

KINGDOM OF CAMBODIA

NATION RELIGION KING

**Regulatory Treatment of Extension of Transmission
and Distribution Grid in Cambodia**

**UNDER ELECTRICITY LAW OF THE KINGDOM
OF CAMBODIA**

ELECTRICITY AUTHORITY OF CAMBODIA

Approved by EAC's session No. 27 dated 28 January 2003

**Decision on Regulatory Treatment
of Extension of Transmission and Distribution Grid
in Cambodia**

Regulatory Treatment of Extension of Transmission and Distribution Grid in Cambodia



ELECTRICITY AUTHORITY OF CAMBODIA

- Seen the Electricity law of the Kingdom of Cambodia, which was promulgated by the Royal KRAM No. NS/RKM/0201/03 of February 2, 2001
- Seen the Royal Decree of Preahbath Samdech Preah **NORODOM SIHANOUK**, the king of the Kingdom of Cambodia No. NS/RKT/0201/039 of February 17, 2001 on the appointment of **Excellency TY NORIN** as Chairman of Electricity Authority of Cambodia
- In accordance with the consultation with concerned Ministries and institutions, licensees and public, made from 7 August 2003 to 7 October 2003
- In accordance with the decision of Session No. 27 of EAC dated 28 October 2003

DECIDES

Article 1

All HV facilities including HV lines shall be treated as part of the Transmission system. A Licensee, who owns and operates HV facility, will need a Transmission License.

Article 2

MV lines, located in the area of supply of other distribution licensees and used to supply power to more than one licensee, shall be treated as part of transmission system and these lines shall be operated under a transmission license. If the owner of MV line also installs transformers to sell power at LV to other licensees, the transformers also shall be treated as part of the transmission system.

Article 3

System not connected to the National Grid shall be treated as isolated system and consolidated license can be issued for operation of such systems.

Article 4

All MV and LV facility of a distribution licensee, in its area of supply, used for the purpose of supplying power to its consumers shall be treated as part of distribution system.

Article 5

The MV lines being treated as part of Transmission system shall be called either **Sub-transmission system or Interim transmission system**.

Article 6

Principle that MV lines being treated as Sub-transmission or Interim transmission system will be valid till there are large numbers of small distribution licensee supplying power to small areas.

Article 7

In case of any difficulty to define the system, EAC may decide whether a facility belongs to transmission system or distribution system and accordingly the facility will be operated under appropriate license.

CHAIRMAN OF EAC

Explanation why issue the Decision on Regulatory Treatment of Extension of Transmission and Distribution Grid in Cambodia

1. Present Situation of Power Supply System in Cambodia

The existing power supply system in Cambodia is dispersed and isolated. Except for Phnom Penh and some towns near the border, the system generally consists of one generating station and associated distribution system. The distribution system generally consists of LV lines supplying to one village or town. Phnom Penh has five diesel generating stations and one hydro station interconnected through 115kV lines and a network of 22 kV lines and LV lines. Some border towns get supply from neighboring country at 22kV or 15kV and supply to consumers through its network of LV lines. Some towns have short lengths of 22kV lines to feed power supply to distribution transformers.

2. Reason why the Cost of Power Supply is High in Small Isolated Systems in Cambodia

At present, cost of generation is high and is the major component of the cost of supply. Each supplier has installed capacity to meet its maximum load with additional capacity to take care of scheduled and unscheduled outages, which are large in number and duration considering that the equipment is old and poorly maintained. In many supply areas the supplier has different generators to run during peak load period and off peak load period. All this contribute to the high cost of generation.

3. Ways to Develop Transmission and Distribution Systems in Cambodia

The declared policy of the Government is to make power available throughout the Kingdom of Cambodia at a reasonable cost and establish a Grid System. The Grid system develops gradually. Initially power supply may be extended from major load centers or towns to the surrounding areas by extending MV system giving rise to several isolated grid systems. Then these may be gradually interconnected by HV system creating a bigger grid. This is how Grid system has developed in many other countries. This arrangement will provide 2 possibilities to develop power sector in Cambodia.

First Possibility

One possibility is to have one bigger generating station to supply power to more than one town/village, rather than having one generating station for each village. The generating station can be located at provincial towns or big towns (load centers) and supply power to the town and near by villages. Considering the present position of the loads in villages, the supply to the villages from the generating station could be through a 22kV (MV) line with a transformer in the village to get low voltage for supply to consumers.

This arrangement shall have the following advantages

1. Reduction in the installed capacity resulting in lower capital cost.
2. Reduction in the operating staff, spares etc will reduce the operation and Maintenance expenses.
3. Better management of load demand there by reducing the consumption of fuel.
4. The generators can be maintained in a more professional way reducing downtime and increasing reliability in supply.

