

Power Sector in Cambodia

An Understanding of Deficient and High-Cost Electricity

While importing power from neighboring countries is crucial for short-term development, diversifying generation sources and establishing a national power grid should be considered for the long-term.

Among other types of infrastructure, the power sector plays a critical role in fostering economic growth and the social development of a country. It can initiate the use of new technology and in turn the modernization of the economy, leading to a general reduction in production cost. Moreover, this sector is important in improving people's livelihoods and enhancing public services such as healthcare and education through better access to appropriate technology.

To understand better the power situation in Cambodia, this article provides an insight into the current development of Cambodia's power sector and identifies the main causes behind the high prices of electricity.

Why Power Sector Matters?

In a country with a fast-growing economy like Cambodia, having a stable power sector is even more crucial to fuel the growth in a sustainable manner. The recent GDP growth of 13.4 percent in 2005 signals that more attention needs to be paid to the development of the power sector in order to be able to respond to that growth.

It is notable that the industrial

"While many enjoy Cambodia's high economic growth of more than 10 percent in recent years, new challenges emerge for power sector developers to make electricity readily available for coping with that growth.", Mr. Yim Nolson, Deputy Managing Director of EDC

sector and service sector have grown at a moderate average rate of about 14 percent and 9 percent respectively over the past five years. While the two sectors successively consume about 15 percent and 40 percent of the total electricity, the growth in these sectors is a promising sign for the future increasing demand of electricity. Yet, the power sector in Cambodia is still undeveloped and very costly.

There is the general consensus that if the current power sector is not quickly and effectively developed the electricity supply will not be able to meet the upcoming growing demand, which will result in an economic slowdown in the long-run.

According to the Global Competitiveness Report 2006-2007 of the World Economic Forum, poor infrastructure including inefficient electricity supply is one of the main competitive disadvantages for Cambodia compared to Thailand and Vietnam. In addition to a low quality and unreliable power sup-

ply, the tariff rate of electricity in Cambodia remains the highest in the region. It is five times more expensive than in Lao PDR, nearly three times more than in Thailand, and about twice the price compared to Vietnam.

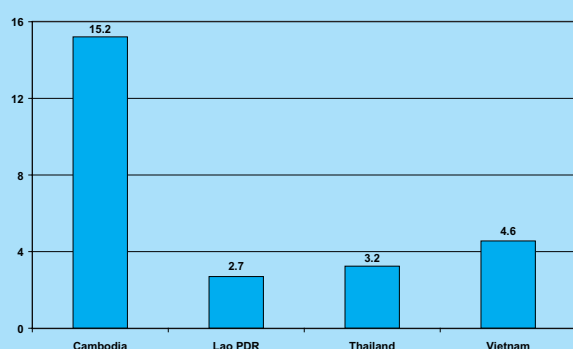
Current Situation

Cambodia's power sector is considered to be at the stage of under-development, which implies that electricity is not adequately supplied and prices are hardly affordable. These two factors are the main reasons why many Cambodian households still live without access to electricity.

Very Low Electrification Rate

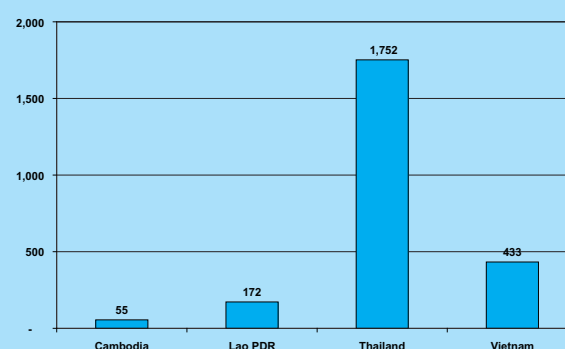
The electrification rate in Cambodia is far below the rates of neighboring countries. Less than 17 percent of Cambodian households can access electricity compared to 84 percent in Thailand, 81 percent in Vietnam, and 41

