Creating COMPETITIVE Power Markets: the PJM Model

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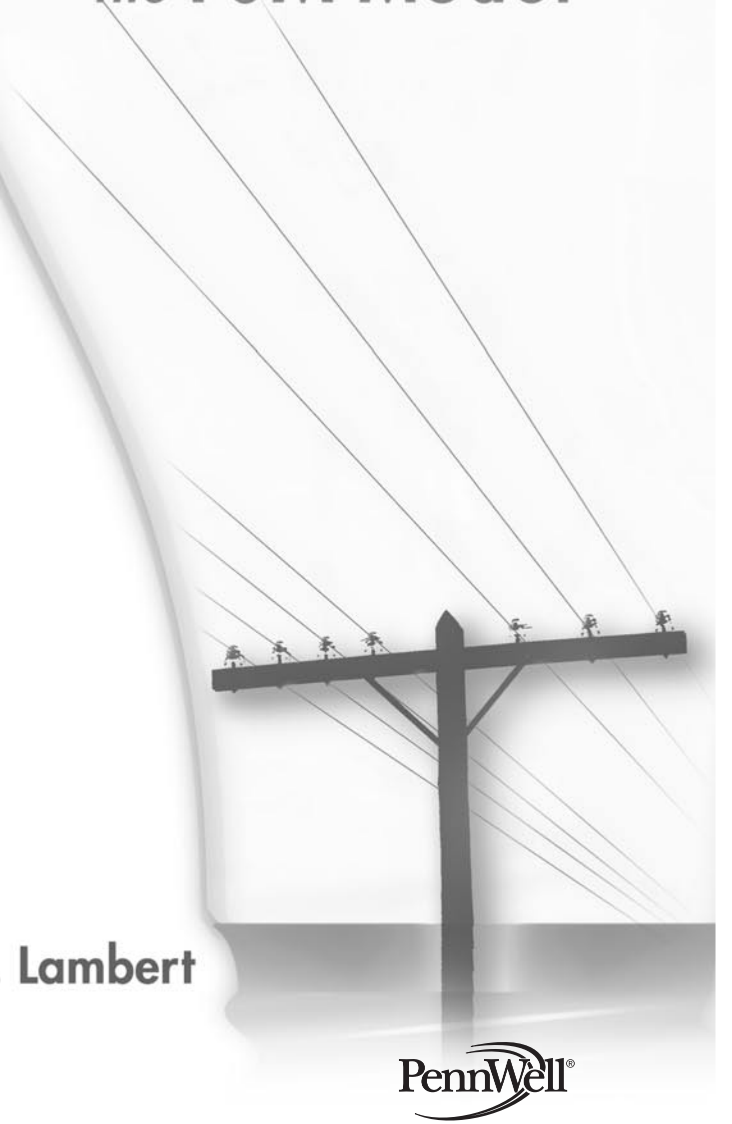

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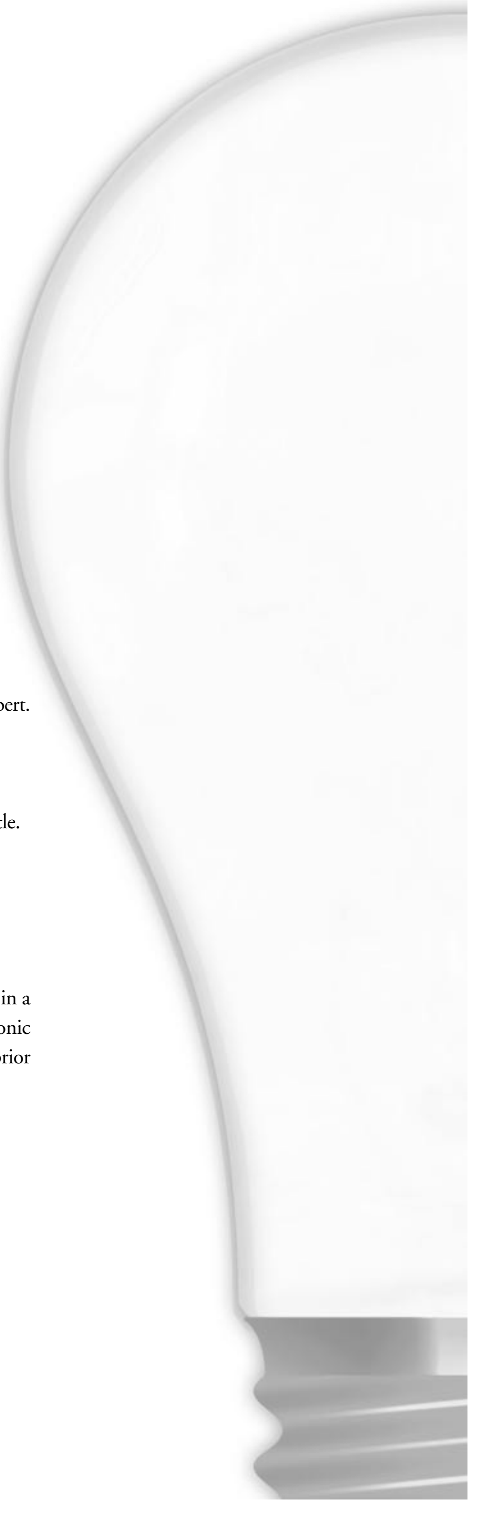

