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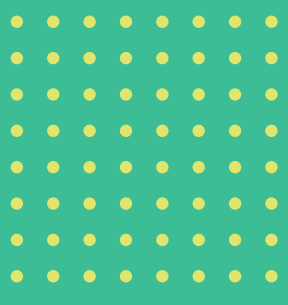
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Energy Efficiency Roadmap for Pakistan



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Energy Efficiency and Conservation Roadmap for Pakistan

Executive Summary

As Pakistan has a tremendous potential for economic expansion, it will be important that energy resources are used efficiently to promote sustainable growth. The National Energy Efficiency and Conservation Act 2016 (NEECA Act, 2016) provides the much-needed governance framework that can facilitate wide scale adoption of sound energy efficient practices throughout all sectors of economy. The Act designates the National Energy Efficiency and Conservation Authority (NEECA) as the apex agency to coordinate and catalyze national efforts to promote conservation. While NEECA is entrusted with a wide range of regulatory responsibility, the Act also recognizes the crucial role the Federal and Provincial bodies must play in implementation and allows them to tailor activities in a manner consistent with national and provincial priorities.

With the governance framework in place, NEECA can take strategic actions in accordance with provisions and spirit of the Act. To facilitate actions a road map is needed to guide coordination and implementation in a disciplined manner across the country. The Energy Efficiency and Conservation Roadmap for Pakistan (Roadmap) contains an actionable agenda to meet the regulatory functions assigned to NEECA in NEECA Act 2016.

Major considerations that went into developing the Roadmap include a review of the barriers to EE&C promotion, and the functions assigned to NEECA and the provinces under the Act. The EE&C potential for each sector of economy as estimated by ENERCON (the former focal agency for energy conservation prior to NEECA Act) and the status of energy conservation programs at the provincial level were reviewed. Relevant international experiences and prevailing government commitments and policies were assessed. Finally, discussions with concerned provincial agencies informed the development of the Roadmap.

The Roadmap is broken down into three phases: An Operationalizing phase, a Development phase, and an Implementation phase. Each phase comprises distinct activities and is sequenced so that activities requiring urgent attention can be done on a priority basis. Implementing the Roadmap begins with operationalizing NEECA and the respective provincial agencies, and so a fully functional NEECA is given a high priority. Operationalizing NEECA requires human resource mapping, and design of an appropriate institutional structure. Ensuring NEECA has staff with appropriate skills and competency is a fundamental and a priority important actionable step. Other early steps include developing a repository of information to provide the source data for preparing relevant and effective programs and projects.

A critical function of NEECA is coordinating and collaborating with provincial governments and other stakeholders in ensuring the country meets the overall goals and objectives, consistent with national and international obligations. These include Pakistan's pledge to reduce, by up to 20%, its 2030 projected GHG emissions. As this improvement (relative to a business-as-usual forecast) will be achieved primarily through a reduction in energy use. EE&C constitutes a key component of the country's commitments on mitigating climate change and the Roadmap recognizes this central role. The operationalizing phase includes giving clear definition to such protocols as a priority for ensuring maximum impact, thereby avoiding conflict and optimal utilization of available resources.

The second phase of the Roadmap, the Development stage, highlights the need for establishing information dissemination and outreach programs, developing energy consumption benchmarks, establishing

conservation targets, and enhancing the policy and regulatory framework, when necessary. Earlier initiatives were hampered by the absence of specific reliable data on energy use patterns, making it difficult to benchmark and set specific conservation targets for any sector/subsector. Now that the regulatory regime is in place to collect such information, it is imperative that barrier be addressed effectively. Increasing awareness among the key actors to assist in developing the technical support through appropriate training and education programs forms an important component of this phase. The Roadmap proposes that the Authority set directions for outreach, determine qualification levels and advise on curricula requirements needed to provide a cadre of qualified professionals and technicians.

The third stage, the Implementation stage, includes creating structured, sectoral programs, developing targeted services designed around low-cost, quick pay back interventions, implementing standards and labelling programs, initiating mandatory audit programs for designated consumers, developing and promoting building energy codes, establishing EE regimes for agriculture and water supply systems, establishing EE programs in the transport sector and other supporting activities to ensure that the benefits of energy conservation are actually realized. The Roadmap also presents an initial list of projects that can be considered for preparation by NEECA or provincial focal organizations with the collaboration of concerned agencies.

Finally, the Roadmap highlights the need for appropriate resource allocation by the government to begin commencement of core activities. The Roadmap may also serve as a useful tool to assist the government in seeking funding and support from the multilateral organizations for activities or projects of specific areas of mutual interest.

1. Preamble

Pakistan's economy has tremendous potential for growth and expansion. A vital input for economically and financially sound growth is an energy sector that is sustainable, affordable and accessible to all. While increased supply will be necessary to meet future demands for commercial energy, it is imperative that in future all energy utilization is efficient. Energy efficiency should be an integral component in delivering fair and equitable energy access to the country's citizens. While the contribution of energy efficiency has been long recognized and prior national initiatives have demonstrated the benefits afforded through energy efficient practices, the full potential remains relatively untapped.

The National Energy Conservation and Efficiency Act (NEECA Act 2016) provides the governance framework that can facilitate national efforts and reinvigorate wide scale adoption of sound energy efficient practices. The Act declares the National Energy Conservation and Efficiency Authority (NEECA) as the apex agency to coordinate and catalyze efforts to promote conservation in all sectors of economy and NEECA has been entrusted with a wide range of regulatory responsibilities. The Act also recognizes the crucial role the Provinces can play in implementing country efficiency initiatives and allows for them to tailor their activities in a manner consistent with individual provincial priorities. In preparing the Roadmap, a meeting with the provincial stakeholders was organized by the Power Division of Ministry of Energy in Islamabad which was followed by a visit of World Bank's team to all provinces. The key elements of the proposed Roadmap were discussed during these meetings. The discussions revealed a broad consensus on the need to (a) establish focal institutions to be responsible for Energy Efficiency and Conservation (EE&C) activities at provincial level as high priority (b) induct experienced professionals in the designated institutions, and (c) prepare work plans tailor made for specific regional needs and conditions.

With the governance framework in place and modalities of coordination between key stakeholders being set, NEECA is now focusing on national initiatives, consistent with the Act, that can deliver energy efficiency throughout key sectors of economy. The initiatives require a Roadmap to guide coordination and implementation of the national EE program. This Energy Efficiency and Conservation Roadmap for Pakistan has been developed considering all the above. Considerations that went into developing the Roadmap include a review of NEECA's mandate as well as barriers that continue to put conservation and efficiency efforts on the backburner. The country's prior energy conservation activities were reviewed, national efforts to tackle climate change assessed and current international best practice analyzed and evaluated to better understand lessons learned and to shape a Roadmap that can be effective and consistent with Pakistan. The Roadmap outlines activities, programs and priority actions that need to be taken by relevant agencies to capture the benefits from energy efficiency and conservation¹. When appropriate, concrete projects can be developed based on identified activities included in the Roadmap. The Roadmap also highlights the collective responsibility that various stakeholders have, be they at the federal and provincial levels, and/or part of the public and private sectors.

¹ "New supply in country provides energy at around 3-30 cents/kWh whereas energy efficiency investments provide energy at 1-3 cents/kWh" Presentation by Special Secretary on NEECA and the Provincial Governments, January 15, 2019

2. EE Roadmap Considerations

This Roadmap consists of an actionable agenda to ensure promulgation of NEECA Act 2016. Other considerations in developing the Roadmap includes a review of barriers to EE&C adoption and the potential for EE&C in various sectors of economy. Also, the Roadmap builds on the strengths of prior initiatives including those coordinated by ENERCON and the lessons learned from these efforts. It also considers complementary on-going in-country initiatives such as the Second National Communication on Climate Change (2018) and donor funded activities. It considers prevailing international best practices and delivery mechanisms and their applicability/implementability with respect to the local context.



Figure 2 – EE Roadmap Considerations

The Roadmap is sequenced so actions such as institutional strengthening and necessary regulatory imperatives are addressed on a priority basis. Given the role envisioned for NEECA under the Act, implementation of many activities will leverage existing provincial and other entities. The primary considerations in building up developing Roadmap are depicted in Figure 2.

2.1 Energy Efficiency and Conservation (EE&C) Opportunity

2.1.1 Energy Sector

Oil and Gas are the predominant energy sources used in meeting national commercial energy needs. About 85% of oil needs are through imports while the gas is mostly indigenous. The total primary energy

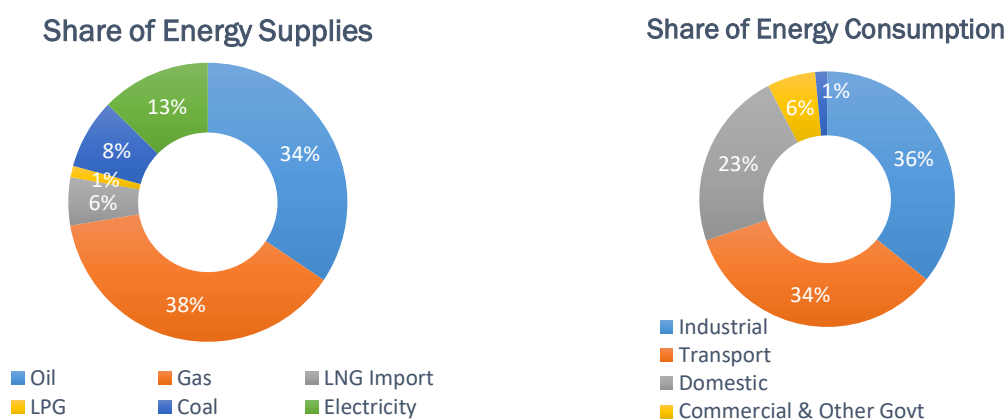


Figure 2.1.1 (a) Energy Supply & Consumption

commercial supplies were around 80 million tons of oil equivalent (TOE) while final energy consumption was recorded as 50 million TOE. (source: Pakistan Energy Year Book 2017). Information relating to supply and consumption is shown in Figure 2.1.1 (a) below

Of original recoverable oil reserves of 160 million TOE, about 116 TOE have been extracted and consumed. Given an annual compound rate of growth (9%) and at the present level of consumption, the remaining recoverable reserves will not last more than three years if the country relied only on its internal sources. Similarly, about 70% of the original gas reserves have been utilized and it has now become unavoidable to import additional gas. The need for fuel imports will continue to increase, if new reserves are not exploited. To enhance energy security, there is an urgent need to utilize indigenous and imported energy resources judiciously to save on foreign exchange expenditures. The original oil & gas recoverable reserves vs balance reserves are shown in Figure 2.1.1 (b).

