managers and auditors in Nigeria** for the project "Developing Institutional Framework for the Energy Efficiency Act and Regulations Targeting the Energy-Intensive Sector in Nigeria" for your kind perusal. We look forward to your inputs on this assignment. Furthermore, we would be happy to provide any necessary clarifications or additional information. We can be reached at the contact details provided below.

Yours faithfully



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1. Introduction

1.1. Background

Nigeria's rapid economic development and subsequent increase in urbanization has led to an increase in the energy demand for the country. The country is well endowed with natural resources; however, it still faces power shortages and blackouts due to inefficiency in energy and power systems. In addition to this, Nigeria has committed a 47% reduction in its emissions by 2030 considering 2018 as baseline. The Government has realized the importance of energy efficiency in its power infrastructure and is taking steps to ensure it incorporates the same through conditional and unconditional support.

This technical assistance, a support by Climate Technology Centre and Network (CTCN) and United Nations Industrial Development Organization (UNIDO), to the Government of Nigeria will help in creating an ecosystem for uptake of energy efficiency investments in the country. The project team will conduct a comprehensive market assessment for energy efficiency and conservation in industry and household to establish a baseline and context for further project activities in the country. The market assessment of the Nigeria's key demand sectors will help create a basis to identify key sectors for which energy efficiency policy regulations could be drafted. The project team will further go ahead to establish the energy efficiency Act for the country. The Act would provide the framework through which new age technologies and practices be introduced as well as provide an environment conducive to energy conservation measures.

The team support in enabling Nigeria in creating a self-sustaining market for energy efficiency by building on capacities and creating energy auditor and manager certification program in the country. The TA will eventually help Nigeria in mitigating climate change across sectors and reducing its emissions.



Figure 1 Key Components of the project

1.2. Need for the assignment:

While the country has recognized the need to increase its power generation capacity, it is vital to address gaps in the current generation setup. Developing the Energy Efficiency Act and Regulations will provide a framework to implement the changes required to achieve this. The assignment will enable a better understanding of the current energy scenario in different sectors of the economy and the existing measures in place to improve energy efficiency. It is important to understand the country's current progress before formulating a new policy. The study will provide the framework through which new age technologies and practices can be introduced, as well as create an environment conducive to energy conservation measures. It will simplify the complex regulatory environment by consolidating various pre-existing laws and measures and bringing them under one umbrella, while also creating institutions to tackle new challenges that arise.

2. Energy Auditors and Managers in Nigeria

2.1. Current Scenario

Nigeria currently lacks a dedicated system or regulation for mandatory energy audits across its large energy-consuming sectors. Additionally, the country needs training and certification programs for energy auditors to effectively implement demand-side energy efficiency measures. At present, there is no central entity responsible for energy efficiency in the country. However, with the formulation of the Energy Efficiency Act, Nigeria will establish a dedicated energy efficiency entity tasked with promoting energy efficiency initiatives among large energy consumers.

Various local and international organizations collaborate to provide rigorous training and certification programs. Notably, the Nigerian Energy Support Programme (NESP), supported by the European Union and the German government, offers comprehensive training that culminates in certification exams for aspiring energy professionals. Additionally, the Energy Commission of Nigeria (ECN) endorses several initiatives aimed at building capacity in energy management and auditing. These programs ensure that professionals are equipped with the necessary skills to conduct detailed energy audits and implement effective energy management practices.

Internationally recognized certifications, such as the Certified Energy Manager (CEM) and Certified Energy Auditor (CEA) from the Association of Energy Engineers (AEE), are also available to Nigerian professionals. These certifications require candidates to pass stringent exams, validating their expertise and enhancing their credibility in the field. Local educational institutions and training centers, such as universities and specialized training institutes, further support these efforts by offering courses that include certification exams. These initiatives, combined with corporate training programs, help to create a robust pipeline of qualified energy managers and auditors capable of driving energy efficiency improvements across various sectors in Nigeria.

2.2. Stakeholder Discussions and key analysis

PwC's team of experts conducted detailed visits to Nigeria to assess the country's energy efficiency infrastructure through comprehensive market surveys and assessments. Our experts also consulted with few available energy managers and key stakeholders in Nigeria's energy sector.

These discussions provided valuable insights into the country's energy efficiency infrastructure, particularly regarding domestic energy audit activities. We realized that the energy efficiency market in Nigeria is still at a very nascent stage. There are currently no domestic energy auditors or certification agencies in Nigeria, and energy audits are being conducted by international consultants. The CTCN's project will support Nigeria in formalizing the market for energy efficiency.

2.3. Need for Energy Auditors and Managers

The country faces numerous energy challenges, including inefficient energy use, frequent power outages, and a heavy reliance on fossil fuels. These challenges underscore the importance of implementing effective energy management practices to improve energy efficiency, reduce costs, and promote sustainability. Energy auditors and managers play a crucial role in identifying inefficiencies, recommending corrective actions, and implementing energy-saving measures across various sectors, including industrial, commercial, and residential.

Moreover, Nigeria's commitment to international climate agreements and its national policies aimed at reducing carbon emissions further highlight the need for specialized energy professionals. Programs that train and certify energy auditors and managers equip individuals with the skills to conduct comprehensive energy audits, analyze

energy consumption patterns, and develop strategies for optimizing energy use. These professionals are essential for driving the adoption of renewable energy technologies, enhancing energy security, and contributing to the country's economic growth by lowering energy costs and improving the competitiveness of Nigerian industries. Therefore, establishing and expanding energy auditor and manager programs are critical steps towards achieving Nigeria's energy efficiency and sustainability goals.

The benefits of certified energy auditor conducting systematic audits of large energy consumers are highlighted along.

Benefits of Systematic Energy Audits

**Increase
competitiveness of
industries**

**Lower impact on
climate - drop in
energy intensity**

**Reduced risk - lower
dependence on
volatile energy prices**

**Increased energy
security and energy
self-sufficiency**

3. Best Practices and Comparator Analysis of Certification program for Energy Auditors and Managers

The Certified Energy Auditor is a professional who evaluates energy consumption profile of a domestic, commercial or industrial facility and determines energy conservation opportunities. The recognition/certification for such professionals is provided by the government or a private entity after the candidate has passed the certification process established by the competent authority in the country.

The process varies country-to-country and factors such as population, economic condition, infrastructure, technical capability needed and number of auditors required play a crucial role in determining the certification process the country should follow. The most widely used certification process is that of Certified Energy Auditor (CEA) provided by The Association of Energy Engineers (AEE), in which eligible candidates (having relevant work experience and a technical degree) under-go a training, which is then followed by an examination in which successful candidates are provided with the certification. The validity of the certificate is three years. Some of the countries where this process is followed are Ireland, Saudi Arab, South Africa, UAE, and the US.

