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TECHNICAL BRIEF

Discussion on Transforming Global Markets to Energy Efficient Lighting and Appliances

CONTRIBUTING ORGANIZATION

United Nations Environment Programme -
United for Efficiency

This technical brief is developed with the support of the contributing organizations to inform the 3rd Global Conference on Strengthening Synergies between the Paris Agreement and the 2030 Agenda for Sustainable Development.

The findings, interpretations, and conclusions expressed in this document do not necessarily reflect the views of any of the contributing organizations or the conference coordinating organizations.

I. Abstract

[The 2030 Agenda for Sustainable Development](#), adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.

Sustainable Development Goal 7 (SDG7) calls for “affordable, reliable, sustainable and modern energy for all” by 2030, and doubling the global rate of improvement in energy efficiency by 2030 is one of its three core targets.

The global transition to efficient appliances and electrical equipment is key to achieving this goal. High-impact appliances and equipment, such as refrigerators, air conditioners, electric motors, and power distribution transformers will account for over 60% of global electricity consumption by 2030. For example, the refrigerator stock in developing countries is expected to more than double by 2030 to 1.6 billion units. **Without intervention, a vast majority of these appliances will be bought and sold without any efficiency standard at all, or to low-level outdated standards by international norms.** As the [Sustainable Energy for All](#) (SEforALL) Appliances and Equipment Accelerator, the United Nations Environment Programme’s [United for Efficiency](#) initiative (UNEP-U4E) is **committed to fully transforming global markets to environmentally friendly, energy-efficient products through focused, strategic, regional and country level proven market transformation programmes such as recently successfully implemented in Pakistan.**

II. Addressing synergies and trade-offs

As the SEforALL Appliances and Equipment Accelerator, UNEP-U4E is working directly to contribute to the success of SDG7 and **delivery of a globally sustainable energy system with eco-efficient electrical products as the norm.** By 2030, it aims to achieve:

- USD \$ 500 billion in power generation cost savings
- **A 10% decrease in global electricity consumption**
- A 1.25 billion tonne reduction in CO₂ emissions annually
- **A USD \$ 350 billion increase in economic development annually**



By bringing together key global and local stakeholders such as technical institutions, the leading multi-national manufacturers and governmental organizations, UNEP-U4E can reliably assess global market trends, product innovations and the international

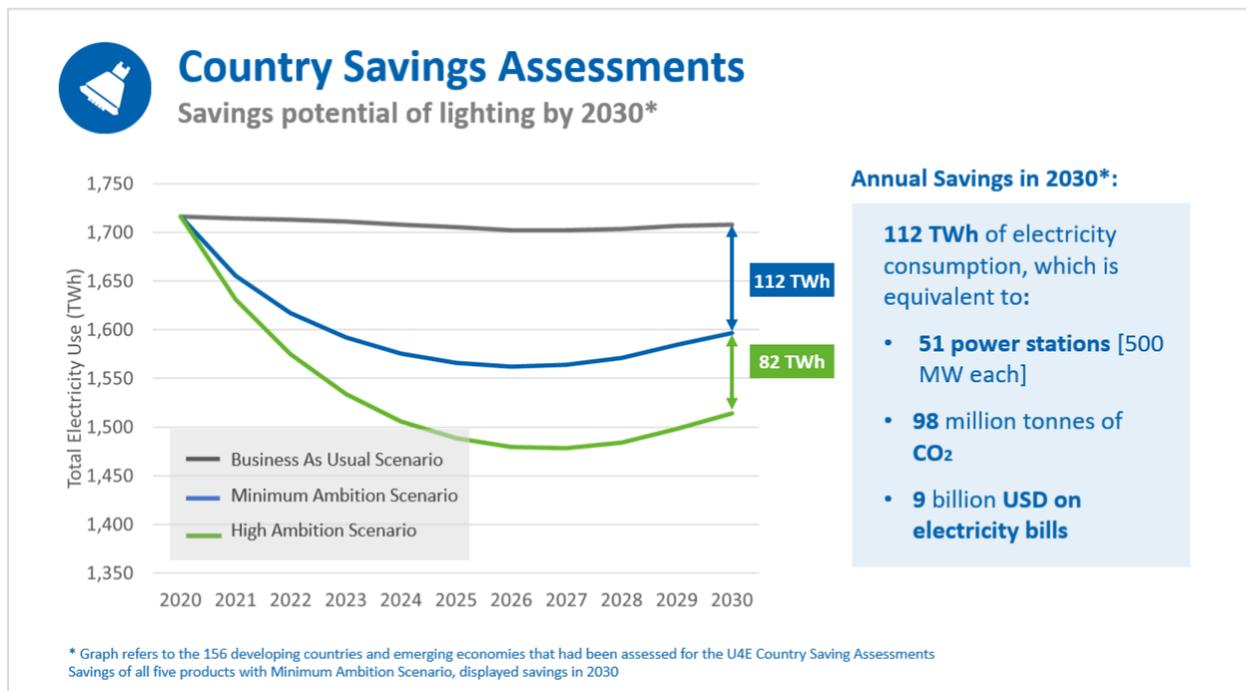
best practice policies and strategies needed to deliver large scale financial, environmental, energy and societal benefits for all – thanks largely to the **successful implementation of energy efficiency standards and policies (mainly, minimum and higher energy performance standards).**