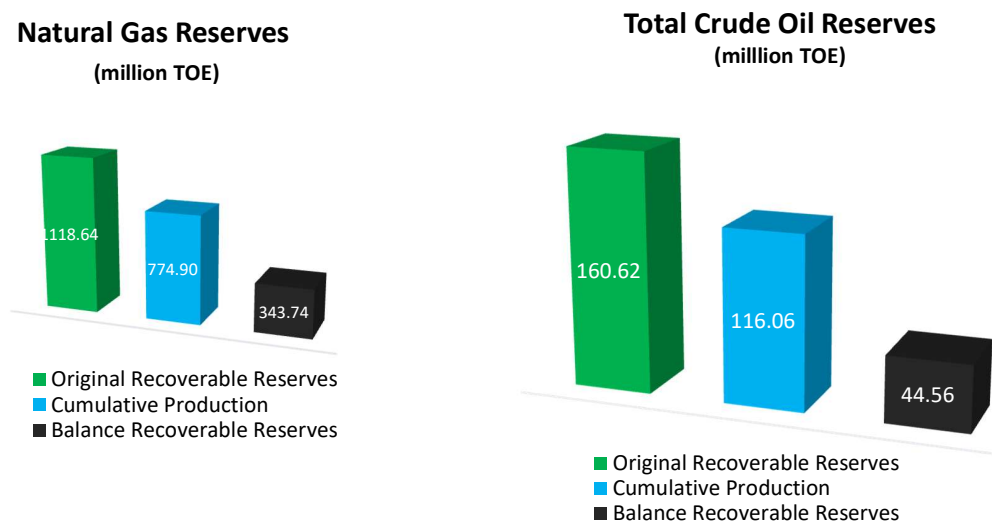


Figure 2.1.1 (b) Oil & Gas Recoverable Reserves (original vs balance)

2.1.2 Conservation Potential

Pakistan submitted its Climate Action Plan to the United Nations Framework Convention on Climate Change (UNFCCC) in November 2015. Subsequently, the Second National Communication (SNC) on Climate Change (May 2018) reiterates the country's commitment to UNFCCC and Paris Agreement. While not a major emitter of greenhouse gas emissions (GHG), the country ranks among the top 10% countries at risk from the impacts of Global Climate Change. The SNC illustrates the need for mitigation actions in the energy and agriculture sectors as collectively they account for over 90% of GHG emissions. Although the contributions will reduce by 2030, the two sectors will still represent more than 88% of the emissions.

Mitigation strategies outlined in the SNC include using market mechanisms and ensuring energy pricing to consumers continue to reflect "cost-of-service". The SNC highlights the key role and active engagement of the Provinces in adopting the mitigation strategies. Implementation of the EE&C can leverage this successful collaboration. The SNC also recognizes energy conservation and efficiency benefits and how this remains underutilized to date. This offers the country a tremendous opportunity. Various sector studies, conducted initially by ENERCON and also corroborated by similar studies carried out by other agencies, show energy saving potential in major sectors of the economy up to of 20% - 25% of total sectorial consumption. This can be translated to realizable savings of around USD \$10 billion to the national economy till 2030.

Table 1 Conservation Potential (source: ENERCON)	
Industry	25%
Buildings	22-25%
Transport	20-23%
Agriculture	25%

The SNC also highlights successes from application of energy efficient practices and adoption of more efficient technologies. Successes include changing to more efficient technologies, for example in lighting, where incandescent lights have been systematically replaced by compact fluorescent lamps under pilot demonstrations that used incentives. Although the market share of incandescent lamps for lighting has reduced to around 50%, an improved lighting technology (light emitting diode (LED) lamps) provides a further opportunity to decrease energy use.

Other opportunities exist. In the residential sector, for example, space conditioning is an area where efficiency improvements are critical. New fan annual sales are about 10 million and fan efficiencies can be improved by up to 35%. Space heaters, using natural gas, are typically more than 30% less efficient than modern units. Home appliances, such as refrigerators and air conditioners, (typical purchases as the economy grows) have low efficiencies compared to international standards.

In the agriculture sector, energy is used predominantly for pumping water for irrigation and for powering farm machinery. Successful pilots undertaken by ENERCON and through the Tube-well Efficiency Improvement Program (TWEIP), supported by USAID, have shown that significant improvement in tube-well efficiency is possible. Also, solar water pumping technology is now commercially viable.

In industry, replacing inefficient technology, (boilers over 35% improvement; electric motors 20-30%) can reduce consumption. In the buildings sector, quick improvements can be made through catalyzing use of new technology for lighting and space conditioning and energy efficient appliances, but these must be complemented by longer term actions that upgrade the energy efficiency of the building stock. For example, it is imperative to ensure new construction and retrofit of existing buildings incorporate energy efficient materials. Earlier, ENERCON developed a building energy code to complement the National Building Code. These documents must be updated, applied and use enforced. For existing building, particularly in the commercial sector, energy audits should be carried out as the energy efficiency performance in the sector has been declining. The transport sector has also seen a fall in efficiency. International experience shows that proper vehicle maintenance pays dividends with respect to fuel consumption with 10% improvement achievable.

2.2 Barriers to Energy Efficiency Adoption

Efficient use of energy resources is hampered by several barriers, including policy constraints, and lack of awareness and information on EE practices and technologies. Others include limited trained personnel and commitment to energy efficiency. The principle barriers are shown below.

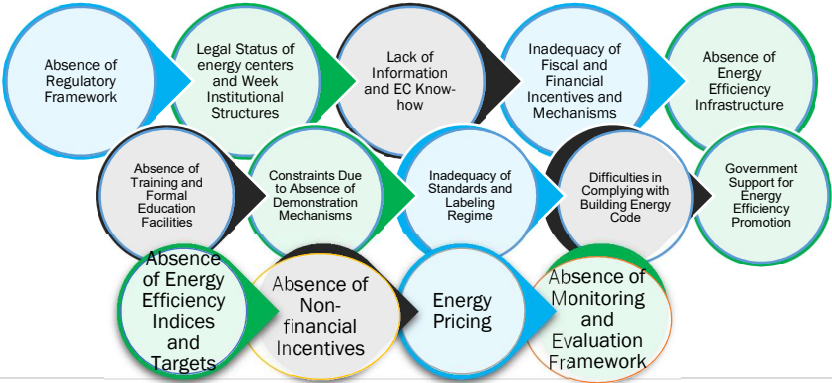


Figure 2.2 EE&C Barriers

2.3 Sectoral Initiatives Identified by NEECA Board

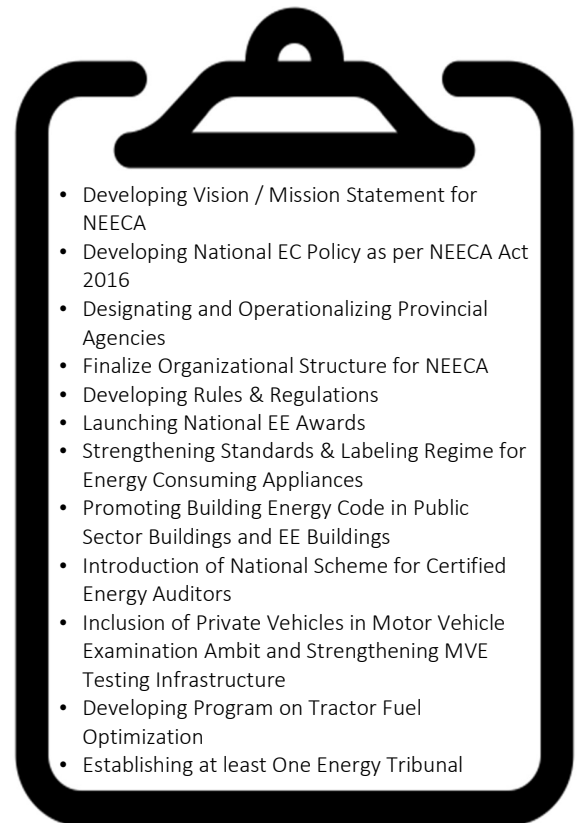
As stated above, significant potential exists in each of the major sectors of the economy. In recognition of this, NEECA Board has identified sectoral initiatives that merit inclusion in a national EE&C activity. Some of these include designating and operationalizing provincial agencies, finalize organizational structure for NEECA, developing rules & regulations, launching national EE awards, strengthening standards & labeling regime for energy consuming appliances, promoting building energy code in public sector buildings and EE buildings and introduction of national scheme for certified energy auditors etc. Unlocking the potential will require careful planning and program design to ensure implementation by the stakeholders, be they policy makers, program developers and implementers. The key initiatives as advised by NEECA Board are summarized in Figure 2.3

2.4 Adopting EE&C - International Best Practices

While prior efforts have clearly shown the country can tap into the benefits from widespread application of energy efficient practices and technologies, the momentum generated by earlier efforts often dissipated as an appropriate framework for sustaining gains was not in place. Fortunately, Pakistan can benefit from international best practice that has seen countries around the world adopt EE&C in a sustainable manner.

The following elements are found in the most successful initiatives:

- An *Enabling Framework* that consists of three elements: governance/oversight, program administration and energy efficiency delivery mechanisms
- A *phased Roadmap* that ensures analyses, adoption and implementation are structured and systematic. In the analytical phase, objectives are set, national institutions, policies and market conditions are analyzed together with energy supply, demand and natural resource considerations, and programmatic options assessed considering policy, technology, and supply and demand options. The technical, economic and financial implications and cost/benefits should be assessed to facilitate selection of appropriate options. Selected options should be adopted through formal legal channels. During the implementation phase it is important to monitor and evaluate progress and to be prepared to modify programs if national priorities change; and
- *Policy and implementation tools* that include:
 - *Effort defining Interventions* that motivate and drive energy efficiency, including target-setting policies, supporting measures
 - *"Carrot-and-stick" policies* that encourage action and address or alleviate barriers to efficiency improvements, thereby leveraging the effectiveness of effort-defining policies
 - *An Implementation toolbox* that provides for guidelines, tools, templates etc. that support the above policies e.g. technology listings etc.



Pakistan now has a robust enabling environment and governance framework. Although, the country needs a clear EE& C Roadmap, prior and on-going work will ensure the country can complete the analysis phase, in an effective and expedient timeline, following development of an overall Roadmap.

The country can also benefit from international best practice when designing implementation programs. Best practice shows it is important to:

- consider other policy priorities that may conflict with energy efficiency program needs,
- account for resource requirements for implementation, such as: human resources (program managers, technical specialists) and capital needs (grants and loans to finance program management, procurement, financing schemes, and other components)
- review roles of coordinating and implementing entities and create a reasonable timeframe for implementation and achieving results.
- include a lag time between implementation and being able to effectively measure changes/improvements.

Successful implementation also indicates programs need the following, irrespective of the area targeted:

- *Management:* chose personnel with an energy efficiency background.
- *Policy and Regulation:* develop programs with cross-cutting EE elements.
- *Data and Information:* for planning and as input into other areas.
- *Technical support:* to develop codes & standards, develop equipment specifications, conduct technical due diligence including energy audits.
- *Training and education:* trained and educated professionals are needed in different disciplines: business, engineering, financing, governance, communications.
- *Promotion & Outreach:* outreach may be needed to create awareness, promote results to scale up programs, facilitate political support, solicit and enlist program participants.
- *Investment promotion:* access to financing is needed to facilitate implementation of EE measures.
- *Monitoring & evaluation (M & E):* all programs need M & E with appropriate KPIs to determine impacts.

