

DISCUSSION PAPER

STRENGTHENING BRICS COOPERATION ON ENERGY EFFICIENCY & APPLIANCES





ACKNOWLEDGEMENTS

The discussion Paper on Strengthening BRICS Cooperation on Energy Efficiency and Appliances was prepared under the aegis of the Ministry of Power (MoP), Government of India, and the Bureau of Energy Efficiency (BEE), Government of India. We would like to recognize the guidance provided by Krushna Chandra Panigrahy, Arijit Sengupta, Deepshikha Wadhwa, Bibhu Padarbinda Mohanty from the BEE. The paper was prepared by Divyam Nagpal, Giorgia Pasqualetto, Ashish Jindal, Neeraj Kuldeep, Balasubramanian Viswanathan, and Indira Abeldinova at Sustainable Energy for All (SEforAll). The authors would like to express their gratitude to the external reviewers, including Sommai Phon-Amnuaisuk at IIEC; Satish Kumar, Pramod Kumar and team at AEEE; as well as Bishal Thapa, Angellah Wekongo, Edilaine Camillo, Feiyan Zhao and Yuping Wei at CLASP, for their technical insights and constructive feedback that helped strengthen the analysis presented in this paper.

Disclaimer: The document is a draft discussion paper prepared to inform dialogue among BRICS member countries. The views, analysis, and recommendations contained herein are those of the authors and do not necessarily reflect the official position of the BRICS member countries, the Bureau of Energy Efficiency and Sustainable Energy for All.

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EXECUTIVE SUMMARY

Energy efficiency is recognized as the *first fuel* of the global energy transition and represents one of the fastest, most cost-effective pathways to improve energy security, strengthen economic competitiveness, reduce emissions and support sustainable development. For BRICS countries, the case for prioritizing energy efficiency is particularly strong. Collectively accounting for more than 40 percent of global energy consumption, most BRICS economies are experiencing rapid growth in demand for energy services driven by industrialization, urbanization, rising incomes, and expanding access to cooling, appliances, transport and digital technologies. Managing this demand efficiently is essential to balancing economic growth, energy affordability and security, infrastructure investment, and climate objectives.

This paper examines the current landscape of energy efficiency across BRICS Member countries and identifies opportunities for enhanced cooperation, with a particular focus on energy-efficient appliances and equipment. It aims to support implementation of the Roadmap for BRICS Energy Cooperation 2025-2030 and contribute to broader international efforts to double the global rate of energy efficiency improvement by 2030.

The introductory chapters establish energy efficiency as a strategic priority for BRICS and highlight the diversity of energy systems, institutional structures and development pathways across Member countries. While the group spans major manufacturing powers, emerging economies, energy exporters and technology importers, these differences create opportunities for complementarity and mutual learning. The chapters also situate energy efficiency within the broader BRICS Energy Cooperation Roadmap (2025-2030) implementation agenda, including industrial development, energy security and just energy transitions.

Chapter 3 reviews energy intensity trends and policy frameworks for energy efficiency across BRICS Member countries. Although energy intensity has generally declined over the past decade, progress remains uneven and below the pace required to meet international targets, suggesting that many opportunities remain untapped. Most BRICS Member countries have adopted national energy efficiency strategies and regulatory instruments such as minimum energy performance standards (MEPS), labelling programs and financial support programmes.



Chapter 4 identifies energy-efficient appliances as a strategic opportunity for BRICS cooperation. Appliances already account for a large and growing share of electricity demand, particularly in cooling, refrigeration, lighting, motors and connected devices. Without stronger policies, appliance-related electricity consumption across BRICS Member countries and its partners could nearly double by 2060. Conversely, ambitious efficiency measures could generate massive cumulative energy savings, reduce peak demand, lower consumer costs and avoid emissions. The chapter highlights the importance of harmonizing standards, strengthening compliance systems and integrating appliance efficiency with grid planning and demand-side management. It also examines investment and market transformation approaches, including bulk procurement, utility-led financing, Energy Service Company (ESCO) models and on-bill financing mechanisms. Finally, it argues that while emerging smart and connected technologies offer significant opportunities for *intelligent energy efficiency*, fragmented standards and limited interoperability remain major barriers.

Chapter 5 presents case studies from across BRICS members, including on bulk procurement and market aggregation, industrial policy and stringent standards for global market transformation, integrated utility financing and consumer labelling approaches, Super ESCOs, compliance-driven efficiency markets, and integrated demand-side management.

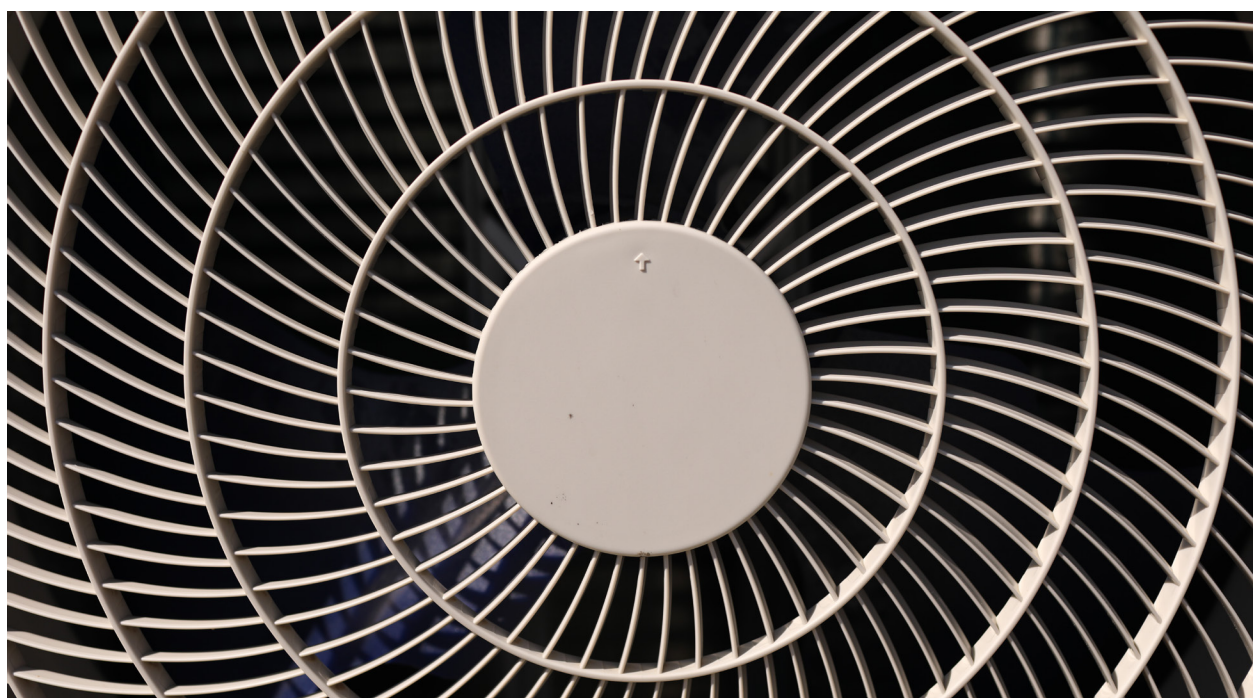
Building on the findings, Chapter 6 proposes the creation of a dedicated workstream on Energy Efficient Appliances under the Roadmap for BRICS Energy Cooperation 2025-2030, together with eight possible focus areas where the workstream can enhance BRICS cooperation:

1. **Building capacity on standards and labelling for high-potential appliances**, delivering technical training and workshops for BRICS regulators, supporting mutual recognition of certifications and South-South exchange opportunities.
2. **Strengthening collaboration on compliance and market surveillance**, through information sharing on testing protocols, non-compliant products and enforcement practices.
3. **Supporting cross-border market signals for efficient appliances**, to activate local manufacturing investments in critical components, and strengthen supply chains for super-efficient appliances.
4. **Facilitating rapid deployment of high-efficiency cooling**, promoting harmonized MEPS pathways, joint R&D and shared financing models for large-scale adoption.
5. **Piloting smart appliances and artificial intelligence- (AI-)use cases**, developing standards and pilot programmes for connected appliances and generating best practices for AI-driven energy optimization.
6. **Promoting industrial efficiency**, through collaboration on stronger MEPS for electric motors, variable-speed drives and distribution transformers, and capacity building for industrial parks.
7. **Scaling financing models for market transformation**, in collaboration with national and multilateral financing institutions, including the New Development Bank.
8. **Leveraging the power of behavioural change**, with coordinated awareness campaigns on energy-efficient appliances.

In implementing these actions, BRICS Member countries can also strengthen collaboration with existing international platforms and initiatives such as Mission Efficiency,¹ to leverage technical expertise, policy tools and implementation support.

1 Mission Efficiency is a global coalition hosted by Sustainable Energy for All (SEforALL), driving progress to double energy efficiency by 2030. At COP30, Mission Efficiency launched its Plan to Accelerate Doubling Energy Efficiency (PAS), uniting more than 30 international partners and over 50 coordinated actions to advance national, subnational, and sectoral strategies for doubling energy efficiency by 2030. Learn more: <https://missionefficiency.org/>





CHAPTER ONE

INTRODUCTION

The global energy system is at an inflection point. The pace and scale of the energy transition will be determined not only by the deployment of low-carbon generation capacity, but by how effectively economies manage the demand side: reducing the energy required to deliver the same or better and more accessible services across buildings, industry, transport and appliances. Energy efficiency is the single most powerful tool available for this purpose, yet it remains systematically underinvested relative to its potential.

This paper is addressed to energy policy-makers, regulators and practitioners across BRICS Member countries, and to the institutions that support joint action on energy transition. Its purpose is twofold. First, it takes stock of where BRICS Member countries stand on energy efficiency in the framework of the global *doubling* goal: tracking trends in energy intensity and demand across key sectors, mapping the landscape of existing policies, standards and programmes that can be leveraged for knowledge exchange and collaboration under potential BRICS-wide initiatives. It then sharpens its focus on appliances and

equipment, a sector where Member countries collectively represent both the world's largest manufacturing base and a fast-growing consumer market, and where the potential for rapid, scalable efficiency gains is significant. Here, the paper presents case studies and examples to highlight the experiences that Member countries can leverage to support knowledge exchange and cooperation.

Second, it identifies specific opportunities where structured cooperation across Member countries can accelerate progress on appliance efficiency, leveraging the strengths of the group to promote joint action in line with

the objectives of the Roadmap for BRICS Energy Cooperation 2025-2030. Concretely, the paper formulates eight recommendations, targeting capacity building for policy & regulations, cross-border collaboration, rapid deployment and piloting of efficient and smart technologies, financing for market transformation, and promoting behavioural change.

Unless otherwise specified, the data and policy analysis in this paper focus on BRICS Member countries as of 2026.

However, the analytical framework and co-operation recommendations are designed to be applicable to BRICS partner countries as well, reflecting the broader ambition of the group to pioneer a model of South-South energy cooperation with relevance beyond its own membership. Experiences and data from BRICS partner countries are considered in the analysis, where relevant.





CHAPTER TWO

ENERGY EFFICIENCY AS A STRATEGIC PRIORITY FOR BRICS

Energy efficiency is widely recognized as the *first fuel* of the global energy transition: the fastest, cleanest and most cost-effective means of improving energy security and decarbonizing economies while supporting economic productivity. Its co-benefits are well documented: efficiency improvements reduce fossil fuel dependency, lower household and industrial energy bills, defer grid infrastructure investment, reduce expensive peak demand, cut air pollution, and create domestic jobs.

The case for treating energy efficiency as a strategic priority within BRICS has never been stronger. Several BRICS economies are experiencing energy demand growth rates above the global average and account for a substantial share of the increase in global energy consumption.² Growth is especially pronounced among emerging economies, such as China, India and Southeast Asian countries, reflecting the strong economic expansion driving demand across the bloc. The buildings sector alone drove nearly 60 per-

cent of total growth in global electricity consumption in 2024,³ underlining how rapidly expanding demand for appliances, including cooling, translates into grid investment and fiscal pressure if not met with demand-side action. Higher energy efficiency ambition also presents unique opportunities for the group's domestic development: manufacturing efficient technologies, retrofitting buildings and deploying smart metering are all labour-intensive sectors that generate skilled jobs distributed across economies.

² IEA. 2025. Global Energy Review.

³ Ibid.

