USAID FROM THE AMERICAN PEOPLE

ERRA

National Association of Regulatory Utility Commissioners

ERRA TARIFF AND PRICING COMMITTEE

ISSUE PAPER

CONNECTION OF NEW CUSTOMERS, CAPACITY ENLARGEMENT AND OVERVIEW OF CONNECTION CHARGES IN THE ERRA MEMBER COUNTRIES

Submitted by
ERRA Tariff/Pricing Committee

April 2008

This publication was prepared by the members of ERRA Tariff/Pricing Committee:

Mr. Indrit Baholli (Albania)

Mr. Armen Arshakyan (Armenia)

Mr. Almir Imamovic (Bosnia and Herzegovina)

Commissioner Dimitar Grivekov (Bulgaria)

Mrs. Lahorka Vlajcevic (Croatia)

Ms. Klarika Siegel (Estonia)

Mr. Iveri Shalamberidze (Georgia)

Mr. Ede Treso (Hungary)

Mr. Anatoly Shkarupa (Kazakhstan)

Ms. Kamilya Amankulova (Kyrgyz Republic)

Mr. Ainars Mengelsons (Latvia)

Ms. Aistija Zubaviciute (Lithuania)

Ms. Evgenija Kiprovska (Macedonia)

Ms. Lidia Zestrea (Moldova)

Ms. Ganchimeg Mujaan (Mongolia)

Mr. Branko Kotri (Montenegro)

Ms. Anna Bednarska (Poland)

Mr. Vioreal Alicus (Romania)

Ms. Elena Pomchalova (Russian Federation)

Mr. Mladen Petronijevic (Serbia)

Mr. Necmi Odyakmaz (Turkey)

Commissioner Sergey Dunaylo (Ukraine)

Ms. Theranda Beqiri (UNMIK, Kosovo)

USAID FROM THE AMERICAN PEOPLE This publication was made possible through support provided by the Energy and Infrastructure Division of the Bureau of Europe and Eurasia under the terms of its Cooperative Agreement with the National Association of Regulatory Utility Commissioners, No. EE-N-00-99-00001-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development or the National Association of Regulatory Utility Commissioners.

TABLE OF CONTENT

Part I 4
A. Introduction 4
B. Types of Customers -- Defined 4
C. Line Extension Tariffs for Retail Distribution Customers 5
1. Line Extension (Customer Connection) Rules 5
2. Line Extension Policies 6
3. Cost and Payment/Financing Components for Line Extensions 6
4. Other Tariff Components 8
5. Customer Information and Consumer Protection 9
D. Connection Tariffs for Wholesale Transmission Customers 10
1. Introduction 10
2. Connection Study 11
3. Other requirements 12
4. Cost Responsibility 13
E. Connection Rules for Wholesale Generation Customers 13
1. Introduction 13
2. Large Generator Interconnection 13
3. Small Generator Interconnection 15
4. Summary 16
Part II 17
A. Introduction 17
B. Two Models of Capacity Enlargement 17
C. Traditional Approach -- Integrated Resource Planning 18
D. Market Approach – Regional Capacity Markets 19
1. Introduction 19
2. The New England Capacity Market 21
Part 3 25
Overview of Connection Charges in the ERRA Member Countries 25
Comments and Answers by Countries 26
Albania 26
Bosnia & Herzegovina 28
Bulgaria 28
Croatia 29
Estonia 30
Georgia 31
Hungary 31
Kazakhstan 34
Kyrgyzstan 35
UNMIK Kosovo 36
Lithuania 37
Latvia 39

Moldova 39
Macedonia 40
Mongolia 41
Montenegro 41
Poland 42
Romania 43
Serbia 45
Turkey 46
Ukraine 50

Connection of New Customers and Capacity Enlargement

Prepared by Sandra Waldstein, Vermont Public Service Board (USA)

Abstract: This paper will review the regulatory concepts and approaches that govern the connection of new consumers to the electric distribution and transmission system. The approaches cover regulations pertaining to the connection of distribution end-use customers, wholesale transmission end-use customers, and wholesale generation customers. The paper then goes on to discuss how to plan for capacity enlargements that result from increases in demand for electric supply. Part I will begin with a description of how new U.S. retail customers are connected to the electric distribution system and how wholesale customers are connected to the transmission system. In Part II, the paper will cover the issues associated with integrated resource planning under traditional regulatory regimes and planning for capacity enlargement in market-based regimes. The paper will conclude with recommendations to consider when connecting new customers or enlarging the capacity of the electric systems within the ERRA region.

Part I

A. Introduction

Part I of this paper will cover general policies and tariff issues related to the connection of new customers. It will begin by discussing the different categories of customers under U.S. regulation. Based on those categories the paper will then discuss tariff treatment for new customer connections in various states. Finally the paper will draw conclusions about best practices in tariffs for the connection of new customers. Since the paper will focus on tariff issues it will not cover issues such as land use policy, or aesthetic or environmental issues that are often connected with the physical expansion of the distribution and transmission systems.

B. Types of Customers -- Defined

In the U.S., both the states and the Federal Energy Regulatory Commission (FERC) have roles in the expansion of the transmission and distribution system. In general, the states have jurisdiction over retail sales and the distribution system. FERC has jurisdiction over wholesale sales and the transmission system. So in considering customer connection it is important to first be sure which jurisdiction applies, state or federal, because the interconnection rules differ in each case.

The first category of customer is the end-use retail customer. The connection of end-use retail customers of electric service is governed by state rules developed by each state regulatory commission. These rules do vary some from state to state but the paper will try to identify common elements across the states. An end-use customer is one that takes service at a distribution level voltage (normally below 115kV). These end-use

customers are from all customer classes – residential, commercial, and industrial. Even in states where there is customer choice and retail competition (restructured states) most end-use customers still have to take their delivery service from the local distribution utility and therefore are considered to be retail customers of the distribution utility, not wholesale transmission customers. This category of customer takes electric service from the distribution utility under the utility's tariffs which are regulated by the state public utility commission. The tariff that governs connection of new retail customers is most often referred to as a *line extension tariff.*

The second category is the end-use wholesale level transmission customer. In some states, large customers are allowed to take electric service directly from the transmission system and do not have to be connected to the local distribution system. Typically these customers would take service at greater than 115 kV. However, not all customers taking service above this voltage level are considered transmission customers. Each state would have to make a determination about which end-use customer is a wholesale vs. a retail customer. Usually it is only a few very large end-use customers that fall into this category and only some states allow this practice. Examples of this type of customer are paper mills, large manufacturing facilities, or makers of aluminum or steel. These customers require direct transmission service to meet their high loads. Under federal law, FERC has jurisdiction over wholesale transmission customers. So in those states that allow large customers to take service directly from the transmission system, rules for connection to the electric system would be covered by that transmission company's Open Access Transmission Tariff (OATT) that is approved by the FERC. To summarize, there are differences across the U.S. with respect to whether a large end-use customer is (1) determined to be a retail distribution customer where connections are covered by state-approved line extension tariffs, or (2) determined to be a wholesale transmission customer where connections are governed by a FERC-approved OATT.

There is also a third category of "customer." Unlike the two categories above, this definition of customer is not an end-use buyer of electric service but rather a seller of electric service. Power generators can be a considered a form of customer of the transmission owning utility. Because these "customers" are connecting to the transmission system and not the distribution system, connections are governed by FERC rules. FERC issued new rules for connection of these customers over the past few years. The specific rules, called interconnection rules, differ depending on whether the generator is "large" or "small". This paper will briefly summarize both the large and small generator interconnection rules approved by the FERC.

C. Line Extension Tariffs for Retail Distribution Customers

1. Line Extension (Customer Connection) Rules

Line extensions are any projects that increase the length of the electric distribution network. They can also be called "service extensions." Any time new retail service is brought to a new customer or expanded to an existing customer the line extension tariff for that distribution utility will apply. The physical character of line extensions include such items as: (a) poles, (b) primary and secondary wiring, (c) transformers and meters, (d) right-of-way acquisition, (e) land clearing, trenching and backfilling and, (f) other one-time costs associated with service to that consumer only.

Distribution utilities in the U.S. have separate tariffs that cover the terms and conditions under which a retail end-use customer can connect to the distribution system. These are referred to as line extension tariffs and they will vary from state to state. In many cases, the state public utility commission (PUC) sets the terms for customer connections by rule rather than by order. Rules are used when a policy or decision is thought to affect all the utilities or customers within the jurisdiction of the PUC. Those rules are then incorporated into each utility's tariff.

2. Line Extension Policies

When reviewing state rules for line extensions certain basic connection policies become apparent. Central to line extension policies in the U.S. is the notion that the cost-causer pays. This policy places the burden of costs on those seeking the service. Therefore, other customers are 'held harmless.' The policy maker also tries to ensure that there is no cost-shifting between providing line extensions to customers and other utility costs. Therefore, distribution line extension costs should not include (a) normal utility maintenance costs, (b) general distribution upgrade or system improvement costs, or (c) any costs associated with the addition of load on the distribution system.[1] These policies have been enacted in all utility line extension tariffs in Vermont and they are fundamental to how costs are recovered for the connection service.

In Vermont, the policy set out in a PUC rule is that all customers requesting line extensions bear the full cost of the service except for a credit provided for a basic 100 foot service drop.[2] All costs above the basic service drop must be paid by the customer. The principle remains the same regardless of the size of the customer – all customers pay the full cost of connection.

3. Cost and Payment/Financing Components for Line Extensions

Most state commissions require utilities to provide customers with comprehensive information that fully explains the line extension process. Since the connecting customer is paying the full cost of the line extension it is important that the tariff clearly articulate the cost components that will determine the overall charge to the customer. In Vermont there are two options for calculating line extension costs. One method is based on an average cost per linear foot calculated on the actual costs of installations by the company in the previous year. The second method is based on the actual as-built cost of a new customer's installation. Vermont allows both options but requires that a utility using an average cost methodology must define each element separately. In order to ensure a customer realizes the extent of costs involved in a line extension, the distribution utility must provide a cost estimate to each customer in advance. Some states such as Ohio require the utility to provide a breakdown of costs in the estimate by discrete categories such as: (a) a list of major materials, (b) material overheads, (c) labor cost by activity, (d)

[1] See Ohio PUC Case No. 01-2708-EL-COI

[2] For further information see Docket #5496 (Board investigation into electric distribution line extension policies for the purpose of developing Board rules related to line extensions) at http://www.state.vt.us/psb/orders/document/5496orderopening3rdphase.pdf

labor overheads, (e) construction overheads, and (f) taxes. Other states may charge customers a support charge or other monthly charge instead of requiring payment of construction costs in advance. In this case the tariff will provide the formula used to calculate the customer's monthly support charge. This formula is most often based on the costs of the line times the customer's allocated share of the line.

Technical requirements for line extensions will vary from customer to customer therefore costs will vary from customer to customer, sometimes significantly. For example, special engineering requirements may be necessary for some customers and connections for large customers may require underground conduit, installation of transformers, or substation upgrades. A rural customer may live far from the nearest distribution line and thus require a long line extension whereas an urban customer may have to connect only a short distance. The costs for line extensions will vary in each case.

Typically, once the utility has determined the technical specifications and provided a cost estimate to the customer, the customer is then required to sign a line extension contract and pay a deposit (for example, 10% of cost). After the utility receives the customer deposit the utility completes its studies and engineering plans. Once these plans are complete and construction is imminent, the customer is informed that the rest of the payment is due (remaining 90% of costs). In most cases the utility will not begin construction until after all costs are paid. Service is initiated to the customer only upon full payment.

As noted, line extension costs for residential, commercial, and industrial customers will vary based on use and location. There are a number of models across the U.S. for how to finance the line extensions. In some states such as Vermont the customer, not the utility, is required to provide financing for line extensions. However other states provide the customer with financing options. These options can include a fixed payment such as in N.H. where a customer can pay $8.00 per 100 feet per month for 60 months to finance at least some portion of a line extension. Another option is to allow the customer to pay a fixed percentage of at least a portion of the total cost, plus a finance charge, over a set time period. For example, N.H. allows customers the option of paying 2% of the total costs per month for 60 months for some portion of the overall costs of the line extension. Other options include having the customer pay a deposit for a portion of the total costs, for example 25%, and then paying the balance of costs plus a reasonable finance charge over time such as over 4 years.

In some states, payment terms are different for very large customers. For example, one utility in Iowa allows commercial or industrial customers taking three-phase service to finance the cost of a customer line extension so long as the costs of construction are less than a portion of the estimated base revenue attributable to the new customer.

