

# Transmission System Operators – Lessons From The Frontlines

**Beatriz Arizu, William H. Dunn Jr. and Bernard Tenenbaum**



THE WORLD BANK  
GROUP



The Energy and  
Mining Sector Board

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

## **AUTHORS**

*Beatriz Arizu is Director of Regulatory Studies at Mercados Energeticos in Buenos Aires, Argentina. She has been involved in establishing transmission system operators and power markets in more than ten countries.*

*William H. Dunn, Jr. is Vice President and Managing Director of Barker, Dunn & Rossi, Inc. in Fairfax, Virginia. He has helped to design and implement transmission system operators and power markets in England and Wales, Northern Ireland, Australia, New Zealand, Venezuela, Colombia, El Salvador, the Alberta and Ontario provinces of Canada and the California, Florida, New England and Southwest regions of the US.*

*Bernard Tenenbaum is a Lead Energy Specialist at the World Bank. Prior to joining the Bank in March 2000, he helped to write the US FERC's December 1999 rule on regional transmission organizations.*

## **DISCLAIMER**

*The findings, interpretations, and conclusions expressed in this Paper are entirely those of the authors and should not be attributed in any manner to the World Bank, to its affiliated organizations, or to members of its Board of Executive Directors or the countries they represent.*

## **CONTACT INFORMATION**

*To order additional copies please call the Energy Help Desk. 202-473-0652  
energyhelpdesk@worldbank.org*

*A shorter version of this Paper called "Regulating Transmission: Why System Operators Must Be Independent" was published in the World Bank Viewpoint series in January 2001. It is available online at [www.worldbank.org/html/fpd/notes/](http://www.worldbank.org/html/fpd/notes/).*

## **AUTHORS**

*Beatriz Arizu [barizu@mercadosenergeticos.com](mailto:barizu@mercadosenergeticos.com)*

*William H. Dunn, Jr. [wdunn@bdrnet.com](mailto:wdunn@bdrnet.com)*

*Bernard Tenenbaum [btanenbaum@worldbank.org](mailto:btanenbaum@worldbank.org)*

---

*The material in this work is copyrighted. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or inclusion in any information storage and retrieval system, without the prior written permission of the World Bank. The World Bank encourages dissemination of its work and will normally grant permission promptly. For permission to photocopy or reprint, please send a request with complete information to the Copyright Clearance Center, Inc, 222 Rosewood Drive, Danvers, MA 01923, USA, fax 978-750-4470. All other queries on rights and licenses, including subsidiary rights, should be addressed to the Office of the Publisher, World Bank, 1818 H Street N.W., Washington DC, 20433, fax 202-522-2422, e-mail: [pubrights@worldbank.org](mailto:pubrights@worldbank.org).*

# Transmission System Operators – Lessons From The Frontlines

**Beatriz Arizu, William H. Dunn Jr. and Bernard Tenenbaum**

**The World Bank, Washington, DC**



THE WORLD BANK  
GROUP



The Energy and  
Mining Sector Board

## **ABSTRACT**

**Over the last ten years, separate (though not necessarily independent) transmission system operators have been created or proposed in more than 30 countries. In this Paper, we discuss lessons learned about TSOs while working on the “frontlines” of power sector reform. We describe the different kinds of TSOs, successful and unsuccessful arrangements for ensuring their independence, workable roles for government and regulators, and a mechanism for institutionalizing change.**

**“We are world class engineers, but that is not true of our institutions.”**

**Power engineer**

## INTRODUCTION

Institutions are the “soft” side of power sector reform. When engineers and economists are asked to think about institutional issues, their eyes usually glaze over. They much prefer to occupy themselves with the “hard” side—technical and economic issues where there is more precision (and possibly even a formula)—and leave institutional issues to politicians and lawyers. But there is a danger in leaving the institutional issues to others. If the new institutions are flawed, it is impossible to practice good engineering and good economics. Successful power sector reform requires all three elements—good engineering, good economics and good institutions.

Among new power sector institutions, Transmission System Operators (TSOs) are critical to the success of any power sector in which competition is sought. A TSO must be the “operator” of both the high voltage transmission grid and generation dispatch center, either directly or through instructions issued to others who operate as agents of the TSO. A TSO must also be the gatekeeper that decides who gets access to the grid and on what terms. Competition, whether through a centralized pool or decentralized bilateral exchanges, will be neither fair nor efficient unless a TSO can provide equal access to unbundled transmission service for all market participants. To achieve a competitive power sector, the TSO must act as an “impartial policeman and not as someone’s private army.”

Over the last ten years, separate - though not necessarily independent - transmission system operators have been created or proposed in more than 30 countries.<sup>1</sup> In this paper, we discuss lessons learned about TSOs while working on the “frontlines” of power sector reform. We describe the different kinds of TSOs, successful and unsuccessful arrangements for ensuring their independence, workable roles for government and regulators, and a mechanism for institutionalizing change.