Finally, efficiency improvements are central to delivering BRICS countries' climate and energy commitments. In 2023, at the COP28 Global Stocktake, Parties to the UNFCCC agreed to collectively double the rate of improvement in energy intensity by 2030. In the same year, G20 countries also endorsed the doubling goal through the G20 Energy Ministers Outcome Document and the New Delhi Declaration, during India's G20 Presidency. Simultaneously, implementation of the Paris Agreement is increasingly anchored in the Global Climate Action Agenda, the framework through which voluntary action by countries, businesses and cities is organized and tracked. Following the first Global Stocktake, energy efficiency and renewable energy have been embedded as priority areas within this process. For BRICS countries, this offers an opportunity to align national and collective priorities with the global agenda while bringing the experience of delivering energy transitions at scale across diverse economies. Harnessing the momentum, in 2025, the 10th BRICS Energy Ministers Joint Communiqué stated support for “energy efficiency improvement, including the goal of doubling its global rate by 2030, through increased cooperation, knowledge sharing and coordination between existing BRICS mechanisms”. Overall, a stronger focus on energy efficiency presents a shared opportunity to pursue just and inclusive energy transitions while balancing energy security, sustainable development and the transition towards a low-carbon future.

DIVERSE JOURNEYS, SHARED CHALLENGES

Despite their economic and geographic diversity, BRICS Member countries share several features that make energy efficiency a compelling priority. Most are grappling with rapidly growing demands for energy services driven by urbanization, industrial-

ization and rising living standards. Many face the structural tension between expanding energy access and containing the carbon and fiscal costs of that expansion. And all operate in a global technology environment where the pace of innovation in efficient end-use technologies (such as heat pumps, electric vehicles (EVs), industrial motors, LED lighting and smart building systems) is accelerating faster than most regulatory frameworks can keep pace with. These shared pressures create a common ground for knowledge exchange and collaboration.

At the same time, the structural differences across the group are substantial, and understanding them is essential to designing practical cooperation frameworks. In terms of economic structure and demand drivers, Member countries vary widely in their levels of economic development and structure and this is reflected in their efficiency priorities. China and Russia have mature, large and heavy industrial bases (such as steel, cement, chemicals and aluminium) where industrial process efficiency is a priority. India, Indonesia and several newer BRICS Member countries are expanding their manufacturing and witnessing a fast phase of structural transformation, which provides a window of opportunity to integrate energy efficiency into the stock of appliances and building from the onset. Brazil and South Africa occupy distinct positions: the former has an energy consumption challenge concentrated in transport and industrial end uses, including agro-industrial chains, the latter is shaped by a capital-intensive mining and smelting sector that has specific energy security requirements. These structural differences mean that policy levers and investment cases vary substantially, and a one-size-fits-all agenda would not prove useful.

Each BRICS Member State also occupies a different position as producer, assembler or

importer of the end-use technologies that energy efficiency depends on. China is the dominant manufacturer of efficient appliances, heat pumps, EVs and LED lighting, simultaneously shaping global cost curves and serving as a supplier to other countries. India has a growing manufacturing base in appliances and HVAC, increasingly serving as both a domestic producer and emerging exporter. Brazil imports lighting products, while most other appliances sold in Brazil are domestically manufactured. Other Member countries are primarily technology importers, meaning their efficiency priorities centre on standards, testing infrastructure and access to affordable products as well as developing local capacity for energy efficiency services. Importantly, across the group, there are various typologies of institutional infrastructure and policy mixes for energy efficiency. This dimension will be analyzed in detail in the next chapter.

Overall, the diversity in demand drivers, value chain position and institutional experiences defines the terms of a potential complementarity, where manufacturing leaders can supply at scale, policy leaders can share instruments and institutional know-how, and importers can build local services markets and leapfrog to efficient technology standards at lower learning costs. Instruments such as labels and minimum energy performance standards (MEPS) are universally applicable, and countries can benefit from mutual learning. For each country's context, however, such instruments need to be tailored in terms of product scope, energy efficiency levels, test methods and enforcement mechanisms. The breadth of approaches reflects BRICS' comparative advantage: the group collectively embodies the spectrum of the global efficiency challenge and owns a portfolio of proven strategies and technologies.

THE BRICS ROADMAP FOR ENERGY COOPERATION 2025-2030

The Roadmap for BRICS Energy Cooperation 2025-2030, adopted by BRICS Energy Ministers in Brasília on 17 May 2025, acknowledges the diversity of the group's energy matrix and provides a formal framework to address global and internal energy challenges. It emphasizes just, inclusive energy transitions while maintaining a commitment to energy security and reliability, and sets four overarching goals:

1. **Strengthening BRICS energy cooperation and coordination in the international energy agenda**
2. **Expanding the scope of cooperation with energy security and just and inclusive energy transitions as essential backdrops**
3. **Improving governance, decision-making and implementation processes for cooperation initiatives**
4. **Expanding trade in energy-related goods and creating favourable conditions for mutual investments.**

Energy efficiency features in the Roadmap in two distinct but complementary ways. It appears as a priority issue within the new advanced technologies thematic area, alongside transport and sustainable buildings. It is also listed as a priority issue under the innovation and technology cooperation thematic area, paired with digitalization and artificial intelligence (AI), thereby framing efficiency as an enabler cutting across all sectoral workstreams. The Roadmap also creates fertile ground for efficiency action through adjacent priorities: standards and regulations, financing energy transitions, capacity building, access to energy services, and the proposed Strategic Partnership Framework between the New Development Bank and the BRICS Energy Research Cooperation Platform (ERCP).

Building on this foundation, this paper proposes concrete activities that help translate the Roadmap's existing commitments into coordinated action across Member countries.





CHAPTER THREE

ENERGY EFFICIENCY TRENDS IN BRICS

ENERGY CONSUMPTION AND INTENSITY

BRICS countries accounted for 43 percent of total final energy consumption (TFEC) in 2023, with consumption growing at 3 percent, notably faster than the global average of 2.2 percent^{4,5}. China, India and Russia together accounted for 136,772,540 TJ in 2023, or 77 percent of BRICS Member countries' TFEC, and 33 percent of global energy consumption. At the other end of the spectrum, Egypt, Ethiopia, South Africa and the UAE each account for less than 1 percent of TFEC (Figure 1 and Figure 2). For several members, the priority is managing rapid demand growth from a still-modest base rather than reducing an already large absolute footprint.

4 UNSD. 2023. Energy Balances.

5 IEA. 2025. Global Energy Review.

FIGURE 1

Country breakdown of global Total Final Energy Consumption (TFEC), 2023

SOURCE:
UNSD Energy Statistics Data Portal

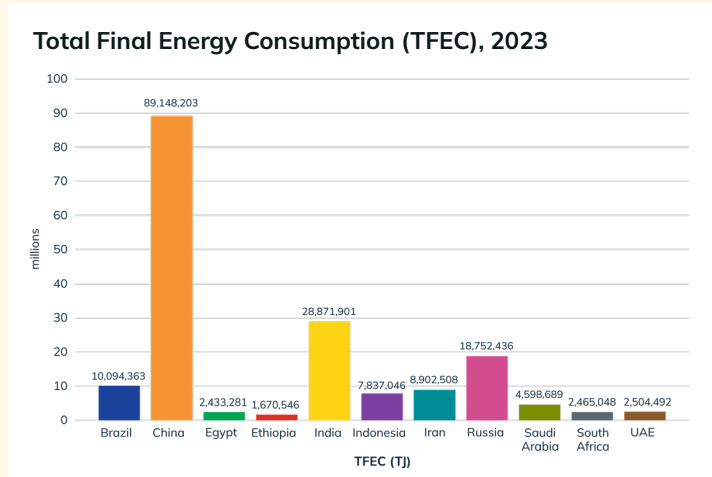
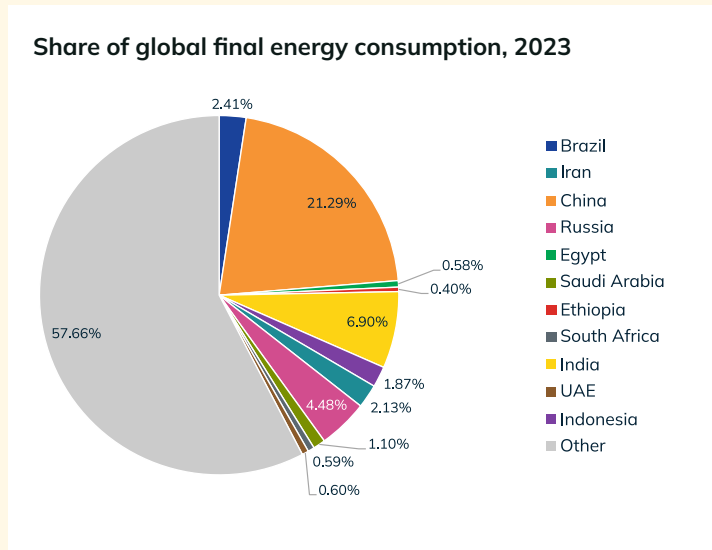


FIGURE 2

Country share of global Total Final Energy Consumption (TFEC), 2023

SOURCE:
UNSD Energy Statistics Data Portal

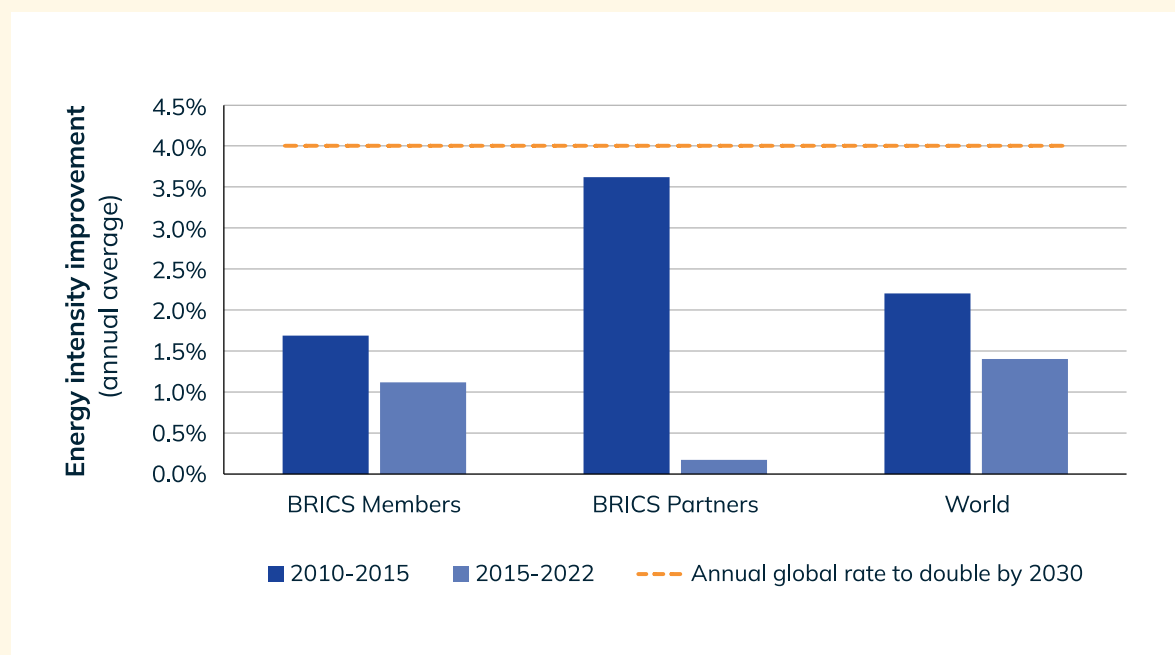


While energy consumption increased, the energy intensity of BRICS economies⁶ decreased by ~8% between 2010 and 2022. In comparison, BRICS partner countries progressed at more than twice that rate between 2010 and 2015 but slowed down to just 1 percent improvement between 2015 and 2022. Still, as seen in Figure 3, average collective annual improvements in energy intensity in both BRICS Member countries and partner countries were below the global average between 2015 and 2022, and fell short of the global rate needed to achieve the *doubling by 2030* goal (4 percent/year), suggesting that there are untapped opportunities to prioritize energy efficiency and realize its benefits.

⁶ Energy intensity is defined as the energy supplied to the economy per unit value of economic output, defined as GDP at constant 2021 purchase power parity.

FIGURE 3

Average annual energy intensity improvement in BRICS Member countries and partner countries



SOURCE:

SEforALL analysis based on Tracking SDG7: The Energy Progress Report 2025 (IEA/IRENA/UNSD/World Bank/WHO).

Energy intensity trends vary across BRICS countries due to differing development context and structural trajectories, baseline energy intensity and changes in national energy policy frameworks. This progress is summarized in Table 1.