In other areas of the world it may be advisable to provide capital subsidies for connection of low-income single family homes or multifamily dwellings. There may be excellent policy reasons for such a subsidy. For example, electric lighting makes reading

and thus education easier which can lead to higher standards of living. Electricity for cooking may be less expensive and reduce indoor air pollution when it substitutes for expensive wood or charcoal as the cooking fuel.[3] The World Bank has financed one program in Armenia which is available for certain-income eligible customers who live in multiple unit apartment buildings heated with gas.[4] There is a mandatory minimum household contribution and the rest of the costs are financed through a subsidy.[5] Other types of targeted connection programs have been used in countries in Africa and Central America.[6] In the U.S. some utilities do provide low income customers with subsidies to lower the cost of line extensions – see for example Central Maine Power Company.[7] Any connection program that involves a subsidy to low income customers must be narrowly crafted and targeted to specific policy goals. Customer eligibility, usually pegged to family income below an explicit poverty level, must be clearly defined in advance.

4. Other Tariff Components

Line extension tariffs usually include other components besides cost and payment considerations. Items such as construction standards, use of private contractors, use of underground conduit, adding other customers to an existing line, tax obligations, and interest paid on customer deposits are often covered in the line extension tariff. Requests for relocation of existing lines can be covered as well.

Minimum construction standards are required to ensure safe and reliable service. Therefore, the tariff should include a minimum requirement (such as the National Safety Code in the U.S.) for construction by the utility or a private contractor. Construction standards beyond the minimum can be controversial. For example, should a customer be required to use conduit when underground lines are built? The use of underground lines is becoming more common, particularly in urban areas. Underground lines are more reliable and maintenance costs are often lower but underground costs can be multiples of overhead costs and capital costs can be up to four times greater. Will the utility allow a customer to use alternative construction standards? Must a customer follow an existing roadway rather than use a more direct route?[8] It is helpful to have such questions addressed in the rule or tariff governing line extensions.

A line extension tariff will often cover the use of private contractors for construction but when private contractors are allowed they must build to utility specifications. Vermont's proposed rule requires all the utilities in the state to allow customers to use private contractors to build line extensions, although the utility is allowed to provide designs and monitor construction at the customer's expense.

---

[3] *See*, http://www.worldbank.org/html/fpd/esmap/energy_report2000/ch7.pdf
[4] http://www.gpoba.org/activities/details.asp?id=4
[5] http://siteresources.worldbank.org/INTURBANPOVERTY/Resources/340040-1181_761629437/Menzies.pdf
[6] http://www.gpoba.org/oba/examples.asp
[7] http://www.whcacap.org/housing html#cmp%20lines
[8] The Board ruled that costs for construction standards that are primarily for the purpose of easing maintenance of the line must be shared between customer and utility (Docket No. 5222)

Many tariffs specify that the distribution utility must own any line extension that is situated in a public right of way. Similarly, many tariffs require that the utility own any line extension that serves a housing development or multiple customers. As for the ownership of the distribution line going from the point of service drop to the home, under Vermont's proposed rule, residential, commercial or industrial customers with demand less than 100 kW will not be allowed to build or own their own primary overhead or underground lines or secondary underground distribution lines without first getting a waiver from the Board.[9] Where customers are allowed to own a line extension, generally the customer and not the utility is responsible for maintenance of the line.

Tariffs often cover the situation when a customer pays for a line extension but at a later date other customers are able to draw on that connection. The tariff will usually also specify how cost allocation should be handled among joint owners of a line. For example, in Vermont, the tariff requires that a portion of costs be credited to the property owner when other consumers join a line within 8 years.

Customers may wish to have the utility relocate an existing line to their premises. Under these circumstances, the customer requesting the change must reimburse the utility for the costs of relocating the line. The proposed Vermont rule sets out a formula for calculation of those costs.

In Vermont, the tariff specifies that the tax obligations fall on the customer, not the utility. Customer payments for line extensions are taxed by the federal government and this tax is paid by the utility and recovered from the customer as part of line extension costs. For customer deposits, any interest on funds held by a utility must be paid to a customer on most deposits until the time that construction begins.

These are the most common charges and components found in line extension tariffs. All other costs and charges (for energy, capacity, etc.) are covered under the normal utility tariff for that customer class and are not part of the line extension tariff.

5. Customer Information and Consumer Protection

Vermont's proposed line extension rule requires all Vermont utilities to develop comprehensive customer information about line extensions. A booklet or brochure must adequately and fully explain the line extension policies to customers and it must include an explanation of the rationale behind these policies.

The information must also explain that the utility will try to accommodate individual customer needs where possible but that no deviations will be accepted that will result in significant additional maintenance problems for the utility. Any additional costs that result from an acceptable accommodation to a customer request will be the responsibility of the customer.

There is another type of information that Vermont's proposed line extension rule will provide to customers. Upon a customer request, a Vermont utility must provide

[9] Vermont does allow customers to own their own primary distribution lines if underground.

relevant information to a customer about alternatives to the proposed line extension. These alternatives can include off-grid electric generation installations.

There are times when a dispute can arise about the design or construction of a line extension. In Vermont, once a customer makes a request to the utility for a line extension the utility must inform the customer in writing of all customer and company rights relating to the line extension requested. In addition, the utility must provide the customer with a toll-free phone number for the state agency responsible for handling any disputes that may arise. Most states have some form of dispute resolution procedures that are incorporated into their line extension tariffs. In the event that a dispute cannot be resolved among the parties, such a dispute would be filed with the Public Utility Commission for a formal investigation and decision.

D. Connection Tariffs for Wholesale Transmission Customers

1. Introduction

In 1996, FERC adopted two rules (Orders 888 and 889) to end undue discrimination in transmission service and to require that all transmission customers have open access to the transmission system. In February 2007, FERC adopted a third rule (Order 890) that incorporates additional reforms to the federal open access regulatory regime. These new reforms are designed to promote competition in the wholesale power markets and strengthen the transmission grid. All users of the transmission system from the transmission owners, to the transmissions customers, to the RTOs and ISOs that manage these systems are now bound by these FERC rules.

There continues to be some debate about FERC/state jurisdiction boundaries. FERC has jurisdiction over interconnections to the transmission system and states have jurisdiction over interconnections to the retail distribution system. However the boundaries between federal and state jurisdictions can be blurred in certain situations. For example, FERC asserts jurisdiction over interconnections for wholesale electric transactions whereas the states assert jurisdiction over interconnections to distribution facilities. Questions still remain about exactly where these jurisdiction boundaries begin and end for specific cases and transactions. FERC and the states try to collaborate whenever possible to resolve these disputes.

Some states do not allow transmission customers to connect directly the transmission system. It is only in those states that do allow such direct connection to the transmission grid that FERC rules governing interconnection of customers would apply. Each transmission utility in the U.S. must have an approved open access transmission tariff or “OATT” that conforms to the FERC rules. This paper will not be able to go over these rules in great detail but will try to draw some common themes from a review of some published OATTs. Each transmission utility has specific facility connection requirements described in its OATT but a review shows that there are common elements to the connection process for this type of customer. These common requirements are described below.

2. Connection Study

Large customers that want to connect their load directly to a transmission system must first file an application with the transmission utility (Transco) with which they want to connect. The customer must provide certain information in its application such as diagrams showing all proposed connection points and technical data on switches, relays, voltage levels, etc. The applicant must also specify the requested voltage level and MW or capacity required at the point of connection. The application is then evaluated by the Transco. Because these are typically very large additions to the transmission system, each application is studied individually to determine any required system additions or modifications that may be needed because of the connection of the new customer. The interconnection study also looks at the impact of the requested service on the physical reliability, safe operation, and integrity of the transmission grid. Such studies can be very comprehensive and expensive. The study will include an analysis of any or all of the following: reactive power requirements, stability requirements, harmonics, short-circuit fault corrections, transient voltages and other voltage impacts, safety requirements, maintenance requirements, and operations protocols including communication. All prudent electric practices must be ensured before a study is considered to be complete. The requirements that must be met in the study will also be consistent with the principles and practices of all the relevant national standards such as those set by the National Electric Reliability Council (NERC).

One example of items that are included in a connection study is this list offered under a recent Avista transmission tariff for Facility Interconnection Requirements. Avista's facility connection requirements address, but are not limited to, the following:

1. Coordination of joint studies of new facilities and their impacts on the interconnected transmission systems;
2. Notification of new or modified facilities to others (those responsible for the reliability of the interconnected transmission systems) as soon as feasible;
3. Voltage level and MW and MVAR capacity or demand at point of connection;
4. Breaker duty and surge protection;
5. System protection and coordination;
6. Metering and telecommunications;
7. Grounding and safety issues;
8. Insulation and insulation coordination;
9. Voltage, reactive power, and power factor control;
10. Power quality impacts;
11. Equipment ratings;
12. Synchronizing of facilities;
13. Maintenance coordination;
14. Operational issues (abnormal frequency and voltages);
15. Inspection requirements for existing or new facilities; and
16. Communications and procedures during normal and emergency operating conditions.[10]

[10] For example, customers receiving service shall maintain a power factor of .90 lagging but in no event leading unless agreed to by Avista. Customers found to have a power factor of less than .90, or leading, or other detrimental conditions shall be required to remedy the problems, or pay and additional charge as

Often these studies can take considerable time to complete. Some Transcos offer customers the option of requesting an expedited procedure for the connection. In such cases, the customer agrees in writing to compensate the Transco for all costs incurred to complete the connection, including the costs of any additional studies of system impacts that the Transco deems necessary.

3. Other requirements

The customer requesting a connection from the Transco will typically have to meet other requirements as well. The customer will have to install and maintain metering and communication equipment so the Transco can measure and account for the capacity and energy transmitted to the customer and properly bill the customer for service taken over its system.

The customer is also normally required to maintain a power factor that is within the same range as the Transco and this power factor requirement will be specified in the agreement between the Transco and the customer.[11] The purpose of this requirement is so that the new customer will not place an undue burden on either itself or the Transco to absorb reactive power. If the power factor requirement is not met then typically the Transco will install power factor correction equipment at the customer's expense.

Harmonic and power quality protections must be maintained. Harmonics can cause interference with communications and solid state equipment so the customer must keep current harmonics within a certain range. The Transco may measure harmonic distortions and could require the installation of transformers to limit any damaging harmonic activity. A connected customer facility will also be required to maintain any voltage imbalance within a certain range because unbalanced phase voltages and currents can lead to system equipment damage such as thermal overloading of transformers.

Other requirements can include maintaining voltage levels within certain limits of the transmission system. Customers are urged to install their own voltage regulation equipment and keep voltage set points within a normal transmission voltage bandwidth. In some cases protective relay equipment will need to be installed to protect the customer's facility. The customer is normally responsible for protecting its own interconnected equipment against any faults, imbalances or disturbances.

Sometimes the Transco requires a connecting customer to take part in certain programs that are included in the tariff for all customers that take transmission service. For example, all Avista end-use transmission customers must participate in an under frequency and over frequency program and are also required to participate in the regional under frequency load shedding program.

---

detailed in the Rules and Regulations section of Service Schedule 70. See, http://www.oatioasis.com/AVAT/AVATdocs /Facility_Connection_Requirements.pdf

[11] *Id.*

4. Cost Responsibility

In all customer connection tariffs, it is the customer applying for the connection that pays all of the direct and associated costs of the connection including all connection components, service drops, and any required transformers or substations. In most cases, the connection study is performed sequentially with continual interaction and communication with the customer so the customer has some control over the costs and timing of expenditures but each stage of the study will not go forward until the customer has either paid in full or provided a deposit to the Transco and signed an agreement to fund the work. Ultimately, the customer is responsible for all costs of the study and the customer is also fully responsible for any costs necessary to upgrade the transmission system that result from the customer's connection.

E. Connection Rules for Wholesale Generation Customers

1. Introduction

There is a third category of consumers that some might consider as "customers" of a transmission utility – generators that need to connect to the transmission system in order to sell power. In the U.S. FERC has issued recent orders outlining the interconnection procedures for generation facilities. Those orders segregate generators by size with one set of rules applying to Large Generating Facilities and another set of rules applying to "Small Generating Facilities."

2. Large Generator Interconnection

FERC issued a series of orders specifying rules for the interconnection of large generating facilities beginning with Order No. 2003 issued in July 2003, and continuing with Orders 2003A-C issued in 2004 and 2005. These interconnection rules are applicable to generating facilities with a capacity of 20 MW or larger. In Order 2003, FERC concluded that the interconnection of generating facilities was a separate, but necessary, element of transmission service. In this decision, FERC required jurisdictional transmission utilities to include provisions in their open access transmission tariff (OATT) regarding interconnection standards. The Order sets out specific requirements that the utilities must follow in the Interconnection Process. In particular, transmission utilities or Transcos must proceed to interconnect generators according to large generator standardized interconnection procedures (LGIP) and must finalize agreements with these customers according to standardized large generator interconnection agreements (LGIA). Some variations from these standards are allowed with prior approval from the FERC.

