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Electricity Security for Economic Diversification in Cambodia: A Shift to Greener Solutions

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Introduction

The Pentagonal Strategy Phase I was unveiled in 2023 as the Royal Government of Cambodia's (RGC) next development strategy. Among the strategy's five "pillars," the second emphasizes the importance of diversifying the country's economy to create "[a] solid foundation for supporting the sustained and resilient growth in medium—and long-term."[1] Growth due to economic diversification is imperative to bolster and maintain the country's momentum to successfully graduate and transition away from its status as a Least Developed Country (LDC) by 2029, avoid the ill-fated middle-income trap, and become a high-income economy by 2050.[2, 3]

To diversify a nation's economy is to diversify the products and services it produces and the market access it has for export. Simultaneously, it is important to note that the effectiveness and success of Cambodia's efforts to diversify its economy greatly hinge on the country ensuring adequate

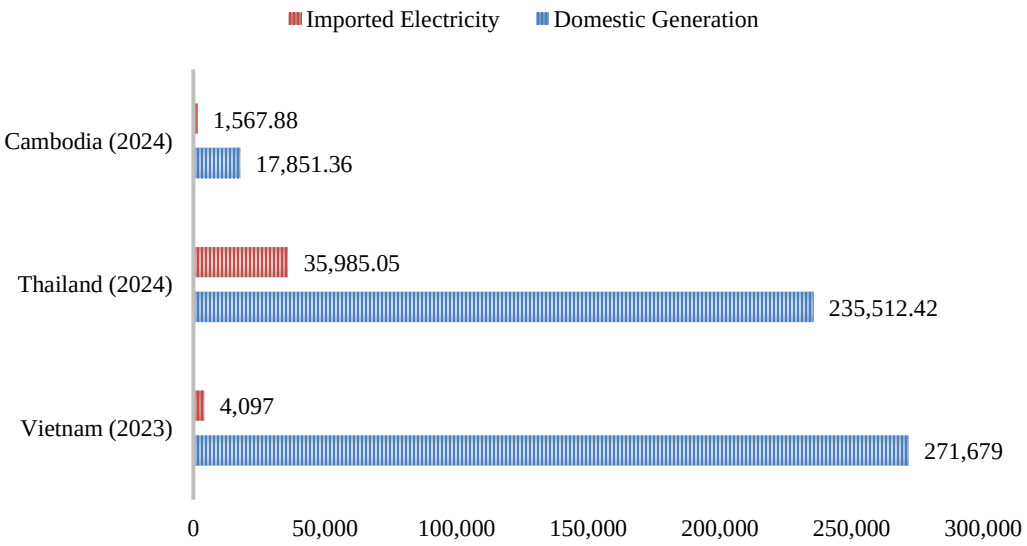
[1] The Royal Government of Cambodia. 2023. "Pentagonal Strategy-Phase I for growth, employment, equity, efficiency, and sustainability: Building the foundation towards realizing the Cambodia Vision 2050." https://www.mfaic.gov.kh/files/uploads/1XK1LW4MCTK9/EN%20PENTAGONAL%20STRATEGY%20-%20PHASE%20I.pdf.
[2] Ibid.
[3] Department of Economic and Social Affairs Economic Analysis. 2024. "Cambodia and Senegal scheduled to graduate from the LDC category in 2029." United Nations. December 19, 2024. https://www.un.org/development/desa/dpad/2024/graduation-of-cambodia-and-senegal-from-the-ldc-category/#:~:text=The%20two%20countries%20will%20graduate,transition%20out%20of%20the%20category.

domestic capacity, which is essential to make this goal a feasible reality. Hence, this article attempts to discuss this matter by spotlighting Cambodia's energy security challenge, particularly within its electricity sector.

Challenges Facing Cambodia's Current Electricity Insecurity

Harvard's Atlas of Economic Complexity's data illustrates that Cambodia's export output relies heavily on textiles and agricultural produce, indicating that the country has low to moderate export complexity levels.[4] What this means is that Cambodia has the potential to export more complex products for a more dramatic growth.[5] Given this, product diversification would push the nation toward manufacturing more complex products. As such, electricity is poised to be an essential resource to power the machinery involved in the manufacturing processes.

Figure 1: Comparison of Total Electricity Production Between Vietnam, Thailand, and Cambodia



(GWh)

Sources: Ministry of Mines and Energy, the Electricity Authority of Cambodia, the Energy Policy and Planning Office, and Vietnam Electricity

[4] Huasmann, Ricardo. 2022. "Cambodia." The Atlas of Economic Complexity-Harvard Growth Lab. 2022. https://atlas.hks.harvard.edu/countries/116/export-basket.
[5] Ibid.

