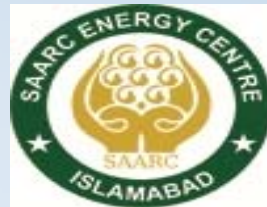


Pakistan Scenario

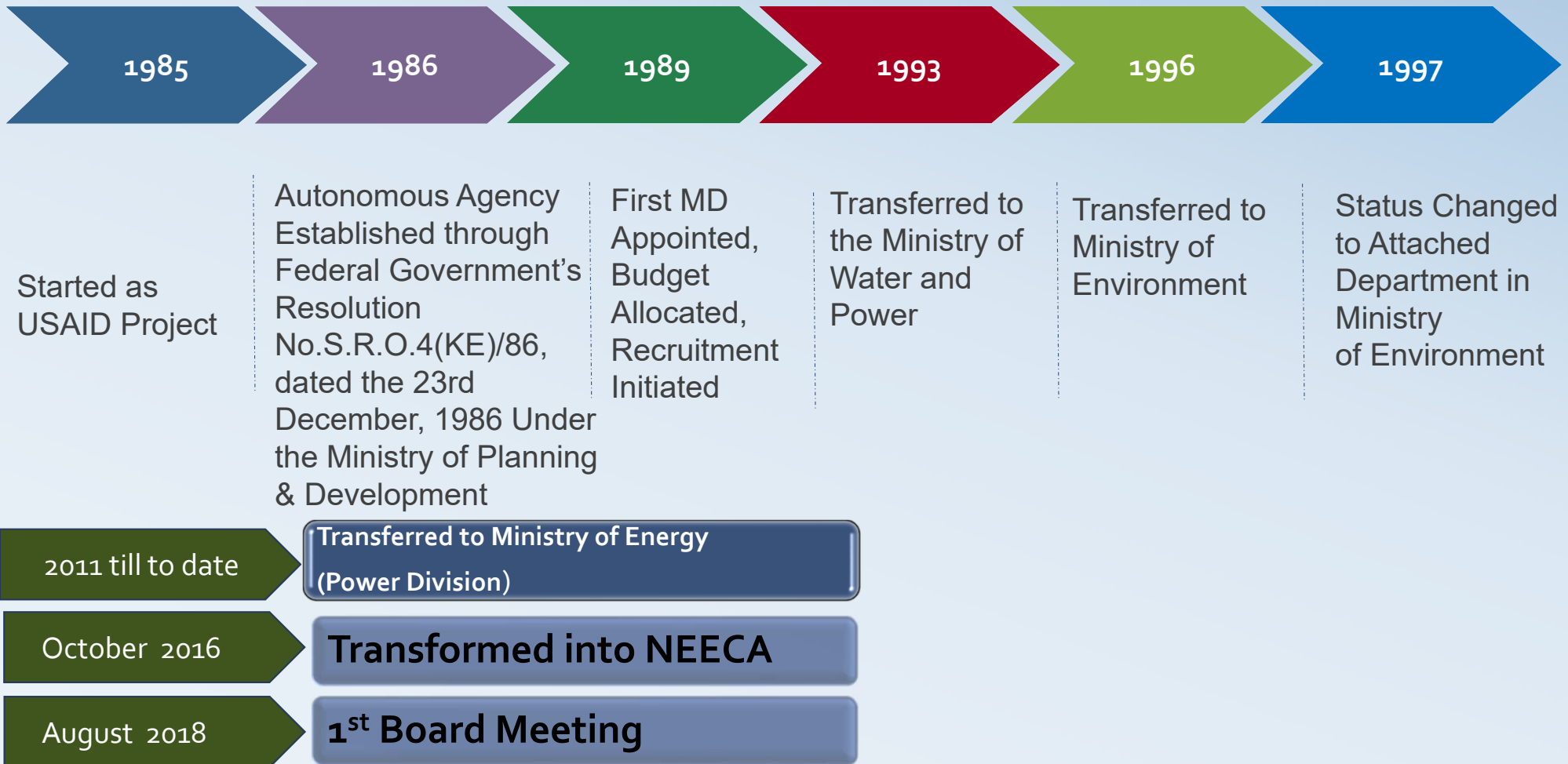


SAARC Workshop

“Techniques on Energy Conservation and Efficiency in Buildings”

Dambulla, Sri Lanka | 26 – 28 August 2019

ENERCON to NEECA Journey



PROCESS OF ENERGY EFFICIENCY LEGISLATION

Approved in Principle by the Federal Cabinet	Sept 2009
Introduced in National Assembly	January, 2011
Administrative control of ENERCON transferred to Ministry of Water & Power after 18th Amendment	July, 2011
Bill withdrawn from National Assembly for amendments	December 2011
Consultative Meeting held with Provinces	April 2012
Approved by Council of Common Interests (CCI)	May 2014
Approved by Prime Minister under Section 16(2)	April 2015
Vetted by Law & Justice Division	April 2015
Introduced in National Assembly	April 2015
Referred to NA Standing Committee on Water & Power	May 2015
1st Meeting of the Standing Committee held	8th July 2015
Approved in 2nd Meeting of the Standing Committee	25th August,2015
Report of NA Standing Committee presented	9th December,2015
Bill Presented in National Assembly (Inputs Given by MoST)	21st January,2016
Bill Presented in National Assembly (Observations of MNAs)	18th February,2016
Bill Presented in National Assembly (Observations of MNAs/Necessary Changes Accepted)	26th February,2016
Bill Approved by the National Assembly unanimously	26th February, 2016
Introduced in Senate (Referred to Senate Standing Committee on Water & Power)	14th April, 2016
Presented in meeting of Senate Standing Committee on Water & Power	30th May,2016
Approved by the Senate Standing Committee on Water & Power	16th June,2016
Report of Committee Submitted-Bill Presented and Passed by Senate	17th June ,2016
Consent of President Given	June, 2016
Published in the Gazette of Pakistan	1st July, 2016
Notification for Establishment of NEECA(S.R.O.953(I)/2016)	6 th October, 2016
Constitution of NEECA Board Approved by the Cabinet	23 November, 2017
Notification of NEECA Board by Ministry of Energy (Power Division)	12 December, 2017

Energy Efficiency Potential & Loss

- Total Primary Energy Supply (PES)= ~80 MTOE
- Total Final Energy Consumption = ~50 MTOE
- Transformation + Transmission Losses= 30 MTOE
- End Use Efficiency Loss= ~32 MTOE

(Inefficient wires, industrial processes, appliances and motor vehicles)

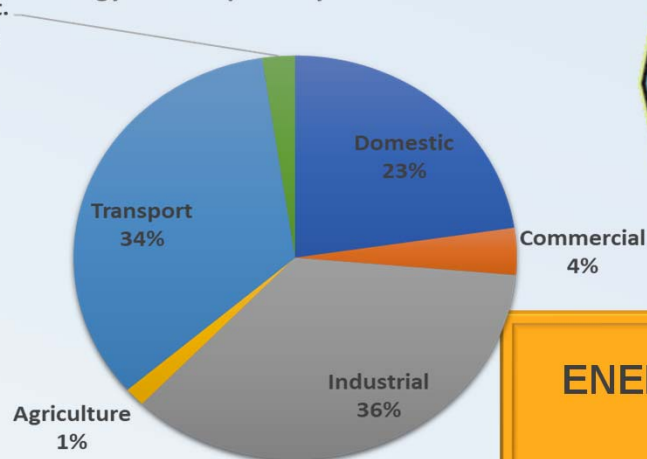
Total Final Productive Use = 50-32 = upto 18 MTOE

• Total Loss= ~62 MTOE

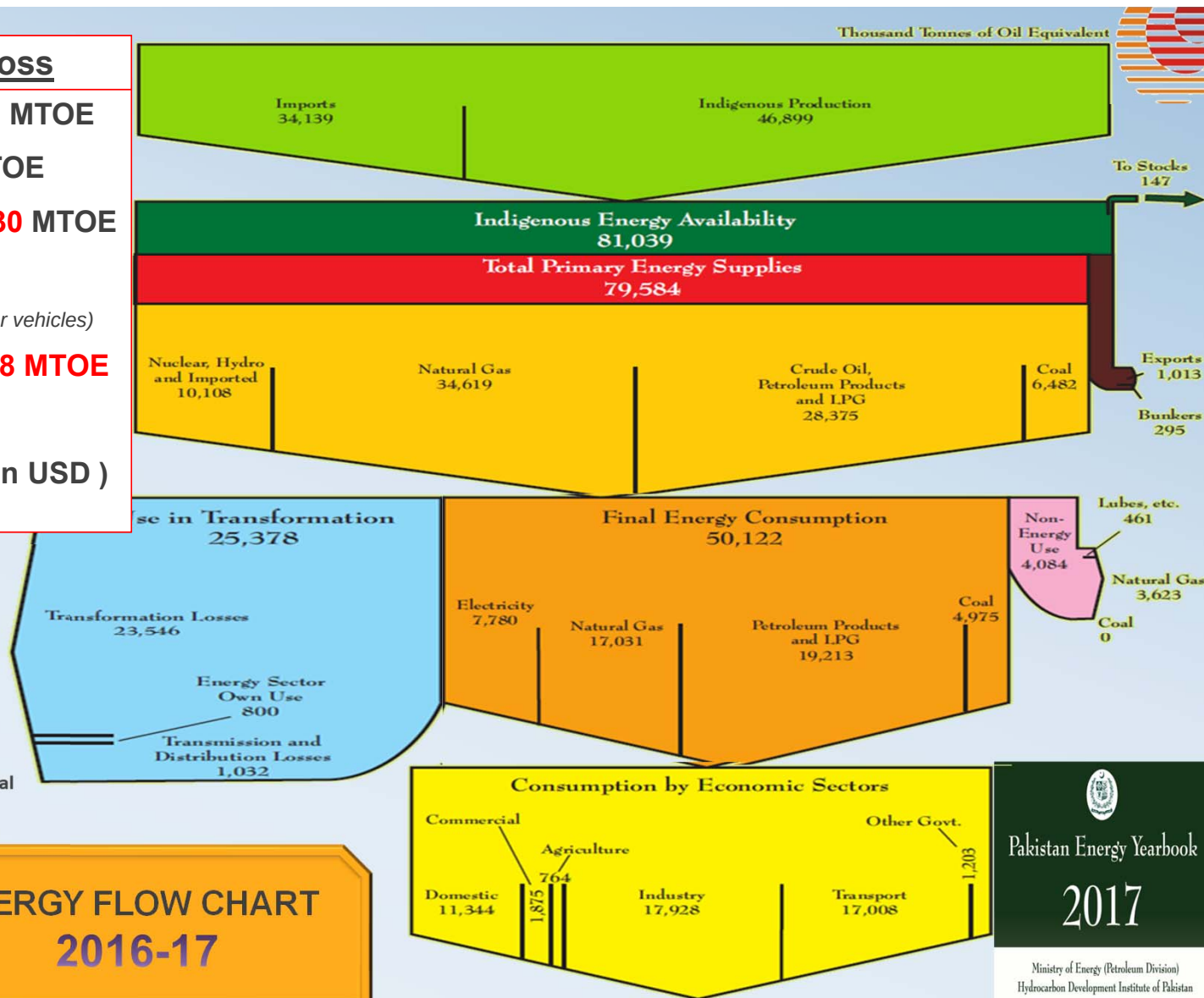
• Imported Energy = 34 MTOE (>10 Billion USD)