There are a number of other processes that are being followed globally, following sections provide the overview for some countries and are categorized as Asian and Others.

3.1. Global Best Practices

The European Union's Energy Efficiency Directive (EED) came into effect in December 2012 and was required to be transposed into Member State legislation by 5 June 2014. The directive gives energy audits and energy management schemes high importance for improving energy efficiency and as a result requires the member countries to promote the usage of cost-effective energy management systems and energy audits. In the US, Certified Energy Auditor was developed almost a century ago and is one of most followed certification system globally. Below are some of the processes followed in the US and Europe. The certification process is also present in Oceania country New Zealand.

3.1.1. United States of America¹

Certified Energy Auditor (CEA) was developed in the US in 1891 under the Association of Energy Engineers (AEE). CEA has accreditation from ANSI/ISO/IEC Standard 17024 for personal certification bodies. The details about the certification process is presented in the table along.

Table 1 Details of certification process for energy auditors – USA

Particular	Details
Eligibility	<p>In the US, candidate should meet one of the below criteria and are required to complete at least two hours of Safety Training in past three years and should have participated in five commercial audits within the same time period. Two of these audits should be of an area of at least 10,000 sq. ft. and the audits should be of at least two different building types.</p> <ul style="list-style-type: none">• (Four-year engineering/architectural degree OR Professional Engineer OR Registered Architect) AND more than three years of related work experience

¹ [AEE](#), accessed on 11 April 2018

	<ul style="list-style-type: none"> • Four-year unrelated degree AND more than four years related work experience • Two year associate degree AND more than five related experience • Current Status of Certified Energy Manager AND more than three years related work experience • If a candidate doesn't possess any degree than he should more than ten years of related work experience
Process	CEA candidates have to attend a CEA preparatory training seminar than submit a CEA certification application, and finally pass an open book examination.
Assessment	A four-hour open book examination.
Validity and renewal process	Validity of the certification is three-years.

3.1.2. Bulgaria

Sustainable Energy Development Agency (SEDA), an executive agency under the Ministry of Energy, is responsible for managing the process. Order No. 38/2013 with regards to the Regulation for Energy Auditors Authorization, Energy managers Certification and Accreditation of Companies Providing Energy Services provides the specifics for issue of certificates and organizing training courses for auditors. In addition, there are certain requirements and level of education required, details are presented in **Table 2**.

Table 2 Details of certification process for energy auditors – Bulgaria

Particular	Details
Eligibility	<ul style="list-style-type: none"> • Higher technical education as recognized in the Republic of Bulgaria Degree in engineering (at least secondary education) • At least two years of work experience for candidate with master's degree and at least three years for candidates with bachelor's degree
Process	Candidates need to submit an application for approval from the SEDA. The candidates have to undergo a training and an examination. The training is mix of lectures and practical work (75 hours).
Assessment	Examinations are accredited by an examination board including professors and representatives of the Ministry of economy, the Ministry of investment and the design agency.
Validity and renewal process	Validity of the certification is three-years.

3.1.3. Finland

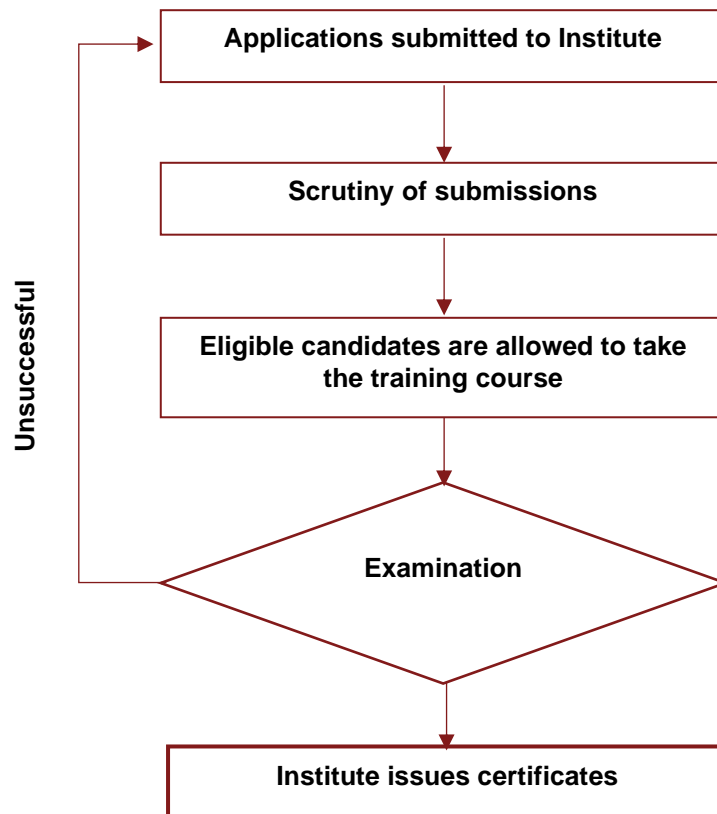
In Finland, The Energy Efficiency Directive (EED) which sets out energy savings requirements for EU countries' was focused on through the Energy Efficiency Act, which entered into force in January 2015, and the Government Decree on Energy Audits. Motiva provides the training courses and also maintains the directory of auditing firms that have auditors. The details of educational background, work experience, and assessment are provided in **Table 3**

Table 3 Details of certification process for energy auditors – Finland

Particular	Details
Eligibility	<ul style="list-style-type: none"> • Engineering or energy degree (at least polytechnic level) OR • Minimum of 3 years of experience in the fields of energy, environment, manufacturing, property or similar. • Special requirements for internal auditors: Should be a registered energy auditors and meet the eligibility criteria for registration

Process	<ul style="list-style-type: none"> • Get registered with Energiavirasto. • Have an minimum level of qualification or have relevant work experience • Undergo a Motiva training course. • Take an examination
Assessment	An examination is conducted to check how familiar candidate is with the implementation of energy audits for companies.
Validity and renewal process	Seven year. Renewal is done without a test if previous audit conducted by the auditor is within last four years.

Finland's Energy Auditor Certification



3.1.4. Denmark

In Denmark, the legislation regarding the conduct of an energy audit is Law No. 345 of 8 April 2014 on obligatory energy audits in large commercial enterprises. DANAK (Danske Akkrediteringsfond) is the national accreditation body, while The Danish Technology Institute (DTI) provides an overview of the requirements for becoming an internal energy auditor in Denmark, without an accreditation from DANAK. The details of the process followed by the Denmark for certifying energy auditors is presented in **Table 4**.