The LGIP specifies the steps that must be followed when interconnecting a large generator. The first step in the interconnection process is for the "customer", in this case a large generator, to submit an application. All necessary information must be submitted by the customer at this point. Once a completed application is on file with the Transco

that customer will enter the interconnection queue. This is important because queue position will determine the order of performing requests for interconnection study which must be completed by the transmission owner before interconnection can proceed.

The Transco and the customer will then schedule a scoping meeting to discuss the application. The scoping meeting will address both technical requirements and data needs. The scoping meeting is followed by a feasibility study, undertaken by the Transco, which will provide the customer with a general indication of whether it is reasonable to go forward with the interconnection. Once the customer agrees to move forward, the next step is for the Transco or its contractor to undertake a series of interconnection and system impact studies. The system impact study is very comprehensive and can entail dynamic modeling of both the transmission system of that particular utility as well as modeling of neighboring systems. Once these studies are complete the Transco will turn to an analysis of the customer's facility to determine what upgrades or technical requirements may be needed to provide the connection to the Transco.

After all studies are completed and the customer decides to go forward with the project a Large Generator Interconnection Agreement is signed by both parties. The FERC Order specifies the content of that agreement. The customer can choose from two services, a basic interconnection service or a network service interconnection which is more comprehensive. The choice is up to the customer.

The pricing policies for large generator interconnections are very complex and have been somewhat controversial. The series of four orders changed some details of the pricing terms over the years. The rule distinguishes between independent and non-independent transmission providers and clarifies who pays for interconnection costs when the transmission provider is not independent. A transmission provider is deemed to be not independent if it owns generators or has affiliates that own generators. The rules clarify who pays for generator interconnections when the transmission provider is not independent. Generally, the generator must pay for facilities on its side of the point of interconnection and then the rules determine who pays for network upgrades beyond the point of interconnection.

FERC maintains a pricing policy for network upgrades that allows the Transco to charge the *higher of* (1) the incremental cost of new upgrades required to interconnect its generating facility or (2) an average embedded cost rate for the network upgrades required to connect its generating facility. FERC emphasizes that this policy is necessary to ensure that other transmission customers will not subsidize network upgrades. FERC will not allow a Transco to recover operations and maintenance (O&M) costs through the interconnection pricing. FERC stated that it has long been its policy that O&M costs associated with network upgrades should not be directly assigned to an interconnection customer. The reasoning behind this is that since all transmission users benefit from the network upgrade, all customers, not just the interconnection customer, should pay for the O&M costs.

The cost of any network upgrade needed to accommodate the new generator is initially funded by the generator. Then the Transco is required to refund the amounts

paid by the generator over a period of years following the commercial operation of the generator. Such payment would be by credits from the Transco to the generating customer. FERC later clarified this term to require that full reimbursement be made to the generator within 20 years for any required network upgrades. Since reimbursement cannot extend beyond 20 years a balloon payment may be required to be paid the customer at that time. FERC stated in this decision that it considers the upfront payment from the generator to the Transco to be a loan from the customer which must be repaid in full no later than 20 years after the date of service. The principle behind this rule is that the customer should not have to pay both for the incremental cost of the new service (by paying for network upgrades) and also pay for the average embedded costs of the system (through the transmission tariff). So once transmission service begins, the generating customer must receive transmission service credits for the cost of all network upgrades it paid upfront to ensure interconnection.

The rules also cover the conditions under which a Transco must pay a generator for reactive power supplied to the Transco's system. Generally, a payment must be made when the Transco asks the generator to provide reactive power outside of a specified power factor range, or dead band. The Transco also may not discriminate between payments made to its own or affiliated generators and payments made to independent generators.

This has been a very brief summary of FERC's complex large generator interconnection rules. The rules allow some flexibility for RTOs and ISOs. Non-RTO Transcos can also apply for flexible treatment as well but will be held to high standards with regard to any deviations from the interconnection rules. All transmission providers must now have an approved tariff or OATT on file with the FERC that includes all the terms of these interconnection rules.

3. Small Generator Interconnection

In order to promote the interconnection of small generators including those producing renewable energy FERC issued Order No. 2006 in May 2005 and issued an Order on rehearing in November 2005. FERC worked closely with the state commissions through NARUC to harmonize federal and state interconnection practices and adopted a number of best practices across states when formulating the federal rule. The goal was to provide national, consistent rules for small generators that would remove unfair barriers to their interconnection. These federal rules do not apply to state jurisdictional distribution systems.

The Orders outline the interconnection rules and procedures for Small Generating Facilities which are defined as generating facilities with a capacity up to 20 MW. In addition to setting out rules for the interconnection of generating facilities below 20 MW these Orders also provide for a default study process that can be used by any small generator, a "Fast Track Process" for certified small generating facilities that are no larger than 2 MW and "Super-Expedited Procedures" for certified inverter-based small

generating facilities no larger than 10 kW.[12] The goal of the default and expedited procedures is to reduce interconnection time and costs for specified types of generators.

The default study process includes four steps – the scoping meeting, the feasibility study, the system impact study, and the facilities study. There are specific rules that set out the various time limits that must be met by the Transco in each one of these steps. The other two expedited processes rely on technical screens rather than interconnection studies to quickly identify reliability or safety issues. In order to successfully pass the screen the aggregated generation, including the proposed small generation, must not exceed 15 percent of the line section annual peak load as most recently measured at the substation.

In parallel with the large generator interconnection rules, the small generator rules require Transcos to include in their OATTs standardized small generator interconnection procedures (SGIPs) and to enter into standardized small generator interconnection agreements (SGIAs) with any generator less than 20MW that files a connection request.

The pricing and payment provisions for small generators are essentially the same as the specified cost responsibility and pricing policies for large generator interconnections. Under that policy, the costs of facility and network upgrades are directly assigned to the customer. But as in the large generator connection rules, if the Transco is a non-independent provider, the rules specify that the customer initially funds the cost of any required network upgrade and the Transco must reimburse the customer for the upfront payment. However, network upgrades are unlikely to be necessary for connection of small generators. FERC stated that it did not expect that there would be any network upgrades required to interconnect for most small generators.

4. Summary

Both the large and small generator interconnection policies are designed to ensure that all generating facilities within FERC's jurisdiction are able to connect and sell electric energy in interstate commerce at comparable terms. The rules were designed to reduce connection time and cost while preserving reliability. Most importantly, they were designed to place all generators in each category on equal footing. Transmission owners must treat all interconnection applications the same; they may not discriminate in favor of their own generators. The pricing policies are designed to segregate the costs incurred by the customer to upgrade its facility in order to be able to interconnect, from the costs that emanate from the need to upgrade the network attributable to the interconnecting customer. The customer is required to pay for these upgrades upfront but the Transco must then reimburse the customer over time via a credit to its bills.

[12] An inverter converts DC voltage to AC voltage and would be used in such applications as solar panels.

Part II

A. Introduction

The purpose of Part II is to discuss two different models for planning and providing for capacity enlargements when new electric loads are added to the system or when existing loads growth increases system demand. One might think that the responsibility for new loads on the electric system should fall to the new customers that are responsible for increasing the system demand. However, as explained below, that is not the way that the U.S. regulatory system has been devised. There are really two paradigms for capacity enlargement in the U.S. today, the traditional regulated model and the more recent market approach.

B. Two Models of Capacity Enlargement

There are two current approaches or paradigms for planning for capacity enlargement in the U.S. There is the traditional state-regulated planning model for vertically integrated utilities where traditional planning oversight is through the Integrated Resource Planning (IRP) process. The second approach is the new market model for states and regions where utilities are no longer vertically integrated and generation is a market-based, unregulated commodity. In these areas planning for capacity enlargement is the responsibility of the regional transmission organization or RTO.

Under traditional U.S. regulatory policy, a distribution utility receives a franchise or certificate to operate from the state regulatory commission. In return for holding the franchise, the distribution utility is under the obligation to serve the electric needs of all of its customers, both existing and new customers. In order to fulfill this obligation the utility must purchase power supplies to meet the entire load on its system. In the traditional model the state regulators ensure an adequate level of capacity by reviewing the plans of their regulated utility companies. The cost of procuring those power supplies is recovered through the tariff and rates of the distribution company, based on the costs of its investments plus a reasonable rate of return. The individual customer has the responsibility to pay for the power it receives under the terms of the tariff published for its customer class. All customers within a given rate class pay the same tariff, no matter whether they are old or new customers. Of course, many tariffs for larger customers are based on peak demand. The tariff structure or price per kW or kWH does not change according to the customer, however the customer bill will vary depending on its usage.

So under the traditional regulatory regime, a new retail end-use customer that connects to a distribution system will pay the connection charges discussed above and then when service begins it will go directly onto the distribution company's published tariff for its rate class. It will be treated as all other existing customers of this rate class and it will incur charges based upon the published tariff rate times its usage. No other charges will be assessed to the new customer. It certainly can be the case that a

sufficiently large customer addition to a small utility distribution company will increase that company's costs so much that the distribution utility will be forced to come to the regulators for an increase in rates. But that scenario is handled by the regulator as would be any other request for a rate increase.

This traditional approach is no longer used in all areas of the U.S. Under the new market models that exist in the U.S. utility companies are no longer vertically integrated, generation assets have been divested to private, unregulated companies, and those generation companies compete in the market to provide power to customers. Customers can freely choose competitive suppliers from among several. Now the distribution company has become a strictly "wires" company and the former obligation to serve the power needs (as opposed to the transportation needs) of all customers has been severed.

This breakup of the "regulatory compact" means that capacity enlargement must now be met through market mechanisms alone. However, regional system operators are charged with ensuring system adequacy and reliability. So, where the deregulated model has been implemented, the regional market operator sets capacity standards and oversees the regional system plan.

Planning for capacity enlargement in both the traditional regulatory regime and the new market environment is quite different. I will discuss both briefly.

C. Traditional Approach -- Integrated Resource Planning

Under the traditional regulatory approach, oversight and planning for capacity enlargement is through the Integrated Resource Planning or IRP process. In this model the state commission requires distribution utilities to show that they can provide sufficient capacity to meet customer needs and plan for these needs in advance. This model is used in most non-RTO areas of the U.S. where load serving entities (distribution utilities) are still vertically integrated and where each state regulates retail electric prices based on cost of service. In these areas of the country, the state typically requires load serving utilities to provide sufficient capacity to meet customer needs and plan for these needs in advance.

Integrated least-cost planning is an approach which is designed to find the set of options most likely to provide electric energy and capacity at the lowest cost once appropriate service and reliability levels are determined. An IRP is an assessment of all demand-side and supply-side resources to cost-effectively meet customer electricity needs. Under the IRP approach, the utility must submit a plan to acquire all resources to meet future need. An IRP includes a forecast of customer energy and demand requirements and an evaluation of supply-side resources such as traditional generation technologies and renewable resources. It also includes an evaluation of demand-side resources such as conservation, energy efficiency, and load-shifting.

The methodology & documentation for an IRP is quite rigorous. The forecast is typically for a 20 year future period and will include load data by customer class. The energy and demand forecasts will be based on historic and projected load shapes and will include annual, seasonal, monthly, and weekly data. The data will also be captured by customer class. An IRP will also usually include alternative forecasts and multiple

scenario alternatives. This alternative approach will examine possible fuel inventory and procurement practices, environmental emission allowances, generation expansion criteria, transmission and distribution upgrades, and all avoided costs. The plan should also include a description of the modeling process used in the analysis.

Many states have laws that require utilities to do least-cost integrated resource planning and to choose the lowest cost resource in meeting future need. The state regulators review these IRPs to ensure that each utility plans for future capacity requirements in a least-cost manner. The IRPs can be reviewed in an evidentiary hearing where multiple parties can comment on the plan. Since state regulators review IRPs to ensure each utility plans for the future in a least-cost manner, the commission review will examine all the options open to the utility. For example, a utility can build generation, it can enter into purchase power agreements, or it can acquire demand-side resources. The regulator reviews the IRP to ensure that the utility's acquisition plan is the lowest cost – based on a societal cost/benefit test which takes into consideration non-priced costs and benefits such as environmental impacts. In reviewing an IRP the regulator looks at all possible resources that could meet the system need including conservation and demand response.