Dedication

To Sanda, with love

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List of Acronyms

ACE	area control error
ACES	accounting contracts and energy schedules
AFUDC	allowance for funds used during construction
ALM	active load management
APS	Allegheny Power System
AR	area regulation
ATC	available transmission capacity
BG&E	Baltimore Gas & Electric
CBM	capacity benefit margin
COB	California-Oregon border
CT	combustion turbine
DRA	Dispute Resolution Agreement
ECAR	East Central Area Reliability Council
eDART	Dispatcher application and reporting tool
eData	PJM electronic data
EEES	Electric Electronic Engineering Society
EFORd	demand equivalent forced outage rate
eGADS	Generator Availability Data System
EHV	extra high voltage
eMKT	Website allowing PJM market participants to submit generation offer data, demand bid, increments offers, decrement bids, and regulation offers into the market's database.
EMS	Energy Management System
EPAct	Energy Policy Act of 1992
ERCOT	Electric Reliability Council of Texas
FCITC	first contingency incremental transfer capability
FCTTC	first contingency total transfer capability
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FRCC	Florida Reliability Coordinating Council
FTR	fixed transmission rights
GPU	General Public Utilities
GWHR	gigawatt hour
Hz	hertz
IPP	independent power producer

ISA	interconnection service agreement
ISO	independent system operator
ISOA	Independent system operator agreement
kV	kilovolt
LA	load aggregator
LDC	local distribution company
LFUM	load forecast uncertainty margin
LLC	limited liability company
LMP	locational marginal price
LPA	locational price algorithm module
LSE	load serving entities
MAAC	Mid-Atlantic Area Council
MAIN	Mid-America Interconnected Network
MAPP	Mid-Continent Area Power Pool
MMP	market monitoring plan
MMU	market monitoring unit
MOA	Market Operations Agreement
MUI	market user interface
MVAR	megavar
MW	megawatt
MWh	megawatt hour
NAPSIC	North American Power System Interconnection Committee
NEPEX	New England Power Exchange
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Council
NJPIRG	New Jersey Public Interest Research Group
NOM	normal operating margin
NPCC	Northeast Power Coordinating Council
NYISO	New York Independent System Operator
NYPP	New York Power Pool
OA	operating agreement
OASIS	open access same-time information system
OC	off-cost
OI	office of the interconnection

PA-NJ	Pennsylvania-New Jersey
PECO	Philadelphia Electric Company
PEPCO	Potomac Electric Power Company
PICS	PJM import capability study
PJM	Pennsylvania-New Jersey-Maryland
PJMIA	PJM Interconnection Association
PJMnet	PJM's intranet
PP&L	Pennsylvania Power & Light
PSE&G	Public Service Electric & Gas
PUHCA	Public Utility Holding Company Act of 1935
PURPA	Public Utility Regulatory Policy Act of 1978
PX	PJM interchange energy market
RAA	reliability assurance agreement
RSA	Reserve Sharing Agreement
RTEP	regional transmission expansion plan
RTO	regional transmission organization
SCADA	supervisory control and data acquisition
SERC	Southeastern Electric Reliability Council
SFT	simultaneous feasibility test
SPP	Southwestern Power Pool
TLR	transmission loading relief
TMI	Three Mile Island
TOA	transmission owners agreement
transco	transmission company
TRM	transmission reliability margin
TTC	total transfer capability
TVA	Tennessee Valley Authority
ULFM	unanticipated loop flow margin
VaPwr	Virginia Power
WSCC	Western Systems Coordinating Council

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Jeremiah D. Lambert

Washington, D.C.
July 2001

Foreword

As the consequences of California's flawed electricity deregulation scheme continue to unfold, policymakers nationwide have expressed concern about restructuring of the electric power industry. In the current climate of uncertainty and retrenchment, however, California is not the only benchmark for electric power restructuring.

The indicative competitive model is instead the market operated by PJM, which succeeds where California fails.

PJM has operated successfully since 1997; implemented innovative and functional business rules; produced reasonable prices; matched growing demand with new investment, and put in place the nation's most liquid energy trading market.

PJM's market operates on a balancing and day-ahead basis; provides sellers and buyers the opportunity to trade through spot transactions or bilateral agreements, and has made increasing use of innovative technologies, allowing participants to do business in real time pursuant to a transparent Internet-based regime. PJM at the same time manages a single control area that is a paragon of reliability.

PJM has expanded its mid-Atlantic footprint through the formation of PJM West, with Allegheny Power. It has exported its business rules and system software to other markets. Most significantly, PJM is now recognized by FERC as the regional transmission organization of choice for the entire Northeast.

In this book I seek to explain how PJM works and how, through astute and technically oriented management, it has become a state-of-the-art, knowledge-based instrument for transformation of the electric power industry.

Jeremiah D. Lambert

Washington, D.C.
July 2001

CHAPTER ONE

The Road to Competitive Electric Markets

Federal Regulatory Initiatives

In their landmark study, *Markets for Power,* Paul L. Joskow and Richard Schmalensee, writing in 1983, forecast the structure of the deregulated power industry in the United States. As read in a contemporary context, the authors' vision proves remarkably prescient. In one scenario, they assume transfer of ownership and operation of all high-voltage transmission lines to a "regional power pooling and transmission entity" with no interest in generation.

