Closure Report

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

4th Main, 2nd Cross

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March 2021

Technical Assistance Closure Report

1. Basic information

Title of response plan	**National Certification Scheme for Energy Auditors in Pakistan**
Technical assistance reference number	**2017000005**
Country / countries	**Pakistan**
NDE organisation	**Ministry of Climate Change**
NDE focal point	**Mr. Muhammad Irfan Tariq, Director General (Environment)**
NDE contact information	mirfantariq@gmail.com
Proponent focal point and organisation	*Mr Asad Mahmood, Technical Unit Head, National Energy Efficiency and Conservation Authority (NEECA), asad.mahmood@gmail.com*
Designer of the response plan	*CTCN*
Implementer(s) of technical assistance	*The Energy and Resources Institute (TERI)*
Beneficiaries	*NEECA*
Sector(s) addressed	1. *Energy Efficiency* 2. *Industry*
Technologies supported	1. *Energy Efficiency* i. *Appliance and equipment – Lighting* ii. *Buildings – Efficient air conditioning system* 2. *Industry* i. *Construction – Cement production* ii. *Manufacturing industry - Machinery* iii. *Mitigation in textile industry* iv. *Mitigation in pulp and paper industry* v. *Conventional power plant efficiency*
Implementation start date	*28.12.2018*
Implementation end date	*31.03.2021*
Total budget for implementation	*US$ 103,569*
Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the	1. *Notification of designated consumers* i. Finalizing the methodology for defining the energy user class for industries. ii. Preparation of questionnaire (in English) and use of same for carrying out survey be NEECA in

original response plan and refer to it as appropriate	various user classes. iii. Analysis of data obtained through questionnaire survey iv. The designated consumers for each section of energy user class will be identified on account of their minimum annual energy consumption, their share in total energy use in Pakistan, their contribution to the national gross domestic product (GDP) etc. v. Notification of designated consumers through awareness raising and stakeholder engagement meetings 2. *Guidelines for accreditation and appointment of evaluators and professionals* i. Finalization of draft guidelines for the accreditation of Energy Auditors and Managers ii. Finalization of draft guidelines on eligibility criteria for the energy auditors and managers iii. Preparation of guidelines for appointment of evaluators and professionals for assessment of Energy Auditor/Energy Manager examinations 3. *Syllabus, course materials, guide books and question banks for the accreditation* i. Design of syllabus for conducting Energy Auditor/ Energy Manager examination ii. Design of course material, guide books, model question banks 4. *Training of relevant professionals* i. Developing relevant training material based on the course material and guide books ii. Conducting a Training of the Trainer (2 week program) 5. *Draft regulations to support implementation roles as defined in National Certification Scheme* i. Finalization of draft regulations on appointment of Energy Managers by Designated Consumers ii. Finalization of draft regulations on frequency, manner, conduct and reporting of energy audits by Designated Consumers *iii.* Finalization of draft regulation on accreditation and review of Energy Audit firms

Methodologies applied to produce outputs and products	1. Secondary data analysis 2. Survey of industries in energy intensives sectors 3. Stakeholder consultation workshop 4. One-to one meetings with industrial associations 5. Online Training of Trainer Programme
Reference to knowledge resources	No UNFCCC TEC knowledge products were used
Deviations	1. Identification of potential designated consumers through online survey was not feasible due to reluctance of industries in sharing data which they deemed confidential. Hence, identification of potential designated consumers was carried out on the basis of reliable secondary data. Fast tracking gazette notification of rules, regulations and guidelines for designated consumers under Energy Conservation Act will ensure mandatory reporting of data to provincial Government departments and assist physical surveys in future. 2. Due to Covid-19 pandemic, the Training of Trainer Programme was organized online. This however ensured that the number of participants trained was increased from 20 (as envisaged in the Terms of reference) to 80
Anticipated follow-up activities and next steps	1. Submission of draft rules, regulations and guidelines developed by the CTCN to cabinet/parliament committee for approval and getting in notified in Gazette. 2. Notification of potential designated consumers in energy intensive industrial sectors identified in CTCN TA project 3. Dissemination of guidebooks, course materials and question banks developed for the National Certification Scheme for Energy Auditors and Managers by the CTCN 4. Follow up on outcome of Phase 2 and Phase 3 of Training of Trainers programme conducted by NEECA and documenting results achieved such as list of participants, identified through the Training of Trainer Programme organized by CTCN in phase 1, who cleared all three phases and became eligible to be empaneled trainers by NEECA, for conducting further training of energy auditors and managers.

2. Lessons learned

	Lessons learned	Recommendations
Lessons learned from the CTCN TA process	Data availability and access with regards to individual industries was a challenge. Physical data collection at more than 500 industries may provide correct and relevant primary data but needs additional resources such as man power, time, funds, etc. Online Training Programmes help in increasing outreach but have the inherent disadvantage of the lack of physical presence. This was overcome by conducting the capacity building and selection of suitable trainers for empanelment in a phased manner. As physical presence was not possible, detailed test/examinations were conducted along with online interviews for selecting the qualified trainers	Mandating online annual data sharing with NEECA, with use of excel sheets developed under TA, after notification of rules and regulations for designated consumers. For online training programme, phased manner of training can be taken up and onsite visit to one or two relevant industries will enhance practical understanding of participants especially those from academia
Lessons learned related to climate technology transfer	The technologies supported by the TA are mainly in energy efficiency and industry sector. The CTCN TA has been able to build capacity of energy professionals to carryout mitigation efforts in the textile, cement, conventional power plant and pulp and paper sectors. The response plan assumed a significant part of data collection (survey in industries) to be carried out by the project proponent. But lack of resources with project proponent required reallocation of activities and adoption of alternate methodology.	After successful implementation of the TA in three main industrial sectors, the activity should be expanded to cover more industries and sectors such as buildings. Project proponent can involve or take support of respective industrial associations and provincial government agencies or create nodal agencies at different provincial governments to carry out physical surveys and annual data collection from industries for identification of designated consumers. Government should also conduct dedicated awareness programs and campaigns to sensitize industries about the aim, target and benefits achievable.

3. Illustration of the TA and photos

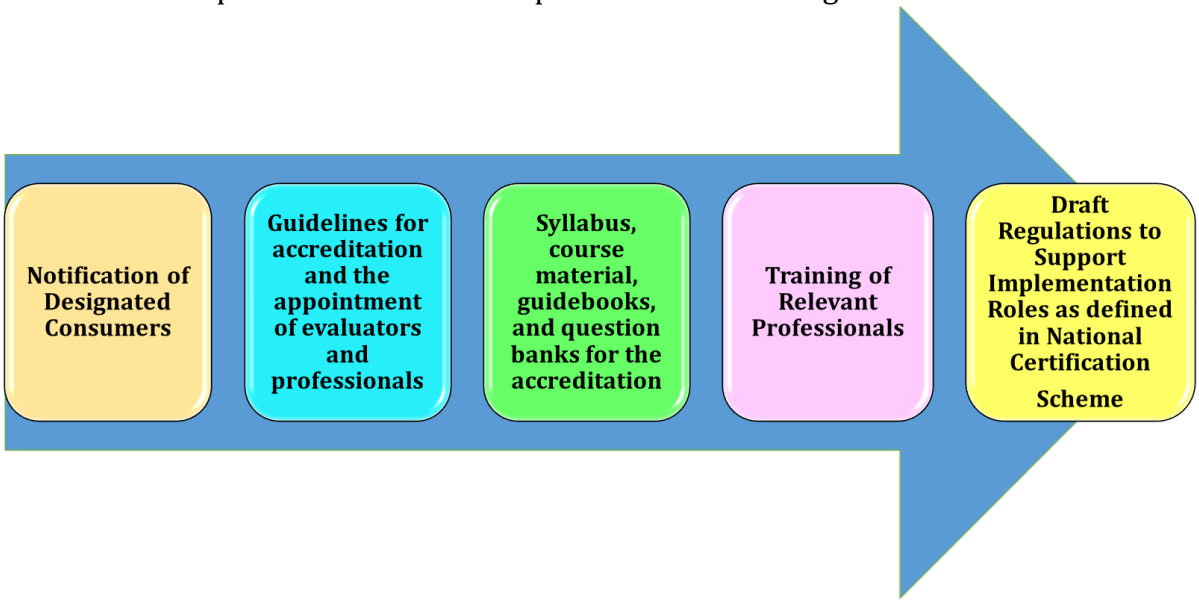
Objectives of the TA

The overall objective of the technical assistance is to

- To develop the national certification scheme for energy auditors and managers including the preparation of draft rules and regulations required for making the certification scheme effective.
- To support the Government of Pakistan, through NEECA, to implement a sustainable system for training and certifying energy auditors as a contribution to the implementation of the National Energy Efficiency and Conservation Act, 2016.

The focus of the certification scheme is on energy intensive industries and buildings. The implementation of the certification scheme will contribute in overall reduction in CO2 emission from highly energy consuming sectors and the adoption of national certification scheme will potentially lead to market transformation in the energy efficiency and conservation sector.
Pakistan has already notified the Energy Conservation Building Code. In the course materials prepared for National Certification Scheme, ECBC was covered along with Air conditioning systems, various electrical equipment (pumps, fans, blowers, electric motors, electrical systems) and lighting, which forms the major load in commercial buildings, are covered.
With reference to Pakistan Energy Year Book 2018, commercial buildings cover only 1.1% of total primary energy consumption (3.6% of final energy consumption) among various sectors while power generation (Thermal Power Plants) consume 28.5% and industrial sector consume 26.8% of primary energy respectively. After multiple round of discussions, Project proponent agreed that buildings will be covered in subsequent phase of notifying designated consumers.