Figure 1: Average Production Costs of Electricity in 2004 (US cents/kWh)



Source: Compiled by Author from Various Sources

Figure 2: Per Capita Consumption of Electricity in 2004 (kWh)



Sources: Compiled Mainly from EDC and World Development Indicators

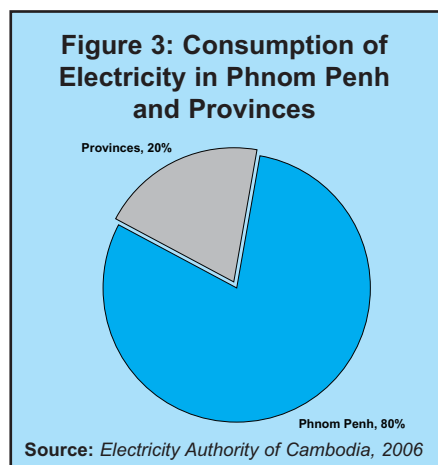
percent in Lao PDR.

In addition to the low electrification rate, Cambodia's electricity consumption remains the smallest in the region. Currently, per capita consumption of electricity in Cambodia is only 55 kWh compared to 1,752 kWh in Thailand, 433 kWh in Vietnam, and 172 kWh in Lao PDR. It should be noted that low per capita consumption reflects not only low usage of electricity among residential users, but also the country's lack of industrialization.

Unlike Thailand and Vietnam, where their industrial sectors are the main power consumers accounting for 46 percent and 42 percent respectively, the main consumer of electricity in Cambodia are residences which consume up to 43 percent of total electricity versus the industrial sector's 16 percent. This low consumption by Cambodia's industrial sector is attributed to the low level of industrial development and most of the existing industry use their own electricity generator for the sake of reliability and efficiency.

Very Expensive, Almost not Accessible by the Poor

From a social viewpoint, there is large disparity among urban and rural households as power supply reaches mainly the cities and provincial towns leaving most rural areas without access. According to the Ministry of Industry, Mines and Energy (MIME), while 54 percent of urban households can access electricity, only 8.6 percent of households in rural areas can access this par-



ticular utility.

Moreover, there is large discrepancy in electricity consumption between urban and rural areas due to the concentration of economic activities in urban areas, particularly around Phnom Penh. As of 2005, it is estimated that with the total electricity of 858 GWh, nearly 80 percent is consumed by Phnom Penh area, while the rest is absorbed by other provinces including rural areas. It is valuable to note that per capita power consumption in urban areas was about 360 kWh compared to less than 8 kWh in rural areas. Considering this, the consumption of electricity in rural areas is roughly seven times less than the national average, 45 times less than in urban areas, and more than 60 times less than in Phnom Penh.

The lack of efficient electricity supply in rural areas, which are home to about 93 percent of the poor, could impede on the government's policy towards effective poverty reduction. It discourages private investment in rural areas, and burdens local's livelihoods in accessing better technology and improved public services.

Therefore, the improvement of rural electricity should be, among others, a necessary measure toward economic development and enhancement of livelihood of rural population.

Why is Electricity so Expensive in Cambodia?

Besides the deficiency and ineffectiveness of power supply, the high tariff rate is one of the most prominent issues in the power sector hampering the economic development of the country. While the high price of electricity badly impacts on people's standard of living, its negative effect on foreign direct investment as well as on

small manufacturing industry in the country is also pronounced.

The weighted average production cost of electricity in Cambodia is roughly US\$0.15 per kWh compared to only US\$0.03 to 0.05 in the neighboring countries. This makes Cambodia the costliest power producer in the region. This highest unit cost of production is caused by two main factors: sources of energy for generation and lack of national grid.

Heavy Dependence on Oil

It is important to note that power generation in Cambodia relies heavily on imported oil while other countries use cheaper sources of energy. It is generally recognized that using oil for generating electricity is the most expensive type of electricity generation.