2.5 EE&C and Climate Change Linkage

The Roadmap recognizes the country's commitments on climate change and the close relationship between those obligations and energy conservation. Specifically, Pakistan has committed to reduce its emissions (in terms of CO₂ equivalent) by 20% – relative to a baseline estimate – by 2030. This will be achieved primarily through improvements in energy supply/demand patterns and reductions in energy use. Pakistan's climate change commitments therefore highlight the need for: (a) improving energy use efficiency; and (b) promoting the use of fuel/energy resources that involve reduced levels of emissions, and clean energy technologies. Various elements of the Roadmap that complement/reinforce these commitments are discussed in the following paragraphs.

As required under the Paris Accord of December 2015, Pakistan is finalizing its Second National Communication (SNC) titled 'Strategic Support for Energy Efficiency in Pakistan' to the UN Framework Convention on Climate Change (UNFCCC). This submission was based, in part, on a report² prepared for NEECA through funding from this activity. The SNC submission provides, inter alia: commentary on the

² This report relied extensively on the analysis and recommendations listed in **ENERGY: Pakistan Low Carbon Scenario Analysis**, a report prepared by a multi-disciplinary team funded by Climate and Development Knowledge Network (CDKN). CDKN is funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS)

process for preparing Pakistan's Greenhouse Gas (GHG) inventory, identifies the major sources of GHG emissions in the country, and provides projections of Pakistan's GHG emissions;

- A documentation of the country's concerns regarding the climate change agenda – given Pakistan's high vulnerability to climate change³;
- A cataloguing of the mitigation analyses carried out, and actions that are being undertaken (or being prepared) across all sectors of the economy, to with Pakistan's commitments under the Paris Accord.

The SNC submission also documents the governance and institutional framework which has been put in place by the federal and provincial governments – for preparing Pakistan's GHG mitigation and adaptation initiatives. Specifically,

- The Ministry of Climate Change (MOCC) is charged with preparing national climate change policies and action plans, and oversees the work of and coordinates with several federal authorities, research institutions, universities and private sector organizations – including:
 - Global Change Impact Studies Centre (GCISC),
 - National Disaster Management Authority (NDMA),
 - Pakistan Environmental Protection Agency (Pak-EPA) and
 - Zoological Survey Department of Pakistan (ZSD).

It also maintains strong interaction with the Pakistan Metrological Department (PMD), Pakistan Agricultural Research Council (PARC), Federal Flood Commission (FFC), Indus River System Authority (IRSA), Water and Power Development Authority (WAPDA), National Energy Efficiency & Conservation Authority (NEECA), Alternative Energy Development Board (AEDB) and Civil Society Organization and private sector. A summary of the key items in the sectoral action plans and projects proposed for the SNC is presented below.

Residential and Commercial sectors

Actions to promote energy conservation and efficiency in these sectors (as per the draft background report for SNC) included recommendations to:

- Establish energy performance standards for appliances, equipment and machinery, and adopt legislation that bans the manufacture, import or sale of appliances not meeting those standards;
- Introduce testing, certification and approval systems, to ensure that these standards are adhered to;
- Undertake skill upgrading programs for small-scale/cottage industry producers – to demonstrate the benefits of upgrading manufacturing processes.
- Improving roof insulation and (other) building design
- Solar/renewable energy lighting, water heating and other systems.

A common theme that will be pursued in future is to price energy at its true cost of supply, and limit subsidies on electricity or gas to only poor households. The Government is aware that subsidizing energy creates a perception in consumers' minds that energy is a free good and using energy

³ Pakistan is among the top ten most climate-affected countries of the world (according to the Global Climate Risk Index).

inefficiently (or wasting it) is not really an issue. This perception will be countered by adopting 'full cost recovery' pricing policies for electricity and gas.

Building Energy Efficiency Regime

A Building Energy Code was prepared in the mid-1990s and is being updated. Also, after the disastrous earthquake in 2005, UNHABITAT provided support for preparing plans and designs for energy efficient housing. The code established minimum performance standards for windows, openings, heating, ventilating and air-conditioning (HVAC) equipment, and lighting. Updates of the code will be designed to ensure that the code reflects recent developments in building technology, that performance are aligned with local and regional conditions, etc.

Industry

Options for improving Energy Efficiency – as documented in the draft report for SNC – included the following:

- Improvement in Process Operation. E.g. Proper metering in the textile and sugar industry can reduce the energy consumption significantly;
- Replacement of low-pressure boilers with higher pressure boilers can increase the energy efficiency in the sugar industry;
- Installation of Variable Frequency Drive (VFD) or inverters on pumps and motors;
- Installation of Heat Recovery Systems (HRS) from exhaust flue gases in sugar and paper industry;
- Thermal insulation of steam lines and valves can reduce the energy losses in almost all the industrial units;
- Improvement of Maintenance Operation i.e. reduction of air leakages; and
- Proper maintenance and operation of electrical motors.

Other options for improving energy efficiency in various sub-sectors included:

- For cement, convert from single-stage dry kilns to high-efficiency multi-stage kilns;
- For bricks manufacturing, convert from bull-trench/clamp kilns to zig-zag or other modern designs;
- In textiles and other industries promote thermal efficiency improvements, introduce energy audits and inspections, etc.;
- Promote the use of bagasse for electricity generation; and
- Require industries to demonstrate regular maintenance of boilers and machinery, and replacement of equipment with more efficient and high-performance equipment.

Options for improving efficiency and reducing emissions in transport which were identified in the draft/background report included:

- Upgrading performance standards for road vehicles⁴, and fuel specifications;
- Improving vehicle owners' and operators' attitude towards vehicle maintenance, and (over time) enforcing regular maintenance practices;

⁴ In addition to vehicles, these standards could cover vehicle spares and replacement parts, tyres and other accessories.

- Transferring from road to rail particularly for freight, and petroleum products from road to pipelines;
- Fuel switching – e.g. to electricity for railways, from diesel and petrol to CNG/LNG for road vehicles; and
- Establishing more, and efficient. Rapid Bus Transport systems in urban areas.

Waste sector

Current activities to improve solid waste management which were documented in the background report for SNC included:

- Solid Waste Management Guidelines (draft) prepared with support by Japan International Cooperation Agency (JICA), Japan.
- Converting waste agricultural biomass into energy – a project by UNEP and other donors.
- North Sindh Urban Services Corporation Limited (NSUSC) – Assisting the district government in design and treatment of water supply, sanitation and solid waste management
- The URBAN UNIT, Planning and Development Department, Punjab - conducting seminars on awareness of waste water, sanitation & solid waste management techniques.
- Lahore Compost (Pvt.) Ltd. – a project to handle organic waste management in Lahore. The company is registered as a CDM project with UNFCCC.
- Different NGOs are involved at small scale for solid waste collection, and recycling.

Forestry sector

Promising options to mitigate and reverse the decline in forest cover (as a means for carbon capture and absorption) which were identified in the draft report prepared for the SNC included:

- Community based forest management – to conserve rare species and conifer forests;
- Agroforestry, particularly on irrigated farmlands;
- Commercial plantations;
- Afforestation of rangelands and degraded lands;
- Riverine plantations; and
- Provision of alternate fuels – to reduce dependency on fuelwood.

Therefore, Pakistan is putting in place with donor support a comprehensive plan (and programs, projects and actions that support this plan) to further its climate change agenda. EE&C occupies a central place in Pakistan's plans, the Roadmap builds on this central role, and a number of actions and recommendations of the Roadmap are aimed at reinforcing the country's plans to meet its climate change commitments.

The EE&C Roadmap covers a timeframe up to 2030, albeit it is front loaded with a heavy agenda of actionable points in the initial five (05) years. The Roadmap highlights several activities that need to be taken up on a continuing basis throughout the indicative timeframe. Further description of the Roadmap is covered in the forthcoming section of the report.

3. Energy Efficiency & Conservation Road-Map

3.1 NEECA Mandate

NEECA Act provides a governance framework for preparing and implementing a nationwide EE&C program. It defines, inter alia, the mandate and functions of the National Energy Efficiency and Conservation Authority (NEECA) and the authorities and powers which are vested in NEECA (to enable it to perform its functions). It also identifies areas for coordination as well as mandates of other departments or entities (e.g. provincial governments and/or federal line Ministries).

The Act delegates broad authority and responsibility to the NEECA Board. The Board consists of key stakeholders including representatives from the Provinces. This facilitates an inclusive process for activity design, development, implementation and oversight of EE&C adoption in the country. The Board, through NEECA, can nominate stakeholders from the public and private sectors to ensure a holistic approach to policy and regulatory promulgation and program design and development.

- 1** Develop Vision, Strategy and targets for EE&C program and make appropriate institutional arrangements
- 2** Initiate, catalyze, carryout and coordinate EC Programs
- 3** Prepare Policy and regulations, systems and procedures
- 4** Establish Protocols for coordination, outreach/ promotion, and implementation
- 5** Establish Repository of Information
- 6** Program Development Demonstration, R&D
- 7** Recommend / strengthen national EE standards. Display of Labels and strengthen infrastructure
- 8** Prohibit manufacture, import and sale of energy in-efficient equipments.
- 9** Obtain data / information and develop energy consumption benchmarks
- 10** Prescribe and implement building energy code
- 11** Energy Auditors and Managers. Carry out Energy Audits and Energy Use Assessments
- 12** Establish fiscal and financial incentive programs
- 13** Establish system of designated consumers

Figure 3.1 - NEECA Mandate

3.2 EE&C Roadmap Phasing

Figure 3.2 shows three phases of the EE&C Roadmap initiatives recommended in adopting EE as an imperative. The Roadmap will help in ensuring mandates are carried expediently, cost-effectively and, in a manner, consistent with the 2016 Act. The Roadmap outlines phased and complementary policy and regulatory initiatives, activities, actions and projects and programs. The Roadmap also includes sequenced coordinated tasks and identifies key actors and their roles and responsibilities. A key starting point is to define a vision for what the EE&C initiative is expected to accomplish and goals and targets the EE&C can deliver for the country. Accomplishing the vision and achieving goals and targets will require a supporting policy and regulatory framework, resource mobilization, including institutional and human capacity development, access to information to increase awareness and aid planning and decision-making, technology and financing. It will also require compliance and enforcement, as prescribed under the policy and regulatory framework. Above all, it will require behavioral change, so energy efficiency is embraced by the citizens of the country and becomes an integral part of their everyday lives.



Figure 3.2 – EE&C Phases

One of the key priorities of the Operationalization phase is to establish the institutions (NEECA at the federal level, and special departments/agencies at the provincial levels) and to staff them adequately. This will involve ensuring a cadre of professionals with experience in climate change issues is also inducted into the respective institutions. Similarly, the Roadmap recommends establishment of a comprehensive Repository of Information, as a stand-alone database, an integrated set of databases, or a combination of the two. This Repository will include statistics on energy use by fuel, emissions factors, etc. and will support the preparation of programs, projects, and other activities that are aligned with national priorities. Also, it is proposed that protocols for information sharing and collaboration (between various Ministries/departments, federal and provincial governments, etc.) be prepared at an early stage of the EE&C program. This will ensure a coordinated approach between Ministry of Energy, Ministry of Climate Change, the provinces and other stakeholders that have key roles in the climate change agenda.

