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**IEEE POWER ENGINEERING SOCIETY  
ENERGY DEVELOPMENT AND POWER GENERATION COMMITTEE**

**PANEL SESSION: POWER MARKETS OF ASIAN COUNTRIES IN THE  
INTERNATIONAL MARKETS ENVIRONMENT**

**(Nikolai Voropai and Tom Hammons)**

**IEEE 2006 General Meeting, Montreal, Canada, 18-22 June 2006  
Monday, 2-6 p.m.  
Room 510b**

**Sponsored by: International Practices for Energy Development and Power Generation\***

**Chairs: Nikolai Voropai, Energy Systems Institute, Irkutsk, Russia  
Tom Hammons, University of Glasgow, UK**

**Topic: Critical Infrastructure of the Power System**

## **INTRODUCTION**

On behalf of the Energy Development and Power Generation Committee, welcome to this Panel Session on Power Markets of Asian Countries in the International Markets Environment.

This Panel Session deals with the current state and problems of power markets in Asian countries in the international market environment. The process of restructuring the electric power industry and forming power markets in the world has almost a twenty-year history. Certain experience has been gained that reflects both the positive effects of market transformations in the electric power industry and some problems. Power markets in Asian countries are formed on the basis of world experience. However, in different countries this process progresses at different paces. Generalization of the experience in market transformations in the electric power industries of Asian countries, analysis of the benefits, and risks that may occur as a result of such transformations will help specialists solve the problems encountered in their countries.

The Panelists and Titles of their Presentations are:

1. Subrata Mukhopadhyay, Central Electricity, New Delhi, India; Sudhindra K. Dube, Power Trading Corporation Ltd., New Dehli, India; and Sushil K. Soonee, Northern Regional Load Dispatch Centre, Power Grid Corporation of India. Development of Power Market in India (paper 06GM0336).
2. Serguey Palamarchuk, and Nikolai Voropai. Energy Systems Institute, Irkutsk, Russia. Russia's Power Industry Restructuring: Current State and Problems (paper 06GM0153).

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\* Document prepared and edited by T J Hammons

3. Marcel A. Lamoureux, Consultant, Power System Management and Economics, Newport, Vermont, USA. Economic Convergence Points of Russian, CIS and Asian Power Markets (paper 06GM0204).
4. Temur P. Salikhov, Director of the Institute of Energy and Automation, Tashkent, Uzbekistan. Uzbekistan Energy Strategy (paper 06GM0506).
5. Jin Zhong and Yixin Ni, The University of Hong Kong, Hong Kong. Power Industry Restructuring in China (paper 06GM0327).
6. Fushuan Wen, South China University of Technology, Guangzhou, China. State-of-the-Art and Prospect of Power Industry Restructuring in China (Invited Discussion)
7. Jae-young YOON, Head of Power System Group, Dongwook PARK and Hoyong KIM, KERI, Korea. Feasible Power Exchange Model between Russia, the DPRK and the ROK (paper 06GM0590).
8. Ahmed F. Zobaa, Cairo University, Egypt and Wei-Jen Lee, Energy Systems Research Center, The University of Texas at Arlington, USA. The Globalization of Energy Markets in Asia (paper 06GM0051).
9. Ikuo Kurihara, Central Institute of Electric Power Industry, Tokyo, Japan. Restructuring of the Electric Power Industry and the Current State of the Power Market in Japan (paper 06GM0078).
10. H S Jeong, Korean Electro-technology Research Institute; D Hur, Department of Electrical Engineering, Kwangwoon University, Korea; C K Han and Jong-Keun Park, Seoul National University, Seoul, Korea. Pricing Transmission Services in Korean Electricity Markets (paper 06GM0287).
11. Xingwang Ma, AREVA T&D Corporation, Bellevue, Washington, USA. Key Features of Successful Market Design and its Relevance to Asian Countries (Invited Discussion).
12. Invited Discussers.

Each Panelist will speak for approximately 20 minutes. Each presentation will be discussed immediately following the respective presentation. There will be a further opportunity for discussion of the presentations following the final presentation.

The Panel Session has been organized by Tom Hammons (Chair of International Practices for Energy Development and Power Generation, University of Glasgow, UK) and Nikolai Voropai (Director, Energy Systems Institute, Irkutsk, Russia).