Table 4 Details of certification process for energy auditors – Denmark

Particular	Details
Eligibility	<ul style="list-style-type: none"> • External experts must be registered as energy consultants or be employed with an accredited company. • They need to conduct at least two audits under the supervision of an experienced auditor. • In addition, for internal auditors DTI has provided the requirements for becoming registered energy auditor without accreditation from DANAK, which are: • Education: Engineering or off-shore technical management. Below are the requirements for A-level and B-level energy auditors:

	<ul style="list-style-type: none"> • Experience in the energy field: relevant training, project management experience with various partners (A-level) or external advisors (B-level), analysis of techno-economic assessments of energy options, evaluation of various energy saving actions, design of energy management systems etc. • Minimum of 3 years of experience within the last 6 years for A-level energy consultants • Minimum of 5 years of experience within the last 10 years for B-level energy consultants
Process	<ul style="list-style-type: none"> • The process includes a voluntary training (recommended).
Assessment	No examination or mandatory training, however auditor needs to carry-out at least two audits, while being administered by an experienced auditor.
Validity and renewal process	One year ²

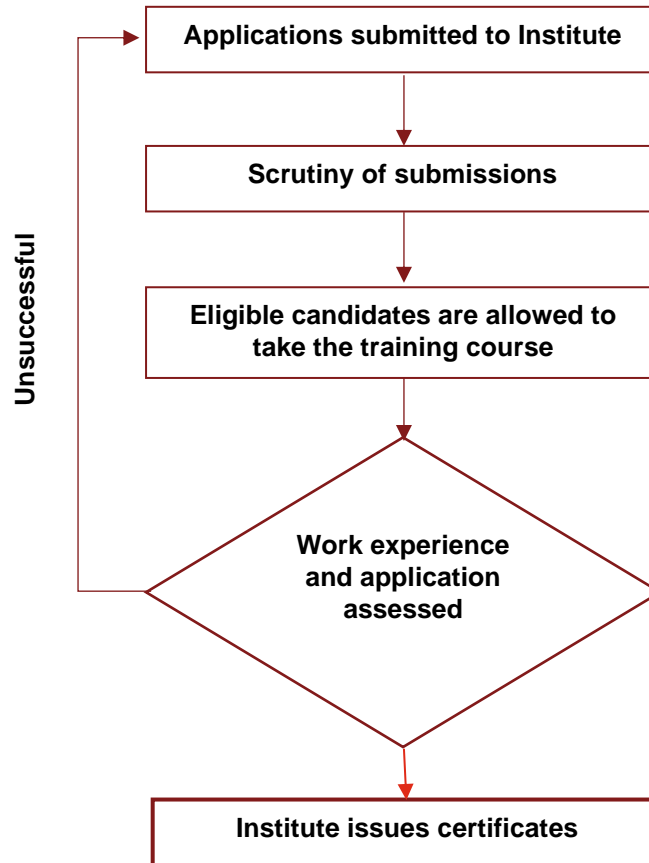
3.1.5. France

In France, Decree No 2014-1393 of 24 November 2014 and its implementing decree lay down the specifics for audits, compliance standards and the qualification basis for auditors. The Minister for Ecology, Sustainable Development and Energy has the responsibility for executing the legislation, COFRAC (Comité Français d'accréditation) is the accreditation body and ADEME is the French Energy Agency, which has the responsibility for country's energy transition. The details for the process adopted by France is presented in **Table 5**.

Table 5 Details of certification process for energy auditors – France

Particular	Details
Eligibility	Requirements for internal and external auditors is different. Special requirements for internal auditors: <ul style="list-style-type: none"> • A minimum of 2-5 years of experience in energy management. • Shouldn't be directly involved in the audited processes External auditors have the following requirements: They need to follow the NF X 50-091 standard and also need to have technical expertise, 3-7 years of experience in energy audits (depending on education), 3-day training on energy audits and at least 3 audit references in the past 3 years.
Process	No examination or interview is taken. The emphasis here is on work experience and technical know-how. Training is also a part of the process, courses for which has been developed by ADEME and has selected 4 organizations to provide this training.
Assessment	Based on work experience and application
Validity and renewal process	N/A

²Auditor has to pay annual charges of EUR670 for maintaining the certification



3.1.6. New Zealand

The Energy Management Association of New Zealand (EMANZ) manages Energy Masters Accreditation programs. One of these programs is the Auditor’s program. The overall requirements and the specifics regarding the program are detailed in **Table 6**.

Table 6 Details of certification process for energy auditors – New Zealand

Particular	Details
Eligibility	<ul style="list-style-type: none"> Though no strict qualifications are required, applicants with a 2 year or higher tertiary qualification in an appropriate field are preferred. Usual qualifications are NZCE, National Diploma in Engineering (level 6), Technology Degree, Building Science Degree, and Engineering Degree and so on. Appropriate fields include: Building services, Chemical, Control Systems, Electrical, Industrial, and Mechanical. Demonstration of sufficient practical experience in a suitable field is also required. Members at IPENZ or other technical body (associate, technical or professional level) or those registered on a register of current competence (CertETn, ETPract, CPEng etc) would satisfy the requirement Specific experience in the analysis of the energy performance of a commercial or industrial facility. Submission of a Type 2: Detailed Energy Audit report or reports carried out by the applicant demonstrating their knowledge of energy auditing as defined in AS/NZS 3598.1:2014 Required to provide the information on two referees (not personally related) who are familiar with applicant’s work and can provide feedback on applicant’s competence in the field of energy auditing.

Process	<ul style="list-style-type: none"> After application is submitted to EMANZ, it reviews the application and provides the accreditation.
Assessment	Based on the information provided in the application form.
Validity and renewal process	<p>The certification has a validity of five years. After this period auditor needs to apply for reaccreditation and submit the Reaccreditation Form, including a Continuing Professional Development section (CPD). For reaccreditation, requirements are the following:</p> <ul style="list-style-type: none"> At least 20 hours (annually) of continuing professional development in areas of energy auditing Details of three Type 2 / Level 2 energy audits completed in the previous 5 years, one of which is to be completed within previous 18 months.

3.2. Deductions from comparative analysis

The above comparative study highlights that demographical similarities and regional presence play a crucial role in determining the certification process a country follows. For instance, all the Asian countries (except for Singapore) listed above, have examination as the final assessment criteria. In addition, to the above countries Japan, Nepal and Vietnam also use national-wide examination for assessing the candidates.

