

**Uhunmwangho E, E, Akinnifesi A.F and Afunlehin O, A**

Department of Electrical & Electronic Engineering

Yaba College of Technology

---

**Effective Regulation of Electric power sector in Nigeria**

---

**Abstract**

As energy crisis in Nigeria worsen and the realization that electricity is an impetus for economic growth, increasing citizen access to electricity continue to maintain its prominence in the country and with the main emphasis moving from the gigantic, national electricity company toward a multi-player privatized market has led to a substantial transformation in the policies governing regulations of the power sector. This paper evaluates the regulatory agency mandate to monitor and regulate the electricity industry in the country so as to guarantee conformity with market rules and operating standards. The paper concludes that the effective development of electric power sector in the country hinges on the implementation of suitable public policies and the effective adoption of these policies that will provide stability, safeguard consumers from the manipulation of market power, protect consumers and operators against political dishonesty, and provides motivation for service providers to operate efficiently.

Keywords: Regulation, Market Power, Privatization, Public policies and Consumer protection

**1.1 Introduction**

The National Academy of Engineering nominated electrification as the 20th century's greatest engineering accomplishment, beating the automobile, computers, and spacecraft. This deduction is hardly astonishing when one considers the complex network of cables that links every light switch in the Nigeria to the gigantic power plants, private solar panels, and every other source of electricity generation.

Over the past decades, the country has undergone a fundamental transformation in electrical industry. Electric utilities have begun to spring up in major cities, and are spreading rapidly across the country. The utility grid continues to expand as the nation's population grows with a related increase energy demand. In 2013, Nigeria consumption of energy was 150 trillion Btus; this energy powers industry, transportation, residential homes, and commercial establishments throughout the country. Regulation of the electric power sector has also evolved over the past decade to ensure that the system is reliable, safe, and fairly administered. This work emphasis is on electric power regulation in the Nigeria, and is meant to evaluate the regulatory agency mandate to monitor and regulate the electricity industry in the country so as to guarantee conformity with market rules and operating standards.

## **2.0 Related Works**

Electric power sector that deliver service to consumers are controlled by state, federal, and local authorities. These bodies oversee the prices they charge, the terms of their service to consumers, their budgets and construction plans, and their programs for energy efficiency and other services. Since electricity affects the air, water, land use, and land disposal are typically regulated by other government agencies.

Two essential principles justify governmental supervision of the electrical power sector. First, because they provide vital services for the welfare of the society both domestic and commercial so it is an industry "*concerned with the civic interest.*" The technical and economic attributes of the power industry are also such that a sole supplier is often able to provide the total demand at a lower overall cost than any mix of smaller units could. Competition cannot flourish under these situations; ultimately, all entities but one will exit the market or fail. The firms that survive are called natural monopolies — and, like other dominations, they have the authority to limit output and set prices at levels higher than are reasonably justified. Taking into consideration these two circumstances, regulation is the public or governmental involvement into a market that is required to achieve civic

benefits that the market fall short of accomplishing on its own. The overall context, in which power sector regulation operates, is a prelude to considering the structure of the industry and the regulatory framework that has evolved with it. John Stewart Mill (1848) analysis of natural monopolies notes that, “(a) Gas and water service in London could be supplied at lower cost if the duplication of facilities by competitive firms were avoided; and that (b) in such circumstances, competition was unstable and inevitably was replaced by monopoly”[2]. The natural monopoly model still pertains to at least the transmission parts of electrical power sector in the country. In spite of this, even where there is adequate rivalry among the supplier of energy and/or retail billing service, the sector’s vital role in the modern society warrants its careful control.

Regulation is expected to safeguard the “public interest,” which covers a diversity of elements. Utilities are intended to offer service to everyone who demands it and can pay for it at the regulator’s approved prices. In this sense, service is “universal.” A connection fee may be levied, if offering the service entails substantial expenses by the utility nevertheless still that is subject to regulation and, in many instances, is subsidized in some way by other customers. Whereas some infrastructure, like fire and police protection, are offered by government without any direct charges to users, utilities even when government-owned are almost always operated as self-supporting enterprises, with regulations controlling the terms of service and prices. Utilities must also adhere to strict government safety standards, because their infrastructure stretches through our societies and the community would be affected by sagging wires, ruptured pipes, and other glitches.