The compliance phase of the integrated planning process usually comes in a rate case where the utility options set out in the IRP are often reviewed against the utility's actual management decisions. If the management decisions are not consistent with the company's IRP, the utility could be penalized for not choosing the least-cost option. For example, if a utility has asked for rates to cover a new acquisition and it was shown in a contested case proceeding that the chosen resource was not in compliance with company's IRP or was not the lowest cost option than that utility could face a rate disallowance.

The advantage of the IRP process is that it provides for a systematic and objective evaluation of all resources available to meet customer load requirements. It also results in a portfolio approach to resources needs that reduce risk to both ratepayers and the company. The IRP process requires a regulated company to develop a rational future plan for capacity enlargement, and review of the company's resource choice is monitored by the regulator through its review of the IRP and if necessary, in a rate case proceeding. Through this process, the regulator ensures that the capacity needs of the state are met in the lowest cost manner possible.

D. Market Approach – Regional Capacity Markets

1. Introduction

In areas of the country that have severed the link between the regulation of generation and utility provision of electric service to customers the IRP approach is no longer workable. Since the distribution utility has been required to divest all generation the regulator cannot require it to have a plan to meet future resource needs. In these areas of the country supply is provided by merchant generation companies that are not under

traditional regulatory review. It is expected that the actions of the marketplace will lead to equilibrium conditions, where supply and demand will be in balance.

However, electricity is unlike other market commodities because the product is used instantaneously and cannot be stored. These physical attributes, combined with a social goal of total reliability, places enormous emphasis on the regional system operator which must ensure that supply and demand are in balance at all times and there is sufficient capacity to meet all demand plus provide reserves for insurance should there be an unforeseen emergency. Under the regional market approach, the system operator (RTO/ISO) is charged with ensuring that sufficient capacity is available to maintain system-wide reliability.

Capacity planning at the regional level begins with a determination of the system-wide Installed Capacity Requirement (ICR). ICR is set annually and is based on actual load and forecasted load. When calculating ICR, the RTO/ISO receives load forecasts from each utility within the region. It also reviews any outstanding generator requests to ensure that there is sufficient supply to meet the demand. In addition, to maintain reliability criteria ICR will also include a reserve margin requirement that is developed by the regional reliability authority.

The RTO/ISO ensures ICR is met each year by imposing the obligation to meet the regional capacity need on each load serving utility. Each load serving utility is responsible for its share of ICR based on its share of system-wide load. Each utility has many options to meet its ICR requirement. It can meet the requirement with owned generation, with bilateral contracts with suppliers, by arrangements with energy service providers under contract to customers within the distribution company's service territory, with imports from another control area, or with demand response resources. However, to the extent that the utility falls short of its obligation in any one month, it must purchase the shortfall on the capacity market.

Planning for sufficient capacity under this market model has been a problem in many areas of the U.S. Since the deregulation movement, many RTO areas have seen declines in new generation being built. Many analysts have studied this issue and agreed that the existing market designs do not provide sufficient incentives for new generators to invest in capacity. Where capacity markets do exist, the generally accepted view is that they are seriously flawed. The experts suggest a number of solutions to this problem ranging from removing price caps in the energy market, to providing all customers with real time meters and time-of-use pricing, to better designs for the capacity market. Others suggest that more long term contracts between generators and distribution companies are needed. Although it is theoretically possible for all of these approaches (or a combination of approaches) to resolve the capacity problem, the solution adopted in New England was to reform the capacity market. The rest of this section will describe the new capacity market in New England.

2. The New England Capacity Market

a. History

In New England we rely on the wholesale electricity market to send signals about where new capacity is needed. But even with an energy market based on locational marginal pricing, new capacity was not being built. Energy market revenues were insufficient for generators to build capacity in the region. Analysts posed a number of reasons for this situation. The main reason was continuation of price caps in the energy market, even during energy shortages. Analysis showed that price caps (set at $1,000 per MWh) constrain the amount of revenue a generator can earn from the energy market alone.

The New England state regulators, among others, agreed that an uncapped energy market was not an acceptable option for largely political reasons. Instead they agreed to develop a capacity market in which generators could earn revenue to finance new investments. New England decided to add an annual auction-based capacity market to its current energy market. The capacity market design was approved by FERC in 2006 and market rules developed and approved by FERC in April 2007. The first auction under this market design is expected to be held in 2008 for delivery of the capacity product in year 2010.

b. Setting and Meeting the Installed Capacity Requirement

ICR is set annually and is based on actual load and forecasts of load. ICR includes the resources needed to serve load plus a reserve margin to cover for any large unforeseen contingency. In the new capacity market, the RTO will purchase 100% of ICR – no more, no less. If there are shortfalls because the RTO has not figured ICR accurately then there will be a reconfiguration auction to make up the shortfall. ICR is purchased in an annual auction for delivery three years in the future. Each load serving utility is responsible for its share of ICR based on its share of system-wide load and as noted earlier the utility can meet its ICR requirements in a number of ways. All capacity must be bought and sold through the auction but a utility with supply commitments already in place can enter its own supply into the auction without incurring any price impact.

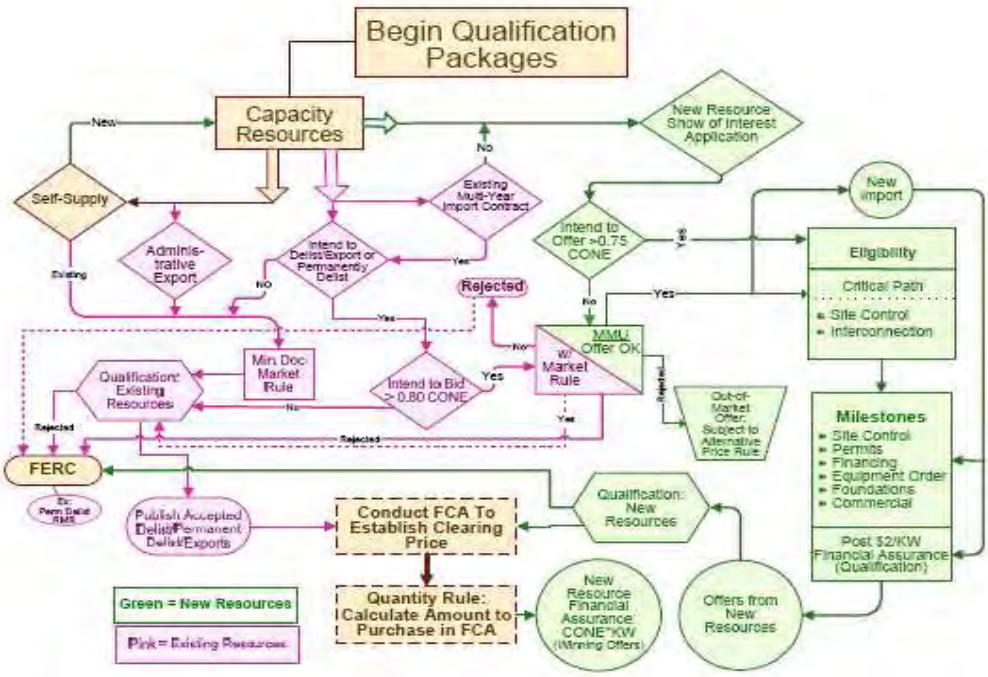
c. Capacity Auction Mechanics

The auction is a descending clock format in which the auctioneer sets out prices in rounds that decline as the auction proceeds. Bidders drop out as the price falls until the full amount of capacity needed in the region is purchased. The auction ends when the full amount of ICR is purchased. The final round sets the clearing price for all suppliers. The initial price in the auction is set at the cost of new entry (CONE) for a hypothetical generator. In New England the marginal new entrant would be a combined-cycle gas-fired turbine. The initial price in the descending clock auction is set at 2 x CONE which is high enough to encourage all bidders. CONE will change over time because after three successful auctions CONE will be determined based on the clearing price in prior capacity auctions. Not all resources can set the clearing price – existing resources must be price-takers. Only new resources can set the clearing price.

This annual auction has a planning horizon of three years (2 years for the first auction). A resource that bids and is selected in 2010 does not have to be on-line and producing energy until 2013. This provides a reasonable period for new resources to finance, plan, and build new facilities. All resources that are selected in the auction are obligated to begin production three years later.

d. Qualification for Bidders in the Auction

There is a stringent resource qualification process for any provider that wishes to bid its resources into the auction. Both new and existing resources must go through the qualification process. To ensure that the auction has strong participation, all bidders must pre-qualify. All resources that pass the pre-qualification screen will then have to go through a full qualification process. It is necessary for this process to be very rigorous so that there will be robust competition in the auction. Resources must pass the qualification process in order to be allowed to bid. Here is a chart of the qualification process.



e. Demand Resources in the Auction

The participation of demand resources in the auction is a significant innovation. In the past, ICR was reduced by any demand side savings forecast by the utilities for the next year. Now ICR will <u>not</u> be reduced by these demand forecasts. This treatment of demand in ICR was necessary to prevent "double counting" that would result if demand resources were both a reduction to the ICR forecast and treated as capacity resources in the auction. Removing demand resources from ICR allows them to bid into the market on a par with supply side resources to earn capacity payments. The proponents of this innovation expect that this will encourage the development of demand side resources; something that most experts agree is seriously missing in the wholesale power markets.

In addition, participation of all types of resources in the auction is expected to lead to the development of the lowest cost capacity in the region – whether that is through demand reductions or additional supply.

The types of demand resources that can participate include load management, energy efficiency, demand response, and distributed generation resources. Complicated rules determine how these different types of demand resources will be allowed to bid as capacity in the auction. These demand resources will also have to go through a rigorous qualification review. Evaluation of the performance of demand resources is also important. Monitoring and evaluation plans have been developed and are now in place to measure the performance of these resources.

f. Payment and Penalty Provisions

As noted earlier, the clearing price in the auction is set by the last bid that meets the ICR requirement. All resources that stayed in the auction then receive that clearing price in the form of a monthly payment based on the actual amount of megawatts supplied in the commitment period. All capacity resources are required to participate in the energy market. This is not optional for generators that receive capacity payments – they must also bid into the energy market. However, a generator is not required to participate in the capacity market - it can choose to only participate in the energy market.

Capacity payments for generation suppliers are reduced by the amount of revenue earned in the energy market or Peak Energy Rent (PER). Peak energy rents are revenues earned (above the fuel cost) by a "proxy unit" in the market (defined in the settlement as a gas-fired generator with a specific heat rate). This adjustment is necessary to ensure that a capacity resource is not paid twice. In effect, there is a reduction for revenue earned in the energy market so there is no double payment to the generator. The PER deduction is based on a proxy unit – not the actual revenues earned – so all generators are treated equally. Demand suppliers do not have this deduction since they do not earn any energy market revenues.

Once cleared in the auction the supplier is under an obligation to perform as it has bid although bilateral trading of these obligations is allowed. To ensure that suppliers meet this obligation there must be serious penalties for non-performance. The penalty structure is designed to ensure that capacity is there when needed. There are "Availability Penalties" which are based on performance during "Shortage Events." Shortage Events are times when system need is the greatest. Penalties are imposed for those resources that provide fewer megawatts than their obligation during Shortage Events. Penalties also apply to those resources that don't meet their offer requirements in the energy market. The maximum penalty amounts are set per day at 10% of that resource's capacity payment for the year, per month at 2.5 times the total capacity payment for the month, and per year at the total capacity payment less PER adjustments for the entire year. As can be seen, the penalty structure provides an incentive for the supplier to come back on line and meet its obligation as quickly as possible.

Payments in the capacity market may also be differentiated by capacity zones. The capacity market will include a locational component. Since capacity is valued

differently around the region the goal of capacity zones is to send price signals to areas that need new capacity. This price differentiation should lead to new generation being built in those areas where it is needed and most highly valued. The capacity zones are determined by transmission constraints modeled in the auction. Some regional sub-areas have significant load growth and transmission constraints. If those constraints are binding at the time of the auction then such areas will have separate auctions and different clearing prices than other zones. If there are no binding transmission constraints anywhere in the region the auction will have a single region-wide clearing price.

g. Summary

The new capacity auction in New England is an innovative design that has advantages for both buyers and sellers. From the buyer's perspective, they can be certain that sufficient capacity will be available to meet system reliability at a price that is set in advance. Once the auction occurs, load is largely protected from any increase in price. Load will not have to pay for substitute power if generators fail to perform. From the seller's perspective, the market provides suppliers with flexibility to stay in the auction or drop out if the price falls too low. Both demand resources and generators compete to supply capacity at given prices. Flexibility is ensured since bidders can choose the commitment period that suits them. They can commit for one year or choose up to a five year annual obligation. Most importantly, once selected, suppliers are guaranteed a capacity revenue stream. They can now assure investors that they have a stream of revenue from which to fund new projects. It allows suppliers to plan for future investments and to find financial backing for those projects.