Currently, about 92 percent of generated electricity in Cambodia is oil-dependent compared to five percent generated by hydropower plants. The heavy oil-dependence combined with the high price of imported oil will by no means make the cost of electricity generation in Cambodia comparable to other neighboring countries. The strong reliance on the high-priced imported oil has brought the cost of power generated by oil in Cambodia as high as US\$0.16 per kWh, which is 1.2 to 1.3 times higher than in Thailand and in Vietnam.

Table 1: Source of Electricity Generation (% of Total)

	Hydropower	Oil	Other	Total
Cambodia	5%	92%	3%	100%
Lao PDR	97%	3%	0%	100%
Thailand	8%	2%	90%	100%
Vietnam	46%	12%	42%	100%

Table 2: Costs of Production by Source of Electricity Generation (US cents/kWh)

	Hydropower	Oil	Other	Average
Cambodia	8.0	16.1	-	15.2
Lao PDR	2.3	15.5	-	2.7
Thailand	-	14.0	3.0	3.2
Vietnam	3.0	12.5	4.0	4.6

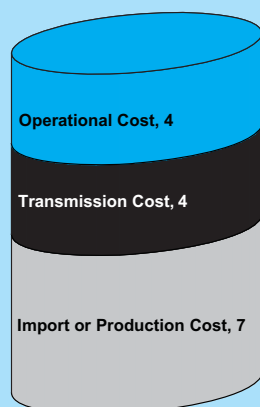
Source: Compiled by Author from Various Sources

Absence of National Grid

Box 1: How Much is Needed to Bring Electricity to all Cambodian Households?

In this regard, it is estimated that Cambodia would require approximately US\$1.2 billion to build the systems, which includes US\$500 million for transmission line and US\$700 million for distribution network.

Figure 4: Possible Cost Structure of Rural Power Supply (US cents/kWh)



power generation in Cambodia is mainly run by small generators that produce electricity at a high unit cost. Added to this, the absence of a national grid network has split the power system in the country into 22 isolated systems where each of them works separately on small-scale power generation. From a technical perspective, small-scale generation and the absence of interconnected system partly contribute to the high unit cost of power generation as the economy of scale of generation cannot be exploited.

Solutions to Expensive and Deficient Power

While the power sector is a challenge for sustainable economic development, the improvement of this sector deserves a priority development agenda. Yet, while Cambodia experiences fast economic growth, the power sector development is still in the transitional stage due to capital and time constraints. In this regard, in order to curb the power problem there needs to

be a focus on two phases, namely the short-term and long-term development phases.

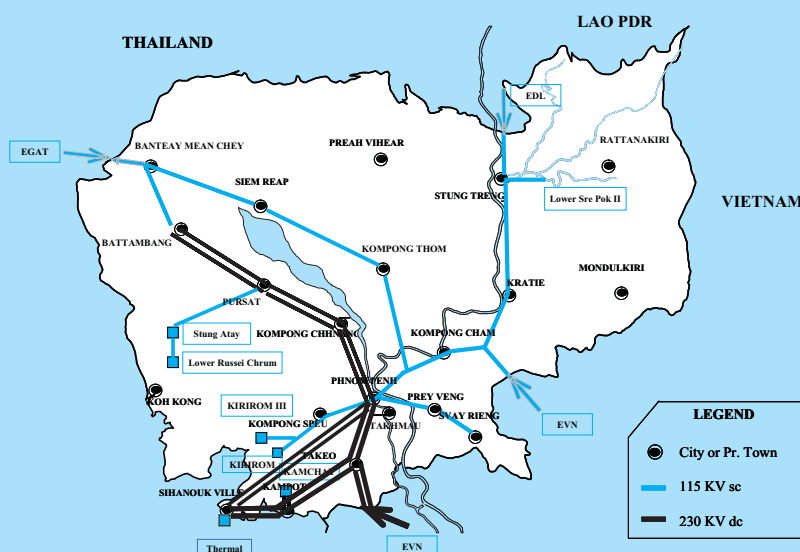
Installing Transmission Lines and Importing Electricity

In the short-term, the power sector needs to be efficient enough to keep up with the current economic growth, and to kick-start the industrialization of the economy. In order for this to happen power interconnection from neighboring countries is necessary. Imported electricity can ensure reliable power supply and the imported price is much lower than the domestic generation cost.

