National Energy Efficiency and Conservation Authority (NEECA)
Ministry of Energy (Power Division)

Strategic Plan (2020-2023)

Contents

ACRONYMS

NEECA	National Energy Efficiency and Conservation Authority
ADB	Asian Development Bank
APFC	Automatic Power Factor Controller
CAFÉ	Corporate Average Fuel Economy
CPEC	China Pakistan Economic Corridor
CAGR	Compound Annual Growth Rate
BEC	Building Energy codes
EE	Energy Efficiency
ESMAP	Energy Sector Management Assistance Program
EVs	Electrical Vehicles
GoP	Government of Pakistan
IEA	International Energy Agency
JICA	Japan International Cooperation Agency
LEDs	Light Emitting Diode
MEPS	Minimum Energy Performance Standards
NDCs	Nationally Determined Contributions
NEPRA	National Electric Power Regulatory Authority
OGRA	Oil and Gas Regulatory Authority
PSCIR	Pakistan Council of Scientific and Industrial Research
PSQCA	Pakistan Standard & Quality Control Authority
MOE	Ministry of Energy
MoPD & SI	Ministry of Planning, Development, and Special Initiatives
PSDP	Public Sector Development Program
SE4ALL	Sustainable Energy for All
TEVTA	Technical Education and Vocational Training Authority
UNDP	United Nation Development Program
UNFCCC	United National Framework Convention on Climate Change

UNITS

DC	Direct Current
GHG	Green House Gas
GWh	Giga Watt Hour
MWh	Mega Watt Hour
KWh	Kilo Watt Hour
MMCFD	Million Meter Cubic Feet per Day
MPG	Miles per Gallon
MTOE	Million Tons of Oil Equivalents
TOE	Ton Oil Equivalent

CURRENCY EQUIVALENTS

Conversion Rate as on 22nd April 2020

Currency Unit – Pakistan rupee/s (PKR/Rs)

Rs1.00 = US$0.0062

$*1.00 = Rs160.64

* In this report, "$" refers to US dollars.

NEECA's Strategic Plan

1. Introduction

National Energy Efficiency and Conservation Authority (NEECA) through its Strategic Plan (2020-23) sets to achieve the goal of 3 MTOE energy saving by 2023.[i] Pakistan has the potential to save up to 10-15% (10-12 MTOE) of primary energy supply through energy efficiency and conservation.[ii] To achieve this goal, the Plan will be implemented in three phases. The first phase (FY-2020) will be the 'institutionalization of the energy efficiency and conservation at the national and provincial levels. The second phase (FY-2021) will be the 'operationalization' of policy & actions, and the third phase will be the 'implementation' of action plans.

The Strategic Plan (2020-23) derives its key components from the NEECA Act. NEECA Act 2016[iii] provides the governance framework to facilitate and strengthen the wide-scale adoption of sound energy-efficient practices at the national level. The Act declares NEECA as the focal organization to coordinate and implement all the policies, programs and regulations to promote energy efficiency and conservation.

The first phase (FY 2020), NEECA will institutionalize energy efficiency and conservation through the establishment of provincial designated agencies, development of provincial and regional action plans, the establishment of energy conservation tribunals, and formulation of national energy efficiency and conservation policy of 2020.

The second phase (FY 2021), the operationalization will be through the development of Minimum Energy Performance Standards (MEPs), labeling schemes, certification of energy auditors, mandatory energy audits of energy-intensive industries, energy audits of public and private buildings, capacity building and coordination mechanism, research and education for promoting energy efficiency and conservation.

The third phase (FY 2022-onwords), the implementation of the strategic plan for the key sectors of the economy[iv] will be consistent with the Act. The NEECA's mandate (Figure-1) includes:

- Initiate, catalyze, carry out and coordinate the implementation of all energy conservation programs in all sectors of the economy;
- Administer, implement and enforce all the provisions made under the NEECA Act 2016;
- Serve as a focal point for all the activities related to energy efficiency in national and international level engagements;
- Formulate, implement, inspect and regulate energy efficiency standards in Pakistan.

Figure 1 NEECA's Mandate

The preparation of NEECA's Strategic plan started in November 2019 through a series of brainstorming sessions, consultations, meetings, and internal reviews. In the process, some critical cross-cutting challenges have been identified that are equally important for each sector which would be addressed with the support of Ministry of Energy. These include:

- Legal & financial framework for up-scaling energy efficiency and conservation measures;
- Federal & provincial departments collaboration, implementation, and communication;
- Inter-Ministerial / Institutional and regional cooperation and reporting;
- NEECA, OGRA (Oil & Gas Regulatory Authority), and NEPRA (National Electric Power Regulatory Authority) mandates are overlapping, which will have challenges;
- ESCOs registration, capacity building, research, and defining scope will be a major challenge. Energy Service Companies (ESCOs) can implement energy efficiency retrofits and process improvements through innovative financing mechanisms without burdening the consumers;
- Energy data collection at the consumer level, analysis to develop an Information House;
- Awareness-raising, education, and knowledge sharing about energy efficiency.

This is the first-ever energy efficiency and conservation Strategic Plan (2020-23) for Pakistan. Based on NEECA's mandate, this Strategic Plan is intended to set national-level

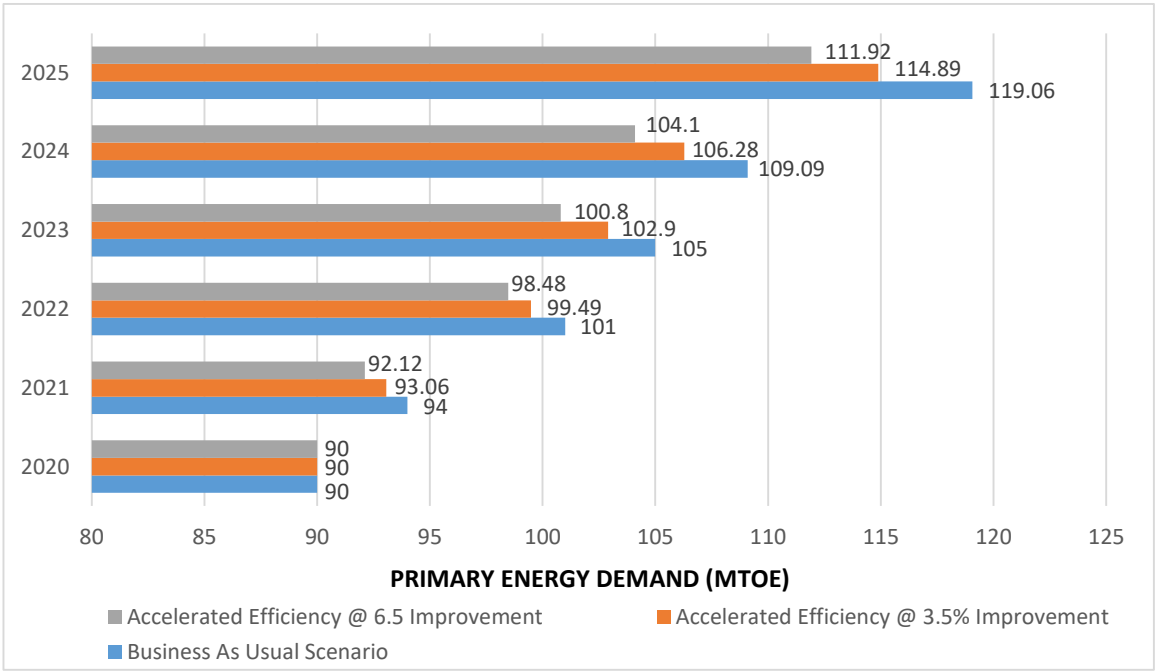
targets and achieve energy efficiency gains. The sectoral analysis, vision, mission, and goals of NEECA are presented in the following sections.