Under this scenario, linkages between distribution, transmission, and generation occur across markets—regulated and unregulated—rather than through internal organization.

Market forces call forth appropriate quantities and types of generating capacity. Actual physical delivery of power, however, always takes place through a real-time pooling-transmission entity subject to agreements to dispatch plants, make financial settlements, and provide for transmission and resale of power.[1]

So described, Joskow's and Schmalensee's transmission entity has the salient characteristics of the independent system operator (ISO) that, almost 20 years later, has become the centerpiece of the Federal Energy Regulatory Commission's (FERC) ongoing initiative to restructure the nation's electric power industry.

Emergence of competitive markets

The intervening decades, as foreseen, have witnessed relentless change. Competitive markets have emerged in wholesale and retail electric power, now routinely traded as a commodity. Vertically integrated investor-owned utilities have in many instances exited generation and/or transmission businesses. Once the providers of bundled energy service at regulated cost-based rates, they now offer or pay market-based prices for wholesale power, no longer protected by exclusive territorial franchises. In the last five years power marketers and wholesale customers have facilitated growth of short-term spot markets in electric power, using financial instruments to hedge risk. Customers now also can choose suppliers, in both wholesale and (increasingly) retail markets. Not least, the architecture of the industry itself is being regionalized and transformed into coherent submarkets, each dependent on a regional transmission organization (RTO), which, in theory at least, may be an ISO, a grid company, or a transmission company (transco).

The critical interaction in power market design is between transmission and dispatch. In an electric power grid, control of dispatch is the only way in which use of the network can be adjusted and true marginal prices determined. Open and nondiscriminatory access to the grid therefore requires open access to unbiased dispatch through a system operator who coordinates use of the transmission system and yet is independent of market participants. As developed and refined in markets such as PJM, short-run market design typically includes the following elements:

- an appropriate system operator to coordinate the short-term spot market through bid-based, security-constrained economic dispatch
- market-clearing locational marginal prices, nodal rather than zonal, reflecting congestion costs and system losses
- bilateral transactions with system-imposed network usage charges consistent with congestion pricing
- a two-settlement system with financially binding day-ahead markets, followed by real-time balancing at real-time locational marginal prices
- fixed transmission rights to allow trading of congestion hedges
- establishment of prices and performance standards for unbundled ancillary services

Globally, competitive markets have emerged along these lines within the last decade, following privatization of state-owned electric power monopolies. Apart from those in the United States, power pools now function (among other venues) in England and Wales, Australia, Canada, Norway, and Sweden. Such pools have unbundled the electricity supply industry into component parts consisting of generation, a wholesale market, transmission, distribution, and power retailing. In England and Wales power retailing until recently involved buying from the pool (through which all wholesale electricity flowed), hedging volatility with financial contracts for differences, and selling to end-use customers. Under new electricity trading arrangements initiated in 2000 to replace the pool bulk electricity is traded forward through bilateral contracts (both long- and short-term) and on power exchanges, subject to balancing and settlement cost. In Norway power retailers buy from generators pursuant to bilateral contracts and from a spot market at the margin, using futures contracts to manage risk. In both markets, customers can access the pool or spot market.[2] In each instance the pools seek to maximize competition in generation, are open to all market participants, and compete on price, not cost.[3]

Typically, a transmission system connects electricity producers and consumers over a large area in which each action by a producer or consumer can affect all market participants within the system. In the United States, for example, all states excluding Texas east of the Rocky Mountains form what is in effect a single network. System operators within that network ensure that increases in demand are met by additional generation and that unplanned outages are met by load shedding or substitute sources of generation. Historically, such load balancing has been the hallmark of power pools, *i.e.,* groups of contiguous utilities operating on a coordinated basis to achieve economies unavailable to each on a stand-alone basis.

PJM has long been regarded as the prototypical tight power pool. Even prior to becoming an ISO in 1997, PJM operated a pool-wide transmission tariff and a bid-based energy market throughout a single control area[4] comprising all or part of Pennsylvania, New Jersey, Maryland, Delaware, Virginia, and the District of Columbia. Through its control center, located near Valley Forge, Pennsylvania, PJM coordinates the operation of approximately 540 generating units encompassing more than 58,000 megawatts (MW) of installed capacity, available to supply a 14,100-mile transmission grid covering nearly 50,000 square miles. PJM's long history of effective operations, dating from 1927 and including 8 utility systems, has facilitated its transition to RTO status (Fig. 1-1).