The various outputs from the TA are represented in below figure.



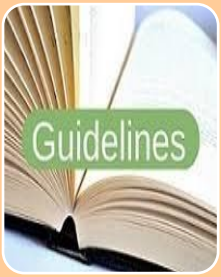
Methodology and Deliverables:

1. Preparation of implementation plan and communication Documents

- Detailed work plan
- Monitoring and Evaluation plan
- CTCN Impact Description
- Closure and data collection report

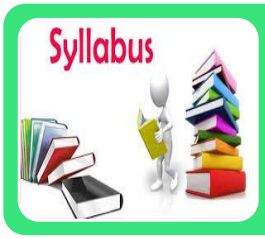
2. Notification of Designated Consumers

- Methodology for defining the energy user class and questionnaire for carrying out the survey
- Consolidated surveyed data
- List of designated consumer to be notified



3. Guidelines for accreditation and the appointment of evaluators and professionals

- Report of the consultative meeting to agree on guidelines
- Guidelines for accreditation of Energy Auditors and Managers and eligibility criteria for the energy auditors and managers
- Guideline(s) for appointment of evaluators and professionals for assessment of EA/EM examinations



4. Syllabus, course material, guidebooks, and question banks for the accreditation

- GuidelinesDesign of syllabus for conduct of examinations
- Design of course material, guide books, model question banks

5. Training of Relevant Professionals

- Developing relevant training material based on course material and guide books and Conducting a Training of the Trainer (2 week programme)

6. Draft Regulations to Support Implementation Roles as defined in National Certification Scheme

- Draft regulations on appointment of Energy
- Managers by Designated Consumers

Stakeholder Consultation Workshop

A methodology for defining the energy user classes for industries (based on secondary energy consumption data, economic data etc.) was prepared based on best practices adopted by other countries and the guidelines developed by UN Environment. Stakeholder consultation workshop was conducted in August 2019 to finalize the methodology in consultation with the request proponent (NEECA) and other relevant national stakeholders.

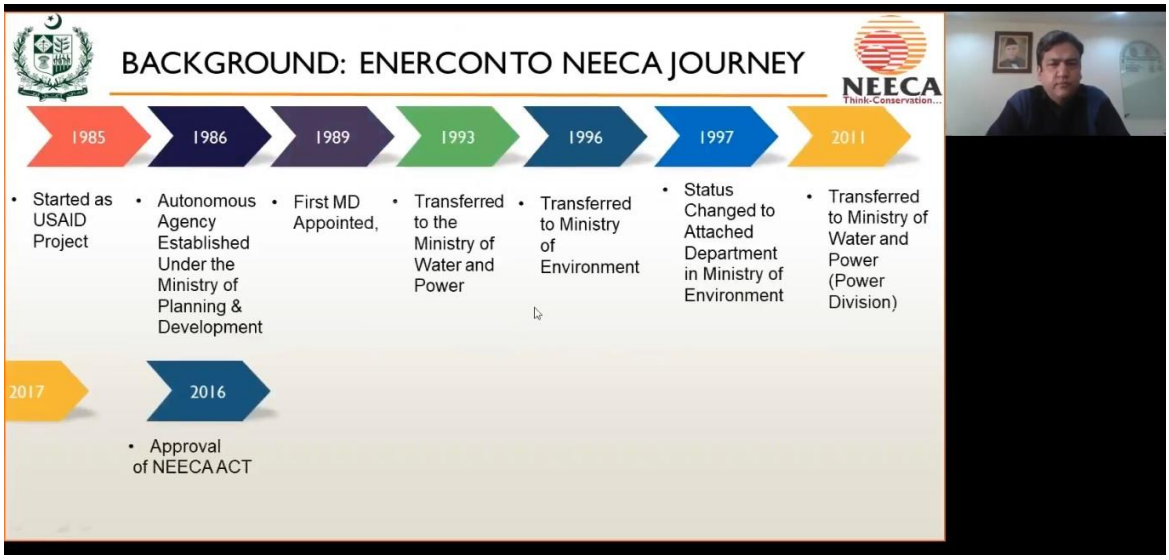
Pictures from Stakeholder Workshop

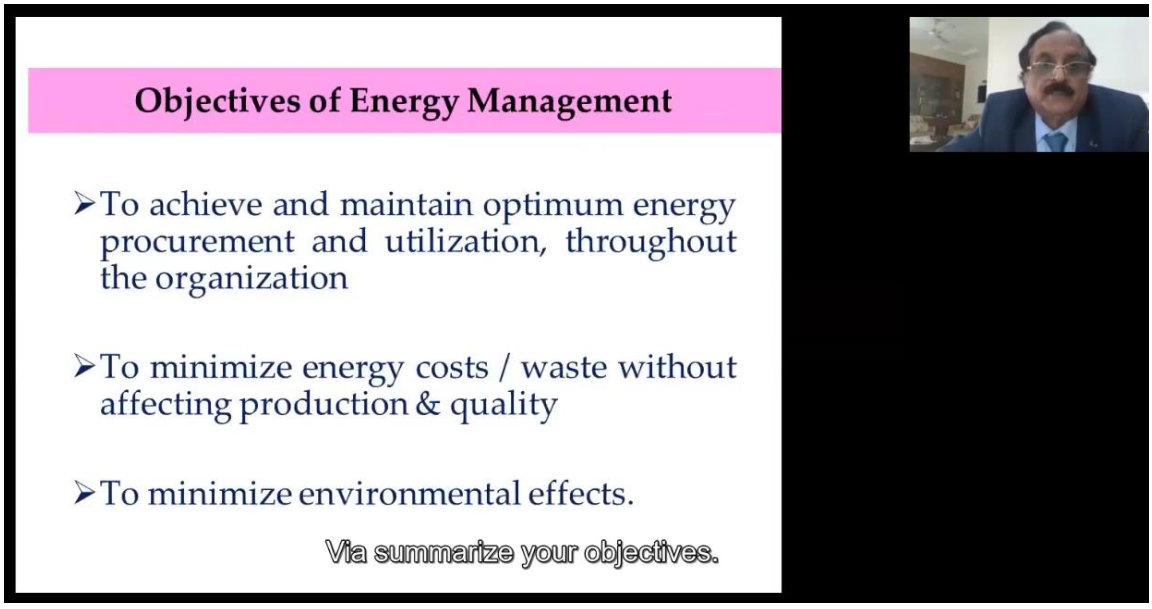
Training of Trainers Programme

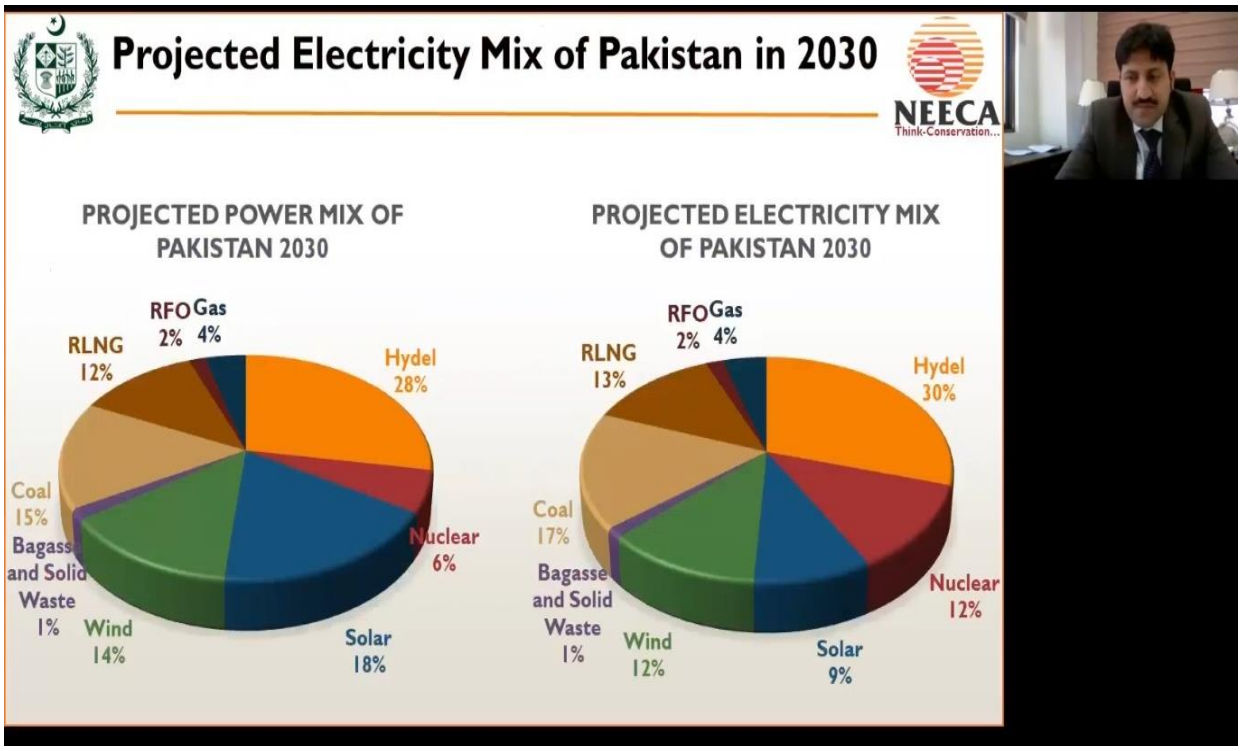
For the successful implementation of this certification scheme, a perquisite is to have a pool of trained trainers, who in turn are able to provide capacity building training to future energy auditors and managers. To develop this pool of trainers, a Training of Trainer Programme was conducted as a series of webinars from 14th to 19th December 2020.