In 2024, Cambodia's total electricity production reached 19,419.24 GWh, with 8.07% (or 1,567.88 GWh) imported from neighboring countries to offset the limited domestic generation capacity.[6] The electricity composition comprised several sources, the two most notable being hydro energy (40.96%) and coal (49.83%).[7] Comparatively speaking, Thailand and Vietnam boasted larger total electricity production–around 235k GWh and 309k GWh, respectively.[8, 9] Nonetheless, Thailand demonstrated a higher ratio of external electricity dependence last year, as it imported 15.27%, or 35,985.05 GWh, whereas Vietnam only relied on 2%, or 4,097 GWh, of electricity from external sources.[10, 11] In terms of pricing, Cambodia charges USD 0.137/kWh compared to Thailand's USD 0.12/kWh and Vietnam's range of USD 0.074/kWh (for consumption of 0-100 kWh/month) to USD 0.15/kWh (for consumption of over 700 kWh/month).[12, 13, 14]

One major implication is that Cambodia's electricity price remains one of the highest in the region. For potential investors in industries the country is eager to attract, this has become a disincentivizing factor as it will incur costs on the final product or service, thereby reducing profit margin because businesses are profit-oriented and will actively identify cost-cutting opportunities whenever and wherever available, Cambodia risks losing its competitive edge to its neighboring countries, which also happen to possess additional enticing bonuses, namely more skilled labor, larger markets, and stronger institutions.

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[6] Ministry of Mines and Energy and Electricity Authority of Cambodia, "Salient features of power development in the Kingdom of Cambodia until December 2024," 2024, https://www.eac.gov.kh/uploads/salient_feature/english/salient_feature_2024_en.pdf.
[7] Ibid.
[8] Vietnam Electricity, "Ministry targets 347.5 billion kWh of electricity production, imports in 2025," December 24, 2024, https://en.evn.com.vn/d/en-US/news/Ministry-targets-3475-billion-kWh-of-electricity-production-imports-in-2025-60-163-500380.
[9] Energy Policy and Planning Office, "Electricity statistics," Ministry of Energy, 2024, https://www.eppo.go.th/index.php/en/en-energystatistics/electricity-statistic.
[10] Ibid.
[11] Vietnam Electricity, "Annual report 2022-2023," April 22, 2024, https://en.evn.com.vn//userfile/files/2024/11/EVNAnnualReport2022-2023-20241107095549165.pdf.
[12] Luong, Bang. 2025. "Vietnam proposes new electricity pricing with higher rates for high consumption." *VietNamNet News*, January 13, 2025. https://vietnamnet.vn/en/vietnam-proposes-new-electricity-pricing-with-higher-rates-for-high-consumption-2362640.html.
[13] Praiwan, Yuthana. 2025. "Thai electricity prices in line for reduction this year following power tariff cut." *Https://Www.Bangkokpost.Com*, January 1, 2025. https://www.bangkokpost.com/business/general/2930806/thai-electricity-prices-in-line-for-reduction-this-year-following-power-tariff-cut.
[14] Koons, Eric. 2024. "Electricity in Cambodia: Quality and price issues." Energy Tracker Asia. March 27, 2024. https://energytracker.asia/electricity-in-cambodia/#:~:text=Electricity%20prices%20in%20Cambodia%20are,considerably%20more%20than%20neighbouring%20countries.

Cambodia's limited electricity capacity also raises concerns and hesitation among both potential and current investors. To attract and welcome investments, a country needs to be ready to provide the necessary infrastructure to facilitate firms in building and operating their businesses. Questions arise on whether the country's electrical grid can handle an influx of investors as Cambodia's capacity remains unstable, subject to rationing of electricity during the dry seasons, as its hydro dams cannot operate at full efficiency.[15, 16] In 2023, 125 enterprises reported experiencing power outages at least once, where 38 cited that the outage's longest average duration lasted 30 minutes.[17] This contributed to a 5% loss in annual sales for 57 companies.[18]

Table 1: Average Duration of Power Outages: Minutes

Minutes	Cases	Percentage
0	2	0.7%
1	0	0.0%
2	1	0.4%
3	1	0.4%
4	1	0.4%
5	48	17.0%
7	3	1.1%
8	10	3.5%
10	78	27.6%
12	2	0.7%
15	46	16.3%
20	34	12.0%
25	17	6.0%

[15] Khmer Times. 2024. "EDC asks Cambodians to conserve electricity in current heatwave." *Khmer Times*, April 8, 2024. https://www.khmertimeskh.com/501469469/edc-asks-cambodians-to-conserve-electricity-in-current-heatwave/.
[16] UNDP. 2019. "Harnessing the solar energy potential in Cambodia." https://www.undp.org/sites/g/files/zskgke326/files/migration/kh/DREI-Booklet-English.pdf.
[17] The World Bank. 2025. "Cambodia - World Bank Enterprise Survey 2023." January 9, 2025. https://microdata.worldbank.org/index.php/catalog/6434/pdf-documentation.
[18] Ibid.

