From Energy Poverty to Global Leadership:

How Emerging Markets Can Reshape the Power Landscape

Introduction

Like power, energy is a force of creation, destruction, and renewal. It is an endless cycle that defines our existence, from one lifetime to the next. When we observe the global energy landscape, we notice a potential opportunity for emerging nations in Asia, Africa and Latin America to redefine energy production and distribution across the world. As the world transitions toward sustainability, traditional energy producers must adapt to renewable, clean energy sources to maintain power (Al-Maamary, Kazem, & Chaichan, 2017). Moreover, the adaptation of Artificial Intelligence will increase the energy demand across the globe. All of these provide a perfect opportunity for many emerging countries rich in renewable energy resources like solar, wind and hydro energies in Africa, Latin America and Asia respectively to utilise their untapped potential (IRENA, 2021).

Additionally, emerging powers, such as India, Brazil, and South Africa, hold vast renewable energy reserves yet face challenges in meeting domestic and regional energy demands. While industrialized nations strive for carbon neutrality, their energy surpluses often remain inaccessible to energy-deficient regions, this perpetuates global inequalities (World Bank, 2023).

Moreover, these emerging regions boast of over 4 billion people of whom a significant portion is under 35 years old. This provides a young, energetic and ready workforce to harness the capabilities of clean energy production.

This essay will explore the opportunity tied to untapped renewable energy potential and smart grid technology by leveraging the vast human capital. We will explore how the alignment of various resources and capabilities will not only address energy equity but also foster economic growth, mitigate environmental challenges and work towards sustainable development goals.

Current situation across the globe

Africa

It goes without saying that the renewable energy potential of Africa is largely untapped. Studies show that the continent can generate 10 terawatts of solar energy due to its land areas and high solar irradiance. Currently, China is the leading producer of solar energy with a current capacity of 710 gigawatts due to government support and heavy investments. In the developed nations, Germany currently takes the reigns with an installed capacity of 70 gigawatts.

In Africa, countries like Morocco and South Africa are leading large-scale projects such as the Noor Ourzazate Solar Complex which is the world's largest concentrated solar power plant and the REIPPP (Renewable Energy Independent Power Producer Procurement) program (IREA, 2023). However, over 600 million people in Sub-Saharan Africa don't have access to electricity. This provides a huge potential for the implementation of smart grids (U.S. Energy Information Administration, 2022).

Considerable efforts are needed in countries like the Democratic Republic of Congo, Ethiopia, Madagascar, Malawi, Niger, Nigeria, Sudan, Tanzania, and Uganda, which together represent more than half of the global population without access to electricity in 2030 (IEA,2024). Rural communities in Africa face significant challenges when it comes to accessing sustainable energy ie 84% of rural areas

don’t have access to modern energy. In Sub-Saharan Africa, it is as low as 30.5% for rural areas (Mperejekumana, P.,2024)

A study by Lau et al, stated that Africa has an abundance of renewable energy such as Solar, wind, hydro and biomass, but it cannot fully exploit it. Moreover, other countries like Kenya have focused on one source of energy (hydropower) and not fully explored the other sources (Naicker et al, 2019). In Nigeria, studies show that grid power losses can exceed 50%. According to the International Energy Agency, incidents such as major cities being plunged into darkness have been reported 46 times between 2017 and 2023. All this implies that even with limited access to electricity, the available electricity isn't fully utilised.

The challenges in Africa affecting energy access include underdeveloped infrastructure, limited financing, political instability, lack of collaboration and implementation of projects, public approval and the maintenance of the infrastructure.

Asia

Asia is currently a global leader in renewable energy, being driven by countries like China and India. China has invested greatly in Solar and wind power i.e. in Tengger Desert Solar Park and the Gansu Wind Farm to boost its manufacturing industry and dominance across the globe (IREA, 2023).