(As per SBP report on Imports Payment By Commodity)

Energy Consumption by Sector FY 2016-17



ENERGY FLOW CHART 2016-17

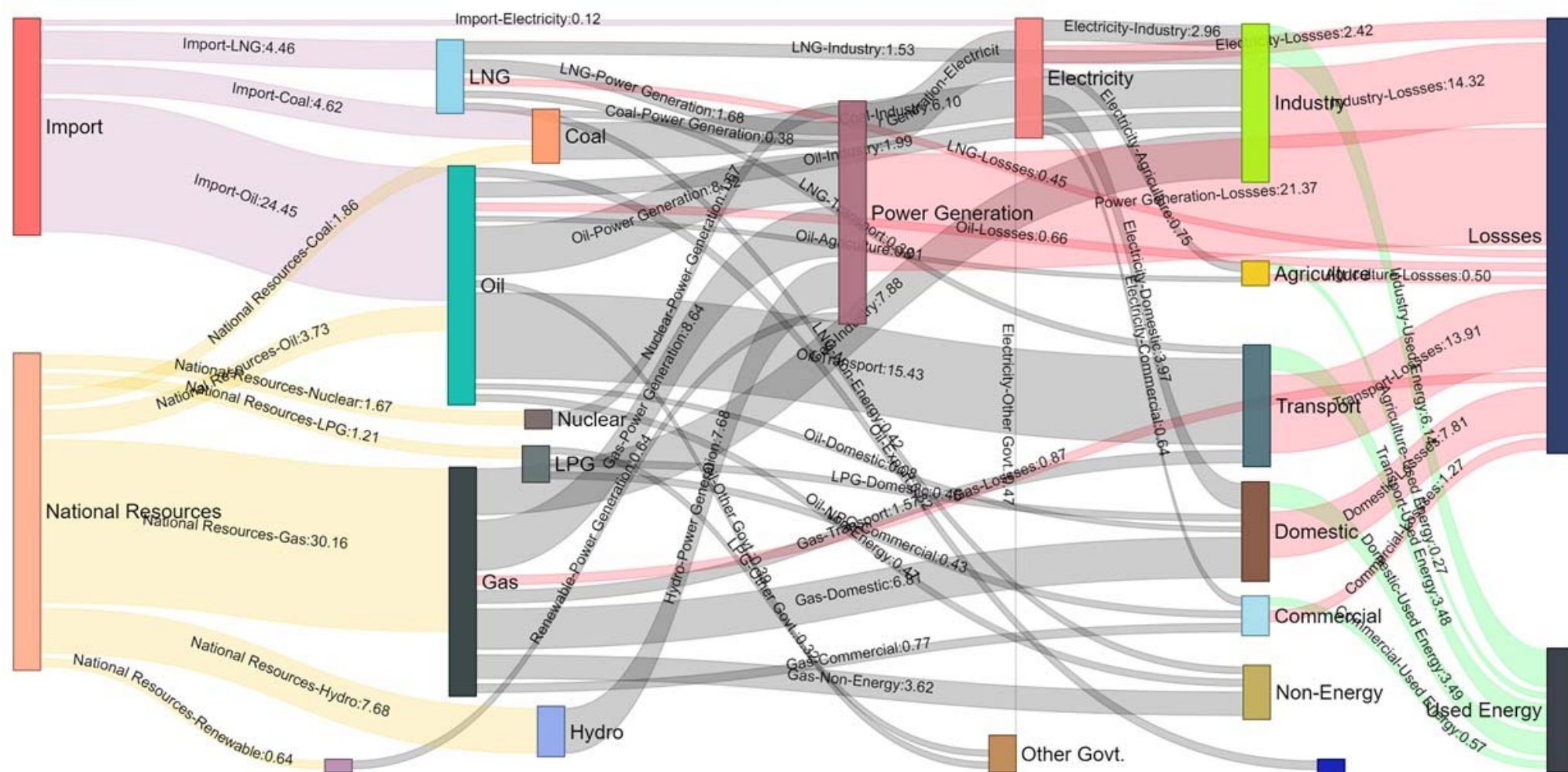




Reference Energy System

NEECA - UET Taxila RES Pak-2017 (Mechanical Engineering Department UET Taxila)

Amount by Start and End





Sectors Covered under NEECA Act

Composition of the NEECA Board

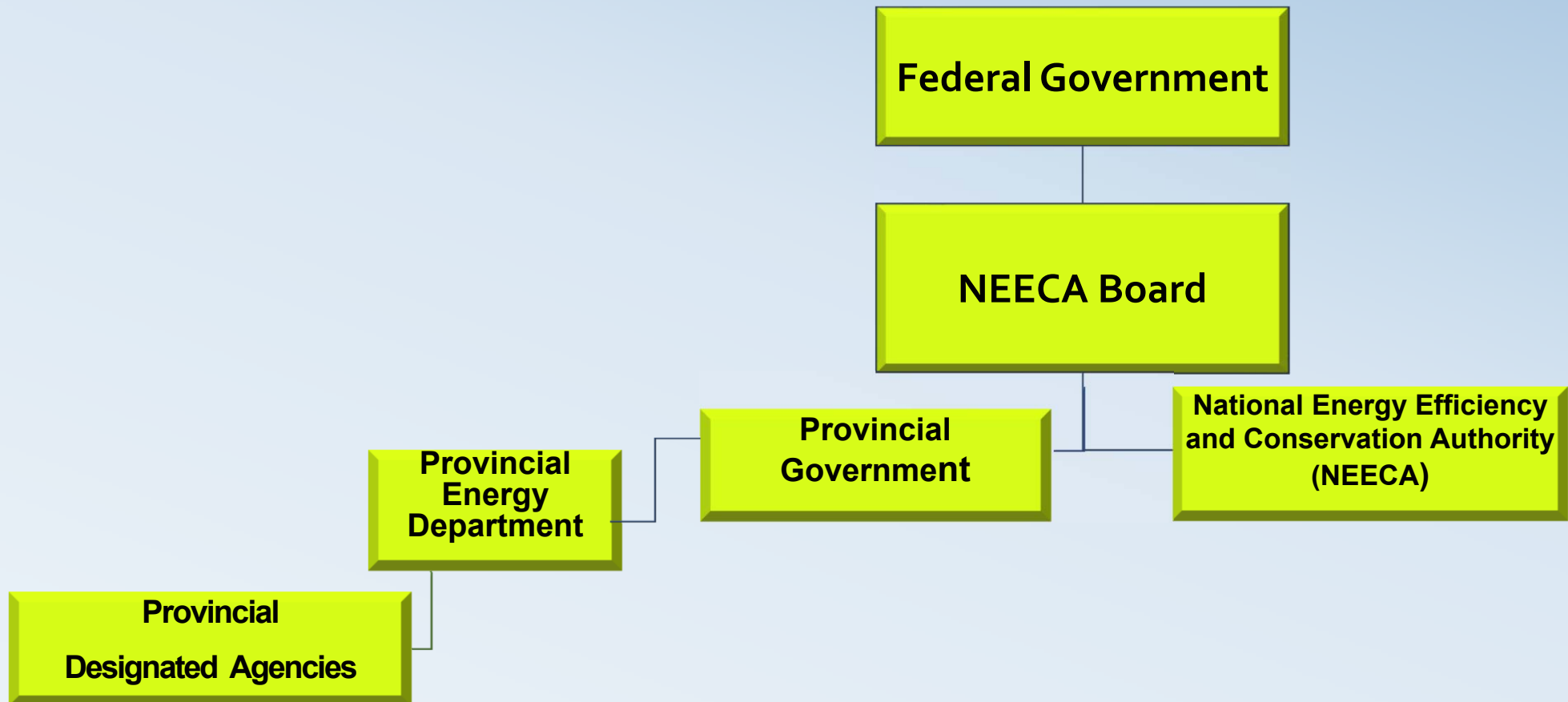
1. **Chairman** — Federal Minister for Power Division
2. **Vice Chairman** — Secretary, Power Division

Members:

- **Federal Secretaries** (Finance, Petroleum & Natural Resources, Planning, Science & Technology, Industries, Housing & Works, Climate Change)
- **Provincial Secretaries (Designated Departments)**
- **Chairman OGRA & NEPRA**
- **Managing Director NEECA**
- **One Nominee from Chambers of Commerce & Industry**
- **One Person from Agriculture sector nominated by the Federal Govt.**
- **Five sectoral experts as members from the Private Sector (Power, Industry, Transport, Agriculture & Livestock and Buildings)**



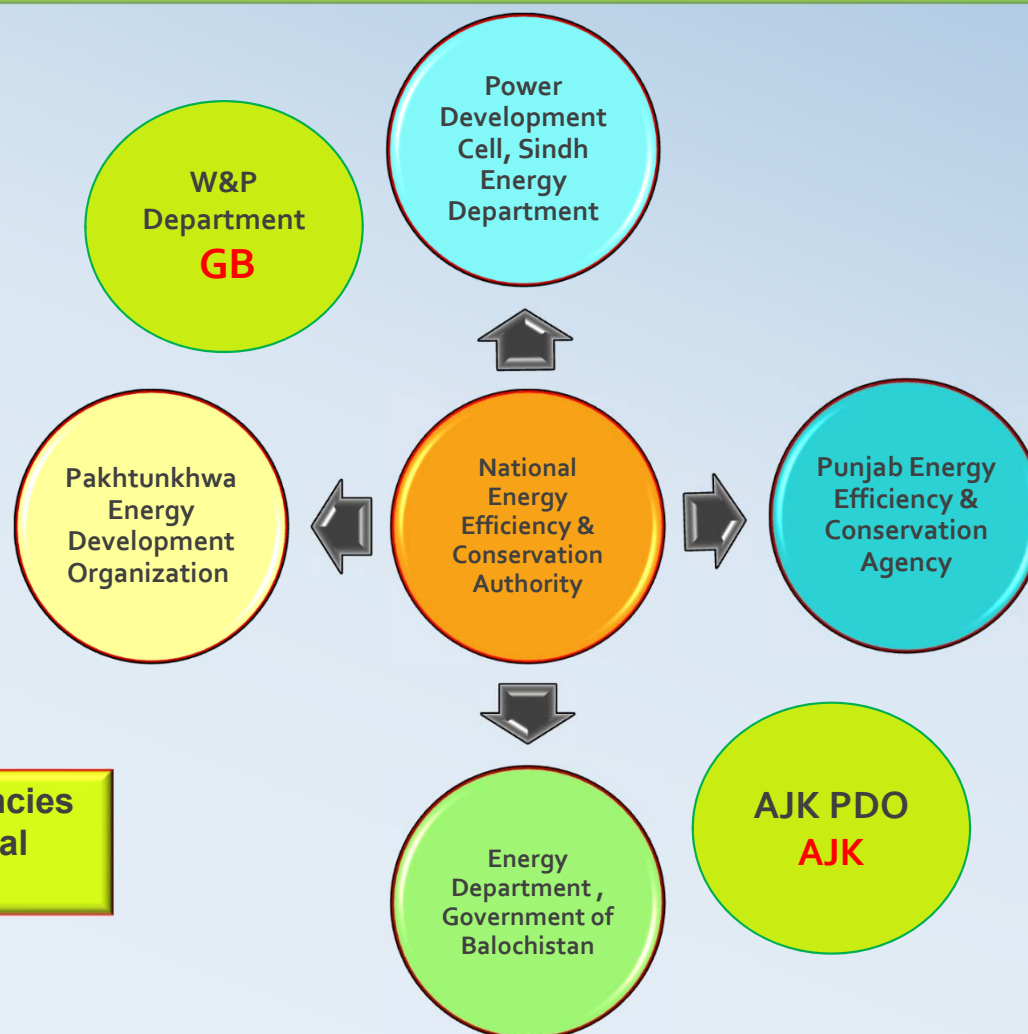
Existing Institutional Framework for EE in Pakistan

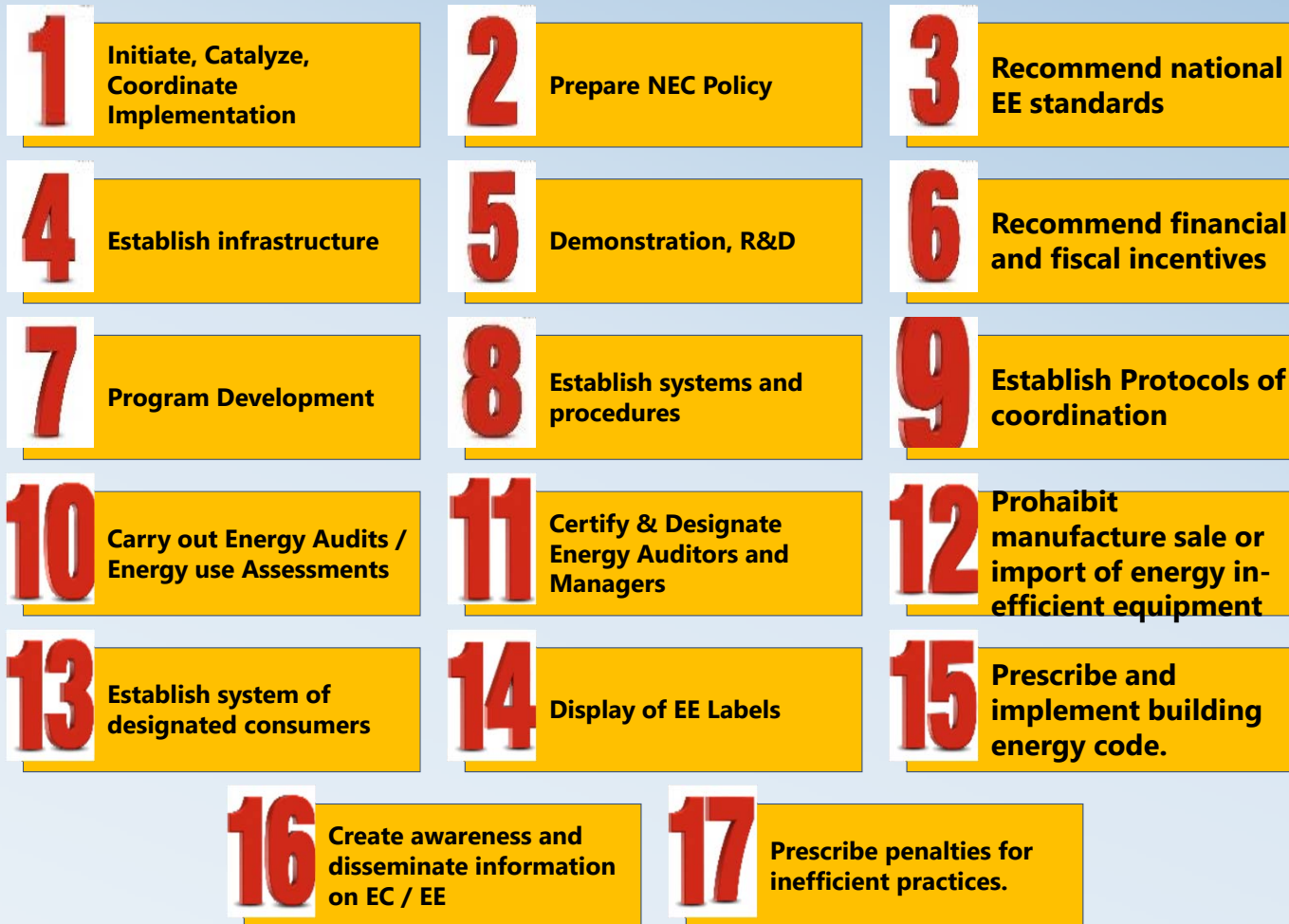


Designated Agencies Nominated by Respective Provincial Departments

As per NEECA Act
“**Designated Agency**”
means an agency
designated as such by the
Board or a Provincial
Government for the
purpose of this Act

NEECA Board to notify Designated Agencies
nominated by the respective Provincial
Departments including GB & AJK





NEECA Functions

KEY POLICIES AND DIRECTIVES FOR EE IN PAKISTAN



- National Environmental Policy 2005 by MoEn (now MoCC)
- **National Energy Conservation Policy 2006** by ENERCON (now NEECA)
- National Climate Change Policy 2012 by MoCC
- National Sustainable Development Strategy 2012 by MoCC
- Framework for Implementation of Climate Change Policy 2013 by MoCC
- Vision 2025 by Ministry of Planning Development & Reform in 2014
- **National Energy Efficiency and Conservation Act 2016**



ACTION PLAN UNDER NATIONAL POLICY ON CLIMATE CHANGE (NPCC)

- The Framework for Implementation of Climate Change Policy (FICCP) includes **735** actions
- About **22** priority actions deal with energy security in the country with objectives
 - ✓ To develop and enhance renewable energy sources and uses to achieve green growth in the energy sector.
 - ✓ To develop and obtain clean energy technologies and uses to achieve low carbon growth in the energy sector.
 - ✓ **To reduce total energy demand through conservation and efficiency.**

No	Categories	Priority Actions
1	Policy/ law making and implementation	7
2	Enabling Environment	3
3	Institutional Strengthening and Capacity Building	4
4	Awareness	2
5	Assessment/ Research	2
6	Infrastructure/ Technology Implementation	4



National Energy Conservation Policy

National Energy Conservation Centre (ENERCON)
Ministry of Water & Power
Government of Pakistan

National Energy Conservation Policy

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EE systems are complex...Scaling up has been an implementation challenge

Supply Side Options (Conventional Supply & Large Scale RE)



- Large Investments
- Fewer Stakeholders
- Standardized Solutions
- Less Transaction Costs
- Homogenous Market