This new capacity market design balances the need for new generation with price security for load and as with any market it is designed to ensure an economically efficient outcome. It also includes an important innovation that allows active participation of demand resources on terms comparable to supply-side resources. This market should provide proper investment signals to enlarge capacity in the region.

What are the results of this new market design? It is too early to say but so far, the interest by all types of resources has been strong. As of July 2007 more than 10,000 MW of new capacity is actively seeking qualification to bid into the New England capacity market. The first auction will be held in mid-2008 and we will know much more at that time.

Part 3

Overview of Connection Charges in the ERRA Member Countries

Prepared by Ms. Aistija Zubaviciute, Chair of the ERRA Tariff/Pricing Committee, National Control Commission for Prices and Energy, Lithuania

The questionnaire on connection charges was sent out and data were collected in April 2007. Additionally what was presented in the presentation on connection charges the information, which was not placed in it, is described in this overview.

Answers received to the question 5 could be summarised in this table:

What percentage of the connection costs is paid by the customer in case of:	AL	BiH	BG	EE	GE	HU	KG	KO	LT	LV	MD	MK	MN	PL	RO	YU	TR	UA
a) high voltage consumption		100	Individual project	100	100	70[1]	20	100	40-100	100	100	100		25	100	100	100	100
b) medium voltage consumption	100	100	More than 1MW - individual project	100	100	10-60	25	100	40-100	60	100	100	Agreed	25	100	100	100	100
c) low voltage consumption	100	100	100 up to 25m	40-100	100	0-40	50	100	40	60	100	100	Agreed	25	100	100	100	100
d) feed in (generator)		100		100	100	100	5	100	100[2]	100	100	100		100[3]		100	100	100

Notes:

1. 5 countries did not answer to this question or, as it was mentioned in the presentation, the connection charges are not applicable.
2. [1] – maximum limit.
3. [2] – except for the generators, using renewable resources.
4. [3] - 50 % for the generators, using renewable resources.

Below in this overview there are presented the comments, explanations and answers by country to the questions III and IV:

1. III. Please give some examples of connection charges (in USD): give appropriate computing formula and results)
   a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection;

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption;

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption;

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line.

2. IV. Please, shortly explain your regulatory philosophy relating to connection and the connection charge setting methodology.

Comments and Answers by Countries

Albania

As explained before the tariff set for new connection is a combined tariff (distance + demanded and fixed). Below we will give you the manner how we can calculate the tariff in low voltage and in medium voltage:

In Low voltage:

For distance tariff:

a) overhead:

Distance from the cabin MV/LV	**Fixed value of tariff**	**Added value for each 100 m or fraction over than 50 m.**
a- distance 0 - 200 m	8 200 ALL	--
b- distance 0 - 700 m - for first 200 m - for further distance	 8 200 ALL --	 -- 4100 ALL
c- distance 0 - 1200 m - for first 700 m - for further distance	 28 700 ALL --	 -- 8 200 ALL
d- distance 1200 m and further - for first 1200 m - for further distance	 69 700 ALL --	 -- 16 400 ALL

b) cable:

Distance from the cabin MV/LV	Fixed value of tariff	Added value for each 100 m or fraction over than 50 m.
a- distance 0 - 200 m	18 000 ALL	--
b- distance 0 - 700 m - for first 200 m - for further distance	 18 000 ALL --	-- 9 000 ALL
c- distance 0 - 1200 m - for first 700 m - for further distance	 63 000 ALL --	 -- 18 000 ALL
d- distance 1200 m and further - for first 1200 m - for further distance	 153 000 ALL --	 -- 36 000 ALL

Demand tariff is the payment for each kW of maximum demand and is equal to ***1500 ALL*** for overhead and ***2500 ALL*** for cable. In case of connection of buildings with more than 4 units (apartments) payment demand tariff is calculated considered the demand of 3.3 kW for each apartment.
Fixed tariff is a fixed tariff equal to ***3 250 ALL.***

In Medium voltage up to 20 kV.
For distance tariff

a) overhead ***15 500 ALL*** for first ***500 m*** from the transmission cabin and further will be increased with value of ***3100 ALL*** for each 100 m distance and:
b) cable ***49 000 ALL*** for first ***500 m*** from the transmission cabin and further will be increased with value of ***9800 ALL*** for each 100 m distance.

In cases of intermediated distances e.g. up to 150 m the payment will be equal as in case of payment of 100 m, otherwise further than 150 m the payment will be equal as in case of payment of 200 m.
Demand tariff is the payment for each kW of maximum demand and is equal to ***4000 ALL***
Fixed tariff is a fixed tariff equal to ***3 250 ALL.***
P.S.: **1USD = 93.05 ALL**

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Our regulatory has approved the methodology for setting connection charge with the request of utility for distribution network. The calculated values are based on works of experts and engineers of this field. Meanwhile we are thinking of preparing a document for the connection of new resources in the network.

Bosnia & Herzegovina

HV connections to the transmission network are performed according to the “Rules for connection”. A connection is fully financed by customer through „deep” connection charge and connection assets belong to the Transmission Company.

MV connections can be fully financed and built by a customer. The connection assets can be transferred to the network company and the customer can request reimbursement from the other customers who wants to use the same connection assets.

There are standard (up to 50 meters) and non-standard LV connections. Standard LV connection has typical project solution and is charged according to the distributor pricelist. Non-standard LV connection is subject of contract between distributor and customer.

Bulgaria

The connection charge includes expenses on delivery and assembly of the electricity measurement panel and its equipment, construction of the wire part for connection at the distance of up to 25 m and delivery and assembly of necessary equipment, fittings and wires. Expenses do not include line extensions that the enterprise has to make in order to ensure reliability and quality of electricity supply.

1. A price for a group of consumers depends on the connected capacity and up to 25 m of the connection line + price per each additional meter exceeding 25 m.:

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
<u>For the consumer group with connected capacity from 16 up to 50 kW with the length of the connection line under 25 m the price is 2 316 lev, and for each additional meter exceeding 25 m the price is 26 lev/m.</u>

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption
<u>For the consumer group with connected capacity from 16 up to 50 kW with the length of the connection line under 25 m the price is 2 316 lev, and for each additional meter exceeding 25 m the price is 26 lev/m.</u>

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption
For the consumer group with connected capacity from 101 up to 200 kW with the length of the connection line under 25 m the price is 9 600 lev, and for each additional meter exceeding 25 m the price is 40 lev/m.

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line
For the consumer group with connected capacity from 201 up to 500 kW with the length of the connection line under 25 m the price is 21 360 lev, and for each additional meter exceeding 25 m the price is 59 lev/m.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Prices for connecting generators are determined on a case by case basis and include actual expenses on construction of connection and on physical connection to the networks of the transmission or distribution enterprise. If a generator's connection requires transmission or distribution network expansion and reconstruction, then the connection charge includes expenses related to that expansion and reconstruction.

The price for connecting consumers is determined for groups of consumers depending on the stated maximal capacity and voltage level and relevant recognized expenses for the group. Expenses for additional equipment for connection, if a consumer desires, should be paid by the consumer.

Croatia

Fee is defined as a product of demand (kW) and a unit price (U$/kW).

CC = demand x unit price = demand (kW) x 250 (USD/kW) (U$)

If projected expenditures exceed 20% of the fee, projected expenditures are applied (such cases usually appear in rural areas and partake in 5% of all new connections).

1. Examples of connection charges:
   a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
   CC = 20 kW x 250 U$/kW = 5000 U$

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption

Real expenses, if customer is not satisfied he can complain to CERA

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption

Real expenses, if customer is not satisfied he can complain to CERA

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

CC = 500 kW x 250 U$/kW = 125000 U$

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

The average connection cost of a 1kW customer is calculated using a simplified network model. The model is constructed for the entire DSO supply area. Although different customer categories may be managed with this method, this is not utilized.

Estonia

A connection charge for individual customer depends on length of connection.

When connection point not more far that 400 m**:**

Connection demand*	Fee for connestion of on amper (est. kr : 1 est kr =15,6466 eur)
until 100A	800 krooni
100 A over	1400 krooni

When connection point is more far than 400 m, there will be included to the connection fee project expenses (will include the medium voltage line expenses and substation expenses proportionally to the client demand from available demand).

1. Examples of connection charges: see above.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Unfortunately the companies do not have to approve their methodology and by electricity law every company can form the connection fee calculations by themselves. As a result the methodology of the companies does not comply with the methodology we would like them to apply. Commonly now small companies apply as a base for connection fee total value of the project.

Georgia

1. Examples of connection charges: these issues are being elaborated now.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

The law on electricity and natural gas states that the Energy Regulatory Commission sets the connection charge. Unfortunately, the law does not determine main principles and methodological approaches to setting the said charge. There is no approved methodology (rules) either for determining the connection charge, neither is there any experience in that field.

Therefore answers given above just represent the position of the pricing department of GNERC.

Meanwhile, based on the practical need to determine the connection charge, at present, specialists of GNERC are developing the corresponding methodology. In the opinion of the pricing department, preliminary determination (approval) of specific amounts of charges for connection (unified by consumer categories) is impossible, unless there are clear obligations and rules for the technological connection per se.

For example, if the detailed list of works on connection is not known in advance, if it is not determined who should perform them, finance them, who should own the created assets (connection assets) etc, it is impossible to determine some unified charge. It is clear that the cost of works performed by the consumer himself cannot be included in the connection charge.

Hungary

Charges and rules determined in decree 58/2002. (VII. 7.) GKM relate to every point of connection between the public network and the electrical installation of network users (consumers, generators). The charges are to be paid in the case of:

a) new connection to the public network, or
b) increasing existing network transfer capacity available for the network user.

I. Generators
have to make an individual agreement on connection charge with network licensee (connection charge = max. 100 % of the value of activated assets installed for connection on the public network's side) or to install the assets necessary for connection on their owns in agreement with network licensee.

II. Consumers have to pay:
1.) connection *standing charge,*
2.) *charge for installing connecting wire or cable,*
3.) *charge for installing public line*

1.) Connection *standing charge*

a) LV consumer, connection to LV line
aa) up to 32 A: free of charge,
ab) above 32 A: 3000 HUF/A;

b) LV consumer, connection directly to LV side of MV/LV transformer: 12 500 HUF/kVA (usually consumers above 20 kW);

c) MV consumer, connection to MV line: 10 500 HUF/kVA;

d) MV consumer, connection directly to MV side of HV/MV transformer: 9500 HUF/kVA;

e) HV consumer, connection to HV network: the consumer, according to the connection agreement with network licensee, must pay max. 70 % of real installation cost of the connection (70 % of the value of activated assets installed for connection).

2.) *Charge for installing connecting wire or cable* (only in the case of consumption on LV level)
(*Connecting wire or cable* connects the public LV line to the consumer's electrical installation – to the point of connection.)

a) If necessary, to fulfil consumer's demand, the network licensee must newly install free of charge (per consumer)
- max. 30 m connecting overhead wire, or
- max.15 m connecting underground cable.

b) The charge above lengths defined in a): - overhead wire – 1000 HUF/m,
- underground cable – 2000 HUF/m.

If several consumers have to be connected to the same public line at the same time through the same connecting wire or cable, *each of them* are entitled (to the necessary extent) to connecting wire or cable of length defined in 2.) a) *free of charge.*

3.) *Charge for installing public line*

3.1. If necessary, to fulfil consumer's demand, the network licensee must newly install free of charge:

a) on LV max. 50 m overhead line or 25 m underground cable (per consumer), and
b) on MV max. 300 m overhead line or 150 m underground cable (*per transformator* in the case of LV consumers, *per connection point* in the case of MV consumers), and
c) the necessary transformators (transformator substations), and/or
d) to increase the transfer capacity of the existing line in necessary extent.

3. 2. The charge for installing public line above lengths in 3.1. a) – b)
a) LV overhead line – 3000 HUF/m,
LV underground cable – 7000 HUF/m.
b) MV overhead line – 3500 HUF/m,
MV underground cable – 8000 HUF/m.

If several consumers have to be connected to the same public line or transformator at the same time, *each of them* are entitled (to the necessary extent) to newly installed public line or cable with length defined in 3.1.) a) *free of charge.* If charge should be paid (the case 3.2.) it must be shared among consumers proportionally to the number of them.

If a consumer is connected to the same line later (within 10 years) the initial *charge for installing public line* must be recalculated, reshared and the respective sum paid back to the initially connected consumers.