1. In this paper, we assume that a country has decided to create a TSO through “unbundling” or “deverticalization.” However, this does not imply that we think that vertical separation is the preferred option for every country. For a good discussion of the advantages and disadvantages of unbundling, see Russell Pittman, “Vertical Restructuring (or Not) of the Infrastructure Sectors of Transition Economies,” paper presented at the World Bank’s Annual Bank Conference on Development, May 2002.

## WHAT KIND OF ENTITY?

Within reformed power sectors, two kinds of TSOs dominate: Transcos and Independent System Operators (ISOs).<sup>2</sup> Transcos are joint owners-operators of the high voltage transmission grid. ISOs are separate operators of grid facilities owned by others. The actual grid owners might be vertically integrated power enterprises or stand-alone owners of transmission facilities, the latter are usually referred to as wirecos or gridcos (Table 1).

The job of the TSO is to ensure the electrical stability of the interconnected system so that bulk power can be transported from generators through transmission networks to distribution systems.<sup>3</sup> A TSO—whether it is a Transco or an ISO—provides open access to the transmission system, monitors and controls system operations to ensure a moment-to-moment energy balance, manages congestion, schedules generation (or reviews the technical feasibility of schedules submitted by

others), acquires ancillary services not otherwise provided by the market participants such as operating reserves and voltage support, administers transmission tariffs, and plans or approves requests for maintenance of transmission and generation facilities. In addition, many TSOs also administer spot and real-time balancing energy markets.<sup>4</sup> If the TSO acts as a market operator, it will generally be responsible for metering, accounting, settlement and billing for these markets. Overall, it is the TSO's job to ensure the electrical stability of the interconnected system so that bulk power can be transported from generators through transmission networks to distribution systems in real time. A TSO can be thought of as the “air traffic controller” of the high voltage grid.

### ISO-Wirecos versus Transcos.

Which is better, a separate ISO, an integrated Transco or some combination of the two? This question is currently being hotly debated in many countries.

**TABLE 1 Functions of transmission entities (owners and operators) by type**

TYPE OF ENTITY AND EXAMPLE	MAINTAINS REAL-TIME CONTROL OF SYSTEM OPERATIONS	MAINTAINS TRANSMISSION FACILITIES	CONTROLS GRID INVESTMENTS	OWNS OR LEASES TRANSMISSION FACILITIES
<b>Independent system operator</b> Cammesa (Argentina), PJM, NEPOOL & NYISO (U.S.), ONS (Brazil), NEMMCO (Australia), IMO (Ontario)	●		○	
<b>Wireco</b> Transener (Argentina), Transelec (Chile), GPU PowerNet (Victoria, Australia)		●	○	●
<b>Transco</b> National Grid Company (England and Wales), Statnett (Norway), Polish Power Grid (Poland), TransPower (New Zealand)	●	●	●	●

● Full responsibility. ○ Shared responsibility

Source: Based on unpublished work of Steve Stoff (University of California Energy Institute) and Carolyn Berry (Charles River Associates)

- Though separate system operators (SOs) are usually described as ISOs, they may not always be truly independent. The next section discusses the requirements for genuine independence.
- In fact, a TSO must operate a “bulk power system” rather than simply a “transmission system.” It is impossible to operate the grid safely unless the TSO also has some control, directly or indirectly, over the operation and scheduling of most of the generating units that are connected to the grid and the scheduling of transactions with other interconnected grids. As a consequence, TSOs are usually created out of existing dispatch centers. For a fuller discussion of system operation in competitive markets, see Sally Hunt and Graham Shuttleworth, “Operating a Transmission Company under Open Access: The Basic Requirements,” *The Electricity Journal*, March 1993, pp. 40-50 and Eric Hirst, “What Is System Control?.” Available at [www.ehirst.com](http://www.ehirst.com).
- If the demand and supply of electricity on an interconnected grid is not in exact balance on a moment to moment basis, the resulting deviation from the targeted frequency (usually 50 or 60 Hz) can damage the equipment of both users and generators. A balancing market is a real-time market in which the TSO receives offers from generators and consumers with dispatchable demand to allow the TSO to raise or lower their output or consumption to obtain overall system balance. The staff of the United States Federal Energy Regulatory Commission (FERC) recently proposed a “Standard Market Design” (SMD) that, if adopted by the Commission, would also require TSOs to be operators of bid-based markets for energy and operating reserves on a day ahead and real time basis. Underlying this recommendation is the view that a TSO cannot be an effective provider of transmission service unless it also is the system controller, operator of real time and near real time markets and manager of congestion. This is quite different from the design that the Commission had previously approved in California where one organization (the PX) operated the spot market and another organization (the ISO) controlled the system and managed congestion. See Federal Energy Regulatory Commission, “Working Paper on Standardized Transmission Service and Wholesale Electric Market Design,” March 15, 2002. Available at [http://www.ferc.fed.us/Electric/RTO/post\\_rto.htm](http://www.ferc.fed.us/Electric/RTO/post_rto.htm).