The NEECA Act provides a substantial role to NEECA to gear up and implement an EE&C program by way of preparation of the National Energy Efficiency and Conservation Policy. The private sector's active participation is critical for a successful EE&C program, both with regard to energy end use and energy supply. On the end use side, the private sector accounts for the bulk of energy use in the country and therefore holds the largest saving potential. On the supply side, again, the private sector has the means to finance the large investment required for increased supply (in an efficient and least cost manner) whereas public sector resources are constrained by the requirement of other priority sectors such as education, health, poverty alleviation, etc. These considerations regarding the central role of the private sector need to be addressed in the national Policy. As EE&C is relatively nascent activity in Pakistan, it requires substantial support and incentives for this activity to be widely accepted and adopted. This includes propagation, demonstration and facilitation - through instruments such as dedicated credit lines, specialized financial institutions etc. There is also a need for developing the capacity of domestic financial institutions and commercial banks to handle the specific financing needs of EE&C activities. The government can best achieve this objective by incorporating these considerations in the national Policy.

In the Development phase, the Roadmap proposes that indicators (and formal energy use indices) be prepared – covering current levels and future targets – for all key economic activities. Future targets for such indices should, clearly, reflect national priorities and obligations in terms of emissions, and other climate change impacts. The Roadmap also proposes that such targets be established for intermediate

years, in addition to the terminal year (2030). This will allow the Government to monitor the progress achieved (annually and over a five-year period) towards meeting the 2030 target for emissions reduction, and to adopt corrective measures, if the mid-term review indicates that the terminal year targets are unlikely to be met. Similarly, it is important to ensure that the rules, regulations, and SOPs that are prepared, under this phase, adequately cater to the needs to monitor climate change and emissions impacts.

The Roadmap recommends outreach and dissemination on EE&C be carried out at the outset of the Implementation phase. This will accelerate building a consensus on energy saving and conservation, as well as help in demonstrating the risks and disadvantages of inefficient energy use, based on the harmful impact of emissions, pollution and other aspects of the climate change agenda. Similarly, it is expected that when programs and projects draw upon the database/Repository of Information, the likelihood of conflicts and contradictions between the climate change agenda and individual investments will be minimized, if not eliminated. Establishing a cadre of energy professionals (including inspectors and/or auditors) can complement such project and programs by allowing each activity to be monitored in terms of its climate change impacts. Similarly, the penalties and restrictions included in the 'inspection, auditing and monitoring' rules and regulations will act as a deterrent for inefficient energy use, especially for polluting activities.

The Roadmap, therefore, needs to be considered in a holistic manner and an integrated approach needs to be adopted in implementing the recommendations.

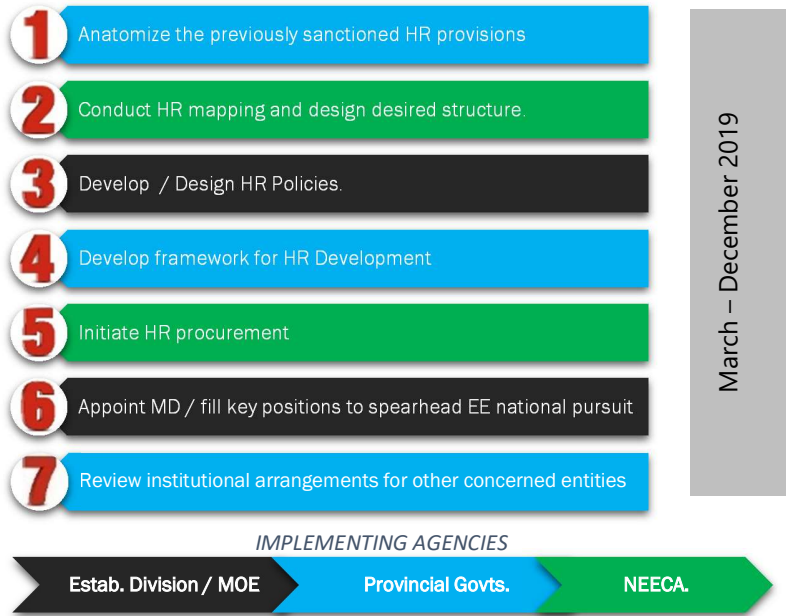
The three phases of the EE&C initiative as discussed above provide a logical pathway in adopting energy efficient practices. The vision of the Government is for the country to utilize energy efficiently while promoting universal energy access to ensure the country continues to grow economically and meets its national climate change goals in a financially sustainable manner. Achieving this will require commitments from a broad range of stakeholders; an enabling environment that stimulates actions and investment through incentives; and establishing the required infrastructure – the capacity of NEECA to perform its functions, protocols for coordinating the program among various governments and departments, rules and regulations to support the implementation of the program. The Act also requires NEECA to facilitate, monitor and coordinate various EE&EC activities. Consequently, NEECA needs to develop capacities to, inter alia, prepare:

- successful pilot/demonstration projects which are replicated/rolled out nation-wide by private investors, consumers, the utilities, etc.;
- awareness and information dissemination campaigns – to publicize the need for and benefits which can be achieved through greater efficiency in energy production, supply and use, list the standards and specifications that apply to various products/equipment, etc.; and
- the rules/regulations through which various EE&C activities will be monitored and enforced.

4. Operationalization Phase

4.1 Operationalizing NEECA and Provincial Focal Agencies

Implementation of EE&C Roadmap begins with operationalizing NEECA and concerned provincial focal agencies. NEECA, being the apex agency, is required to coordinate and lead national pursuits to promote EC effectively. Making NEECA fully functional is thus a high priority in the Roadmap. Other steps to be taken include developing a repository of information which provides the source for preparing relevant and effective action plans and projects, evaluating the impacts of such plans in relation to national priorities and circumstances and relative to their (originally) projected/anticipated outcomes; and establishing communication and coordination protocols.



Key steps for equipping NEECA with the required Human Resources (management, professional staff, and manpower) are shown in Figure 4.1.

Figure 4. 1. – Operationalizing NEECA – A key first step

A key step in operationalization is to determine the functions NEECA will carry out on a day-to-day basis and what functions can and should be delegated to third parties. NEECA’s HR requirements should be developed from this assessment and/or determination. As the overall strategy is to leverage existing organizations and entities, the overall professional NEECA staffing requirement can be relatively small, provided the recruited professional staff have the necessary skills and capabilities to carry out their respective duties in a manner consistent with the expected modus operandi.

A critical function for NEECA is coordination, collaboration and cooperation with provincial governments and other stakeholders, to achieve overall goals and objectives, consistent with international obligations on Climate Change (Greenhouse gas emission reductions by 20%, relative to a baseline forecast, by 2030), and it is important the organization structure and human resource base cater for this.

4.2 Develop Repository of Information

There have been several major prior EE initiatives. They include activities supported by international agencies and carried out at provincial, and national levels. However, there is no centralized repository of all the outputs of the prior work and the lessons learned. Creation of an easily accessible central information repository with relevant energy efficiency-related information/data can help expedite future EE programming.

It will, inter alia, provide credible and c

intermediate and long-term targets for the EE&C programs, permit ranking in terms of economic priority of key sectors, programs and projects, support preparation of least-cost and high return projects and investments, and enable such activities to be evaluated (mid-course or on completion). NEECA will need to access information for benchmarking and targeting as well as for initiating and coordinating requests for technical and financing assistance and information exchange. The key steps required for establishing a repository of information are listed in Figure 4.2.



Figure 4.2 - Develop Repository of Information

4.3 Establish protocols for coordination and collaboration

The EE&C Program (and specific projects and activities to implement the Program) need to be prepared in coordination with provincial governments and other stakeholders to avoid conflicts and duplication of efforts, ensure maximum impact and optimal utilization of available resources (including, inter alia, skills and expertise, as well as financial resources). The approach to and specific steps to ensure coordination need to be developed early on.

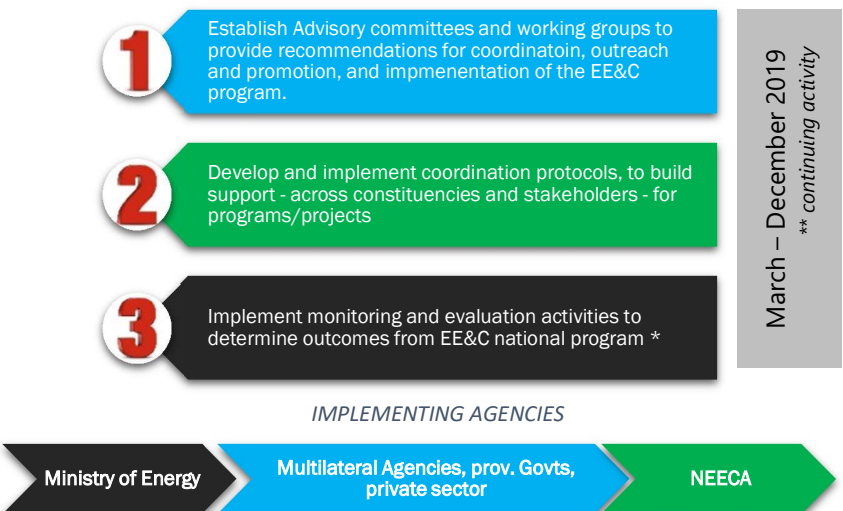


Figure 4.3 – Establish Coordination Protocols

4.4 Developing the policy & regulatory framework

One of the key tasks for NEECA (under the Act) is to develop and periodically update the National Energy Conservation Policy. The key steps are listed in Figure 4.4. They include: (a) determining the rules and regulations to be promulgated, preparing drafts and submitting those to the required approval forums; (b) developing protocols for coordination between federal and provincial governments and between various departments and entities; and (c) establishing energy tribunals.

- 1** Ascertain Constitutional and Legal requirements
- 2** Establish a Task Force/committee to prepare (draft) Policy and Vision/Strategy for EE&C;
- 3** Develop process for seeking inputs from Stakeholders - academia, sector professionals/experts, manufacturers, equipment and fuel suppliers, etc.
- 4** Draft Policy prepared
- 5** Discussion and comments
- 6** Submission to CCI
- 7** EE&C Policy approved and adopted

March – December 2019



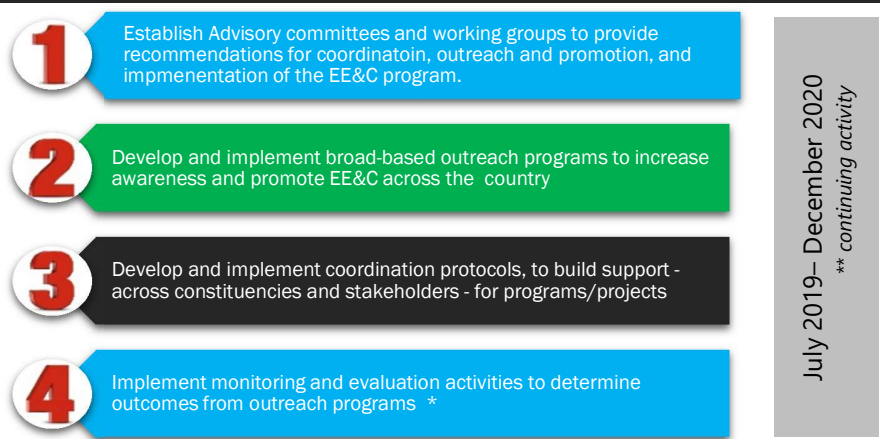
Figure 4.4 – Policy and regulation development

5. Development Phase 2019 - 2020

5.1 Establish Promotion and Outreach programs

Promotion and Outreach activities need to address two key areas. The first is to increase awareness of EE &C benefits and the National Policy. The second is to support implementation of specific programmatic initiatives and encourage and stimulate participation by intended beneficiaries.

