Consolidated Survey Data

Technical Assistance for National Certification Scheme for Energy Auditors/Managers in Pakistan

Submitted to:

Climate Technology Centre and Network

United Nations Industrial Development Organization

Submitted by:

The Energy and Resources Institute

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We are also extremely thankful to NEECA for providing complete support, guidance and cooperation in execution of this Technical Assistance program.

We will be happy to provide any further clarifications, if required.

Abbreviations

AFBC	Atmospheric Fluidized Bed Combustion
APCMA	All Pakistan Cement Manufacturers Association
CFBC	Circulating Fluidized Bed Combustion
DISCO	Distribution Company
IFC	International Finance Corporation
kCal/kg	Kilo Calorie per kilogram
kCal/kWh	Kilo calorie per Kilowatt hour
kJ/kg	Kilo Joule per kilogram
Mtoe	Metric Tonnes of Oil Equivalent
NEECA	National Energy Efficiency and Conservation Authority
PKR	Pakistani Rupees
Toe	Tonnes of Oil Equivalent
ToT	Training of Trainer
WHR	Waste Heat Recovery

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Executive Summary

The National Energy Efficiency and Conservation Act 2016, paves the way for energy conservation and efficient use of energy in Pakistan. The legislation has provided a legal basis to enforce necessary measures for efficient use and conservation of energy in the country in all sectors of the economy, in coordination with the relevant Provincial Departments.

As per the act, the National Energy Efficiency and Conservation Authority (NEECA) is mandated to carry out energy audits either by itself or by directing any certified or designated energy auditor for the designated consumers. In this context, NEECA, as the CTCN request proponent, had requested CTCN's support for developing the national certification scheme for energy auditors and managers including the preparation of draft rules and regulations required for making the certification scheme effective. The objectives of this technical assistance are:

1. Identification of designated consumers based on the definition and engagement of energy user classes for industries;
2. Guidelines on the eligibility and accreditation process;
3. Revision and finalization of draft guidelines, syllabus, and course modules including the development of model question banks for examination processes;
4. Organization and delivery of a two weeks Training of Trainer (ToT) programme; and
5. Review and finalization of draft regulations to support implementation roles as defined in National Certification Scheme.

It is estimated that savings of around US$ 5 billion per year and 42ktonnes per annum of carbon dioxide can be achieved through energy efficiency activities in Pakistan. The certification scheme will also create a pool of energy managers and auditors with relevant skill sets for identification of energy conservation opportunities.

Out of the above objectives, first objective, identification of designated consumers based on the definition and engagement of energy user classes for industries has been completed. Deliverable 2.2 details the outcome of industrial survey, challenges faced and alternate methodology adopted for arriving at individual industry's energy consumption figures.

1 Industrial survey in identified energy user class

On the basis of secondary energy consumption and economic data, five energy intensive sectors were identified for identification of designated consumers. For these five sectors, detailed survey questionnaires were developed. In addition a sixth questionnaire, more generic in nature was also developed. The developed sector specific questionnaires along with a forwarding letter from NEECA were shared with various industrial associations and individual industries. (Sector specific questionnaire is provided as annexure 1.1 to 1.6 in deliverable 2.1 and NEECA letter is provided as annexure 1 in deliverable 2.2).

As per the Monitoring and Evaluation plan, total of 100 industries are to be notified as designated consumers. Thus, for conducting the survey, attempts were made to reach minimum 50% of all the industries in each sector. Table 1.1 below gives a summary of the sector-wise industries contacted for carrying out the survey

Table 1.1: Summary of the survey process

Sl. No.	List of Sectors	No. of industries contacted	Total industries	Percentage Coverage
1	Cement Industry	14	25	56%
2	Textile Industry	329	329	100%
3	Paper & Pulp Industry	24	24	100%
4	Power Plant	28	49	57%
5	Steel Mills	21	21	100%
6	Sugar Mills	83	83	100%
7	Industry Associations	38	38	100%
Total		537	570	94%

Contact details of the industries and industrial association were shared by NEECA. From table above, it can be seen that a total of 537 emails were sent out to various associations and industries requesting them to respond to the survey questionnaires. But even after rigorous follow-ups over 12 weeks period, both telephonic and via emails, only 6 industries responded. Table 1.2 below, shows the sector-wise number of responses obtained.