It should be noted that the price of electricity imported from Thailand and Vietnam is only US\$0.055 to 0.065 per kWh compared to US\$0.15 of generation cost in Cambodia. So, importing electricity can provide more efficient power to industrial development and to the Cambodian population as a whole.

However, while neighboring

Figure 5: Government Power Supply Development Plan



Source: Ministry of Industry, Mines and Energy

Lao PDR is the main power exporter in the region, Cambodia plans to import only a small amount of electricity from this country. It is remarkable that as the exporting rate of electricity from Lao PDR, according to Asian Development Bank, is only US\$0.0265 per kWh, importing power from Lao PDR should be promptly considered; particularly to industrialize the northern part of Cambodia, which is currently underdeveloped compared to other areas of Cambodia.

Diversifying Generation Source

Despite the fact that importing electricity is an immediate means for fostering economic development, it is yet to be a sustainable solution. The rapid industrialization and modernization in Thailand and Vietnam may prompt the two countries to limit their power exports to Cambodia. In such a case, it is important for Cambodia, in the medium- to long-term, to be able to generate its own efficient electricity, which can be served domestically as well as exported to the region through the to-be-established regional grids – ASEAN power grid and GMS power interconnection.

It is notable that while Cambodia is endowed with hydropower potential of up to 10 GW, the country currently exploits only 13 MW of capacity, which contributes merely 5 percent to the total power generation. Therefore, there is greater opportunity for Cambodia to further exploit the hydropower resource to improve the current power deficiency and to lower the price of electricity. Particularly, since the cost of hydroelectricity is very much comparable to that of imported electricity, the development of hydropower plants can be a good option if Cambodia is to ensure long-term electricity efficiency.

Besides hydropower, the recent recovery of natural gas in Cambodian territorial seas gives another hope for power sector development. Due to its economic efficiency and less environmental problem, power generation by natural gas can also be an appro-

prate choice for Cambodia to generate reliable and low-cost electricity. Experience from Thailand highlights that the unit cost of power generation from natural gas is less than US\$0.05 per kWh, which is cheaper than the unit price of hydroelectricity in Cambodia. Nevertheless, this generation cost may vary according to technology and resource availability.

Establishment of National Grid

Apart from generation, construction of a national grid through the establishment of a power interconnected system is also necessary to provide reliable electricity to the whole country at a low price. It is worth noting that an interconnected system will consolidate different power plants together, particularly large power plants, which supply electricity to the grid in a complementary manner. This complementarity combined with possible low unit cost of electricity generated by large-scale power plants will significantly improve the reliability and lower the price of electricity.

Concluding Remarks

The fast economic growth in recent years should prompt Cambodia

to pay more attention to the development of its power sector. The underdeveloped power sector in the region coupled with high tariff rates are impediments to sustain economic growth in the long-run.

While investing in power generation is costly, in the short-term, importing electricity from neighboring countries is crucial. Currently, Cambodia mainly imports electricity from Thailand and Vietnam; however, Lao PDR should be also considered as a potential main partner for its low-cost exporting rate. In the long-term, the diversification of energy source of generation is a must as the country has a high potential for hydropower and natural gas in the offshore area, which are low-cost sources of energy for power generation. In addition, a national power grid needs to be established as soon as possible to provide reliable and cheap electricity to every part of Cambodia.

Should the power sector be well developed and efficient, Cambodia will be able to foster the growth, and people will have better access to public services which, together, lead to an effective reduction of poverty.

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