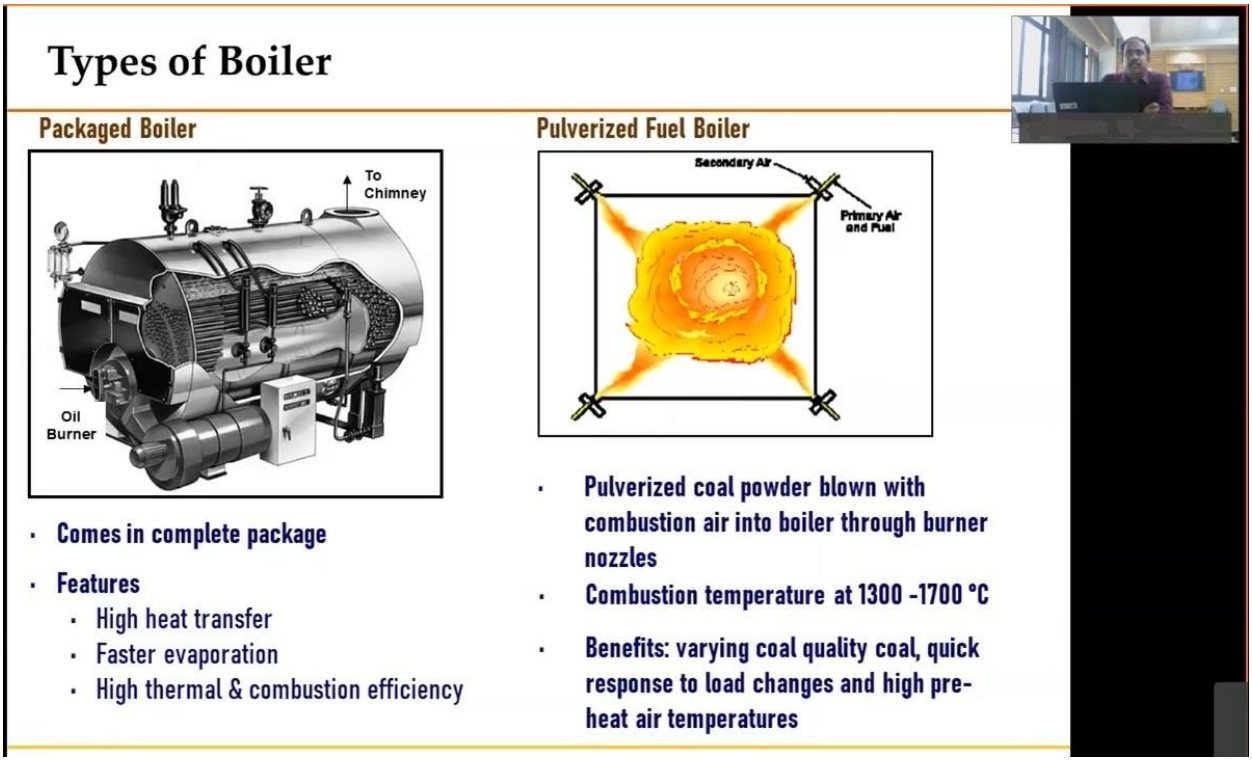
An online Training of Trainer Programme was conducted by TERI in collaboration with PITCO and NEECA from 14th to 19th of December 2020. The training focused on capacity building of trainers in Pakistan for the successful implementation of the National Certification Scheme for Energy Auditors and Managers. A total of 80 participants registered for the Training of Trainer Programme. The participants were from the academia, government organizations, energy consulting firms and industries.

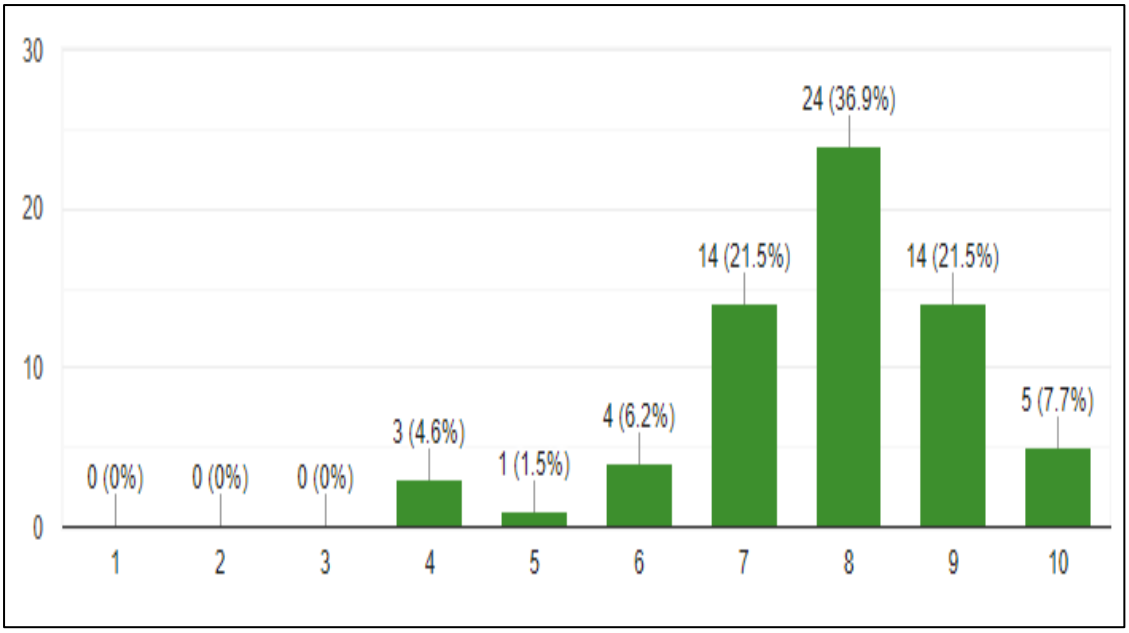
Pictures from Online Training of Trainer Programme:






Projected Electricity Mix of Pakistan in 2030
NEECA
Think-Conservation...
PROJECTED POWER MIX OF PAKISTAN 2030
RFO 2%
Gas 4%
RLNG 12%
Hydel 28%
Coal 15%
Bagass and Solid Waste 1%
Nuclear 6%
Wind 14%
Solar 18%
PROJECTED ELECTRICITY MIX OF PAKISTAN 2030
RFO 2%
Gas 4%
RLNG 13%
Hydel 30%
Coal 17%
Bagasse and Solid Waste 1%
Nuclear 12%
Wind 12%
Solar 9%


Types of Boiler
Packaged Boiler
To Chimney
Oil Burner
Comes in complete package
Features
High heat transfer
Faster evaporation
High thermal & combustion efficiency
Pulverized Fuel Boiler
Secondary Air
Primary Air and Fuel
Pulverized coal powder blown with combustion air into boiler through burner nozzles
Combustion temperature at 1300 -1700 °C
Benefits: varying coal quality coal, quick response to load changes and high pre-heat air temperatures



As seen from graph above, 66% of the participants gave an overall rating of 8 and above and almost 94% gave an overall rating of 6 and above.

4. Impact Statement

The information in the table below will be used to communicate results and anticipated impacts of this technical assistance publicly. Please copy information from impact statement developed in the M&E Plan and update as relevant.

Challenge	The National Energy Efficiency and Conservation Act of Pakistan was passed in 2016. As per the Act, authorities have to establish a certification mechanism for Energy Auditors/Managers. Energy audits would also become mandatory for designated consumers (energy intensive industries). Thus, NEECA requested handholding support from CTCN for developing, institutionalizing and executing National Certification Scheme for Energy Auditors and Managers.
CTCN Assistance	• Identification of potential designated consumers • Finalization of rules and regulation for the National Certification Scheme for Energy Auditors and Managers in line with the National Energy Efficiency and Conservation Act • Development of guidebooks for the certification scheme • Conducting Training of Trainer Programme
Anticipated impact	• The TA will help Pakistan in implementing the National Energy Efficiency and Conservation Act effectively and contribute substantially in savings through energy conservation measures in various sectors • Will foster job creation by generating a pool of energy auditors and managers
Co-benefits: Achieved or anticipated co-benefits from the TA	• Overall reduction in CO_2 emissions from highly energy intensive sectors • Aggregated energy savings will help the country to defer the need to install additional electricity generation capacity
Gender aspects of the TA	In addition to energy consumption and economic data, gender aspects were also taken into consideration for identification of designated consumers. Textile sector employs maximum percentage of women (30% of total work force). Women have shown interest in going for higher studies with specialization in textile sector. Hence, Textile sector was selected as one of the energy intensive sectors for identification of designated consumers. Improving energy efficiency in textile sector will reduce cost of production and improve global market share of textile products from Pakistan which helps in enhancing job opportunity for women. Classification of designated consumers and related regulations will help in • Providing equal opportunities for both genders in field of energy efficiency as energy auditors and compete for job opportunities created as energy auditors / managers in industries • Enhanced capacity through training will provide better economic opportunities for women