For such projects to be financially viable, the cost of generation together with the cost of transmission should be less than the present cost of generation. The possible arrangements could be that the owner of the generating plant owns the 22kV lines or a different person owns the 22kV line.

This arrangement could also provide the opportunity to some suppliers to sell Electricity from existing generating stations having spare capacity to the suppliers of nearby areas by extending 22kV (MV) lines.

Second Possibility

The second possibility is to get power supply from neighboring countries through HV system and gradually extend the supply to larger areas by extending HV and MV system.

The proposed Rural Electrification and GMS Transmission project provides for Construction of 220kV line from Vietnam to Phnom Penh and associated substations at Phnom Penh and Takeo with the aim to

make power available at a lesser cost. EDC has signed a Power Purchase Agreement with Electricity Generating Authority of Thailand (EGAT) to purchase power from Thailand. The power will be received through a 115kV line to be constructed from Aranyaprathet Substation in Thailand to Banteay Meanchey. Subsequently the 115kV line can be extended up to Siem Reap. Ultimately the Grid supply will be extended to other parts of the country through 220 kV/115kV lines and associated substations. From these substations power can be supplied to the suppliers in different areas/ villages through 22kV (MV) lines. The 22kV line supplying power to more than one supplier could be owned by the licensee owning the 220kV /115kV lines or by a different person. In cases where one 22kV line supplies power to only one supplier, it could be owned by the supplier. The 22kV line is likely to pass through the licensed distribution area of one or more than one supplier.

In a vertically integrated industry structure generation, transmission and distribution are under one operator and there is not much need to differentiate between the transmission or distribution facility. But in a market structure where Transmission and distribution are different businesses and each is operated under a different license, as provided in the Electricity Law in Cambodia, it is necessary to differentiate between transmission and distribution facilities.

In view of the probability of gradual development of a Grid System through 22kV (MV) system, it is necessary to decide on the regulatory treatment of these systems in the Cambodian context. This will decide what licenses are required for the operation of such systems, how these extensions will be classified i.e. what facilities will be considered as transmission system and what facilities will be considered distribution system. Deciding these issues in advance will bring in transparency in the regulatory process and remove uncertainties for the operators/ licensees.

4. Provisions in the Electricity Law of Cambodia

Some of the relevant Articles of the Electricity Law for this consultation paper are given below:

Article 30:

The Generation Licensee shall have the right to generate electricity power from specifically fixed identified generation facilities. The Generation Licensee right in this law is to own, operate and manage or control the generation facilities for generating electricity for sale and not solely for own consumption.

The granting of Generation License shall be for the purpose of promoting the safe, reliable, and economic efficient operation of the national transmission grid or distribution grid and the connection facilities.

The validity of the generation license shall generally be for the expected useful life of the generation facility except in the case the Power Purchaser Agreement has a shorter term. The generation license can be revoked under this Law.

Article 31:

The Transmission Licensee shall have the right to provide the transmission service. The transmission licensee right in this law is to own operate and manage the power transmission facilities for transferring and delivering or selling the electricity in bulk.

There shall be two types of transmission: National Transmission License and Special Purpose Transmission License.

Article 32:

The National Transmission License shall be issued to the state power transmission company that has the right to provide the transmission service for delivering the electric power to the distribution companies and bulk power consumers throughout the Kingdom of Cambodia, except in the territory served by the isolated systems as stipulated in Article 35 paragraph 1 and subject to the rights of special purpose licensees under Article 33 of this Law.

The license issued under this Article may be of an indefinite term, subject to revocation under this Law.

Article 33:

The Special Purpose Transmission Licensee shall have the right to construct, own and/or operate the specifically fixed identified transmission facilities in Cambodia that have the specified purpose and ensure the public interest. The principles and conditions for issuing the Special Purpose Transmission Licenses shall be determined by the government regulation.

The validity of Special Purpose Transmission Licenses may have the indefinite term or limited to the useful life of that particular transmission facilities. The Special Purpose Transmission License is subject to revocation under this Law.

Article 34:

The Distribution Licensee shall have the right to provide the electricity distribution services in a determined contiguous territory. The right to provide the electricity distribution services under this law is the right of ownership, operation and managing or controlling the distribution facilities for supplying and selling the electricity to the customers. The ownership, operation and managing or controlling the distribution facilities in private territory for their own use is not considered as the provision of distribution service.

The license issued under this Article may be of an indefinite term, subject to revocation under this Law.

Article 35:

The Consolidate License is a license, which may be the combination of some or all types of licenses stated in paragraph 1 to 7 of Article 29 of this Law.

The consolidated license can be issued to EDC and to the isolated systems to grant the right to generate, transmit, dispatch, distribute and sale the electric power to consumers. If a consolidated licensee intends to add new generation facilities, then he must apply for generation license for each new generation facility.