1. Examples of connection charges (in USD):
a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
1027 USD

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption
916 USD

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption
916 USD/flat

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line
66 907 USD

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Nowadays when activity of distribution network licensees is profitable, connection charges should not serve primarily for covering (or even full covering) of costs related to connection of new consumer or of increasing of the network capacity available for the existing consumer but rather for preventing consumers from unjustified network capacity demand through partial pre- or co-financing of connection capital expenditures through "shallow type" connection charges. Due to this concept there is no need for sophisticated and exact calculations concerning connection charges: it is not very important that the charges should amount a very exactly defined share of capital expenditures of the connection (or network capacity enlargement), but it is more important that they should relate to consumers (consumer groups) without any discrimination and reflect "tariff solidarity". At the same time assets realized on network users' money can not serve for base for depreciation and calculated cost of profit. The latest in this relation means that consumers with different connection costs pay the same "shallow type" connection charges defined by unified method for the given consumer group (even they have not to pay any charge e.g. low voltage consumers up to 32 A). Beyond regulatory (regulator's) considerations this "solidarity" also is justified by "historical" reasons: in the previous regime many (most of) consumers were connected without any connection charges, but today's consumers entering the network even now have to pay some cost elements of "old time" connections.

Kazakhstan

1. Connection charge is a fixed fee independent of expenditures. Payment for development of general use networks. In essence it is determined by the level of investments of the network company for development of networks related to connection of new capacity and the volume of connected additional load. It is recorded in the Plan of network development, which contains a list of new upgraded, reconstructed facilities, volumes of investments, terms. Correspondingly, the Plan, and correspondingly, the connection charge for connecting new capacity are approved by the local executive body, are coordinated with the Ministry of Energy and the Agency. Construction of individual use networks, within the technical specifications received by the consumer, is carried out by the consumer.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Examples are not typical for Kazakhstan. Connection charge is uniform (S/kW) within one company and is used for development of networks of general use. Individual networks – all costs and responsibility of the consumer.

Kyrgyzstan

A connection charge for individual customer depends on demand:

for the population with more than 6 kW up to 10 kW (a month)
– 30 som or 79 cents; (without VAT);
for the population with more than 10 kW (a month)
– 45 som or 1.19 USD (without VAT);

for non-residential consumers with declared capacity (a month)
- more than 150 kW - 45 som or 1.19 USD without VAT,
54 som or 1.42 USD with VAT;

for all consumers (irrespective of the type of ownership) who use electricity at bath houses and saunas for the purposes of heating and hot water to get dry (humid) steam and for other purposes during the year
- per 1 kW of installed capacity - 60 som (a month) or 1.58 USD (without VAT), 72 som (a month) or 1.90 USD (with VAT).

1. There is a special price list for paid services provided by subdivisions of energy companies upon requests from the population, enterprises, and organizations.

For example: connection to electricity supply networks -0.4 kV:
- single-phase lead wire for 1 subscriber 108.6 som or 2.87 USD;
- three-phase lead wire for 1 subscriber 164.1 som or 4.34 USD.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

There is a regulation “On the methodology of setting tariffs for paid services” approved by Decree of the Government of the Kyrgyz Republic of October 26, 2000, # 637.

The named Regulation is a uniform methodological instruction on setting tariffs (prices) for paid services (works) provided by executive power bodies, by their divisions, institutions, entities, who got the task to provide state paid services.

Tariffs (prices) for paid services (works) are determined only based on the costs of the entity that is authorized to provide paid services.

When coordinating tariffs (prices) for paid services (works), the following is presented to the authorized body:

- Draft price list of tariffs (prices) for paid services (works);
- Description of services (works) included in the price list;
- Calculation of cost by types of services with breakdown of material, labor and other costs;
- Analysis of application of currently valid tariffs (prices) in aggregate and quantitative terms for each type of paid services. Institutions should also present information on received profit (loss) for the previous period and its allocation;
- justification of reasons for changing the level of tariffs (prices) for paid services (works);
- a report on actual fulfillment of estimates of expenses and revenues on budgetary and special funds;
- a comparative table of currently valid tariffs (prices) and draft of tariffs (prices).

An explanatory note should be enclosed to estimates; it should contain brief description of the body that provides paid services, regulatory-legal framework for provision of these services.

Entities that carry out their activities on a supporting basis, in addition to materials named above should also provide justification of the rate of return included in the cost.

In the course of reviewing calculations, if necessary, additional data may be requested needed to clarify and coordinate the levels of tariffs (prices).

At present, in connection with restructuring, coordination of tariffs for paid services is delegated to the State Department for Regulation of the Fuel and Energy Complex.

UNMIK Kosovo

Connection charge is mixed: deep and shallow. Household customers' connection is socialized related to connection charges. Commercial costumers connected in 0.4 kV are also socialized related to connection charges. In Deep type connections costumer pay for connection but have rights to be reimbursed from other new connections over the time. Reimbursement has to be carried out by network operators since whole cost of the certain connection will be paid the first applicant.

1. Examples of connection charges: under development. Old one is in use with temporary ERO decision.

Standard charge for LV customers requiring 60A 3-phase supply within 60m of existing LV network for underground supply (customer to provide duct), or within 30m of existing LV network for overhead supply.

Application processing fee **€30**

Cable:	**100**
Meter kiosk:	**223**
Labour (Meter box installation):	**37**
Labour (Cable connection):	**30**
Total	**390**

Note: **All prices are in €**

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

System operators shall develop the connection Charging Methodology and procedures in full compliance with the adopted rule by ERO "Tariff Methodology for the Electricity Sector" that includes charges for:

- prior to the activities necessary in order to design, build and maintain the connection in response to an application by a system user and eligible customers;
- installation of: electrical lines or heat pipes, energy plants or meters for the purposes of connection at entry or exit points to the networks;
- circumstances where the electrical lines, heat pipes, or energy plants to be installed are of greater size than that required for use of network;
- maintenance and repair (including any capitalized charge) required for connection and meters provided or installed for making a connection to the network, if applicable.

The Charging Methodology has to be approved by Regulator prior entering to the force.

Lithuania

A connection charge for individual customer:

a) depends on demand. Formula:

where Lv = 38 m, xL = 4,49 m/kW

if L =< Lv, o k1 =< xL, when k1=L/P and Lv and xL are set: M1 =YP*P,

here: M1 – one-part connection charge, USD;
YP – fee of the new connected allowed power, USD/kW – 42 USD for one-phase and 55 USD for three-phase connection (1 USD = 2,6 LTL);
P – allowed power for the customer, kW.

b) depends on length of connection; according to what formula? No.

c) combined (demand and length). Formula:

if L > Lv, o k1 > xL: M2 =YP*P+YL (L-xL*P),

here: M2 – combined connection charge, USD;
YP – fee of the new connected allowed power, USD/kW;
P – allowed power for the customer, kW;
YL – fee of the new connected length, USD/m – 5,7 USD for one-phase and 7,4 USD for three-phase connection (1 USD = 2,6 LTL);
L – the shortest length between the connection point and the metering box, m.

1. Examples of connection charges:

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
One-phase: 613 USD and three-phase: 805 USD

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption
One-phase: 613 USD and three-phase: 805 USD

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption
4725 USD

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line
18287 USD

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Connection charges are based on the historical costs of several years and reflected as 40% of the connection expenses. They have not changed since 2003.

Latvia

A connection charge for individual customer is combined (demand and length). 60% of real construction and project design expenses.

1. Connection charges are 60% for low and medium voltage customers and 100% for high voltage (>110kV) customers from the real costs of construction works and project design.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Distribution system operator is obliged to provide connection for all customers in the operating area of his license. There are no any entry charges for the connection as such, but connection charge reflects real costs of construction works and project design (60% for low and medium, 100% for high voltage customers and generators).

Moldova

A connection charge for individual depends on length of connection. Formula:

$T = C_t (1 + P/100)$, where:

C_t *- costs and expenses of the enterprise incurred while connecting a consumer;*
P – size of profit in %.

1. Examples of connection charges:

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
205 lei (17 USD)/service

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption

263 lei (22 USD)/service

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption

406 lei (33 USD)/service

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

554 lei (45 USD)/service

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

A mechanism adopted for calculation and regulation of prices for connection services is based on the principles that prices for these services should:

- Cover costs and expenses related only to provision of these services;
- Include a reasonable rate of return necessary for further normal operations of enterprises;
- Not to envision subsidizing at the expense of electricity tariffs.

Macedonia

The connection charges shall be acknowledged with in the revenue of the regulated company on the basis of the real expenses made for the connection.

In accordance with Energy Law, article 114, the ERC may request the corresponding power system operator to bear the grid connection expenses, and to return them through the price of the regulated services when needed to:

- incentive the electric power generation from renewable power sources or from high-efficiency cogeneration; or
- achieve the targets of the Strategy for energy development, Strategy for energy efficiency improvement or Strategy for renewable power recourses exploration.

1. Examples of connection charges: the Energy Regulatory Commission of the Republic of Macedonia has no data about this so far.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

In accordance with Energy Law, the system operator in the corresponding grid code shall establish rules for connection to the corresponding grid and methodology for connection expenses calculation. Charge setting methodology has to ensure covering the real cost of the system operator for connection of new consumers or generators.

Mongolia

1. Examples of connection charges:

a) LV (low voltage) customer, urban area, distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
Cable line connection charge is 500 $; Overhead line connection charge is 360 $.

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption.

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption.

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

In case of issue the technical condition to the consumers the transmitter and distributor shall comply with the Connection rule approved by the Energy Regulatory Authority and shall reflect the Development program and the technical ability of electricity network of the area.

Montenegro

Disclaimer: The methodology for establishing the connection charges to network (transmission and distribution) and the pricelist for standard and non-standard connections in compliance with this methodology approve the Regulatory Agency after proposal from transmission company i.e. Distribution Company. Work on creation of the Methodology and the Pricelist is underway. The Energy Law stipulates “shallow charge” principle. All the following answers are given on the basis this Law’s provisions and licence conditions.

1. Examples of connections charges: unable for the reasons given in the disclaimer.

2. The regulatory philosophy relating to connection and the connection charge setting methodology:
- the “shallow charge” principle is applied;
- development costs are within the tariff for the use of network;
- The methodology for establishing the connection charges to network has not been finished yet.

Poland

The percentages of the connection costs is paid by the customer in case of:

a) high and medium voltage consumption
The fee for the connection to electricity greed of a rated voltage of more than 1kV and not higher than 110 kV, except for the connection of sources and grids, shall be determined on the basis of 25% of the investment incurred in relation to the connection.

b) low voltage consumption
The fee for the connections to an electricity grid of a rated voltage not higher than 1 kV shall be determined on the basis of the fee rates included in the tariff, calculated on the basis of 25% of average annual costs of investment in the construction of the grid sections used to connect such entities.

c) feed in (generator): the fee for connection of sources cooperating with the grids or the grids of energy enterprises whose activity consists in the transitions and distribution energy is calculated on the basis of the actual costs of investments incurred in relation to the connection.
Renewable sources and co generate electricity and heat of not more than 5 MW of capacity of electricity generation and a designed total average annual conversation efficiency not lower than 70% whose connection to the grid shall be subject to a fee equal to a 50 % of the fee calculated on the basis of the actual costs of investment incurred.

A connection charge for individual customer is combined (demand and length). Formula: fixed charge for kW and if the length of the connection is above 200 m there is a additional fee 12 USD per each meter.

1. Examples of connection charges:
a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
About 619-680

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption
About 619-680

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption

About 7826 $

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

About 22 000 $ plus station and transformation 15 000$

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Customers which apply for connection to the grid shall be grouped by grid parameters, quality standards, type and size of the equipment, installation and grids to be connected. Also see above.

Romania

The connection fee is between “deep” and “shallow”: “deep” type for HV and, partially, “deep” and “shallow” to MV and LV.

The percentage of the connection costs is paid by the customer in case of:

a) high voltage consumption: 100%
b) medium voltage consumption: 100%
c) low voltage consumption: 100%
d) feed in (generator): …. - ….

A connection charge for individual customer is combined (demand and length). Formula:

(1) In accordance with the calculation principles established in “The regulation regarding the connection of users at the public electricity network” approved by the Governments Act nr. 867/2003 (HG no 867/2003), the connection at electricity networks tariff of medium and/or high voltage, T, cumulates three components: A, B and C, meaning **T=A+B+C,** where:

A = ($a_i \times S$) represents the component corresponding to the reserved capacity of the user connected in the network upstream from the point of the connection; the value of this component is determined as a product of the approved power, S, expressed in kVA and a specific tariff $\mathbf{a}_i$ expressed in lei/kVA established on the basis of average costs;

B represents the component corresponding to the connection installation; the value of this component is determined taking into account the type of the network, the length of the connecting line and the approved power, on the basis of **specific indexes b_i ,** representing the average costs on measurement unit (km, kW, pcs and so on);

C represents the component referring to the commissioning of assets (work acceptance and voltage injection in the installation), **established through tariffs.**

(2) The tariffs and the specific indexes expressed at point (1) are established in accordance with the present methodology, after discussion and proposal of the distribution operators, and approval of ANRE and it should be revised annually.