30	38	13.4%
35	1	0.4%
40	1	0.4%
Total	**283**	**100%**

Source: The World Bank

Cambodia's considerable dependency on electricity imports presents another challenge, as fossil fuel prices are likely to remain volatile due to ongoing geopolitical and geoeconomic developments. In other words, it is not a matter of if, but when fossil fuel prices will fluctuate. Indeed, when prices spike, the prices of imported fossil fuel (i.e., coal) and electricity sourced from fossil fuel in Cambodia will increase correspondingly—so much so that the Ministry of Mines and Energy has had to subsidize annually for the past several years to keep electricity costs stable.[19, 20, 21] This vulnerability to external shocks is also a concerning issue as energy security is closely tied to national security; Cambodia's reliance on external actors for its electricity supply is an issue that should be thoroughly addressed.

How and Why Green Electricity Can Fit Within this Jigsaw

One approach to addressing the issues mentioned above is to increase Cambodia's electricity production capacity. Unlike the erratic fluctuations of fossil fuels, green energy is projected to gradually decrease its costs over time.[22] In the case of solar energy, for instance, assessments conducted by the UNDP in Cambodia revealed overwhelmingly positive findings. In essence, solar energy is demonstrated to be economically profitable with shorter construction and installation

[19] Chea, Vanyuth. 2023. "Govt subsidises $150M to stabilise electricity tariffs in 2023." *Khmer Times*, July 19, 2023. https://www.khmertimeskh.com/501326253/govt-subsidises-150m-to-stabilise-electricity-tariffs-in-2023/.
[20] Khmer Times. 2023. "PM vows to curb rising electricity prices despite the global crisis." *Khmer Times*, October 28, 2023. https://www.khmertimeskh.com/501383092/pm-vows-to-curb-rising-electricity-prices-despite-the-global-crisis/.
[21] Chea, Vanyuth. 2025. "Govt to continue electricity subsidies." *Khmer Times*, February 6, 2025. https://www.khmertimeskh.com/501635211/govt-to-continue-electricity-subsidies/.
[22] Timmons, David, Johnathan M. Harris, and Brian Roach. 2014. "The economics of renewable energy." *Boston University*. https://www.bu.edu/eci/files/2019/06/RenewableEnergyEcon.pdf.

periods, cheaper investment costs according to global LCOE analysis, and Cambodia's geographical location allows it to receive high levels of sunlight exposure of up to 5.6 kWh/m^2.[23]

Despite Trump's attempts to undermine global efforts towards a more environmentally conscious direction, increasing investments in green energy is a prudent decision given the ever-worsening impacts of the climate crisis. This means bypassing the unnecessary two-step process of investing in traditional fossil fuel energy generation and then transitioning to renewable alternatives by moving directly to the latter. Simultaneously, it is within Cambodia's interests to provide greener electricity for domestic and foreign firms so that they have a smaller carbon footprint so that their products remain viable for exports. One of Cambodia's primary exporting destinations, the European Union, is gradually adopting the Carbon Border Adjustment Mechanism (CBAM) as a non-tariff barrier that Cambodia needs to comply with.[24]

A green and secure electricity sector for Cambodia would address the issues related to economic diversification and create two additional positive opportunities. Once electricity production exceeds typical consumption levels, accounting for future demand and unforeseen emergencies, it should reach a point of greater affordability and abundance. This surplus can then be used as an incentive to electrify vehicles, particularly cars, in densely populated areas, supporting the nation's goal of achieving net-zero carbon emissions by 2050.[25] Transcending the domestic focus, Cambodia can leverage its advantage in electricity capacity to export green energy to Southeast Asian countries. Furthermore, Cambodia may integrate with fellow ASEAN countries as one of the region's power suppliers and as a crucial piece of the ASEAN Power Grid.