In case of European countries, however, it was a combination of examination, assessment of applicants work experience and technical know-how. Training for most European countries was part of the certification process which wasn't the case with Asian countries. All the countries above have laid emphasis on work experience in relevant field and a technical degree highlighting the highly technical nature of the role.

A generalized universal certification process deduced from the comparative analysis is presented in **Figure 2**.

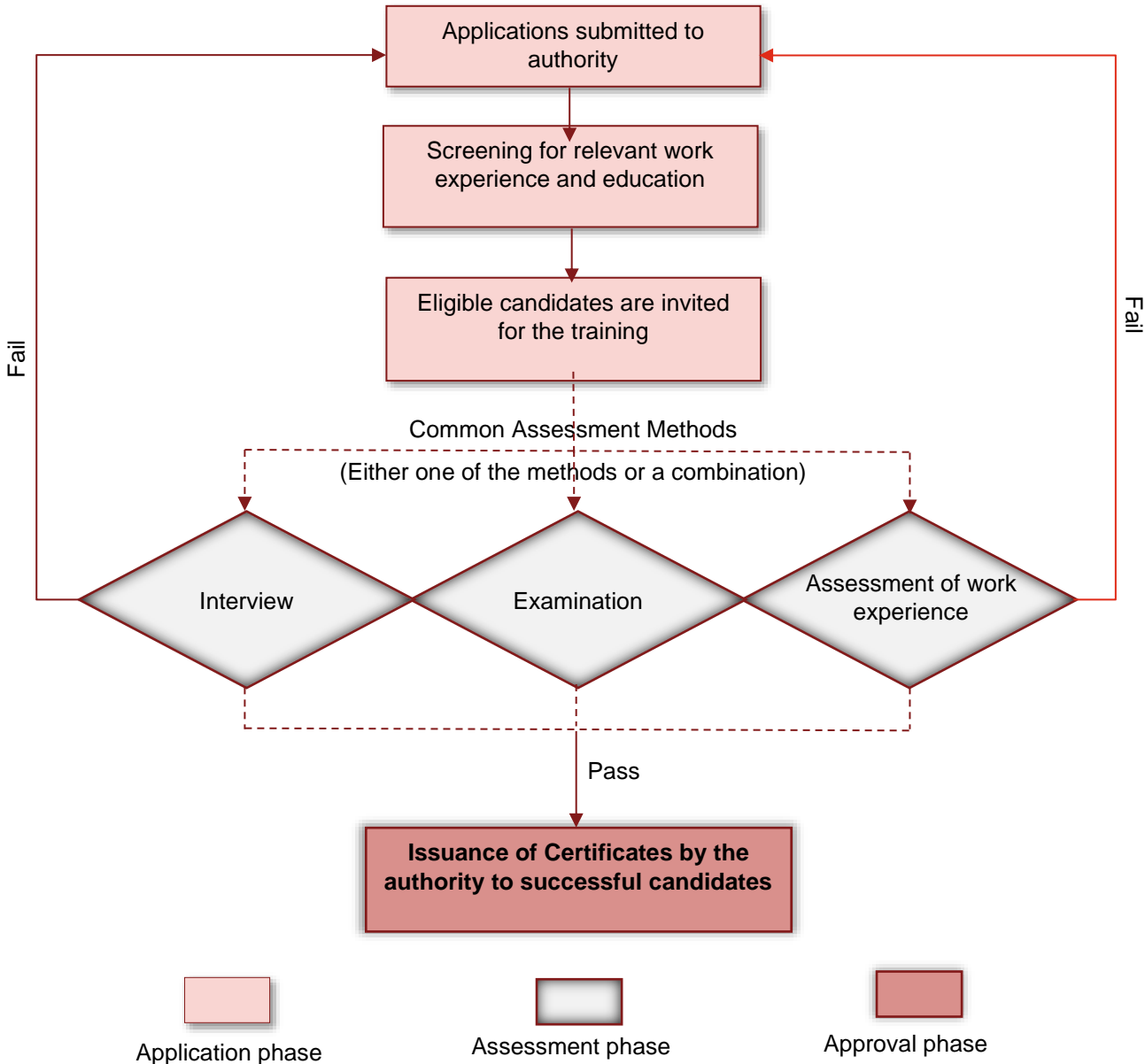


Figure 2 Certification of energy auditors – Universal process

Table 7 Comparative analysis of energy audit certification for different countries

Countries	Administrator	Examination body	Certification	Professional certification	Training	Assessment	Validity
Asian Countries							
Japan	Ministry of Economy, Trade and Industry (METI)	Energy Management Examination & training Center, the Energy Conservation Center – Japan (ECCJ)	METI & ECCJ	Qualified Energy Manager	Yes	Examination	3 years
India	Bureau of Energy Efficiency	National Productivity Council	National Certifying Agency	EM & EA	Voluntary	Examination	5 years
	BCA	N/A	BCA	Certified EA	No	Interview	3 years
Singapore	National Environment Agency (NEA) and Institution of Engineers, Singapore	SCEM Monitoring Committee	NEA & IES	Certified EM of Singapore (CEMS)	Yes	Examination	1 year
Malaysia	Suruhanjaya Tenaga	MAESCO	MAESCO	Certified EA & EM	Yes	Examination	1 year
Indonesia	Ministry of Manpower and Transmigration	LSP HAKE	LSP HAKE	Certified EA & EM	Yes	Examination	N/A
Other countries							
USA	Association of Energy Engineers	Certified Energy Auditor Board	AEE	Certified EM & EA	Yes	Examination	3 years
Denmark	Danish Energy Authority	Bureau Varitas Certification	Bureau Varitas Certification	Certified EA	Voluntary	Complete two audits under supervision	1 year
Finland	Energiavirasto	Motiva	Motiva	Certified EA	Yes	Examination	7 years
France	Ministry of Ecology, Sustainable Development and Energy	Agency for Environment and Energy Management (ADEME)	COFRAC (Comité Français d'accréditation)	Certified EA	Yes	Application/work experience	NA
Australia	Depart. of Climate Change & Energy Efficiency	No exam. Registration to the Greenhouse & Energy Data Officer	Depart. of Climate Change & Energy Efficiency	Registered Greenhouse & Energy Auditor	Yes	Application/work experience	3 years
New Zealand	EMANZ	N/A	EMANZ	Certified EA	No	Application/work experience	5 years

