



USAID
FROM THE AMERICAN PEOPLE

ELECTRICITY TRANSIT PRINCIPLES

ASSISTANCE TO ENERGY SECTOR TO
STRENGTHEN ENERGY SECURITY AND
REGIONAL INTEGRATION

CONTRACT NUMBER EPP-I-08-03-00008-00

SEPTEMBER 2012

This publication was produced for review by the United States Agency for International Development. It was prepared by Tetra Tech ES, Inc.

Electricity Transit Principles

ASSISTANCE TO ENERGY SECTOR TO
STRENGTHEN ENERGY SECURITY AND
REGIONAL INTEGRATION

CONTRACT NUMBER EPP-I-08-03-00008-00

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

Electricity Transit Principles

ASSISTANCE TO ENERGY SECTOR TO
STRENGTHEN ENERGY SECURITY AND
REGIONAL INTEGRATION

CONTRACT NUMBER EPP-I-08-03-00008-00

September 2012

Prepared for: United States Agency for
International Development
Armenia Mission
1 American Ave.
Yerevan 0082 Armenia

Tetra Tech ES, Inc.
4601 N Fairfax Drive
Suite 601
Arlington, VA 22203

Prepared by: Tetra Tech ES, Inc.

Tel: +1 703 387 2100
Fax: +1 703 387 2160
www.tetratech.com
www.arnesri.am

Version: 1.0

TABLE OF CONTENTS

| | | |
|-----------|---|------------|
| 1. | Introduction | 1-1 |
| 2. | Principles of Organization of Electric Energy (Capacity) Transit | 2-1 |
| 3. | Tariffs/prices for electric energy (capacity) transit services | 3-1 |
| 4. | Management of Transmission Capacity Shortage | 4-1 |
| 5. | Conclusions | 5-1 |
| | Attachment A. Key Issues of Electric Energy (Capacity) Transit over High Voltage Electric Grids of Armenian and Georgian Power Systems | A-1 |

1. INTRODUCTION

Under current conditions due to expansion of international trade in energy resources, including electric energy and capacity, transit issues acquire more importance. On the way from a producer to a consumer the energy resources increasingly cross the state borders, and the parties of trading operations need to solve difficult issues related to movement of goods, including transit issues.

In this case transit implies movement of goods (electric energy) produced in one country (a power system) through the territory (over electric grids) of another country (a power system) to be consumed in a third country (a power system), as well as movement of goods (electric energy) from one point in a country (a power system) to another point of the same country (power system) through the territory (over electric grids) of another country.

Solution of transit issues because of restructuring of electricity sector and development of competition has become a more vital task. Given the importance of settlement of transit issues, the countries-signatories to the Energy Charter Treaty stipulated a number of provisions related to transit. The most principal provision states the freedom and non-discriminatory transit of “energy materials and products”, in particular, electric energy (capacity).

The purpose of this document is to discuss the most crucial issues connected with electricity transit and develop proposals that would be applied at transboundary trade in electric energy in terms of parallel operation of power systems of Georgia and Armenia.

2. PRINCIPLES OF ORGANIZATION OF ELECTRIC ENERGY (CAPACITY) TRANSIT

Electric energy (capacity) transit is performed in accordance with transit agreements concluded between the economic entities – participants of trading operations with an organization-transiter. As a rule, such agreements accompany agreements for supply (sale/purchase) of electric energy (capacity). To fulfill these agreements the respective power flows are performed over transmission grids of the power system, where the ownership right for this electric energy is not changed. Transit conditions may vary by an agreement and reflect various nuances of supply contracts. However, there is a number of principles and provisions which, as agreed by the parties, should be followed without regard of features of specific electric energy (capacity) supply agreements. To enforce these principles and provisions the parties concerned (countries, power systems), through electric grids of which transit is performed, as a rule conclude “framework” agreements that contain principles and provisions to be followed when concluding specific electricity transit agreements in accordance with a specific power purchase agreement.