UNEP-U4E’s market transformation programmes follow an integrated policy approach – a combination of proven policy measures based on the latest international best practice which defines the minimum efficiency levels and quality criteria which products must satisfy in order to be sold in the market. Based on detailed market research, its public-private partnership approach and in collaboration with dozens of experts from various sectors, U4E has developed a wide range of independent tools and resources for countries to apply. Its [international model regulation guidelines](#), for example, contain details on the essential elements to start transforming markets, including product scope, definitions, test methods, minimum efficiency levels and a set of minimum performance requirements, along with market surveillance measures which ensure consumers can purchase quality efficient products with confidence. As such, they provide key guidance to assist Governments in developing and emerging economies that are planning and designing regulatory or legislative frameworks for use with incentive programmes, in public procurement, in minimum and higher energy performance standards (MEPS and HEPS), in energy labelling and for other key market transformation interventions.

UNEP-U4E has successful examples from more than 30 countries around the globe of the effective application of this proven integrated policy approach to the implementation of energy efficiency programmes. By strategically supporting developing and emerging economies (where electricity demand is set to more than double by 2040), to accelerate their transformation to higher efficiency products (e.g., lighting, refrigerators, room air conditioners, electric motors and power distribution transformers), inefficient products are removed from the global market and substantial financial and CO₂ emission savings achieved.

III. Lessons learned on opportunities and challenges

Based on the [UNEP-U4E 2020 Country Savings Assessment analysis](#), annual electricity savings from the transformation of lighting markets to more energy-efficient products in emerging and developing countries could reach over 194 TWh of electricity in 2030, reducing CO₂ emissions by more than 200 million tonnes annually and **saving consumers over USD 15 billion on their electricity bills each year.** This is a conservative estimate based on UNEP-U4E’s 2021 model lighting regulation guidelines.



Achieving these savings relies on commitment from individual countries to the implementation of robust and sustainable market transformation programmes. This is well illustrated in the case of Pakistan.

Pakistan has rapidly become a large emerging economy and in parallel with its population growth, energy consumption has risen steadily, giving rise to an increasing national energy crisis with a large portion of the population still lacking full access to reliable electricity. An important step towards meeting the objectives of increasing energy access for all, reducing the gap between energy supply and demand, as well as national CO₂ emissions reduction was achieved in 2020 through the successful implementation of the first ever MEPS and labels for energy efficient LED lighting.

According to U4E's Country Saving Assessment for the Pakistani lighting market, the transformation to more energy efficient lighting systems will result in annual savings of 1 million tonnes of CO₂ emissions from the avoided burning of fossil fuels in the country and over USD 100 million in annual savings in electricity costs for residential consumers by 2030. The new mandatory lighting standards were successfully approved at the 99th meeting of the Pakistan Electrotechnical National Standards Committee in November 2019 and came into force in December 2020.

This was accomplished through the *Delivering the Transition to Energy Efficient Lighting in Residential, Commercial, Industrial, and Outdoor Sector* project, using the UNEP-U4E model regulation guidelines for energy-efficient lighting as the basis for the implemented MEPS and labels as well as a higher performance three-star minimum level in public procurement.

In addition to the development of the national energy efficient LED lighting policy for MEPS and labelling which led to the implementation of the new MEPS and labels, the project included:

- Development of process and procedures to ensure compliance with lighting minimum energy performance standards and labelling, including technical support to testing laboratories, development of HS Customs Codes and recommendations for monitoring, verification and enforcement system enhancement.
- Proposal of an operational framework to establish a collection scheme, recycling facilities and/or sound disposal systems, to ensure the sustainable end of life treatment of spent lamps.
- Development of administrative and operational procedures to establish a revolving loan fund, including the provision of technical assistance for capacity workshops for on-lending entities for the loan programme.
- Development and provision of technical assistance for the implementation of a pilot demonstration programs for local appropriate LEDs and lighting controls.