ISO proponents argue that separate ISOs are preferable because a Transco will always favor its own commercial interests over the interests of market participants.<sup>5</sup> They assert that it is difficult to design incentives to induce the Transco to minimize total electricity production costs rather than just congestion costs. They also claim that a Transco will almost always choose the transmission investment solution to an operating or congestion problem, even if there are lower cost alternatives (e.g., it will expand transport capacity by building a new line rather than paying a new generator to build at another location or implementing a demand-side management option).<sup>6</sup>

In contrast, Transco proponents claim that separate ISOs are inherently inefficient because they are usually non-profit organizations and require complex governance systems. Professor Paul Joskow of MIT observes that “[n]ot for profit entities operating assets owned by others with none of their capital at risk have a long record of failure.”<sup>7</sup> Other Transco proponents assert that it is difficult to write and enforce contracts to ensure that the ISO will both efficiently and reliably operate the assets of transmission owners and be responsive to the desires of market participants. They also argue that Transcos are preferable in the early stages of reform because they are easier to create from state-owned utilities (i.e., require the fewest changes) and may serve as a countervailing force to the political power of generators and distributors.

We have yet to see clear-cut empirical evidence that conclusively supports the assertions of either group. In our view, both types of systems operators can be made to work, singly or in combination.<sup>8</sup>

### THE “WHY” AND “HOW” OF INDEPENDENCE

A TSO, whether an ISO or a Transco, must be independent of the ownership and control of market participants (e.g., generators, distributors and suppliers).<sup>9</sup> Independence is needed so that the TSO does not discriminate in favor of one market

participant over another. For example, if a generator owns or controls the TSO, it will have both the incentive and ability to: (i) shift transmission access charges to distributors; and (ii) provide favored transmission access to its own generating units. Or, if a distributor owns or controls the TSO, especially if it is also a retail supplier, it can direct the TSO to write rules that: (i) provide lower transmission rates to itself; and (ii) favor itself over others if overall demand needs to be curtailed to avoid a blackout. Independence is not just a matter of fairness; it has real world consequences. Private investors will be reluctant to build new or buy existing generation or distribution facilities unless they believe that the TSO will be independent of all market participants in “word, deed and appearance.”

### Ownership

Ownership usually conveys control so there must be restrictions on who owns the TSO. In fact, restrictions on ownership must go in two directions. The TSO cannot have financial interests in market participants and market participants cannot have financial interests in the TSO. Additionally, the TSO itself must not be a market participant (e.g., it should not be financially at risk because of fluctuations in the price of energy).

The first restriction must apply to the TSO as well as to its directors, managers and employees. These individuals must divest themselves of financial interests in market participants before joining the TSO or soon afterwards. The second restriction prohibits market participants from having equity ownership interests in the TSO. For example, the corporate charter of the National Grid Company (NGC), the privately owned Transco that serves England and Wales, prohibits any “restricted persons” (i.e., market participants) from owning more than 1 percent of NGC’s voting equity. In contrast, regulatory authorities in the United States have been willing to allow market participants to retain passive ownership interests in TSOs. The theory is that passive ownership is acceptable because it is “ownership without control.” The difficulty with

5. Some countries (Poland and Hungary) have created Transcos that have also been granted the exclusive right to purchase electricity from generators and to sell it to distributors. The problems created by a combined Transco-Single Buyer model are discussed in Laszlo Lovei, “Single Buyer Model: A Dangerous Turn on the Road to Liberalized Electricity Markets,” World Bank Viewpoint, January, 2001. Available at [www.worldbank.org/html/fpd/notes/](http://www.worldbank.org/html/fpd/notes/)  
6. See Larry E. Ruff, “Opening Statement on Defining and Allocating RTO Functions,” FERC Technical Conference on Allocation of RTO Functions and Characteristics, February 19, 2002. Available at [www.ksg.harvard.edu/hepg/](http://www.ksg.harvard.edu/hepg/)  
7. Paul L. Joskow, “Regional Transmission Organizations: Don’t Settle for the Nth Best (N+ 1),” presentation to the Harvard Electricity Policy Group, September 21, 2001. Available at [www.ksg.harvard.edu/hepg/](http://www.ksg.harvard.edu/hepg/)  
8. One hybrid option involves transferring some operational functions from the ISO to the Wireco. This option has been discussed in the New England and Western regions of the United States. See [www.nerco.com](http://www.nerco.com). Another hybrid is a partial Transco-partial ISO (i.e., it owns and operates some grid facilities and operates but does not own other facilities). This arrangement is usually pursued when legal or economic impediments prevent current grid owners from selling their assets to the TSO.  
9. The US FERC defines a market participant as any entity “whose economic and commercial interests are likely to be affected [by a TSO’s] decisions and actions.” See Order 2000, December 14, 2000, p. 194. Available at [www.ferc.fed.gov](http://www.ferc.fed.gov). We use the terms “market participant” and “stakeholder” interchangeably in this paper. The fact that a TSO is independent of market participants does not mean that the TSO lacks economic interests. In fact, a TSO’s economic interests will sometimes conflict with the economic interests of stakeholders. For example, transmission owners will always want the TSO to accept a broad definition for any liability for damages arising from instructions given to them. In contrast, the TSO will want a narrow definition of its liability

implementing this exception is that it leads to complicated and time-consuming legal disputes over whether the ownership is “truly passive.”<sup>10</sup>