3.3. Types of certifications of energy auditors

The manpower being trained for energy efficiency assessments in the Nigeria can have different levels and designations depending on their level of expertise and regional experience. We propose Nigeria to have Certified Energy Managers, Certified Energy Auditors and Accredited Energy Auditors

For Certified Energy Manager and Certified Energy Auditors the requirements shall be

Level of energy auditor	Requirements or Qualifications
Certified Energy Manager	<ul style="list-style-type: none"> • a graduate Engineer (Bachelor of Engineering/Bachelor of Technology) or equivalent with three years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a post-graduate Engineer (Master of Engineering/Master of Technology) or equivalent with two years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a graduate Engineer with post-graduate degree in Management or equivalent with two years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a diploma Engineer or equivalent with six years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a post-graduate in Physics or Electronics or Chemistry (with Physics and Mathematics at graduation level) with three years of work experience involving use of energy in operation, maintenance, planning, etc.
Certified Energy Auditor	<ul style="list-style-type: none"> • a graduate Engineer (Bachelor of Engineering/Bachelor of Technology) or equivalent with three years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a post-graduate Engineer (Master of Engineering/Master of Technology) or equivalent with two years of work experience involving use of energy in operation, maintenance, planning, etc.; or • a graduate Engineer with post-graduate degree in Management or equivalent with two years of work experience involving use of energy in operation, maintenance, planning, etc.

When the energy efficiency program in the country matures, the country can accreditate energy auditors for carry out mandatory energy audits in its large energy consumers. The accredited energy auditors will have extensive experience in carrying out energy audits in the building and industries of the country as well as strong regional experience. The procedure for selection of Accredited Energy Auditors can be decided at a later stage. However, the qualifications can be as shown along

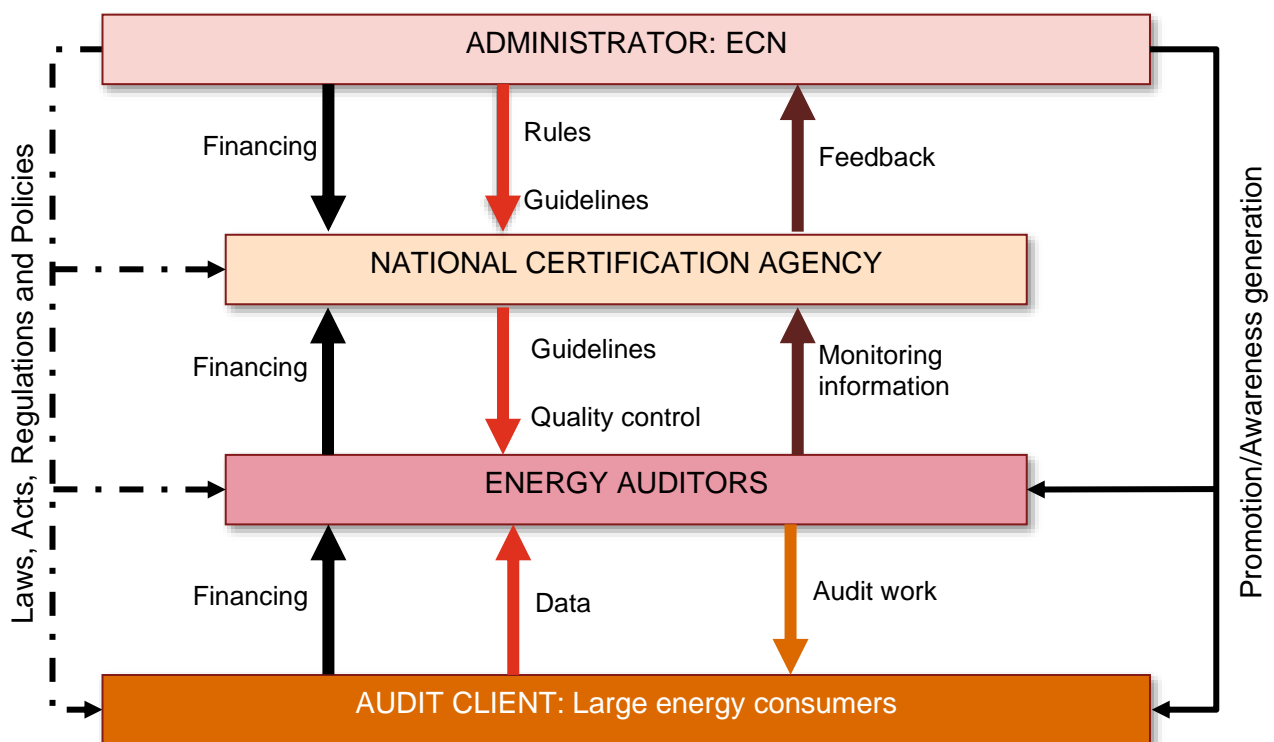
Level of energy auditor	Requirements or Qualifications
Accredited Energy Auditors	<ul style="list-style-type: none"> • is a certified energy auditor • has an experience of five years in energy audit out of which at least three years' shall be in any of the Energy Intensive Industries; • five detailed energy audit reports in any of the Energy Intensive Industries undertaken by the energy auditor in an individual capacity or as a leader or associate or active team member of the energy audit team; • feed back on energy audit received from Energy Intensive Industries;

4. Identifying key stakeholders and defining their roles

An energy audit programme has several operational activities e.g., financing, reporting, monitoring, supervision (guidance) and marketing as well as concrete objects such as databases and help-desk services that need to be maintained somewhere. The Government of Nigeria and CTCN has proposed a **Energy Commission of Nigeria (ECN)** as the nodal agency for carrying out program for energy manager and auditors. This Agency for Energy Efficiency will be the nodal body for surviving the energy auditor and manager exam and building domestic capacity towards energy efficiency.

However, in consideration of other entities to which work may be sub-contracted/delegated, the responsibilities need to be distributed. The following sections present the probable boundaries, decision points and recommended scope of work for all the key stakeholders.

The organisational design of the framework is quite important for successful implementation. ECN will play the role of ADMINISTRATOR and will be responsible for setting rules, guidelines and notifications regarding energy efficiency and conservation. The ADMINISTRATOR will appoint an OPERATOR i.e. National Certification Agency, who would be the technical agency responsible for organizing and conducting the certification program under supervision of ADMINISTRATOR. The key players involved in the certification of energy auditors is shown in the infographic along and their envisaged roles, responsibilities and key decision points are presented in subsequent section.



