



TRAINING PROGRAM on ELECTRICITY MARKETS REGULATION

A series of 8 webinars will be delivered, focusing on electricity regulation with the objective to create knowledge in and understanding of regulation issues. The training program will provide and disseminate relevant knowledge related to conceptual properties and practical application of regulation in electricity industry. The webinars are designed in clear and understandable form in order to allow successful participation of non-expert audience.

This training will be delivered by regulation experts of KEMA Consulting directed by Konstantin Petrov, energy economist and electrical engineer with major expertise in the areas of market design, regulatory economics and pricing. Dr. Petrov has worked in more than 25 countries in Europe, Australia, Asia, South America and North Africa.

<http://www.leonardo-energy.org/training-module-electricity-market-regulation>

REGISTER

<https://www.onlineregistrationcenter.com/register.asp?m=211&c=97>

CALENDAR (15h00 Brussels time)

Webinar	Topic	Date	Your local time
1	General Principles	23.10.2009	Time 1
2	Market Design	02.11.2009	Time 2
3	Price Regulation	16.11.2009	Time 3
4	Revenue Requirements	30.11.2009	Time 4
5	Cost of Capital	14.12.2009	Time 5
6	Efficiency Assessments	11.01.2010	Time 6
7	Quality of Supply Regulation	25.01.2010	Time 7
8	Pricing	08.02.2010	Time 8

CONTENTS

Session 1 explains the nature of economic regulation. Economic theory advocates that firms have the strongest incentives to provide best service to customers in terms of price and quality of service when they are in competition. Therefore, energy industry reforms have introduced competition wherever possible (e.g. production, wholesale and retail activities). Competition, however, is not feasible in all segments of the energy sector; transmission and distribution networks remain regulated. In many cases regulators control and monitor production and supply activities.

Session 2 discusses the design of electricity markets. The technical characteristics of the electric power industries require a number of specific measures to enable the creation of an effective and well functioning energy market. There are several types of markets, such as cost- and price-based pools, mandatory and voluntary markets, as well as bilateral and single buyer markets.

Session 3 explains different forms of price control. Under rate of return regulation, the regulator sets prices for the company in such a way that they cover the utility's costs of production and include a rate of return on capital that is sufficient to maintain the investors' willingness to replace or expand the company's assets. This method has been criticised that it does not provide sufficient incentives to control and reduce costs. Numerous regulatory methodologies (revenue caps, price caps, yardstick competition) have been developed to counteract the deficiencies of rate of return regulation to

various degrees. All these alternative methodologies focus on the establishment of incentive mechanisms by moving from rate of return to incentive based forms of price regulation, and to the application of comparative approaches by means of benchmarking as opposed to the only individual performance assessment of the regulated service providers.

Session 4 explains how the regulated revenue is set and what is the role of regulatory asset base (RAB). The allowed revenue for provision of regulated services include the operating cost, depreciation and return on regulated assets. The return is calculated as the allowed rate of return (cost of capital) is charged on the regulatory asset base. The RAB is a measure of the net value of the company's regulated assets and is estimated for each year of the regulatory period.

Session 5 explains the role of cost of capital. Investors will be interested in an engagement in the regulated industry, if projects allow them to meet financial requirements. These financial requirements are measured against the benchmark of earnings to be made in other product markets, in industries in other countries or the international capital markets. Put in financial terminology, investors will be comparing the net present value of cash flows from an investment in the power industry to alternative investment opportunities. Only if investment in the particular country is as profitable as some alternative investment will the investor decide on the particular project. The weighted average cost of capital (WACC) methodology is a widely accepted method for calculating the cost of capital. It is understood by both the finance community and the industry, and is consistent with the methodology used by many regulators.

Regulatory authorities usually look for aggregate efficiency assessments that support the setting of efficiency increase factors (regulatory benchmarking). **Session 6** explains various mathematical techniques to assess efficiency. Partial (one-dimensional) measures of performance (performance indicators) are the simplest forms to perform comparisons between different companies. Multi-factor (total) models are used to account for the relationships between different input and output factors.

Session 7 explains the role of quality of supply regulation. In an unbundled energy industry, the responsibility for providing reliable energy supply is distributed to a number of players. Production companies operate in a market environment and provide capacity according to the market arrangements. Networks are regulated and requirements to their reliability are imposed by network codes, industry licenses, performance standards and quality incentive schemes. Sometimes regulators design supplementary market-based incentives for producers to encourage the provision of existing and new capacity. Quality of supply of energy networks is characterised by two

additional elements: product quality (voltage quality for electricity and substance quality for gas) and commercial quality. Product quality is related to technical characteristics of electricity and gas. Usually there are national or regional technical standards for product quality. Commercial quality measures the quality of services provided by network operators to connected customers in terms billing, meter readings, responding to complaints etc. Commercial quality is usually regulated by performance standards imposed by national regulators.