Table 1.2: Sector wise number of responses obtained

Sl. No.	List of Sectors	No. of Emails Sent	Data Received	Percentage of Response
1	Cement Industry	14	02	14.0%
2	Textile Industry	329	01	0.3%
3	Paper & Pulp Industry	24	00	0.0%
4	Power Plant	28	01	4.0%
5	Steel Mills	21	00	0.0%
6	Sugar Mills	83	02	2.4%
7	Industry Associations	38	00	0.0%
Total		537	06	1.0%

The poor response from industries was due to their reluctance to share data which they deemed confidential. In the absence of any existing regulation mandating industries to

share their energy consumption data, the participation of industries was very dismal. The same was highlighted to NEECA (Minutes of meeting attached as annexure 2) and meetings were organised between NEECA, PITCO (local partner based out of Pakistan) and various industrial associations. But even after further follow ups, no responses were received from the industries. Evidently, there is a requirement for creating awareness about energy efficiency in industrial sector. The benefits to be accrued by participation in the National Certification Scheme as a Designated Consumer need to be properly understood by industries. Proper dissemination of knowledge and information is required for creating awareness about energy efficiency.

After discussion with NEECA, as an alternate approach, it was decided to rely on data available in Pakistan Energy Yearbook and with industrial associations. NEECA also provided a list of major electricity and gas consumers (from DISCOs and Gas Supply companies) along with consumption data. Data from above sources was available only for three sectors, namely:

- Thermal Power Plants
- Cement Plants
- Textile Plants

These sectors also constitute 77% of total number of industries, 79% of energy consumption in industries and power generation sector and more than 30% of women workforce are employed in these sectors.

1. Thermal Power Plants:

For thermal power plants, annual energy consumption data was derived either from gas utility company data or from Pakistan Energy Yearbook 2018. (Details of the methodology are given in deliverable 2.1.) An analysis of thermal power plants in Pakistan (both government owned and private) shows that mostly gas and furnace oil based power plants are in operation. There is large variation in individual unit capacity as well as type of technology. It was observed that open cycle plants have an operating efficiency of around 25%, whereas for large capacity combined cycle plants efficiency is in the range of 45% to 47%. Moreover variation was also observed in the auxiliary power consumption of individual units mainly owing to low plant load factors. It was observed that few plants commissioned in 1965-66 are still in operation. Though technology upgradation has been taken up for few units, significant potential for energy conservation by upgradation still exists.

Only 3 coal based power plants were in operation in Pakistan in 2018. For coal based power plants, parameters such as boiler design pressure, type of re-heaters, boiler technology type (CFBC/AFBC) etc. will contribute to the variation in heat rate. Significant scope exists for energy conservation by up-grading to super critical and ultra-super critical technology. The projected power generation capacity (by Ministry of Energy) in Pakistan by 2030 will be around 101,325MW, of which 16% will be from coal based power plants. Thus energy efficiency in coal based power plants will provide substantial scope for energy cost savings.

As mentioned in deliverable 2.1, out of 49 thermal power plants in Pakistan, 40 plants have been identified with annual energy consumption above 50,000 Mtoe (finalized threshold value) and qualify as potential designated consumers.

2. Cement Plants:

For cement plants, production data available with All Pakistan Cement Association (APCMA) was used to arrive at the annual energy consumption figure. (Details of the methodology are given in deliverable 2.1.). After textile, cement is the second major export of Pakistan. In recent years, Pakistan cement plants have carried out substantial capacity addition and 14 out of 25 industries have also invested in waste heat recovery systems. In cement plants, scope for energy conservation exists in installation of latest generation clinker coolers with 60% - 65% efficiency, upgrading ball mills to vertical roller mills, introducing additional roller press for cement mills, using multi fuel burners and oxy fuel combustion and utilization of Refuse Derived Fuel to substitute part of coal consumption. As per International Finance Corporation (2014 report), 56,760 Mtoe energy saving potential amounting to 6930 million PKR exists in Pakistan's cement sector.

As mentioned in deliverable 2.1, out of 25 cement plants in Pakistan, 23 plants have been identified with annual energy consumption of above 50,000 Mtoe (finalized threshold value) and qualify as potential designated consumers.

3. Textile Plants:

For textile sector, electricity and gas consumption data, provided by NEECA (obtained from gas supply companies and DISCOs) was used to arrive at the annual energy consumption data. Textile products are the main export for Pakistan. According to IFC report, energy shortages and rising energy prices are driving textile sector to reduce energy consumption on voluntary basis. In addition, inability to timely modernize equipment has increased cost of production in Pakistan as compared to India, Bangladesh and China. An IFC funded study "Sustainable Growth: Cleaner Production in Pakistan" by National Productivity Organization found that textile sector offers highest gains from energy efficiency projects with energy saving potential of 2150GWh and cost savings of over 4 billion PKR. In textile sector, sizeable reduction in energy consumption can be achieved by investing in energy efficient motors, energy efficient spindles, installation of variable frequency drives, reduction in air leakages etc.