	• Number of women participants was only 5% in the training of trainer programme. Federal and Provincial Governments of Pakistan should adapt Gender mainstreaming framework in energy value chain developed by CTCN and encourage equal representation of both genders under SDG 7.
Anticipated contribution to NDC	• The TA will create a basis at the national level for conducting energy audits and identifying and implementing energy conservation measures • Capacity building of public sector for promoting, regulating and monitoring energy efficiency.
The narrative story	Pakistan's Ministry of Climate Change requested for technical assistance through CTCN for developing, institutionalizing and implementing the National Certification Scheme for Energy Auditors and Managers. CTCN assistance was aimed at identifying designated consumers in energy intensive industrial sectors, finalization of associated rules and guidelines, development of course materials for conducting the National Certification Examination for Energy Auditors and Managers and carrying out Training of Trainer Programme for developing a pool of trained manpower for capacity building of future energy auditors and managers. Through multiple stakeholder consultations and secondary data analysis, the potential designated consumers for energy intensive industrial sectors were identified and the necessary rules and guidelines were finalized. The relevant course materials were developed to match the local requirements. The online Training of Trainer Programme helped in accommodating more number of participants than targeted and improved their knowledge about energy efficiency and energy auditing. All training recordings have been shared with the project proponent. The CTCN assistance supports the strategy adopted by Pakistan's Nationally Determined Contributions as well as Pakistan's Vision 2025 document and aims to provide capacity building for energy efficiency professionals. After implementation of the TA, the Federal Government of Pakistan can mandate identified designated consumers to carry out energy audits by certified energy auditors / managers, set energy reduction targets, improve energy and water use efficiency, reduce carbon emissions, increase revenue generation and manufacture products in more greener way. This will also assist the Government of Pakistan to achieve its NDC target. It will encourage young professionals to undertake job opportunities in the field of energy efficiency and also contribute to their national cause.

Contribution to SDGs A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/	• **SDG 7, Ensure access to affordable, reliable, sustainable and modern energy for all**: Implementation of National Certification Scheme will improve energy use efficiency (through energy audits) and reduce energy consumption in various sectors. The energy saved can be used to provide energy to unserved community and contribute in universal access to affordable, reliable and modern energy services. • **SDG 8, Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**: The rolling out of the National Certification Scheme for Energy Auditors and Managers and subsequent use of those certified auditors and managers for energy audits will create and help in expanding productive employment. • **SDG 13, Take urgent action to combat climate change and its impact**: The National Certification Scheme and the regulations developed under the TA will support the implementation of the National Energy Efficiency and Conservation Act 2016 and will enhance the capacities to implement energy conservation measures in designated sectors.

Annex 1 Technical assistance data collection

A. Output and outcome indicators

Indicator	Quantitative value	Qualitative description
Total number of events organized by proponents and implementing partners	*2*	*1) Stakeholder Consultation Workshop for creating awareness about the National Certification Scheme and to obtain stakeholder feedback on relevant rules, regulation and guidelines, course materials and potential designated consumers* *1. Training of Trainer Programme*
Number of participants in events organized by proponents and implementing partners	*134*	*Stakeholder Consultation workshop had total of 54 participants* *Training of Trainer Programme had total of 80 participants*
a) Number of men	*126*	*Stakeholder Consultation workshop had 50 men participants* *Training of Trainer Programme had 76 men participants*
b) Number of women	*8*	*Stakeholder Consultation workshop had 4 women participants* *Training of Trainer Programme had 4 women participants*
Number of climate technology RD&D related events	*1*	*One number of Training of Trainer Programme conducted to train Trainers who can be utilized to conduct future training programmes and develop skills of energy auditors and energy managers*
Number of participants in climate technology RD&D events	*80*	*A total of 80 members participated in Training of Trainer Programme*
a) Number of men	*76*	*76 men participated in Training of Trainer Programme*
b) Number of women	*4*	*4 women participated in Training of Trainer Programme*
Number of training organized by proponents and implementing partners	*1*	*One Training of Trainer Programme conducted*
Number of participants in trainings organized by proponents and implementing partners	*80*	*Training of Trainer Programme had total of 80 participants*
a) Number of men	**76**	*76 men participated Training of Trainer Programme*

Indicator	Quantitative value	Qualitative description
b) Number of women	**4**	*4 women participated Training of Trainer Programme*
Total number of institutions trained	***49***	*Governmental, Private (Industries, Consultancy agencies, etc.) and non-governmental (Academia)*
a) Governmental (national or subnational)	**7**	1) Energy Department, Government of Punjab 2) NEPRA 3) Punjab Infrastructure Development Authority 4) NEECA 5) Punjab Energy Efficiency and Conservation Agency (PEECA) 6) PESCO 7) GEPCO
b) Private sector (bank, corporation, etc.)	**35**	1) Feroze 1888 Mills 2) Siemens Pakistan Engineering 3) Energy Consultancy 4) HUBCO (Hub Power Company Ltd. And Hub Power Services Ltd.) 5) SGS Pakistan 6) Envirogreen Trainings & Consulting 7) Arch Associates 8) Gul Ahmed Textile Mills 9) Hub Power Services Ltd. 10) OMS pvt Ltd 11) Keystone Enterprises Pvt. Ltd 12) Juma Al Majid Group 13) CIBEA 14) Lucky Cement 15) Indus Motor Co. Ltd. 16) Energy Futures Consulting (SMC Pvt. Ltd.) 17) Synergized Solutions 18) Resource Inspections Canada Incorporated 19) Descon Technical Institute 20) 8.2 Renewable Energy Experts 21) Laraib Energy Ltd. 22) World Call Telecom Ltd, Lahore 23) Asian Food Industries Ltd 24) Masco Energy Services 25) Sabri Group of Companies 26) Inspectest Private Limited 27) TUV Austria Bureau 28) Zeus Energy Pvt Ltd 29) Independent Monitoring Unit (IMU-A)

Indicator	Quantitative value	Qualitative description
		30) Orient Energy Systems Pvt. Ltd 31) Al Awan Electric Works & Construction 32) TUSDEC (Technology Upgradation and Skill DEvelopment Company) 33) IMMUSCO 34) Alam Medix, Lahore 35) LMKR
c) Nongovernmental (NGO, University, etc.)	**7**	1) IBA University, Sukkur 2) Mehran University of Engg & Tech 3) NEDUET 4) USPCASE UET Peshawar 5) Fast National University Chiniot Faisalabad Campus *6)* USPCASE NUST Islamabad *7)* Energy Research Center, COMSATS university
Percentage of participants reporting satisfaction with CTCN training (from CTCN training feedback form)	**66%**	*Satisfied= 4+ on 5-pt scale*
Percentage of participants reporting increased knowledge, capacity and/or understanding as a result of CTCN training (from CTCN training feedback form)	**93.8%**	*Increased knowledge, capacity and/or understanding= 4+ on 5-pt scale*
a) Percentage of men	**87.6%**	87.6% of men participants reported Increased knowledge, capacity and/or understanding
b) Percentage of women	**100%**	All women participants reported Increased knowledge, capacity and/or understanding
Total number of deliverables produced during the assistance (excluding mission, progress and internal reports)	***13***	**(Advertisement, Course materials, Question banks, excel sheets, daily quiz questions)**
a) Number of communication materials, including news releases, newsletters, articles, presentations, social media postings, etc.	**2**	*Advertisement in one Urdu and one English daily for Training of Trainer Programme*
b) Number of tools and technical documents strengthened, revised or developed	**10**	*4 course materials for National Certification Scheme* *1 set of Question Bank* *5 additional sets of question banks for conducting*

Indicator	Quantitative value	Qualitative description
		offline examination
c) Number of other information materials strengthened, revised or created (For example training and workshop reports, Power Points, exercise docs etc.)	**25**	*20 Power point Presentations as part of Training of Trainer Programme* *1 excel sheet for technological calculations* *4 numbers of daily quiz*
d) Total number of policies, strategies, plans, laws, agreements or regulations supported by the assistance	***6***	*A total number of six policies, rules, guidelines or regulations were developed as part of TA to assist the implementation of National Certification Scheme.*
e) Adaptation related	**0**	
f) Mitigation related	**6**	*1.* Guideline(s) for the accreditation of Energy Auditors and Managers *2.* Guideline(s) on eligibility criteria for the energy auditors and managers *3.* Guideline(s) for appointment of evaluators and professionals for assessment of EA/EM examinations *4.* Development of draft regulations on appointment of Energy Managers by Designated Consumers *5.* Development of draft regulations on frequency, manner, conduct and reporting of energy audits by Designated Consumers *6.* Development of draft regulation on accreditation and review of Energy Audit firms
g) Both adaptation- and mitigation related	**0**	
Anticipated number of policies, strategies, plans, laws, agreements or regulations proposed, adopted or implemented as a result of the TA	**6**	*All the six numbers of rules, guidelines or regulations developed under the TA will be adopted and implemented to achieve the target of*
a) Adaptation related	**0**	
b) Mitigation related	**6**	1. Guideline(s) for the accreditation of Energy Auditors and Managers 2. Guideline(s) on eligibility criteria for the energy auditors and managers 3. Guideline(s) for appointment of evaluators