Demand Side EE Measures



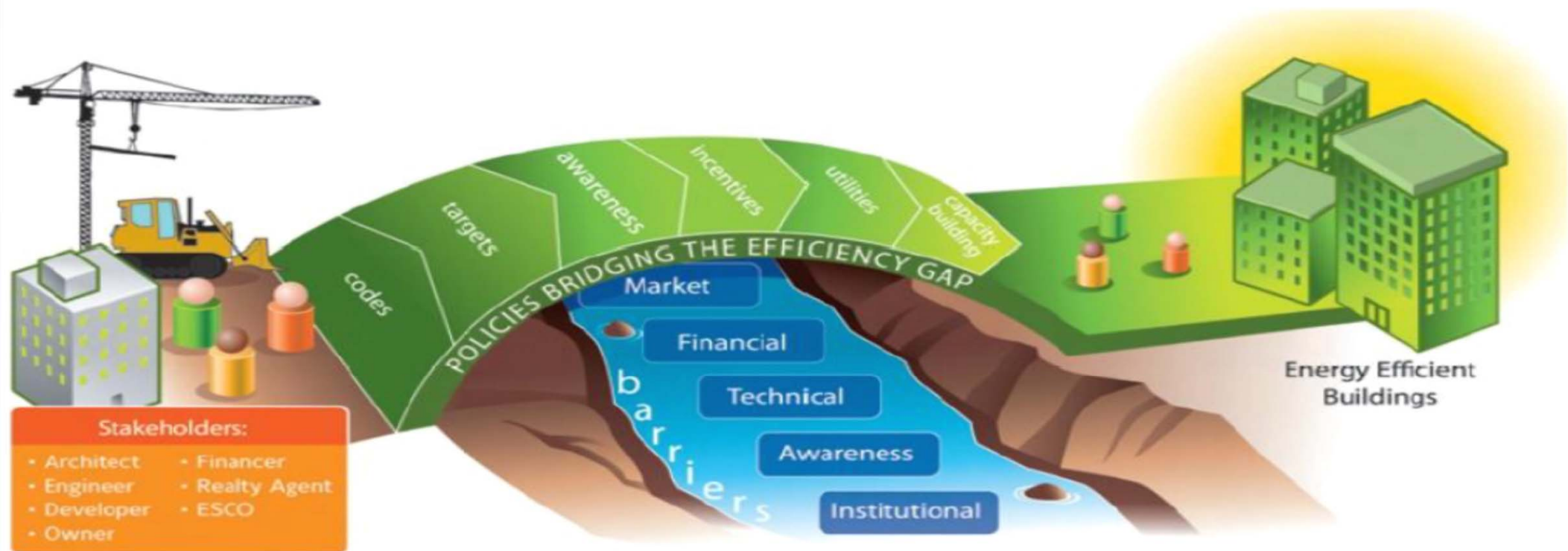
- Small and Dispersed
- Multiple Stakeholders
- No "One Size Fits All" Solutions
- High Transaction Costs
- Heterogenous Market

But solutions have been
developed and are being
applied...



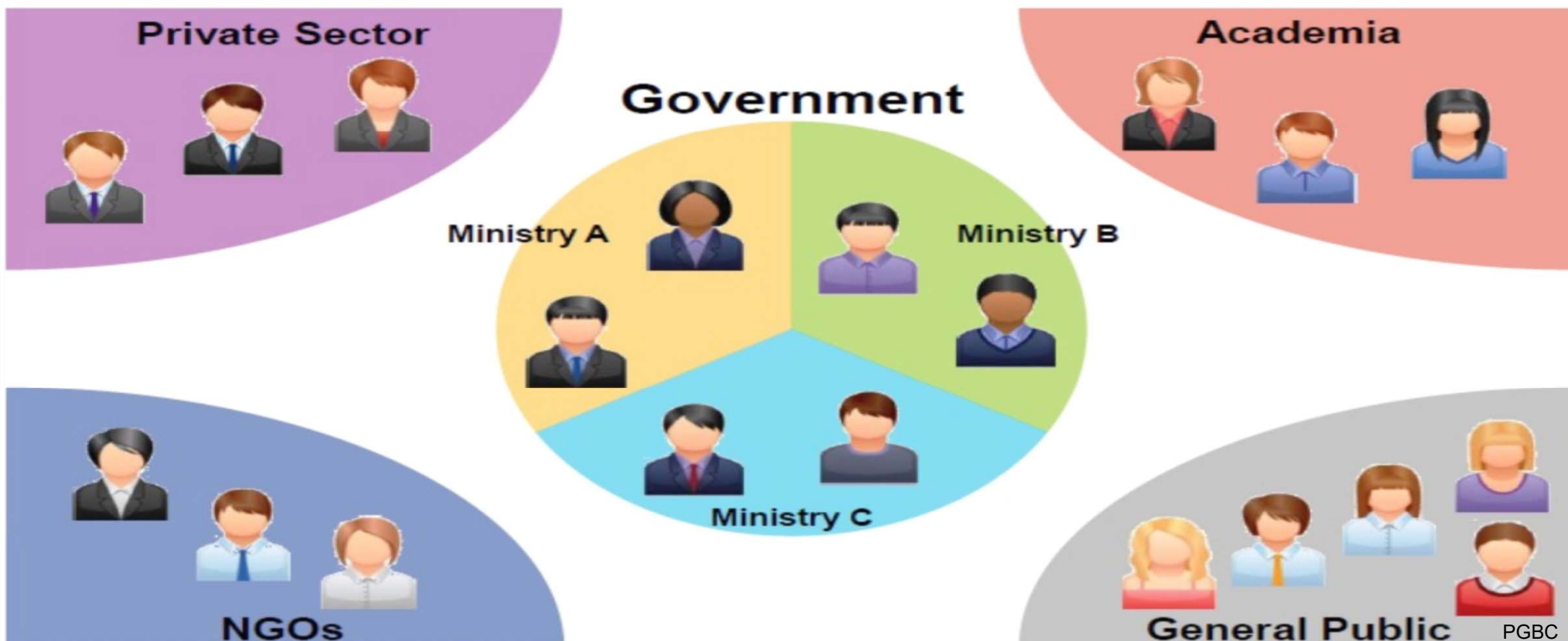
Challenge??

Government policies can help bridge the efficiency gap

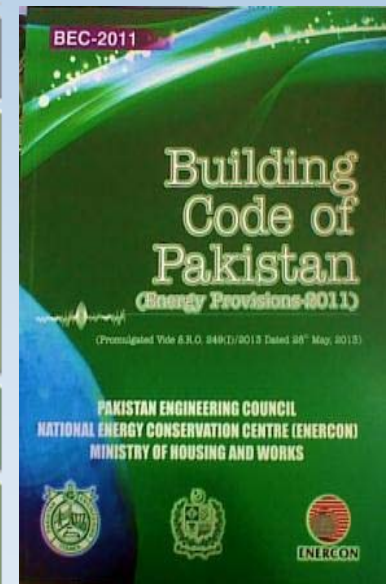


Challenge??

When it comes to energy policy regarding building efficiency, there are many stakeholders and many, many opinions



EE Potential in Buildings



Efficient Design

Upto 30%

Retrofits + Efficient Appliances

30-40%

Efficient Design +Retrofits +Efficient Appliances + Training of Occupants

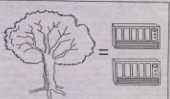
Up to 60 %

BUILDING ENERGY FACTS 1

LANDSCAPING

Landscaping helps reduce energy consumption for heating and air conditioning and improves comfort levels in non-air conditioned buildings.

In the days before there was mechanical air conditioning, landscaping was recognized as an effective way to help people remain comfortable during the hot summers in Pakistan. Lush gardens were planted with plenty of shade trees, flowering and non-flowering plants, and grass lawns. Landscaping of buildings was designed to take the best advantage of prevailing winds to bring fresh air into buildings for natural cooling in the summer and away from buildings to keep them warmer in the winter.



One tree is equivalent to cooling to one to three tons of air.

40 to 60 percent, and reduce building wall temperatures by as much as 10°F. Using trees and shrubs to provide a windbreak effect reduces building heat loss by as much as 25 percent. In fact, a shade tree can provide the same improvement in indoor comfort as a one to three ton air conditioner.

Building Energy Facts are published by ENERCON, The National Energy Conservation Centre, Islamabad. For more information, contact ENERCON, National Energy Conservation Centre, Islamabad. For more information, contact ENERCON, National Energy Conservation Centre, Islamabad.

BUILDING ENERGY FACTS 2

BUILDING ORIENTATION

Proper orientation of a building with respect to the sun and prevailing winds takes advantage of natural heating and cooling and reduces energy consumption.

A major goal of building design is to maintain the comfort of the building's occupants with a minimum of cost and energy. There is a well-defined range of temperature and humidity conditions which human mental and physical activity is at an optimum point. Outside of this comfort range, human life is uncomfortable.

Some building designs try to achieve these comfort conditions through the use of energy intensive heating and cooling systems. In many cases, however, proper orientation of a building on the building site can reduce the need for mechanical heating and cooling without reducing the comfort of the occupants of the building.

Building orientation is simply the optimum positioning of a building with respect to the general movement of the sun in the sky, and with respect to prevailing winds. One objective of proper building orientation is to provide the greatest possible amount of heat from the sun during the winter, while at the same time, reducing the amount of heat gain from the sun in the summer.

Proper building orientation can have a dramatic effect on the building's energy consumption. An improperly oriented building can consume as much as 15 to 25 percent more energy for heating and air conditioning than one that is properly oriented.

Building Energy Facts are published by ENERCON, The National Energy Conservation Centre, Islamabad. For more information, contact ENERCON, National Energy Conservation Centre, Islamabad.

BUILDING ENERGY FACTS 4

ROOM AIR-CONDITIONERS

Proper selection, installation, operation, and maintenance of room air-conditioners ensures that comfort is provided at the lowest cost.

