Global Energy Demand Trends

Global Demand Transition is Underway
ENERGY CONSERVATION DEPARTMENT – KE

- **ENERGY AUDIT**: Onsite energy audits for our industrial, large commercial, and strategic consumers, analysis of consumption patterns followed by a comprehensive tailored report inviting efficiency.

- **POWER FACTOR**: Review of existing Power Factor issues and provision of technical counseling to industries on PF improvement matters.

- **SOLAR PV SYSTEMS**: Assessment of opportunities for small to big scale Solar PV projects.

- **NET METERING**: A billing mechanism that credits solar energy system owners for the electricity they add to the grid.

- **ENERGY EFFICIENCY**: Design and deploy energy efficient solutions for plant and office environments.

- **OUTREACH**: An awareness & empowerment platform for industrial, ordinary consumers, Youth Awareness Campaigns, Consumer Galas, and trade events.
What is Energy Efficiency..??

- Reduced **Energy Waste**; Using less energy to perform the same task
- Reduced **Greenhouse Gas Emissions** and **Demand for Energy Imports**
- O&M and **Energy Management Plan** ensuring **Sustained Savings** and **Enhanced Performance Standards**

**Technological Advancements in Industrial & Commercial Sectors**

- Lightings
- Air conditioning (Inverters & VRF)
- Efficient solutions for high inductive loads (Motors/Comp/Heaters)
- Alternate energy sources (Wind/Solar)
- Process automation leading to higher efficiency
- Heat Rejection/Rooftop Insulation
- Smart Building MS – Automation & Monitoring
ENERGY AUDIT PROCESS

01. Outreach
   Reaching out to consumers having the willingness and potential to contribute towards efficient lifestyle

02. Interaction
   Initial meetings with interested clients to explore EA process & the associated benefits

03. Pre Survey Data Mining
   Analysis of billing, load profiles & consumption patterns as a baseline for the audit processes

04. Field Audit
   Experienced EC teams carry out physical site survey specific to each customer’s need

05. Post Survey Analytics
   Evaluate the current energy pattern & compare it with international best practice.

06. Report
   Present comprehensive energy audit report with consumer

Salient features
- Assessment of energy use as per ISO 50001 & ASHRAE 90.1
- Recommendations
- Establish ROI
- Hyper Care

Evaluate the current energy pattern & compare it with international best practice.
**ISO 50001 CERTIFICATION FOR KE CONSUMERS**

**HOW KE SUPPORTS ORGANIZATIONS FOR ISO 50001**

1. **Development of Energy Management Policy** as per ISO 50001
2. Coordinate with appointed representative
3. Implementation of EnMS –
4. Assistance throughout the process for third party ISO 50001 certification

**ENERGY MANAGEMENT SYSTEMS (ENMS)**

ENMS is a series of processes based on PDCA cycle, enabling use of data to improve energy performance, improve operational efficiencies, decrease energy intensity, and reduce environmental impacts. It serves as a basis for investments in energy efficiency.

**PROCESS FLOW FOR IMPLEMENTING ENMS**

- **Vision / Management’s Commitment**
- **EnMS Team Establishment**
- **Team Development**
- **Standards**
- **Gap Analysis**
- **Work scope Determination**
- **Execution**
- **Post Implementation Gap Analysis**
- **Certification Audit**

**How KE supports Organizations for ISO 50001**

**Act:** take actions to continually improve performance of the energy management system

**Plan:** establish the objectives and processes necessary to deliver results in accordance with organization’s energy policy

**Checkpoint:** monitor and measure processes against energy policy, objectives, targets, legal obligations and other requirements to which the organization subscribes, and report the results