Indicator	Quantitative value	Qualitative description
		and professionals for assessment of EA/EM examinations 4. Development of draft regulations on appointment of Energy Managers by Designated Consumers 5. Development of draft regulations on frequency, manner, conduct and reporting of energy audits by Designated Consumers 6. Development of draft regulation on accreditation and review of Energy Audit firms
c) Both adaptation- and mitigation related	**0**	
Anticipated number of technologies transferred or deployed as a result of CTCN support	**2**	1. Energy Efficiency i. Appliance and equipment – Lighting ii. Buildings – Efficient air conditioning system 2. Industry i. Construction – Cement production ii. Manufacturing industry - Machinery iii. Mitigation in textile industry iv. Mitigation in pulp and paper industry v. Conventional power plant efficiency
Anticipated number of collaborations facilitated or enabled as a result of technical assistance	**0**	
a) Number of South-South collaborations	**0**	
b) Number of RD&D collaborations	**0**	
c) Number of private sector collaborations	**0**	
Number of countries with strengthened National System of Innovation as a result of CTCN support	**1**	Pakistan

B. Core impact indicators

Core indicator 1	**Anticipated metric tons of CO_2 equivalent (CO_2e) emissions reduced or avoided as a result of CTCN TA**	
	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **on annual basis**	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **in total**
Quantitative value (emissions reductions)	1.09 (Details provided in Annex B)	3.28 (Details provided in Annex B)
Unit	Million tCO_2e	Million tCO_2e
GHG assessment boundary (project emissions) Identify expected post-TA activities, associated effects and assess boundary for quantification of GHG emission reductions	Details provided in Annex A	Details provided in Annex A
Baseline emissions Describe baseline scenario, baseline candidates, emission factors and emissions calculated	78.67 (Details provided in Annex B)	236.00 (Details provided in Annex B)
Methodology Explain the method or process of verifying the indicator and how data was gathered	Details provided in Annex B	Details provided in Annex B
Assumptions Describe assumptions made during calculation and quantification of GHG reductions	Details provided in Annex C	Details provided in Annex C

Core indicator 2	**Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance**
Infrastructure and built environment Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets)	**N.A.**
Ecosystems and biodiversity Anticipated increased ecosystem	

resilience (areas with increased resistance to climate-induced disturbances and with improved recovery rates)	**N.A.**
Economic Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood)	**N.A.**
Health and wellbeing Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security)	**Water savings over three year period:** **Textile Sector : 1.842 MCM** **Thermal power plants : 5.580 MCM** **Cement sector : 2.319 MCM**

	Anticipated water savings as a result of CTCN TA	
	Anticipated water savings as a result of the TA on annual basis	Anticipated water savings as a result of the TA in total
Quantitative value (Water savings)	3.247 (Details provided in Annex E)	9.742 (Details provided in Annex E)
Unit	MCM	MCM
Water savings assessment boundary (project emissions) Identify expected post-TA activities, associated effects and assess boundary for quantification of water savings	Details provided in Annex D	Details provided in Annex D
Methodology Method or process of verifying the indicator and how data was gathered	Details provided in Annex E	Details provided in Annex E
Assumptions Assumptions made during calculation and quantification of Water savings	Details provided in Annex F	Details provided in Annex F

Core indicator 3	Anticipated number of direct and indirect beneficiaries as a result of the TA	
	Quantitative value	**Means of verification**
Total beneficiaries	Total number	
Number of adaptation beneficiaries	5 - 10 200 – 500 100 - 200	Number of participants of Training of Trainer programme to be inducted as Trainers, after successful completion of phase II & III (Not under the scope of TA) of ToT programme, to conduct future training programmes for aspiring energy managers and auditors Number of participants expected to undertake the National Certification Scheme and get certified as "Energy Managers / Energy Auditors" within 3 years after gazette notification of draft rules and regulations developed under the TA. Number of industries expected to be notified as designated consumers within 3 years after gazette notification of draft rules and regulations developed under the TA.
Number of mitigation beneficiaries	N.A.	
Number of adaptation-and mitigation beneficiaries	N.A.	

Core indicator 4	Anticipated amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding)			
	Quantitative value confirmed *in USD*	**Quantitative value anticipated** *in USD*	**Qualitative description**	**Methods**
Total funding	Total number in USD	Total number in USD		
Anticipated amount of public funding mobilised from national/domestic sources	N.A.			
Anticipated amount of public funding mobilised from international/ regional sources	N.A.			

Anticipated amount of private funding mobilised from national/domestic sources	N.A.			
Anticipated amount of private funds mobilised from international/regional sources	**N.A.**			

Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation
This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.

Annexure A

GHG Assessment boundary			
Sl. No	**Expected post TA project activity**	**Primary Effect**	**Secondary Effect**
1	Empanelment of Trainers with NEECA	Job creation	Capacity building of future energy auditors and managers
2	Conducting National Certification Examination for Energy Auditors and Managers	Creation of pool of certified energy professionals	Job creation and economic development
3	Notification of designated consumers from Cement, Textile and Thermal Power Plant sectors	Market creation for certified energy auditors and managers	
4	Notification of rules and regulations for appointment of enrgy auditors by DCs	Market creation for certified energy auditors and managers	
5	Notification of rules and regulations for conduct of mandatory energy audits by designated consumers	Market creation for certified energy auditors and managers	Reduction in GHG emission and water use by improving energy efficiency in the designated consumers

Annexure B

From the GHG assessment boundary, it can be seen that secondary effect of post TA activity 5 is linked to GHG emission reduction	
Baseline scenario	As part of this TA, 3 energy intensive industrial sectors (thermal power plants, cement and textile sector)were identified as the major energy consumers. Potential designated consumers have been identified from these 3 sectors. Implementation of the expected post TA activities will result in reduction in GHG emissions for the designated consumers
Baseline candidates	All thermal power plants, cement plants and textile industries in operation in Pakistan during 2017-18

Baseline emissions	Unit	Value	Source
Pakistan CO2 emissions due to primary energy consumption in 2017-18	Million tCO2	195.7	BP Statistical review of world energy 2019
Total primary consumption in 2017-18	Toe	68511571	Pakistan Energy Yearbook 2018
Sectoral primary energy share			
Thermal Power Plants	%	28.50	Pakistan Energy Yearbook 2018
Cement sector	%	10.51	
Associated sectoral CO2 emissions due to primary energy consumption			
Thermal Power Plants	Million tCO2	55.77	Calculated pro-rata basis on primary energy consumption
Cement sector	Million tCO2	20.57	
Textile sector primary energy consumption (data obtained from actual gas consumption figures of 135 textile plants, provided by gas distribution companies)	MMcft	42447	Data provided by Sui Southern and Sui Northern Gas Company in Pakistan, attached as annexure B1
CO2 emission of textile sector (considering carbon dioxide emission factor of 0.0549 kg of CO2/cft of natural gas)	Million tCO2	2.33	IPCC 2006

Since the TA provides the groundwork required to mandate energy audits for designated consumers, the GHG emission reductions will continue till the audits are continued. However for this calculation, the GHG emission reduction by conducting the first round of mandatory energy audits and associated implementation of energy conservation measures have been considered. As per the finalized regulation, designated consumers need to conduct energy audits every 3 years. Thus the life of this TA has been considered as 3 years till the end of first round of mandatory energy audits.

Baseline emissions sector wise	**Total number of plants in operation**	**Million tCO2 emission per year**	**Million tCO2 emission over 3 years period**
Thermal Power Plants	49	55.77	167.32
Cement sector	25	20.57	61.70
Textile sector	135	2.33	6.99
Total	**209**	**78.67**	**236.02**

The National Energy Efficiency and Conservation Act 2016, of Pakistan requires the competent authority to provide targets for reduction in specific energy consumption of the designated consumers identified through this CTCN technical assistance. The targets are to be met over a set period of time and the process is to be repeated after the completion of the set time frame. Taking in to consideration the learnings and achievements of similar schemes in the Asia Pacific region, it was observed that around 5% reduction in annual energy consumption and associated CO2 emissions were observed after the first rounds of mandatory energy audits (Document attached as Annexure B2, Section 2.5). Thus for evaluating the annual GHG emission reduction and GHG emission reduction over the life of the project (considered here as 3 years), a 5% reduction in emissions have been considered.

Sector	**Total number of plants in operation**	**Identified DCs**	**Million tCO2 emissions by DCs**	**Emission reduction , million tCO2***
Thermal Power Plants	49	40	45.5	2.28
Cement sector	25	23	18.9	0.95
Textile sector	135	71	1.2	0.06
Total GHG emission reduction over 3 years period				**3.28**

**** Considering a 5% reduction in energy consumption over 3 years period***

Annexure C

Assumptions made during calculation of GHG emission reduction	
Sl. No	**Assumption**
1	It is assumed that NEECA, the project proponent will be able to complete the post TA activities within a period on 3 years from March 2021
2	The production levels for all designated consumers is assumed to remain same as 2017-18 levels
3	It is assumed that the designated consumers will be given a specific energy reduction target of 5%
4	All designated consumers are able to achieve the 5% reduction
5	The second round of mandatory energy audits will be conducted after 3 years of completion of the first round
6	Emissions from other green house gases could not be quantified