In Pakistan, few buildings are equipped with central air conditioning systems. Even for some of the newer commercial office buildings and major hotels, few if any houses are centrally air conditioned. The majority of room air-conditioners, sometimes known as window or through-the-wall air conditioners, to help us cope with the heat of Pakistan's summers.

Room air-conditioners are split systems since they generally have a single room, a relatively small area as a house, or a single office in a commercial building. They are usually installed in a window that will accept the unit or in a wall using an accommodation sleeve. No job is required for this type of air conditioner. Several brands of room air-conditioners are manufactured in Pakistan and others are purchased abroad and brought back here.

In purchasing a room air-conditioner, the thought is generally given to the proper sizing or energy efficiency of the air conditioner. Low purchase price is a major criterion for purchase, and the capacity of the unit is selected to fit the room. The energy efficiency of the unit contributes to the operating costs of the air conditioner. In some cases, a "cheap" air conditioner turns out to be no bargain at all because the high operating costs more than outweigh the low initial cost.

Building Energy Facts are published by ENERCON, The National Energy Conservation Centre, Islamabad. For more information, contact ENERCON, National Energy Conservation Centre, Islamabad.

PAKISTAN SOLAR ARCHITECTURE

(A selection of energy efficient house designs)

BEC-2011

Building Code of Pakistan

Energy Efficiency (ECC)

(Revised) R.R. 2.0. 149.2. 2011 (Ed. 01)

PAKISTAN ENGINEERING COUNCIL
NATIONAL ENERGY CONSERVATION CENTRE (ENERCON)
MINISTRY OF HOUSING AND WORKS



Building Energy Code of Pakistan

ENERCON

COMPLIANCE HANDBOOK

FOR THE BUILDING ENERGY CODE OF PAKISTAN

ENERCON

IMPROVING ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS

IMPROVING STEAM BOILER OPERATING EFFICIENCY

TUBEWELL ENERGY AUDIT MANUAL

ERVATION CENTRE

ENERCON

NATIONAL ENERGY CONSERVATION CENTRE

ENERCON The National Energy Conservation Centre

Energy Efficient Housing

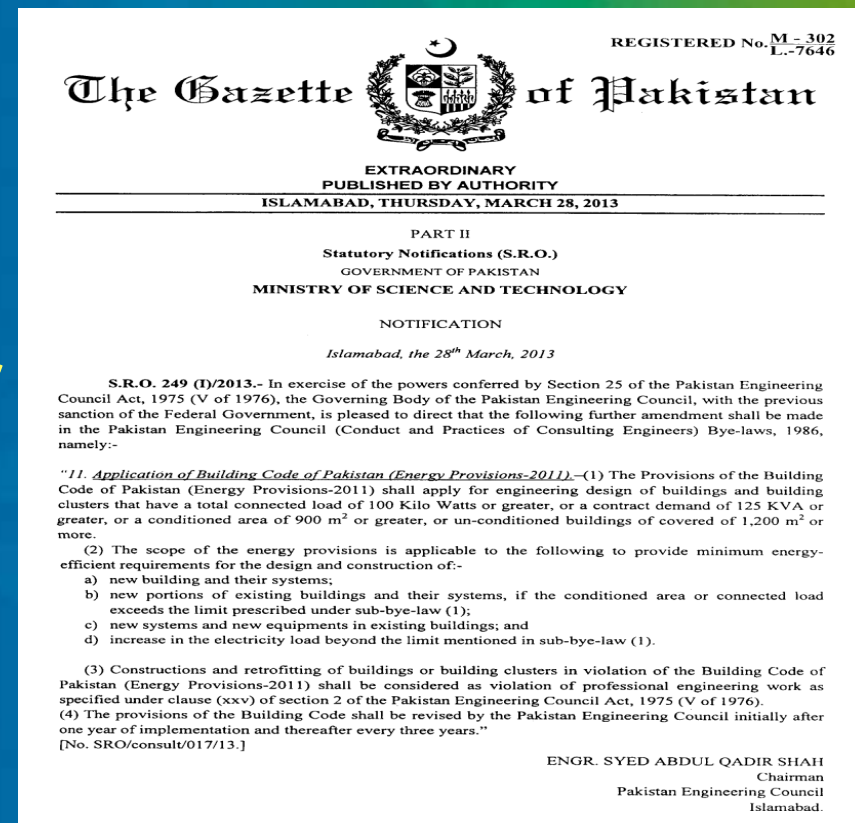
Improvement of Thermal Performance of RC Slab Roofs

November 2010



BEC IMPLEMENTATION PLAN

- SRO issued for implementation / enforcement after approval from the Law Division
- But now as per Provisions of the NEECA Act, the Provincial Designated Agencies and NEECA will adopt their own implementation/revision strategies with the consent of NEECA Board.



NEECA Act 2016 & Building Sector

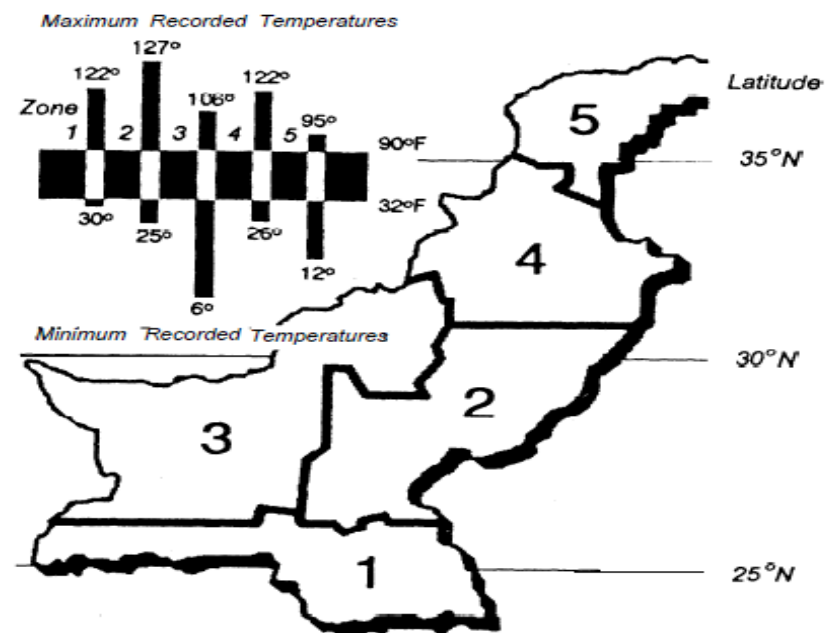
“Buildings Sector” means all buildings including private domestic household, commercial, industrial, public and community buildings;

10. Powers and functions of the Federal Government to facilitate and enforce efficient use of energy and its conservation:

13. Powers and functions of Provincial Governments to facilitate and enforce efficient use of energy and its conservation:

MAP OF CLIMATE ZONES AND LIST OF CITIES

Climate Zones of Pakistan



Housing Categories per Income Group 1

Income & electricity usage

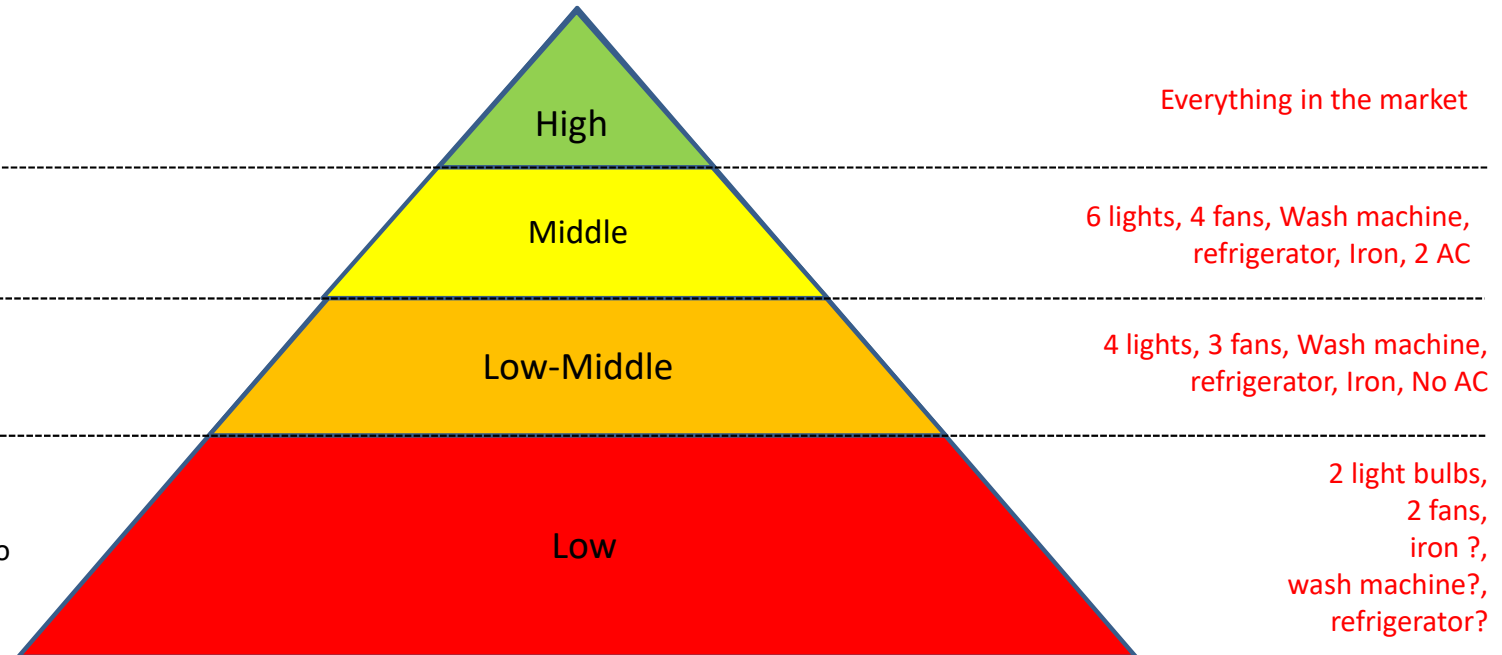
High-income Group: (5%)
Family Income: Greater than 1000 USD/M
Electricity Consumption: >700 units