As mentioned in deliverable 2.1, out of 135 textile units in Pakistan, 71 units have been identified with annual energy consumption of above 5,000 Mtoe (finalized threshold value) and qualify as potential designated consumers.

1.1 Finalization of threshold annual energy consumption:

On the basis of annual energy consumption data for cement plants, thermal power plants and textile plants, threshold annual energy consumption was fixed. Detailed methodology for finalisation of threshold annual energy consumption is given in Deliverable 2.1. The finalized threshold annual energy consumption to qualify as designated consumer is:

Thermal Power Plants: 50,000 Mtoe

Cement Plants:	50,000 Mtoe
Textile Plants:	5,000 Mtoe

Thermal power plants, cement industries and textile units having annual energy consumption higher than above mentioned figures qualify as Designated Consumers.

2 Stakeholder Consultation Workshop

A Stakeholder Consultation Workshop was conducted on 7th Aug 2019, in Islamabad to discuss the above mentioned sector wise threshold annual energy consumption values. Representatives from all three sectors (thermal power plant, cement and textile sector) participated in the stakeholder consultation workshop. (List of participants is given in Annexure 4). A total of 54 professionals participated in the workshop. Around 8% of participants were women. (As per World Bank blog, around 4.9% women hold engineering supervisory roles in Pakistan) A brief of the industrial participants is given in table 1.3.

Table 1.3: Summary of Stakeholder Consultation Workshop Participants

Sector	Industries Participating
Thermal Power Plant Sector	KAPCO group
	SAIF group
Cement Sector	Bestway Cement
	Cherat Cement
Textile Sector	Kamal Ltd
	Artistic Fibre Mills
	STIL
	Artistic Fabrics
	SAIF group

In addition to above mentioned industry participants, representatives from different government departments, gas utility company, engineering colleges, funding agencies and freelance consultants also participated in the workshop.

The methodology along with the threshold values were accepted by the participants.

Some of the points raised by the participants are listed below:

- *Expertise development of the certified energy auditors for carrying out audits in different sectors like cement, thermal power plants etc:* The participants were informed that sector specific energy audit training will be provided by international experts during the training program for energy auditors. In addition, one of the guidebooks being developed for the certification scheme deals solely with sector specific energy audits.

- *Benchmarks depending on the product type and technologies:* The participants were informed that under the scheme, benchmarking is done by comparing the present technology used by each industry and its gap to the performance of best industry using the latest technology available for a particular product in a particular sector. The timeline to achieve the best benchmark among similar product manufacturing units may be spread over few years considering the investment and expansion plans.

The queries and suggestions put forth by the stakeholders are being incorporated while developing the guidebooks and materials for training of trainer programme.

The finalized threshold values have been arrived at on the basis of secondary data from Pakistan Energy Yearbook, APCMA, Gas supply companies and DISCOs. Once the National Certification Scheme is in place and annual energy consumption data is submitted by designated consumers, the above figures can be revised if changes in threshold values are required for bringing in more industries under ambit of the scheme.

Annexures

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Annexure 1: Forwarding letter from NEECA for carrying out survey

GOVERNMENT OF PAKISTAN
MINISTRY OF ENERGY (POWER DIVISION)
NATIONAL ENERGY EFFICIENCY & CONSERVATION AUTHORITY
ENERCON Building, G-5/2, Islamabad, Pakistan
www.neeca.gov.pk

NEECA

No. NEECA/NCEM/2019 Islamabad February 25, 2019

Dear Sir

Subject: **Industrial Energy Efficiency Survey**

In order to achieve the vital and challenging mandate of energy efficiency and conservation in all sectors of economy, a need was felt to introduce a credible law – which has now been provided through the National Energy Efficiency and Conservation Act 2016.

2. Subsequently, the National Energy Efficiency & Conservation Authority (NEECA) erstwhile known as (ENERCON) has been established under Ministry of Energy-Power Division (Former Ministry of Water & Power) to cover the whole spectrum of activities as specified in the aforementioned Act, starting from identification of energy efficiency and conservation opportunities and including technology demonstration, undertaking pilot projects, information and outreach, training and education, and development of plans and policies for promoting mitigation, energy efficiency and conservation best practices.

3. In pursuance of its mandate, NEECA started compiling information and statistics on various aspects of energy conservation which will be essential input into its work program and integrated energy planning activity, a questionnaire was earlier sent in this regard. This effort needs to include various industry associations and groups which represent most if not all of the industries and manufacturers of specific products, equipment, appliances and machinery.