S. NO.	ID	NAME	Total annual energy consumption. Mtoe	Total natural gas consumption, MMCft	Associated CO2 emission in Million tCO2
1	1090880000	M/S AI KARAM TEXTILE MILLS (PVT)LTD	37105	1585.7	0.087
2	8160738602	M/S GUL AHMED TEXTILE MILLS	24218	1034.9	0.057
3	5980880000	M/S YOUNUS TEXTILE MILLS	23196	991.3	0.054
4	4135480000	M/S LUCKY TEXTILE MILLS	21245	907.9	0.050
5	9624651000	M/S INDUS DYEING & MANFG. CO. LTD	20843	890.7	0.049
6	3184492912	M/S GUL AHMED TEXTILE MILLS	18702	799.2	0.044
7	5165851000	M/S AGAR TEXTILES (PVT)LTD	18244	779.7	0.043
8	4980880000	M/S YOUNUS TEXTILE MILLS	16053	686.0	0.038
9	2198200000	M/S AMNA INDUSTRIES (PVT) LTD	15513	662.9	0.036
10	46280000	M/S KASSIM TEXTILE PVT.LTD	15360	656.4	0.036
11	6329090000	M/S NOVATEX LIMITED	15490	662.0	0.036
12	3839978381	M/S GUL AHMED TEXTILE MILLS LTD	14665	626.7	0.034
13	4077137014	M/S NOVATEX LIMITED	14275	610.0	0.033
14	7546951000	M/S PREMIUM TEXTILE MILLS LTD	14119	603.4	0.033
15	8723418868	M/S A KARAM TEXTILE MILLS (PVT LTD	13603	581.3	0.032
16	2667331000	M/S LIBERTY MILLS LTD	13237	565.7	0.031
17	1046280000	M/S KASSIM TEXTILE PVT.LTD	12252	523.6	0.029
18	4741110494	A-RAHIM TEXTILE INDUSTRIES	12706	543.0	0.030
19	7990070000	M/S AFROZE TEXTILE INDUSTRIES (PVT) LTD	12670	541.5	0.030
20	7187341000	M/S M.P.COTTON MILLS PVT LTD	12355	528.0	0.029
21	30290000	M/S INDUS DYEING & MANFG. CO. LTD	12143	518.9	0.028
22	8622431000	M/S M HANIF INDUSTRIES	12028	514.0	0.028
23	72336865	M/S COLONY MILLS LTD, ISMAEELABAD SHERSHAH ROAD MULTAN	12071	515.9	0.028
24	6012239131	M/S ZAMAN TEXTILE MILLS LTD	11781	503.5	0.028
25	7746951000	M/S ZAHRA TEXTILE	11439	488.8	0.027
26	6516020525	M/S ARTISTIC FABRIC & GARMENTS INDUSTRIES (PVT)	11429	488.4	0.027
27	4880880000	M/S GUL AHMED TEXTILE MILLS	11296	482.8	0.027
28	3546951000	M/S NADEEM TEXTILE MILLS LTD	11254	480.9	0.026
29	4699190000	M/S ARTISTIC DENIM MILLS LIMITED	11071	473.1	0.026
30	6165851000	M/S NGAINA COTTON MILLS LTD	10791	461.2	0.025
31	8457051000	M/S SAPHIRE TEXTILE MILLS LIMITED (WEAVING AND PROCESSING UNIT) 1.5 KM, WARBURTON RD FEROZEWATTWAN DISTT SHEIKHUPURA	10703	457.4	0.025
32	2365851000	M/S SAPHIRE TEXTILE MILLS LTD	10189	435.4	0.024
33	7936280000	M/S ORIENT TEXTILE MILLS LTD	10043	429.2	0.024
34	6646951000	M/S YOUNUS TEXTILE MILLS LTD	10035	428.8	0.024
35	8646951000	M/S METCO TEXTILE (PVT) LTD	9952	425.3	0.023
36	6413741000	M/S QUETTA TEXTILES MILLS LTD (CAPTIVE POWER) 47 5-KM MULTAN ROAD BHAI PHERU DISTT KASUR	9733	415.9	0.023
37	646951000	M/S FAISAL SPINNING MILLS LTD	9576	409.2	0.022
38	3973590000	M/S IBRAHIM FIBERS PRIVATE LTD SHEIKHUPURA ROAD FAISALABAD	9484	405.3	0.022
39	2487341000	M/S SIDDIQ SONS DENIM MILLS PVT LTD	9056	387.0	0.021
40	4187341000	M/S FEROZE 1888 MILLS LIMITED	8462	361.6	0.020
41	6757051000	M/S RIAZ TEXTILE MILLS (PVT) LIMITED 23-KM SKP FSD RD FEROZEWATTOAN DISTT SHEIKHUPURA	7586	324.2	0.018
42	4646951000	M/S YUNUS TESTILES MILLS LTD	7577	323.8	0.018

43	1913590000	M/S NISHAT TEXTILE MILLS SHEIKHUPURA ROAD FAISALABAD	7372	315.0	0.017
44	3646951000	M/S LATIF TEXTILE MILLS (PVT)LTD	7329	313.2	0.017
45	6746951000	M/S LUCKY COTTON PVT. LTD	7308	312.3	0.017
46	7781651000	M/S UNITED TEXTILE MILLS	7301	312.0	0.017
47	3177988425	M/S RJBY TEXTILES (PVT) LTD	7293	311.7	0.017
48	346480000	M/S INTERNATIONAL TEXTILE LTD	7206	308.0	0.017
49	3870741000	M/S U S DENIM (PVT) LTD 3-KM DEFENCE ROAD OFF RAIWIND ROAD LAHORE	7043	301.0	0.017
50	7646951000	M/S KHAS TEXTILE MILLS PVT LTD	6915	295.5	0.016
51	7757051000	M/S DIAMOND FABRICS LTD 20-KM SKP FSD ROAD FEROZEWATTUAN	6809	291.0	0.016
52	8630741000	M/S GHAZI FABRICS INTERNATIONAL LIMITED (CAPTIVE POWER) 46 KM MULTAN ROAD DINA NATH DISTT KASUR	6784	289.9	0.016
53	2100741000	M/S NISHAT MILLS LTD DYEING FINISHING 21 KM OFF FEROZEPUR ROAD LHR	6706	286.6	0.016
54	9993590000	M/S CRESCENT Textile Mills Ltd. TEXTILE MILLS LTD SARGODHA ROAD FAISALABAD FAISALABAD	6608	282.4	0.016
55	8575090000	M/S INDIGO TEXTILE (PVT) LTD	6605	282.3	0.015
56	6449641000	RUPALI POLYESTER LTD 30 K M SKP ROAD LAHORE	6181	264.1	0.015
57	7430741000	M/S COLONY WEAVING MILLS (PVT) LTD (CO-GENERATION WEAVING) 4-KM MANGA RAIWIND RD D/KASUR	6177	264.0	0.014
58	7893590000	M/S IBRAHIM FIBERS LTD CAPTIVE POWER THROUGH CO GENERATION 38TH K M S SHEIKHUPURA ROAD FASIALABAD	6153	262.9	0.014
59	6792259800	M/S AHMAD HASSAN TESTILE MILLS LTD MM ROAD CHOWK SARWAR SHAHEED SANWAN MOON MUZAFAR GARH	6039	258.1	0.014
60	6057051000	M/S NISHAT MILLS LIMITED 12-KM FISALABAD RD DISTRICT SHEIKHUPURA	6033	257.8	0.014
61	4398666914	M/S ARTISTIC FABRIC & GARMENTS INDUSTRIES	5739	245.2	0.013
62	3167051000	M/S SURAJ COTTON MILL LTD (CAPTIVE POWER) CH 144-RB 50KM FSD SKP ROAD KOTLA KAHLON SHAH KOT DISTT SHEIKHUPURA	5167	220.8	0.012
63	3586040000	M/S FAZAL CLOTH MILLS JHANG ROAD MUZAFFAR GARH	5761	246.2	0.014
64	3110741000	M/S SAPHIRE FINISHING MILL LTD 2-KM RAIWIND MANGA RD DISTRICT KASUR	5034	215.1	0.012
65	7609278918	M/S FAZAL CLOTH MILLS UNIT # 3 QADIR PUR RAWAN BYPASS KHAENWAL ROAD MULTAN	4868	208.0	0.011
66	4745140000	M/S MEHMOOD TEXTILE MILLS MULTAN ROAD MUZAFFARGARH	4746	202.8	0.011
67	1457051000	M/S SAPHIRE TEXTILE MILLS LTD (UNIT NO 5) 1-5 KM (CAPTIVE POWER) WARBUTON RD FEROZE WATTWAN DISTT SHEIKHUPURA	4712	201.4	0.011
68	2556410830	FAZAL REHMAN FABRICS LTD QADAR PUR RAWAAN KHANEWAL ROAD MULTAN	4583	195.9	0.011
69	2051020000	RELIANCE WEAVING MILLS LTD FAZALPUR KHANEWAL ROAD MULTAN	4547	194.3	0.011
70	8257051000	M/S NISHANT MILLS LTD 20 KM FEROZEWATWAN FSD SKP ROAD SHEIKHUPURA	4454	190.3	0.010
71	3051020000	M/S RELIANCE WEAVING MILL LTD FAZALPUR KHANEWAL ROAD MULTAN	4460	190.6	0.010
72	9189120000	M/S MASOOD SPINNING MILLS 4TH KILOMETRE MULTAN ROAD KABIRWALA	4238	181.1	0.010
73	3122230000	M/D AHMAD FINE TEXTILE MILLS AJAB NAGAR SHAHBAZ PUR RD R Y K	4208	179.8	0.010
74	8709049214	M/S HASSAN SPINNING MILLS (CAPTIVE POWER) LTD 2.K.M, JARANWALA ROAD KHURRIANWALA FAISALABAD	3921	167.6	0.009

