

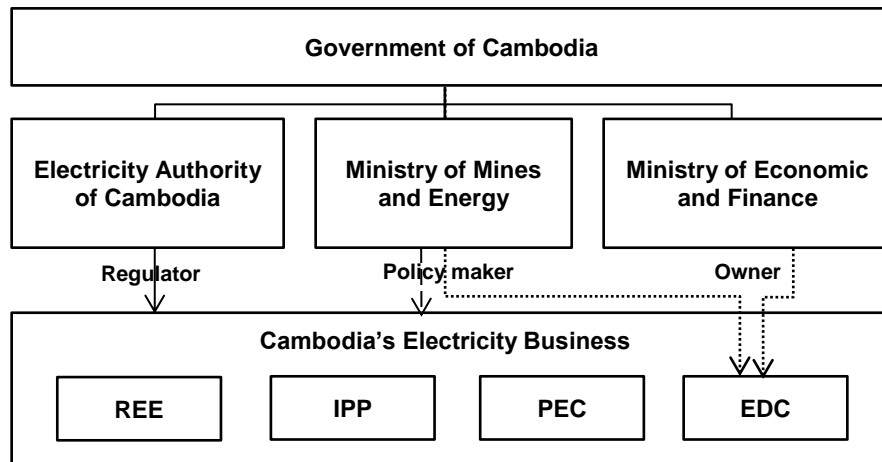
SECTOR OVERVIEW

A. Sector Framework

1. The current energy sector organization in Cambodia was established pursuant to the enactment of the Electricity Law in 2001. The law provides the governing framework for electric power supply and services throughout Cambodia. It covers all activities related to the supply of electricity, provision of services and use of electricity, and other associated activities of the power sector. Key components include (i) establishing the principles for operation of the power sector; (ii) establishing favorable conditions for competition, private investment, private ownership, and commercial operation of the electric power industry; and (iii) establishing and defining the functions of the Electricity Authority of Cambodia (EAC) and the Ministry of Mines and Energy (MME). The regulatory framework for electricity generation from photovoltaic solar power is the same as for other types, since no specific laws or rules apply separately to renewables to date. The regulatory permits required for solar power plants are as follows: (i) feasibility study, (ii) power investment authorization, (iii) approval of qualified investment project status with the environmental and social impact statement, (iv) electricity generation license, (v) registration with the EAC, and (vi) construction permit.

2. The MME is the main agency responsible for setting and administrating government policies, strategies, and planning in the energy sector, including setting technical standards. The agency has three core departments: (i) the Department of Energy Development, which is responsible for energy and electricity planning; (ii) the Department of Hydropower; and (iii) the Department of Technical Energy, which is responsible for renewable energy (other than hydropower) and energy efficiency. The electric power sector structure is illustrated in Figure 1. Beginning in the 1990s, given the need for the rapid addition of electricity supplies to support economic growth, new generation capacity has been developed, mainly by the private sector.

Figure 1: Electricity Power Sector Structure



EDC = Electricité du Cambodge, IPP = independent power producer, PEC = provincial electricity company, REE = rural electricity enterprise.

Source: Government of Cambodia. 2016. *Scaling-up Renewable Energy for Low Income Countries Program Investment Plan for the Kingdom of Cambodia*. Phnom Penh.

3. The EAC is an autonomous government agency created under the Electricity Law, responsible for regulating electricity services. It issues rules, regulations, and procedures; and provides monitoring, guidance, and coordination of operators in the energy sector—both suppliers and consumers—including requiring them to follow the policy, guidelines, and technical standards issued by the MME. The EAC as the regulator confirms whether the provision of services and the use of electricity are performed efficiently, qualitatively, sustainably, and in a transparent manner. All power service suppliers must be licensed by the EAC.

4. Electricité du Cambodge (EDC) is a state-owned and vertically integrated monopoly responsible for generation, transmission, and distribution. It is owned jointly by the MME and the Ministry of Economy and Finance. Generation in Cambodia is private sector-driven, and EDC buys power from independent power producers (IPPs), mainly joint ventures of Cambodian and foreign investors. EDC is also responsible for power imports. With regard to distribution, EDC serves mainly the larger urban areas whereas rural areas of Cambodia are served by several small, privately owned electricity enterprises. EDC mainly supplies the capital city, Phnom Penh. Many rural areas are supplied by rural electricity enterprises (REEs), which operate as licensees, buying power from EDC and selling power into local distribution networks. REEs may have their own generation assets (typically diesel). Provincial electricity companies (PECs) have operated as integrated utilities at the province and sub-province level; these organizations have mostly been phased out in favor of REEs and IPPs.