2. Energy Efficiency in Pakistan

Among all sectors of the economy in Pakistan; Industrial, transport and the building sectors respectively are the most energy-intensive because of high energy losses, wastage in the supply chain, and lack of investment in replacing obsolete technologies, and overall aging infrastructure. Low energy productivity is not just putting additional pressure on the energy situation; it more specifically affects industrial competitiveness and the cost of doing business. The comparison with regional countries shows Pakistan's industry uses more energy compare to regional countries (15% more energy than India and 25% more than the Philippines) for each dollar of GDP[v]. This indicates a very high potential for energy efficiency improvements in the industrial sector.

International Energy Agency projection shows that Developing countries are expected to show an approximately 74% increase in global primary energy consumption by 2030. The projections, coupled with the ground realities of Pakistan, where, demand as well as, cost of energy is going up at a faster rate than the affordability, necessitates immediate action for correcting the situation through energy efficiency and conservation measures.

Pakistan's current primary energy supply stands at about 90[vi] MTOE in 2020. The country 's overall primary energy supply will rise to 115.06 MTOE by fiscal year 2023, with a Compound Annual Growth Rate (CAGR) of 5.8% in business as usual scenario. NEECA has taken 2020 as a base year to save 3 MTOE by 2023 from primary energy supply. The figure below shows the projected energy efficiency scenarios for Pakistan up to 2025.



Graph 1 ENERGY Efficiency Improvement – BAU Projected Scenarios
Source: NEECA's Estimates based on Energy Year Book 2018

Pakistan's Vision 2025 and National Action Plan- SE4ALL 2030 highlight the importance of creating Demand-Side Energy Efficiency for Pakistan on a priority basis. In monetary terms, there is an investment potential of $ 18 billion in energy efficiency by 2030[vii]; which can be achieved by using new and more efficient technologies along with effective demand-side management.

3. NEECA Strategic Sectors- Situation Analysis

In the light of provisions made in the Act for energy efficiency and conservation in Pakistan, following sectors has been prioritized;

- Industrial Sector
- Building/residential Sector
- Transport Sector
- Power Sector
- Agriculture sector

3.1. Industrial Sector

The industrial sector has great energy saving potential. Being the largest consumer of energy it can make Pakistani export more competitive in global markets. Over $4 billion investment opportunities exist only in energy efficiency improvements in the industrial sector of Pakistan with a typical payback of around 5 years[viii]. The key areas of intervention for energy efficiency in industrial sector include; implementation of energy management systems, mandatory energy audits through certified energy auditors/Managers, energy saving certificate schemes and energy efficiency financing mechanisms. The energy efficiency financing mechanisms shall bring momentum in the energy efficiency drive and shall supplement in increasing exports by making export-oriented industries more productive.

- Textile Sector (accounting for 27.6% of the overall electricity consumed by industries & 40 % of the Natural Gas) offers the highest efficiency gains with a total energy saving potential of 2,150 GWh by improving the efficiency of compressors, heat transfer & recovery systems, lights, motors, power factor correction panels, process control, steam system optimization and variable frequency drives ("VFDs").
- Cement Sector (accounting for 68.9% of the total coal consumption by industries) has significant energy saving potential.
- Steel sector which has the worst energy benchmarks in the region can be taped for gaining high energy savings.
- The sugar mills in Pakistan have a high specific energy consumption of over 1250 MJ/ton which is much higher than the average value of 935 MJ/ton for the regional sugar sector. The high value in Pakistan can be attributed to the use of antiquated sugar manufacturing systems and inefficient boilers. Sugar industry has a saving potential of 138.35 GWh per year.
- The leather industry has saving potential of 17 GWh per year from heat transfer and recovery systems, motors, general process, and steam system optimization.

- Electric Motor-Driven Systems (EMDS) in the industrial sector consume almost half of the total electricity. The cost effective potential to improve the EE of electric motors is about 20 to 30%.
- Informal energy-intensive industries energy optimization programs would be low hanging fruits to focus on e.g. Introducing Zig-Zag technology in Brick Kilns, Installation of APFC units in cottage industries, etc.

Industry	Energy Savings Potential (%)
Textile Spinning	3.5
Textile Processing	18.4
Sugar	3.6
Leather	6.9
Pulp & Paper	6.3
Total	38.7

Table 1 Energy Saving Potential in the industrial sector of Pakistan
Source: Planning Commission of Pakistan (2019).SE4ALL-Nation Action Plan

3.2. Building Sector

Pakistan is the most rapidly urbanizing country in Asia. By 2023, over 40 million people are expected to live in urban centers and towns in Pakistan[ix]. It represents a massive and fast transition from rural to urban settlements. Around 800 registered and unregistered housing societies exist in the federal capital territory only[x]. Most of these societies are in the development phase. The pattern of traditional construction is shifting due to new construction technologies, so the opportunity exists for energy-efficient appliances and effective Energy Efficient Building Codes.

NEECA will be implementing building codes which covers the energy efficiency standards for building envelops, heating, ventilation and air-conditioning (HVAC) equipment & lighting and will ensure code compliance in the building sector by the end 2021. Building Code of Pakistan existed before but it does not address these energy efficiency issues in the building. NEECA in collaboration with Pakistan Engineering Council (PEC) – the statutory body for the development and implementation of building codes, has prepared Energy Provisions-2011, as an addendum to the Building Codes. Currently, the NEECA and PEC are revising these codes which will be launched by the end of 2020 to achieve the 0.5 MTOE energy saving target. NEECA designated agency Punjab Energy Efficiency and Conservation Agency (PEECA) has also modified the Building code as per their province climatic conditions, which is also under review and will be implemented in Punjab. NEECA has started various initiatives related to building sector such as:

- The launching of Minimum Energy Performance Standards (MEPS). These MEPS regimes are voluntary not mandatory at this stage.
- Effective regulation is needed to make MEPS mandatory for which Energy Efficiency Tribunals will be set-up as the first step in this direction.
- The MEPS and Energy Labels for fans have been launched and voluntarily labeling regime is in place.