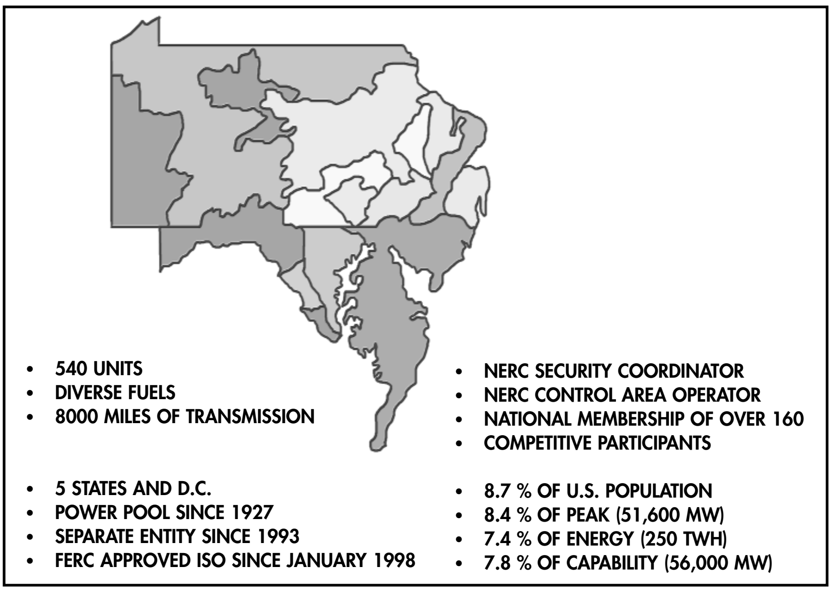

Fig. 1-1 Overview of PJM

Since 1997 PJM has been the nation's only full-function ISO. In that capacity PJM:

- centrally schedules and dispatches the installed capacity mentioned earlier and wholesale transmission in six jurisdictions (all or portions of Delaware, Maryland, New Jersey, Pennsylvania, Virginia, and the District of Columbia) comprising 23 million end-users of electricity
- performs the functions of the North American Electric Reliability Council regional reliability area coordinator for the Mid-Atlantic Region
- operates five energy markets, including a real-time power exchange that is the most vibrant wholesale spot market for electricity in the nation
- is responsible for preparing and implementing regional transmission expansion planning
- operates a single, uniform tariff for all transmission customers[5]

Open-access transmission

The indispensable predicate for development of competitive markets is open-access, non-discriminatory transmission. Power transmission lines are classical essential facilities—a natural monopoly whose owner can, in the absence of a regulatory mandate, keep competitors out of indicated markets. If the owner is a vertically integrated utility with generation assets, its control of transmission can be used to favor its own generation at the expense of potential third-party suppliers, resulting in higher than competitive prices and other abuses.[6]

Therefore, market reform in the United States has focused on the bottleneck implications of transmission facilities owned or controlled by market participants. To encourage transmission access and enhance competition in wholesale markets, the Energy Policy Act of 1992 (EPA) gave FERC broad authority to order wheeling of power, *i.e.,* the transfer of electric power from a generator to a purchaser over the transmission system of an intermediate utility.[7]

The law removed most of the onerous native load protections, previously contained in Sections 211 and 212 of the Federal Power Act that had effectively neutralized FERC's ability to compel the transmission of power, either on its own or in response to a complaint. Before enactment of the EPA, FERC could only proceed indirectly by using unrelated powers under the Federal Power Act to cause utilities to provide transmission services, specifically its Section 203 authority to approve and condition utility mergers[8] and its Section 205 and 206 authority to set wholesale rates.[9] In *Utah Power & Light* Co.,[10] a landmark case, FERC conditioned a merger upon the participants' acceptance of broad obligations to provide transmission services to third parties—a practice that came to be known as "open access."[11] Typically, however, early open access tariffs required only that a utility provide point-to-point transmission services and did not mandate service to third parties equivalent to that which the utility itself enjoyed. Under Section 211 as amended, FERC granted requests for network service permitting the applicant to integrate load and resources on an instantaneous basis.[12]

Order No. 888

Although an important step, the EPA nonetheless constituted only a partial response. It became quickly apparent that case-by-case adjudication of transmission disputes under Section 211 could not effectively assure open access to the nation's transmission system.[13] To meet such concerns, in 1996 FERC issued Order No. 888, a broad rule stating that the "legal and policy cornerstone . . . is to remedy undue discrimination in access to the monopoly-owned transmission wires that control whether and to whom electricity can be transported in interstate commerce."[14] For this purpose FERC's principal instrument was a *pro forma* open access non-discriminatory transmission tariff containing minimum terms and conditions of service, including both network and point-to-point service. All public utilities owning interstate transmission facilities were required to file such tariffs and take service thereunder for their own wholesale sales and purchases of power. The key to non-discrimination was comparability of service.[15]

FERC ordered access pursuant to its authority over public utilities under Sections 205 and 206 of the Federal Power Act, not its authority to order case-by-case transmission under Sections 211 and 212, as amended. As a result, the open access requirement did not directly apply to non-public utilities such as municipalities, most cooperatives, and federal power marketing agencies. The *pro forma* tariff was nonetheless accessible by any person eligible to seek a Section 211 transmission order, including any investor-owned utility, municipality, cooperative, independent power producer, affiliated power producer, qualifying facility, or power marketer. Non-public utilities taking open access service from public utilities were required to offer comparable access in return but not to have an open access tariff of general applicability. The transmission provider was an eligible customer under its own tariff. Retail customers were eligible for service where utilities offered unbundled retail transmission service voluntarily or pursuant to a state requirement.