75	2140741000	M/S NISHAT CHUNIAN LTD (DYEING OF CLOTHES) NR COLONY WEAVING BUCHEKI MAJHA MANGA RAIWIND RD DISTT KASUR	3801	162.4	0.009
76	587590000	M/S BISMILLAH TEXTILE PRIVATE LTD 1 KM JANAN WALA RD KHURRIANWALA	3557	152.0	0.008
77	6267051000	M/S PROSPERITY WEAVING MILLS LTD CAPTIVE POWER NAGINA HOUSE 91-B-1 M M ALAM ROAD GULBERG III LAHORE - 54660	3504	149.7	0.008
78	2070741000	M/S ZYPHER TEXTILES LTD (CAPTIVE POWER) 1KM HEAD BALLOKI ROAD BHAI PHERU DISTT KASUR	3255	139.1	0.008
79	3240741000	M/S KOHINOOR WEAVING MILLS LTD (CAPTIVE POWER) 8- KM MANGA RAIWIND RD DISTT KASUR	3135	134.0	0.007
80	7020741000	M/S ELLCOT SPINNING MILLS LTD 63 KM MANGA RAIWIND ROAD DISTT KASUR	3132	133.8	0.007
81	5710741000	M/S TRITEX COTTON MILLS LTD JAMBER KHURD B/H CENTURY PAPER	2994	127.9	0.007
82	8586040000	M/S SUNRAYS TEXTILE MILLS LTD KHANPUR BAGASHER ROAD MUZAFFAR GARH	2992	127.9	0.007
83	4759671000	M/S RESHAM TESTILE IND LTD. 15 KM HABIB ABAD CHUNIAN ROAD DISTT KASUR	2896	123.8	0.007
84	7726013847	M/S H.A FIBERS (PVT) LTD SUJAN PUR CAPTIVE POWER 6 KM KHANEWAL ROAD MULTAN	2857	122.1	0.007
85	Electricity Ref No			0.0	0.000
86	28131545401530	MUHAMMAD WASEEM MUKHTAR	11443	489.0	0.027
87	28131335310200	A A SPINNING MILLS LTD	7652	327.0	0.018
88	24118442604800	M/S DIAMOND FABRICS LTD 26KM FAISALABAD ROAD WARBARTON	7152	305.6	0.017
89	24119199002400	MASTER TEXTILE MILLS, 3 K.M OFF DARS ROAD RAIWIND	5721	244.5	0.013
90	24118112604900	M-S RELIANCE COTTON MILL WARBURTON ROAD FEROZE WATOWAN	4649	198.7	0.011
91	24118432604700	M/S SAPPHIRE FIBRES LTD FAISALABAD ROAD WARBARTAN	4291	183.4	0.010
92	28131525201800	MASOOD TEXTILE MILLS LTD CK 69 RB FSD	3862	165.0	0.009
93	24119199002500	MUHAMMAD BUKSH TEXTILE MILL LT RAIWIND MANGA RD RWD	3647	155.9	0.009
94	24372250000111	FAISAL SPINNING MILL PLOT NO:A-150 SITE NOORIABAD	3576	152.8	0.008
95	30159212533900	MASOOD SPINNING MILLS LTD 4TH KILOMETER MULTAN ROAD KABIR WALA DISTT: KHANEWAL	3575	152.8	0.008
96	30157111346902	MEHMOOD TEXTILE MILLS MULTAN ROAD M.GARH	3575	152.8	0.008
97	24119199001500	M/S AMIR COTTEN MILLS PVT LTD 64.KM MULTAN ROAD JUMBER	3572	152.6	0.008
98	24116212105500	CRESCENT FIBERS (LTD) BHIKHI 16- KM FAISALABAD ROAD SHEIKHUPURA.	3570	152.6	0.008
99	30157111346203	FAZAL CLOTHS MILLS UNIT 2 JHANG RD M GARH	3569	152.5	0.008
100	24116222113730	MUHAMMAD SALEEM M-S BHANERO TEXTILE MILLS FEROZEWATTAN 18KM FSD ROAD SKP	3564	152.3	0.008
101	30151280490205	HUSSAIN MILLS LIMITED BASTI MALOOK BWP ROAD MULTAN	3562	152.2	0.008
102	24116222114002	MS BLESSED TEXTILE LTD UNIT 01FEROZ WATWAN 18KM F.BAD R SKP	3552	151.8	0.008
103	30151321942801	HUSSAIN MILLS LTD SHAHRA-E-RASHID VEHARI ROAD MULTAN	3540	151.3	0.008
104	30159212533901	M/S MASOOD SPINNING MILLS 04-KM MULTAN ROAD KABIR WALA	3540	151.3	0.008
105	28131285504900	SARGODHA SPINNING MILLS LTD SGD ROAD FAISALABAD	3540	151.3	0.008
106	28131525200535	ZAHIDJEE TEXTILE MILLS LTD S/O MUHAMMAD SHARIF M-3 SAHIANWALA FIEDMC FSD	3540	151.3	0.008
107	24116222113740	MS FAISAL SPINNING MILLS LTD WEAVING UNIT FEROZWATTWAN SKP	3540	151.3	0.008
108	24116222113790	M/S BHANERO TEXTILE MILLS LTD WEAVING UNIT 18KM FSB ROAD SKP	3540	151.3	0.008
109	24116222114000	M/S BLESSED TEXTILE MILLS NO.3FEROZE WATTWAN SHEIKHUPURA.	3540	151.3	0.008
110	24118322603300	M-S NORTH STAR TEXTILE MILLS WARBURTON ROAD FEROZE	3540	151.3	0.008

111	24119199006900	M/S SAPPHIRE FIBERS LTD RAIWAND ROAD	3540	151.3	0.008
112	24119199058000	M/S KOHINOOR TEXTILE MILLS MANGA RAIWIND ROAD DISTT KASUR	3540	151.3	0.008
113	30157111346701	TATA TEXTILE MILL KHAN PUR BAGGA SHER M.GARH	3537	151.2	0.008
114	30157111346403	HUSNAIN TEXTILE MILLS PVT LTD. 3-KM JHANG ROAD MUZAFFAR GARH	3508	149.9	0.008
115	24372210000011	M/S NAGINA COTTON MILLS LTD PLOT NO A-16 INDUS HIGHWAY SITE KOTRI	3504	149.7	0.008
116	24372210000331	M/S SAPPHIRE TEXTILE LTD NO: 1 PLOT NO A-17 SITE KOTRI	3504	149.7	0.008
117	30151923126100	RELIANCE WEAVING MILLS FAZAL NEAR 500 KV GRID STAION MULTAN	3504	149.7	0.008
118	30151951551802	M/S FAZAL CLOTH MILLS QADIR PUR RAWAN MULTAN	3504	149.7	0.008
119	30157111346207	FAZAL CLOTH MILLS (LTD) RAKH KHAN PUR JHANG ROAD M GARH	3504	149.7	0.008
120	24116132102700	AYESHA SPINNING MILL LAHORE ROAD SHEIKHPURA	3504	149.7	0.008
121	24117449004302	DIN TEXTILE MILLS MULTAN ROAD PATTOKI	3504	149.7	0.008
122	24118322601999	IDREES TEXTILE MILLS FEROZWATWAN WARBURTON	3504	149.7	0.008
123	24119199003900	FOR M/S AL NASR TEXTILES LTD 9 KM RAIWIND MANGA ROAD	3504	149.7	0.008
124	24119199004200	M/S HIRA TEXTILE MILLS 8 K.M RAIWIND MANGA ROAD 3.4 KM RAIWIND MANGA ROAD	3504	149.7	0.008
125	24119199006500	ZEPHYR TEXTILE MILLS BALOKI ROAD PHOOL NAGAR	3504	149.7	0.008
126	24119199178000	M/S ELLCOT SPINNING MILLS LTD 6.3 KM MANGA RAIWIND ROAD	3504	149.7	0.008
127	28131335310000	RAFIQ SPINNING MILS PVT LTD SHREEN WALA 20 KM SKP ROAD FSD	3498	149.5	0.008
128	27145219320900	KOHINOOR SPINNING MILL BHONE ROAD CHAKWAL	3492	149.2	0.008
129	24117349030001	NAFEESA TEXTILE MILLS KASUR DEPALPUR RD THEENG MORE	3445	147.2	0.008
130	30157230343101	M/S MEHMOOD TEXTILE MILLS UNIT NO 6 CHOWK SARWAR SHAHEEDC S S	3433	146.7	0.008
131	24119199003501	TRI TAXCOTTON MILLS JAMBER KHURD MULTAN RD BHAIPHERU	3433	146.7	0.008
132	28131285313870	M/S CRESCENT TEXTILE MILLS LTD SARGODHA ROAD FAISALABAD	3419	146.1	0.008
133	30151923126102	RELIANCE WEAVING MILLS NEAR 500 KV GRID STATION KWL ROAD MULTAN	3397	145.2	0.008
134	30151951551803	M/S FAZAL CLOTH (WEAVING UNIT) QADIR PUR RAWAN KWL ROAD MULTAN	3397	145.2	0.008
135	24116110000700	M/S C.A TEXTILE MILLS LAHORE ROAD SHEIKHUPURA.	3397	145.2	0.008
136	24372210000021	M/S ISLAND TEXTILE MILLS LTD PLOT NO.A-12 SITE AREA KOTRI	3361	143.6	0.008
	Total		**993270**	**42447**	**2.330**

2.4 INVESTMENTS MADE FOR ACHIEVEMENT OF TARGETS :

PAT cycle-I was successful on account of the measures implemented by the DCs. While some chose to tap the low hanging fruits, others invested in major and minor projects. The DCs also improved their O&M practices. Some of the measures were even inhouse, involving little or no investment, and hence could not be quantified. The reported investment figure from the DCs of PAT cycle - I is approx. Rs. 26100 Cr.