### Decision Making Control

Control of the TSO's decision making process can be achieved by one or more market participants even if they are not owners. This is a particular concern if the TSO is established as a non-profit or cooperative organization (the typical structures for an ISO). In such situations, close attention must be paid to the TSO's governance—what decisions are made, who makes them, how decisions are enforced and how disputes are resolved. The key to governance lies in the composition and voting rules of the TSO's governing board.<sup>11</sup>

### Governing Boards

TSO governing boards can be stakeholder boards, non-stakeholder boards or a combination of the two. The stakeholder board, which is the dominant model throughout Latin America, allows each class of market participant to have one or more representatives on the decision making board. Board members are permitted to represent directly and openly the economic interests of their organizations or constituencies within the existing regulatory framework and rules of the TSO. The presumption is that independence can be achieved if no single entity or class can dominate board outcomes. This has been described as “independence through balance of power.”

An alternative approach is the non-stakeholder or “classless” board, currently the dominant model in the United States. Board members are chosen to be independent rather than representative of stakeholders. This is accomplished by prohibiting board members from having any current and future financial interests (at least for a “cooling off” period) in market participants, their affiliates or companies that provide them with products or services. Specific board seats may be

reserved for particular skills (e.g., system operations and planning, finance and accounting, law and regulation).<sup>12</sup> To avoid becoming isolated from day-to-day operational and market realities, the board is usually advised by one or more committees of stakeholders.<sup>13</sup>

In general, a non-stakeholder board is the preferred option because it is easier to implement, less likely to become deadlocked and more likely to produce decisions that do not systematically favor the commercial interests of one type of market participant. But a stakeholder board may be the best initial option for some countries that are trying to privatize and restructure their power sectors for three reasons. First, it gives new private investors comfort to know that they will be able to participate in decisions that can have a major financial impact on their investments. Second, even if a non-stakeholder board is the preferred option, it may be impossible to find enough knowledgeable individuals within the country that would be perceived as independent. Third, non-stakeholder board members may be susceptible to “capture” (e.g., bribes or offers of future employment).

The worldwide experience suggests several requirements for a successful stakeholder board.

- **The board cannot be too large or it will be ineffective as a decision making body.** Most Latin American boards are limited to 7 or 9 members. In California, however, the ISO board had 25 voting members and 4 non-voting members. The US FERC dissolved the board after concluding that its decisionmaking process was “overly complex” and “mired in controversy.”<sup>14</sup> When a stakeholder board becomes large, the different stakeholder groups often choose their board representatives more for their political skills than for their technical expertise. In a public investigation of the 2001 California crisis, the CEO of the

10. The difficulty of monitoring of passive ownership has clearly been recognized by US regulatory authorities. In Order 2000, the FERC presented a long list of characteristics and behaviors that it would need to monitor to ensure that passive owners were truly passive. The list included: “fiduciary responsibilities of the [TSO] board and management to passive owners; ability of the [TSO] to raise capital independently of its passive owners; ability of the [TSO] to make investment and financing decisions independently of its passive owners; the extent of control by passive owners over board selection and removal; the extent of control over transmission rates, terms and conditions; control of passive owners over issuance of new membership interests and/or equity; services that will be provided by the passive owners or their employees to the [TSO]; and the extent of access of passive owners to information not available to other market participants.” Many transmission users have expressed skepticism about FERC's ability to monitor these many subtle dimensions of corporate conduct.

11. An early discussion of different approaches to governance in developed countries can be found in James Barker, Jr., Bernard Tenenbaum and Fiona Woolf, “Governance and Regulation of Power Pools and System Operators: An International Comparison,” World Bank Technical Paper No. 382, 1997. For a more recent discussion, see Ashley C. Brown, “RTO Governance,” April 3, 2002 and Stephen C. Bird, “Appendix A—RTO Governance: A Comparison of ISO Governance Structures in the US,” April 3, 2002. The Brown and Bird papers are available at [www.ksg.harvard.edu/hepg/](http://www.ksg.harvard.edu/hepg/).

12. However, the fact that board members and staff are experienced in the operations of a traditional utility does not mean that they will be equally adept at operating in a more open, competitive world. One system operator in Central America described the difference in the “two worlds” as follows: “before we didn't have to explain anything to anyone and now we are suppose to explain everything to everyone.”