In addition to requiring that utilities file an open access tariff, Order No. 888 and Order No. 889 contemplated the functional unbundling of transmission and generation. Functional unbundling means:

- a utility must take both wholesale and unbundled retail transmission service under its own tariff
- quote separate rates for wholesale generation, transmission, and ancillary services
- develop an electronic information network that accords all users of the transmission system comparable access to transmission information
- follow a code of conduct that separates employees involved in transmission operations from those involved in wholesale marketing functions[16]

Power pools

However, mere functional unbundling was insufficient to mitigate utilities' vertical market power. For this purpose FERC sought structural separation, applied regionally and not simply to individual utilities. Order

No. 888 therefore accorded special attention to power pools and ISOs, which had been the subject of FERC technical conferences in 1995 and early 1996. Tight power pools such as PJM had long existed to aggregate and centrally dispatch the generating capacity of contiguous utilities through high voltage interconnection of systems within a region. Benefits included reductions in installed and capacity reserves, lower operating costs, and enhanced service reliability.

The economic benefits of pooling lie largely in the economies of scale and advantages of the diversities in load, risks and operating costs available among coordinating systems.[17] Investment costs are reduced through use of larger, centrally dispatched units and through reduced reserve margins, which result from lowering the ratio of generating unit size to combined system peak load. Operating economies are gained through load diversity of combined systems, reduced operating costs per unit of output of larger units, and more extensive use of lower cost generation available anywhere in the combined systems. Reliability benefits are also available through access to support from other systems, typically realized as a reduction in both operating and installed reserves required to achieve a given level of reliability. The existence of transfer capability determines the economic value of system interconnection as a means of improving reliability. There is a tradeoff between adding generating reserve capacity and installing additional transmission facilities to achieve equivalent reliability (Fig. 1-2).

To control generation and transmission, each interconnected network is divided for operating purposes into discrete control areas, each of which has a geographical and electrical boundary. A tight power pool, such as PJM, may operate a single control area. Subject to central dispatch, all generating utilities within a control area operate and control their combined resources to meet their combined loads as one system. Each control area has at least one dispatch center to monitor system generation output, system frequency, and tie line power flows within the control area and between it and contiguous control areas. The term "economic dispatch" refers to the process of operating the various resources of the system to minimize overall costs. It is a function of economic dispatch to determine the proper loading on each unit so total load is met at the lowest possible production cost consistent with other necessary

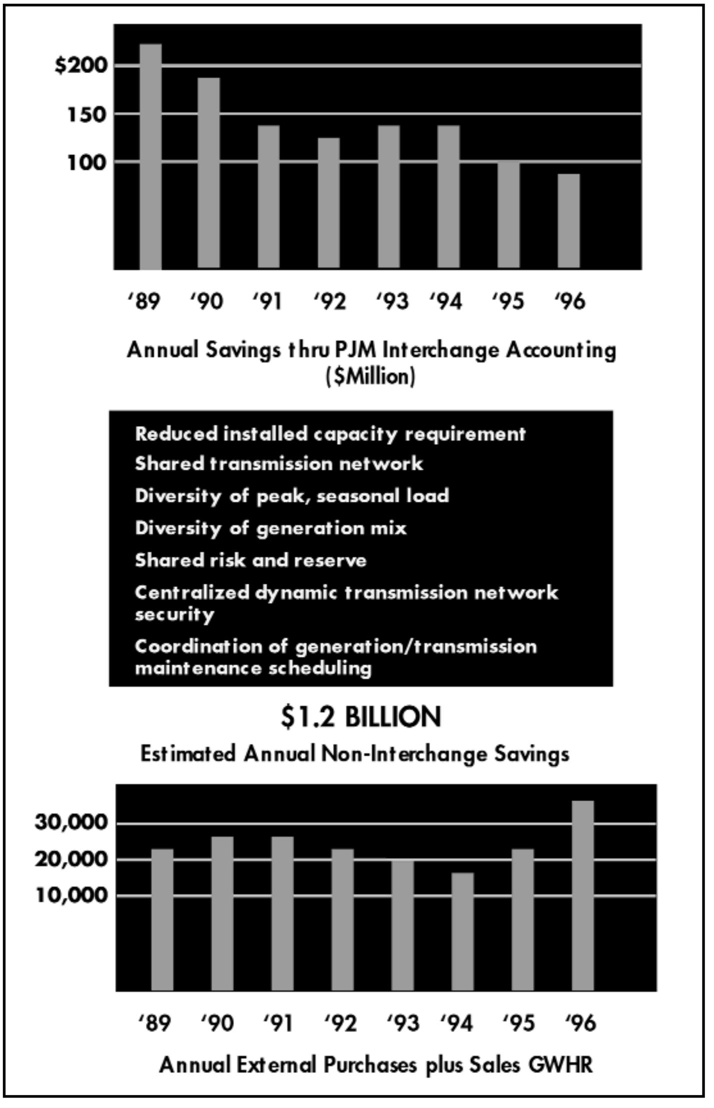

Fig. 1–2 PJM's Transfer Capability as a Function of System Viability

constraints, such as transmission line loading, transmission losses, spinning reserve requirements, and environmental considerations. [18]

In contrast to bilateral arrangements, therefore, power pools present "an intricate set of rights, obligations and considerations among [its] members. . ."[19] The filing of individual open access tariffs by constituent members of a power pool is not enough "to cure undue discrimination in transmission if those public utilities can continue to trade with a selective group within a power pool that discriminatorily excludes others from becoming a member and that provides preferential intra-pool transmission rights and rates."[20]

FERC requirements

To address this problem FERC required tight power pools such as PJM to file reformed power pooling agreements and a joint pool-wide *pro forma* tariff by December 31, 1996. Starting on that date, pool members were also required to take service under the pool-wide tariff, and the pool itself was to be open to any bulk power market participant, regardless of entity type, affiliation, or geographic location. FERC's deadline induced stakeholders in PJM to address numerous contested restructuring issues, not least the configuration of an ISO for the PJM control area.

