

## Transmission Planning & Pricing for Fast Growing Markets

*Luiz Augusto Barroso, Tom Hammons and Hugh Rudnick*

*Working Group on Latin America Electricity Infrastructure*

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### Track 1: Transmission Capacity Enhancements in the 21st. Century

#### INTRODUCTION

Transmission networks provide the critical physical link between generation and load, and the basis for modern competitive markets. Therefore, the adequate resolution of transmission-related issues such as planning of reinforcements and pricing of transmission services is essential for the successful implementation of a competitive electricity market. While there is some industry consensus on the overall organization principles of the generation sector, in the transmission area the situation is far less clear. The institutional challenges, related to the interface between regulated (transmission) and competitive (generation) environments, combined with the technical challenges form the backbone of the new transmission planning activities in restructured electricity markets. For fast-growing markets, this issue is even more critical, be the developing world or the industrialized one. The fast development of wind-based generation parks in Europe is posing critical questions to transmission expansion will be discussed in the panel as well. The panel will also discuss the Latin American challenges, with the great diversity of the countries in relation to size, network characteristics, strong presence of hydro power and heavy investments in both generation and transmission required to serve their growing economies. The network expansion-planning problem is made even more complex in competitive environments, where the economic effect of a generator's siting decision is signaled indirectly through transmission tariffs. The objective of this panel is to review the planning structure and regulation of transmission expansion-related activities in fast-growing markets, demanding intense investments in new generation and transmission.

The Panelists and Titles of their Presentations are:

1. Luiz Augusto Barroso, Tom Hammons and Hugh Rudnick. *Transmission Planning and Pricing for Fast Growing Markets* (Invited Panel Presentation Summary 09GM0131)
2. Rodrigo Moreno, Christos Vasilakos, Danny Pudjianto and Goran Strbac (Imperial College London) *The New Transmission Arrangements in the UK* (Invited Panel Presentation Summary 09GM1199)
3. Hugh Rudnick, Juan Carlos Araneda and Sebastian Mocarquer *Transmission Planning--from a Market Approach to a Centralized One--The Chilean Experience* (Invited Panel Presentation Summary 09GM0558)
4. Luiz A. Barroso, Fernando Porrua, R. Chabar, M. V. Perreira and Bernardo Bezerra. *Incorporating Large-Scale Renewables to the Transmission Grid: Technical and Regulatory Issues* (Invited Panel Presentation Summary 09GM0779)
5. Daniel Carmac, Raul Bastidas, Ramon Nadira, Carlos Dortolina and Hyde Merrill. *Transmission Planning in Developing Countries: Criteria and Risks* (Invited Panel Presentation Summary 09GM0990)
6. Harold Salazar, Luis Zuluaga-Lopez and Ramon A. León. *Transmission Expansion and Pricing in Colombia: An Appraisal of Current Practices* (Invited Panel Presentation Summary 09GM1153)
7. Manuel Tinoco, *Transmission Tariffs and Planning in the Central American Regional Electricity Market* (Invited Panel Presentation Summary 09GM0618).

Each Panelist will speak for approximately 25 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 Luiz Augusto Barroso (Technical Director, PSR, Brazil), Hugh Rudnick (Professor, Pontificia Universidad Catolica de Chile, Chile), and Tom Hammons (Chair of International Practices for Energy Development and Power Generation IEEE, University of Glasgow, UK). They will moderate the Panel Session.

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**Luiz Augusto Barroso**, IEEE Senior Member, has a BSc degree in Mathematics, and MSc/PhD degrees in Operations Research from the Federal University of Rio de Janeiro, Brazil. He joined PSR in 1999 where he is now Technical Director. He has been coordinating several studies and research in the following areas: (i) economic studies; (ii) energy trading, risk management and physical-financial optimization in energy markets; (iii) system planning studies; (iii) electricity-gas integration, (iv) strategic pricing in competitive energy markets and in energy auctions and (v) regulatory assessment to private investors and institutions. Dr. Barroso has been an invited speaker on energy deregulation and power-gas system planning and economics in workshops, courses and talks in Brazil and many countries in Latin America, in USA/Canada, in Europe, and in Oceania.



**Hugh Rudnick**, an IEEE Fellow, graduated as an electrical engineer from the University of Chile, Santiago, Chile. He received the M.Sc. and Ph.D. degrees from the Victoria University of Manchester, Manchester, U.K. Currently he is with the Pontificia Universidad Catolica de Chile, Santiago, Chile and also with Systep Engineering Consultants, which specializes in power-gas system planning and operations issues. His research activities focus on the economic operation, planning, and regulation of electric power systems. He has been a consultant with utilities and regulators in different countries, the United Nations and the World Bank, mainly on the design of deregulation schemes and transmission and distribution open access tariffs.



**Thomas James Hammons** (Fellow IEEE 1996) received the degree of ACGI from City and Guilds College, London, U.K. and the B.Sc. degree in Engineering (1st Class Honors), and the DIC, and Ph.D. degrees from Imperial College, London University. He is a member of the teaching faculty

of the Faculty of Engineering, University of Glasgow, Scotland, U.K. Prior to this he was employed as an Engineer in the Systems Engineering Department of Associated Electrical Industries, Manchester, U. K. He was Professor of Electrical and Computer Engineering at McMaster University, Hamilton, Ontario, Canada in 1978-1979. He was a Visiting Professor at the Silesian Polytechnic University, Poland in 1978, a Visiting Professor at the Czechoslovakian Academy of Sciences, Prague in 1982, 1985 and 1988, and a Visiting Professor at the Polytechnic University of Grenoble, France in 1984. He is the author/co-author of over 400

scientific articles and papers on electrical power engineering. He has lectured extensively in North America, Africa, Asia, and both in Eastern and Western Europe. Dr Hammons is Chair of International Practices for Energy Development and Power Generation of IEEE, and Past Chair of United Kingdom and Republic of Ireland (UKRI) Section IEEE. He received the IEEE Power Engineering Society 2003 Outstanding Large Chapter Award as Chair of the United Kingdom and Republic of Ireland Section Power Engineering Chapter (1994~2003) in 2004; and the IEEE Power Engineering Society Energy Development and Power Generation Award in Recognition of Distinguished Service to the Committee in 1996. He also received two higher honorary Doctorates in Engineering. He is a Founder Member of the International Universities Power Engineering Conference (UPEC) (Convener 1967). He is currently Permanent Secretary of UPEC. He is a registered European Engineer in the Federation of National Engineering Associations in Europe.