LED IS UPTO 8X MORE EFFICIENT

CHOOSE THE RIGHT ONE

MINIMUM EFFICACY

- Efficacy based on flux output range and size of tube lights
- Different levels for LED tubes, tubes, down lights and street lights
- 2 feet LED tube: 108 lumens/Watt
- 4 feet LED tube: 114 lumens/Watt
- 5 feet LED tube: 116 lumens/Watt
- Outdoor luminaire: 100 lm/W for up to 90W, 120 lm/W for more than 90W
- Products complying to Minimum Energy Performance Standards (MEPS) must be used

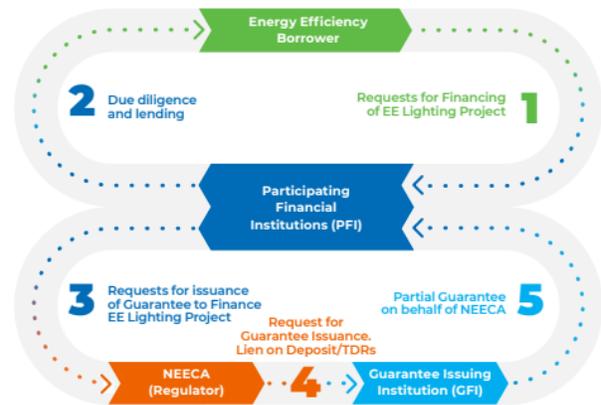
FLUX LEVEL	BUILD	DOWN LIGHTS
60+ @ <600	80 lumens/Watt	70 lumens/Watt
600+ @ <1200	90 lumens/Watt	75 lumens/Watt
1200+ @ <3300	100 lumens/Watt	80 lumens/Watt

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The launch of the MEPS and labels was accompanied by an extensive awareness campaign to encourage broad public acceptance and help modify user behaviour. This included radio and television broadcasts, and digital campaigns on social media with videos and informative brochures.

The third-party partial risk guarantee mechanism that has been developed as part of the project to mitigate the risks against loans provided for energy-efficient lighting projects went operational in 2021, with allocated funds of USD \$ 350,000. In the case of default on a loan, this mechanism absorbs a portion of the lender's losses on the loan. By mitigating some of the risk to lenders, it aims to stimulate commercial lending for replacement of conventional lighting with energy-efficient light emitting diode (LED) lighting in all end-use sectors in Pakistan.

The first risk guarantee agreement was signed on 3 November 2021 for an energy-efficient LED lighting retrofit project where 890 existing 4-foot and 2-foot fluorescent tubes were replaced with LED tubes approved under the scheme, leading to projected savings of 63,000 kWh or about 1.3 million Pakistani Rupee per year and a payback period of less than a year. Although the total investment for this energy-efficient lighting project is relatively small (one million Pakistani Rupee (PKR), or about USD \$ 6,000), it has proven the viability and practicality of the risk guarantee mechanism for energy-efficient investment projects in Pakistan.



IV. Recommendations for Action: Means of Implementation and Partnerships to Accelerate Progress

Following the UNEP-U4E **integrated policy approach** to accelerate adoption of energy-efficient lighting, appliances and equipment ensures that the priorities and perspectives of key stakeholders – consumers, businesses, civil society and officials – are addressed during the market transformation process. This results in a powerful approach focused on consumer purchasing and new eco-efficient technology procurement which results in a relatively very fast, more robust and sustainable programme at national level scale. **The five stages in the typical United for Efficiency [integrated policy approach](#) are:**

- Standards and regulations which specify energy efficiency and other requirements for a product to be sold in the market.** MEPS, testing standards and definitions should reference international best practices. Mandatory standards are essential to market transformation.
- Supporting policies where labelling, information, education, training and outreach supports standards by ensuring that requirements are understood clearly and consistently conveyed.** Labels affixed to products help purchasers and procurers understand performance and other attributes so they can make informed decisions. Outreach efforts raise awareness of the benefits and activities associated with market transformation activities.
- Finance, incentives and financial delivery mechanisms which support consumers to offset the higher purchase price of efficient products.** Governments may use existing budgets or outside sources (e.g., fees, donors), while consumers may tap grants or financing options (e.g. loans, leases, utility bill assessments) to cover the incremental cost. Incentives can be a very fast and effective way to drive large scale market changes in many electrical product sectors, introducing and bringing down prices for higher performance eco-efficient products at the same time.
- Monitoring, verification and enforcement which involves overseeing products sold in the market, verifying compliance with standards and labels (e.g., by testing the products), enforcing these requirements, and reporting on the results so that consumers and businesses trust and benefit from market transformation activities.**
- Environmentally sound management and health considerations are crucial to ensure products do not cause undue harm to people or the planet during manufacturing, operation, or recycling/disposal.** Potentially hazardous ingredients (e.g., mercury, toxins, ozone depleting or global warming refrigerants) must be handled according to global best practices in eco-design and end of product life management, including national collection systems.

V. Guiding questions

- Do you have a thorough understanding of the current electrical product market, its national energy implications and the relevant stakeholders?
- How will you sustainably fund your programme?

- **What policy options will you select? Why?**
- How will the policies be enshrined effectively in national legislation and procurement practices?
- **How will you set the levels for your regulations and procurement guidance?**
- How will you ensure compliance and ongoing engagement of the main stakeholders?
- **How will you engage with stakeholders on the development of the new policies and practices?**
- How will you communication information on the new policies to consumers and stakeholders?

References and additional reading list

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