In Order No. 888 FERC encouraged, although it did not require, the formation of ISOs to run the pool-wide transmission system. Drawing on international examples, its own transmission precedents, and a substantial body of theoretical writing, FERC viewed the ISO as an effective means of operationally unbundling vertically integrated utilities with monopoly power over territorial franchises by separating their control of transmission from ownership and control of generation and distribution. Although short of divestiture, ISO-driven operational unbundling represented a potential structural fix. The question nonetheless remained how to define the minimum necessary characteristics of an acceptable ISO, a vehicle then rooted in theory rather than practice.

Independent system operators

To provide guidance to applicants submitting ISO proposals to FERC, Order No. 888 set forth general principles of organization and operation for

ISOs as control area operators, including those established in the restructuring of power pools. Since FERC had expressly declined to mandate ISOs (none then existed in the United States), the principles were prospective in nature and designed to achieve restructuring through independent operational control of transmission (operational unbundling), not its divestiture. To this end, FERC determined:

- An ISO must be independent of any individual market participant or any class of participants (*e.g.*, transmission owners or end-users) Independence is a function of the ISO's governance structure, which could include "fair representation of all types of users of the system" on its governing board or as FERC subsequently found, a non-stakeholder board not dependent on neutralization of user classes through concurrent representation but instead on independence from all market participants and user groups. A related principle dictates that an ISO and its employees have no financial interest in the performance of any power market participant, which in turn can have no ownership interest in an ISO.
- An ISO must provide open access, self-scheduled transmission at non-pancaked rates under a single, unbundled, grid-wide tariff applicable to all eligible users in a non-discriminatory manner.
- An ISO must have primary responsibility for short-term reliability of grid operations, including planning and oversight of maintenance of transmission facilities under its control.
- An ISO must control the operation of specific transmission facilities within the system.
- An ISO must also exercise some degree of operational control over generation facilities within the system in order to regulate and balance power flows and relieve transmission constraints pursuant to established trading rules.
- An ISO must efficiently perform operational functions, such as determination of system expansion, transmission maintenance, operation of a settlements system, and operation of an energy auction.

- An ISO's transmission and ancillary services pricing policies must promote efficient use of and investment in generation, transmission, and consumption.
- An ISO must make transmission system information publicly available on a timely basis through an electronic information network, including information on system operation, available capacity, and constraints and contracts or service arrangements.
- An ISO must coordinate with neighboring control areas to ensure provision of transmission services that cross system boundaries.

These broad principles have determined the functions, structure, and governance of ISOs that have since come into being, mostly as a consequence of brokered negotiations among stakeholders in a quasi-political process. PJM has followed this pattern and has implemented FERC's principles more successfully than any other ISO. At the same time, as FERC itself has conceded, Order No. 888 was itself simply a first step and not enough to fully achieve competitive markets and open access transmission. FERC perceived continuing impediments to competition, including:

- insufficient separation between generation and merchant functions
- multiple pancaked transmission rates within a region
- congestion management and loop flow problems
- generation market power that results when market size is limited by transmission constraints

In the years following Order No. 888, industry restructuring imposed new stresses on the transmission grid, including:

- divestiture by integrated utilities of more than 50,000 MW of generating capacity
- increased merger activity
- significant growth in the volume of electric power trading
- increased use of market-based rate authority
- the emergence of retail competition at the state level

Although the nation's transmission traffic increased, very little was done to increase the load serving and transfer capability of the bulk transmission system. FERC noted both economic and engineering inefficiencies:

- difficulty in determining available transmission capacity
- parallel path flows
- use of non-market approaches to managing transmission congestion
- pancaking of transmission access charges
- absence of clear transmission rights
- absence of secondary markets in transmission service
- disincentives created by the level and structure of transmission rates[21]

Regional transmission organizations

To address these and other related concerns, FERC focused on capturing maximum regional efficiency from the transmission grid through development of independent regional transmission organizations (RTOs) that may be ISOs, transcos, grid companies, or a hybrid combination. Invoking its authority under Section 202(a) of the Federal Power Act to divide the country into regional districts for the voluntary interconnection and coordination of generation and transmission facilities, FERC built on Order No. 888's initial effort to reform and restructure power pools by use of ISOs.

FERC's RTO initiative deals with several critical issues:

Independence remains a bedrock principle. RTOs must structurally separate the merchant and transmission functions of vertically integrated utilities. Experience with ISOs reinforces the importance of governance standards in achieving independence. To realize its objective of light-handed regulation, FERC requires a structural fix rather than labor-intensive behavioral mitigation.

Size matters. A system operator must have broad geographic reach to internalize loop flow, re-dispatch constrained interfaces, eliminate pancaked rates, and improve system reliability. Single-state grid organizations, such as those in New York and California, may be insufficiently competitive. FERC therefore envisages RTOs with at least the size of current regional reliability councils.