Middle-income Group (15%)
Family Income: 500-1000USD/M
Electricity Consumption: >300 unit

Low-Middle-income Group(20%)
Family Income: 200-500USD/M
Electricity Consumption: 100-300 units

Low-income Group (60%)
Family Income: 100-150USD/M
Electricity Consumption: 50-100 units or No electricity

Electrical Equipment/ Appliance



Housing Categories per Income Group 2

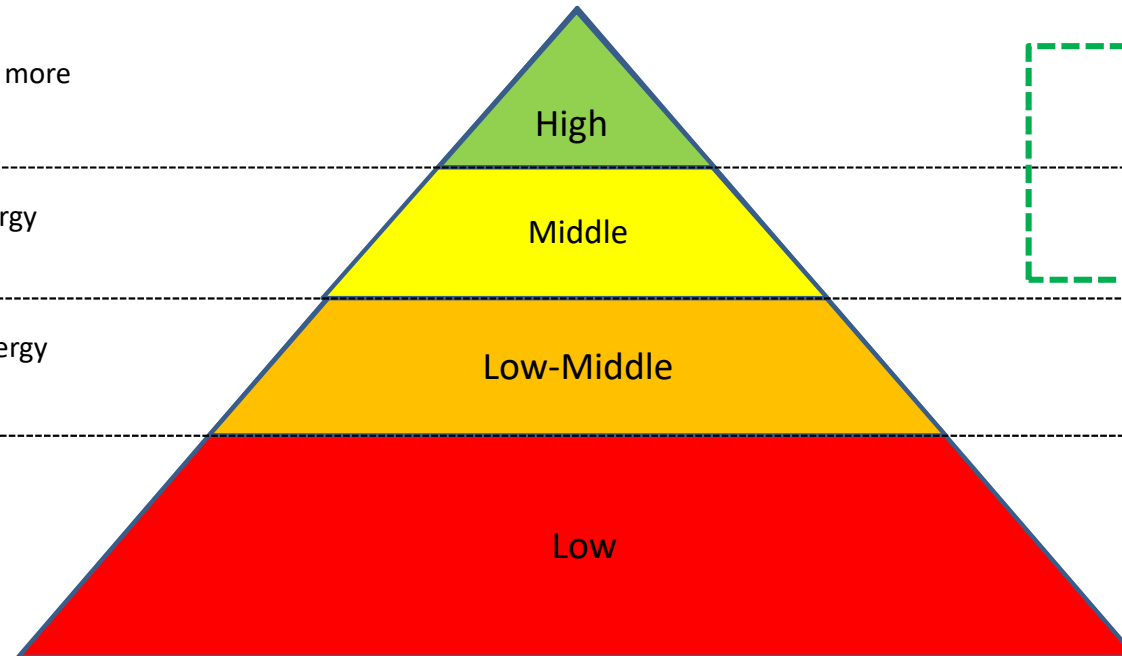
Construction Unit Cost / EE&C Awareness

Building Unit Cost: PKR 2,500-5,000 / ft² or more
Energy Efficiency Awareness: High

Building Unit Cost: PKR 1,500-2,500 / ft² Energy
Efficiency Awareness: Middle

Building Unit Cost: PKR 1,000-1500 / ft² Energy
Efficiency Awareness: Low

Building Unit Cost: PKR 1,000 / ft²
Energy Efficiency Awareness: Low



Applicability of EE&C on building

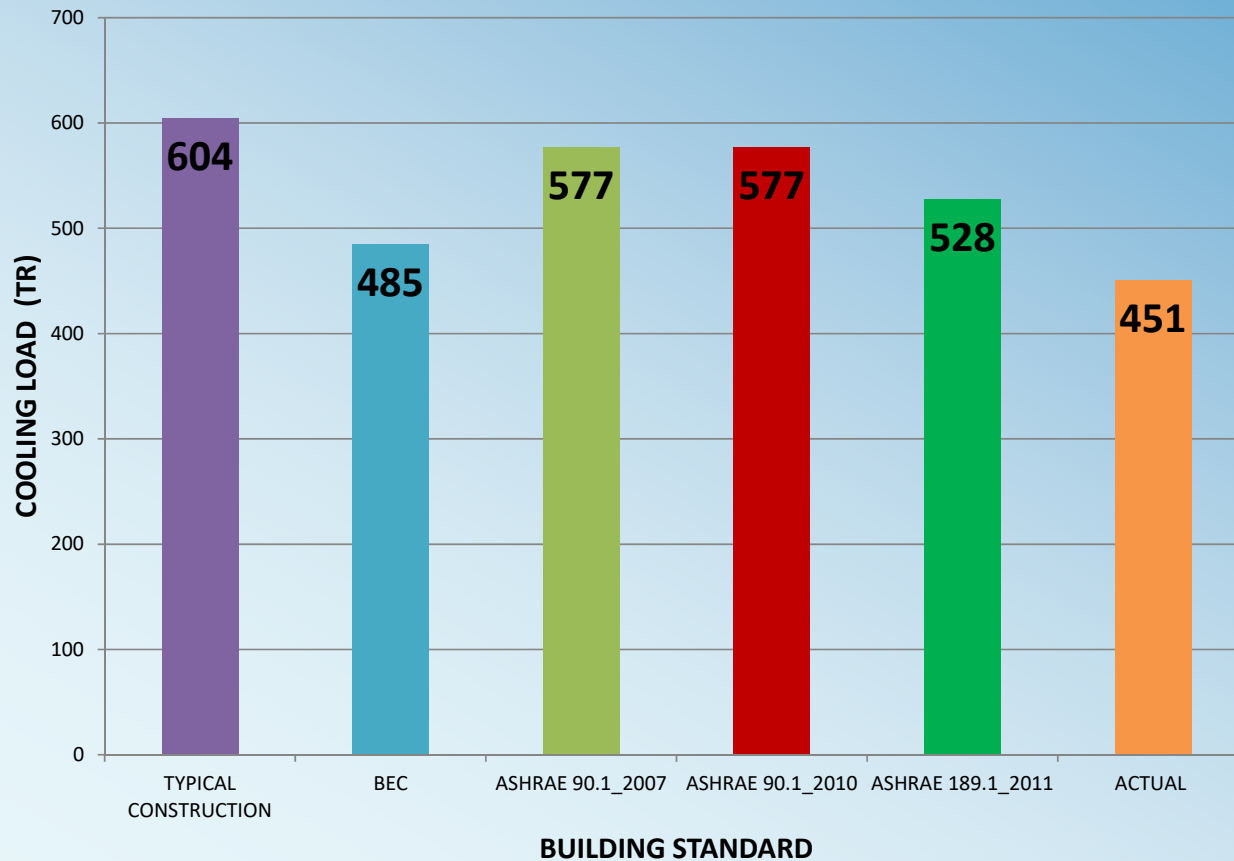
Enforcement Applicable

Incentive may be required

Difficult to find benefit

Difficult to find benefit

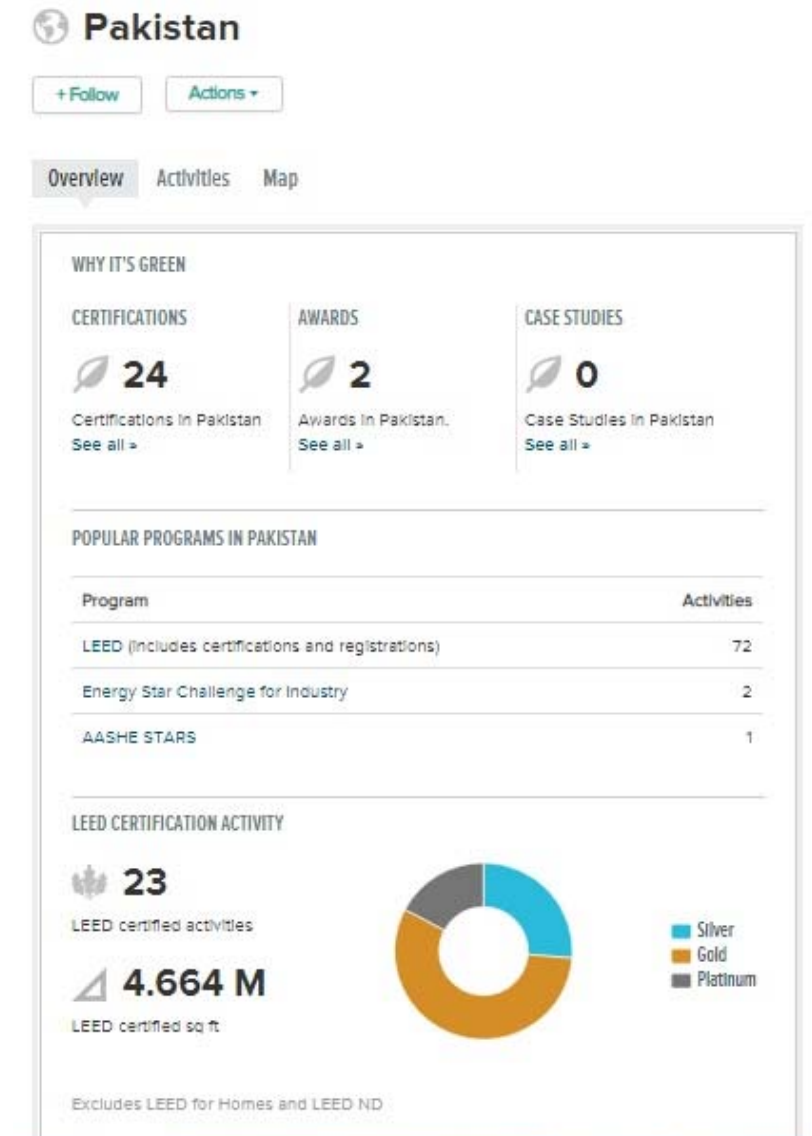
Cooling Load on Different Standards – Margalla