- MEPS for LEDs (lighting alone consumes 15 % of total electricity generated) has been launched in January 2020 and labelling regime is under formulation which will be implemented by end of year 2020.
- NEECA is working on the MEPS of air conditioners and refrigerators in coordination with Japan International Development Co-operation (JICA) and they are expected to be launched by July 2020.
- NEECA with collaboration of Collaborative Labeling and Appliances Standards Program (CLASP) team has also finalized MEPS for motor which will be launched by end of 2020.

NEECA is in the consultation phase with the Naya Pakistan Housing Authority (NPHA) to ensure the construction of energy-efficient buildings and implementation of NEECA's mandatory regime for home appliances in all newly constructed houses.

The adoption of labeled energy-efficient appliances has been growing at an impressive rate. These energy efficient appliances are gradually penetrating the local market due to their cost competitiveness as their upfront costs have come down in the international market. The price point for these appliances and increased awareness for the energy efficiency gains are the two major forces, which will enable the market for favorable conditions for energy-efficient appliances. Similarly, the new initiatives such as Naya Pakistan will provide leverage to NEECA to become a catalyst of Energy Efficiency.

3.3.Transport Sector

The transport sector accounted for 33.93% of the total final energy consumption in 2019[xi]. With a contribution of over 13% to Pakistan's GDP, oil (liquid fuels) dominates in the transport energy consumption mix, while the share of natural gas is about 10%.

There is a pressing need to adopt a standard & labeling regime and establish a target for vehicle fuel efficiency standards and emissions. The vehicle fuel efficiency standards are essential to phase out inefficient and polluting vehicles.

- The fuel economy standards such as Corporate Average Fuel Economy (CAFE) as practiced in developed world will be formulated and adopted for the transport sector of Pakistan.
- Following that, establishment of model Motor Vehicle Examination (MVE) Centers with the inclusion of Energy Efficiency parameters would also be focused.
- Various other interventions would be taken in cargo and mass transportation modes such as railways, buses, etc.
- NEECA has been mandated to establish center of research and development for electric vehicles in Pakistan by Electric Vehicle (EV) policy. NEECA will be instrumental along with other stakeholders in the implementation of the recent EV Policy in Pakistan.

3.4. Power Sector

Transmission and distribution losses of Power and Natural Gas (Unaccounted for Gas Losses) in Pakistan are one of the highest in the region. The average power losses in Pakistan are as high as 20%. But for some DISCOs, these losses reach over 38%[xii]. Similarly, the Unaccounted-for-Gas (UFG) Losses are around 11.4% for the gas sector[xiii].

There is huge potential to save energy by deploying smart metering technology for power consumers to avoid distribution losses, by expanding the electricity network to withstand pressures from demand & potential breakdowns, by upgrading and expanding the grid to minimize line losses, by operationalizing small and digital feeders for load management and replacement of old transformers with small, smart and digital transformers.

Targeted interventions like, small captive power units, heat rate improvement program, and demand-side load optimization programs for energy audit of overloaded transformers/feeders would be developed and implemented with DISCOs. Similarly, a dedicated program in collaboration with Sui Northern Gas Pipeline Limited (SNGPL) and Sui Southern Gas Company Limited (SSGC) will be developed and implemented.

3.5. Agriculture Sector

Agriculture sector only accounts for 2% of total final energy consumption in Pakistan, Water pumps for irrigation and tractors for soil preparation are major energy consumers in the agriculture sector. The process of irrigation through diesel and electric powered pumps is extremely inefficient in Pakistan. Besides, the use of commercial energy is also steadily increasing with the growing number of mechanized practices to improve agricultural productivity.

Over 90% of the energy consumed in the agriculture sector is in the form of electricity, while 10% is supplied by oil in the form of High-Speed Diesel for irrigation pumps and machinery. On the contrary, the ratio of electricity versus diesel pumps installed in the country is 20:80. Electric tube wells offer high-cost advantages as running cost is much lower than diesel pumps. However, electricity supply in rural areas for irrigation purposes is highly irregular which negatively affects the farmers and reduces yields. MEPS for motors will be launched to ensure energy efficiency in the irrigation sector coupled with process optimization techniques to increase the yields. Training programs for farmers'/tractor operators will be launched across Pakistan with the support of relevant stakeholders.

With the growing population, NEECA aims to improve energy efficiency in agri-food systems and to integrate food and energy products under the umbrella of Water-Energy-Food Nexus.

3.6. Cross-cutting Areas: Capacity Building and Training Programs

There are two main crosscutting areas which are on top priority and they are cross cutting in NEECA Strategic Plan i.e. (Training and Capacity Building). The initiatives, out of which some of them are in pipeline are;

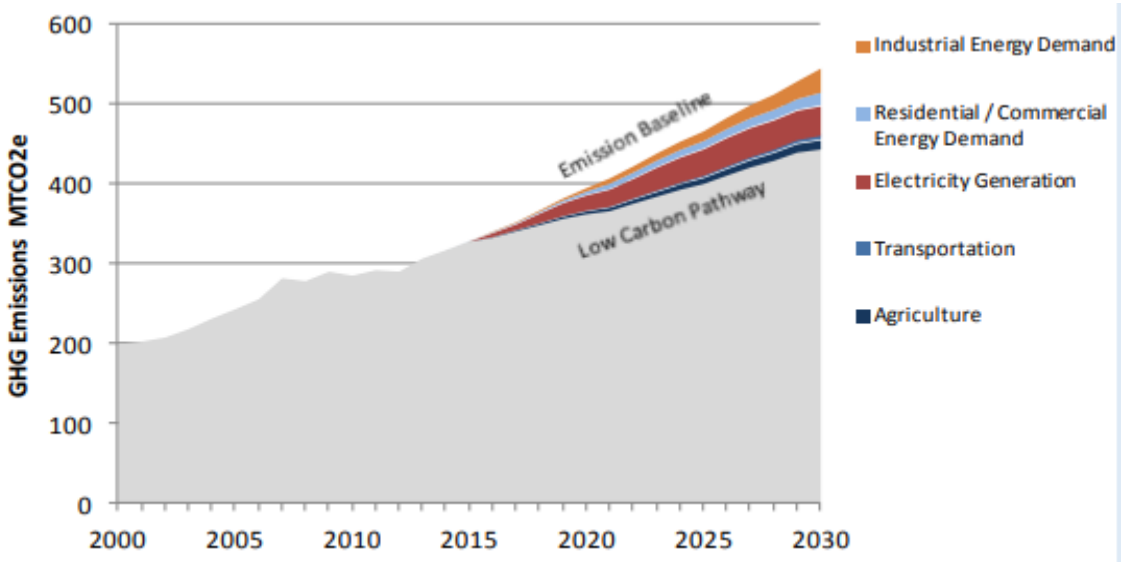
- Awareness through Schools program & PTV Tele school Channels.
- Awareness of Chamber and Commerce, Manufacturer Associations and other key stakeholders.
- Energy Auditors and Manager Program will be launched.
- Industrial Assessment Centers with collaboration of HEC will be developed and launched.
- NAVTEC/TEVTA training program will be launched.