**Do:** implement the processes
## Some Strategic handshakes

<table>
<thead>
<tr>
<th>Client</th>
<th>Energy Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOVERNOR HOUSE</td>
<td>61 kW</td>
</tr>
<tr>
<td>CM HOUSE</td>
<td>347 kW</td>
</tr>
<tr>
<td>SINDH ASSEMBLY</td>
<td>228 kW</td>
</tr>
<tr>
<td>SINDH SECRETARI</td>
<td>143 kW</td>
</tr>
<tr>
<td>SIND CLUB</td>
<td>380 kW</td>
</tr>
<tr>
<td>IBA</td>
<td>151 kW</td>
</tr>
<tr>
<td>MEEZAN BANK</td>
<td>478 kW</td>
</tr>
<tr>
<td>KGS</td>
<td>65 kW</td>
</tr>
<tr>
<td>ICAP</td>
<td>58 kW</td>
</tr>
<tr>
<td>SGS</td>
<td>60 kW</td>
</tr>
<tr>
<td>NEDUET</td>
<td>600 kW</td>
</tr>
<tr>
<td>MARIE ADELAIDE</td>
<td>27 kW</td>
</tr>
<tr>
<td>Dawlance</td>
<td>460 kW</td>
</tr>
<tr>
<td>Hilton</td>
<td>96 kW</td>
</tr>
<tr>
<td>Asia Petroleum</td>
<td>267 kW</td>
</tr>
<tr>
<td>KGS</td>
<td>416 kW</td>
</tr>
<tr>
<td>Pakistan State Oil</td>
<td>2300 kW</td>
</tr>
<tr>
<td>GENERAL TYRE</td>
<td>300 kW</td>
</tr>
<tr>
<td>General Chrome</td>
<td>280 kW</td>
</tr>
<tr>
<td>Lady Dufferin Hospital</td>
<td>33 kW</td>
</tr>
<tr>
<td>B Brookes</td>
<td>44 kW</td>
</tr>
<tr>
<td>HBL</td>
<td>38 kW</td>
</tr>
<tr>
<td>Institute of Science</td>
<td>210 kW</td>
</tr>
<tr>
<td></td>
<td>110 kW</td>
</tr>
</tbody>
</table>

**Energy Audits**
- 500+ energy audits conducted
- 60 MW saved
- 162,675 tons of CO₂ reduced
SMALL SCALE RENEWABLE ENERGY STRATEGIC CLIENTS

- 947 kW Projects Completed
- 1,540 kW Projects Counseled
- 785.45 tons of CO2 p.a. reduced

Over 2.5 MW consultancy provided

- 360 kW
- 55 kW
- 407 kW
- 143 kW
- 102 kW
- 150 kW
- 110 kW
- 10 kW
- 35 kW
- 5 kW
- 600 kW
- 350 kW
CASE STUDIES
**RAJBY TEXTILE INDUSTRY**

<table>
<thead>
<tr>
<th>ENERGY EFFICIENCY TARGETS</th>
<th>Potential energy savings</th>
<th>Potential financial savings</th>
<th>Potential CO2 reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25% optimization per year</td>
<td>1.5 million rupees per year</td>
<td>32 metric tons per year</td>
</tr>
</tbody>
</table>

**Before audit**
- Monthly average units consumed: **46,116 kWh**

**After Audit**
- Monthly average units consumed: **39,118 kWh**
- Monthly savings: **6,998 kWh**

**Investment**
- PKR 500,000
### Energy Efficiency Targets

<table>
<thead>
<tr>
<th>Before Audit</th>
<th>After Audit</th>
<th>Potential Financial Savings</th>
<th>Potential CO2 Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly average units consumed</td>
<td><strong>234,509 kWh</strong></td>
<td><strong>157,654 kWh</strong></td>
<td><strong>2.5 million rupees per year</strong></td>
</tr>
<tr>
<td>Potential energy savings</td>
<td>38% optimization per year</td>
<td><strong>7,655 kWh</strong></td>
<td><strong>76,855 kWh</strong></td>
</tr>
</tbody>
</table>

350 kW Solar PV system installed

**Potential energy savings:** 38% optimization per year

**Potential financial savings:** 2.5 million rupees per year

**Potential CO2 reduction:** 128 metric tons per year
Potential energy savings: 34% optimization per year

Potential financial savings: 6.9 million rupees per year

Potential CO2 reduction: 128 metric tons per year

Before Audit: 45,633 kWh Monthly average units consumed
After Audit: 42,459 kWh Monthly average units consumed

Per month savings: PKR 300,000 Investment
EC Awareness Sessions

• Technical sessions for our industrial and commercial consumers.
ENERGY EFFICIENCY IN KE
At BQPS-II...

- First ever plant in Pakistan to achieve ISO 50001 certification.

Gross installed capacity of 248 MW 8% total plant auxiliary power consumption.

BQPS II used the vision and insight of KE energy conservation to develop and roll out and EnMS as per ISO 50001 guidelines.
KPC used the vision and insight of KE energy conservation to develop and roll out an EnMS as per ISO 50001 guidelines.

KPC has developed a plant-wide energy policy, and made major changes in lighting and AC.
SGTPS develop plant wide energy policy

Major changes were made to HVAC & Lighting that together accounted for 75% + energy used at SGTPS
TSW through energy policy implementation achieve energy efficiency in its process areas. Load optimized by the maintaining of PF, installation of VFDs, Inverter and LED technologies. Installing 300 kW solar PV system.
KE IT & procurement building have been achieved energy efficiency through installation of building automation system.