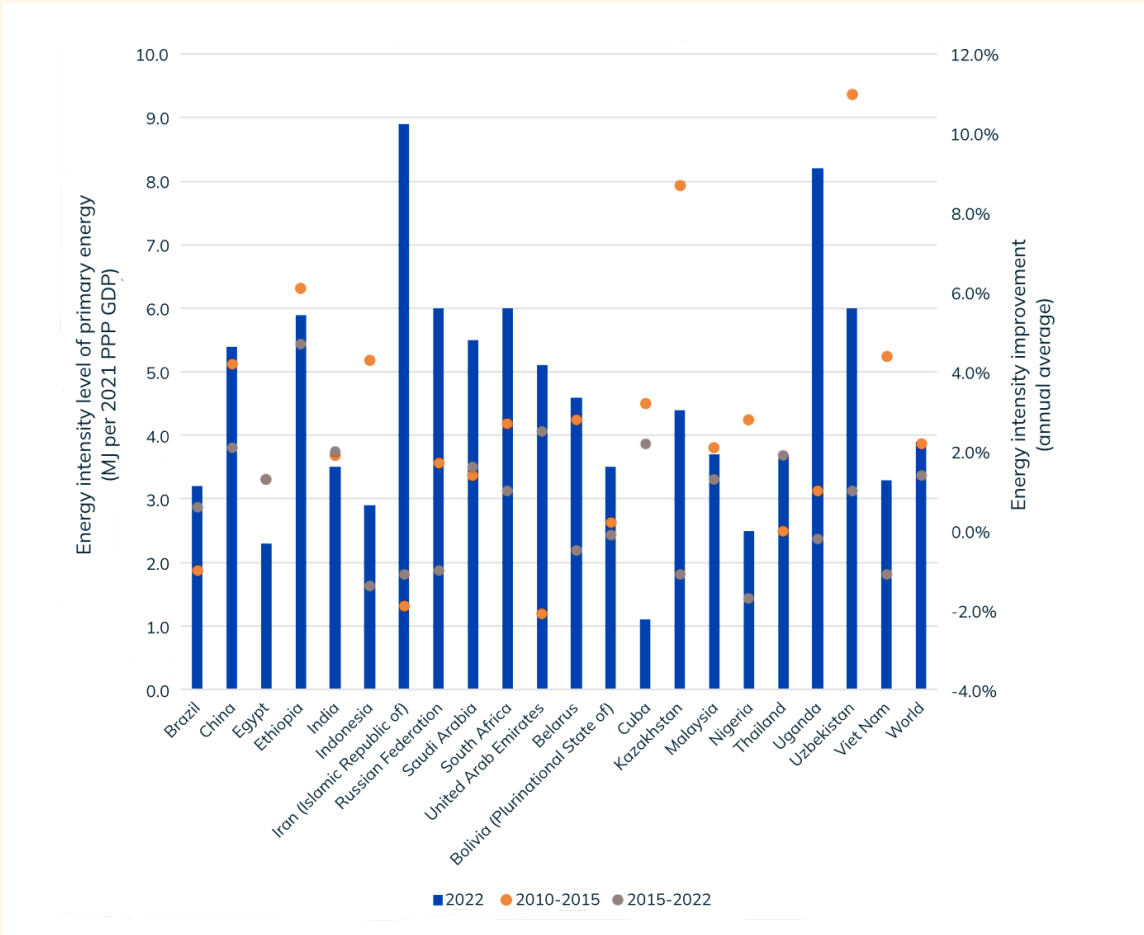
Most BRICS countries show deceleration in their energy intensity improvements after 2015 (Figure 4 and Table 1), mirroring the global trend and likely following economic changes. Early intensity gains are largely driven by structural economic shifts: in some cases, by the shift from subsistence agriculture toward manufacturing and modern services, which raises GDP faster than energy consumption, and in other cases, such as in fast-growing Asian economies, by the rapid expansion of light manufacturing and services. As *structural dividends* start to fade, further energy intensity improvements increasingly require deliberate policy action: tightening standards, replacing inefficient capital stock, reforming energy pricing and strengthening capacity for demand-side management. Some countries, such as India, have maintained their improvement trajectory, suggesting that sustained policy frameworks can compensate for the exhaustion of structural gains. Others, such as China, Ethiopia, India and South Africa, have reduced their intensity since 2010, either approaching or outpacing the world average. In China and Ethiopia, energy intensity started far above the world average in absolute terms and declined sharply over time. Iran and the UAE actually increased intensity between 2010 and 2015, but the UAE

reversed trends with a notable reduction between 2015 and 2022. Indonesia and Russia showed the opposite trajectory, making progress between 2010 and 2015 but reversing trends between 2015 and 2022. Brazil and Egypt remained steady across two decades with energy intensity below the global average, and only marginal changes during this period.

Notably, early estimates for 2025 by the International Energy Agency (IEA) suggest a possible acceleration of energy intensity improvements in China, India and Southeast Asia. Based on preliminary data, annual progress is expected to surpass 4 percent in 2025 in India, and reach 3.5 percent in China, although a single year’s data are not sufficient to confirm an accelerated trajectory. This potential jump forward is driven by easing pressures on energy consumption growth in 2025, with the primary energy demand of both countries growing at approximately half the pace of their respective averages between 2010 and 2019, based on preliminary estimates.⁷

FIGURE 4

Energy intensity and average annual energy intensity improvement in BRICS countries



SOURCE: SEforALL analysis based on Tracking SDG7: The Energy Progress Report 2025 (IEA/IRENA/UNSD/World Bank/WHO).

7 IEA. 2025. Energy Efficiency 2025.

TABLE 1

Energy intensity trends by country (primary energy per unit of GDP, PPP basis)

Country	2010-2015	2015-2022	Overall trend
 Brazil	Energy intensity increased by 1%/yr but remained below global average	Trend reversal with slight energy intensity improvement	● Decreasing (reversal)
 China	Sustained and notable reduction in intensity, averaging approximately 4.2%/yr	Rate of improvement moderated averaging approximately 2.3%/yr	● Decreasing (slowing rate)
 Egypt	Gradual improvement but lower than global trends	Rate of improvement remained around 1.3%/yr with energy intensity notably below global average	● Decreasing (steady)
 Ethiopia	Energy intensity improvements of 6.1%/yr, which is significantly above global average	Trend continued; per-capita consumption remains significantly below global average	● Decreasing (slowing rate)
 India	Steady reduction, averaging approximately 1.9%/yr aligned with global trends	Improvement continued at a consistent rate of approximately 2.0%/yr, in line with the historical trend	● Decreasing (steady)
 Indonesia	Strong energy intensity improvements of 4.3%/yr, above global average	Reversal of trends with energy intensity increasing at 1.4%/yr	● Increasing (reversal)
 Iran	Energy intensity increased by 1.9%/yr	Intensity continued growth at 1.2%, notably higher than global average	● Increasing (slowing rate)
 Russia	Moderate improvements slightly below global average (1.7%/yr)	Reversal of trends with energy intensity increasing at 1.0%/yr	● Increasing (reversal)
 Saudi Arabia	Gradual improvement but lower than global trends (1.4%/yr)	Energy intensity improvements only marginally accelerated (1.6%/yr)	● Decreasing (steady)
 South Africa	Steady reduction averaging 2.7%/yr	Slower rate improvement, dropping to 1%/yr	● Decreasing (slowing rate)
 UAE	Energy intensity increased by 2.1%/yr	Reversal of trends with energy intensity improvements faster than global trends (2.5%/yr)	● Decreasing (reversal)

GLOBAL REFERENCE:

energy intensity improvement averaged approximately 2%/yr between 2010 and 2019, slowing to approximately 1.2%/yr between 2019 and 2023. Source: IEA Energy Efficiency 2025; Tracking SDG7 2025 (IEA/IRENA/UNSD/World Bank/WHO)

ENERGY EFFICIENCY POLICIES AND PROGRAMMES IN BRICS MEMBER COUNTRIES

The table in Annex 1 maps the principal energy efficiency instruments currently in place across BRICS Member countries, drawing on national policy documentation and the 2024 BRICS Just Energy Transition Report.⁸ It classifies instruments across five broad categories: regulatory and standards-based measures (such as minimum energy performance standards (MEPS) and building codes); planning and governance frameworks (national strategies, plans and sectoral roadmaps); market-based instruments (including tradable certificates and Energy Service Company (ESCO) frameworks); financial support mechanisms (such as utility obligations and funding); and information measures (such as labelling and awareness campaigns). The table does not aspire to be a comprehensive stocktake of BRICS' energy efficiency policy, but rather a review of the most prominent experiences that can be leveraged for mutual learning, recognition and cooperation.

A common feature across the group is the presence of national plans: every country has adopted some form of energy efficiency strategy, framework or economy-wide tracking, even if sectoral coverage and depth vary considerably. Regulations and standards are the most common instruments: mandatory MEPS for appliances and equipment are in place, at least partially, in most countries, making them the single most widely deployed policy tool across the group. This reflects a global pattern: OECD climate policy data⁹ recently found that MEPS and labels for appliances, including heating systems, freezers and air

conditioners, have expanded steadily since 2010, and by 2024, MEPS had been adopted by 80 percent of countries covered by OECD data. Mandates for large industrial emitters, building energy codes and appliance labels were the next most widely adopted instruments. Building energy codes are also present in several BRICS Member countries, though their scope and enforcement rigour differ. The residential sector is often primarily addressed through appliance standards and labelling, even though comprehensive building energy performance requirements are incorporated in building energy codes (e.g., through EPI-based metrics). This highlights the need to strengthen implementation, expand retrofit programmes for existing housing stock, and enhance compliance with codes for new buildings. Transport efficiency is covered less, both globally and in BRICS Member countries, despite transport representing a large and growing share of energy demand.

Overall, the convergence around regulatory instruments targeting appliances and industrial equipment point to these sectors as a natural entry point for BRICS cooperation that can build on existing experiences, address common challenges and level the playing field for the adoption of energy-efficient technologies across the group.

⁸ BRICS Energy Research Cooperation Platform. 2024. 2024 BRICS Just Energy Transition Report.

⁹ OECD. 2026. *The Energy Crisis and Energy Efficiency: What Countries Are Doing to Promote Energy Efficiency and Where Gaps Remain*.



CHAPTER FOUR

ENERGY-EFFICIENT APPLIANCES: A STRATEGIC OPPORTUNITY

Appliances represent a strategically significant and growing share of global energy demand. They already account for 45 percent of electricity consumption in buildings and are responsible for nearly 3 gigatons (Gt) of CO₂ emissions annually.¹⁰ For BRICS economies, appliance efficiency is not only a demand-side issue but a system-level strategic priority that is intertwined with structural dynamics. For instance, rapid adoption of cooling, refrigeration and motors is disproportionately driving peak electricity demand, particularly in India, Indonesia, Saudi Arabia and the UAE. In several markets, cooling alone is expected to contribute 30-50 percent of incremental peak demand by 2030.¹¹ Additionally, appliances purchased today will operate for 10-20 years, locking in energy consumption trajectories. In rapidly growing economies, this creates a unique window of opportunity to influence long-term demand. Finally, BRICS collectively hosts major global manufacturing hubs (Brazil, China, India) while also representing fast-growing demand centres. This creates a unique opportunity to look at appliance efficiency as *a manufacturing–consumption nexus, aligning standards, production and markets simultaneously. The combination of these factors positions appliances as a high-leverage intervention point for reducing system costs, enhancing energy security and managing grid stability across BRICS economies.*

¹⁰ IEA: IEA. 2025. *Energy Efficiency Policy Toolkit 2025: Appliances*.

¹¹ IEA. 2023. *Can Efficient Cooling Help Manage Fast-Rising Electricity Demand in India and Achieve Thermal Comfort for All?* (India), IEA. 2019. *The Future of Cooling in Southeast Asia*. (Indonesia), vQuarter. 2025. *IEA Projects 50% Surge in MENA Electricity Demand by 2035, Driving Major Power Mix Shift*. (Saudi Arabia), Araner. 2023. *District Cooling Company in UAE*. (UAE)

Not all appliances offer equal opportunity for efficiency gains, and not all BRICS Member countries have the same sectoral mix. A small number of appliances such as electric motors, air conditioners and distribution transformers offer disproportionately higher energy savings than other appliances. The policy landscape governing energy-efficient appliances is also highly diverse across BRICS Member countries, reflecting their distinct economic structures, industrial priorities and institutional capacities. The highest-potential appliances are not uniformly distributed across sectors either: electric motors are predominantly industrial challenges, most relevant to countries with large manufacturing and heavy industrial bases, such as China, India, Russia and South Africa. Air-conditioning and water heating are primarily residential and commercial challenges, with the sharpest growth occurring in Egypt, Ethiopia, India, Indonesia and the UAE, where living standards have risen and climate conditions have intensified.