4.1. Administrator

The administrator is a government body, which initiates the whole certification process. In Nigeria, we propose the role to be taken by ECN. The administrator would be responsible for overall supervision, guidance of the Operator, financing the subsidies (if any) and financing the Operator's work. The Administrator is always the policy maker but not necessary the body to implement the policy at a practical level. The administrator hands over part of its responsibility to the Operator.

The **Table 8** presents the key responsibilities with which ECN has been entrusted and the corresponding regulations from which ECN derives these responsibilities.

Table 8 Roles envisaged in national regulations for ECN

Entity	Role as specified in the regulation	Act/Regulation from which the entity derives its power
ECN	<ul style="list-style-type: none"> ➤ Making regulation for qualification and competency of energy manager and energy auditors and selection of accredited energy auditor firm. ➤ Impose fee with the prior approval of the FGoN for any act done ➤ Conduct and administer the examination. ➤ Issuing certificate to CEAs, CEMs and AEAs ➤ Selection of examination organization ➤ Constitution of Examination and Accreditation (E&A) Committees. ➤ Cancel approval of Examining organization for conducting examination. ➤ Review the contents of the syllabus from time to time and make necessary changes in the syllabus and prospectus ➤ Reviewing eligibility criteria <ul style="list-style-type: none"> • Determination of examination and supplementary examination fee • Cancellation of certification for any commission or omission • Issuing duplicate certificate in case of loss of certificate/damage to certificate by collecting a fee • Empaneling or affiliating organization for providing training • Constitute some other committees as and when required for smooth conducting of whole certification and accreditation process time to time. • Call for application from specified person • Making available reference materials for accreditation examination at least three months before the actual date of examination • Maintaining register • Removal and restoration of names ➤ Request Accredited Energy Auditors to furnish information— <ul style="list-style-type: none"> • Relating to sector-wise details of energy audits conducted, and the energy saving potential identified and achieved; and • Additional information as considered necessary. ➤ The Authority may make available the information received under sub-regulation (1) to the general public through its website or through any of its publication. 	<ul style="list-style-type: none"> - ECN Act - National Energy Efficiency Act (Draft)

4.1.1. Key decision points

The key decision points for the administrator i.e. ECN are presented in **Table 9**.

Table 9 Key decision points for administrator

Sr. No.	Decision	Guidance
1.	Extent of centralization or decentralization of responsibilities between Administrator and Operator	<ul style="list-style-type: none"> ➤ The basic idea of having a separate Operator agency comes from the lack of resources and/or time in the Administrator's organization.

Sr. No.	Decision	Guidance
		<ul style="list-style-type: none"> ➤ It is not advisable to divide work based purely on the sensitive and the non-sensitive tasks (with sensitive tasks reserved for Administrator and Non-sensitive tasks reserved for Operator). In addition, ease of sub-contracting may also be considered. ➤ In the formative years of the certification program, a greater level of centralization of power is preferable, which can be brought about by allowing ECN the power of approval for sensitive tasks which have been sub-contracted to the operator agency.
2.	Considerations determining the choice of operator agency	<ul style="list-style-type: none"> ➤ New Entity vs Existing Entity: New entity may increase the time required for roll out of the project. Setting up an organization for managing the certification process may be realistic if the volume of audits expected to be carried out is very large. ➤ Neutrality: If public money is involved, the Operator should be free of all connections that might endanger free competition. If the Operator is somehow competing with the energy auditors there is a clear case of conflict of interest. In this sense the Operator should not be involved in the energy auditing business itself. ➤ Confidentiality of data: In voluntary programs, it is out of the question that clients give this information to an organization, which is not officially restricted to use it commercially or to distribute it further without a written approval by the clients.
3.	Permission to operator to further subcontract	<ul style="list-style-type: none"> ➤ If the additional resources required for fulfilling responsibilities can be quickly mobilized, then outsourcing is not required. However, if outsourcing is carried out, there should be check and balances to ensure no conflict of interest or anti-competitive behavior.
4.	Metrics for monitoring the performance of certification program	<ul style="list-style-type: none"> ➤ Goals defined in terms of public expenditure required per unit emission reduction or public expenditure required per unit energy saving may be used for benchmarking and optimizing public expenditure. At the lowest, an energy audit program can result to savings at the cost of 0.18 cent/kWh. Equally in reduction of CO₂ emissions the cost can go down to 10 to 14 €/tCO₂. Secondary research has indicated that a good program can after a few years bring the cost down to level of 6 to 8 €/tCO₂. The cost-efficiency of the invested public money increases with the length of the programme. The annual targets for cost efficiency should be framed in such a way that they progressively reduce every year. ➤ Alternatively a simpler approach is to monitor and maintain the energy audit volumes, which requires an efficient reporting of audits to administrator.
5.	Choice of entity for performing quality control	<ul style="list-style-type: none"> ➤ The competence for quality control involves auditing skills, technical skills and also the knowledge on auditing guidelines. ➤ The quality controller should be neutral, have the technical expertise and have the resources to handle the amount of work and to meet reasonable deadlines. Considering these aspects, the administrator or a consultant appointed by the administrator with the requisite competency would be best placed to perform quality control
6.	Approach for assessment of audit quality	<ul style="list-style-type: none"> ➤ When the training provided to the candidates is not very rigorous, the quality control should be stringent and vice versa. Two such options are provided below: ➤ Non-stringent: This approach involved Random quality control. It means that the quality control procedure is triggered by an internal

Sr. No.	Decision	Guidance
		<p>or external impulse, such as client complaint. The systematic quality control means that there is a pre-defined procedure how the quality control is carried out.</p> <ul style="list-style-type: none"> ➤ Stringent: Quality control may be based on the submitted reports or site visits. <p>The following guiding principles should also be used to determine the level of rigor for quality control</p> <ul style="list-style-type: none"> ➤ Non-professional auditors should be kept out of the business; ➤ All auditors should do work in a similar way and produce equal quality of work to clients; ➤ The quality and public image of audits is appreciated and controlled for Clients and auditors.
7.	Coverage for quality control, if stringent	<ul style="list-style-type: none"> ➤ The coverage of quality control should set a target (% of total energy audits for a sector). This target should be higher in the initial few years of the program and when a certain minimum level of quality has been achieved, the same may be lowered. ➤ The Operator would need to frame clear criteria to choose the energy audit reports for quality control in a way that increases the chances of finding those with the highest probability for poor quality.
8.	Financing of quality control	<ul style="list-style-type: none"> ➤ The Administrator may raise a part of the costs of quality control from the auditors in the form of a yearly authorization fee.
9.	Trigger for administrator to provide subsidy	<ul style="list-style-type: none"> ➤ In exceptional cases, subsidies may be used as a supporting instrument for the certification program. If, for a year, the number of candidates getting certified is significantly less than desired, subsidies could be considered by ECN. ➤ The subsidies can take the form of increased budget allocation in the succeeding year for training and/or promotion and marketing activities. ➤ Subsidies may only be provided to a sector in which energy audits are voluntary rather than mandatory. ➤ When applicable, the trigger point for application of subsidies and the amount of subsidy would be determined by the expert advisory committee constituted by ECN.