However, there are huge disparities in Asia because countries such as Myanmar and Cambodia are struggling to expand energy access. The consistent challenge Emerging countries face with their energies is the high population density which limits grid expansion and energy distribution. Despite that, India is aiming to achieve 280GW of solar capacity by 2030 through its National Solar Mission. This is in line with South East Asia’s rapid industrialisation demand for a robust energy supply (ADB, 2021).

The challenges in Asia affecting energy access include different levels of technological readiness across the region, and the political will to enact change.

Central and South America

Latin America's energy landscape is driven by hydropower which accounts for more than 50% of electricity generation. Countries like Brazil and Colombia are taking the lead. More recently, Chile and Argentina have ventured into solar and wind energy leveraging the Atacama Desert and Patagonia’s wind corridors (IREA, 2023). Brazil being a dominant producer of hydroelectric energy has the potential to become a global energy exporter (BNEF, 2022).

The challenge in South America pertaining to energy access is the over-reliance on hydropower making the region vulnerable to droughts and climate change.

Developed Countries – A comparative analysis

Assessing Developed nations we note that they have adopted strategies to address energy challenges. In Europe, smart grid technology has been integrated into the energy systems. Moreover, the European Green Deal emphasizes grid modernization with the example of SmartNet which facilitates real-time energy balancing across borders.

Developed countries also benefit from established infrastructure, financial resources and regulatory frameworks which allow them to establish large-scale energy projects rapidly. This advantage allows them to dominate the global clean energy markets by producing high-efficiency solar panels and intelligent energy management systems for export.

Size of the Problem - Energy Demand

Energy inequity is a pressing global issue. 750 million people worldwide, predominantly in Africa and South Asia, lack access to electricity in 2023 which is less than 10 million in 2022(IEA, 2022 & 2024). This was influenced by the expansion of grids in Africa where 80% of the population without electricity live. Also, countries across Asia like Bangladesh, India and Indonesia achieved universal electricity access. 97% of the region in Asia has access to electricity which is a tremendous increase from 79% in 2010.

When it pertains to the storage of this surplus energy, the world was set to increase its storage capacity by 100 gigawatt hours by the end of 2024. This was largely driven by China's growth and it is geared to continue being the largest energy storage market globally followed by the US(BNEF, 2024).

Additionally, the rapid advancement of emerging technologies such as artificial intelligence (AI), blockchain, robotics, space exploration, quantum computing, and 5G networks is driving an unprecedented increase in global energy demand. AI alone is projected to consume over 340 terawatt-hours annually by 2030, equivalent to the energy usage of some small nations (IEA, 2023). As these technologies continue to expand, regions with abundant renewable energy resources such as Africa and Asia are uniquely positioned to lead the global digital revolution by producing, storing, and distributing clean energy efficiently (IRENA, 2023). Investing in energy infrastructure and smart grids will not only foster economic growth but also position these regions at the forefront of the AI and digital age, attracting industries reliant on sustainable energy solutions (World Bank, 2023).

Opportunity

There lies a huge opportunity for renewable energy as the world shifts from fossil fuels to sustainable sources. If more emerging countries would emulate China and utilise their natural resources (water, sun, wind), invest in technological advancement such as smart grids among others, utilise ready manpower, and put in place policies that support this vision then these nations can:

1. Accelerate domestic electrification ensuring that every household has affordable and adequate energy.
2. Enhance the efficiency of energy transmission and minimise wastage for instance transfering excess energy from urban regions to rural areas.
3. Drive industrial and economic growth.
4. Produce and export eco-friendly technologies and energy solutions
5. Strengthen their influence in the international energy market.
6. Support the energy requirements of the digital age.

According to BloombergNEF forecasts, the global energy storage market is set to grow by 21% annually. Global Solar and wind markets will have compound growth rates of 9% and 7% respectively (BNEF, 2024)

Solution

Capitalizing on this opportunity doesn't just require one solution, it requires multiple solutions intertwined into a wholesome strategy. The strategy needs to look at technological innovation, access to natural resources, capacity building, policy frameworks, providing decentralised solutions and deployment of smart grid among others.