1. Examples of connection charges:
Exchange rate: 1 USD = 2,4933 lei

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection
T= A+B+C=1698 USD,
Where:
A=778 USD (20 kVA*97 lei/kVA= 1940 lei)
B= 880 USD (1251 lei/conection + 942 lei/ suplimentary pile= 2193 lei)
C= 40.5 USD

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption
T= A+B+C = 13651 USD
Where:
A= 377 USD (20 kVA*47 lei/kVA = 940 lei)
B= 13234 USD (88.6 lei/m*50 m +28565 lei/ 1 trafo = 32995 lei)
C= 40.5 USD

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption
T= A+B+C=57649 USD = 5765 USD/connection,
Where:
A= 3770 USD (200 kVA *47 lei/kVA=9400 lei)
B = 53474 USD (116 lei/m *50 m+107617 lei/buc+10*1991 lei/buc = 133327 lei)
C= 10*40.5 USD = 405 USD

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line
T= A+B+C=56089 USD
Where:
A= 9425 USD (500kVA*47 lei/kVA=23500 lei)
B= 46525 USD (116000lei/km * 1 km=116000 lei)
C= 139 USD

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

The principle for connection is the following: which player is causing changes in the network will pay the changes incurred. According with the new energy law, new network assets own by a player (generator, distribution or consumer company) might be transferred to the distribution operator only with payment.

Serbia

"Shallow" type connection charge, increased for the part of system costs incurred by connecting the facility, which includes the costs of providing the system capacities necessary for secure supply of electricity to the customers (which is expressed as a unit cost per kW). The Agency is going to decrease the part of the system costs slightly, following the increase in the real price of the use of system

The costs of building a **standard connection** are set on the basis of the **standardised average** quantity of required equipment, devices and materials whose installation is required, **average** costs of works and design preparation, gathering of required documentation, the costs of providing system capacities necessary for secure supply of electricity to the customer and fulfilment of other conditions for building a connection. The costs of a standard connection may be fixed (which do not depend of the distance of the facility from the system) and variable (which depend on the distance of the facility from the system). Standard distance from the system is accounting unit for setting costs of a standard connection to the low voltage network, which is equal to 15 meters for any distance from the system not exceeding 25 meters. The part of system costs incurred by installing a standard connection is set as an accounting unit expressed as a unit cost per kW. This unit cost is the quotient of total average costs of construction of the part of the system defined for a standard connection, and the total customers' power that is possible to connect to thus defined part of the system, and it is expressed in dinars/kW.

The costs of building a **custom connection** are set as the total sum of **actual** costs of: equipment, devices and materials, works, design preparation, gathering of required documentation and fulfilling other conditions for building the connection.

1. Examples of connection charges:

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20kW – overhead connection

1.956,25 USD

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection;

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption

8.295,10 USD

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

This is a custom connection and the costs of building a custom connection are set as the total sum of actual costs of: equipment, devices and materials, works, design preparation, gathering of required documentation and fulfilling other conditions for building the connection.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

Methodology for the Criteria and Manner of Setting Costs of Connection to the Electricity Transmission and Distribution System in the Republic of Serbia make differentiation between 1) Standard connection (connection of the customer's facility to the low voltage network, the maximum allowed power of which does not exceed 43,5 kW (3 x 63 A) per metering device) and 2) Custom connection (any connection of the producer's energy facility to the transmission or distribution system and every connection of the customer's facility to the transmission or distribution system which does not meet the conditions for being classified as a standard connection).

Connection costs comprise: 1) Costs of equipment, devices and materials, 2) Costs of performing the works, 3) Costs of design preparation, gathering of required documentation and securing of other conditions for building a connection, and 4) The part of system costs incurred by connecting the facility, depends on the allowed power (which includes the costs of providing the system capacities necessary for secure supply of electricity to the customers and expressed as a unit cost per kW). The connection costs are set on the basis of the most favourable market value of the equipment, materials, works and services.

Energy entities for electricity transmission and distribution set standards for calculation of connection costs and unit costs for determining the part of system costs incurred by connecting a facility to the system.

Turkey

First of all there is a need of explaining what do we mean by connection charges in order to reveal our country case and more importantly to prevent "confusion of concept" regarding the main purpose of this questionnaire, and of course issue paper, in terms of benchmarking. When we talk

about “distribution connection charges” which is subject of regulation, is a one time payment paid by customer in order to compensate operational costs of distribution companies namely transportation, testing of new connection and connection assets that are used during installation such as clemens, isolator etc. On the other hand connections which can be classified as grid expansion, renovation and maintenance of current grid are considered as distribution investments and are regulated separately. Therefore, questions 1-9 are answered by considering connection services and small scale connection assets whose principles are offered by Distribution Company and approved by the regulatory authority while the rest of questions are answered regarding distribution investments particularly for grid expansion.

Fixed fee independent of expenditures.
For the year 2007 and 1 US$ = 1.3750 by 10/4/2007

Installed Power	**(YTL)**
LV	
0-15 kW (including)	24,5
15-100 kW (including)	61,4
Above 100 kW	72,9
MV	
0-400 kVA (including)	326,7
Above 400 kVA	553,6

Can a customer build and finance a connection on his own? Does the company know the expenditures involved? If connection to the system is established, in cases where system expansion investment or new investment is required due to insufficient capacity regarding system use and if the necessary financing is not present, such investments may be performed or financed by the real person or legal entity requesting connection to the system in line with the technical standards indicated in the applicable legislation, on behalf of TEIAS (transmission company) and/or distribution licensee. In such cases, total cost of the actual investment shall be deducted from the transmission and/or distribution tariff charges within the framework of the connection and system use agreement to be signed between the real person or legal entity connecting to the system and TEIAS and/or distribution licensee.

Does any list of standard elements of connection, together with prices for these elements, exist? There a list that covers standards and elements of connection together with prices for these elements at the incumbent distribution firms, but this list is not subject to be approved by the regulatory

authority. This list can be used by distribution companies in order to make their ex-ante investment proposals. According to the current legislation, distribution firms have to make theirs investment proposal and these proposal have to be very detailed both psychical amount and costs. Regulatory authority has to make his own decision after benchmarking and evaluating proposals that are made by distribution companies and then has to come up with investment unit costs in terms of different distribution investments assets such as different types of lines and transformers.

1. Examples of connection charges.

According to the latest amendment of the Electricity Market Law, tariffs proposals, including necessary information and parameters for revenue setting, have to be approved as it is offered by the incumbent distribution firm (TEDAS) for the transition period that will end 2011. Since this proposal envisaged a macro approach for investments, a detailed data base in terms of investment could not be set for distribution firms for benchmarking purposes, it is impossible us a cost evaluation for different voltage level. But with the latest code, “By-law Concerning Monitoring Distribution System Investments and Controlling Realizations of Investment Plans in Electricity Market “ since there are templates that should be filled by distribution firms regarding investment plans and realizations, there will be necessary data base in order to determine unit investment costs for different distributions assets.

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

It is obligatory that connection to the transmission and/or distribution system and system use demands of real persons or legal entities be met in a non-discriminatory manner by TEIAS and/or the distribution company that is authorized to perform transmission and/or distribution activity within the scope of the applicable legislation.

The rights of eligible consumers in terms of choosing its own supplier may under no condition be prevented or intervened in and the system access and system use rights of eligible consumers may not be prevented.

The demands of real persons or legal entities regarding connection to the transmission and/or distribution systems operated by TEIAS or distribution licensees shall not be rejected unless;

a) The technical features of the network at the demanded connection point are insufficient as of the connection date that was requested,

b) The standards set out in the Grid and/or Distribution Regulations or other applicable legislation with respect to system connection have not been met in the project of the facility requesting connection,

c) TEIAS and/or distribution licensees demonstrate and justify that the intended connection and electricity transport arrangements constitute an obstacle for public service obligations,

d) The values regarding technical issues such as voltage decrease, harmonic, electromagnetic levels, in the project of the facility requesting connection fail to meet the limits set out in the applicable legislation, at the network entry and exit points and at the transmission and/or distribution levels,

e) The condition of the facility to be connected to the grid for getting the quality of system electricity out of the standards envisaged in the related legislation.

TEIAS or the legal entity operating the distribution system should justify their negative opinions regarding the connection to the system and system use, and the justifications for such opinions should also be approved by Board decision.

The license of TEIAS and the distribution licenses shall include provisions stating that if the reasons for negative opinion regarding the system connection and system use are not deemed appropriate by the Board due to concluding that such views are not based on objective technical criteria, TEIAS and distribution licensees shall be obliged to sign the related connection and system use agreements, or otherwise provisions of Article 11 of the Law shall be applicable. The administrative fines charged within such scope from the public legal entities shall be revoked to the personnel according to the general provisions and with due regard to the responsibilities of the personnel.

If connection to the system is established, in cases where system expansion investment or new investment is required due to insufficient capacity regarding system use and if the necessary financing is not present, such investments may be performed or financed by the real person or legal entity requesting connection to the system in line with the technical standards indicated in the applicable legislation, on behalf of TEIAS and/or distribution licensee. In such cases, total cost of the actual investment shall be deducted from the transmission and/or distribution tariff charges within the framework of the connection and system use agreement to be signed between the real person or legal entity connecting to the system and TEIAS and/or distribution licensee.

The evaluation regarding system connection and system use by generation facilities shall be concluded and submitted to the Authority within forty five days following the date of notification of such opinion request by TEIAS and/or distribution licensee.

In cases where system connection and system use by generation companies is possible, the licensees and TEIAS and/or the distribution licensees shall enter into connection and use of system agreements. Requests for construction of direct line between consumer facilities and a busbar of a generation facility connected to or connection is approved according to opinion concerning connection to and use of system, either distribution system or a distribution busbar of TEİAŞ is concluded in accordance with the provisions of the Distribution Regulation.

In cases where connection to the system is not possible as of the proposed connection point due to one of the reasons indicated in this article and if justifications are accepted by the Authority, TEIAS and/or distribution licensees may propose another alternative connection point. The Authority shall receive the opinion of the legal entity requesting connection to the system regarding the alternative connection point.

In cases where an alternative connection point is not proposed or proposed alternative connection point is objected by the legal entity requesting connection, this legal entity may request the Authority to construct private direct transmission lines between its generation facility subject to license application and its partners and/or customers. This request is asked to TEIAS and/or the distribution licensee by the Authority for sending their oppositions – if exist – regarding the request within thirty days. Construction of private direct line is permitted by a Board decision. The request to

construct private direct transmission lines is approved by a Board decision. A transmission control agreement between TEIAS and the legal entity having a license is a must for constructing direct private lines at transmission level.

TEIAS and/or distribution licensees shall assign priority for system connection of generation facilities based on domestic natural resources and renewable resources.

Ukraine

A connection charge for individual customer is combined (demand and length). Formula:

Formula: $П = К_з \cdot (ПП_л \cdot К_{лв} + ПП_с \cdot К_{сп}) \cdot W_C$,

where:
П – is payment for connection, thous. hrivnas.;
$К_З$ – load factor of the section of the power network, relative value;
$ПП_Л$ – linear component of the unit cost of connection, thous. Hrivnas/kW;
$ПП_С$ – substation component of the unit cost of connection, thous. Hrivnas/kW;
$К_{ЛВ}$ – rate of remoteness from substations, from which the power is supposed to be supplied, relative value;
$К_{СП}$ – ratio of the range of the connected load, relative value;
W_C – connected load, kW.

Source data for calculation of the cost of connection to power networks of a certain network company.