13. Key design issues for a non-stakeholder governing board are presented in Appendix B.

14. See Wall Street Journal, “US Agency Proposes To Alter California's Market For Electricity,” November 2, 2000, p. A-16. A similar problem arose in Brazil with the governance of MAE, the market operator. The government found it necessary to replace a large stakeholder board with a smaller non-stakeholder board because the stakeholder board was often subject to “politics and paralysis.”



ISO stated that: "All the operating things that I deal with daily, they [members of the governing board] don't have a clue what they mean."<sup>15</sup>

- **The voting rules must ensure that one or two classes cannot control the board's decisions.** Rules should be designed so that no one class of market participant can block a TSO board action, no two classes can mandate board decision and no market participant can participate in more than one class. In contrast, the board of the Chilean market operator was, until recently, limited to large generators (i.e., a cartel) and each board member had veto power. This domination by large generators was so complete that other market participants often did not know the details of its operational and dispatch rules.
- **The board must have real decision making authority.** In Panama, the manager of the system operator located within the government-owned Transco was recently removed without the approval of the stakeholder board. When a board is excluded from such key decisions, it is really only an advisory body with no genuine decision making power.
- **The regulator must be able to step in and make a decision if there is a deadlock among the board members.** This does not mean that the regulator must formally approve each and every decision of the board or arbitrate every dispute. Such a requirement would slow down the reform process, especially in the early months when changes will be needed on an almost continual basis. However, the regulator must have the legal right to intervene if there is an appeal by a market participant or on the regulator's own initiative. If the governance system is well designed, this should not happen very often and "government regulation" will be effectively replaced by "industry self-regulation."<sup>16</sup>

### ***If The ISO Is Independent, Isn't That Enough?***

In some countries which have chosen the ISO-Wireco model, it has been argued that only the system operator needs to be independent and that wirecos can be partially or completely owned by market participants. The presumption is that an ISO will be able to prevent the wireco from favoring an affiliated generator or distributor.

This view has been proposed in amendments to the Chilean electricity law that would allow individual market participants to own up to 8 percent of the equity in individual wirecos. The same proposed amendments would allow market participants as a group to own up to 40 percent of a wireco's equity. Similarly, regulatory authorities in the US would allow market participants to own 100 percent of wire companies as long as the system operator entity is found to be independent.<sup>17</sup> In contrast, the 1994 Bolivian electricity law prohibits any market participant from having any equity interest in a transmission company.<sup>18</sup>

If a country chooses the ISO-Wireco model, we think the better strategy is to prohibit market participants from owning or controlling either the system operator or any wireco. If this structure cannot be created immediately, then it should be moved to as soon as possible. The problem with allowing wireco-genco affiliations is that the wireco can undertake numerous subtle actions that can favor its affiliated generators over non-affiliated generators. For example, a wireco will have considerable discretion over the timing and location of grid maintenance actions and grid upgrades. It is virtually impossible to prevent a wireco from using this discretion to favor its affiliates. Some have argued that such favoritism can be prevented if the transmission control agreement, the basic contractual agreement between an ISO and transmission owner, is written with tight and detailed provisions. However, it is inevitable that such an agreement has to be written in general terms since it is impossible to anticipate all possible operational conditions on the grid.<sup>19</sup> The need for a generally written agreement makes it virtually impossible for an ISO or a regulator to assure that a wireco's actions are "reasonable" and

15. Los Angeles Times, "State Electricity Grid Chief Defends His Secretive Action Plan," November 7, 2001, p. B-7.

16. This has not happened in Chile, Peru and Bolivia, where almost every rule change has to be approved by the government and then issued as a presidential decree. In designing a new regulatory system for TSOs, the three basic design issues are: Which rule changes need regulatory approval? What level of government must approve the rule changes? Does approval require an explicit, formal approval or can it be automatic after a certain number of days? If there is effective industry self-regulation, the regulator would have a limited backstop role. However, the regulator would still retain a primary role setting overall transmission revenues and approving most transmission expansions.

17. In Order 2000, FERC stated that it was imposing "restrictions on corporate or shareholder ownership in the [TSO] itself and not to ownership of transmission facilities under the [TSO's] operational control." See Order 2000, December 20, 2000, footnote 314.

18. The Bolivian Law states that: "None of the Generation or Distribution Companies, nor any of their Related Companies and Related Stockholders or Partners may be holders of property rights in any percentage of the capital stock of any Transmission company, neither may any [Generation or Distribution company] exercise administrative control of said [Transmission] company." Bolivian Electricity Law (December, 1994), Article 15 (a).

19. See Appendix A for a listing of the issues that are usually covered in a transmission control agreement (TCA) between ISOs and owners of transmission facilities.