Abroad-based outreach initiative must be designed to raise collective consciousness across a diverse constituency, and it is important to recognize reaching each one will require different outreach avenues and methodologies. The programmatic-related outreach must be designed to ensure maximum uptake and participation in the program by intended target audiences.



July 2019– December 2020
** continuing activity

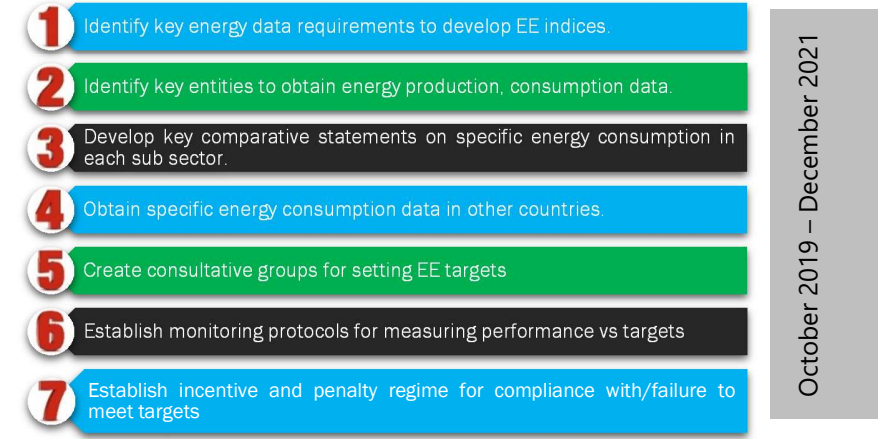
IMPLEMENTING AGENCIES



Figure 5.1 – Implement Outreach Activities

5.2 Develop Indices, Targets, & Address Barriers

Although the energy saving potential in the various sectors is well known, absence of specific reliable data on energy use patterns makes it impossible to benchmark and set specific targets for any sector/subsector. After establishing a central information repository, a next step will be to evaluate and determine what goals can be set for reducing energy intensity and for meeting GHG emission commitments.



October 2019 – December 2021

IMPLEMENTING AGENCIES



Figure 5.2- Develop EE Indices / Set Regional, Sectoral / National EE Targets

5.3 Develop Training and Investment Programs

There are some key barriers that need to be addressed early on. These include: increasing awareness among key actors to ensure they understand why the Federal Government is seeking to tap into the EE opportunity as well as assisting in developing the technical support capability through appropriate training and education programs. While there is a prime role for the Authority to oversee and coordinate awareness creation initiatives to ensure that messaging is consistent with national policy goals and that training and education activities deliver a qualified and competent workforce with the skills to execute EE&C actions, actual delivery of promotion and outreach campaigns and training courses and education programs, can be realized using existing channels such as media companies and vocational and professional education providers. The role for the Authority will be to set direction for outreach and determine education levels and advise on curricula requirements needed to provide a cadre of qualified professionals and technicians.

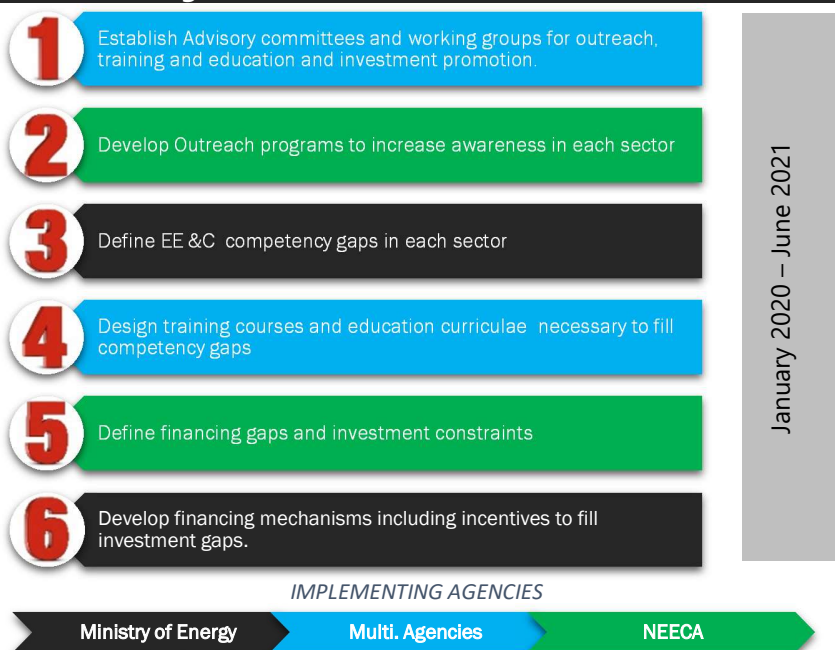


Figure 5.3 - Create Structured Programs for Outreach, Training & Education and Investment Promotion

Similarly, there is a need to determine if financial incentives are needed to stimulate investment in energy efficiency technologies and practices. Therefore, NEECA, in concert with advisory committees and working groups, should develop activities for outreach, training and education and investment promotion.

5.4 Establish Modus Operandi to Enforce Regulatory Regime

A fully functional NEECA also requires a standardized approach to operations and for enforcement of regulatory regimes. These are shown in Figure 5.4.

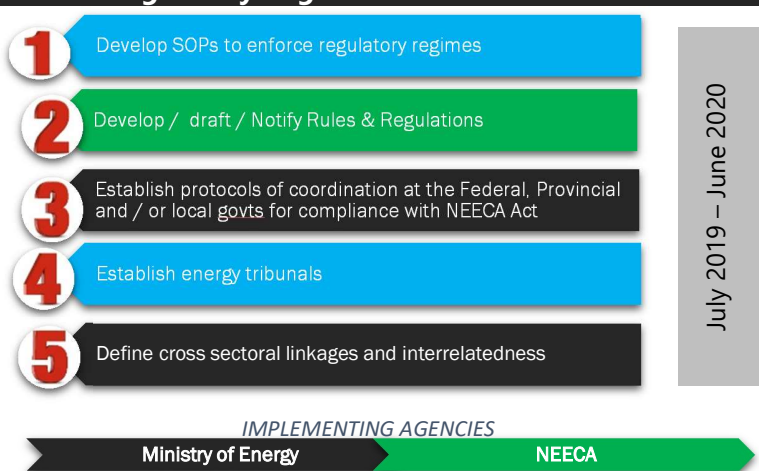


Figure 5.4 - Establish Modus Operandi to Enforce Regulatory Regime

5.5 Establish Certified Energy Auditors Program

Establishing a certification program for energy auditors is a key component of the Act and is likely to serve as a fundamental instrument to build local capacity for promoting EE. The required steps are shown in Figure 5.5

Energy Audits can be instrumental in achieving end results: for regulators and oversight institutions they provide a basis to assess the compliance by companies and firms with applicable standards and enable them to take corrective actions; for management they document efficiency of energy use within the company and identify opportunities for cost savings.

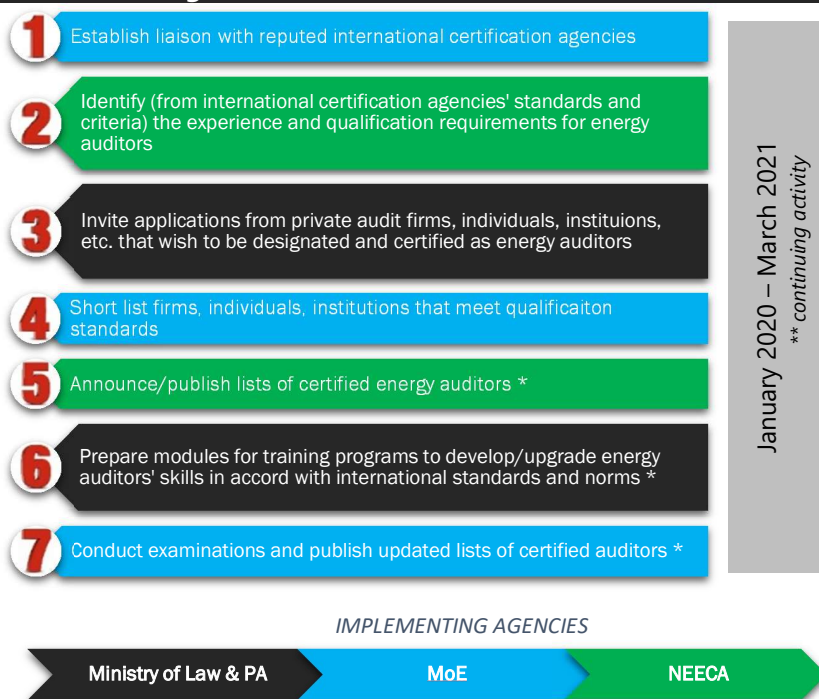


Figure 5.5 Establish Certified Energy Auditors Program

5.6 Develop Performance Contracting

Performance contracting is often used for implementing EE&EC activities. It involves formal agreements between 2 or 3 parties – a consumer, an energy service company (ESCO) and, in some cases, a utility or financial institution to share investment risk and profits. The steps involved are described below. Usually, the ESCO prepares an investment grade audit/program/project for a consumer and estimates the value of energy savings the program/project will generate for the consumer. The investment grade audit also provides for a performance

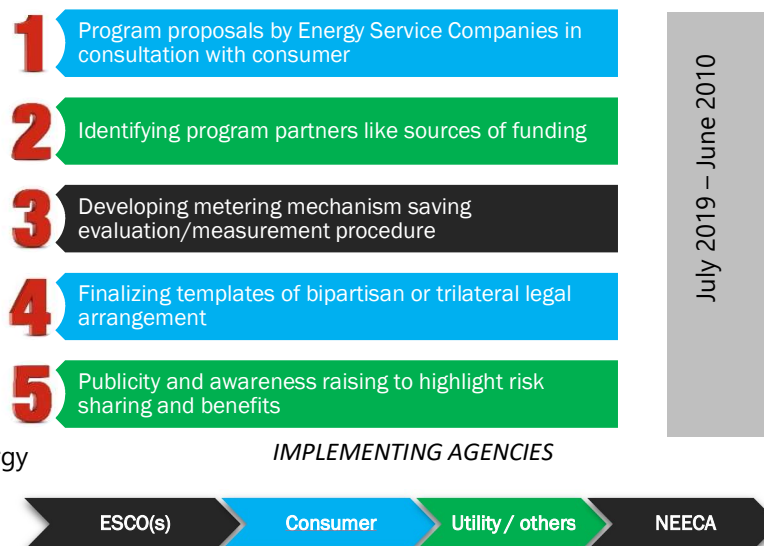


Figure 5.6 Develop Performance Contracting

guarantee (and consequently the level of energy savings) of the savings, which may equal or a portion of the total/computed level of savings, that will accrue to the consumer. The consumer and ESCO enter into a legally binding contract agreement, based on the (energy efficiency) performance guarantee, and implicitly the actual/accrued value of savings (reduction in the consumer's electricity or gas bill) that forms the basis

for payment to the ESCO. The risk/rewards from the investment/project are thereby shared by both the consumer and ESCO. The agreement usually prescribes a measurement and verification (M & V) protocol for determining the level of energy savings.