5. EDC is a profit-generating utility unlike some regional peers. In 2015, it recorded revenue of KR3.8 trillion (\$937 million equivalent); earnings before interest, taxes, depreciation, and amortization of \$145 million equivalent; and net profit of \$91 million equivalent. It consistently recorded earnings before interest, taxes, depreciation, and amortization of over \$110 million and net profit of over \$76 million during 2013–2015. EDC does not rely on fiscal support from the government for satisfying its obligations as an offtaker. On the other hand, since EDC is a state-owned entity with a mandate to extend electricity supply to the population, it continues to enjoy concessional loans from bilateral and multilateral development institutions including ADB's public sector operations, for undertaking its investment, including transmission lines and rural electrification.

B. Electricity Demand

6. Electricity consumption in Cambodia has been increasing significantly. In 2015, per capita consumption of electricity reached 400 kilowatt-hours (kWh), a more than fivefold increase from 66 kWh in 2005.¹ Power consumption is forecast to grow at 9.4% per year until 2020, which will require an increase of more than 50% in energy output to keep pace with demand growth. This will mainly be driven by population increase, accelerated economic activity, and rural electrification.

7. From 2002 to 2011, the annual electricity demand growth rate in the country was 16.3%. This was met mainly by imports from Thailand and Viet Nam. Imports have declined since 2013 as new domestic coal and hydro plants have come online (Table 1). As energy demand in Phnom Penh grew slightly faster, with an average growth rate of 17% during the same period, the share of Phnom Penh in the total electricity demand increased (4.8 times since 2002), and is at least 80% of the country's total electricity consumption. Annual electricity demand in Svay Rieng Province, a site for this solar power project, is expected to grow from 69,500 megawatt-

¹ World Bank. World Bank Open Data. <http://data.worldbank.org> (accessed 18 October 2016).

hours (MWh) in 2015 to 184,860 MWh in 2024. Peak load in Svay Rieng Province is also expected to increase from 14.4 MW in 2015 to 37.1 MW in 2024.²

C. Electricity Supply

8. Electricity supply in Cambodia does not meet basic demand—24-hour supply of electricity is not assured and the quality of electricity is not reliable. Electricity coverage remains low despite the progress that has been made. Out of 13,935 villages, only 67% have transmission lines in their villages.³ The electrification rate grew to 55.0% in 2015, up from 20.3% in 2007. Yet, about half of the entire population still has no access to electricity.

9. Total installed generation capacity in 2015 was 1,569 MW, producing 4,448 gigawatt-hours (GWh) and accounting for about 74% of total grid-supplied electricity. In 2015, an additional 1,572 GWh was imported from the Lao People's Democratic Republic, Thailand, and Viet Nam. Domestic production increased significantly from 2013 to 2015, reducing imported electricity from more than 56% in 2013 to about 26% in 2015 (Table 1). Hydropower accounts for the largest share of domestic capacity and output, with coal second, diesel third, and industrial (captive) generation fourth. Biomass power and generation by small licensees (mainly REEs) account for less than 1% of supply, and solar power and generation account for none as of now.

Table 1: Grid-Supplied Electricity Composition and Recent Trends, 2013–2015

Power Sources	2013			2014			2015		
	MW	GWh	%	MW	GWh	%	MW	GWh	%
Domestic									
Biomass	14.6	6.0	0.1	16.6	2.9	0.1	16.6	38.0	0.6
Coal	110.0	168.1	4.2	110.0	840.3	17.8	368.0	2,210.1	36.9
Diesel	275.9	487.3	12.0	177.0	159.9	3.4	218.0	117.7	2.0
Hydro	344.1	1,015.5	25.1	682.1	1,829.8	38.8	927.0	1,988.4	33.2
Industrial	23.2	75.3	1.9	23.2	56.5	1.2	23.2	78.8	1.3
Small	26.3	16.9	0.4	16.4	29.5	0.6	16.4	15.2	0.3
Licensees									
Subtotal	794.1	1,769.1	43.7	1,025.3	2,918.9	61.9	1,569.2	4,448.2	74.3
Imports									
Lao PDR	2.0	10.7	0.3	2.0	13.8	0.30	4.0	17.4	0.3
Thailand	95.5	579.6	14.3	135.5	524.2	11.1	135.5	243.9	4.1
Viet Nam	196.3	1,691.3	41.7	196.3	1,256.2	26.7	277.0	1,280.1	21.4
Subtotal	293.8	2,281.64,050.7	56.3	333.8	1,794.2	38.1	416.5	1,541.4	25.8
Total	1,087.9		100.0	1,359.1	4,713.1	100.0	1,985.7	5,989.6	100.0

GWh = gigawatt-hour, Lao PDR = Lao People's Democratic Republic, MW = megawatt.