For now, we will explore the following three solutions :

1. Establishing renewable energy hubs
    a. More emerging countries need to develop large-scale solar, wind and hydropower farms in resource-rich regions i.e. the Sahara Desert.
    b. Enable universal electricity access.
2. Leveraging human capital
    a. Design and implement workforce/entrepreneurial training programs in the renewable energy sector.
    b. Promote research and innovation through partnerships.
3. Developing energy trade networks
    a. Create regional grids integrated with smart technologies to facilitate cross-border electricity trade across emerging regions ie South East Asia, Sub-Sahara Africa, South West Asia, Central America, and South America.
    b. Position emerging economies as exporters of clean energy and advanced grid solutions to global markets.

Implementation strategy

This strategy can be implemented in the following three phases to achieve global integration by 2040.

Phase One: Policy and infrastructure development

For there to be substantial change, governments across these regions need to have the initiative and put down policies that will enable them to be renewable energy leaders in the world They need to include various subsidies for renewable energy and smart grid projects.

In addition to that, collaborative partnerships between the private and the public sector can boost the development of infrastructure for energy generation, grid expansion and smart grid deployments.
Finally, regions should form alliances to coordinate energy trade and technological exchange emulating the European cross border trade.

Phase Two: Workforce and innovation

Since emerging regions boast huge populations, they can leverage that and roll out training programs for the manufacturing, deploying, and distributing of renewable energy. They can also encourage entrepreneurship and allow their young workforce to provide local solutions to boost clean energy production.

Moreover, they should open knowledge exchange across the regions so that people in different countries can easily collaborate to provide innovative solutions that can be easily replicated in various countries and scales.

Phase Three: Commercialisation and global integration

Firstly, we would encourage the countries to serve at least 99% of their population with existing electricity and then export the surplus energy produced. This can be enhanced by the deployment of smart grids across the region to enhance reliability and efficiency. They can expand to the production and export of eco-friendly energy equipment and smart grid technologies. Finally, they can strengthen global partnerships to ensure they are among the leaders in the supply of renewable energy and products.

Challenges of this strategy

Some of the expected challenges that may be faced while implementing this solution will be financial barriers, current infrastructure, coordinating with multiple stakeholders not only in one country but across regions; limited availability of a skilled workforce in emerging economies; maintenance of the infrastructure after being built; market integration i.e. supplying to international markets and finally adapting to the changes that may be brought about by the increased energy production and penetration.

Expected outcome

We anticipate that this strategy will yield the following outcomes:

- Universal energy access: By 2040, every household in the participating country will have reliable electricity, closing the energy gap.
- Economic growth: the enhanced energy availability and smart grids will stimulate industrialisation, drive the digital age, create jobs for the huge young population and boost GDP in emerging economies (U.S. Department of Energy, 2023).
- Environmental benefits: With increased reliance on renewable energy and smart grid efficiency, there will be a significant reduction in greenhouse gas emissions, thus positively impacting climate change.
- Global Leadership: Emerging nations will position themselves as pivotal players in the global energy market. This will allow them to redefine geopolitical power dynamics (European Commission, 2023).
- Social Equity: equitable energy distribution through smart grids will uplift marginalised communities ie in rural arrears thus fostering inclusive development.

Conclusion

Renewable energy supported by smart grid technologies offers a clear pathway for emerging nations in Asia, Africa and Latin America to grab global power and influence. They can achieve this by leveraging their abundant resources and human capital to address energy poverty, drive economic development and contribute to a sustainable world.

These economies need to strategically plan, invest and collaborate for this vision of becoming global energy powerhouses to be actualised thus shaping a world where Power(Energy) is more equitably distributed.

Word Count (essay text only): (2132 /2100)

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Auxillary Aids

Grammarly for proofreading- British English.

ChatGpt – for reference suggestions