Nikolai Voropai and Tom Hammons will moderate the Panel Session.

The first presentation is on development of the power market in India and has been prepared by Subrata Mukhopadhyay, Sudhindra K. Dube, and Sushil K. Soonee.

The presentation presents the status of development of the power market in India with the creation of opportunities consequent to restructuring of the sector through unbundling, opening up for private sector participation, positioning of regulatory mechanism through commissions at state and central level and appellate tribunal, allowing open access, etc. Starting with the background, it gives a clear picture of achievement to date and the issues to be resolved to reach the goal. In this context opportunities that exist for power and energy trading with neighboring countries are highlighted.

**Subrata Mukhopadhyay**'s employment experience of 35 years includes teaching and research in Roorkee and power system planning, design and operation with the Central Electricity Authority of Government of India. He has authored two books and twenty-eight papers, was awarded the IEEE Third Millennium Medal in 2000, the PES Delhi Chapter Outstanding Engineer Award & PES Asia-Pacific Regional Outstanding Engineer Award for 2001, RAB Leadership & Achievement Awards in 2002 and 2004, respectively. He is also a Fellow of the Institution of Engineers (India) and the Institution of Electronics and Telecommunication Engineers, India.

**Sudhindra K Dube** is presently working for PTC India Ltd. (PTC) as Director (Operations) since December 2002. Prior to joining PTC he was working as Executive Director (Northern Region) in POWERGRID. In POWERGRID he handled very crucial assignments like *Erection and Commissioning* of 400 KV URI- Transmission system in Kashmir Valley, the first 800 KV Kishenpore-Moga Transmission System in India and development of O&M manuals of Transmission equipment. In his current assignment in PTC he is responsible for Marketing, Operation and Commercial activities, formulation of Power Purchase Agreements with domestic/foreign Developers of Power Projects and Cross-Border transactions with Bhutan and Nepal. He is a Fellow of the Institution of Engineers (India) and a Member of CIGRE.

**Sushil K Soonee** currently heads the Northern Regional Load Dispatching Center of the Power Grid Corporation of India as Executive Director. After a brief stint in the private sector he joined the Central Electricity Authority and worked extensively in integration of the State Grid to form a Regional Grid in the Eastern and North-Eastern Region, carried out Research and Literature Survey in Power System Operation and Control at IIT Kharagpur in 1981, traveled extensively in Europe, USA and SAARC countries. He has authored 24 technical articles presented in various forums, chaired many technical sessions in seminars / workshops, and acted as Member of various committees for Regional Power System on disturbance and restoration. He is a Fellow of the Institution of Engineers (India).

The second presentation is entitled: *Russia's Power Industry Restructuring: Current State and Problems*. It has been prepared by S.I. Palamarchuk, Professor and chief researcher, Energy Systems Institute and N.I. Voropai, Director, Energy Systems Institute, Russian Academy of Sciences, Irkutsk, Russia

The Russian power industry is on the way to radical structural and managerial reforming. The presentation gives an overview of the present state of power industry restructuring in Russia. The current technical characteristics of the industry and main features of the new round of restructuring are described. New steps in electricity market development and regulating system improvement are discussed. The restructuring policy in Russia may be useful for countries where industry is on the way of reforms.

**Sergey I. Palamarchuk** was born in Irkutsk, Russia. He graduated from the Energy Department of Irkutsk Polytechnic Institute in 1968. In 1997 he defended the postdoctoral thesis “Construction of mathematical models for adaptive control of power system operation conditions” at the Energy Systems Institute, Irkutsk, Russia. His professional fields of research include electricity market design, transaction scheduling and electricity pricing.

**Nikolai I. Voropai** was born in Belarus in 1943. He graduated from the Leningrad (St. Petersburg) Polytechnic Institute in 1966. Voropai received his PhD degree from the Leningrad Polytechnic Institute in 1974 and the Doctor of Technical Sciences degree from the Siberian Energy Institute in 1990.

His research interests include: modeling of power systems, operation and dynamics performance of large power grids; development of national, international and intercontinental power grids; reliability and security of energy systems.

The third presentation discusses economic convergence points of Russian, CIS and Asian Markets and has been prepared by Marcel A. Lamoureux, L. A. Melentiev Energy Systems Institute, Russian Academy of Science, Irkutsk, Russia. Marcel Lamoureux, Consultant, Power System Management and Economics, Vermont, USA will present it.