“non-discriminatory.” Therefore, we believe that the safer strategy is to prohibit cross-ownership between wirecos and generators. Without such a prohibition, the regulator and the ISO will face the impossible and unproductive task of policing the wireco’s day-to-day actions and decisions.<sup>20</sup>

## FUNCTIONAL UNBUNDLING: THE IMPOSSIBLE DREAM

### What Is It?

Functional unbundling has been proposed as a “second best” alternative to an independent TSO. It has been tried in the United States and Europe (where it is called “separation on a management basis”) and has also been proposed for India and Ghana.<sup>21</sup> It allows the grid operator to remain within a larger power enterprise that owns generation and transmission facilities, but tries to establish detailed conduct rules so that the grid operator “will act as if it is separate, even though it really isn’t.”<sup>22</sup>

Typically, these rules require:

- Separate accounts for grid operations
- Separate management of grid operations
- Restrictions on information flows between the grid operator and other divisions/affiliates of its parent enterprise
- Provision of non-discriminatory transmission service to affiliated and non-affiliated grid users under a published transmission tariff.<sup>23</sup>

### Why Does It Not Work?

Functional unbundling does not work for two reasons.

First, it conflicts with the normal incentives of any commercial enterprise to try to protect the profits of a parent or affiliated company.<sup>24</sup> For example, in the US it has been widely alleged

that vertically integrated companies have placed competitors at a disadvantage by “playing games” with biased estimates of available transmission capacity, questionable curtailments of transmission service for “security” reasons and excessive allocations of transmission import capacity reserved for itself or affiliates. But it has been difficult to prove these allegations because the rules are very general and therefore can be applied with considerable discretion.<sup>25</sup>

Second, it is virtually impossible for the regulator to enforce the rules. Consider, for example, the common prohibition against the grid operator sharing information on available transmission capacity with its power marketing division or affiliate before this information is shared with other market participants. To enforce such a rule would require a veritable army of regulators to monitor “who spoke to whom in the company cafeteria.” It would be equally difficult for a regulator to determine the true reasons underlying a TSO’s refusal to provide transmission service to a competitor. Was there a genuine lack of transmission capacity? Or, was it simply an after-the-fact, engineering rationalization designed to hide favoritism to an affiliate? Most regulatory commissions do not have the technical expertise to make such assessments. Even if they had the necessary expertise, the decision would probably come too late to be of use to the company that made the complaint. In summary, any unbundling scheme that requires the regulator to be a “conduct policeman” is doomed to fail.<sup>26</sup>

### Government Ownership (Control) is not a Long Run Solution

System operation is “the last true monopoly” of the power sector. Ministers, who are willing to privatize almost everything else, are often reluctant to give up government ownership or control of system operations. Their unwillingness to “let go” is often grounded in the political reality that the minister, not the regulator, will be held responsible if something goes wrong.

20. A good discussion of these issues can be found in NERA, Final Report For Component 1 (Market and Industry Structure), prepared for the National Energy Policy Organization of Thailand, March 1, 2000. Available at [www.nepo.go.th](http://www.nepo.go.th)

21. The Ghanaian government seems to recognize that functional unbundling through a wholly owned subsidiary of Volta River Authority (VRA), the state-owned generating company, will prove unworkable. In newly proposed legislation, the Minister of Finance is required to issue a directive after one year that would create a Transco that is separate and “fully autonomous” from VRA.

22. This is not the only example of functional unbundling in reforming power sectors. It has also been attempted in several countries that have introduced retail competition but were unwilling or unable to require the creation of distribution wires companies unaffiliated with retail suppliers. In these countries, the incumbent distribution company will often block competitors in subtle ways from reaching its customers. After several years of unsuccessful efforts at policing this behavior, New Zealand passed the Electricity Reform Act of 1998 which requires all integrated distribution companies to choose to operate a single business, distribution or retail supply, and to implement this decision through mandatory divestiture by 2004.

23. In fact, this was not required in Europe. The European Commission’s 1996 Electricity Directive gives TSOs the option of providing “negotiated access” which requires that potential user must negotiate terms and conditions of access with the TSO. In Germany, where negotiated access has been the norm, potential users have had to hire “an army of lawyers” to try to get access. See *The Economist*, November 4, 2000, p. 24.

24. Sometimes a government will require that the grid operator establish a new separate company. But the fact that there is a “different nameplate on the door” does not eliminate the underlying incentive to favor an affiliated or parent company.

25. See US FERC, Order 2000 (December 14, 2000), “Continuing Opportunities for Undue Discrimination,” pp.64-70 and Narasimha Rao and Richard D. Tabors, “Transmission Markets: Stretching The Rules For Fun and Profit,” *The Electricity Journal*, June 2000.

26. For example, the US FERC has found it necessary to interpret and clarify Order 889, its 1996 functional unbundling rule, in more than 80 separate, follow-up orders covering more than 1300 pages. In December 1999, FERC concluded that functional unbundling was inefficient, unfair and difficult to enforce.

The government may also be trying to protect the value of its remaining generation assets in cases of partial or full privatization. Therefore, it is not surprising that the government continues to own the dispatch center in Panama, Colombia and Nicaragua. In Argentina the Energy Secretariat retains the authority to specify changes in the grid operator and market rules, to serve as the president of its Board of Directors and to veto its decisions.