- Full bright program will be engaged with NEECA to brief professors from world class academics institutions on sabbatical for research, similarly students from International Universities will be offered internship to work on NEECA's different Projects.
- International Donor Organization s will be engaged for capacity building of NEECA's staff regarding Electric Vehicles, Public Private Partnership Building Codes/Designs, Energy Audits of power plants and developing infrastructure mechanism for promotion of Energy Service Companies (ESCOs).

4. Climate Change Mitigation: NEECA's Mandate

Pakistan is among the top ten vulnerable countries due to climate change impact. Pakistan is also signatory of Paris Agreement. In terms of Paris Agreement to address global climate change impact, Pakistan's Nationally Determined Contributions (NDC's) also categorically point out climate change mitigation through energy-efficient appliances and improvement in the process as one of the highest priority areas to achieve CO2 emissions reduction.

Based on the National GHG Inventory for 2014-15, the total GHG emissions of Pakistan from energy sector were projected around 331 MT CO_2-equivalent[xiv]. It is more than 50% of the total GHG emissions. Achieving 3 MTOE energy saving target in next three years will reduce emissions by 6.4 MT CO_2 –equivalent at an accelerated energy efficiency of 3.5%. The graph below represents the projected GHG Emission reduction by 2030. NEECA will contribute approximately 6.5% of the total emission reduction by 2023.



Graph 2: 18% percent below projected business as usual emissions by 2030, for a total reduction of about 97 Mt CO2eq. 5% is unconditional and 13% conditional on international support.
Source: Pakistan INDC Report

5. NEECA's Vision, Mission, and Goal

Vision

"To improve quality and affordability of energy through efficiency and conservation for a better future of the country."

Mission

"Formulating and implementing energy efficiency and conservation policies and programs to ensure sustainable, stable, secure, sufficient, and accessible energy".

NEECA's Goal

The goal of NEECA till 2023 is to save up-to 3 MTOE[xv] in the primary energy supply by introducing and implementing Energy Efficiency & Conservation Programs in all major sectors of the economy, leading towards 6.4 MT CO_2 -equivalent carbon emissions reduction of the country in energy sector. The following are sectoral objectives of the Strategic Plan (2020-23);

- In industrial sector, a total saving up to 1.3 MTOE will be achieved by improving energy efficiency in electrical systems, optimization of thermal utilities, and carrying out mandatory industrial energy audits.
- In building sector, a total saving up to 0.5 MOTE will be achieved by the implementation of building codes, development of building energy management systems, and launching of mandatory appliances labeling regimes in the buildings.
- In the transport sector, a total saving up to 0.5 MTOE will be achieved by developing vehicle examination system & regulation, the establishment of vehicle tune-up centers, development of fleet management mechanisms and supporting the implementation of electric vehicle policy-2019.
- In power sector, a total saving up to 0.4 MTOE will be achieved through the intervention of various EE programs which includes transformer and LT capacitor programs, carrying out heat rate assessments, and enforcement of mandatory energy audits in industries.
- In agriculture sector, a total saving up to 0.3 MTOE will be achieved by replacing inefficient tube wells[xvi], establishment of agricultural tractor tune-ups centers, overall addressing water-energy-food nexus.

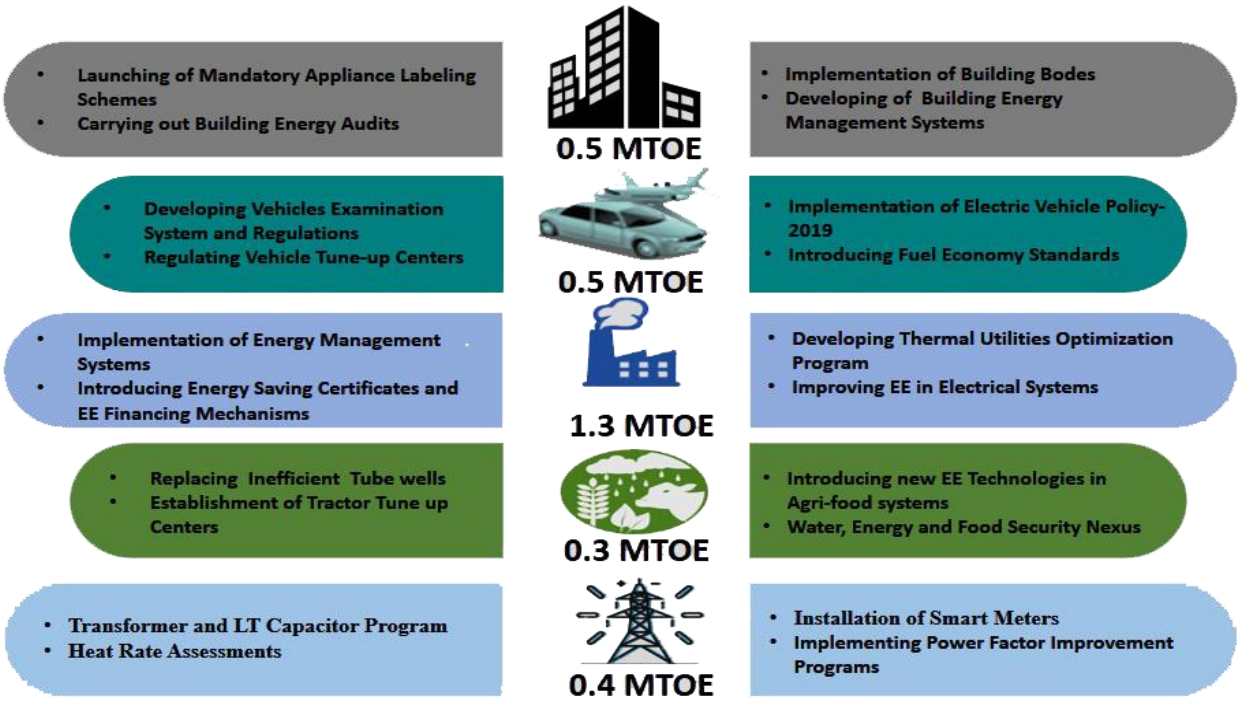


Figure 2 Sectoral Distribution of Energy Saving 3MTOE by 2023

6. NEECA's Strategic Plan- Phase-Wise Description

NEECA's strategic plan is based on following three consecutive phases spread over three years.