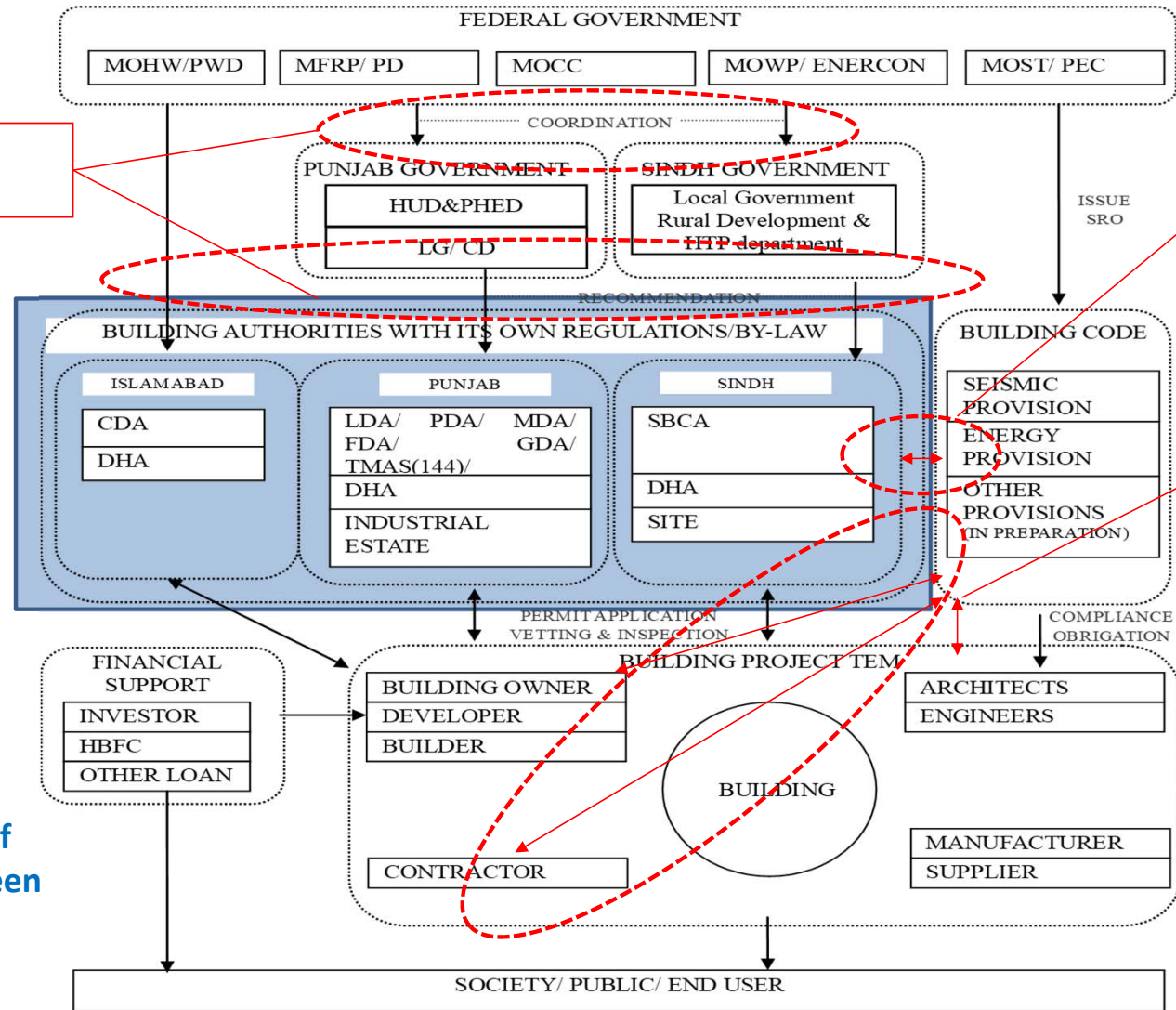
Location: **Islamabad, Pakistan**
Building Type: **TelCo Headquarters Office Building**
No. of Floors: **3 Floors with a separate 2 floor Parking Building**
No. of occupants: **1320**
Total Area: **468,000 sft.**
Total AC Area: **172,737 sft**
HVAC System: **2 Water Cooled Screw Chillers**
+ 2 Medium Water Temperature Screw Chillers with Primary Secondary Pumping + DOAS System.

S. Mehboob & Company

Issues/Barriers & Proposed Action Plan



ISSUES & BARRIERS



Not enough promotion

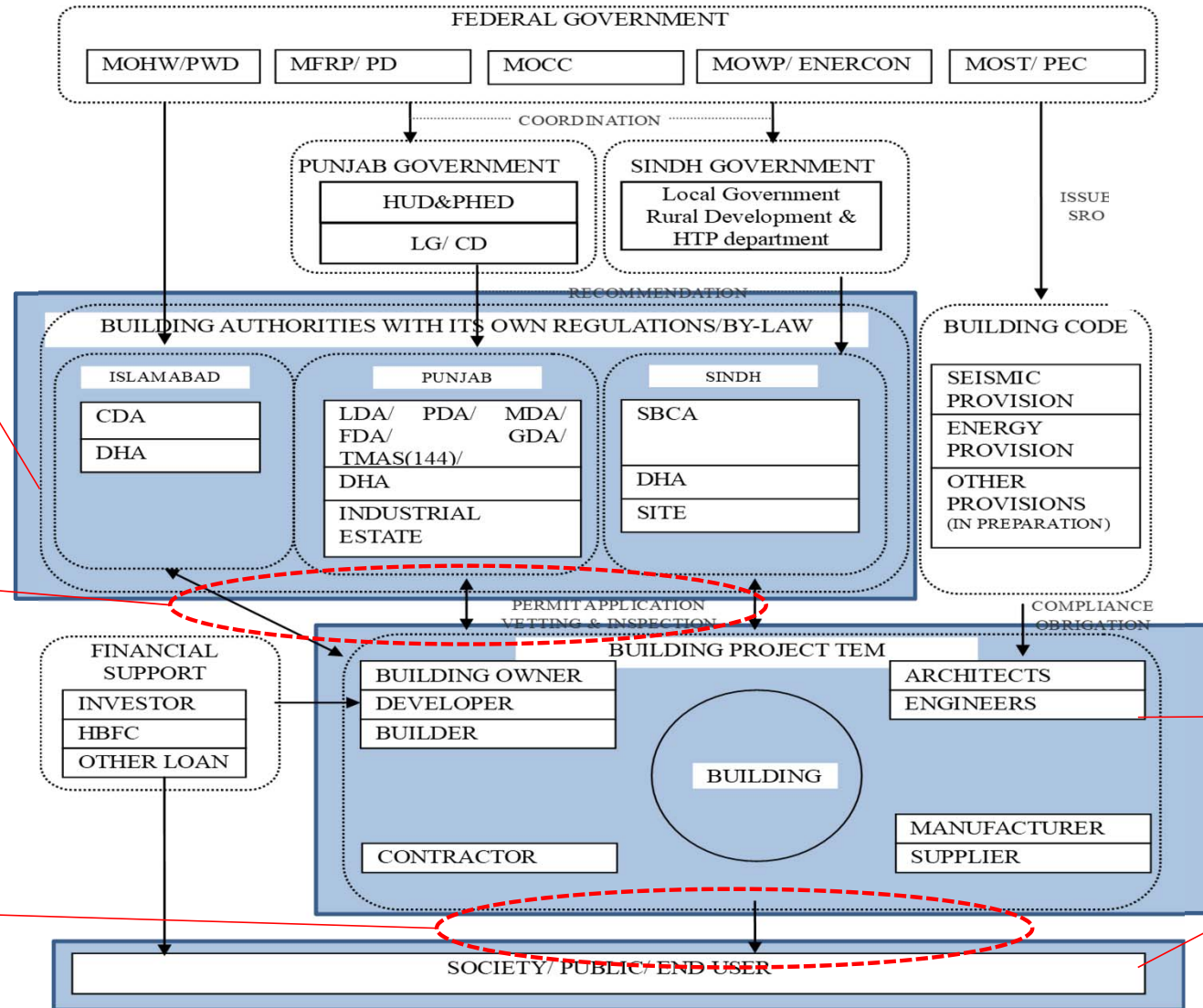
Building Code is not adopted to Building Authorities for their review except for few