The investment to implement the project is either made by the consumer or through a third party that may include the ESCO. Any necessary maintenance necessary to ensure the guaranteed performance of the project is usually done by the ESCO at the ESCO's expense. The performance of the project is monitored on a regular basis as set out in the contract, often by an independent entity, following the prescribed mutually agreed M & V protocol and the savings determined and payments made as appropriate. The performance contract often includes penalties, payable by the ESCO if the guaranteed performance is not realized.

This mechanism has been used successfully in the United States to upgrade the energy efficiency performance of federal and state facilities. Federal and provincial governments, and the respective departments/entities/agencies, should review whether such an approach could be adopted and utilized for specific EE&C activities in the country. Key points to consider include whether consumers would carry out a specific activity on its own (because of its profitability or quick returns) or whether a mechanism for sharing the risks may prove of interest. In all cases, there is still the need for access to financing and the creditworthiness of ESCOs and consumers may be a barrier that needs to be considered. In addition, the legal veracity of a performance contract in the country is unknown.

If it is concluded that this mechanism has merit or can stimulate some types of investments, for investments involving 'large' expenditures, then NEECA could, inter alia, prepare: (a) templates of performance contract agreements that can form the basis of third party agreements between the parties; (b) use publicity and awareness raising campaigns, to highlight the benefits (e.g. sharing of risks among various parties) of this approach; and (c) projects/programs which they would like to partner, or support through available sources of financing (e.g. the ECF).

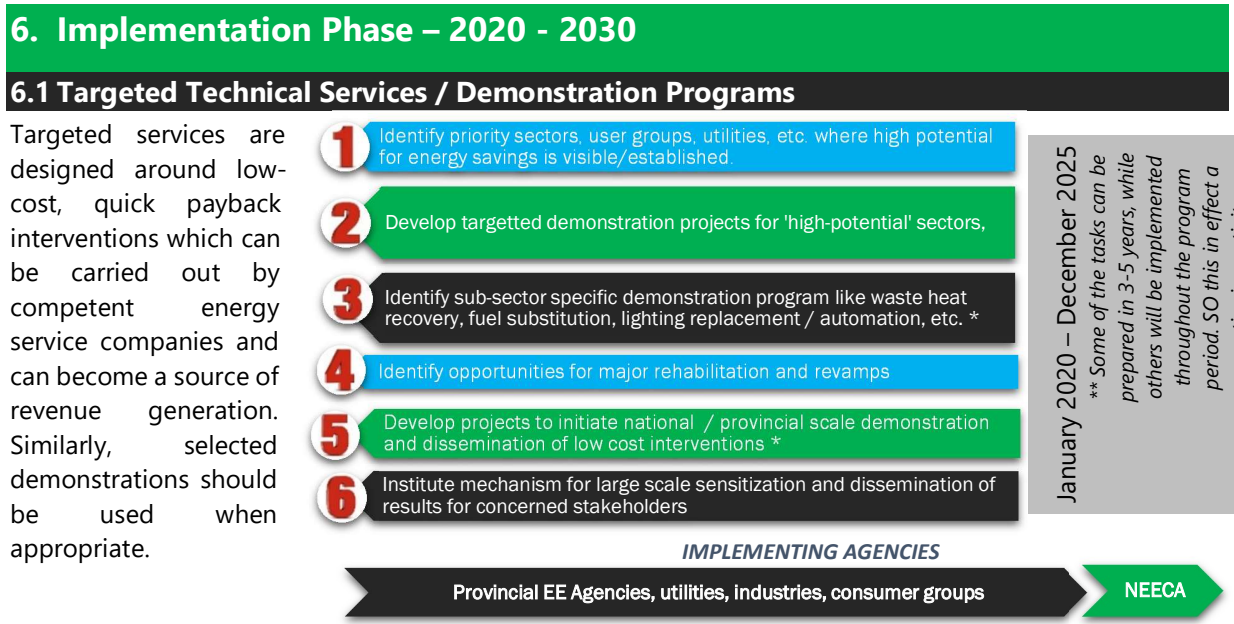


Figure 6.1 - Targeted Technical Services / Demonstration Programs

6.2 Appliance Standards and Labeling Programs

Phasing out of inefficient appliances and adoption of new standards is needed. Appliance testing and certification and labeling infrastructure needs to be established. Figure 6.2 sets out the key steps.

The process should involve an early review of standards and specifications for equipment and machinery prepared by reputable international institutions (for example, IEEE, US DOE.), and a subsequent decision on what standards are most applicable and best reflect the local situation. The standards and specifications selected for adoption should seek to replicate the adoption of the international best standards and specifications in a phased manner. A phased approach is required because current standards for equipment and machinery (manufactured, sold or used) in Pakistan may need to be revised/updated in order to conform to internationally accepted standards; producers, importers and traders will have invested in facilities and stocks in compliance with existing standards, and it is not fair to ask them to adopt the updated standards and specifications immediately. Therefore, a phased approach should be followed that

- describes the norms /standards/specifications that will apply to all machinery, equipment and appliances after a transition period;
- sets out the time limit for this transition period;
- defines the tests and certificates (e.g. those carried out by internationally reputed and recognized laboratories, and by accredited laboratories in Pakistan) which will be acceptable for complying with the 'approved' standards and specifications;



July 2019 – December 2023
 ** Preparing and adopting performance standards for equipment, machinery, appliances and products will require 3-5 years, but enforcing and implementing them will be a continuous task, so this is also (in effect) a continuing activity

Figure 6.2- Standards and Labelling for Appliances

- d. encourages the private sector to invest in laboratories, etc., to perform testing and certification functions – i.e. specifies the equipment/facilities and resources (including professional staff and expertise) which a certified lab must have, the fees it can charge for tests and certificates, and periodically invites applications from firms and individuals that wish to set up such facilities; and
- e. specifies penalties which will be imposed on manufacturers, importers, traders, etc. who continue to provide items that do not comply with approved specifications, after the transition period.

Legal documentation to ban the manufacture, import and sale of non-compliant items after the transition period needs to be prepared and notified, in parallel.

6.3 Mandatory Audit Programs for Designated Consumers

An energy audit is necessary to assess the efficiency of energy utilization in any entity and the 2016 Act prescribes their use. A key role will be for NEECA to set criteria for qualified energy audits and auditors and to determine what facilities will be subject to mandatory audit programs. The program can be initiated through a combination of voluntary and mandatory audits for specific enterprises and industries.

Subsequently, periodic (annual perhaps) audits should be required for all large energy consumers.

Mandatory audits can be carried out by private sector firms/companies certified by NEECA. It will be important NEECA and provincial EE Agencies monitor the actions taken by private- and public-

sector firms, in response to the energy audits. The entire rationale for undertaking the audits will be negated if the audited firms/companies do not prepare retrofit and other investment plans to offset the inefficiencies in energy use efficiency identified during the audits.



Figure 6.3 – Energy Audit Programs for Designated Consumers

6.4 Building Energy Code (BEC)

A NEECA- developed BEC can set benchmarks for energy consumption in the building sector, the most electricity intensive sector in the country. Implementation will require appropriate awareness programs and compliance guidelines.

A task force or committee of experts should be put in place to develop the Code, and comments and inputs sort from professional bodies and practicing professionals prior to adoption of the Code.

- 1 Gear provincial governments to amend / adopt building energy code.
- 2 Develop Compliance Handbook of Building Energy Code of Pakistan
- 3 Develop standard operating procedures and protocols for implementing Building Energy Code
- 4 Develop strategy for nation-wide training programs for architects, builders, developers and to implement BEC *
- 5 Initiate building energy audit and retrofit programs in public and private sector buildings
- 6 Facilitate local development authorities to incorporate BEC in their by-laws *

January 2020 – December 2026

** The first BEC can be finalized in 2-3 years, an implementation handbook can be prepared over the same period, and initial implementation can also be completed in this time frame. However, the BEC may need revisions to incorporate region specific conditions, etc. So, this is also a continuing activity

IMPLEMENTING AGENCIES

Provincial EE Agencies

NEECA

Figure .6.4 - Enforce Building Energy Codes

6.5 Identify/specify Energy Efficient Building Materials

The use of EE building materials constitutes a necessary element to promote EE in the residential / community / commercial buildings. A comparative analysis of building materials to highlight their EE characteristics will be important parts of this activity. Architect / building associations / Ministry of Housing can provide useful inputs. A list of actions to promote the use of EE materials in (building and other) construction is provided in Figure 6.5.

- 1 Identify building materials for energy efficiency characteristics
- 2 Identify procedures to use such materials
- 3 Develop comparative statements for energy efficiency characteristics to allow for informed decision making
- 4 Disseminate information regarding energy efficient materials

January 2020 – December 2023

A comprehensive list of building materials can be prepared in 3-4 years. The time frame for the major portion of this task is therefore 2020-2023

IMPLEMENTING AGENCIES

Provincial EE Agencies

NEECA

Figure 6.5- Energy Efficient Building Materials

This task will be an ongoing activity for NEECA and provincial EE entities. Periodic dissemination of these efforts is important for ensuring that the advice provided by experts and professionals, and documented by NEECA, is optimally and continually utilized.

6.6 Develop Prototype EE Building Designs

Buildings are major energy users accounting for about 50% of the national electricity consumption. The household sector is the major contributor and offers a tremendous potential for energy savings. Developing prototype Energy Efficient (EE) building designs for the housing sector will provide a good opportunity for architects, builders and end users to replicate in their construction projects.

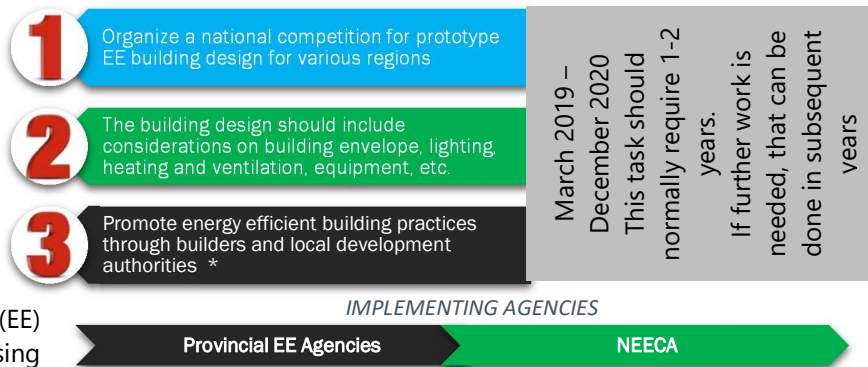


Figure 6.6 - Develop Prototype EE Building Designs

The Prime Minister’s Housing Program presents a good opportunity to publicise EE designs, construction methods and efficient materials. This Program represents a large investment which will be closely monitored by building designers, construction firms, financiers, etc. and can set precedents for the construction of residential buildings well into the future. The Government can promote this by appointing a Task Force, comprising experienced professionals (architects, engineers, etc.) to prepare: (a) designs and prototypes of small to medium-sized homes; (b) construction standards/SOPs for installing appliances and fixtures, workmanship, etc. for homes constructed under the Program; (c) recommendations about building materials that are best suited, from an EE perspective, for various sized homes; and (d) specific considerations (responsive to the geographic, climatic and other conditions) which can apply to houses constructed in various regions.