- **Phase-1: NEECA's Institutionalization**
- **Phase-2: NEECA's Operationalization**
- **Phase-3: NEECA's Strategic Sectors- Programme Implementation**

1st Phase (FY- 2020) Institutionalization	2nd Phase (FY-2021) Operationalization	3rd Phase (FY- 2021 to onward)- Implementation
• Formulation of National Energy Efficiency and Conservation Policy • Establishment of Provincial Designated Agencies • Provincial Action Plans • Energy Efficiency & Conservation Tribunals	• Formulation of Standard & Labelling • Minimum Energy Performance Standards • Monitoring, Verification and Enforcement System • Certification and Accreditation of auditors and laboratories	Implementation of Major Energy Efficiency and Conservation Program in five strategic sector; • Industry • Buildings • Transport • Power • Agriculture

7. NEECA's Objectives and Key Performance Indicators

PHASE-1: Institutionalization

#	Output	Major Activities	Responsibilities	Funds Required (Pak Rs.)	Potential Sources	Key Performance Indicators	Timeline
1	Formulation of National Energy Efficiency and Conservation Policy	Coordination and consultation with national and provincial stakeholders for data compilation, prioritizing key areas and setting targets	NEECA	20 Million	World Bank Group-Technical Capacity Building Program	Draft National Energy Efficiency and Conservation Policy	30th December 2020.
2	Establishment of Provincial Designated Agencies	Coordination and consultation Provincial Governments	NEECA & Provincial Governments	30 Million	-	Provincial Designated Agencies Established	30th July 2020
3	Provincial Action Plans	• Development of baseline statistics at provincial level • Identification of provincial priorities and aligning with NEECA mandate • Provincial level consultations with relevant department	NEECA & Provincial Governments	50 Million	World Bank Group-Technical Capacity Building Program	Draft Provincial Action Plans	30th December, 2020
4	Recruitment of Technical Human Resource to implement NEECA's Mandate	• Review of HR Structure Study already conducted by NEECA • Development of Rules of Business for HR hiring • Development of HR Policies and Regulations	NEECA	1 billion	NEECA Own Resources/ MOE	Human Resource is available	30th July 2021
5	Establishment of EE & C Tribunals	Review of already existing Tribunals i.e. Environment Protection Tribunal	NEECA	25 Million	-	EE & C Tribunal Established	30th December 2020

		Consultation with stakeholders i.e. MOE, MoL&J Preparation of ToRs of the EE & C Tribunal					
Phase –II: Operationalization							
#	**Output**	**Major Activities**	**Responsibilities**	**Funds Required (Pak Rs.)**	**Potential Sources**	**Key Performance Indicators**	**Timeline**
1	Minimum Energy Performance Standards	Development of Energy Performance Standards for all appliances and machinery used in five strategic sectors i.e. lights, fans, boilers, motors, geysers,	NEECA	300 Million	JICA, WBG, USAID, UNEP, ADB, GIZ, CLASP	MEPS are available by the end of 2021	30th June 2021
2	Mandatory Labelling and Standards Regime	Development of ToRs for Labels and standards of all the appliances and machinery' consuming energy in all strategic sectors (Industry, Buildings, Transport, Power and Agriculture)	NEECA	100 Million	JICA, WBG, USAID, UNEP, ADB, GIZ, CLASP	Labels and Standards available for each appliance and machinery	30th December 2021
3	Monitoring, Verification and Enforcement System	• Development of Protocols i.e. registration of manufacturing units, registration of audit firms • Enforcement mechanisms and imposing penalties/fines • Complaint response mechanisms	NEECA	12 Million	_	MVE system established	30th June 2021
4	Certification and Accreditation of	• Development of ToRs for establishment and	NEECA	12 Million	JICA, CLASP		30th June 2021

	appliances Testing Laboratories	certification of Laboratories • Development of Accreditation database					
5	Development of Curriculum for Energy Auditors	• Consultation and coordination with Pakistan Engineering Councils, Universities and Energy Audit Firms		10 Million	HEC, Engineering Universities, PEC, Donor agencies	**C**urriculum is available	30th April 2021
6	Establishment of Capacity building Program for Energy Auditors	• Signing MoU with HEC for Capacity Building of Energy Auditors • Establishing Capacity Building Programs at NEECA	NEECA & HEC	75 Million	HEC, Engineering Universities, PEC, Donor agencies	Capacity Building Centers established	30th June 2021
7	Revolving Loan Fund (RLF)for Energy Efficient appliances	• Consultation with Commercial Bank • Consultation with Donor agencies • Consultations with Manufacturers and retailers	NEECA	2 Billion	UNEP, WBG, ADB, GIZ, KFW	RLF established with commercial banks	30th June 2021
8	Knowledge Management to Promote EE & C in Pakistan	• Establishment of EE & C Policy Institute at NEECA • Industrial Assessment Centers at Universities in Collaboration with HEC • NAVTEC Training Programs • Electric Vehicle Research Centre • Scholars Exchange Program with Fulbright	NEECA & Partner organizations	500 Million	MOE, PSDP and Donor agencies		30th December 2021

		• Collaboration with International Organization for capacity building of technical staff at NEECA and designated agencies					
9	Outreach and awareness Plan	• Development of Communication and outreach strategy and plans • Quarterly awareness campaigns for demand side management of EE&C • Advocacy campaigns and policy engagement seminar series • Social Media Awareness campaigns	NEECA	40 Million	ADB, UNDP and other donor agencies	• Communication Strategy developed • Quarterly campaigns conducted	Ongoing throughout the timeline
Phase- III: Implementation							
Sectoral Objective 1: To save up to 1.3 MTOE by 2023 by the implementation of minimum energy performance standards (MEPs) in the industrial sector							
#	**Output**	**Major Activities**	**Responsibilities**	**Funds Required (Pak Rs.)**	**Potential Sources**	**Key Performance Indicators**	**Remarks**

1	Installation of energy meters and automatic controls in the textile industry (100) to reduce leakages of compressed air.	• Facilitating preliminary energy assessment of industrial units to set benchmarks for energy efficiency. • Establishing coordination mechanisms with industrial associations • Implementation of rules and regulation related to energy audits and certification of standardized equipment. • Developing case studies of various industrial units to replicate the energy efficiency practices.	• Power Division • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Industrial Association • Banks and SMEs • ESCOs	30 Million	• PSDP • Energy efficiency surcharge (proposed[xvii]) • Micro-financing • RLF • Donor Assistance[xviii]	• By 2022, More than 100 textile industries have installed energy meters' automatic control system to monitor their Energy consumption. • Energy audit reports on specific formats available for 200 textile industrial units by 2023. • Energy savings of up to .2 MTOE in the textile industry by 2023.	• The Indirect interventions like acknowledgment letters, award distribution, awareness, oversight by NEECA and Provincial Designated Agencies are also expected to contribute to achieving energy efficiency targets in the industrial sector at the National level.
2	Installation of Heat Recovery Systems (HRS) from exhaust flue gases and High-Pressure Cogeneration (HPC) in 50 Sugar mills.	• Facilitating preliminary energy assessment of industrial units to set benchmarks for energy efficiency. • Establishing coordination mechanisms with industrial associations and other stakeholders. • Implementation of rules and regulation related to energy audits and certification of standardized equipment.	• Ministry of Energy • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Industrial Association • Banks and SMEs	9 Million	• PSDP • Energy efficiency surcharge (proposed) • Revolving Loan Fund • State Bank of Pakistan – Green Banking Guidelines • Donor Assistance	• Heat Recovery and High-Pressure Cogeneration system installed in targeted Sugar mills. • Energy savings of up to .1 MTOE in the Sugar mills by 2023.	