The generation, transmission and distribution of electricity also have environmental and health impacts by the release of pollutants, on scenic landscapes and land uses, and even from noise that can negatively affect the people. Generating power often produces pollution; transmission lines have both visual and physical impacts on land use; and the availability of natural gas creates opportunities to use less-polluting fuels than oil or coal. John Stewart Mill, cited in Garfield and Lovejoy, *Public*

*Utility Economics*, 1964, P. 153. A subsidy occurs when a service is delivered at a price that is less than its long-run marginal cost which is the value of the resources needed to make any more of it. Whereas some market scholars make a case for pricing based on short-run marginal cost. In general equilibrium where the market is operating as effectively as it can and total costs are reduced then long-run and short-run marginal costs are identical, since the cost of generating one more unit from an existing power plant is the equal to the cost of constructing and running a modern, more efficient power plant. Indeed, on the long run the period of time in which all factors of production are variable is the rational context in which to reflect on the public-policy effects of utility matters, since investments in power infrastructure are, particularly long-lived. Regulators enforces environmental duties on utilities to defend these civil interests and regulation purpose is to ensure that service is adequate, that utilities are alert to consumer requirements, and that issues like new service orders and billing queries are treated quickly.

Lastly, in view of utilities' vital role in the economic and social welfare of the people, service reliability guidelines are also imposed as well.

The prices of goods that are marketed are often influenced by what the customer will bear. In economic words, markets will clear at the point where marginal costs equal the value that consumers, in the aggregate, set for the good or service; that is at the point where supply intersects with demand.[4] A different method to price-setting is needed for power utilities, since competition and liberalization of markets does not occur in natural monopolies. Regulators use a cost of service methodology to fix a fair price for electric service, by which the total costs including a realistic return on investment for offering each category of service residential, commercial, and industrial are determined. Prices are set to recuperate those costs, based on the sales volumes for each category. Regulation represents a contract between a utility and the authority, while the utility agrees to the responsibility of offering service in return for the authority's agreement to set tariffs that will

reimburse it completely for the expenses it incurs to meet that obligation. This contract is occasionally called the regulatory compact. Though this word is often heard, there is no binding contract between a utility and the authority in some countries like in the US.

Regulation is the use of the control power of the state, over a business that is “concerned with the public interest.” Its necessity arises mainly from the monopoly attributes of the industry, and its main aim is to guarantee the delivery of safe, satisfactory, and reliable service at prices that are appropriate, but no more than enough, to recompense the regulated company for the expenses that it incurs to accomplish its duty to serve. The legal duties of regulators and utilities have evolved through a long series of court decisions, several of which are documented. Incentive regulation is a system in which the regulator rewards utilities for making effort to achieve precise public policy objectives. Nevertheless, it is significant to know that all regulation is incentive regulation, because every regulation enforced by the authority creates restrictions on what the utility can do; but every control also gives the utility rewards to act in manners motivated largely by the wish to boost revenue, or profits that might or might not advance the public interest. With or without regulations, utilities will take those decisions which most profit their shareholders and management while meeting the requirements of the regulations. Regulation has changed from the old-fashioned policies regulating bodies that are “affected with the public interest” into an intricate system of economic regulation. One of the first recorded practices of business regulation was the obligation in Roman and primitive times that hoteliers admit anyone who came to them in search of a room. Clients could be disallowed only if they were disorderly. [6]. At the outset, electric utilities were permitted to run without regulation in the US. If they could attract business, no matter what prices they charged, they were permitted to do so. Metropolises did enforce “franchise” stipulations on them, charging levies and creating guidelines that permit them to route their wires and pipes over and under metropolitan highways. Around 1900, approximately 20 years after Thomas Edison founded the premier central electric utility in New York,

the earliest state regulation of electric utilities emerged [10]. The “cost of service” principles of regulation have developed over the last century from this beginning. Due to the expansion in the infrastructure of the telecommunications and natural gas businesses, large industrial-power users started asking for the right to become wholesale buyers of electricity. This led to the time of reformation during which some states “unbundled” the electricity-supply function from distribution on the principle that only the fixed network system represented a natural monopoly, while the generation of power did not. In some circumstances, large volume customers were permitted to bargain directly with wholesale power distribution that competed with the services offered by the utility at controlled prices. In other states, the utilities were forced to divest their power-plant ownership, and the production of power was allotted to competitive suppliers. In the two situations, the utilities preserved the controlled natural monopoly of distribution. [11]. The electric utility sector is economically massive and enormous in scope, and it combines ownership, management, and regulation in multifaceted ways to achieve reliable electric service.