The convergence of power markets is emerging from strictly technical reliability concerns to economic reliability concerns. Commonalities of Russian and the Commonwealth of Independent States’ power sectors include structural reforms, power system integration, legislation and price liberalization. Other Asian countries divide reform incentives along macroeconomic lines. However, they share the primary aim to improve overall economic efficiency. Based upon experiential research, each country in Asia should nationally *and* regionally contextualize a reform program designed on one or many models. This is critically discussed.

**Marcel A. Lamoureux** is conducting doctoral-level research and economic analysis with and at the L. A. Melentiev Energy Systems Institute, Russian Academy of Science, Irkutsk, Russia. He was employed as a Transmission and Distribution System Operator for 12 years at Citizens Energy Services, Vermont Electric Cooperative, Vermont, USA. He currently holds the position of Field Faculty Advisor, Master of Arts degree program, at The Union Institute, Vermont College, Montpelier, Vermont.

He is the IEEE Power Engineering Society Membership & Chapters Awards and Resources Committee Chair.

The fourth presentation concerns Uzbekistan energy strategy and has been prepared by T.P. Salikhov, Director of the Institute of Energy and Automation, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan. It will be presented by Nikolai Voropai.

An analysis of Uzbekistan energy policy on the basis of a system approach has been performed. It indicates that the energy policy can be presented in the form of various components of the policy such as geopolitical, economic, technical and social ones. Step by step principle of reforming has been used in its realization. Due to correct and balanced implementation of the energy policy, Uzbekistan has been able over a relatively short time to ensure stable advancement of its vast fuel and power complex. This is discussed.

**T.P. Salikhov** was born in 1954 in Tashkent, Uzbekistan. He graduated from Moscow Power Engineering Institute (Russia) in 1977. He awarded the PhD scientific degree at the specialized council of the Moscow Power Engineering Institute (Russia) in 1984. He is Doctor of Technical Sciences since 1994. He is an internationally renowned specialist in thermo-physics. He is the author of more than 100 publications in different scientific magazines. He has participated in different International Conferences and Symposiums (USA, France, Germany, Austria Italy, China, etc.). Now he is a director of the Institute of Power Engineering and Automation of Uzbekistan Academy of Sciences and professor at the Tashkent State Technical University.

The fifth presentation is on Power Industry Restructuring in China and has been prepared by Jin Zhong and Yixin Ni, The University of Hong Kong, Hong Kong. Jin Zhong, who is an assistant professor in the Department of Electrical and Electronic Engineering of the University of Hong Kong, will present it.

The China power industry is on the way to a deregulated electricity market since industry restructuring in 2002. Integrated generation and transmission has been regrouped into five independent generation companies and two grid companies. The regional grid companies act as the system operators and exchange centers for the regional electricity markets. The customer side is still regulated by the government. In this presentation, the presenter will introduce the situation of the China power industry restructuring. Some issues will be discussed for the current regional electricity markets, such as, electricity price policy, renewable energy policy, investment and planning issues.

**Jin Zhong** received her B.Sc. degree from Tsinghua University, Beijing, China, in 1995; the MSc. degree from EPRI China in 1998 and the PhD degree from Chalmers University of Technology, Gothenburg, Sweden in 2003. At present, she is an assistant professor in the Department of Electrical and Electronic Engineering at the University of Hong Kong. Her areas of interest are electricity sector deregulation and ancillary service pricing.

**Yixin Ni** received her B. Eng., M. Eng. and Ph. D. degrees all from Tsinghua University, China. She was a former professor and director of National Power System Laboratory, Tsinghua University and is currently with the University of Hong Kong. Her research interests are in power system stability and control, HVDC transmission, FACTS, and power markets. She received several nation-wide awards in China for her contributions to power engineering.

The next presentation is an invited discussion entitled State-of-the-Art and Prospect of Power Industry Restructuring in China. It has been prepared and will be presented by Fushuan Wen, South China University of Technology, Guangzhou, China.

The seventh presentation has been prepared by Jae-young YOON, Head of Power System Group, Dongwook PARK and Hoyong KIM, KERI, Korea. It is entitled Feasible Power Exchange Model between Russia, the DPRK and the ROK. Jae-young YOON will present it.