Unfortunately, continued government ownership and control continues the very problems that the reform was supposed to have solved. For example, in Latin America government-owned TSOs often lose talented people because the TSO is usually limited to paying government level salaries. Market participants are willing and able to pay much higher salaries to individuals who understand grid and market operations. It should also not be a surprise that government-controlled TSOs are vulnerable to politically motivated decisions. For example, if a Minister controls rule changes, he or she may take actions for political or personal reasons. Since the changes are usually made in obscure operating rules, generally there will be no serious, substantive review by other parts of the government. Or the Minister, who usually is not appointed for reasons of technical expertise, may simply not understand, what he or she is being asked to approve. In one Latin American country, an Energy Minister, with pen in hand, turned to an advisor and said: "I do not understand anything of what I am signing. Promise me it is correct."

### **You Can't Do Everything at Once**

Politicians are often slow in deciding to reform, but once they make the decision, they almost always want the reform to be done quickly before the political "window of opportunity" closes. As one power sector official observed: "We waited and waited and then didn't see our families for a year." The pressure to meet a political or legislative deadline means that there may not be enough time to get all elements of a new grid operating system up and running before the mandated starting date. Additionally, it is impossible to anticipate how the different pieces of a complex, new system will fit together and actually operate. These realities argue for two strategies: start simple and make sure that mistakes can be corrected.

Latin America, in contrast to North America, has generally opted for the "keep it simple" approach. For example, most

Latin American countries have initially mandated ancillary service obligations on individual generators and distributors, as opposed to trying to acquire these services through competitive markets.<sup>27</sup> Similarly, most Latin American countries have opted for cost-based rather than bid-based markets in the early years of reform. Finally, the Latin American countries have generally limited retail competition to large customers in the initial years of reform.

These administrative and cost-based approaches have been criticized for not being "real reforms." But the more incremental Latin American approach has produced genuine efficiencies, while avoiding some of the operating and political crises associated with the North American "do it all at once" approach.<sup>28</sup> Many of the Latin American countries are now moving to "second generation" reforms that are more market oriented.

### **Institutionalizing Change or It Pays to Have An Outside Coach**

The biggest danger to the ultimate success of any power sector reform is getting "stuck" with a set of grid or market rules that are flawed or incomplete. Once rules are in place, some market participants will benefit economically if they can prevent any further changes to the rules, even though such changes would lead to overall gains in efficiency. Those who profit from a flawed rule will usually cry "discrimination" if anyone proposes to change the rule. The challenge, then, is how to create a system that ensures efficient rule changes even though the government may be suffering from "change fatigue" and one or more new private participants are strongly opposed to such changes.

One option is to assign this ongoing review responsibility to the new regulator. But generally this is not a viable solution because most new regulators do not have the detailed, technical knowledge to detect changes that are needed. Even if they have the requisite knowledge, there is a good chance that new private companies that benefit from the status quo will be able to lobby ministers to block any further changes.

An alternative, used in the US, the Netherlands and Panama, is to establish a market surveillance group of independent outside experts to "institutionalize change."<sup>29</sup> The recent experience of these countries suggests four lessons.

27. For example, in most Latin American countries generators have been required to provide different kinds of operating reserves and reactive power within the technical capabilities of their generation units. Distributors have been required to provide reactive power and automatic load shedding. Similarly, the initial approach in England and Wales was to require that generators provide certain ancillary services (e.g., reactive power and frequency control). Over time, the transmission system operator in England and Wales, NGC, has acquired an increasing proportion of such services on a commercial or market basis.

28. The US FERC has concluded that the California market was "in dire need of simplification." "Market Order Proposing Remedies For California Wholesale Electricity System," November 1, 2000, p. 36.

29. Ms. Arizu and Mr. James Barker (a colleague of Mr. Dunn) are two of the three outside experts in Panama.

- **The experts must be perceived as “independent and objective.”** In small and even medium sized countries, this probably requires hiring experts from outside the country. Most knowledgeable people within the country will be perceived, at least initially, as biased because of past connections with the industry.
- **The experts must have a broad mandate.** In addition to assessing the performance of the market, they should be charged with assessing the performance of the TSO and the regulator. The experts should be instructed to recommend changes in structure as well as changes in rules. If the underlying problem is structural (i.e., too much concentration in generation to support workable competition), it will not be fixed with rule changes.
- **The experts should be required to make regularly scheduled visits.** It is best to fix a “problem” before it becomes a “crisis” (i.e., a headline in the newspaper). This requires scheduling frequent visits in the early years of the reform.
- **The experts should be allowed to present their analysis and recommendations in a timely and public manner.** Everyone needs to know the views of the experts. If there is widespread confidence in their objectivity, it will be politically difficult to ignore their recommendations.