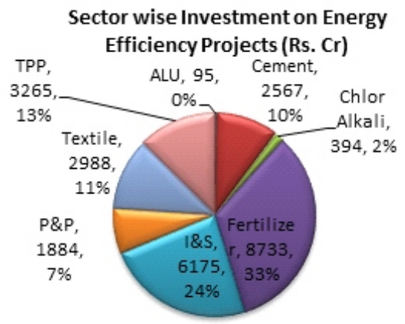


Fig. 6. Sector wise Investment on EE Projects (Rs. Crore, %)

The sector wise breakup of investment made by DCs of 8 sectors is given in the pie chart. The fertilizer sector contributed the maximum share which is about 33% of the total investment followed by iron and steel sector (24%), thermal power plant (13%), textile sector (11%) and cement (10%) sector. The remaining % share of investment is from chlor alkali, pulp and paper and aluminium sector. In the aluminium sector, there are only 10 DCs. The total investment from the aluminium sector is about Rs. 94 Cr which is about 0.004 %.

The sector wise categorization of DCs with respect to the investments made is tabulated below :

Sector	Central		Cooperative		Private		State		Total No. of DCs	Investment (Rs. Cr.)
	No. of DCs	Investment (Rs. Cr.)	No. of DCs	Investment (Rs. Cr.)	No. of DCs	Investment (Rs. Cr.)	No. of DCs	Investment (Rs. Cr.)		
Aluminium	3	20			6	75			9	95
Cement					65	2567			65	2568
Chlor Alkali					11	332	4	62	15	394
Fertilizer	9	4745	6	1837	7	533	2	1618	24	8733
I&S	6	2361			31	3813			37	6175
P&P	2	0			15	1884			17	1884
Textile					64	2988			64	2986
TPP	17	638			20	1521	33	1106	70	3265
Grand Total	**37**	**7764**	**6**	**1837**	**219**	**13714**	**39**	**2786**	**301**	**26101**

Footnote: Investment details have been furnished by only 301 DCs.

The maximum share in the total investment is from the Private sector Industries Rs. 13714 crores (52%) followed by Central PSUs Rs. 7764 crores (30%) and State PSUs Rs. 2786 crores (11 %). There are 6 Co-operative Industries in Fertilizer sector which have also contributed Rs. 1837 crores (7 %) of the total investment. The details may be seen in the given pie chart.-

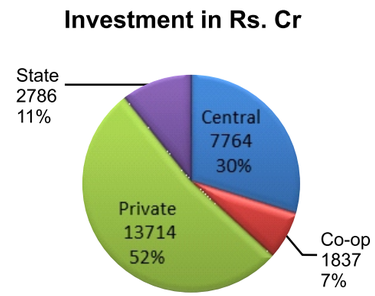


Fig.7.Ownership wise Investment on EE Projects (Rs. Cr, %)

2.5 QUANTIFICATION OF ENERGY SAVINGS WITH AND WITHOUT PAT

The annual energy consumption of these 8 energy intensive sectors in the baseline was reported to be 165 million tonnes of oil equivalent and the target was to reduce about 4.05 % of this consumption at the end of PAT cycle I. After monitoring and verification (M&V), it was found that the industries have achieved the target by more than 30 %, i.e., against the reduction target of 4.05 % of baseline energy consumption, 5.03 % reduction was achieved.

PAT Cycle-I witnessed huge investments in energy efficient projects. These projects brought down the specific energy consumption of the plants reducing the overall energy consumption. It would be worth estimating the impact without the implementation of such projects, with the actual production/ generation profiles in the assessment year.

The annual energy consumption of these DCs during baseline year and assessment year with and without PAT scheme has been shown in the given bar chart. The red bar depicts the energy consumption of the baseline. The blue bar represents the actual energy consumption in the assessment year. The green bar represents the hypothetical situation where the industries did not undertake energy conservation measures. Sector wise analysis of these conditions has been depicted below :

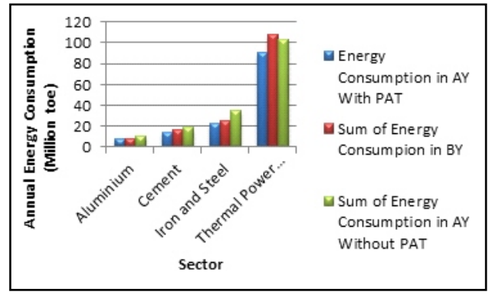


Fig.8. Annual Energy Consumption in AY with and Without PAT

The most energy intensive industries i.e. Aluminium, Cement, Iron and Steel and Thermal Power Plant have played the major role in reducing their annual energy consumption during the assessment year compared to the baseline year after implementation of the PAT scheme.

The annual energy consumption reduction in the assessment year from fertilizer, pulp and paper, textile and chlor alkali sector may also be seen in the given chart. Each sector has reduced their annual energy consumption from the level of their baseline annual energy consumption after implementation of the PAT scheme.

It could be observed that the blue bar in any case is smaller than the green bar which represents that the energy consumption without PAT scheme would have been much higher.

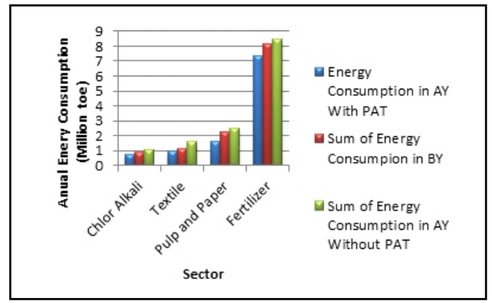


Fig.9. Annual Energy Consumption in AY with and Without PAT

Annexure D

Water Savings Assessment Boundary			
Sl. No	**Expected post TA project activity**	**Primary Effect**	**Secondary Effect**
1	Empanelment of Trainers with NEECA	Job creation	Capacity building of future energy auditors and managers
2	Conducting National Certification Examination for Energy Auditors and Managers	Creation of pool of certified energy professionals	Job creation and economic development
3	Notification of designated consumers from Cement, Textile and Thermal Power Plant sectors	Market creation for certified energy auditors and managers	
4	Notification of rules and regulations for appointment of enrgy auditors by DCs	Market creation for certified energy auditors and managers	
5	Notification of rules and regulations for conduct of mandatory energy audits by designated consumers	Market creation for certified energy auditors and managers	Reduction in water consumption by improving energy efficiency in the designated consumers

Annexure E

From the GHG assessment boundary, it can be seen that secondary effect of post TA activity 5 is linked to GHG emission reduction	
Baseline scenario	As part of this TA, 3 energy intensive industrial sectors (thermal power plants, cement and textile sector)were identified as the major energy consumers. Potential designated consumers have been identified from these 3 sectors. Implementation of the expected post TA activities will result in reduction in GHG emissions for the designated consumers
Baseline candidates	All thermal power plants, cement plants and textile industries in operation in Pakistan during 2017-18

Baseline emissions	Unit	Value	Source
Total primary consumption in 2017-18	Toe	68511571	Pakistan Energy Yearbook 2018
Sectoral primary energy share			
Thermal Power Plants	%	28.50	Pakistan Energy Yearbook 2018
	toe	19525798	
Cement sector	%	10.51	
	toe	7200566	
Conversion factors used to calculate water savings			
Particulars	**Unit**	**Value**	**Source**
Textile Sector			
Average water consumption per plant per year	m3/year	519000	Sustaining Growth: Cleaner Production in Pakistan
Water savings potential from energy audits	%	10 - 15%	
Thermal Power Plants & Cement Plant			
Average specific water consumption for power generation	m3/MWh	1.57	Energy-Water Nexus and Efficient Water-Cooling Technologies for Thermal Power Plants in India
Average specific energy generation	MWh/toe	4.46	Pakistan Energy Yearbook

The National Energy Efficiency and Conservation Act 2016, of Pakistan requires the competent authority to provide targets for reduction in specific energy consumption of the designated consumers identified through this CTCN technical assistance. The targets are to be met over a set period of time and the process is to be repeated after the completion of the set time frame. Taking in to consideration the learnings and achievements of similar schemes in the Asia Pacific region, it was observed that around 5% reduction in annual energy consumption and associated CO2 emissions were observed after the first rounds of mandatory energy audits (Document attached as Annexure B2, Section 2.5).

Sector	Total number of plants in operation	Identified DCs	Water savings potential, %*	Water savings, m^3
Textile sector	135	71	5%	1842450
Total water savings over 3 years period				**1842450**

**** Considering 5% reduction in water consumption due to adaption of energy conservation measures identified through mandatory energy audits***

Sector	Total number of plants in operation	Identified DCs	TOE consumption by DCs	Reduction in primary energy consumption, toe*	Equivalent reduction in electricity, MWh	Water savings, m^3
Thermal Power Plants	49	40	15939427	796971	3554492	5580553
Cement sector	25	23	6624521	331226	1477268	2319311
Total water savings over 3 years period						**7899864**

**** Considering 5% reduction in energy consumption due to adaption of energy conservation measures identified through mandatory energy audits***

Annexure F

Assumptions made for calculation of Water Savings	
Sl. No	**Assumption**
1	It is assumed that NEECA, the project proponent will be able to complete the post TA activities within a period on 3 years from March 2021
2	The production levels for all designated consumers is assumed to remain same as 2017-18 levels
3	It is aasumed that the designated consumers will be given a specific energy reduction target of 5%
4	All designated consumers are able to achieve the 5% reduction
5	The second round of mandatory energy audits will be conducted after 3 years of completion of the first round