The presentation will describe the feasible power exchange model on NEAREST (Northeast Asian Electrical System Ties) . It contains the feasible scenario in technical, economical and marketable viewpoints between Russia, the DPRK and the ROK. Power exchange between Russia, the DPRK and the ROK is a part of NEAREST, which is expected to become a reality within the near future, as it offers great economic benefits, and contributes to peace in this region. This presentation will specify basic conclusions for feasibility studies on power system interconnection between Russia, the DPRK and the ROK, considering the future power industry and electricity balances in each country. It will address technical, economic and marketable study results.

**Yoon Jae-Young** is head of the Power System Research Group at the Korea Electrotechnology Research Institute [KERI]. Since 1987, he has been working in the research field of power system analysis, including custom power systems. Currently, he is managing a research project examining the applications of HTS-equipment, such as cables, current-limiting reactors and transformers. Additionally, he plays a key role in the research project related to the Northeast Asia Power System Interconnection, including North Korea.

**Kim, Ho-yong** is director of the Power System Research Laboratory at Korea Electrotechnology Research Institute [KERI]. He has been working at KERI since 1986. His main research areas are distribution automation and AI applications to power systems and Power System Interconnection.

**Park, Dong-wook** is vice president of R&D and Testing at the Korea Electrotechnology Research Institute [KERI]. He has been with KERI since 1978. He has mainly worked in the field of high power testing, system insulation coordination, and reliability assessment, and he is very interested in Northeast Asia System Interconnection, including North Korea.

The eighth presentation is on the Globalization of Energy Markets in Asia. Ahmed F. Zobaa, Cairo University, Egypt and Wei-Jen Lee, Energy Systems Research Center, The University of Texas at Arlington, USA, have prepared it. Wei-Jen Lee will present it.

Energy market globalization brings significant benefits for producers and consumers if the political will can be mustered to implement thoroughgoing market oriented reforms. Experience in power trade zones in Europe and North America shows that to achieve the benefits of fully fledged trade, the countries in the sub-region need to closely coordinate electricity sector policy, operating protocols, and network development. This presentation sets out the market development options, reviews sector reforms so far, assesses the obstacles to full power trade, and briefly outlines multilateral efforts to promote an infrastructure that will support international power trade in the sub-region. The presentation will review the globalization of energy markets in Asia.

**Ahmed F. Zobaa** is an Assistant Professor in the Department of Electrical Power & Machines, Faculty of Engineering, Cairo University, Giza, Egypt. He is an Editorial Board member for Electric Power Components & Systems Journal, International Journal of Emerging Electric Power Systems, International Journal of Computational Intelligence, and WSEAS Transactions on Power Systems. He is an Editor for IEEE Power Engineering Letters and IEEE Transactions on Energy Conversion. Also, he is an Associate Editor for IEEE Transactions on Industrial Electronics, Electrical Power Quality and Utilization Journal, International Journal of Power and Energy Systems, International Journal on Modelling and Simulation, International Journal of Energy Technology and Policy, and Neuro-computing Journal.

Dr. Zobaa is a Senior Member of the IEEE Power Engineering / Industry Applications / Industrial Electronics / Power Electronics Societies. Also, he is a member of the Institution of Electrical Engineers, the International Association of Science and Technology for Development, and the International Solar Energy Society.

**Wei-Jen Lee** joined the University of Texas at Arlington and currently is a Professor of the Electrical Engineering Department. He has been involved in research on power flow, transient and dynamic stability, voltage stability, short circuit, relay coordination, power quality analysis, and deregulation of utility industries. He is also involved in research on the design of integrated microcomputer-based monitoring, measurement, control, and protection equipment for electric power systems. He is a senior member of IEEE and a Registered Professional Engineer in the State of Texas.

The ninth presentation is on Restructuring of the Electric Power Industry and the Current State of the Power Market in Japan. It has been prepared and will be given by Ikuo Kurihara, Central Institute of Electric Power Industry, Tokyo, Japan.

Restructuring of the Japanese electric power industry has been carried out in stages, and in April 2005 a third-step deregulation measure was implemented to expand the scope of liberalization of electricity retailing, allowing non-utility power producers to supply electricity to all high-voltage service customers in the retail market, excluding residential customers and small factories. At the same time, a neutral body tasked with securing impartiality in the use of utility power grids and an electric power exchange started operations.