Authority. RTOs must have day-to-day and hour-to-hour authority to operate the grid, *i.e.*, the RTO must be a control area operator in order to determine transmission maintenance schedules, relieve constraints through re-dispatch, acquire and dispatch ancillary services, and calculate available transmission capacity.

Reliability. RTOs must have exclusive authority for maintaining short-term reliability of the transmission grid under its control.

Order No. 2000

FERC's Final Rule on Regional Transmission Organizations, Order No. 2000, issued in December 1999, took the next ambitious step to open wholesale electricity markets to competition. "Our objective," stated FERC, " is for all transmission-owning entities in the Nation, including non-public utilities, to place their transmission facilities under the control of RTOs in a timely manner. . . . [W]e expect jurisdictional utilities to form RTOs."[22] Although nominally voluntary, Order No. 2000 requires public utilities to make appropriate filings with FERC to initiate operation of RTOs—existing ISOs must also file.

FERC perceives an array of pro-competitive benefits from RTOs, including more efficient regional transmission pricing, improved congestion management, elimination of rate pancaking, more efficient transmission and generation planning, and reduced transaction costs. Most important, by separating control of transmission from power market participants, RTOs are thought to reduce opportunities for discrimination and market power abuse, while resulting in consumer savings over a 15-year period in excess of $5 billion per year.

Building on Order No. 888 and intervening experience, Order No. 2000 confirms four minimum characteristics of an RTO:

- independence from market participants
- regional scope
- possession of operational authority
- exclusive authority to maintain short-term reliability

Order No. 2000 also specifies eight minimum functions of an RTO, including:

- tariff administration and design
- congestion management
- parallel path flow
- ancillary services
- determination of total transmission capability available transmission capability
- market monitoring
- planning and expansion
- interregional coordination

Having provided the requisite blueprint, Order No. 2000 requires all utilities that own, operate, or control interstate transmission facilities to put them under the control of an RTO according to the following schedule:

- The RTO must be functioning by December 15, 2001
- A congestion management function must be operational by December 15, 2002
- Interregional parallel path flow coordination, transmission planning, and expansion functions must be implemented by December 15, 2004
- Termination of passive ownership must occur no later than December 15, 2006

The Final Rule contemplates either an ISO or a transco model. Any utility electing to form a transco must relinquish active ownership in transmission assets within five years of RTO approval, with the result that all transmission owners will be obliged to cede control of their transmission assets to an ISO or to a transco, having only passive ownership not later than December 15, 2006.

Because the Final Rule avoids prescribing forms of organization for RTOs or mandating that transmission owners participate in an RTO, FERC was spared deciding the extent of its statutory authority in these respects.

Under Sections 205 and 206 of the Federal Power Act, however, FERC is empowered to ensure that the rates, charges, classifications, and services of public utilities are just and reasonable and not unduly discriminatory. FERC also "has responsibility to consider . . . the anticompetitive effects of regulated aspects of interstate utility operations pursuant to Section 202 and 203, and under like directives contained in Sections 205, 206 and 207 [of the Federal Power Act]."[23] It seems clear enough that in the event of a legal test, FERC's exercise of prescriptive authority would be sustained.

In Order No. 2000 FERC chose not to exercise this authority by requiring participation in RTOs as a remedy for undue discrimination by public utilities or as a necessary condition to their receiving or retaining market-based rate authority. Similarly, Order No. 2000 avoids construing the implications of Section 202(a), which authorizes FERC "to divide the country into regional districts for the voluntary interconnection and coordination" of transmission and generation facilities. (Order No. 2000 nonetheless recites FERC's authority under Section 203 of the Federal Power Act to approve disposition of jurisdictional transmission assets by public utilities, including transfer of control of such assets to RTOs).[24] Despite the Final Rule's nominally voluntary nature, FERC's self-pronounced obligation to promote RTO operation at the earliest feasible date is unlikely to be disregarded by jurisdictional utilities.

PJM's Compliance Filing under Order No. 2000 and FERC's Response

In October 2000, PJM and its transmission owners made a joint compliance filing at FERC pursuant to Order No. 2000[25]. PJM submitted that it had satisfied all of the required characteristics and functions of an RTO. By order issued on July 12, 2001, FERC provisionally granted PJM RTO status[26]. In doing so, FERC largely agreed with PJM's submission and noted:

- PJM has operational authority over all the facilities under its control
- PJM's existing operations meet the criteria for maintaining short-term reliability

- PJM is the sole administrator and transmission provider, provides ancillary services, and is the sole OASIS administrator

FERC also noted its preference for development of very large RTOs—one for the Northeast, one for the Midwest, one for the Southeast, and one for the West. Successful large-scale RTOs would, in FERC's view, improve grid reliability, remove remaining opportunities for discriminatory transmission practices, improve market performance, and facilitate lighter-handed regulation. Significantly, FERC determined that PJM's RTO proposal should serve as a platform for a prospective unified Northeast RTO that would embody both the New England and New York ISOs, whose Order No. 2000 compliance filings were contemporaneously denied.