Name of data	Designation	Values				
		General	As examples			
			a)	b)	c)	d)
1. Data according to item 14 of the questionnaire						
1.1 Connected load, kW	Wc		20	20	200	500
1.2 Connection point:						
At voltage, kV			0,4	0,4	10	10
In figure 1 of the Methodology			$C_{4.1}$	$C_{4.1}$	$C_{3.1}$	$C_{3.1}$
1.3 Length in meters of the power transmission line, which is planned to be built, Power transmission line with voltage, kV						
10(6)	$lф_3$				50	2000
0,4	$lф_4$		50	50		
2. Additional data needed to calculate the connection cost						
2.1 Unit cost of the connection:						
Linear component						
Substation component						
At voltage levels, kV						
110(150)	$ППл_1$	0,431				

	ППс$_1$	0,093				
35	ППл$_2$	0,891				
	ППс$_2$	0,418				
10(6)	ППл$_3$	1,010				
	ППс$_3$	0,476				
0,4	ППл$_4$	1,155				
	ППс$_4$	0,375				

End of table A

Name of data	Designation	Values				
		General	As examples			
			a)	b)	c)	d)
2.2 Length in meters of the power transmission line with voltage of 0,4 kV, which is supposed to be reconstructed	lф$_4$		250			
2.3 Average length in meters of the power transmission line, which was taken into account when determining the unit cost of connection, power transmission line with voltage, kV						
10	l$_3$	6000				
0,4	l$_4$	490				
2.4 Ratios of remoteness at voltage levels, kV						

110 (150)	$Клв_1$		0	-	0	0
35	$Клв_2$		-	-	-	0
10(6)	$Клв_3$		0	0	0,0083	0,3333
0,4	$Клв_4$		0,6122	0,1020		-
2.5 Power range ratio at voltage levels, kV 110 (150)	$Ксп_1$		0,95		0,97	0,97
35	$Ксп_2$				0,95	0,95
10(6)	$Ксп_3$		0,9	0,9	0,93	0,96
0,4	$Ксп_4$		1,0	1,0		
2.6 Actual load ratio of the section of network at voltage levels, kV 110 (150)	$Кзф_1$		0,6		0,6	0,6
35	$Кзф_2$					0,45
10 (6)	$Кзф_3$		0,7	0,39	0,7	0,5
0,4	$Кзф_4$		0,7	0,5		
2.7 Designed load ratio of the section of network at voltage levels, kV 110 (150)	$Кзр_1$		0,6		0,6	0,6
35	$Кзр_2$					0,45
10 (6)	$Кзр_3$		0,7	0	0,7	0,5
0,4	$Кзр_4$		0,7	0,5		

Calculation of the cost of connection for the examples was done using the formula:

$$
\begin{aligned}
П = {} & К_{зр1}(ПП_{л1}К_{лв1} + ПП_{с1}К_{сп1}) \cdot W_c + \\
& + К_{зр2}(ПП_{л2}К_{лв2} + ПП_{с2}К_{сп2}) \cdot W_c + \\
& + К_{зр3}(ПП_{л3}К_{лв3} + ПП_{с3}К_{сп3}) \cdot W_c + \\
& + К_{зр4}(ПП_{л4}К_{лв4} + ПП_{с4}К_{сп4}) \cdot W_c,
\end{aligned}
$$

1. Examples of connection charges:

a) LV (low voltage) customer, urban area , distance from existing overhead line (low level): 50 m, demand 20 kW – overhead connection

П=0,6·0,418·0,95·20+0,7·0,476·0,9·20+0,7·(1,155·0,6122+0,375·1) ·20=
=25,913 thous. hrivnas (5131 USD).

b) LV customer, countryside, distance from existing overhead line (medium level): 50 m, demand 20 kW – overhead connection; transformer is placed directly at the place of consumption

П=0,5·(1,155·0,1020+0,375·1) ·20=4,929 thous. hrivnas (976 USD).

c) LV customer, urban area, distance from existing MV cable line: 50 m, demand 200 kW, 10 flats building (all customers with demand 20 kW) – underground cable connection, transformer is placed directly at the place of consumption

П=0,6·0,093·0,97·200+0,7·(1,01·0,0083+0,476·0,93)·200=
=84,804 thous. hrivnas (16792,87 USD).

d) MV customer, demand 500 kW, distance from existing MV line - 1000 m; underground cable connection directly from existing MV line

П=0,6·0,093·0,97·500+0,45·0,418·0,95·500+0,5·(1,01·0,33333+0,476·0.96) ·500=
=314,819 thous. hrivnas (62340,896 USD).

2. Regulatory philosophy relating to connection and the connection charge setting methodology.

A connection charge is payment for the connection service provided by a network company.

The amount of the connection charge is determined by the cost of works executed by the network organizations, and also by the cost of assets is utilized. In each individual case the amount of the connection charge is determined by the detailed design of the connection made by the relevant design institution.

Conceptually, the charge for connecting to power networks of a network organization assumes that connection assets remain on the balance sheet of the network company as production assets of the subject of the natural monopoly.

Transfer capacity of power networks is limited.

Power network companies do not have in their electricity tariffs funds for reconstruction of power networks necessary to connect new consumers (expand capacity of existing ones).

The cost of connecting to power networks is calculated based on the agreed point of connection of power installations, scheme of development of power networks of the region and the scheme of power supply of power installations of the customer based on their ground location with respect to power networks; unit cost of connection at the voltage level that corresponds to the coordinated point of connecting power installations, and at other higher voltage levels; connected load (increase of the connected load) of power installations of the customer and power supply reliability requirements; taking into account remoteness from substations and load of substations, which have to supply power to power installations of the customer.

The connection point, which as a rule would be a border between power networks belonging to the power network company and those of the customer, is chosen based on conditions of maximal possible volume of networks at the customer (as a rule, within the territory of the enterprise).

The unit cost of connection is calculated for four voltage levels (110(150), 35, 10(6) and 0.4 kV) for power network companies based on the structure of their power networks.

When calculating the cost of connection, ratios of remoteness from substations, which have to supply power, are applied to the linear component of the unit cost of connection, it is determined as correlation between the length of power transmission lines of a certain voltage level that are meant to be built or reconstructed from substations, and the average length of the relevant voltage level line, on the basis of which the unit cost of connection was calculated.

Load range ratios set in the Methodology of determination of the cost of connection to power networks are applied to the substation component of the unit cost of connection.

When calculating the cost of connection network load factors at each voltage level are taken into account, they are determined as ratios of load of substations that transform power to relevant voltage levels.

Calculation of the connection cost starts with the voltage level that corresponds to the relevant connection point and then is continued at higher voltage levels, as a rule, up to voltage of 110 (150) kV.

At voltage levels higher that the voltage level of the connection point, calculations are made based on design power network load ratios that are adopted depending on actual load ratios of substations.

The amount of the connection charge is determined in accordance with the Methodology for determining the cost of connection to power networks, the concept of which is that the amount of the connection charge is set based on physical and technical characteristics of existing power networks, and also based on requirements set by the customer, by means of processing source data in accordance with the procedure set in the legislation.

Summary

The answers to the Questionnaire on the connection charges, as a part of the Issue Paper on Connection of New Consumers, showed the variety of possibilities to regulate and set the methods for calculation of connection charges. There were received the answers to the mentioned questionnaire from 23 ERRA countries.

Generalizing information it is possible to say, that in the most ERRA countries the Regulatory Agencies have the right to approve the connection charges. 15 countries declared that the connection charges are a part of publicly available tariffs. Most probably some connection expenses are reflected partly, because the connection charges are differentiated in 20 ERRA countries, except Armenia and Russia. In these countries the connection is based on the bilateral agreements, but the methodologies on connection charges are on the way.

In the half ERRA countries, which sent the answers to the questionnaire, the customers have to make one-off up-front payment, and in the other 10 ERRA countries the initial payment and the remaining part directly before connection on the basis of individual agreement is applied. Also we can notice that in reality the “deep” connection charges are the most popular, despite that the connection rules declare the connection charges to be “shallow” in 15 countries. The network asset, which has been financed by connection charges, is not included in the price calculating the depreciation expenses and the regulatory asset base respectively in 11 and 18 ERRA countries. In the most countries the connection asset, which was built by the customer, can be transferred to the network company. It is reimbursed just in the one third of the countries.

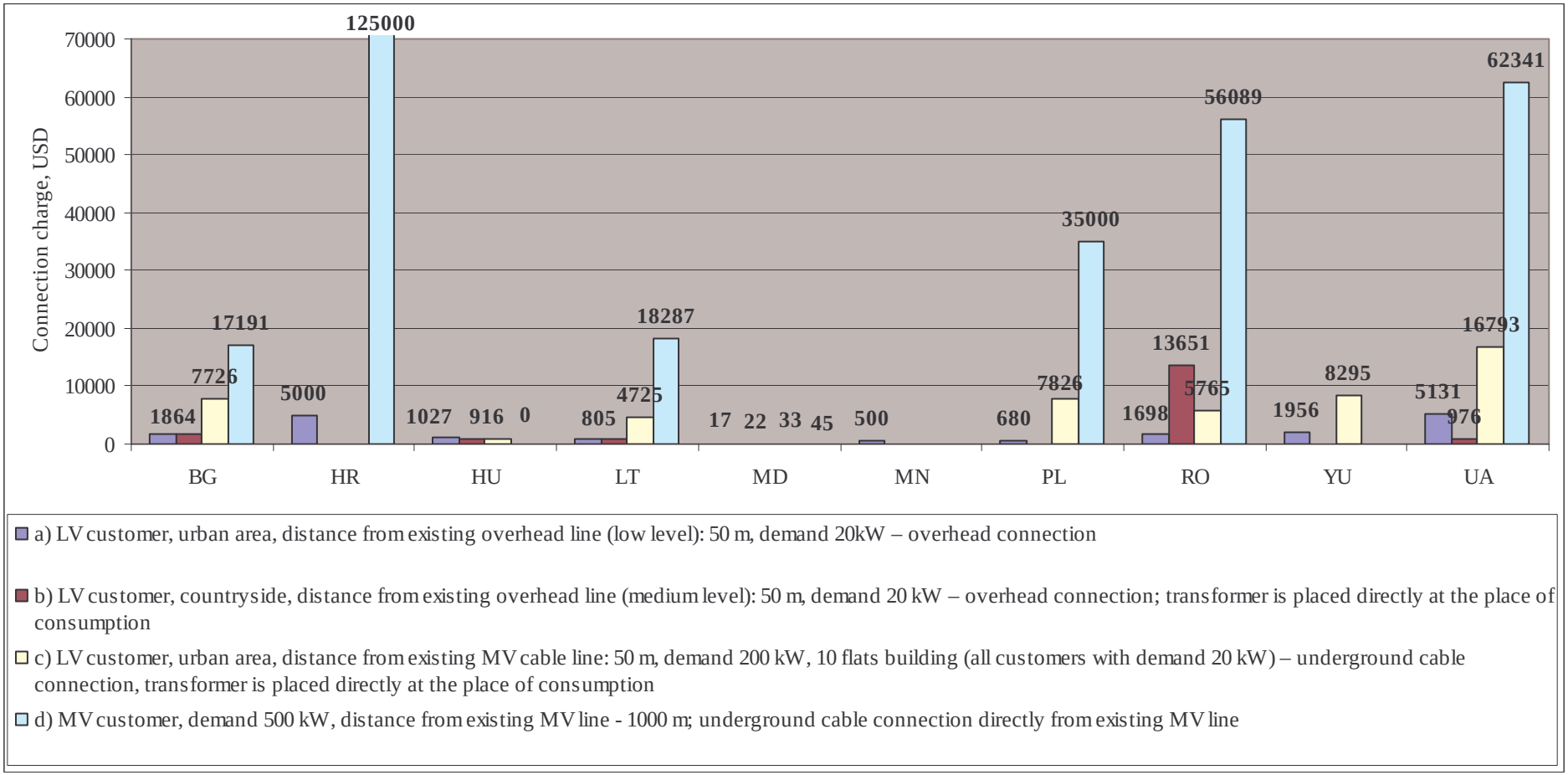
There are 3 the most frequently used factors for setting the connection charges: the voltage level, power demand and distance from existing grid. All differentiation criteria of connection charges are showed in the table below.

Table. Criteria of setting the connection charges

No.	Criteria	Number of positive answers
1.	Category of the customer	6
2.	Voltage level on which a connection will be made (point of breaking the existing grid)	16
3.	Final voltage level (on which electricity will be delivered to the end – user)	6
4.	Power demand	13
5.	Distance from existing grid	10
6.	Type of area: / urban / country / mountainous / other difficulties	3
7.	Type of grid connection: / overhead / cable / overhead cable (insulated connection)	9
8.	Category of demand: household customer / small industrial / big industrial	5
9.	Required standards of supply	4
10.	Availability of own generation or other source of reserve supply	2

It is interesting to notice, that the generators, using renewable and waste resources, have the special conditions for the connection, i.e. rebates, in the 6 ERRA countries. The examples of connection charges are showed in the graph below.

Chart: Connection charges by the certain cases in the ERRA countries (data collected in 2007)



As it is possible to see in the picture there are the different magnitudes of the connection charges in the certain countries. The ERRA countries, which are not shown in the picture, did not provide concrete data or the calculations are under development, or the charges based on real costs (bilateral agreements).