4.1.2. Recommended scope of work

1. Making regulation/amendments for qualification and competency of energy manager and energy auditors and selection of accredited energy auditor firm;
2. Selection of examination organization in consideration of
 - a. institutional capacity in conducting such examination;
 - b. logistic and infrastructure facility in conducting the examination;
 - c. expert manpower to prepare question and marking the answer script;
 - d. capacity and track record for providing standard quality of training for the candidates appearing in the examination;
3. Deciding on organization structure, governance structure, DOP and establishing bye laws for the operator.
4. Constitute some other committees as and when required for smooth conducting of whole certification and accreditation process time to time.
5. Request Accredited Energy Auditors to furnish information
 - a. relating to sector-wise details of energy audits conducted, and the energy saving potential identified and achieved; and
 - b. additional information as considered necessary.

6. The Authority may make available the information received to the general public through its website or through any of its publication.
7. Defining malpractices and punishments for malpractices
8. Issuing certificate to Energy auditors, energy managers and accredited energy auditors
9. Carrying out evaluation is to see if the programme is running well and the set goals have or can be achieved. Evaluations are usually carried out by a third party with the aim of providing an objective consideration of the impact and usefulness of a programme.

4.2. Operator

The Operator is the National Certifying Agency, which runs the program as a neutral organization working under the supervision of the Administrator vis-à-vis ECN. The operator is responsible for carrying out training, reporting to the Administrator, guidance of the auditors, promotion, maintaining of databases, help desk services etc. The Operator must be adequately staffed to handle all the applications and reports within a reasonable period of time. The Operator must also be able to provide the market with adequate number of energy auditors. The roles envisaged for the Operator is presented in **Table 10**.

Table 10 Roles envisaged in national regulations for Operator

Entity	Role	Act/Regulation from which the entity derives its power
Operator	<ul style="list-style-type: none"> ➤ Upon approval of conducting examination, the Centre, shall enter into a contract with the Authority with validity of five years and renewable after every five years on an application made to the Authority. ➤ The Centre shall collect fee from each participant willing to sit for certification and transfer the revenue collected from such activity to the Authority after deducting the necessary expenditure as well as fee of the Centre, as prescribed by the Authority. ➤ By publication in the newspaper and in the website, notify the date, time and place where such examination shall be conducted. <ul style="list-style-type: none"> • Scrutinizing application for admission in the Examination, Admission of candidate to examination, Conducting of Examination, evaluation of papers and qualifying candidates. ➤ Making available reference materials for accreditation examination at least three months before the actual date of examination ➤ Cancellation of certification, maintaining register and issue of duplicate certificate under specified conditions 	Energy Audit Regulations

4.2.1. Key decision points

The key decision points for the Operator are presented in **Table 11**.

Table 11 Key decision points for Operator

Sr. No.	Decision	Guidance
1.	Mandatory or voluntary training	<ul style="list-style-type: none"> ➤ Training may be voluntary in the early years of the certification program. If the quality control presents adverse findings, then mandatory trainings may be considered.

2.	Pre-qualification criteria required to take the energy auditor's/energy manager's certification exam	<p>The following options may be considered:</p> <ul style="list-style-type: none"> ➤ No requirements should be specified when there is a high likelihood that auditor candidates coming to the training will have very different backgrounds and knowledge. ➤ Recommended pre-qualification is just a message to the auditor candidates on the basic skills needed for the work. This is an easy approach from the Operator's point of view. ➤ Required pre-qualification is the heaviest option for the Operator, but it will bring several benefits. In this option there is always an application procedure involved. The heavier the requirements are the more work is needed.
3.	Level of rigor of training of energy auditors/managers	<ul style="list-style-type: none"> ➤ The higher the requirements for the energy audit programme, its duration and its results, the more important the quality of the audits. The smaller the size and shorter the duration of the programme, the less effort should be put into training. ➤ The comprehensiveness of content is closely connected to the likelihood of quality work by the energy auditors post certification. However, length of the training course would be limited by the budget allocated for carrying out training programs.
4.	Purely theoretical training vs. combination of theoretical and practical	<ul style="list-style-type: none"> ➤ The technical training on audit methodology may be carried out as theoretical training or also as practical training (including field work & measurements at a test site). ➤ For practical training a longer time and a test facility is needed. Extending the training to other topics means a higher cost for the training and more work for the Operator.
5.	Methods can be used for administering the examination	<p>The following options may be considered:</p> <ul style="list-style-type: none"> ➤ A theory test is a light option to indicate the auditor's competence and it can be even arranged as a homework test without a real examination event. ➤ Practical test is to ensure that in addition to his theoretical knowledge the auditor can also perform in the field. The test can be arranged as a test in a test facility or as a separate pilot audit with full reporting. ➤ A real audit in the supervision of a senior auditor gives a good picture of the auditor's competence - this approach has a close connection to quality control.
6.	Conditions in which training may be sub-contracted	<ul style="list-style-type: none"> ➤ Total organized and supervised by the operator: In the first option everything about the training is in the hands of the Operator and the amount of work needed in comparison to the following options is higher. However, real audit experts should be used as teachers. ➤ Supervised by operator, organised by a sub-contractor: If the Operator does not have the resources to organise the training, this part of the work can easily be subcontracted to a professional training organisation. It is important that the contract clearly specifies the roles and the fees of the sub-contractor ➤ Organisation and administration totally sub-contracted: If the training is voluntary and/or recommended, the Operator can sub-contract the whole training activity.
7.	How should the fees for the registration be set?	<ul style="list-style-type: none"> ➤ The fee for registration should be set at a level which is commensurate to the business opportunities that the registration would bring along for the beneficiary

4.2.2. Recommendations on scope of work

Responsibilities which can be performed independently

- Template of application form to become CEA, CEM and AEA, Documents that would be required
- Impose fee with the prior approval of the FGON for any act done