"We conclude," FERC stated, "that PJM's tariffs, agreements, and other governing contracts provide a sound framework that will enable PJM to expand geographically and merge with other markets in the Northeast region and to the West." To implement that conclusion and encourage a joint proposal, FERC directed PJM and the other ISOs to participate in settlement discussions at FERC.

PJM has therefore become the RTO template of choice, with profound influence over the architecture, technology, and politics of electricity restructuring in the United States. This book seeks to tell the story of PJM's transformation from an administrative adjunct to the PJM power pool to an independent, self-funded, information-based, and FERC-sanctioned regional enterprise.

Notes

[1] Joskow and Schmalensee, *Markets for Power*, 1983, pp. 104-05

[2] Henney et al., "Energy Marketing: Is There Added Value in Value Added?" 17 *Public Utilities Fortnightly* 30, 1997, pp. 16-17

[3] Barker, Tennenbaum, and Woolf, *Governance and Regulation of Power Pools and System Operators*, World Bank Technical Paper No. 382 -1997, p. 9

[4] Within a control area, generation is controlled to match the area's load plus exports and less imports. A control area has an electrical and geographical boundary. It may consist of a single utility or many utilities bound together pursuant to contractual arrangements. Technically, however, all generating utilities within a control area operate and control their combined resources to meet their combined loads as one system. Each control area has one dispatch center that monitors generation output, system frequency, and line power flows within its control area and between its control area and adjacent control areas. Each control area:

- provides enough capacity to carry its own expected load with provision for adequate reserve and regulating margin
- operates so as not to affect interchanges of energy through frequency changes or overload of another control area's transmission facilities
- continuously balances its generation against its load so that its net tie line loading agrees with its scheduled net interchange

Federal Energy Regulatory Commission, *Power Pooling in the United States*, (FERC-0049) (hereafter *Power Pooling*) (1981), pp. 26-27

[5] See prepared remarks of Robert H. Lamb, Washington representative for PJM Interconnection, L.L.C., *Hearing on Pending Electricity Legislation, United States Senate, Committee on Energy and Natural Resources,* April 11, 2000

[6] See, *e.g., Public Serv. Co. of Col.,* 58 FERC ¶ 61,322 at 62,038, 1992; Kelliher, "Pushing the Envelope: Development of Federal Electric Transmission Policy," 42 *American Univ. L. Rev.*, 1993, pp. 543, 548

[7] See *Otter Tail Power Co. v. United States,* 410 US 366, 368 (1973)

[8] 16 U.S.C. § 824b (1988)

[9] 16 U.S.C. §§ 824c-d (1988)

[10] 45 FERC ¶ 61,095 at 61,269 (1988)

[11] See *Public Serv. Co. of Col.,* 58 FERC ¶ 61,322 at 62,039 (1992)

[12] See *Florida Municipal Power Agency v. Florida Power & Light Company,* 65 FERC ¶ 61,125 (1993)

[13] See*, e.g., Hermiston Generating Company,* 69 FERC ¶ 61,025 (1994)

[14] *Promoting Wholesale Competition Through Open-access Non-discriminatory Transmission services by Public Utilities,* Final Rule, Order No. 888 [FERC Stats. & Regs., Regs. Preambles 1991-1996] ¶ 31,036 at 31,634 (1996)(hereafter *Order No. 888*) *Order on reh'g,* Order No. 888-A [Regs. Preambles] III FERC Stats. & Regs. ¶ 31,048 at 30,226 (1997)

[15] See, *e.g., Kansas City Power & Light,* 67 FERC ¶ 61,183 (1994)

[16] Marlette, 37 *Nat Resources J.,* 125, 130 (1997)

[17] See *Power Pooling in the United States* (FERC-0049)(1981), pp.15-23, 26-27

[18] The difference between a generator's capacity to produce electricity and its actual output is the "spinning reserve" of the unit. Spinning reserve is needed on a system to regulate, second by second, the generation output to match the load and to provide rapid replacement of power when other facilities experience outages

[19] *Order No. 888* [citation]; Mimeo, p. 268

[20] Id.

[21] *Regional Transmission organizations,* Final Rule, Order No. 2000 [Regs. Preambles], III FERC Stats.& Regs., ¶ 31,089 at 31,014 (1999)(hereafter *Order No. 2000), Order on reh'g.,* Order No. 2000-A, FERC Stats. & Regs., ¶ 31,092 (2000)

[22] *Order No. 2000,* at p. 30,933**.**

[23] *Order No. 2000* at p. 31,043; *Gulf States Utilities Co. v. FPC,* 411 U.S. 747, 758-59 (1973)

[24] *Order No. 2000* at p. 31,045; *El Paso Electric Company and South West Services*, 68 FERC Para. 61,181 at 61,914-15 (1994)

[25] Regional Transmission Organization, 65 FR 809 (Jan. 6, 2000), FERC Stats. & Regs. ¶ 31,089 (1999), *order on reh'g,* Order No. 2000-A, 65 FR 12,088 (March 8, 2000), FERC Stats. & Regs. ¶ 31,0992 (2000), *petitions for review pending sub nom.,* Public Utility District No. 1 of Snohomish County, Washington, v, FERC, Nos. 00-1174, *et al.* (D.C. Cir.).

[26] *PJM Interconnection, L.L.C., et al,* 96 FERC ¶ 61,061.