Electricity supply has conventionally been characterized by vertically integrated monopolies subject to public control. That is, the generation, transmission, and distribution of electricity in a particular area has usually been the duty of a single regulated firm. However, many countries have in recent times reorganized or are in the course of restructuring their power sectors. One of the fundamental objectives of electricity sector restructuring is to form unregulated competitive generation-services markets with many competing generation suppliers and open entry. The transmission network, nevertheless, normally remains a controlled monopoly.

According to Alfred Kahn in his book *“The economics of regulation”* “All competition is imperfect; the preferred remedy is to try to diminish the imperfection. Even when highly imperfect, it can often be a valuable supplement to regulation. But to the extent that it is intolerably imperfect, the only

acceptable alternative is regulation. And for the inescapable imperfections of regulation, the only available remedy is to try to make it work better” end of quote [12].

Over the past three decades Nigeria have often implemented market-led energy sector reforms, impetus was given to this approach by major international funding agencies, which often required restructuring as a condition for loans. The role of the government was meant to be reduced to creating and enabling the environment within which the private sector would take the initiative to provide services and this have necessitated the regulation of the power sector

Regulation in this case is the control by the government over the conduct of private or public enterprises in the electric power sector and investment and operating decisions,, revenues, tariffs, quality of service, obligation to supply or buy, entry and exit rights can all be regulated. Regulation becomes necessary when the government believes that the operator, left to its own, would behave in a way that is contrary to the government’s objectives, In Nigeria an early solution to this perceived problem was government provision of the utility service, frequent failure of this approach has led to other solutions such as private participation in service provision under a regulated monopoly scheme and the unbundling and liberalization of some activities that are left to competition forces. Governments establish regulation to improve the performance of a sector and regulation should be intended to improve the benefit that the sector services provide to consumers and operators, including also the externalities sector performance can be measured in terms of consumer surplus, service availability, and cost efficiency, affordability of prices, range of services offered, quality and the rate of innovation. In reality, regulation may also serve other purposes, short-term objectives of a government, usually to gain some political advantage.

## **2.1 Objectives of regulation of the Electric power sector**

The objective of regulation can be streamlined into consumer protection from high prices and low quality resulting from utilities market power and shareholders protection from arbitrary and opportunistic regulatory changes. Companies protection from superfluous interference in their running and investment

decisions from anti-competitive activities of competing agents in the market. These items to be regulated includes prices and tariffs to consumers, quality of service, economic viability of the companies, environmental impact of the activities of the sector policies for services to the poor or those without access to electricity, market structure and market power adequacy of investment, as well as its efficient operation in order to meet demand information asymmetry of regulator and firms. In order to successfully regulate the power sector the instrument can be used as price and revenue capping, cost-of-service subject to regulatory oversight, unbundling of activities, subjecting agents to competitive pressures ,benchmarking of regulated monopolies, use of economic incentives, application of command and control such as standards, targets, penalties and putting conditions in licensing of operation and conditions in authorization of mergers and acquisitions, obtaining and analyzing information in order to monitor market behaviour.

Regulatory powers is allotted among the several bodies such as ministries whose primary function is to create laws under which the regulator performs her function and we also have the independent regulatory commission, competition authority, judiciary time wise and their powers are exercised to authorize, promote and mandate changes in the power system business structure or penalize anti-competitive activities.[11]. Regulatory function are performed by National Electricity Regulation Commission (NERC) in Nigeria who exercise the powers to make regulations is conferred on it by Section 96(1) of the Electric Power Sector Reform Act 2005 (Act No.6 of 2005),while in the United State, there are states regulators PUC, Public Utility Commissions and one federal regulator (FERC) In the European Union EU there are member state regulators represented in the ERGEG, cooperating with the European Commission (DG TREN), as required by the 2008 EU directives for gas and electricity. The new Energy regulatory package will create a European Regulatory Agency (ACER). Regulators are organized in regional associations such as: CEER and ERRA in Europe, NARUC in North America, ARIAE in South America.’