## CONCLUSION

Engineers like to operate sophisticated power systems, economists like to think about optimal incentives, and lawyers like to write rules and agreements. Power sector reform brings all of them into close contact. But none of them can succeed at their chosen tasks unless they work together in designing sustainable institutions. If a government wants a competitive power sector, it must recognize that the TSO is the key institution. More importantly, it must create a TSO whose decisions are not controlled by any one or more market participants or by the government itself. The hardest lesson for a government is to accept the fact that it must be willing to give up political power in order to obtain electrical power.



## APPENDIX A

### Transmission Control Agreement (TCA) Design Issues

Some of the issues usually addressed in a Transmission Control Agreement (TCA) include:

- Whether there will be one TCA between the TSO and all of the Transmission Owners (a multi-party agreement) or individual TCAs between the TSO and each Transmission Owner. If there is a multi-party TCA, it will have to define the participating Transmission Owners.
- A definition of the terms used in the TCA, unless there is a separate document defining all of the common terms used in all of the industry documents (the approach we recommend).
- The usual terms and conditions of any contracts, such as the effective date and term, provisions for withdrawal and termination, residual obligations upon withdrawal or termination (especially residual obligations to continue to provide transmission service), dispute resolution, record retention, liability, force majeure, and assignment of obligations under the TCA.
- A description and listing of the facilities being turned over to different kinds of TSO authority. In other words, different facilities can be put under the TSO's operational authority, pricing authority, planning authority and interconnection authority.
- A description of the relationship of the TCA to the other industry documents. Which documents take precedence over other documents?
- A description of the separate rights and responsibilities of the TSO and the Transmission Owners. This might include any "inalienable" rights of the Transmission Owners to prohibit certain changes to the TCA by any party if such changes would impact, for example, their ability to meet certain other contractual or statutory obligations or jeopardize the tax exempt status of bonds issued by some Transmission Owners.
- A description of maintenance coordination obligations and maintenance standards, including rights of the TSO to access and use Transmission Owner equipment.
- A description of the responsibilities of the various parties during a system emergency.
- Provisions for transmission planning and expansion, including the relative roles of the TSO and the Transmission Owners and the degree of participation in the process by market participants.
- A description of how the TSO will administer the process for granting access to and use of the combined transmission facilities of the Transmission Owners.
- How encumbrances on the transmission facilities, such as pre-existing contracts and operational agreements, will be honored under the new arrangements.
- The terms and conditions for the TSO to pay for the cost of the transmission facilities.
- Establishment of any coordination committees.

## APPENDIX B

### Design Issues for Non-Stakeholder TSO Governing Boards

#### Independence and Accountability

- Is the Board independent from market participants and affiliates?
- What is the definition of a market participant?
- Is the Board independent from political authorities?
- How many members are on the Board?
- What are the conflict of interest provisions for Board members and employees? What are the restrictions on past, present and future financial ties between board members/employees and market participants? Are there restrictions on other positions the board members may hold while serving on the Board?
- To whom is the Board accountable? A regulator, an advisory committees or a government ministry? Must there be a formal appeal to an oversight entity or can the oversight entity undertake a review of a Board decision on its own initiative?
- If there is market monitoring, does the market monitor report to the Board or some government body such as the regulator? Does the market monitor have the legal authority to review the actions of the TSO and its Board?
- Is there a formal “code of conduct” that Board members must sign as a pre-condition to serving on the Board?

#### Board Selection

- Who selects the initial Board?
- Should an outside executive search company present one or two candidates for each board position?
- After initial selection, does the Board have the authority to renew itself when members leave the board (i.e., a self-renewing Board)?
- Are there professional or educational requirements to be a member of the Board?
- Do Board members serve staggered terms?

#### Fiduciary Responsibility of the Board

- Is the Board responsible to market participants, the government, the general “public interest” or the TSO itself as an organization?
- What interests should the Board be promoting and advancing—the general public interest (e.g., open access, competition and reliability), the interests of market participants or the interests of the TSO as an organization?
- What are the legal liabilities of individual Board members? What are the liabilities of the board as a whole?
- How much time are Board members required to devote to the Board?

#### Functions of the Board

- Is the Board responsible for:
  - Filing transmission tariffs and market design rules before the regulatory commission?
  - Operating a market and meeting established reliability standards
  - Oversight and hiring of the TSO senior staff?
  - Review and approval of the budget?
  - Market monitoring?
- What matters go to the Board?
- What is the Board’s relationship with management?

#### Relationship to Stakeholders

- Are there one or more committees of market participants?
- Are the committees advisory in nature or do they share some decision making authority with the Board?
- Who is eligible to participate on these committees? How are committee members selected?
- Do Board members serve on one or more of the advisory committees?
- Are there both formal and informal channels of communication between the Board, the advisory committees and individual stakeholders?
- Are representatives from regulatory commissions or government ministries allowed to participate on these committees?





THE WORLD BANK  
GROUP



The Energy and  
Mining Sector Board

The World Bank  
1818 H Street N.W.  
Washington, D.C. 20433  
USA