6.7 Establish National / Regional Building Energy Audits Programs

Energy savings in buildings can be achieved based on comprehensive energy audits carried out by competent energy service and/or audit firms/companies. Audits not only identify opportunities to reduce energy use but also help the market build its capacity to effectively promote energy consumption patterns in the sector. The Building Audits can be part of an overall Energy Audit program (see above) or be considered a separate program, with implementation through the private sector, if they are allowed to charge fees that

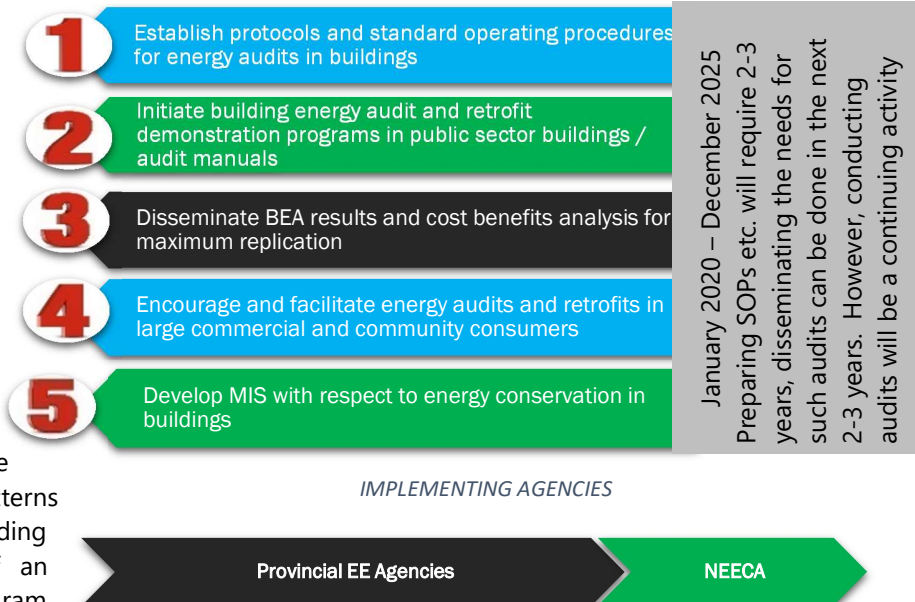


Figure 6.7 - Establish National Programs on Building Energy audits

are sufficient to cover the costs incurred in conducting these audits. The role for NEECA should be to establish a process for certifying private parties to carry out the audits.

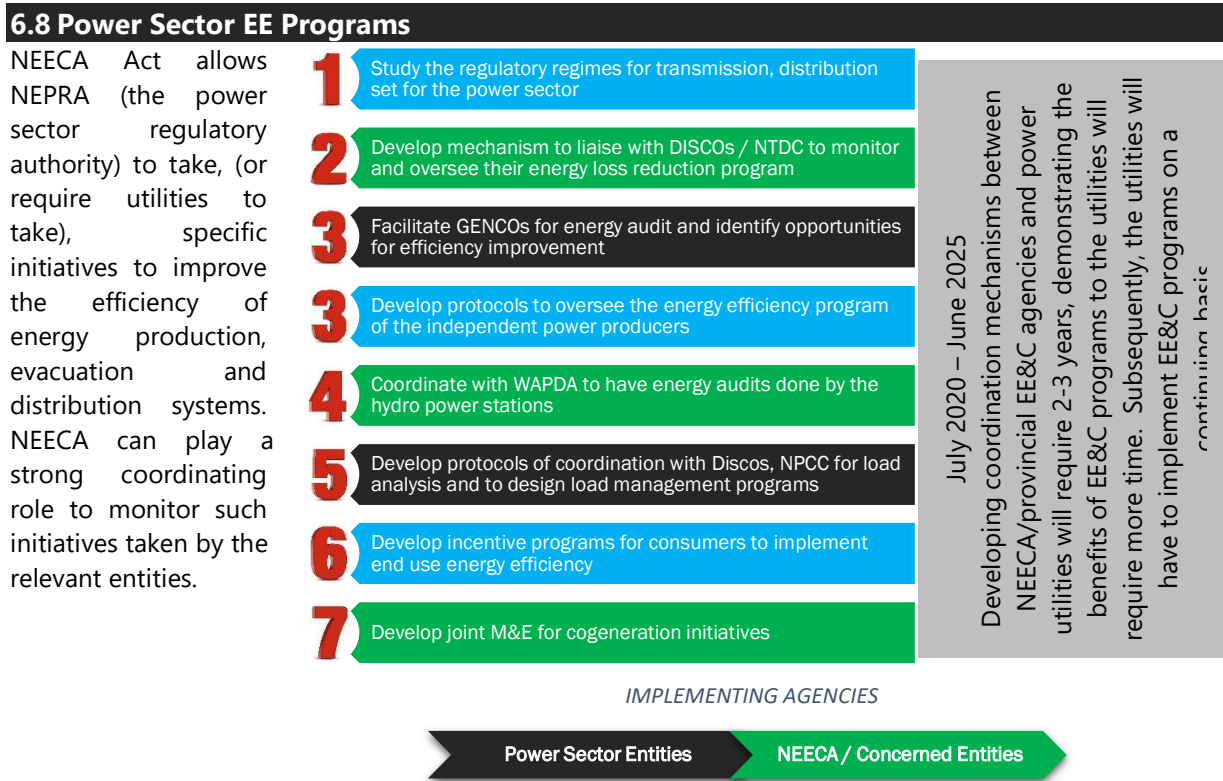


Figure 6.8 – Power Sector EE Programs

6.9 Establish EE Programs in the Transport Sector

Transport is an important sector of economy with large potential for energy savings. NEECA Act provides for improvement for the all modes of transport.

Road transport is the major consumer of petroleum products, and should be a priority area of focus. A range of activities can be initiated to promote efficiency in road transportation.

A list of actions that can be taken to promote efficiency in fuel use in the transport sector is provided in Figure 6.9. Perhaps the most important of these is Item 5 – promoting regular vehicle maintenance. While other measures, to upgrade vehicle specifications (to e.g. Euro 3, 4 etc. in a phased manner) and

fuel quality will also be required, it needs to be recognized that even vehicles manufactured to the latest specifications will not sustain improvements in fuel efficiency unless vehicle owners, fleet operators, etc. are required to carry out routine maintenance on their vehicles. The situation in Pakistan appears to be the opposite – regular vehicle maintenance is not considered an important activity, nor is it seen as a requirement for the manufacturers’ specifications and warranties. Clearly, this situation will not be addressed by one or two actions and so a phased program is proposed:

- start with promoting the benefits of regular maintenance,
- follow up by announcing a timeline when ‘annual vehicle inspections and certification’ will become mandatory, and
- promote the setting up of tune-up/maintenance/testing and certification centers

Demonstration/pilot’ projects can be set up in the public sector if the review of experience of the centers established by ENERCON concludes that these facilities accomplished their objectives.

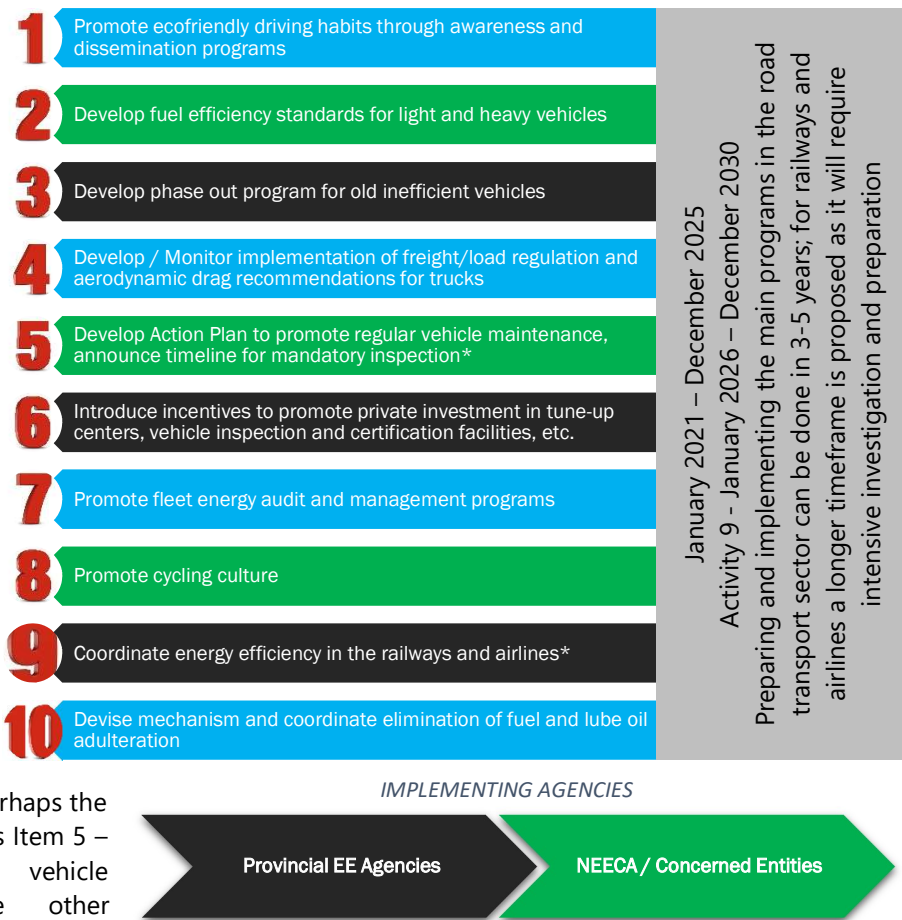


Figure 6.9 - Establish EE Regimes for Transport Sector

6.10 Establish EE Regimes for Agriculture and Water Supply Systems

Electric tube wells operated by urban water supply entities constitute a very high peak load. Petrol and diesel used by such agencies is also a drain on the national availability of fuels. Most tube wells operate below rated capacities and require retrofits. National / regional projects can be developed by the municipalities and urban authorities, to improve tube-well efficiency. Opportunities for energy saving also include converting such tube-wells to solar powered pumps, etc. This may also offer

- 1 Promote energy efficient operation of agricultural tube wells by demonstration, information dissemination, pricing of power, etc.
- 2 Promote energy efficient operation of tractors
- 3 Initiate energy audits and retrofits of urban water supply systems (require municipalities to develop project documents)
- 4 Promote farm mechanization and energy efficient cropping practices
- 5 Evaluate viability of promoting 'solarization of tube wells' based on location specific conditions / priorities

July 2020 – December 2025
The tasks – conducting efficiency audits of tubewells, preparing energy efficient designs, and implementing retrofits – can be done in 3-5 years, but audits will always be a continuing activity.