The conversion of the allowed revenue into tariffs is explained in **Session 8**. We discussed the main pricing principles and methods of electricity pricing. Then we extend the discussion towards the price setting of the different activities in the electricity supply chain. The individual technical and economic characteristics of the energy activities require different approaches and models for their pricing. While generation and supply charges should incorporate substantial component associated with the fuel costs, network charges need to cover largely fixed capital cost.

FULL PROGRAM

Webinar 1: Regulation – General Principles

This session explains the main tasks of regulation and addresses four main questions: what is regulated, where is regulated, how is regulated and how is the regulated. In addition we explain how the communication between regulator and regulated companies is organised and how is the regulatory performance measured.

- General tasks of regulators
 - Price
 - Quality
 - Market functioning
- Areas of regulation
- Scope of regulation
- Methods of regulation
- Institutional questions
- Consultation and communication
- Regulatory performance
 - External performance
 - Internal Performance

Webinar 2: Market Design

This section explains the main properties of different types of electricity markets exhibiting different level of competition and different forms of organisation.

- General market models
 - vertically integrated companies
 - single buyer
 - wholesale competition

- retail competition
- Power pools
 - Price based
 - Cost based
- Markets with bilateral trade
- Balancing markets
- Power exchanges

Webinar 3: Price Regulation

This session explains different forms of price control including the classical rate of return organisation and more advance forms of incentive regulation. We explain also the principle design criteria of the different price control models.

- Major price control models
 - Rate of return
 - Cap regulation
 - Yardstick competition
 - Sliding scale regulation
- Principle design criteria
 - Efficiency properties
 - Demand impact
 - Regulatory burden
 - Practicability
 - Coherence with industry/ market design

Webinar 4: Revenue requirements and RAB

The allowed revenue for provision of regulate services include the operating cost, depreciation and return on regulated assets. The return if calculated as the allowed rate of return (cost of capital) is charged on the regulatory asset base. This session explains how to the regulated revenue is set and what is the role of regulatory asset base (RAB).

- Revenue components
 - Depreciation
 - Return on assets
 - Regulatory asset base (RAB)
 - Rate of return on assets
 - OPEX
- RAB
 - Exiting assets
 - New investments
 - Capital contributions
 - Rolling forward
- Asset valuation
 - Historic cost
 - Replacement cost
 - Optimised replacement cost
 - Deprival value

Webinar 5: Cost of Capital

The weighted average cost of capital (WACC) methodology is a widely accepted method for calculating the allowed rate of return. Regulators use different models to set

the allowed cost of capital. This section explains the models and their practical application.

- Definition of cost of capital
 - WACC
 - Cost of equity
 - Cost of debt
 - Capital structure (gearing)
 - Treatment of taxes
- Quantification of cost of capital
 - CAPM (Capital Assets Pricing Model)
 - Price Arbitrage Theory
 - Dividend Growth Model
 - Comparable Earnings Model
 - “Precedent Case” Approach
- Financial Analysis

Webinar 6: Efficiency Assessments

Regulators use efficiency assessment to set efficiency targets of the regulated service providers. This session explains the role of the efficiency assessment, the methods to measure efficiency and the incorporation of efficiency results in the price control.

- Why measure efficiency?
- Methods for efficiency assessments
 - Uni-dimensional ratio analysis
 - Statistical and econometric methods
 - Linear programming methods
 - Virtual network models

- Application of efficiency results
 - TOTEX versus OPEX benchmarking
 - Building block approach
 - Cost controllability (short and long run)
 - Efficiency convergence speed
 - Capping efficiency scores
 - Using efficiency bands

Webinar 7: Quality of Supply Regulation

Quality of supply regulation becomes more and more important as cost decreasing incentives may have a mid- and long-term effect on the quality provided. This session explains how quality of supply is defined, measured and regulated.

- Quality definition
 - Reliability
 - Commercial quality
 - Technical quality
- Quality measurement
- Relevance of quality regulation
- Regulatory quality control
 - Indirect controls
 - Minimum standards
 - Incentive schemes
- Design of incentive schemes for quality
 - Parameters
 - Controllability

- Incentive function
 - Shape
 - Dead bands
 - Cap and floors
- Outage cost

Webinar 8: Pricing

Once the revenue requirements are established they should be converted into tariff systems. This session explains the major economic principles of electricity pricing and the general pricing models using average and marginal costs. Moreover the session explores the major pricing models for the electricity activities including: generation, transmission, distribution and retail activities.

- Pricing principles
 - Economic efficiency
 - Cost recovery
- General pricing models
 - Average cost pricing
 - Marginal cost pricing
- Cost allocation issue
- Pricing for different activities in the electricity industry
 - Generation pricing
 - Transmission pricing
 - Distribution pricing
 - Retail supply pricing