Future Outlook

Efforts to strengthen Cambodia's electricity capacity and improve its security are underway. With an emphasis on achieving a 70% renewable energy share by 2030, the RGC has halted any further

[23] UNDP. 2019. "Harnessing the solar energy potential in Cambodia." https://www.undp.org/sites/g/files/zskgke326/files/migration/kh/DREI-Booklet-English.pdf.
[24] European Commission. 2025. "Carbon Border Adjustment Mechanism." February 26, 2025. https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.
[25] Royal Government of Cambodia. 2021. "Cambodia's long-term strategy for carbon neutrality." Uploaded by UNFCCC. https://unfccc.int/sites/default/files/resource/KHM_LTS_Dec2021.pdf.

issuances of licensing for coal power plants since 2019.[26] Simultaneously, avenues for potential cooperation are also being explored between the RGC and its governmental and non-governmental counterparts to generate investments, facilitate the transfer of best practices, and promote innovation. Evidently, September last year alone saw the approval of 23 green energy projects subject to potential investments, and 26 projects this April have been given government payment guarantees.[27, 28] Last but not least, a new Renewable Energy Certificate (REC) will soon be launched, allowing businesses to demonstrate their commitment to green energy and international environmental standards.[29]

Table 2: Side-by-Side Comparison of Cambodia's Electricity Mix Between 2024 and 2040 (Measured in MW)

2024	**Capacity**	**Percentage**	**2040**	**Capacity**	**Percentage**
Coal	1,300	29.74%	Coal	2,266	21.40%
Hydro	1,796	41.09%	Hydro	2,973	21.40%
Fuel oil	400	9.15%	Fuel oil	490	4.60%
			Natural gas	900	8.50%
Solar PV	827	18.91%	Solar PV	3,155	29.80%
			Battery Energy Storage System	420	5.80%
Biomass	49	1.11%	Biomass	198	1.90%
Imported electricity	672		Imported electricity	4,095	
			Energy efficiency measures	2,205	

[26] Chea, Vanyuth "Kingdom to add more 720MW from solar sources this year," *Khmer Times*, February 10, 2025, https://www.khmertimeskh.com/501636605/kingdom-to-add-more-720mw-from-solar-sources-this-year/.
[27] Ibid.
[28] Hin, Pisei "Government approves payment guarantees for energy investment projects," *The Phnom Penh Post*, April 22, 2025, https://www.phnompenhpost.com/business/government-approves-payment-guarantees-for-energy-investment-projects.
[29] Chea, Vanyuth "Cambodia to launch new REC scheme to boost sustainability," *Khmer Times*, December 31, 2024, https://www.khmertimeskh.com/501616527/cambodia-to-launch-new-rec-scheme-to-boost-sustainability/.

Total	**5,044**	**Total**	**16,702**

Sources: Ministry of Mines and Energy and the Electricity Authority of Cambodia

Regardless, it remains to be seen how the contents on paper will be fully translated into reality. However, the current trajectory through the RGC's Power Development Plan (PDP) 2022-2040 aims for the fourth scenario in which the conventional hydro-coal energy mix will be preserved, while efforts are being made to initiate and expand investments in Liquefied Natural Gas (LNG) and solar energy, respectively.[30] Moreover, following the National Energy Efficiency Policy (NEEP), energy efficiency measures will be implemented to reduce excess consumption and unnecessary losses.[31]

As one of the supply-side determinants, adequate electricity production is important for pushing long-term economic growth and diversification, for it is a core component of all industrial activities Cambodia is expanding into. That said, the PDP's fourth scenario seems to suggest that fossil fuels are here to stay. In a sense, Cambodia is trading a portion of its reliance on coal in exchange for a substantial reliance on LNG instead. Whether or not LNG is "green" is another discussion. Still, the more important matter is that this energy plan moving forward would have the country continue its dependence on imported electricity alongside fossil fuels (coal and LNG) to generate electricity, all of which means the country is vulnerable and susceptible to future external shocks.[32]

Thus, a question arises: How can alternative solutions be designed to ensure ample electricity production for economic diversification while mitigating concerning implications?

[30] Ministry of Mines and Energy. 2022. "Power Development Masterplan 2022-2040." https://vdb-loi.com/wp-content/uploads/2023/06/Final-PDP-Cambodia-English-version.pdf.
[31] Ibid.
[32] Reynolds, Sam. 2024. "Understanding the Opportunities and Challenges in Cambodia's LNG Ambitions | IEEFA." November 26, 2024. https://ieefa.org/articles/understanding-opportunities-and-challenges-cambodias-lng-ambitions.

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