4. NEECA with the support from the United Nations Climate Technology Center and Network (CTCN) through technical assistance from the consortium of The Energy and Resources Institute (TERI) and PITCO (Private) Limited is developing a National Certification Scheme for Energy Managers/Auditors. As part of the assignment, the consortium will collect data pertaining to general information, energy consumption and production from the energy intensive industries by using the modified version of questionnaires sent earlier.

5. The questionnaire requires mainly generic information and can therefore be completed in a short period of time. The aforementioned consortium will compile and consolidate the information provided by you and will use it solely for official purposes related to the work program of NEECA. If you have any questions about the work we are undertaking or the information we are requesting you to provide, please feel free to contact the Mr.Qazi Sabir at xxxxxx email:xxxxxx for any clarification purposes at your convenience.

Asad Mahmood
Manager Technical-ECF

Annexure 2: Minutes of Meeting of skype call with NEECA and PITCO regarding use of alternate methodology for defining energy user class

Minutes of Meeting

Date: 17.04.19

Participants:

TERI:	PITCO	NEECA
Mr. D. Ramesh	Mr.Qazi Sabir	Mr. Asad Mahmood
Mr. C.Vijayakumar		
Ms. Sabreen Ahmed		

Agenda: To update on the status of the survey

The skype call started at 2:30PM.

Based on the feedback received from PITCO, even after repeated follow-ups, only 6 industries out of 500+ industries (with whom survey questionnaires have been shared) have responded to the survey questionnaire. Considering the high reluctance of industries in sharing data, it was decided to adopt alternate methodology to obtain industry wise energy consumption figures. NEECA has already received annual electricity consumption figures of 100 industries from DISCOs. This will be very useful in arriving at annual energy consumption figures. As discussed during previous skype calls, the conversion factor mentioned in appendix 7.4 of Pakistan Energy Yearbook can be used to convert the electricity consumed from grid (in kWh) to mtoe. TERI suggested that Ministry of Energy (Petroleum Division and Coal Division) can be contacted by NEECA to obtain the industry-wise thermal energy consumption figures. Mr. Asad will be contacting the Ministry of Energy for the figures.

TERI had also discussed with PITCO regarding any prevalent energy conservation awards or availability of industry-wise sustainability report. PITCO clarified that such energy conservation awards are not in place and sustainability reports are not published by all industries.

TERI mentioned that in worst case scenario, if bottom up approach and a mix of both top down and bottom up approach fails, the only option left would be to go for an entirely top down approach. TERI has already shared international and regional (Indian) sector specific benchmark figures with NEECA and PITCO. Using the annual production figures and type of technology used, annual energy consumption will be back-calculated by considering Specific Energy Consumption (SEC) figures for Best Available Technology. Mr. Asad reiterated that this approach should be adopted only in worst case scenario.

To improve industry participation, TERI requested that the stakeholder consultation meeting needs to be held at the earliest. It will create awareness among industries and industrial associations and might generate a better response. The methodology for finalizing the energy user classes along with the rules and regulations reviewed by TERI under deliverable 3 and 6 can be discussed with relevant stakeholders during the consultation meeting.

PITCO suggested that both NEECA and PITCO should hold meetings with the relevant Lahore based industrial associations during last week of April to apprise them of benefits of the project and seek their help in getting the data from their member industries. International and regional (Indian) sector specific benchmark figures developed by TERI may also be discussed with the associations to give them an idea about the overall objective of the data gathering process and find out if they have any SEC numbers (rough/ballpark figures) readily available with them.

Mr. Asad said that he will check with PEECA whether they can invite all the relevant industrial associations to their office so that we may have their inputs/feedback in a single session.

TERI also discussed a few points mentioned by senior energy expert Mr. K.K. Chakarvarty. Points are summarized below:

- Whether and draft regulations are available with NEECA for notification of Designated Consumers
  NEECA's response: Draft regulations are not available. Same needs to be worked on.
- NEECA can also consider engaging engineers on contractual basis for each energy intensive sector
- As mentioned in earlier feedbacks, it is highly recommended to have only two committees; Management Advisory Committee, headed by Secretary of the Ministry to whom NEECA reports and Policy Advisory Committee, headed by MD, NEECA. This has been a hugely successful model in India and will definitely aid NEECA in its future operations.
  NEECA's response: The feedbacks are appreciated and NEECA will look into it.

TERI informed NEECA and PITCO that it has started work on the course material and guide books. Mr. Asad requested to include topics like energy management system which are important constituents of Industry 4.0.