		• Facilitating the financing mechanisms for installation Heat Recovery Systems for energy efficiency gains.	• ESCOs				
3	Installation of Variable-frequency Drive (VFD) on pumps and motors to reduce energy losses in 50 industrial units.	• Facilitating preliminary energy assessment of industrial units to set benchmarks for energy efficiency. • Establishing coordination mechanisms with industrial associations and other stakeholders. • Implementation of MEPs for Motors.	• Power Division • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Industrial Association • Banks and SMEs • ESCOs	21 Million	• PSDP • Energy efficiency surcharge (proposed) • Revolving Loan Fund • State Bank of Pakistan – Green Banking Guidelines • Donor Assistance	• Capacity building mechanisms for improvement of energy efficiency operations executed by 2022. • Variable-frequency Drive (VFD) on pumps and motors installed in 500 industrial units by 2023 to save .3 MTOE.	
4	Thermal insulation of steam lines and valves in 100 industrial units in Pakistan.	• Steam leakage survey/ assessment for identification of compress air leakage points. • Establishing coordination mechanisms with industrial associations and other stakeholders. • Implementation of EE standards technologies.	• Ministry of Energy • NEECA • Provincial Designated Agencies • Provincial Designated Agencies • Chamber of Commerce & Industries	90 Million	• PSDP • Energy efficiency surcharge (proposed) • Revolving Loan Fund • State Bank of Pakistan – Green Banking Guidelines • Donor Assistance	• Coordination mechanism established with Industrial Associations for Energy Efficiency Targets by 2021. • Industrial units have installed thermal insulation of steam lines and	

			• Industrial Association • Banks and SMEs • ESCOs			valves to save .3 MTOE by 2023.	
5	To improve the overall energy efficiency of the Cementing process in 10 Cement Factories.	• Preliminary Energy Assessment of the industrial unit to identify the energy-saving potential. • Establishing coordination mechanisms with industrial associations and other stakeholders. • Implementation of EE standards technologies.	• Power Division • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Industrial Associations • Banks and SMEs • ESCOs	50 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• Coordination Mechanism established with Industrial Associations for Energy Efficiency Targets by 2022. • Cement industry has improved energy efficiency processes to save .18 MTOE by 2023.	
6	Tuning up boiler burners and adjusting air-to-fuel ratios in Pulp and Paper Units (100).	• Facilitating preliminary energy assessment of industrial units to set bench-marks for energy efficiency. • Establishing coordination mechanisms with boiler associations and other stakeholders. • Implementation of EE standards technologies.	• Power Division • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Brick-Kiln Association	20 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• Coordination Mechanism established with Industrial Associations for Energy Efficiency Targets by 2022. • Pulp and Paper mills to reduce	

			• Banks and SMEs • ESCOs			their gas demand by 7% and overall energy consumption by 5.6% percent just by 2022 to save .1 MTOE.	
7	Launching energy efficiency steam reforming and Haber-Bosch synthesis in the Fertilizer Industry.	• Facilitating preliminary energy assessment of industrial units to set bench-marks for energy efficiency. • Establishing coordination mechanisms with fertilizers associations and other stakeholders. • Implementation of EE standards technologies.	• Power Division • NEECA • Provincial Designated Agencies • Chamber of Commerce & Industries • Industrial Association • Banks and SMEs • ESCOs	50 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	✓ Energy saved up to .5 MTOE by 2023 in fertilizer industry through implementation of EE practices and Technologies.	
8	Zig-Zag Technology for 12000-18000 Brick Kilns.	• Consultative workshop on zig-zag Technology with stakeholders. • Conduct of training workshops for brick kiln labors and workers at targeted brick kiln locations. • Development of project proposal for conversion of brick kiln to zigzag technology.	• Power Division • Ministry of Climate Change • NEECA • Provincial Designated Agencies	100 Million	• PSDP • Energy efficiency surcharge (proposed) • microfinancing • RLF • Donor Assistance	• Brick-kiln industry declared as formal industry in Pakistan. • Coordination developed with brick kiln association for introducing new EE technologies.	

			• Chamber of Commerce & Industries • Brick-Kiln Association • Banks and SMEs • ESCOs			• 30% of the energy efficiency gains from total energy used by brick kiln industry by 2023	
Sectoral Objective 2: To save up to 0.5 MOTE in the building sector by the implementation of building codes and mandatory labeling schemes in all new construction in domestic, commercial and public sector							
1	Implementation of Building Energy Codes in Naya Pakistan Housing Scheme (NPHS) (5 Million House Units).	• Establishing coordination and developing collaboration mechanisms with Naya Pakistan Housing Authority • Channelizing finances for energy-efficient home appliances under State Bank Green guidelines/ on-bill financing • Ensure implementation of Energy Efficient Building Codes in construction of houses as per provision of the NEECA Act	• Power Division • NEECA • Provincial Designated Agencies • Planning and Development Departments • NPH • Pakistan Engineering Council • State Bank • Manufacturers • Banks	10 Million	• RLF • Commercial Banks • Microfinance Banks • Donor Assistance	• By December 2020, MoU with Naya Pakistan Housing Authority on implementation of Energy Efficiency Building Codes. • By June 2021, the Coordination Mechanism for the financing of standardized home appliances established • Energy saved up to .1 MTOE by 2023.	• Naya Pakistan Housing Scheme is a long-term project. If implemented successfully, it would help to save about .2 MTOE only in the residential sector by 2023 • The major component of the building sector is residential/ household. As the home appliances consume a major share of electricity and
2	Provision of clean and	• Development and implementation of energy standards for	• Power Division • NEECA	60 Million	• Commercial Banks • Microfinance Banks • Donor Assistance	• By June 2021, Coordination mechanism	