ENERGY-SAVING OPPORTUNITIES FROM APPLIANCE EFFICIENCY

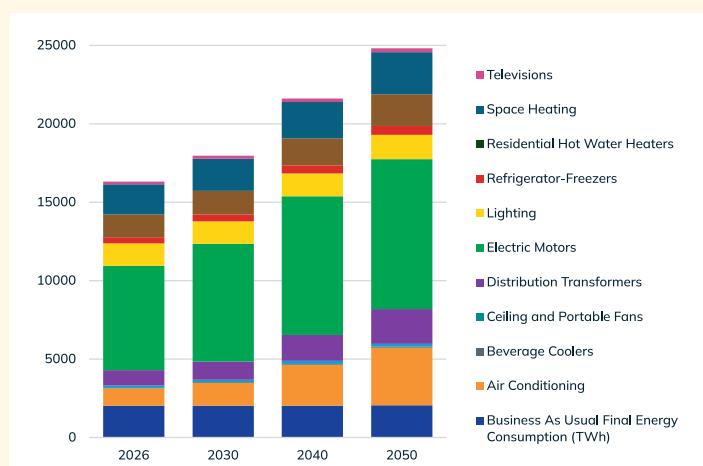
In BRICS Member countries, the trajectory under business-as-usual (BAU) policies is striking: based on projections by CLASP¹² (Figure 5), annual energy demand from a bundle of 10 common appliances¹³ in BRICS could grow by 60 percent between 2026 and 2050, from about 14,000 TWh to over 22,000 TWh – just short of global electricity generation in 2023. As a result, carbon emissions from this appliance stock would rise by over 28 percent, from 6.9 Gt in 2026 to 8.8 Gt by 2050. Electric motors dominate, going from 6,700 TWh in 2026 (46 percent of combined energy consumption) to a projected 9,500 TWh (41 percent) in 2050. Space heating is the second-largest category today, but over the coming decades it will be overtaken by air-conditioning, which is projected to register the steepest growth.

FIGURE 5

Projected Annual Energy Consumption by Appliance in BRICS Member countries, under a BAU scenario (2026-2050)

SOURCE:

SEforALL analysis based on CLASP. Mepsy: The Appliance & Equipment Climate Impact Calculator, Version 1.15.3. March 2026.



¹² CLASP. Mepsy: The Appliance & Equipment Climate Impact Calculator, Version 1.15.3. (March 2026).

¹³ Air-conditioning, beverage coolers, ceiling and portable fans, distribution transformers, electric motors, lighting, refrigerator-freezers, residential hot water heaters, space heating and televisions.

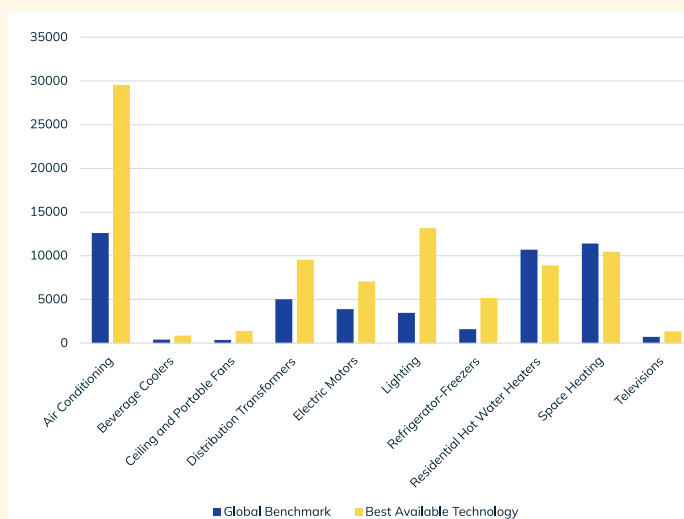
The scale of the efficiency opportunity, again based on CLASP's projections, is equally significant (Figure 6). Deploying the best available technologies¹⁴ could deliver savings of over 87,000 TWh for BRICS Member countries by 2050. The appliances offering the highest energy savings potential under a low-ambition policy scenario (indicated as 'global benchmark' scenario) are air-conditioning, space heating and residential water heating while under a best-available-technology rollout, residential water heating is overtaken by electric motors.

FIGURE 6

Projected cumulative energy savings in BRICS Member countries, by appliance (2026-2050)

SOURCE:

CLASP. Mepsy: The Appliance & Equipment Climate Impact Calculator, Version 1.15.3. March 2026.



Comparing the estimated annual energy savings potential in the shorter term, until 2030, based on UNEP's United for Efficiency (U4E) Country Saving Assessments (Table 2), four appliances dominate opportunities in BRICS Member countries: lighting, air conditioners, residential refrigerators and industrial electric motors. These point to possible priority areas for BRICS collaboration over the next four years, exchanging regulatory experience and industrial know-how to help members target high-impact appliances to realize meaningful efficiency gains.

14 • BAU scenario: The model assumes that before a policy is implemented, all appliances on the market operate at a well-defined baseline efficiency.

• Global Benchmark: This is a low-ambition policy scenario, based on efficiency levels recommended by CLASP and others such as United for Efficiency.

• Best Available Technology: This scenario assumes all new appliances will operate at the highest efficiency levels currently achievable, using the most advanced and effective technologies available today.

Source: CLASP. Mepsy: The Appliance & Equipment Climate Impact Calculator, Version 1.15.3. March 2026

TABLE 2

Top 3 appliances by annual savings potential in 2030

	Top 3 appliances by annual savings potential - 2030	Savings potential - 2030 (Minimum vs. High Ambition Scenario)
 Brazil	Lighting	12.2-20.8 TWh
	Air Conditioners	5.8-13.1 TWh
	Residential Refrigerators	3.8-6.7 TWh
 China	Lighting	31.0-115.0 TWh
	Air Conditioners	24.0-50.0 TWh
	Residential Refrigerators	16.0-32.0 TWh
 Egypt	Lighting	9.1-15.1 TWh
	Air Conditioners	2.3-4.9 TWh
	Residential Refrigerators	1.5-2.8 TWh
 Ethiopia	Lighting	557-919 GWh
	Air Conditioners	235-656 GWh
	Residential Refrigerators	81-153 GWh
 India	Lighting	37.0-77.1 TWh
	Air Conditioners	27.1-45.1 TWh
	Residential Refrigerators	10.7-13.5 TWh
 Indonesia	Lighting	22.5-36.9 TWh
	Air Conditioners	6.4-12.8 TWh
	Residential Refrigerators	2.2-4.8 TWh
 Iran	Lighting	8.3-13.9 TWh
	Air Conditioners	2.9-5.7 TWh
	Residential Refrigerators	0.7-2.1 TWh
 Russia	Lighting	12.1-18.0 TWh
	Air Conditioners	4.1-5.8 TWh
	Residential Refrigerators	3.3-6.3 TWh
 Saudi Arabia	Lighting	8.0-13.3 TWh
	Air Conditioners	7.8-17.9 TWh
	Residential Refrigerators	0.8-1.5 TWh
 South Africa	Lighting	1.8-6.3 TWh
	Air Conditioners	0.4-0.9 TWh
	Residential Refrigerators	0.2-0.5 TWh
 UAE	Lighting	5.4-10.9 TWh
	Air Conditioners	3.5-5.5 TWh
	Residential Refrigerators	0.8-1.1 TWh

SOURCE:

UNEP United for Efficiency. Country Saving Assessments. (2026).

Heat pumps and ceiling fans, not included in the appliances discussed above, represent two distinct and significant opportunities. U4E's 2024 Savings Potential Assessment¹⁵ modelled the savings potential from heat pump deployment across 29 developing and emerging economies with high heating demand, including several BRICS Member countries and partner countries (China, Iran, Kazakhstan, Russia and South Africa, besides a number of Central Asian and Eastern European economies). Full market transformation to heat pumps by 2040 would save 5,000 TWh annually in delivered energy, with MEPS adding an additional 680 TWh. An important consideration is that, while total energy declines, electricity consumption rises as heating shifts from fossil fuels to the grid, making heat pump deployment inseparable from grid planning and renewable energy expansion. For ceiling fans,¹⁶ adopting minimum energy performance standards (MEPS) across 14 countries (including India, Indonesia, Malaysia, Thailand and Viet Nam) could collectively save hundreds of TWh of electricity and tens of billions of dollars in electricity bills by 2040, with India alone accounting for over 26 TWh and USD 5.3 billion in annual savings. It is worth noting that the market for ceiling fans is largely informal, unorganized and fragmented, making large-scale stock-and-sales analysis unreliable.

EXPERIENCES AND GAPS IN APPLIANCE EFFICIENCY POLICY ACROSS BRICS

Across BRICS, the coverage and stringency of appliance standards and labelling programmes varies considerably by both member

and appliance category.

Brazil, China and India have comprehensive MEPS and labelling programmes covering most major appliance categories, supported by dedicated national agencies (MIIT/SAMR and CNCA in China; BEE in India; INMETRO in Brazil), established testing infrastructure, and relatively robust enforcement mechanisms. China and India achieved electricity savings of around 5 percent and 4 percent respectively in 2018 attributable to MEPS and labelling programmes, with Brazil at a comparable level.¹⁷ The three countries account for the bulk of global efficient appliance manufacturing capacity and are well positioned to serve as technology anchors for the group.

Indonesia, Russia (operating partly through the Eurasian Economic Union (EAEU)), South Africa and the UAE have established labelling schemes and MEPS for major residential appliances, but coverage varies considerably across industrial appliances and newer categories. Enforcement capacity and testing infrastructure also differ within this group; Russia's participation in the EAEU introduces a regional dimension that is unlike the bilateral structure of most other members' standards regimes.

Egypt¹⁸, Ethiopia, Iran and several BRICS partner countries have limited or no mandatory MEPS for most appliance categories, *with insufficient publicly available data further constraining comprehensive assessment of existing standards and enforcement*. This is not necessarily a deficit: these are the markets where standards frameworks can be estab-

15 United for Efficiency (UNE). 2024. *Heat Pumps Savings Potential Assessment*.

16 United for Efficiency (UNE). 2024. *Ceiling Fans Savings Potential Assessment*.

17 IEA. 2021. *Achievements of Energy Efficiency Appliance and Equipment Standards and Labelling Programmes*.

18 Council of Engineers for the Energy Transition (CEET). 2024. *Energy Rating Labels and Potential for Energy Savings Across the Global South*.

lished at higher ambition levels, without the political and economic challenge of phasing out incumbents. The cost of leapfrogging to best-available standards is lowest in markets where the appliance stock is still being built out.

Across all typologies, four gaps stand out as particularly significant for a BRICS cooperation agenda.

The first is the dominance of mandatory standards for residential appliances over industrial ones, particularly distribution transformers and variable-speed drives for motor systems (beyond China and India). These are the highest-potential categories for several BRICS Member countries with large industrial bases, and their absence from most national regulatory frameworks represents a significant opportunity for action.

Second, efficiency thresholds for the same product category differ significantly across the group, and BRICS markets do not share a common efficiency metric. India uses ISEER, China uses APF and other members rely on variants of Seasonal Energy Efficiency Ratios (SEER) measured under different test conditions. This metric incompatibility means that ratings are not directly comparable across borders and a fundamental barrier to harmonization. The consequences of this are two-fold: on one hand, fragmented metrics and thresholds limit the ability of BRICS markets to collectively drive manufacturer investment into higher-efficiency products. On the other hand, the absence of mutual recognition agreements or harmonized test methods means that even regulatory upgrades in one country generate limited spillover to neighbours, preventing the bloc from leveraging its combined market scale.

Third is the enforcement and market surveillance gap. Even where MEPS exist, most air

conditioners sold are far less efficient than the most efficient models available, both world-wide and across many BRICS markets. Weak post-market surveillance, including testing infrastructure, allows non-compliant products to remain in circulation, eroding the real-world savings that standards are designed to deliver. Closing this gap requires not just stronger national enforcement, but cross-border information-sharing on non-compliant products moving through intra-BRICS trade channels.¹⁹

Finally, appliance efficiency programmes and grid investments are often designed in isolation or with limited coordination, despite the significant impact of demand-side efficiency on peak demand, capacity addition and system costs. In particular, air conditioners, water heaters, heat pumps, distribution transformers and electric vehicles (EVs) all have highly concentrated load profiles that, if unaddressed, often impose disproportionate costs on grid infrastructure. Yet, the demand reduction potential of MEPS and labelling programmes is rarely factored into generation capacity projections, transmission investment decisions or electricity tariff design. As adoption of these appliances and equipment grows across BRICS countries and infrastructure investments are locked in, the current siloed approach becomes increasingly difficult to reverse.

Moving forward, it will be imperative to ensure that energy efficiency cooperation among BRICS Member countries encompasses matters of cross-border alignment, enforcement and market development, and adopts a system integration perspective.

DISTRIBUTED INVESTMENTS AND MARKET TRANSFORMATION

Unlike large infrastructure, appliance efficiency represents a highly distributed investment

¹⁹ IEA. 2025. *Global Progress on Energy Efficiency Picks Up in 2025*.

category, requiring aggregation mechanisms to unlock market transformation. Scaling proven investment models across BRICS could transform appliance efficiency into a mainstream asset class, particularly for cooling and industrial equipment. Such models include:

- Bulk procurement programmes and super Energy Service Company (ESCO) aggregation models, which address the fundamental problem of scale in appliance efficiency: individual projects are too small to attract institutional capital, but an aggregator can bundle hundreds of projects into standardized contracts with predictable cash flows, effectively creating an asset class where none previously existed. Examples such as India's Energy Efficiency Scheme Unnat Jyoti by Affordable LEDs for All (UJALA) and Saudi Arabia's national ESCO Tarshid are discussed in Chapter 5. In the air-conditioning segment specifically, India's Energy Efficiency Services Limited (EESL) super-efficient air-conditioning initiative has been shown to achieve price reductions of 20-30 percent on efficient models compared to retail market prices, while simultaneously shifting manufacturer production toward higher efficiency tiers.²⁰
- On-bill financing through utilities, where the cost of efficient appliance replacement is repaid through utility bill savings over time, is particularly relevant where utility relationships with end users are strong but access to consumer credit is limited. This allows efficiency upgrades to reach households and small businesses that would otherwise be excluded from conventional financing channels.