For the purposes of encouraging efficiency and competition where this will contribute the least long run marginal cost of electricity, the Authority shall include the provision in this license for disaggregating the generation, transmission and distribution services in the service coverage territory of licensee.

Article 38:

In issuing consolidate licenses, the Authority shall consider long term planning and the objectives of Government policy to reduce long run marginal cost in the long term supply of electricity to consumers, establish a national grid and progressively expand this grid throughout Kingdom of Cambodia.

Article 39:

The Retail Licensee shall have the right to engage in the sale of electric power to consumers. Each retail license shall apply to a contiguous service territory.

To obtain a retail license, the applicant shall have a subcontract agreement with electric utility licensed by Authority and this contract shall be submitted to the Authority for reviewing and approval.

The electricity sold to consumers by retail licensee shall be purchased from a licensed electric utility to supply in the applicable geographic territory, until such time when the Authority permits to purchase from other suppliers of electric power consistent with national energy policy.

The provisions of law can be summarized as follows:

1. Transmission facilities are the facilities used for transferring and delivering or selling the electricity to distribution licensees and bulk consumers. A transmission licensee can sell power to another licensee or bulk consumer.
2. Distribution facilities are the facilities used for supplying and selling the electricity to the consumers.
3. Retail licensee has the right to engage in the sale of electric power to consumers. The Retail licensee does not own facility for supplying power i.e. distribution lines. He can own facilities needed for sale of power to consumers i.e. meters, metering equipment.
4. Consolidated license can be issued to EDC and to the isolated systems.
5. The EAC shall encourage steps which reduce the long run marginal cost, establish a national grid and progressively expand the grid.

5. Regulatory Treatment of Grid Extensions

Classification of a facility as belonging to transmission system or distribution system can be done by taking into consideration a number of parameters as given below:

- a. **By voltage level** – Lines of same voltage level (HV, MV or LV) can have same classification.

- b. **By use or purpose** – Lines being used for supply to consumers are generally classified as distribution system. The Electricity Law provides that bulk consumers can be supplied from transmission system. Lines being used to interconnect two major generating station or two grid substations or for supplying power to more than one licensee are classified as transmission system.
- c. **By ownership** - The facility can be classified depending on whether the facility is being owned by a transmission licensee or distribution licensee.
- d. **By location** – The facility can be classified depending on whether the facility is located in the area of one or more than one distribution licensee.
- e. **Technical expertise and convenience in operation** - In cases where the facility requires specialized skills in operation and maintenance, it will be better that these facilities are kept under the operator who can best operate it. A short HV line on towers supplying power to a single consumer can be an example. As the line is supplying power to a consumer, it can be classified as distribution line, but perhaps a transmission licensee, who operates many other similar lines, may be better equipped to construct and operate this short line. The level of technical expertise available to a small licensee in Cambodia should also be taken into consideration.
- f. **Financial capability to fund construction and operation of the facility** – Sometimes the capability to arrange funds for the construction and operation of the facility may be considered to decide the classification of the facility.
- g. **Ultimate goal** – The decision on classification of the facility should help achieving the ultimate goal of “Quality power supply to entire Cambodia at reasonable price and development of the Grid system”.

No single parameter can be applied strictly for the classification. There may be exceptions. However similar facilities under similar conditions of operation are to be classified similarly.

6. Preparation of Content of Regulatory Treatment

6.1 HV Lines and Substations

The construction, operation and maintenance of HV lines and substations, its protection and communication system need specialized technical expertise. These lines generally connect major generating stations, grid substations and carry electricity for more than one distribution licensee and bulk consumer. So generally these should be classified as Transmission system. In future, there may be HV lines supplying power to a single bulk consumer. As per the consideration that the line is used to supply power to a consumer it could be considered as part of the Distribution System. But as per the consideration of technical expertise and convenience in operation it should be treated as transmission system. Considering that technical expertise and convenience in operation is more important, it will be better if all HV facilities are considered as Transmission facility.

Decision Point:

All HV facilities including HV lines supplying power to bulk consumers are part of the Transmission system. A Licensee, who owns and operates HV facility, will need a Transmission License.

6.2 One Licensee Supplying Electric Power to Another Licensee through MV Lines

A. A Distribution Licensee Proposes to Supply Power to another Distribution Licensee through MV Lines

Consider that licensee “A” has been issued a Distribution license and proposes to sell power to Distribution Licensee “B”. “A” will construct a 22 kV (MV) line beyond its area of supply and into the area of supply of “B” and sell power to “B” in the area of supply of “B”. “A” may also provide transformers at the end of the MV line to supply power at LV.

If the supply is considered to be given under a distribution license, the 22kV line will be considered part of the distribution system of “A” and the area of supply of “A” has to be extended to cover the point of sale. This will mean that there will be two distribution licensees for the same area of supply and hence both will have right to supply power to consumers of the area. Concerns have been expressed about allowing more than one licensee to supply power to consumers of the same area. This will bring in uncertainties for the licensee and affect the much needed investment in the distribution system. Hence it is not desirable to consider the sale under distribution license.