Source: Government of Cambodia, Ministry of Mines and Energy. 2015. Updated Power Development and Exchange. Presented at the 19th Greater Mekong Subregion Regional Power Trade Coordination Committee Meeting, Bangkok. 16–17 November.

10. Based on Cambodia's Power Development Plan, 2008–2020,⁴ coal and hydropower are expected to continue to dominate growth in new capacity during the next several years (Table 2).⁵ Renewable energy potential in Cambodia is also considered high. Solar energy has particularly high potential, with an average of 5 kWh per square meter per day and average sunshine duration of 6–9 hours per day. Solar energy is estimated to have technical potential of

² Electricité du Cambodge estimates.

³ Government of Cambodia. *Scaling-up Renewable Energy for Low Income Countries Program Investment Plan for the Kingdom of Cambodia*. Phnom Penh.

⁴ Government of Cambodia, Ministry of Mines and Energy. 2015. *Updated Power Development and Exchange*. Presented at the 19th Greater Mekong Subregion Regional Power Trade Coordination Committee Meeting, Bangkok. 16–17 November.

⁵ Government of Cambodia. *Scaling-up Renewable Energy for Low Income Countries Program Investment Plan for the Kingdom of Cambodia*. Phnom Penh.

8,100 MW and energy output of 14,781 GWh per year. According to EDC, solar energy can serve up to 5%–10% of total generation in the long run.

D. Tariff

11. Electricity tariffs in Cambodia are higher than those in neighboring countries, reflecting the high cost of petroleum-based generation and the fragmented power supply system in the country, as well as inefficiencies in power generation and transmission infrastructure. In Phnom Penh, households pay about \$0.18/kWh and industrial consumers pay as much as \$0.21/kWh. Tariffs are even higher outside of Phnom Penh, at about \$0.70/kWh, and supply is even less dependable.⁶

12. Retail electricity tariffs established by the EAC for 2016 through 2020 are summarized in Table 2. Retail tariffs are expected to decline, reflecting the drop in the overall cost of supply as the share of imports and diesel-based electricity decreases and supplies from lower cost coal and hydro plants increase. EDC's weighted average cost of supply was estimated at \$0.106/kWh in 2014 and \$0.095/kWh in 2015.⁷ The tariff that REEs can charge residential consumers has been reduced to \$0.20/kWh. While the EAC is an independent regulatory authority, a no-subsidy policy has been consistently applied in Cambodia's energy sector, except for lifeline tariffs for poorer consumers, so retail tariffs are not expected to go below EDC's average cost of supply. The decreasing cost of implementation of solar projects and high retail tariffs, combined with abundant solar resources, offer great potential in Cambodia for utility-scale solar projects without subsidies such as feed-in tariffs, by achieving solar power production at grid parity.

Table 2: Retail Electricity Pricing (\$/kWh)

Type of Consumers	2016	2017	2018	2019	2020
Industrial and commercial customers					
Purchase from grid substation	0.13	0.13	0.13	0.13	0.13
Purchase from national grid	0.17	0.17	0.17	0.16	0.16
Purchase from provincial grid	0.17	0.17	0.16	0.16	0.16
Residential customers					
Supplied by EDC	0.22	0.19	0.19	0.19	0.18
Supplied by licensees (REEs)	0.20	0.20	0.19	0.19	0.19
Subsidized tariff for poor households and agriculture					
Urban consumers with use below 50 kWh/month	0.15	0.15	0.15	0.15	0.15
Rural consumers with use below 10 kWh/month	0.12	0.12	0.12	0.11	0.11
Pumping in agriculture sector; use from 21:00 to 7:00	0.12	0.12	0.12	0.11	0.11

EDC = Electricité du Cambodge, kWh = kilowatt-hour, REE = rural electricity enterprise.

Source: Electricity Authority of Cambodia.

⁶ United States Agency for International Development. 2015. *Private Financing Advisory Network (PFAN) – Asia Program: The Business Case for Solar PV in Cambodia*. Washington, DC.

⁷ W. Derbyshire. 2015. *Cambodia – In Depth Study on Electricity Cost and Supplies*. Phnom Penh.