- Utility obligation schemes have been identified by the International Energy Agency (IEA) as among the most cost-effective mechanisms for scaling energy efficiency investments, with several international programmes achieving lifetime energy savings at average costs around or below USD 0.03/kWh.²¹ One example, that of Brazil's Energy Efficiency Programme (PEE), is discussed in Chapter 5.

At the same time, ESCOs are a demonstrated model for market transformation, helping consumers identify, finance and implement efficiency projects, thereby lowering the threshold for investment and reducing the burden of upfront capital expenditure. Global ESCO investments grew by 10 percent in 2024, reaching a record USD 42 billion, with average annual growth of 5 percent over the preceding five years. However, this growth remains highly concentrated: more than 75 percent of global ESCO investment occurs in just two countries, China and the US.²²

Among BRICS Member countries, ESCO frameworks are at varying stages of development. One of the approaches is a *Super ESCO* model that relies on heavily capitalized, state-backed entities to overcome the traditional barriers of high upfront costs and fragmented demand. In India, the government-owned EESL aggregates national demand to drastically lower procurement costs. Similarly, Middle Eastern nations have leveraged state funds to create massive public-sector market makers. Further details on these experiences are provided in the Case Studies chapter. Overall, by subcontracting the actual implementation to private firms, these Super ESCOs modernize public infrastructure while rapidly

20 World Bank ESMAP. 2020. *Compendium to the Primer for Space Cooling*.

21 IEA. 2020. *Paving the Way to Recovery with Utility-Funded Energy Efficiency*.

22 IEA. 2026. *Why the Growth of Energy Service Companies Is Uneven Globally*.

jumpstarting the regional energy performance contracting market.

In a contrasting approach, Indonesia and South Africa are stimulating decentralized, private ESCO markets through targeted regulatory pressure. Indonesia recently overhauled its efficiency landscape through Government Regulation No. 33 of 2023 which expanded the regulatory scope, requiring thousands of smaller industrial facilities and commercial buildings to have energy management systems. To support these new compliance targets, it introduced Regulation No. 1 of 2026, establishing a licensing structure and legally recognizing shared-savings models to de-risk performance contracts and unlock commercial banking capital for nationwide retrofitting efforts. In South Africa, the market is driven by regulations requiring mandatory Energy Performance Certificates (EPCs) for non-residential buildings. By legally mandating property owners to audit and publicly display their energy consumption, the government has created a massive pipeline of demand for private ESCOs to execute compliance-driven building upgrades.

Despite growing momentum, the ESCO market remains structurally uneven across BRICS. Key barriers include limited access to affordable and long-tenor financing, underdeveloped project pipelines, weak enforcement of regulatory mandates, and lack of standardized contractual and measurement frameworks. In particular, the absence of harmonized measurement and verification (M&V) protocols such as the International Performance Measurement and Verification Protocol (IPMVP), which provides globally recognized methodologies to validate energy savings, continues to increase transaction costs and perceived

investment risks.²³ At the same time, these gaps present a clear opportunity for BRICS cooperation. A coordinated approach could leverage the strengths of both state-led *Super ESCO* models (e.g., India, Saudi Arabia) and market-driven regulatory approaches (e.g., Indonesia, South Africa) to accelerate scale-up. Priority areas for collaboration include developing pooled and blended finance facilities to crowd in private capital, standardizing ESCO contracts and M&V frameworks to reduce risk, and strengthening financial sector capacity to evaluate performance-based investments. Given that ESCO projects deliver average energy savings of around 20-30 percent in mature markets and remain heavily concentrated in the buildings sector (~60 percent of activity), scaling ESCO adoption across BRICS could unlock billions in investment while delivering rapid, cost-effective emission reductions. Strengthened cross-country knowledge exchange and policy alignment can therefore play a catalytic role in transforming ESCOs into a core delivery mechanism for energy efficiency across BRICS economies.

CONNECTED AND COGNITIVE APPLIANCES: ARTIFICIAL INTELLIGENCE AND THE NEW INTELLIGENT ENERGY EFFICIENCY FRONTIER

Achieving the rate of energy-efficiency improvement required for net zero—roughly double the historical average—demands a coordinated push towards intelligent energy efficiency, leveraging artificial intelligence (AI) across the full stack of energy consumption, which is capable of delivering efficiency gains at a pace and scale that conventional standards and labelling instruments alone cannot achieve.

²³ *ibid.*

Electrical appliances have evolved in recent years and are structurally different from the ones they are replacing. New appliances are not just efficient, following stricter MEPS, but are increasingly able to provide real-time data, and network and grid services. The global smart appliances market, valued at USD 42 billion in 2025, is projected to reach USD 71 billion by 2030, at a compound annual growth rate of 11 percent, driven by the rapid integration of IoT connectivity and AI across refrigerators, washing machines, air conditioners and water heaters.²⁴ The underlying infrastructure is growing even faster with 18.5 billion globally connected IoT devices in use at the end of 2024, a number that is on course to reach 39 billion by 2030.²⁵ The market is growing at a compound annual growth rate of 13.2 percent and the consumer segment will account for roughly 60 percent of all connected devices.²⁶ The convergence of affordable sensors, ubiquitous connectivity and increasingly capable cutting-edge AI is creating conditions in which intelligent energy management is no longer the preserve of large industrial facilities but is entering homes, commercial buildings and farms at scale.

AI has opened opportunities for dynamic load forecasting, real-time optimization, predictive maintenance, demand response management and occupancy-based controls. AI-enabled and -connected appliances simultaneously cater to reducing energy consumption and optimizing their own operations, based on real-time sensor data, user behaviour patterns and external signals, to shift when and how energy is consumed. Further, the active participation of connected appliances in manag-

ing the electricity demand-supply mismatch, also referred to as demand flexibility, will ease grid constraints resulting from rising peak demand, increasing power system cost, delayed industrial growth and renewable curtailment and connection queues.

Intelligent energy efficiency therefore represents savings that are otherwise invisible to the conventional test-and-label framework of appliance energy efficiency. Across BRICS, this opportunity remains largely untapped. While smart metering and digital infrastructure are expanding, appliance-level demand flexibility is not yet systematically integrated into policy frameworks. A coordinated BRICS approach on development of interoperability standards and demand-response-ready appliances, and integration with utility programmes and time-of-use tariffs will unlock high-value opportunities on intelligent energy efficiency.

India is rapidly emerging as a leader in AI-driven energy efficiency, supported by initiatives such as NITI Aayog's frontier tech repository.²⁷ AI applications in agriculture, power systems and buildings are enabling 25-50 percent resource savings through precision irrigation, demand forecasting and smart grid optimization. These deployments demonstrate how AI can enhance productivity, reduce energy waste and enable demand-side flexibility, positioning India to achieve faster, system-wide efficiency gains.

Translating this opportunity into realized energy savings requires confronting the fragmentation of device ecosystems around proprietary communication protocols and AI-specific

24 MarketsandMarkets. 2024. *Smart Appliances Market – Press Release*.

25 IoT Analytics. 2025. *Number of Connected IoT Devices*.

26 Statista. 2025. *IoT Connected Devices Worldwide*.

27 Government of India, NITI Aayog. 2024. *Frontier Tech Repository*. NITI Frontier Tech Hub.

governance frameworks for appliances. The majority of IoT platforms today are closed ecosystems: manufacturers embed proprietary protocols to establish market advantage, consumers face vendor lock-in, and the result is that the full system-level value of connected appliances is unrealized. There is wide consensus that open communications protocols are required to fully implement interoperability and derive energy benefits, and that policies to encourage interoperability should focus on support for open protocols and standardization efforts, stimulation of market uptake, information to end-users, and encouragement of organizational cooperation.

The absence of AI-specific governance frameworks for appliances, governing standards,

verification methodologies, data architectures and risk management creates a significant challenge for the AI-enabled appliance ecosystem. This creates gaps in MEPS test procedures accounting for dynamic and adaptive performance, energy-efficiency label procedures to communicate AI-driven efficiency gains, data sharing obligations for appliance manufacturers, and embedded cybersecurity in appliance standards. A coordinated BRICS approach on defining shared methodologies for testing AI-enabled appliances, establishing common data and interoperability requirements, and building AI literacy within national standards agencies is essential to narrowing the governance gap with the commercial deployment of AI-enabled appliances.





CHAPTER FIVE

CASE STUDIES: APPLIANCE EFFICIENCY STRATEGIES IN BRICS MEMBER COUNTRIES

INDIA ENERGY EFFICIENCY MARKET TRANSFORMATION THROUGH STANDARDS & LABELLING

India has emerged as a global leader in accelerating the adoption of energy efficient appliances through a combination of appliance labelling and market transformation programmes led by the Bureau of Energy Efficiency (BEE) and Energy Efficiency Services Limited (EESL).



As per India Energy Scenario 2024-25, the overall energy efficiency interventions in the country have delivered total energy savings of 65 million tonnes of oil equivalent (MTOE). Of this, appliance and equipment initiatives accounted for 15.87 MTOE, highlighting appliance efficiency as one of the most significant instruments in the national energy efficiency portfolio.

Launched in 2006, the Standards and Labelling Programme introduced a simple but effective 1 to 5 star rating framework, where 5 Star represents the highest level of efficiency. The programme enables consumers to compare appliance performance at the point of purchase and provides a strong signal to manufacturers to continuously improve product efficiency. Since its inception, the programme has expanded to cover 41 appliances and equipment categories, with 18 under the mandatory regime and 23 under the voluntary regime.

A clear example of this market transformation is visible in the room air conditioner segment. Through the periodic tightening of star rating thresholds, BEE has driven substantial efficiency improvements in room air conditioners. As of today, the efficiency of split air conditioners has improved by 52 percent at the 1 Star level and by 81 percent at the 5 Star level. In addition, BEE undertook an important policy reform during 2016-17 to harmonise the labelling framework for fixed speed and variable speed air conditioners. This contributed to a significant shift in market preferences. The share of variable speed air conditioners increased from about 1 percent in 2015 to 77 percent within eight years, fundamentally reshaping the cooling market and supporting the objectives of the India Cooling Action Plan.

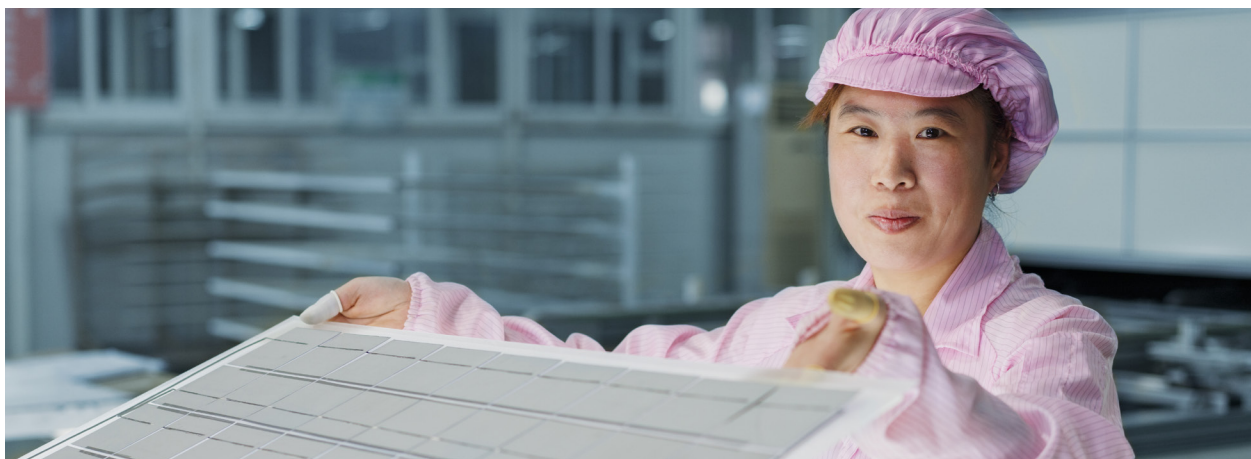
The regulatory framework has been further strengthened by demand aggregation and innovative financing models implemented by EESL through the Unnat Jyoti by Affordable LEDs for All (UJALA) programme. By aggregating demand at the national level,

EESL directly distributed more than 360 million LED bulbs and catalysed wider market sales of more than 5 billion LED bulbs. This large scale intervention helped reduce retail prices by more than 80 percent, from about USD 3.5 to 4 per bulb to below USD 1 per bulb. The programme currently delivers annual electricity savings of more than 47 billion kWh, avoids over 38 million tonnes of carbon dioxide emissions, and reduces peak demand by more than 9,500 MW.