These fundamental principles and provisions are as follows:

- Freedom of transit: the parties within technical capabilities of their power systems shall facilitate electric energy (capacity) transit;
- Non-discrimination of transit: the parties shall not discriminate on the basis of a location, a place of destination and an owner of electric energy and capacity, and render transit services at agreed and economically reasonable and transparent tariffs;
- Equal conditions: the parties, within technical capabilities, shall provide for equal conditions for transit, as well as for electricity transmission of suppliers located on its territory;
- Compliance with international agreements: each party shall oblige to comply with all electric energy (capacity) obligations resulting from international agreements on electric energy (capacity) exchange concluded by the other party or its economic entities;
- Inadmissibility of unauthorized withdrawals of electric energy (capacity): a party through territory of which the electric energy (capacity) transit is carried out shall undertake every possible action to prohibit and prevent unauthorized withdrawals of electric energy (capacity) in the process of transit by any economic entities connected to the grid of a country-transiter;
- Transparency of transit services tariffs: transit tariffs may reflect investment and operating expenses and may be set on the basis of existing methodologies, including regulation and mechanisms of management of deficit of transmission capacity;
- Prevention and mitigation of consequences of emergencies: the parties shall undertake all possible actions to minimize the risk of emergency interruption, reduction of volume or termination of transit supplies of electric energy (capacity) and in the event of such situations it shall undertake all actions required to restore a usual operation of power system facilities used for transit of electric energy (capacity).

3. TARIFFS/PRICES FOR ELECTRIC ENERGY (CAPACITY) TRANSIT SERVICES

As noted above, tariffs/prices for transit should be determined on the basis of specially developed methodologies for respective power systems and may reflect both operating and investment costs of a power system-transiter. The practice of pricing/tariff setting for transit services used different methodologies. In general, it can be summarized under two principles –

- Marginal costs related to electric energy transit, and
- Average costs assuming cost recovery of transmission system

Marginal costs methodology assumes determination of additional expenses in the power system of transiter related exclusively to provision of transit services, including losses on grids. For this purpose, the analysis of power flows caused by transit flows is performed. Under results of this analysis nominally selected areas of grids are determined for each transit case and marginal costs related to transit are computed for these areas. Tariffs may be differentiated based on the distance to which electric energy is transmitted. Transit tariffs may also reflect the difference of marginal electricity prices between nodes of supply and consumption. This approach is used by the systems with electricity markets created with the model of marginal nodal prices. Deficiencies of the methodology based on marginal costs include the need to conduct specialized technical and economic estimates to determine the marginal transit cost for different trading operations assuming transit services. The estimates may be quite comprehensive and may be used by the power system-transiter operator to manipulate with tariffs for the benefit of economic entities in the system, so that they can benefit from the market activity. Therefore, this methodology is not common in terms of modern electricity markets. Methodologies based on the principles for ensuring cost recovery, including operating and investment, and on the operation of transmission system in the transiter power system, are used more often.

Methodologies based on the principle of recovery of average costs are based on the concept that the use of transmission system for electricity transit is one of the forms of using this system, and entities that utilize transit services are, in fact, use the services provided by operators of power systems-transiters to its principal users, according to the validity period of supply contract. Respectively, tariff for transit services calculated as \$/kWh should be uniform for all users. One of the most frequently used tariffs is based on this methodology, i.e. “postage stamp” tariff. The deficiency of this methodology is inability to account for actual power flows that take place in the power system.

The variety of the postage stamp methodology is the methodology of “contractual ways”. This methodology assumes that an operator of a power system-transiter allocates a specific number of “contractual ways” for a multitude of possible transit flows resulting from the trading operations and for each “contractual way” a tariff will be calculated based on the recovery of investment and operating costs regarding transmission facilities used for transit under this “contractual way”. The relative advantage of using this methodology is that it allows attributing costs of transmission facilities, construction of which was based by the need to ensure transit, only to those who benefit from trading operations that involves electricity transit. This methodology in some cases may reflect the impact of actual physical flows. However, it does not reflect the impact of loop flows caused by transit power flows.

4. MANAGEMENT OF TRANSMISSION CAPACITY SHORTAGE

In many cases, especially with increase of electric energy (capacity) supply volumes and resulting loading of transmission systems and interconnections, it turns out that transmission capacity of elements of existing transmission systems are loaded to such an extent that a power system-transiter cannot satisfy bids of all parties willing to enter into trading operations requiring transit, i.e. there is a shortage of transmission capacity. The most obvious way to deal with this phenomenon is to perform technical actions in order to increase transfer capacity of existing grids and build new grid facilities. However, these solutions require sufficient investments and considerable time to solve a lot of emerging issues. For the purpose of rapid solution of issues related to solving problems that emerged because of shortage of transmission capacity, the approaches are used that can be described as congestion management. These approaches are characterized by application of various methods of allocation of transmission capacities. The most frequently used are the following:

- “First in first out”: under this approach the first party that submitted request for transmission capacity gets the requested transmission capacity, and the parties that addressed later will get what has left;
- “Proportional” allocation: a transmission system operator collects requests for use of transmission capacity for a specific period and if total requested capacity exceeds the available transmission capacity it allocates the available transmission capacity in proportion to requests;
- Auctions for selling transmission capacity: a transmission system operator conducts auctions for selling the available transmission capacity. The parties which managed to buy transmission capacity at the auctions get the right for transit required to perform a trading operation. It is interesting to note that there is no concept of transit in power systems that operate markets built under the model of nodal marginal prices, where electricity transmission cost from one node to another is determined by the difference of nodal prices for electricity at respective nodes. The market entities willing to hedge against nodal prices fluctuations may purchase at the auctions the financial equivalent of transmission capacity – Financial Transmission Right from one node to another. An entity with such Financial Transmission Rights has the right to collect a difference of nodal prices at appropriate nodes.

It should be stressed that operators of transmission grids used for transit purpose should develop and maintain an information system, from which all market entities and potential consumers of transmission services may promptly get data on the condition of transmission grid and availability of transfer capacity.

5. CONCLUSIONS

These issues and many other issues should be reflected in framework agreements so that economic entities by analyzing possibility of concluding specific trading operations have the maximum possible data about the fundamental issues of a specific contract for transmission/transit of electric energy.

For the purpose of efficient negotiations on drafting framework agreements the special working groups consisting of representatives of all stakeholders are usually formed.

Key issues of electric energy (capacity) transit over high voltage electric grids of Armenian and Georgian power systems are attached as Annex A.

ATTACHMENT A. KEY ISSUES OF ELECTRIC ENERGY (CAPACITY) TRANSIT OVER HIGH VOLTAGE ELECTRIC GRIDS OF ARMENIAN AND GEORGIAN POWER SYSTEMS

In the course of presentation and further discussion of issues of electric energy (capacity) transit the following key issues were identified⁶ which require either clarification or further elaboration:

- Equal rights for electricity transit – this notion assumes equal rights of business entities who apply to a grid operator-transiter for transit service, as compared to business entities in the power system of transiter, which may want to export power and are potential competitors of economic entities that need transit services. **This comparison is not applicable with the rights of domestic consumers in the power system of transiter who always enjoy priority rights.** Any transit should not cause limitations in supply of power to domestic consumers.
- Transit tariffs should be transparent – transparency does not mean simplicity. It means that the methodology and applied software should be trusted and approved, and source data, based on which tariff is calculated, should be transparent and available for verification and validation.
- Tariffs for rendering electricity transit services over electric grids of every country should be a “mirror” images. Does it mean that tariffs should be equal in numerical expression or that the methodology used for tariff calculation for transit over the grids of each country should be consistent but numerical values of tariffs calculated with the use of this methodology may vary? Discussion of this issue should be continued.
- With respect to methodology applied for calculation of transit services tariffs, it is believed that “postal stamp” methodology based on calculation of average costs is the most preferred than other methodologies being considered in the presentation of methodology. However, there were proposals that other methodologies based on calculation of average costs, in particular, methodology of “contractual way” should not be disregarded at this stage. For some scenarios of prospective development of electric grids some options of “contractual ways” should be identified and for each of them the calculation of transit tariff should be done. This would allow to have a more objective picture at selection of the preferred methodology option for tariff calculation.
- With respect to congestion management it was proposed that given existing and planned transit ways and proposed potential trade volumes of electricity requiring transit services, transfer capacity for long-term transboundary supplies of electricity is adequate and, therefore, no additional fee for reserving transmission capacity is required. In case of shortage and conducting auctions to reserve transmission capacity, a question emerges about whether a participant may reserve transmission capacity and keep the reserved portion of transfer capacity without entering into sale/purchase contract for this portion. The latter actions represent barriers to the competitive market development and the proper procedures should be developed to prevent them.
- Whatever methodology of congestion management is adopted for the purpose of proper operation congestion management system, every power system should adopt an information and technological system available for market participants to confirm entering into contracts for electric energy (capacity) supplies in order to

have a possibility to get a prompt information about available transmission capacities in the power systems of transmitters and in the event of availability of required transfer capacity to reserve it in the “Online” mode with further confirmation of entering into contract for electric energy (capacity) within the timeframe set by the rules;

- It would be good to have available data about whether preliminary actions to prepare for negotiations on transit agreements by counteragent in the power system of Georgia are taken place. Does it make sense to conduct preliminary consultations with Georgian representatives to determine the key issues to be considered during negotiations on framework transit agreement and appropriately edit the draft agreement on electric energy (capacity) transit through the power systems of Armenia and Georgia?