30% reduction in energy consumption in both buildings by automation system.
Features…

• Complete system designed in-house
• State of the art structure
• Annual production target of 302,000 kWh exceeded
Problem Statement

- PF: 0.99
- PF: 0.85
- PF: 0.67

Benefits

- Correcting poor PF can significantly reduce load on transformers and conductors
- Improves voltage regulation and stability of network
- Reduced line losses due to higher currents
- Lower kVA to cater the same load

PF Survey for Consumers

- We conduct PF survey for our industrial consumers.
- We recommend the consumers for the power factor improvement remedies.
Use LED lighting. Payback - 1 to 2 months

In industrial buildings, lighting accounts for approximately 10%-20% of the total energy used. Deploying efficient lamp technologies such as LEDs can increase savings by 80%.

Implement Process Automation and Energy Management System. Payback - 1 to 4 years

Improved automation in plants can save up to 80% energy. It can increase productivity, decrease downtime and minimise maintenance requirements while reducing energy consumption. Automation also aids in data collection for metering and instrumentation required for the Energy Management System.

Use high efficiency motors with Variable Speed Drives. Payback - 3 to 12 months

Motors are very energy-intensive. Energy-efficient motors pay back their purchase price within a few months.

Small reductions in the speed of Variable Speed Drives (VSDs) can optimise the voltage and frequency supply to the motor. Matching the speed of the motor to the actual load demand can produce significant energy savings. An effective motor management policy with VSDs can be implemented, resulting in further savings.

Install efficient heating and cooling technology. Payback - 2 to 5 years

Heating and cooling use around 20%-40% of a building’s energy. Replacing old boilers and chillers with modern versions can reduce energy usage.

A modern condensing boiler operates at an efficiency of 95%, whereas a conventional boiler has an efficiency of only 80%. A recommended chiller’s Coefficient of Performance (COP) should be around 6. A higher COP figure means less energy is required — thus, reducing costs.

Improve power controls and power factor. Payback - 1 to 4 years

Power factor correction can improve the usable power available to the equipment, thus, maximising its efficiency. Recommended power factor as per NEPRA guidelines is 0.9. Power Factor Improvement panels can:

- Increase current carrying capacity of the factory’s electrical network.
- Stabilise network voltage.
- Decrease the electricity bill by avoiding low power factor penalties.

Active Harmonic Control removes noise from power lines while saving energy and reducing deterioration of electrical equipment. By scheduling production during off-peak hours and managing electricity tariffs, you can use energy when it is cheaper.
K-Electric has taken a special initiative to address the issue of low power factor which is the root cause of additional penalties in your monthly bills.

**Power Factor** is defined as the ratio between active power and apparent power. It must be maintained up to a value of 0.95.

The correct value of power factor can save you from paying monthly penalties and enable us to reduce overloading of network infrastructure, and enhance system capacity.

Steps that can be taken to improve Power Factor:

**Immediate Steps**

1. Installation of capacitor banks
2. Adequate sizing of capacitor banks according to load
3. Proper switching mechanism for supply of adequate reactive power

**Note:**
The capacitor size should be kept at a minimum of 7.5 or 12.5 KVAR at first and last stages.

**General Guidelines**

1. Use branded motors and avoid using rewound motors.
2. Replace standard motors with energy-efficient motors.
3. Use synchronous motors instead of induction motors.
4. Minimise operation of idling or lightly loaded motors.
5. Avoid operation of equipment above its rated voltage.
6. Vendor should be PEC registered.

Consumers can approach our energy conservation department for guidance and determination of best options including the following services:

1. Technical assistance in PF determination and counselling sessions
2. Fault diagnosis of existing capacitor banks
3. Recommendations and implementation strategies for PF improvement

Once your power factor is maintained between 0.9 and 1.0, the quality of power supply to your premises will be greatly improved. It will further result in a reduction of tripping cases and complaints. **Improvement in voltage stability, improvement in energy efficiency and life of appliances**, and last but not least the elimination of power factor penalties.
Use LED bulbs instead of CFLs or conventional incandescent bulbs. LED lights can save up to 80% load on average and last up to 10 times as long as conventional incandescent lights.

Use inverter ACs instead of conventional ACs. Inverter ACs can save up to 50% AC load i.e. 1440 kWh per year. When purchasing an inverter AC, opt for DC inverter based components. Set your AC thermostat settings between 24°C and 26°C.

Switch off, unplug and save. Turn off unnecessary appliances such as lights, fans, and ACs, especially during peak hours. Appliances continue to consume energy on standby mode.

Use motion sensor switches and timers. Install motion sensors and timers to avoid leaving electrical appliances switched on around the clock.

Heat Rejection Sheets. Use Heat Rejection Window Sheets. These sheets allow maximum sunlight to enter the building while simultaneously blocking heat, creating a comfortable working environment and saving electricity costs.

Energy Efficiency at Workplace

Energy Efficiency at Workplace

*HVAC: Heating, Ventilation and Air Conditioning

2-year payback 80% less heat & glare 30% off HVAC energy costs*
Thank you