Taken together, the BEE Standards and Labelling Programme, which now covers 41 appliance categories and continues to expand into new technologies, and the EESL deployment model based on aggregation and innovative financing, demonstrate how regulatory signals and market transformation mechanisms can reinforce each other. The Indian experience shows that a coordinated approach combining standards, labelling, public procurement, and demand aggregation can deliver rapid, affordable, and large scale gains in appliance energy efficiency.

Key Insight for BRICS:

India demonstrates how integrating policy (minimum energy performance standards (MEPS) and labelling), aggregation (bulk procurement), and scale-based financing models can rapidly transform appliance markets, reduce costs, and deliver system-wide energy, economic, and environmental benefits, particularly in fast-growing economies.



● CHINA'S TOP RUNNER PROGRAMME AND INDUSTRIAL SCALE EFFICIENCY

China has built one of the most comprehensive and impactful appliance efficiency ecosystems globally, combining stringent MEPS, large-scale manufacturing capacity, and the *Top Runner* programme to drive continuous efficiency improvements.

The Top Runner programme sets best-in-class performance benchmarks for appliances and industrial equipment, going beyond minimum standards to promote market leaders. Products that meet these high-efficiency thresholds receive policy incentives, preferential procurement support and enhanced market visibility. This has effectively shifted entire product categories toward higher efficiency tiers, accelerating technological innovation and adoption.

China's MEPS framework covers a broad spectrum of appliances and equipment, including lighting, air conditioners, refrigerators, motors and distribution transformers, with frequent revisions ensuring alignment with technological progress. As a result, MEPS and related policies are estimated to contribute

to electricity savings of over 300-400 TWh annually, equivalent to the total annual electricity consumption of a mid-sized economy, while avoiding hundreds of megawatts of additional capacity investments.

A key strength lies in China's integration of energy efficiency with industrial policy. As the world's largest appliance manufacturer accounting for over 50-70% of global production in key categories such as air conditioners and lighting, China has leveraged economies of scale to reduce costs of high-efficiency technologies globally. In parallel, the country has invested heavily in testing infrastructure, digital labelling platforms and compliance systems, enabling stronger enforcement compared to many emerging markets.

Beyond residential appliances, China has made notable progress in industrial equipment efficiency, particularly electric motors, which account for nearly 60 percent of industrial electricity consumption, unlocking large system-level savings.

💡 Key Insight for BRICS:

China demonstrates how linking efficiency policy with manufacturing scale and industrial strategy can drive global cost reductions, strengthen enforcement and accelerate the large-scale adoption of high-efficiency technologies.



BRAZIL'S INTEGRATED POLICY, UTILITY FINANCING AND MARKET SIGNALS

Brazil has developed a relatively mature appliance efficiency ecosystem that combines standards, labelling and utility-driven financing. The Brazilian Labelling Programme (PBE), managed by INMETRO, mandates energy labels across more than 40 appliance categories, ensuring broad market coverage. These labels are closely aligned with MEPS, which progressively tighten efficiency thresholds and help phase out less efficient products over time. A key contributor factor has been the National Electricity Conservation Programme (PROCEL), which promotes high-efficiency appliances through labelling, incentives and awareness campaigns. The PROCEL seal is awarded to the most efficient 10–20 percent of products, influencing consumer choice and driving manufacturers toward higher efficiency tiers. The programme delivers approximately 10–15 TWh of annual electricity savings, equivalent to avoiding around 4–6 GW of generation capacity and reducing 5–8 million tonnes of CO₂ emissions annually.

Brazil also offers useful lessons through its utility-driven energy efficiency financing model. Under National Electricity Agency (ANEEL) regulations, electricity utilities are mandated to invest 0.5 percent of their annual revenues in energy efficiency programmes, helping mobilize significant funding for implementation. This funding supports large-scale initiatives such as refrigerator replacement programmes for low-income households, delivering 300–500 kWh annual savings per household, reducing electricity consumption by 25–30 percent and lowering energy bills while addressing energy poverty.

These experiences highlight how coordinated use of standards, labelling and financing mechanisms can support market transformation, while also delivering broader system benefits such as peak load reduction, improved grid reliability and deferred investments in new infrastructure.

Key Insight for BRICS:

Brazil demonstrates how strong regulatory frameworks combined with dedicated, utility-backed financing mechanisms can scale appliance efficiency programmes, deliver measurable system-wide savings and ensure inclusive access to efficient technologies.



SAUDI ARABIA'S SUPER ESCO MODEL AND STRINGENT MEPS

Saudi Arabia has pursued an ambitious appliance efficiency agenda driven by MEPS and implemented through Tarshid, its Super Energy Services Company (ESCO) model.

Tarshid aggregates demand across government buildings, schools, hospitals and municipal infrastructure, executing nationwide retrofit programmes, including upgrades of HVAC systems and replacement of inefficient appliances and lighting. The programme targets retrofits of thousands of public buildings, delivering energy savings in the range of 25-30 percent per facility, with associated reductions in operating costs and emissions.

The model addresses key barriers such as high upfront costs, fragmented demand and performance risks by centralizing financing and guaranteeing energy savings. Importantly, these interventions generate system-level benefits, including peak load reduction (critical in a high cooling-demand economy) and deferred investments in generation capacity.

The Saudi Standards, Metrology and Quality Organization (SASO) has implemented strict MEPS and mandatory labelling, particularly for air conditioners, which account for an estimated 60-70 percent of residential electricity consumption and a significant share of peak load. Progressive tightening of standards combined with enforcement measures such as import restrictions on inefficient units has significantly improved the average efficiency of cooling appliances entering the market. These policies have contributed to electricity savings of over 20-30 TWh annually across appliances, alongside measurable reductions in peak demand.

Key Insight for BRICS:

Saudi Arabia demonstrates how strong regulatory frameworks combined with centralized, state-backed execution mechanisms can rapidly scale appliance efficiency, particularly in cooling-dominated, high-demand systems.



SOUTH AFRICA'S COMPLIANCE-DRIVEN MARKET CREATION THROUGH EPCs

South Africa's approach to energy efficiency emphasizes regulatory demand creation, leveraging mandatory compliance mechanisms to stimulate adoption of efficient appliances and technologies.

A central policy instrument is the introduction of Energy Performance Certificates (EPCs) for large non-residential buildings (greater than 2,000m² for public buildings and 1,000m² for private buildings). These certificates require disclosure of building energy performance, creating transparency, benchmarking and reputational incentives for building owners to improve efficiency. As a result, EPCs are expected to cover thousands of commercial and public buildings, driving systematic upgrades to lighting, HVAC systems and other appliances.

This compliance-driven approach has created a strong demand pipeline for energy efficiency services, with ESCOs playing a central role in delivering audits, retrofits and equipment upgrades. However, actual compliance with EPC regulations remains very low; fewer than 10 percent of eligible buildings are certified and the majority of building owners have yet to comply, significantly constraining the scale and effectiveness of this demand pipeline.

Alongside this, South Africa's Eskom Demand-Side Management (DSM) programme has supported large-scale efficiency improvements, delivering cumulative savings of over 7,000-8,000 GWh annually at its peak, equivalent to avoiding several gigawatts of generation capacity and contributing to load reduction during critical supply shortages.

Eskom's DSM and incentive schemes have historically supported the deployment of efficient lighting, industrial motors and commercial HVAC upgrades, generating 15-25 percent energy savings in participating facilities. These interventions are particularly important in the context of South Africa's ongoing power supply constraints, where reducing demand is often more cost effective than adding new capacity. Due to financial constraints, Eskom's DSM programmes were halted in 2018, before being revived in 2023 through the Distribution Demand Management Programme (DDMP), aimed at addressing persistent supply-demand imbalances and load shedding challenges.

South Africa implements MEPS through compulsory specifications (VCs) enforced by the National Regulator for Compulsory Specifications (NRCS), a programme that is led by the

Department of Electricity and Energy (DEE). This VC-based regulatory framework covers key appliance categories including electric motors (VC 9113), general service lamps (VC 9109), hot water storage tanks (VC 9006), and a broad range of household appliances under VC 8055, and has played a central role in driving appliance efficiency across sectors. While challenges remain in enforcement and financing

scale, including limited post-market inspection capacity, documented non-compliance both at point of entry and within the market, and constraints faced by the NRCS in effectively curbing and enforcing standards, the model demonstrates how regulatory mandates combined with targeted incentives can unlock sustained market demand for efficient technologies.

Key Insight for BRICS:

South Africa shows that compliance-driven frameworks (such as EPCs), when combined with utility-led incentives, can create durable markets for appliance efficiency and retrofit services, especially in supply-constrained power systems, though strengthening market surveillance and enforcement capacity remains critical to fully realizing these benefits.



UAE'S INTEGRATED DEMAND-SIDE MANAGEMENT AND COOLING FOCUS

The UAE has positioned energy efficiency as a central pillar of its long-term energy strategy through integrated DSM programmes, with a strong emphasis on cooling and appliance efficiency.

The national DSM programme (Vision 2050) targets a 40 percent reduction in energy demand and 50 percent reduction in water consumption, with buildings and appliances accounting for a significant share of the potential savings. Cooling is the dominant driver

of electricity demand, with air-conditioning accounting for nearly 60-70 percent of peak load in some Emirates, making appliance efficiency a critical intervention area.

The UAE has implemented stringent MEPS and labelling requirements, particularly for air conditioners and household appliances, progressively eliminating inefficient products from the market. These standards are complemented by green building regulations (such as Estidama and Dubai Green Building

Regulations), which reinforce efficiency gains at the system level.

A defining feature of the UAE's approach is the role of Etihad ESCO, a government-backed entity that aggregates retrofit demand and mobilizes financing. The programme has enabled the retrofitting of thousands of buildings, targeting energy savings of 20-30 percent per building, and aiming to retrofit over 30,000

buildings by 2030 in Dubai alone. These efforts are expected to deliver cumulative energy savings of over 1 TWh annually and significant reductions in peak demand.

The UAE also integrates appliance efficiency with grid planning and renewable energy deployment, recognizing the role of efficient and flexible demand in supporting high shares of solar energy.

Key Insight for BRICS:

The UAE demonstrates how integrated DSM strategies, stringent appliance standards and centralized ESCO-led implementation can deliver large-scale, system-wide benefits particularly in cooling-intensive, rapidly urbanizing economies. It also underscores the importance for BRICS countries to complement building-focused interventions with targeted efficiency improvements in energy-intensive industries such as mining and heavy manufacturing.



CHINA'S AI-ENABLED APPLIANCE ECOSYSTEM

China has moved beyond MEPS and labelling to embed artificial intelligence (AI) as the next layer of its appliance efficiency strategy, combining national industrial policy with manufacturer-led innovation at scale. At the policy level, China's 2025 government work report explicitly incorporated AI-enabled home appliances within its national *AI Plus* initiative, framing intelligent consumer terminals as a priority area for generating new, quality, in-

dustrial growth and driving domestic energy efficiency. A national appliance trade-in scheme launched in 2024 provides subsidies for replacing energy-intensive appliances, creating a demand-pull mechanism aligned with the AI upgrade cycle.

At the manufacturer level, AI integration is accelerating rapidly with leading companies embedding intelligence across product ecosystems. Connected platforms now link mul-

tiple appliances into coordinated systems, using AI for predictive maintenance, adaptive controls and user-centric optimization. In parallel, the use of digital twins and advanced analytics is improving product design and performance, enabling significant efficiency gains beyond what conventional MEPS

improvements alone can achieve. These capabilities are increasingly being integrated with utility demand response programmes, enabling AI-coordinated fleets of connected appliances to shift loads during peak demand periods and directly addressing grid stress in cooling-intensive markets.

Key Insight for BRICS:

China demonstrates how aligning national AI policy, manufacturer innovation and consumer incentives can mainstream intelligent energy efficiency beyond conventional MEPS.

REGIONAL POLICY ROADMAP HARMONIZATION OF ENERGY PERFORMANCE STANDARDS FOR AIR CONDITIONERS IN SOUTHEAST ASIA

The first Regional Policy Roadmap for Harmonization of Energy Performance Standards for Air Conditioners in ASEAN Member countries (AMS) was endorsed by the ASEAN Ministers on Energy Meeting (AMEM) in September 2015. This 2015 roadmap addressed multiple barriers hindering the adoption of energy-efficient room air conditioners in Southeast Asia, with key actions focusing on harmonizing energy efficiency testing and evaluation methods, aligning MEPS requirements across AMS, and enhancing the capabilities of testing laboratories through round-robin testing (RRT) exercises.