Not enough awareness on Building Code & no penalty to Building owners

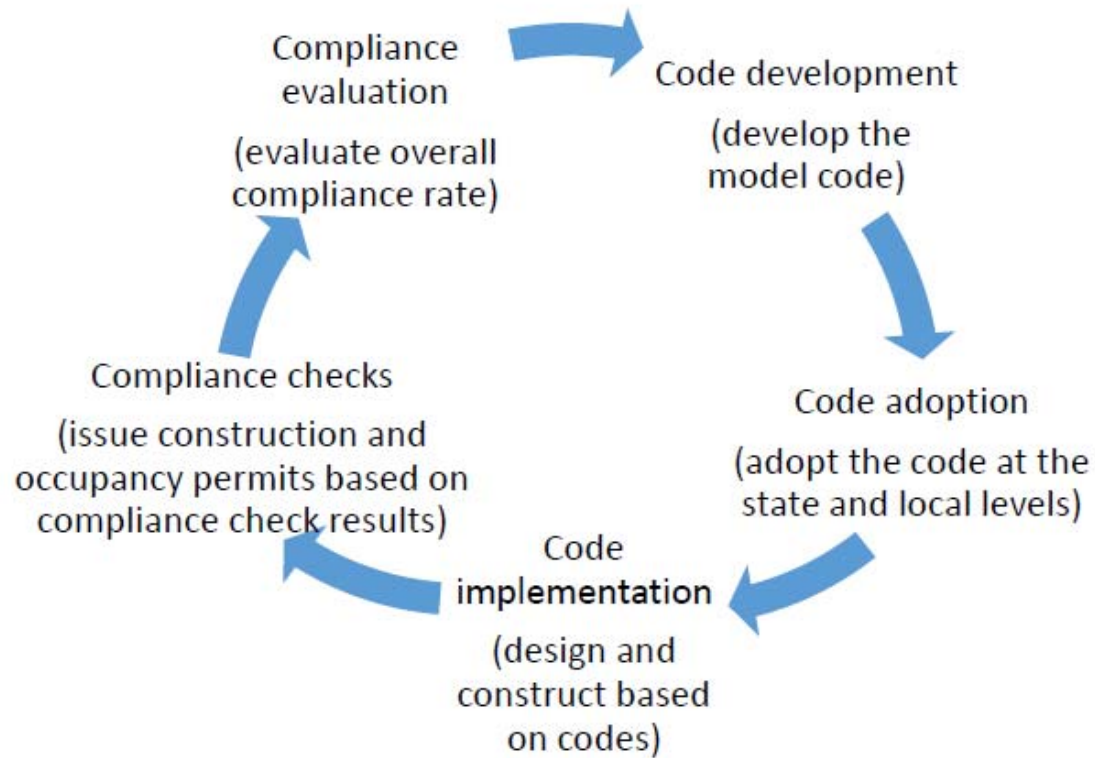
Only enforcement by PEC act. No enforcement to Architects registered under PCATP

Certain Provision of BCP-EP-2011 have been adopted by few Development authorities

ISSUES & BARRIERS



**Required Capacity
Development
&
Awareness raising**



The Cycle Of Energy Code Development And Implementation



DATABASE	
STATIC DATA	VARIABLE DATA
Built up Area	EPI
Climate Zone	kWh
Envelope Summary	kVA

The Conundrum

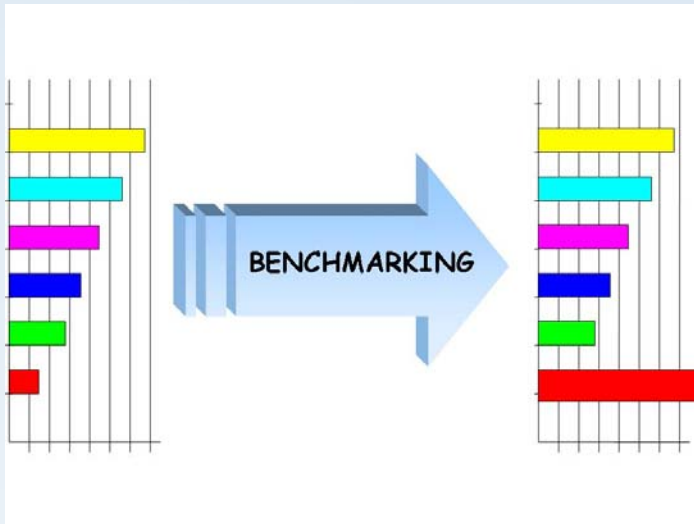
- New construction is a very small % of total construction
- So what do we do for existing construction ?



**WRITE A CODE FOR EXISTING
CONSTRUCTION ? / !**

Building Energy Audits

- **Benchmark** performance of existing buildings
- **Highlight** potential for savings



IT'S NOT HOW
GOOD YOU ARE,
IT'S HOW **GOOD**
YOU WANT TO BE.

The world's best selling
book by **PAUL ARDEN.**

PHAIDON

Energy Audits on Cost Sharing Basis

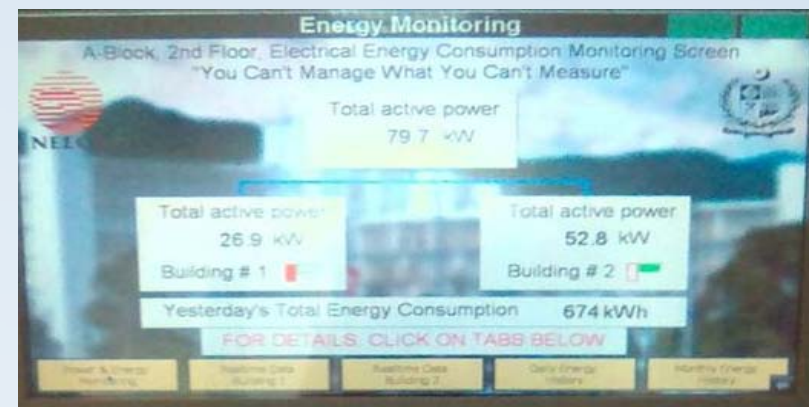
Energy Audit of Public Buildings - A-Block(Pak Secretariat)

The main objective of the Building Energy Audit was to find out how energy flows in the building and what should be done to improve end use efficiency to optimize energy use in the building without compromising recommended comfort level and determining the financial implications involved in improving the energy use characteristics in the building. The Scope also covered water saving potential.

The implementation of only one measure an investment of about 1.2 million Pak Rs, average **55,000 units (50%)** reduction has been recorded. Further, retrofitting of appliances with energy efficient ones will significantly reduce the billing amount of the entire A-Block. The motion sensors have been installed in the selective corridors A-Block. HMI screen/sub-meters were also installed at 2nd-Floor.



Snapshots of the activity at A-Block



Introduction of Energy Efficient Zig-Zag Brick Kilns in Pakistan

- ✓ >250 Zig-Zag Kilns are operational and numerous under Construction Regulations Issued by Punjab Government for Construction of Zig-Zag Kilns Only.
- ✓ Capacity Building of 3000 Brick Kiln Owners & Related Professionals completed.
- ✓ HEC Approved Technical Development Fund Project of 8 Million Pak Rs developed by NEECA and NUST on “**Retrofitting of Brick Kilns to Improve Energy Efficiency and Environmental Impact**” .
- ✓ Further International Assistance through CCAC, ICIMOD, GEF and UN in Pipeline.



Trainings & Technical Assistance on Construction and Operation of Zig-Zag Brick Kilns

پاکستان میں زگ زگ طرز پر اینٹ کے بھٹے بنائے اور
چلانے پر تربیتی پروگرام

September 2018, Pakistan

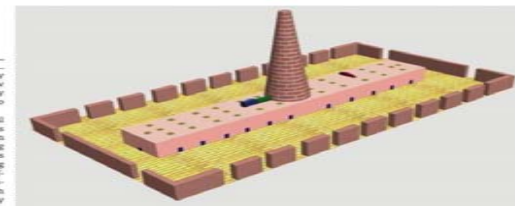
Combating pollution

‘Zigzag technology to help save 40% coal in brick kilns’

Experts claim new technology will produce more quality bricks

ISLAMABAD
International experts on Sunday stressed kiln owners to adopt new zigzag technology as was not only environment-friendly but also cost-effective.
International experts from Nepal, Reema Dixit, Raj Kumar, Syam Prasad and Syam Mahajan were of the view that the zigzag brick-kiln technology reduces 40% coal consumption for baking of bricks and similarly, it also offers 40% top quality bricks compared with 70% secured through conventional methods. They were speaking at a workshop, held on environmental issues and modern brick kiln technology. The workshop was jointly organised by the Environment Protection Department Punjab, International Centre for Integrated Mountain Development (ICIMOD), National Energy Efficiency and Conservation Authority (NEECA) and Pakistan Brick Kiln Association at a local hotel.

The experts said the world was adopting zigzag technology in kilns. They said the new technology was cheap as it reduces



over 40% coal consumption. In Pakistan, there are over 20,000 kilns and these were causing huge pollution.

Nepali expert Reema Dixit said baking of 1,000 bricks used to add two kilograms of smoke to the atmosphere in traditional style brick kilns, while it could be reduced to 400 grams only by adopting the zigzag technology. Technical Manager Asad Mahmood said the NEECA was working on the

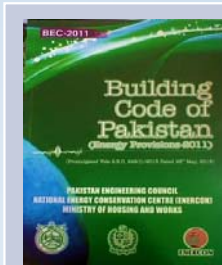
efficient use of energy and coal is important sources for producing energy in the country. “Coal is used in brick kiln industry so the NEECA was facilitating the Environment Protection Department to check rising pollution in the atmosphere. ICIMOD Country Representative Abdul Wahid Khan said the international body was working in eight countries including Pakistan, Bangladesh, India, Bhutan, Nepal, Burma, Afghanistan and

China. The mandate of ICIMOD was to work in mountainous areas of the countries. Pakistan Brick Kiln Association President Shabbir Nadeem also observed that their organisation would surely follow the zigzag technology. Muhammad Iqbal, a kiln owner, who recently installed zigzag technology as a pilot project in Rawalpindi, said the technology was very much effective in terms of cost as well as a reduction in pollution.”





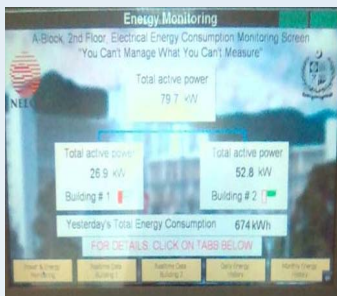
Building Sector Activities



Development/Revision & Implementation of Energy Conservation Building Codes for Commercial & Residential Buildings



Building Energy Audits , Centralized HVAC Energy Assessments, Installation of Building Energy Management Systems



Energy Efficient Products Installation in 5 Million Houses under Prime Minister Scheme



Buildings Energy Rating System



Road Map for Energy Efficiency & Conservation Programs



SUSTAINABLE DEVELOPMENT GOALS



THANK YOU