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Figure 6.10 - Establish EE Regimes for Agriculture and Water Supply Systems

a solution for some water pumping for agricultural uses – though those decisions should be taken after a careful evaluation of what is most appropriate in each location. In some areas the key constraint may not be the energy used for water pumping. The issue may be the optimal extraction and utilization of groundwater. Therefore, a program to convert agricultural tube-wells to solar power should be prepared only after it is determined this addresses the key challenges in the location.

6.11 Prepare and publicize (prototype) EE Project ideas

For each sector, NEECA should consider preparing a set of project ideas and publicize potential benefits (rate of return, benefit-cost ratio, payback period, etc.) of those ideas to private investors. Projects can cover investments, capacity building and the provision of specific EE services. Potential investors would, clearly, be allowed to conduct formal and detailed feasibility studies, to confirm the “likely benefits” which are identified and publicized by NEECA.

A tentative list of projects that can be considered for detailed preparation is provided below.

Industrial Sector

- Sector specific pilot / national projects on audit and retrofit in energy intensive industries
- Energy audit and retrofit in energy intensive industries
- National / regional projects to promote targeted technical services for quick energy savings
- Demonstration projects on waste heat recovery / cogeneration / heating and ventilation / power factor improvement / equipment or process upgradation
- Develop database management system to determine specific energy consumption indices
- National / regional projects to promote EE in SME enterprises.
- Awareness / training / dissemination of information / ToT / auditors / symposiums / regional workshops etc.

Building Sector

- Projects on BEC sensitization to include developing compliance handbooks, regional workshops / seminars and programs for architects / builders / housing societies, demonstration activities, other training and outreach activities.
- National / regional pilot projects for building energy audits and retrofits
- Developing / upgrading S&L regime, establishing / upgrading testing infrastructure.
- Awareness / training / dissemination of information / ToT / auditors / symposiums / regional workshops etc.

Transport

- Project on developing program on phasing out old and inefficient vehicles.
- Establish model vehicle test centers
- Project on fleet management program
- Project to promote low cost high payback initiatives in the transport sector
- Awareness / training / dissemination of information / ToT / auditors / symposiums / regional workshops etc.

Agriculture & Water Supply System

- Regional projects on EE operations of water supplies.
- Regional projects for EE agricultural tube-wells, farms mechanizations and promoting solar tube-wells
- Awareness / training / dissemination of information / ToT / auditors / symposiums / regional workshops etc.

Technical Assistance Programs

- Special studies like developing fiscal and financial incentives for EC & EE, creating VC funds to promote EC & EE, baseline / feasibility studies, reconisense studies
- Sector specific project development
- Developing rules / regulations / codes / SOPs / handbooks etc.
- Developing information systems on BAP / BAT on successful programs in other countries
- Capacity building programs
- Awareness / training / dissemination of information / ToT / auditors / symposiums / regional workshops etc.

An alternate approach can also be considered. Investment projects can include the assembly or manufacture of high-value/energy intensive appliances such as air-conditioners, refrigerators, freezers, etc.; the manufacture of appliances consuming lesser amounts of energy (water pumps and motors, fans, irons, etc.); manufacture and/or assembly of energy efficient gas appliances – stoves and cooking ranges, room/space and water heaters; and electrical and electronic appliances – TVs, etc. One or more items can be selected from each category and feasibility studies conducted, and results publicized.

An approach which may be more attractive to existing manufacturers can be to:

- ascertain the current local market prices of existing models/appliances – covering both “regularly available” appliances and those marketed as “energy efficient” by manufacturers and sellers;
- determine average sizes of factories producing such appliances in Pakistan, and the incremental revenue stream which accrues when a factory converts from producing regular to EE appliances;
- compute the total/up-front investment (covering both debt and equity) this incremental revenue stream can cover/support, and the pay-back period and rate of return for this investment; and

- publicize the results as projects for re-tooling of existing factories to produce EE appliances which are feasible/attractive given the current market conditions (market size, prices, etc.) in Pakistan.

Capacity building projects include programs to develop and upgrade the skills of labor employed in manufacturing appliances including fans, pumps, motors. These items are produced in a few large-scale modern factories and in hundreds of small scale, local workshops and factories. The skill levels of workers in the latter category can (and most likely should) be upgraded – in simple tasks such as the electrical wiring of motors (and more specialized tasks), to produce items that comply with high EE standards. One potential project could be to use the training facilities available in national and provincial vocational training academies/institutions. Those institutions can be encouraged to develop programs (2-3-week duration courses for the simple tasks, longer duration programs for more sophisticated tasks) to upgrade workers’ skills. The benefits of hiring workers who are certified through such courses (and can produce appliances that meet EE standards) can be publicized to existing producers and assemblers. Factory owners will have to pay to have the skill levels of their labor force upgraded, so the training institutions can recover the costs incurred in preparing and conducting such training programs.

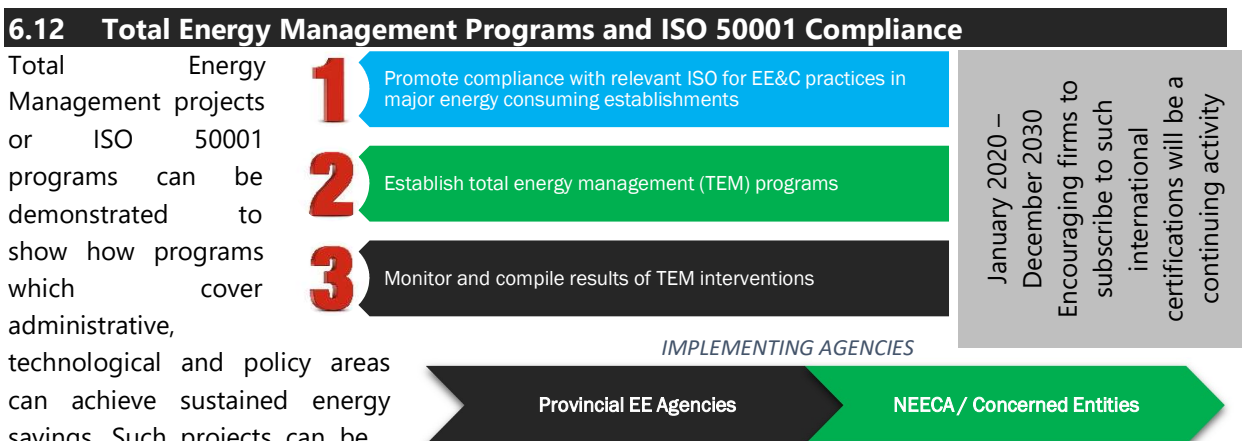


Figure 6.12- Total Energy Management Programs & ISO 50001 Compliance

6.13 Devise Appropriate Energy Pricing Regime, Design / Implement Fiscal & Financial Incentives

Pricing energy at its true cost of supply and limiting subsidies to only poor segments of society is an important element to promote EE&C. Adopting full cost recovery pricing policies for electricity and gas can discourage inefficient energy use.

There is an absence of fiscal and financial incentives to promote EE practices. Incentives are used by many countries to successfully promote EE practices. Such incentives include dedicated credit lines, accelerated depreciation for efficient appliances, risk sharing credit guarantee mechanisms, soft loans, subsidiaries for energy audits, VC financing etc. Designing appropriate incentives will be a cornerstone to successful implementation of EC programs.

- 1 Conduct studies to devise appropriate energy pricing regimes to promote EE&C
- 2 Review international experiences, market studies to formulate incentive regimes
- 3 Liaison with SBP for financial incentives
- 4 Attuned banking system to EC financing through awareness and well-structured mechanism
- 5 Educate stakeholders on incentive regime to encourage participation
- 6 Promote ESCOs for advisory services, risk sharing, monitoring and EC project evaluations
- 7 Create facilitation services for stakeholders to avail fiscal and financial incentives

January 2020 – December 2030
 The need for the proposed reforms – pricing to reflect true cost of supply, fiscal and financial incentives etc. to promote EE&C – will remain throughout the program period

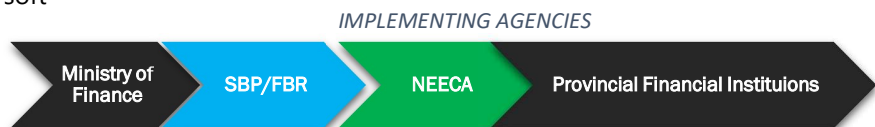


Figure 6.13 - Design and Implement Fiscal and Financial Incentives

6.14 Instituting National EE Awards

National awards for outstanding EE practices will go a long way to promote EE practices in the country. It is important that such awards are based on a pre-defined criterion and truly transparent and decided purely on merit.

- 1 Introduce categories of awards and evaluation criteria
- 2 Define a transparent process for awards
- 3 Solicit maximum participation
- 4 Award by the President or the Prime Minister of Pakistan
- 5 Highlight and publish success stories for dissemination and replication .

Starting 2020 this activity can be done periodically after every 2



Figure 6.14– Instituting EE National Awards

7. Proposed Funding Arrangements

Efficient use of energy resources makes financial and economic sense. Studies previously conducted by ENERCON suggest that for every unit of cost spent on EC, savings amounting to four to 12 times higher in value can be achieved. Hence, the financial incentive exists for the country to adopt EE&C. Fully mobilizing the country to adopt EE&C will require about five years, so it will be imperative for the government to allocate resources to catalyze efforts. As such, it is strongly recommended in the first instance, one billion rupees' contribution be committed by the government and released to kick-start NEECA and the EE&C. These funds should be in addition to the ECF funds, amounting to PKR 300 million, that are expected to be transferred to NEECA accounts to initiate core activities. It should be noted that for most activities in the Roadmap, specific projects can be developed based on basic information gathering, viability and reconnaissance studies. Support of multilateral agencies can help facilitate this. Once the Roadmap is approved by the government it can be shared with the multilateral bodies to assess level of interest in funding support for activities/projects.

An alternate proposal is to explore avenues for funding NEECA largely from non-budgetary resources. This will involve developing the EE&C program in collaboration with the private sector to promote the acceptance and support by investors, manufacturing plants, building owners and other large users of energy. Once such support and buy-in is established, they should be willing to pay fees and charges for NEECA's various services such as plant, building or entity energy audits. Since such services will generate profits (through significant reductions in energy use and costs) for private and public enterprises, they should be offered on a fee-for-service basis. The level for such fees and charges should be prepared and submitted to the required approval forum(s) for their concurrence. However, it is unrealistic to expect that the fees and charges can be imposed immediately. Therefore, for an initial period, NEECA will need to be financed primarily from the federal budget. Funds currently available can help the government through the initial period⁵.

⁵ It is recognized that those funds can only be transferred to NEECA through a decision of the Board of ECF. The custodian of the ECF should convene a meeting of the Board of ECF; and require the Board (through a resolution of the Annual Meeting) to transfer Rs 300 million to NEECA.