Implementation of the roadmap was successful, and all participating AMS have adopted international standards (ISO 5151 and ISO 16358-1 for energy efficiency testing and evaluation). Each participating AMS also agreed to set a minimum MEPS level of 3.08 W/W CSPF, as specified in the policy. The Regional Policy Roadmap was subsequently updated in 2021, proposing more stringent MEPS levels of 3.7 W/W CSPF by 2023 and 6.09 W/W CSPF by 2025.

Key Insight for BRICS:

Southeast Asia's experience shows that harmonization can begin from aligning the technical foundations. For BRICS, a practical first step would be to establish comparable energy performance metrics that allow recognition between national systems, while working towards the alignment of testing and evaluation methods to enable greater consistency across markets.

OTHER NOTABLE EXPERIENCES

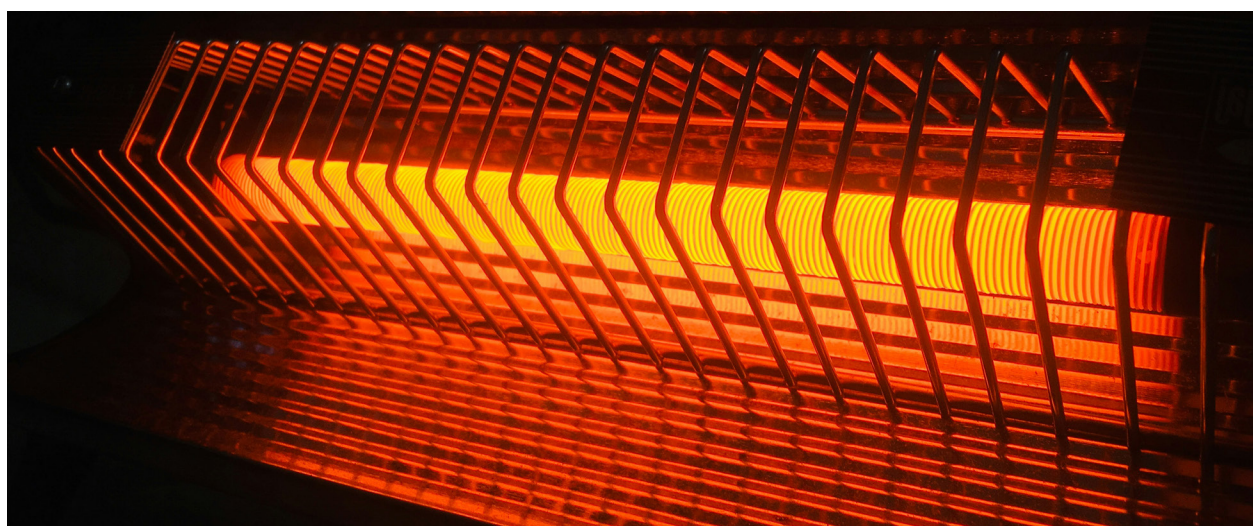
Beyond the major case studies, several BRICS Member countries are advancing appliance efficiency through evolving regulatory frameworks and targeted programmes, though with varying levels of maturity and impact. Russia, through the Eurasian Economic Union (EAEU), has implemented regional MEPS and labelling systems covering key appliances, with energy efficiency targets aiming to reduce energy intensity by up to 20-30 percent by 2030, although enforcement remains uneven across regions. Indonesia has introduced mandatory energy management regulations and is expanding ESCO frameworks, with industrial and commercial sectors targeted to deliver 10-15 percent energy savings.

Egypt and Iran have rolled out appliance MEPS and labelling schemes, particularly for air conditioners and refrigerators, which together account for a significant share (often 40-60 percent) of residential electricity use. Ethiopia, at an earlier stage, is establishing standards and institutional systems, offering the potential to leapfrog directly to high-efficiency technologies as demand grows.

Key Insight for BRICS:

These diverse trajectories highlight strong opportunities for capacity building, regulatory harmonization and targeted financing to unlock large-scale efficiency gains across emerging BRICS markets.





CHAPTER SIX

RECOMMENDATIONS FOR ENHANCED BRICS COOPERATION

Chapter 5 reviewed the potential of energy efficiency – and particularly efficient appliances – in BRICS Member countries' energy transition journeys, and their experiences in establishing effective policies and programmes.

To capitalize on this potential, this paper proposes to create a dedicated Workstream on Energy-Efficient Appliances under the Roadmap for BRICS Energy Cooperation 2025-2030.

The workstream will bring together experts, policymakers and practitioners from BRICS Member countries and partner countries, and serve as a platform for cooperation to jointly accelerate market transformation to energy-efficient appliances through a variety of activities. Possible areas of activity and their overarching goals are laid out below.

In implementing these actions, Member countries can also strengthen collaboration with existing international platforms and initiatives such as Mission Efficiency, to leverage technical expertise, policy tools and implementation support.

RECOMMENDED FOCUS AREAS FOR A BRICS WORKSTREAM ON ENERGY EFFICIENT APPLIANCES:

1. Building capacity on standards and labelling for high-potential appliances

Goal: Support institutional capacity to enhance minimum energy performance standards (MEPS) coverage, stringency and enforcement mechanisms for high energy-saving potential appliances (air conditioners, lighting, refrigerators, variable-speed drives for electric motors, distribution transformers) across the group.

Recommendation: Create a voluntary, multi-year plan of action on MEPS capacity building among BRICS Member countries and partners, with annual technical training and workshops

for BRICS regulators to address common challenges and learnings in MEPS design, updating and testing procedures, and specific opportunities for coordination and mutual recognition of certifications. The plan of action can also look beyond BRICS and support South-South exchange with countries across Africa, Asia and Latin America (as well as regional initiatives) to address capacity gaps in MEPS development and enforcement.

2. Strengthening collaboration on compliance and market surveillance

Goal: Strengthen testing infrastructure, compliance and market surveillance systems across BRICS to ensure real-world performance of appliances.

Recommendation: Convene a network of BRICS authorities and practitioners to strengthen appliance compliance and market surveillance, facilitating information sharing on testing protocols, non-compliant products and enforcement practices. This could include exploring the establishment of regional centres of excellence for testing, promoting mutual recognition of test results, and building digital platforms for tracking compliance across markets.

3. Supporting cross-border market signals for efficient appliance manufacturing

Goal: Leverage cross-border market signals across BRICS to strengthen local manufacturing and interconnected supply chains for critical components of super-efficient appliances, especially air conditioners and motors.

Recommendation: promote BRICS cooperation for joint market transformation for super-efficient appliances. The initiative can define common *super-efficient* thresholds and also work towards more interconnect-

ed, diverse supply chains. This could entail identifying supply chain risks for critical components and opportunities for cost reductions, and promoting coordinated market signals to activate investments into local manufacturing capacity for critical components of energy-efficient appliances.

4. Facilitating rapid deployment of high-efficiency cooling

Goal: Accelerate deployment of high-efficiency cooling solutions to manage rapidly growing electricity demand and peak loads.

Recommendation: strengthen cooperation on BRICS Cooling Efficiency, with a focus on improving the efficiency of room air conditioners, chillers and commercial cooling systems through harmonized MEPS pathways, joint R&D, and sharing lessons on delivery models and financing mechanisms for large-scale replication programmes. The initiative should also integrate passive cooling and building design considerations to reduce cooling loads, and explore South-South cooperation opportunities with other high-demand markets.

5. Piloting smart appliances and AI use-cases

Goal: Expand the appliance energy efficiency policies to provide enhanced grid management, renewable energy integration and demand flexibility through applications of smart appliances and artificial intelligence- (AI-) powered energy use optimization.

Recommendation: Identify and roll out pilot programmes on AI-enabled, -connected and demand-responsive appliances across BRICS Member countries to mainstream AI applications, such as dynamic load forecasting, real-time demand optimization, predictive maintenance and utility-demand response programmes. Based on learnings from pilots the workstream can also support the devel-

opment of standards for AI-connected and -enabled appliances, and generate best practices for the use of AI in energy consumption optimization.

6. Promoting industrial efficiency

Goal: Expand coverage of MEPS and policy frameworks to high-impact industrial equipment (motors, drives, transformers) across BRICS, and support implementation in industrial parks.

Recommendation: Work with BRICS experts and practitioners on introducing and strengthening MEPS for electric motors, variable-speed drives and distribution transformers. Alongside improving the regulatory framework, these activities can cultivate a network of industrial parks, providing technical assistance and capacity building for adoption of efficient equipment, process optimization and creation of best practices that can be replicated across regions.

7. Scaling financing models for market transformation

Goal: Facilitate scaling of financing models for appliance replacement and market transformation, especially in emerging BRICS Member countries.

Recommendation: Work towards a BRICS Appliance Financing Facility in collaboration with national and bilateral financial institutions, including the New Development Bank, to support large-scale appliance replacement programmes (e.g., inefficient air conditioners, refrigerators, motors), developing pooled and blended finance facilities to crowd in private capital, standardizing ESCO contracts and M&V frameworks to reduce risk, and strengthening financial sector capacity to evaluate performance-based investments.

8. Leveraging the power of behavioural change

Goal: Promote consumer awareness and behavioural change to accelerate adoption of efficient appliances across BRICS economies.

Recommendation: Consolidate learnings from national campaigns promoting sustainable lifestyles and behavioural change, to support the roll-out of a coordinated BRICS Energy-Efficient Appliances Awareness Campaign that strengthens labelling visibility, promotes life-cycle cost awareness, and integrates behavioural nudges to influence appliance purchase decisions, particularly in rapidly growing consumer markets.





CHAPTER SEVEN

CONCLUSION

This paper shows that BRICS countries have made important progress in managing energy intensity and deploying energy efficiency policies and programmes. However, as current rates of improvement remain below the global objective of doubling energy efficiency progress by 2030, significant untapped opportunities remain across the buildings, industry, transport, and especially appliances and equipment sectors.

Appliance efficiency emerges as one of the most immediate, scalable and cost-effective opportunities for collective action. The projected growth in electricity demand from cooling, motors, refrigeration, lighting and connected devices risks locking BRICS economies into higher system costs, greater peak demand and additional infrastructure investment for decades to come. At the same time, high-ambition appliance efficiency policies could unlock hundreds of thousands of terawatt-hours in cumulative energy savings, generate major consumer cost reductions, strengthen grid stability and avoid substantial emissions. Because BRICS countries collectively represent both major manufacturing centres and rapidly expanding consumer markets, the group occupies a uniquely influential position in shaping

global markets for efficient technologies.

The experiences reviewed in this paper also show that effective efficiency policy is already being implemented across the bloc, although gaps and opportunities for improvement remain. Brazil's utility-backed financing mechanisms, China's integration of efficiency with industrial policy, India's aggregation and bulk procurement models, Saudi Arabia's Super Energy Service Company (ESCO) model, South Africa's compliance-driven market creation, and the UAE's integrated demand-side management strategies each provide valuable lessons that can be leveraged to accelerate collective progress.

Looking ahead, the next phase of BRICS cooperation can focus on appliance efficiency as a

strategic opportunity to advance just energy transitions and energy security in line with the Roadmap for BRICS Energy Cooperation 2025-2030. Cooperation on this front can be strengthened through the creation of a dedicated workstream, whose priority focus areas should include: strengthening capacities for standards and labelling systems; improving coordination of testing and market surveillance; accelerating deployment of super-efficient cooling technologies; scaling ESCO and blended finance models; promoting industrial equipment efficiency; piloting smart, connected appliances; and integrating demand-side

measures into power system planning. Greater harmonization of testing procedures, interoperability standards and compliance frameworks can also help leverage the collective market scale of BRICS to accelerate innovation and reduce costs globally.

Energy efficiency offers BRICS countries a practical pathway to reconcile development priorities with long-term sustainability objectives. By embedding efficiency at the centre of energy and industrial strategies, infrastructure planning, and consumer markets, BRICS can position itself as a leading architect of a more secure, sustainable and resilient energy future.