	energy efficient cook-stoves.	mandatory labeling regime for Cook-stoves and monitoring mechanisms. • Training and capacity building of NEECA and Provincial Agencies. • Certification and registration of cook stove manufacturers associations. • Certification and facilitation for the establishment of accredited testing laboratories.	• Provincial Designated Agencies • State Bank • MoCC • Manufacturer • Donor Agencies like JICA • Banks • DISCOs • SNGPL &SSGC			established with the Ministry of Climate Change and provincial departments for distribution of EE Cooking Stoves. • Energy saved up to .08 MTOE by 2023.	gas, hence a realization for energy efficiency gains is necessary at the consumer level. As per the NEECA mandate, a comprehensive outreach and awareness plan about MEPs for Home appliances' will be implemented at various levels for energy efficiency gains. • Demonstration and pilot projects • Training manual for energy audits for all home appliances
3.	Mandatory labeling scheme for electric Fans at the domestic level	• Development of energy standards for mandatory labeling regime • Training and capacity building of NEECA and Provincial Agencies • Establishment of monitoring mechanisms. • Registration of manufacturers Fans associations. • Development of web-portal for feedback to	• NEECA • Provincial Designated Agencies • Ministry of Energy-Power Division • Ministry of Science & Technology • MoPD &R • Ministry of Finance • JICA • PSQCA • PCSIR • Manufacturing Associations	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• By June 2021, Development of NEECA Registry Portal for Energy Efficient Fans. • By end 2021, Launch of Mandatory Fans Labeling scheme. • Energy saved up to .1 MTOE by 2023.	

		ensure compliance with set standards. • Establishment of stars (labeling surcharge) rating system for domestic appliances.					
4.	Mandatory labeling scheme for air-conditioners and refrigerators.	• Consultation with stakeholders at the national and provincial level. • Development of energy standards for mandatory labeling regime and establishment of monitoring mechanisms. • Registration of manufacturers associations and accredited testing laboratories. • Trainings and Capacity building of NEECA and Provincial Agencies. • Development of web-portal for feedback to ensure compliance with set standards. • Establishment of star rating system for Air-conditioners and Refrigerators	• NEECA • Provincial Designated Agencies • Ministry of Energy-Power Division • Ministry of Science and Technology • MoPD &R • MoF • PSQCA • Manufacturing Associations • MoF • MOPD&R • JICA	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• Launch of MEPs for AC and Refrigerators in June 2021. • Launch of labeling scheme for air conditioners and refrigerators in June 2021. • Energy saved up to .1 MTOE by 2023.	

5	Mandatory labeling scheme for lights.	• Consultation with stakeholders at the national and provincial level • Development of energy standards for mandatory labeling regime and monitoring mechanisms. • Trainings and capacity building of NEECA and Provincial Agencies. • Registration of Lights Manufacturers Associations. • Facilitating the establishment of accredited testing laboratories. • Development of web-portal for feedback to ensure compliance with set standards. • Establishment of stars (labeling surcharge) rating system for lighting.	• NEECA • Provincial Designated Agencies • MoE- Power Division • Ministry of Science and Technology • MoPD &R • MoF • Provincial Development Authorities • CDA • Registered housing colonies • JICA • PSQCA • PCSIR • PWD	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	✓ Launch of MEPS for LEDs in January 2020. ✓ Launch of voluntarily LEDs/ lights labeling in December 2020. ✓ Development of NEECA Registry Portal for Energy Efficient lights. ✓ Launch of mandatory LEDs/ lights labeling in February 2021. ✓ Energy saved up to .1 MTOE by 2023.	
6	Mandatory labeling scheme for Electric Motors.	• Consultation at the national and provincial level and establishing a coordination mechanism with stakeholders.	• NEECA • Provincial Designated Agencies	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• Launch of MEPS for motors in June 2021. • Launch of voluntarily	

		• Trainings and Capacity building of NEECA and Provincial Agencies. • Development of energy standards for mandatory labeling regime and facilitating accredited testing laboratories. • Development of web-portal for feedback to ensure compliance with set standards. • Development of MEPS and launch of labeling scheme for motors.	• Ministry of Energy-Power Division • Ministry of Science and Technology • Provincial Development Authorities • CDA • Registered housing colonies • UNEP • PSQCA • PCSIR			motors labeling in June 2021. • Development of NEECA Registry Portal for Energy Efficient Electric Motors. • Launch of mandatory electric motors labeling in February 2023. • Energy saved up to .1 MTOE by 2023.	
7.	On-bill financing mechanisms for the provision of energy-efficient home appliances	• Consultations with stakeholders for developing mechanisms for the provision of energy-efficient appliances i.e. DISCOs, Banks. • Drafting procedures for bulk procurement and pricing mechanism. • Establishing financial channels (Banks, Investors, and manufacturer).	• Power Division • NEECA • State Bank • DISCOs • SNGPL &SSGPL • Manufacturer • Donor Agencies • Manufacturers	100 Million	• Commercial Banks • Microfinance • Banks • Donor Assistance	• By January 2022, on-bill financing channelized in IESCO. • By January 2022, on-bill financing channelized in LESCO, FESCO, PESCO, MEPCO.	
8.	Establishment of a revolving loan fund to	• Liaison with Micro financing Banks and	• Power Division • NEECA	100 Million	• Commercial Banks • Microfinance Banks	• By January 2022, small grants provided	

	channelize finances for energy-efficient products.	other Commercial Banks. • Consultation with Donor Agencies i.e. USAID. • Establishing financial channels (Banks, Investors, and manufacturer).	• State Bank • Manufacturer • Donor Agencies • Banks • DISCOs • SNGPL &SSGPL		• Donor Assistance	for SMEs for energy-efficient appliances production.	
Sectoral Objective 3: To save up-to 0.5 MTOE energy by 2023 in the transport sector							
1	Establishment of Automotive Engine Diagnostic and & Tune-up Centers and Inspection mechanisms for quality insurance	• Consultative Workshop and Training Program with stakeholders for automatic mechanics. • Development and up-gradation of manuals on the establishment of tune-up centers and up-gradation of training manuals. • Facilitating the establishments of tune-up centers at the national and provincial level. • Formulation of revolving loan fund facility for procurement of diagnostic systems.	• Power Division • NEECA • NHA • NH&MP • MVE • TEVTA • Provincial Transport Authorities	100 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• ECF/revolving funds are operational to finance Automotive Engine Diagnostic and & Tune-up Centers. • NHA/Provincial Transport Authorities coordination established. • MEPs established for vehicle emissions. • Coordination with Donor agencies developed.	• The government of Pakistan has formulated the National Electric Vehicle Policy, 2019. NEECA will facilitate and liaison with all relevant departments, ministries, and stakeholders for energy efficiency targets in transports sectors

						• Energy saved up to .1 MTOE by 2023.	
2	Establishment of fleet management system and inspection mechanisms for quality insurance	• Consultative workshop with stakeholders. • Development and up-gradation of manuals on fleet management systems and up-gradation of training manuals. • Facilitating the development of an inspection mechanism based on set standards/ energy audits. • Revolving loan fund facility for improvement of fleet management and inspection mechanisms.	• Power Division • NEECA • NHA • NH&MP • MVE • Provincial Transport Authorities	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• NHA/Provincial Transport Authorities coordination established. • MEPs established for vehicle emissions. • Energy saved up to .2 MTOE by 2023.	
3	Rules and regulations for energy efficiency standards for electric vehicles instruments	• Consultation with stakeholders • Formulation and implementation of MEPS for electric vehicles • Facilitating the establishment of electric charging stations and establishment of	• Power Division • NEECA • PSQCA • PNAC • NHA • NH&MP • MVE • Provincial Transport Authorities	10 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• NHA/Provincial Transport Authorities coordination established. • MEPs established for vehicle emissions.	