Although it is still too early to draw a firm conclusion about the benefits of the restructured electric power industry, electricity rates, one of the important measures of the

implications of restructuring, have dropped significantly. Electricity transactions on the electric power exchange have also been growing in volume gradually over time. The results of institutional reforms to date are now being assessed in order to start discussion in 2007 on the complete liberalization of the retail market to include all customers. The presentation will give an update of the current market in Japan.

**Ikuo Kurihara** joined the Central Research Institute of Electric Power Industry (CRIEPI) in 1982. From 1986 to 1987, he was a visiting researcher of University of Texas at Arlington, Texas, U.S.A. His main research field is planning and operation of power systems. He is a Doctor of Engineering. He won paper prize awards in 1992, 1998 and 2005 from the Institute of Electrical Engineers of Japan. He is a Senior Member of IEEE.

The tenth presentation will discuss Pricing for Transmission Services in the Korean Electricity Market and has been prepared by H. S. Jeong, D. Hur, C.K. Han, and J.K. Park. H S Jeong is with the Korean Electro-technology Research Institute; D Hur is with the Department of Electrical Engineering, Kwangwoon University, Korea; C K Han and Jong-Keun Park are with Seoul National University, Seoul, Korea.

In Korea, the trend of heavier real power flows into densely populated load centers from several vast power plants in remote locations will continue or become profound, leading to their national-interest transmission bottlenecks during some periods of the year. The first step toward increasing the role of market forces in managing transmission system operations is to develop the role of locational price signals to direct the actions of market participants toward outcomes that improve operations when congestion occurs on the bulk power grid. In this overall perspective, they need to thoroughly investigate how best it would be to send an adequately accurate locational price signal with the congestion costs incorporated into the transmission pricing rule when the electricity market is not unduly maintained. This presentation attempts to make a supportive and self-explanatory proposal that could fit the Korean Cost-Based Pool (CBP) that satisfactorily sharpens the locational price signal. It will be given by H. S. Jeong.

**Hae-Sung Jung** is with the Korea Electrotechnology Research Institute. His research interests are in the areas of power system operation in the deregulated electricity markets.

**Don Hur** is currently a professor of the Department of Electrical Engineering, Kwangwoon University. His research interests are in the areas of power system restructuring, power system operation, and risk management in the deregulated electricity markets.

**Choong-Kyo Han** is a Ph.D. candidate in the Department of Electrical Engineering at Seoul National University. His research interests are in the areas of capacity mechanism in the deregulated electricity markets.



**Jong-Keun Park** has worked as an assistant professor, an associate professor and a professor in School of Electrical Engineering, Seoul National University, Korea. His research areas are power system economics and energy policy, and power system analysis. He is the Vice President of the Korean Institute of Electrical Engineers (KIEE), and the Korean representative of the study committee SC5 “Electricity Markets and Regulation” in CIGRE. He served as a commissioner of the city Council of the Ministry of Commerce, Industry and Energy (MOCIE), Korea. He is currently the Director of Electrical Power Reliability & Power Quality Research Center (EPRRC) sponsored by MOCIE.

The final presentation is an invited discussion entitled: Key Features of Successful Market Design and its Relevance to Asian Countries. It has been prepared and will be given by Xingwang Ma, AREVA T&D Corporation, Bellevue, Washington WA, USA

Economic forces have been driving dramatic restructuring of the power industry in the United States and throughout the world in the last decade or so. A successful market design covers many aspects from societal cost and benefits, real-time metering of generation and load to the mathematics of pricing methodology for energy and ancillary services. This will be reviewed. Experiences with electricity markets have shown that getting the price right is crucial to market success; and the right prices mean providing market incentives that encourage market participants to comply with short-term grid security requirements and long-term reliability needs for generation and transmission. In this presentation, key elements of such a successful market design are discussed with reference to several US markets in Mid-Atlantic PJM, New England and Mid West regions.

**Xingwang Ma** is a corporate engineer. He has been with AREVA T&D since 1996. In the last ten years, he has worked on market system design and implementation for many international markets, including New Zealand Wholesale Electricity Market, Australian National Electricity Market, ISO-New England Market, PJM RTO market, Midwest ISO market, ERCOT Market and consultation with North China Grid Company. His main interest is on the development of market applications and market design philosophy.

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12. Invited Discussers

## **PANEL SESSION CHAIRS**

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