Licensee “A” having distribution license and Licensee “B” having retail supply license is also not possible as Licensee “B” owns facility for distribution in its area of supply and a retail supply licensee can not own distribution facility.

The 22kV line will be used for transferring and selling electricity to distribution licensee. So the 22 kV line supplying power to licensee “B” can be considered as transmission system. It means the licensee “A” will need a transmission license for transferring and selling electricity to licensee “B”. A transmission licensee has the right to own and operate the power transmission facility and sell electricity in bulk. If “A” is EDC, who is having National transmission license, it can own and operate the MV transmission facility and sell power under the National transmission license and no other license is required. But if “A” is a licensee other than EDC, it will need a Special Purpose Transmission License. The license issued will become a consolidated license being combination of Distribution License and Special Purpose Transmission License. By Law Consolidated license can be issued to EDC and isolated system. Consolidated license can include transmission license. Hence system having transmission system as a part of it can be considered as isolated system and eligible to receive consolidated license. Systems not connected to the National grid are to be considered as isolated system. The system under consideration is not connected to the National Grid and is an isolated system and hence consolidated license can be issued.

In future when the National Grid develops and it becomes necessary to connect this system to the National Grid, its nature of isolated system will change and depending on other changes that might have taken for the system, the 22kV line may become a part of the distribution system (the areas of supply of “A” and “B” have come under one distribution licensee) or the 22kV line, still considered as a transmission facility, may be transferred to EDC or to a licensee having Special purpose transmission license only.

As per Article 33, the principles and conditions for issuing the Special Purpose Transmission License shall be determined by government regulation. Hence it is necessary that the regulations are issued by the Government before the special purpose transmission license is issued by EAC.

B. One Big Generating Station Supplies Power to more than one Distribution Licensee and Bulk Customer through 22kV Lines

Consider that one generating station “G” has to supply power to more than one distribution licensee say “D”, “E”, and “F” through 22kV (MV) lines.

In the course of project development, It is more likely that “G” arranges funds for the total project including 22kV lines and generating station as one project and owns both. The 22kV lines will be used for transferring and selling electricity to distribution licensees. So the 22kV lines supplying power to licensees “D”, “E” and “F” can be considered as transmission system. The operator will need a consolidated license consisting of generation license and special purpose transmission license for operating both facilities. As the system is not connected to the National Grid, it can be considered as an isolated system and consolidated license can be issued.

The other possibility is that the 22kV lines supplying power to licensees “D”, “E” and “F” are owned by a separate operator and the lines are considered as transmission line. In such a case the separate operator will need a special purpose transmission license.

If the 22kV lines supplying power to licensees “D”, “E” and “F” are owned by one of the distribution licensee “D”, then “D” will need a consolidated license comprising of special purpose transmission license and distribution license.

It is not desirable to consider that the 22kV lines supplying power to licensees “D”, “E” and “F” are part of distribution system because the problem of two distribution licensees operating in one area, as discussed in the preceding paragraph 2a will be there.

C. 22kV Lines Extended from the Grid Substation of the Transmission Licensee to Supply Power to Distribution Licensees

If the 22kV line is owned by the transmission licensee, it can be considered part of the transmission system. If the line is owned by the distribution licensee and supplies power to that distribution licensee, the line shall be part of the distribution system. If the line supplies power to more than one distribution licensee, it will be considered as part of transmission system and will need a transmission license for its operation.

Decision Point:

- a. MV lines, located in the area of supply of other distribution licensees and used to supply power to more than one licensee, belong to transmission system and these lines will be operated under a transmission license. If the owner of MV line also installs transformers to sell power at LV, the transformers will be a part of the transmission system.
- b. System not connected to the National Grid is considered as isolated system and consolidated license can be issued for operation of such systems.
- c. All MV and LV facility of a distribution licensee, in its area of supply, used for the purpose of supplying power to consumers will belong to the distribution system.
- d. In case of any difficulty, EAC may decide whether a facility belongs to transmission system or distribution system and accordingly the facility will be operated under appropriate license.

6.3 Naming the MV Transmission System

The MV lines being considered as transmission system will be valid till there are large numbers of small distribution licensee supplying power to small areas. The situation may change in future only if the number of distribution licensees reduces very much and each licensee supplies a big area so that the inter connection between distribution areas is effectively through HV lines and not through MV lines. The MV lines being considered as part of Transmission system could be called either **Sub-transmission system or Interim transmission system**. The Sub-transmission will indicate that it is the smaller or junior transmission compared to HV transmission and Interim transmission will indicate that now it is being considered as transmission system and the situation will change after a period of time.