		inspection Laboratories				• Energy saved up to .2 MTOE by 2023.	
Sectoral Objective 4: To save up to 0.4 MTOE through the intervention of various EE Programs in the Power Sector							
1.	Deployment of smart metering technology	• Consultation with DISCOs. • Consultation workshops at the national and provincial level. • Consultation with Donor Agencies • Trainings and capacity building of NEECA and Provincial Agencies.	• Power Division • NEECA • MoPD &R • MoF • Manufacturers • Donor Agencies • DISCOs •	100 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• By September 2021, Coordination mechanism established with DISCOs and K-Electric for installation of Smart Meters. • Energy saved up to .1 MTOE by 2023.	
2.	Upgrading and expanding the Grid to minimize line losses in the electricity sector	• Coordinate in the consultation process with NTDC, Planning Commission and Ministry of Finance for energy efficiency gains. • Consultation with Donor Agencies. • Trainings and capacity building of NEECA and Provincial Agencies to facilitate the up-gradation of National	• Power Division • NEECA • MoPD &R • MoF • Donor Agencies • Banks • DISCOs	500 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• By January 2023, Coordination mechanism established with NTDC for installation up-gradation of electricity grids. • Energy saved up to .1 MTOE by 2023.	

		Grid to achieve national-level targets.					
3	To operationalize small and digital feeders for load management.	• Consultation with DISCOs. • Consultation workshops at the national and provincial level. • Consultation with Donor Agencies. • Trainings and Capacity building of NEECA and Provincial Agencies. • Demonstration and pilot projects.	• Power Division • NEECA • MoPD &R • MoF • Donor Agencies • DISCOs	500 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• By January 2021, Coordination mechanism established with DISCOs and K-Electric for the identification or overloaded feeder and program development for Power Factor improvement. • Energy saved up to .1 MTOE by 2023.	
4	Replacement of old transformers with small smart and digital transformers	• Consultation with DISCOs, K-electric and NTDC. • Consultation with Donor Agencies. • Trainings and Capacity building of NEECA and Provincial Agencies. • Demonstration and pilot projects.	• Power Division • NEECA • MoPD &R • MoF • Donor Agencies • DISCOs • NTDC	700 Million	• PSDP • Energy efficiency surcharge (proposed) • Donor Assistance	• By June 2022, Coordination mechanism established with DISCOs and K-Electric for Replacement of Copper wire transformers with smart/efficient transformers. • Energy saved up to .1 MTOE by 2023.	

Sectoral Objective 5: To save up to 0.3 MTOE in the agriculture sector							
1.	Replace maximum possible tube wells pumps (out of 180,000) with more efficient pumps	• Consultation at the national and provincial level and establishing a coordination mechanism with stakeholders. • Trainings and capacity building of NEECA and Provincial Agencies. • Development of energy standards for mandatory labeling regime and facilitating accredited testing laboratories. • Development of web-portal for feedback to ensure compliance with set standards.	• Power Division • NEECA • NESPAK • ZTBL • Provincial Agriculture Departments • Provincial Designated Agencies	500 Million	• PSDP • Energy efficiency surcharge (proposed) • Microfinancing • RLF • Donor Assistance	• Launch of MEPS for Motors in December 2020. • Launch of voluntarily motors labeling in June 2021. • Development of NEECA Registry Portal for Energy Efficient Electric Tube-wells. • Launch of mandatory tube-wells labeling in February 2023. • Energy saved up to .2 MTOE by 2023.	
2.	Tune-up center for 20k Tractors having power greater than 66HP.	• Consultation with stakeholders at a various level including manufacturers, vehicle financing banks. • Formulation and implementation of	• NEECA • Provincial Agriculture Department	100 Million	• PSDP • Energy efficiency surcharge (proposed) • Micro-financing • RLF • Donor Assistance	• Automotive Engine Diagnostic and & Tune-up Centers. • MEPs establish for vehicle emissions;	

		MEPs for electric vehicle instruments. • Consultation with stakeholders for the implementation of MEPS. • Development of manuals for the establishment of tune-up centers specifically for tractors.				• Energy saved up to .1 MTOE by 2023.	

Endnotes

[i] Energy savings potential assessment is based on available data and information from Pakistan Energy year Book 2018, Pakistan's SE4ALL-National Action Plan, World Bank Energy Efficiency Roadmap for Pakistan and various other documents. The Inputs of consultative meetings with selected stakeholders are also included.

ii (a)Report and Recommendation of the President to the Board of Directors, Energy Efficiency Investment Program, August 2009.

(b) USAID Pakistan: Energy Efficiency and Capacity. http://www.usaid.gov/pk/sectors/growth/epeec.html

(c) Report of the Energy Expert Group, Integrated Energy Plan 2009-2022, March 2009

[iii] In the light of the NEECA Act approved on 26th February 2016, the notification for the establishment of the National Energy Efficiency and Conservation Authority (NEECA) was issued on 6th October 2016.

[iv] Industrial Sector, Transport Sector, Building Sector, Power Sector, and Agriculture Sector are the five sectors, specified in NEECA's Act 2016.

[v] Friends of Democratic Pakistan-Integrated Energy Sector Recovery Report and Plan

[vi] SAARC *Country reports, CRISIL Research*

[vii] Ministry of Planning, Development and Reforms "SE4ALL- National Action Plan" December 2019.

[viii] Conducted by International Finance Corporation of World Bank

[ix] UNHABITAT, 2005. "Energy-Efficient housing in Pakistan. A case of RC Roofs in Pakistan"

[x] Official Statistics of Federal Ministry of Housing and Works published in daily dawn December 2017.

[xi] Ministry of Planning, Development and Reforms and UNDP- Pakistan (2019) "SE4ALL- National Action Plan".

[xii] National Electric Power Regulatory Authority

[xiii] Ibid

[xiv] Calculations based on Least-Cost Greenhouse Abatement for Asia (ALGAS) Project-ADB

[xv] Minimum threshold saving subject to enabling Environment and available financial resources

[xvi] At this 29000 tube wells in Baluchistan will be targeted to ensure energy efficiency in Agriculture.

[xvii] Energy efficiency surcharge is also a way to promote energy conservation and the use of renewable resources. Energy surcharge in Pakistan needs to be revitalized to align with international best practices. For example, China has an EE surcharge of 0.30 RMB per KWh and India has 0.01 INR per KWh.

[xviii] USAID, World Bank, ADB, JICA, KFW