ANNEX I

KEY ENERGY EFFICIENCY PROGRAMMES AND INSTRUMENTS IN BRICS MEMBER COUNTRIES

Country	Programme or Instrument	Instrument Type	Targeted Sectors	Key Features	Years
 Brazil	Brazilian Labeling Programme (PBE)	Information	Appliances	Covering 29 appliances and equipment with a consumer rating label.	1984-present
	PROCEL (National Programme for Electricity Conservation)	Financial support / Information	Residential, commercial, public, industry	Has invested BRL 4.22 billion and saved 240 billion kWh of electricity since its inception. Key initiatives include the recognizable <i>PROCEL Seal</i> for top-tier appliances, the <i>PROCEL Edifica</i> programme for decarbonizing and retrofitting buildings, and <i>RELUZ</i> , a massive public lighting modernization effort.	1985-present
	PEE – Energy Efficiency Programme (ANEEL mandate)	Regulation & Standards / Financial support	Low-income residential, public, industry	Defines that 0.5% of the net operating revenue of companies must be invested in energy-efficiency measures.	2000-present
	Energy Efficiency Law (Law 10,295)	Regulation & Standards	Appliances	Defines the establishment of MEPS for machinery and equipment manufactured and/or sold in the country, and buildings constructed or retrofitted in Brazil.	2001-present
	National Plan for Energy Efficiency (PNEF)	Planning & Governance	Economy-wide	Guidelines for an Energy Efficiency Action Plan	2011-present
	Brasil Mais Produtivo / Aliança / PotencializEE	Capacity building / Financial support	Industry	Provides technical support to help industries adopt efficient technologies. Recently expanded nationally with BRL 75 million to assist at least 1,500 small and medium enterprises by 2027.	Ongoing
 China	15th 5-Year Plan EE Targets	Planning & Governance	Industry, buildings, transport, data centres	Mandates a 10% reduction in the amount of energy used per unit of GDP by 2030.	2025-2030
	MEPS	Regulation & Standards	Appliances	The first batch of MEPS included 8 categories of appliances, now the policy covers a wide and frequently-updated list of household appliances, lighting products, commercial equipment, industrial equipment, vehicles and office equipment.	1989-present
	Notice on Further Strengthening the Updating, Upgrading, and Implementation of Energy-Saving Standards	Planning & Governance / Regulation & Standards	Appliances and industry	Emphasizes continuously improving the energy efficiency levels of key energy-consuming products and equipment, particularly enhancing mandatory MEPS for major energy-consuming products and equipment such as motors, fans, pumps, compressors, welding machines and industrial boilers.	2023-present
	Work Plan for Accelerating the Establishment of a Dual Control System for Carbon Emissions	Regulation & Standards / Planning & Governance	Economy-wide	During the 15th 5-Year Plan (2026-2030) period, a dual control system for carbon emissions will be implemented, with a primary focus on emission intensity supplemented by control over total emission amount. It will establish a product carbon footprint management system and a product carbon labelling and certification scheme.	2026-present

Country	Programme or Instrument	Instrument Type	Targeted Sectors	Key Features	Years
 China	Action Plan for Promoting Large-Scale Equipment Renewal and Consumer Goods Trade-In	Financial support	Equipment and appliances	Provide subsidy to highly efficient equipment and appliances.	2024-2026
	Implementation Plan for High-Quality Development of Energy-Saving Equipment (2026–2028)	Planning & Governance	Industry	The plan calls for energy-saving equipment to move toward intelligent, green and integrated development.	2026-2028
	General Code for Building Energy Efficiency and Renewable Energy Utilization	Regulation & Standards	Buildings	Requires that all new, expanded and reconstructed buildings, and energy-saving renovations of existing buildings, are designed for energy efficiency.	2022-present
 Egypt	Petroleum Sector EE Strategy 2022-2035	Planning & Governance	Petroleum sector	Sets 48 specific objectives aiming to reduce energy use in the petroleum sector by 10% by 2027, and 18% by 2035.	2022-2035
	Institutional EE Governance Framework	Planning & Governance	Petroleum sector	Establishes a dedicated governance structure and a centralized database for monitoring sectoral energy consumption and emissions.	2022-present
	Appliance Standards & Labelling (MEPS)	Regulation & Standards / Information	Residential, appliances	Enforces MEPS and mandatory consumer rating labels for major electrical appliances to regulate market efficiency.	Ongoing
	Building Energy Efficiency Codes (EEBCs)	Regulation & Standards	Residential, commercial, government buildings	Establishes thermal and energy efficiency construction codes. The codes were sequentially introduced for residential (2005), commercial (2009) and government buildings (2010).	2005-present
 Ethiopia	Strategic Objective 4.3 (10-Year Plan)	Planning & Governance	Economy-wide	Focuses on adopting efficient technologies, upgrading national infrastructure, and introducing energy standards.	2021-2030
	Energy Efficiency Standards	Regulation & Standards	Cross-sectoral	Prioritizes creating energy standards, though currently faces challenges due to a lack of accredited testing laboratories.	Ongoing
 India	Energy Conservation Act	Planning & Governance	Economy-wide	Set up the Bureau of Energy Efficiency, and provides a regulatory mandate for: standards & labelling of equipment and appliances; building codes for commercial buildings; and energy consumption norms for energy intensive industries. It also directs states to designate agencies for energy efficiency.	2001-present
	PAT Scheme (Perform, Achieve and Trade)	Market-Based Instruments	Energy-intensive industries	Required industries to meet strict energy reduction targets. Companies that overperformed earned tradable certificates to sell to those that underperformed. The programme concluded in 2025.	2012-2025
	Standards & Labelling Programme (BEE)	Regulation & Standards / Information	Appliances and equipment	Uses a recognizable <i>star rating</i> system to help consumers easily identify the energy efficiency of various household appliances.	Ongoing
	Energy Conservation Building Code	Regulation & Standards	Commercial and residential buildings	Establishes standardized rules and construction guidelines to ensure buildings are designed for energy efficiency.	Ongoing

Country	Programme or Instrument	Instrument Type	Targeted Sectors	Key Features	Years
 India	Lifestyles for Environment (LiFE)	Information	Cross-sectoral	Seeks to channel the efforts of individuals and communities into a global mass movement of positive behavioural change to save energy, reduce waste and adopt other sustainable lifestyles practices.	2021-present
 Indonesia	10% Cut of Energy Use (Potong 10%)	Information	Public sector, industry, general public	Runs a national awareness campaign aiming to reduce energy consumption by 10% across government organizations, industrial facilities and households.	2016-present
	General Plan for National Energy (PR No. 22/2017)	Planning & Governance	Economy-wide, public buildings	Formalizes ambitious long-term goals to reduce national energy intensity by 1% every year and scales up mandatory energy audits for public infrastructure.	2017-present
	Government Regulation No. 33 of 2023	Regulation & Standards	Industry, commercial buildings	Lowers the mandatory compliance threshold, legally requiring smaller industries and commercial buildings to implement strict energy management systems.	2023-present
	ESCO Framework (Regulation No. 1 of 2026)	Market-Based Instruments / Regulation & Standards	Economy-wide	Establishes a formal licensing and regulatory structure for Energy Service Companies (ESCOs) to unlock private capital for efficiency upgrades.	2026-present
 Iran	Iranian Fuel Conservation Company (IFCO)	Planning & Governance / Regulation & Standards	Economy-wide	Focuses on optimizing national fuel use, creating energy standards and conducting audits across the economy.	2000-present
	Mandatory EE Standards & Labels	Regulation & Standards	Appliances, heavy industry	Enforces strict limits on energy use and requires efficiency labels for major consumer appliances and heavy industrial equipment.	Ongoing
	Building Efficiency Codes & Standards	Regulation & Standards	Buildings	Aims to make existing buildings 25% more efficient and ensure new buildings are 60% more efficient through revised construction codes.	Ongoing
	ESCO Framework	Market-Based Instruments	Industry, buildings	Supports the growth of Energy Service Companies (ESCOs), specialized businesses that help other companies finance and implement energy-saving projects.	Ongoing
 Russia	Comprehensive State Programme	Planning & Governance / Regulation & Standards	Energy, industry, transport, housing	Aims to reduce the amount of energy required to produce a unit of GDP by 35% by the year 2035, compared to a 2019 baseline.	2023-2035
	Regional EE Programmes (62 regions)	Financial support / Regulation & Standards	Economy-wide (regional)	Provides funding at the local level, with investments reaching RUB 170 billion in 2022 to support regional energy projects.	Ongoing
	All-Russian Festival #Together-Brighter	Information	General public and youth	Runs a national public awareness campaign targeting citizens and youth to promote an energy-saving lifestyle.	2016-present
	Energy Strategy to 2035	Planning & Governance	Economy-wide	Integrates energy-saving measures into a broader national action plan designed to secure the country's long-term energy future.	2021-present
 Saudi Arabia	Saudi Energy Efficiency Programme (SEEP)	Planning & Governance / Regulation & Standards	Industry, Buildings, Transport	Managed by the Saudi Energy Efficiency Center (SEEC), it establishes mandatory energy intensity benchmarks for heavy industries (like petrochemicals, cement, and steel) and enforces Corporate Average Fuel Economy (CAFE) standards for light-duty vehicles.	2012-present

Country	Programme or Instrument	Instrument Type	Targeted Sectors	Key Features	Years
 Saudi Arabia	Saudi Standards, Metrology and Quality Organization (SASO) Appliance Energy Efficiency Standards (MEPS)	Regulation & Standards / Information	Appliances (residential, commercial)	Enforces strict MEPS and mandatory consumer star-rating labels for high-drain electrical equipment, particularly air conditioners, refrigerators and washing machines.	2007-present
	Tarshid (National Energy Services Company)	Market-Based Instruments / Financial support	Public buildings, municipal infrastructure, commercial	Established by the Public Investment Fund (PIF) to act as a national <i>Super ESCO</i> (Energy Service Company). It develops, funds and manages large-scale retrofit projects across government facilities, schools and hospitals, such as upgrading central HVAC systems, and executes nationwide replacements of traditional streetlights with highly efficient LED alternatives.	2017-present
 South Africa	Integrated Resource Plan (IRP)	Planning & Governance	Power sector	The 2010 national power plan actively factored in a 35% improvement in efficiency, but the updated 2019 plan notably excluded demand-side management.	2010, 2019
	Eskom EEDSM / IDM Programme	Financial support	Residential, commercial, industrial	Provides financial rewards through the state utility to encourage efficiency. The programme was recently revived with new offerings in April 2023.	2004-present
	National Energy Efficiency Strategy (NEES)	Planning & Governance / Regulation & Standards	Economy-wide	Acts as the guiding national strategy, identifying opportunities to improve energy efficiency by 20% to 30% across various economic sectors.	2005-present
	EEDSM Grant Programme	Financial support	Municipal infrastructure	Supplies direct grant funding to local municipalities. ZAR 256.2 million was allocated for 2026/2027 to assist 61 municipalities in upgrading public infrastructure.	Ongoing
 UAE	National DSM Programme 2050	Planning & Governance / Regulation & Standards	Built environment, transport, agriculture, industry	Sets a long-term goal to reduce total national energy demand by 40% and water demand by 50% by the year 2050.	Ongoing-2050
	DSM Sub-Programmes	Regulation & Standards	Buildings, transport, industry	Implements specific initiatives like green building codes, transportation frameworks to reduce travel needs and stricter transparency rules for industry.	Ongoing

SOURCE:

BRICS-JET Report 2024, updated by SEforALL from various national reports

ANNEX II

ENERGY INTENSITY IN BRICS MEMBER COUNTRIES

Country	Energy intensity level of primary energy (megajoules per constant 2021 PPP GDP)				Energy intensity rate of change (average annual)		
	2000	2010	2015	2022	2000-2010	2010-2015	2015-2022
 Brazil	3.2	3.2	3.4	3.2	-0.1%	1.0%	-0.6%
 China	9.4	7.8	6.3	5.4	-1.9%	-4.2%	-2.1%
 Egypt	2.4	2.7	2.5	2.3	1.0%	-1.3%	-1.3%
 Ethiopia	18.8	11.3	8.2	5.9	-5.0%	-6.1%	-4.7%
 India	5.3	4.4	4.0	3.5	-1.9%	-1.9%	-2.0%
 Indonesia	4.1	3.3	2.7	2.9	-2.1%	-4.3%	1.4%
 Iran (Islamic Republic of)	7.1	7.5	8.2	8.9	0.5%	1.9%	1.1%
 Russian Federation	8.7	6.1	5.6	6.0	-3.5%	-1.7%	1.0%
 Saudi Arabia	5.3	6.6	6.2	5.5	2.2%	-1.4%	-1.6%
 South Africa	8.4	7.4	6.4	6.0	-1.3%	-2.7%	-1.0%
 United Arab Emirates	4.2	5.4	6.0	5.1	2.6%	2.1%	-2.5%
 Belarus	9.4	5.1	4.5	4.6	-5.9%	-2.8%	0.5%
 Bolivia (Plurinational State of)	2.9	3.5	3.4	3.5	1.8%	-0.2%	0.1%
 Cuba	2.8	1.5	1.3	1.1	-6.1%	-3.2%	-2.2%
 Kazakhstan	7.4	6.5	4.1	4.4	-1.3%	-8.7%	1.1%
 Malaysia	4.7	4.5	4.1	3.7	-0.4%	-2.1%	-1.3%
 Nigeria	3.7	2.6	2.2	2.5	-3.7%	-2.8%	1.7%
 Thailand	4.2	4.3	4.3	3.7	0.3%	0.0%	-1.9%
 Uganda	11.2	8.5	8.1	8.2	-2.7%	-1.0%	0.2%
 Uzbekistan	22.8	11.6	6.5	6.0	-6.6%	-11.0%	-1.0%
 Viet Nam	3.7	3.9	3.1	3.3	0.5%	-4.4%	1.1%
World	5.3	4.8	4.3	3.9	-1.0%	-2.2%	-1.4%

SOURCE:

Tracking SDG7: The Energy Progress Report 2025 (IEA, IRENA, UNSD, World Bank, WHO)