- Conduct and administer the examination
- Recommending candidates for energy manager, energy auditor and accredited energy auditor to ECN
- Call for application from specified person
- Making available reference materials for accreditation examination at least three months before the actual date of examination
- Process of application scrutiny to be detailed out in a transparent manner
- Interface activities between ECN, Examination body, Auditors/Managers/Accredited auditors and hierarchy defined
- Disclosure and maintenance of personnel list of energy managers, certified energy auditors and accredited energy auditors
- Preparation of reference book, training, written test

Responsibilities requiring approval of ECN

- Constitution of Examination and Accreditation (E&A) Committees.
- Determination of examination and supplementary examination fee
- Cancellation of certification for any commission or omission
- Issuing duplicate certificate in case of loss of certificate/damage to certificate by collecting a fee
- Empaneling or affiliating organization for providing training
- Maintaining register
- Removal and restoration of names
- Review of
 - Eligibility criteria
 - Contents of the syllabus from time to time and make necessary changes in the syllabus and prospectus

Promotion and Marketing

Certification program would require marketing activities to support the off-take during the initial few years and promotional activities later on in the time horizon. In promotion the aim is to maintain awareness and good publicity for energy auditing - not to sell individual projects. In marketing, the aim is especially to sell projects to clients. The main idea of promotion is to support the marketing.

4.3. Examination and accreditation committee

The roles envisaged of examination and accreditation committee are presented in **Table 12**.

Table 12 Roles envisaged in national regulations for Examination and accreditation committee

Entity	Role	Probable Act/Regulation from which the entity derives its power
Examination and Accreditation committee	<ul style="list-style-type: none"> ➤ The Examination and Accreditation (E&A) Committees, formed, shall work as to grant the certificate of accreditation. The designated Centre with the overall supervision of the E&A Committee shall arrange written and oral interview to the candidates who have applied for accreditation to assess the audit experience and competence of energy auditing for large energy consumers. ➤ Where the name of the Accredited Energy Auditor or the Energy Audit Firm, as the case may be, is removed on the grounds specified in sub-regulation (1), the Authority or the Committee formed under Regulation 15, as the case may be, may review the grounds of removal on an application made by the auditor or by 	Energy Audit Regulations

	<p>the audit firm on payment of fee and may restore the name of Accredited Energy Auditor or the Firm.</p> <p>➤ In case of grounds specified in clause (a) and (c) of sub regulation (1), the Authority or the Committee, as the case may be, should cautiously pass the order of restoration.</p>	
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4.3.1. Key decision points

The key decision points for the examination and accreditation committee are presented in **Table 13**.

Table 13 Key decision points examination and accreditation committee

Sr. No.	Decision	Guidance
1.	Mode of constituting the committee	➤ It is recommended that separate regulations be notified for constituting the advisory committees
2.	Content of advisory committee regulations	➤ Members, functions, tenure of the committee quorum for meeting, resignation and removal, fee and allowances payable may be covered in the regulations
3.	Binding nature of recommendations to ECN vs. Recommendatory nature	➤ The opinions of the expert committee may be of recommendatory rather than binding nature with regard to removal/restoration of audit firms
4.	Neutrality of committee	➤ To maintain neutrality of recommendations, it is recommended that the decisions be taken by majority vote (satisfying quorum conditions)

4.3.2. Recommendations on Scope of work

1. Disposal of complaints forwarded by ECN
2. Supervise the Operators in the written and oral interview of candidates for Accreditation
3. Where the name of the Accredited Energy Auditor or the Energy Audit Firm, is removed on the grounds specified in sub-regulation (1), the Committee may review the grounds of removal on an application made by the auditor or by the audit firm on payment of fee and may restore the name of Accredited Energy Auditor or the Firm. Committee would also have the power to cautiously pass the order of restoration.
4. Determining the trigger point for application of subsidies and the amount of subsidy.
5. Advising ECN on matters forwarded by it pertaining to certification and accreditation process.

4.4. Auditor/Manager/Accredited Energy Auditor

The auditors/managers/accredited energy auditors would be the beneficiaries from the training and certification programs. The expectations from the auditors as specified in the regulations would form their scope of operation/work. The roles envisaged are presented in **Table 14**.

Table 14 Roles envisaged in national regulations for Auditor/Manager/AEA

Entity	Role	Act/Regulation from which the entity derives its power
Accredited Energy Auditor	<ul style="list-style-type: none"> • Accredited Energy Auditor accredited & not the Certified Energy Auditor, who shall be allowed to conduct the mandatory provision of energy audit in designated consumers under these regulations. 	Energy Audit Regulations

	<ul style="list-style-type: none"> • Subject to the provision of the defining law, the Certified Energy Auditor can also conduct energy audit for designated consumers. • Inform in writing to the Authority for any changes in the personal or business information for the purpose of updating the list. 	
Certified Energy Auditor	Each Certified Energy Auditor shall be eligible to conduct the energy audit activities in SME industry or the designated consumers, during their voluntary phase in such manner as may be prescribed by defining law	Energy Audit Regulations

4.5. Client

It is an end-use sector for energy consumption and orders the auditing work. If target groups are not informed about certain incentives they will not use them. Smaller target groups can be addressed by face-to-face meetings, presentations and specific events.

- It is the responsibility of the Clients to report to the administrator via the auditors, as and when such as requirement is specified by the administrator.

It is recommended that stakeholder consultations with clients be carried out every 5 years for incorporating industry feedback into key processes

5. Way Forward

As per our discussions with stakeholders and secondary research, The Nigerian market for energy efficiency is at a very nascent stage. This Training the Trainers programme for energy auditors will allow to establish a self-sustaining market for energy efficiency in Nigeria.

For kickstarting the energy efficiency market, CTCN is supporting Nigeria in creating manpower capable of conducting energy efficiency assessments across demands sectors of the country. This is being established through trainings and certification programs for energy auditors and energy managers in the country. The proposed nodal body overlooking the training and certification programs for energy managers and energy auditors will be formed under the ambit of the in-draft stage The National Energy Efficiency and Conservation Bill of Nigeria. The proposed National Energy Efficiency and Conservation Bill shall help in designating ECN as the nodal agency for energy efficiency in Nigeria, which shall support in in development of the energy management program

The first steps for the development of the energy management program will be formulation of program goals in preparation of the institutional framework, which is useful in defining the scope, resource requirement (including human resource for implementation and management), budget and monitoring program performance. The target setting is the basis for promotional activities and also useful to estimate the required budget for subsidies. Developing curriculum of energy auditor certification and training program will follow through.

The steps thereafter for development and establishment of energy management program in Nigeria shall be taken up based on the country's requirements by Federal Government of Nigeria.

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