Annexure 3: Agenda for Stakeholder Consultation Workshop

Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/ Energy Managers with UN- CTCN Support in Pakistan

August 7th, 2019- Kehkeshan-1, Serena Hotel, Islamabad

AGENDA & SESSION PLAN

09:30 - 10:00	Arrival of participants and registration
10:00 - 10:05	Recitation of the Holy Quran & Round of Introduction
10:05 - 10:10	Welcome Remarks by MD NEECA
10:10 - 10:25	Remarks by Mr. Nadeem Babar Special Assistant to Prime Minister, Ministry of Energy Petroleum Division
10:25 - 10:45	Overview of NEECA Act and CTCN Project Components
10.45 – 11.00	Tea Break
11:00 - 11:30	Presentation on Selection Criteria of Designated Energy Consumers and Salient Aspects of the Scheme
11.30 – 13.00	Sectoral Presentation(s)/Discussion/Q&A
13:00 - 13:05	Vote of Thanks
13:05	Lunch

Annexure 4: Minutes of Meeting of Stakeholder Consultation Workshop

Date: 07 August 2019
Venue: Serena Hotel Islamabad (Kehkeshan-I Hall)

The workshop officially started at around 10:00 am. Center stage was shared by the following persons;

- Mr. Nadeem A Babar (Advisor to Prime Minister on Energy)
- Mr. Sajjad Haider Yaldram (Joint Secretory Development, Ministry of Energy Government of Pakistan)
- Mr. Saadullah Ayaz (National Programme Coordinator, UNDP/Ministry of Climate Change)
- Mr. Irfan Yousaf (Director CDM, Alternate Energy Development Board (AEDB))
- Mr. Ateeq ur Rehman (Director General, PNAC)
- Mr. Asghar Nizam (Joint Director, OGRA)

Mr. Asad Mahmood Manager Technical from NEECA gave the welcome remarks. Furthermore, he delivered a detailed presentation on the project, its key features and how it will help the industries in future.

Mr. Nadeem A Babar (Advisor to Prime Minister on Energy) addressed the participants in which he appreciated the project idea and emphasized that energy efficiency is necessary for all sectors in Pakistan, especially for industrial sector. He also said that energy efficiency can only be achieved through change in attitude towards energy use which is a gradual process. After his address, Mr. Qazi Sabir from PITCO presented the methodology regarding identification of designated consumers for Textile, Cement and Power Plant sectors.

After the tea break and networking session, Mr. Ghulam Yasin (Deputy General Manager, Bestway Cement) gave his presentation on energy conservation measures already implemented at bestway cement. He shared experiences of Bestway cement regarding process optimization through latest technologies, such as waste heat recovery systems, water savings through rainwater harvesting pounds, etc.

This was followed by the presentation of Mr. Abdul Wahab on energy efficiency measures implemented at KAPCO. He also shared what are the normal energy efficiency techniques for combined cycle power plants. such as cooling towers, improvement of heat rates of GTs through maintenance procedures, etc.

After that Mr. Irteza Bukhari Head Quality Assurance from Frontier Foundry presented his company profile and experience of energy efficiency through efficient furnace. The first ever green furnace of Pakistan is installed at Frontier Foundry which uses less electricity and environment friendly. Other than that, they have implemented several other demand side managed activities such as smart air conditioning, LED lighting, Power factor improvements and 11 kV electricity distribution.

Mr. Kamran Asghar (Chief Engineer Serena Hotel, Islamabad) shared his experiences regarding building efficiency measures implemented at Serena Hotels Islamabad. He further said that, in less than 3 years, they have managed to reduce energy demand to 30% and they are planning to further reduce it to 50% through efficient monitoring and demand side management. The company is also planning to implement ISO 5001 Energy management system.

Ms. Jamie, Regional Manager Asia Pacific CTCN, spoke about positive impact of similar technical assistance projects implemented in other countries, need for co-operation from the industries for successful implementation and provided the concluding remarks to end the session.

Annexure 5: List of participants in Stakeholder Consultation Workshop

Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/Managers in Pakistan

Venue: Kehkeshan Hall-1, Serena Hotel, Islamabad **Date: August 07, 2019**

Sr.#	Name of Participant	Organization	Designation	Contact No/Email
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Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/Managers in Pakistan

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UNEP CTCN CLIMATE TECHNOLOGY CENTRE & NETWORK NEECA

Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/Managers in Pakistan

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31	Muhammad Rabnawaz	NEECA	Finance Officer	0334-5009033
32	M Afzal	NEECA	NA	0303-0056090

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Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/Managers in Pakistan

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Stakeholders Consultative Workshop on National Certification Scheme for Energy Auditors/Managers in Pakistan

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Annexure 6: Photographs of Stakeholder Consultation Workshop


CTCN
NESCA