## **2.2 Functions of the regulatory bodies**

The main functions of the regulatory bodies includes but not limited to prevention and repression of abuse of dominant position by the network operators and ensuring competition in the commercial activities and technical regulation are be left to the companies themselves which does not appear to be a good solution since technical regulation can be biased. The Competition Authority intervene only ex-post and typically has trouble in gathering evidence of violations and understanding the complex issues involve and the need for regulation may decrease after the first phase of restructuring and liberalization but regulation is still required both for the networks or natural monopolies and for the competitive markets like in the case of financial markets. The trend happens to be just the reverse in the power sector where the context of the regulatory activity has changed, but the volume has probably increased and long-term issues such as climate change, energy security and provision of universal access to electricity require regulatory intervention in this sector.

## **3.0 Methodology**

### **3.1 Design of the Regulatory framework**

In designing the regulatory framework the basic issue to be considered are activities that should or should not be regulated, division of responsibilities between government, competition authority, sectorial regulators and judiciary and the jurisdiction of regulator over one or more sectors, responsibility in creation and enforcement of rules and level of regulator's independence of Government

How accountable a regulator is depends on whether it is a single regulator or a number of people forming a body of commission and the institutional arrangements in the design of regulatory agencies should encourage independence and transparency so that the regulator can be held accountable and there should be a level of predictability to ensure consistency over time, so stakeholders can anticipate how the regulator will resolve issues. It is pertinent to note that legitimacy must be such that regulator will not be captured by special interests and there should be credibility so that the

stakeholders can trust that commitments will be kept of the regulatory system. In creating the structure, choice have to be made between a single regulator and a plural board, while the board of (3, 5, 7, 9) members is more stable than the single regulator who is more swift, flexible and more economical.

The review and appeal ministry duty is to politicize regulation and it should be noted that judicial review is preferable, if courts can overrule regulator only on procedural grounds and not on the substance of the regulatory decision

Regulatory processes involve administrative mechanism to receive stakeholders inputs and to solve stakeholders' complaints, the advisory boards, public hearings, transparent and well-established administrative procedures, negotiated settlements and arbitration, independence and democratic legitimacy. The legitimacy is based on legal mandate, limitations, and appointment procedure, accountability to parliament and judicial review which is linked to transparency and predictability. The independence of the regulator varies according to national approaches and traditions for example a minimum of independence is required by the EU directives, but countries differ widely, in issues of independence and democratic legitimacy. In order to achieve and sustain independence ,efforts should be made to reduce the influence of short-term pressures from government, parties or other lobbying groups and from the regulated agents, and this entails transparent selection process of board members, with final proposal by Government and approval gotten from the senate which gives single mandates and without renewal. This necessitate the need for stability and also ensuring that the institution is sufficiently financed.

### **3.2 Proficiency required from the regulatory bodies**

Engineering: Technical and economic management of a power system, basic understanding of the technologies involved, \sequence and inter-relation of the multiple operation and economic activities,

network implications in market functioning, issues in priority of access, network charges, location signal, aspects of electricity supply, security and adequacy.

- (1) Economic: Electricity supply costs, price control of regulated monopolies (e.g. principles of incentive-based regulation), Microeconomic principles applied to the electric power sector (e.g. monopolistic vs. competition models, short and long-term costs and prices, economies of scale, demand response, market power abuse and control), financial and accounting aspects of firms, environmental costs and constraints
- (2) Legal: Defense of competition, principles, domestic and international legislation (e.g. in the EU). The regulatory institutions and norms, general purpose institutions, sectorial regulatory institutions, \ electricity and gas Acts plus secondary regulation, criteria to authorize acquisitions, mergers and diversification of companies, administrative procedures Communication techniques, relations with the media interrelations with other industrial sectors

### **3.3 Models of Regulation of Electric power sector**

The regulation activities can be further divided into two major models, the traditional and the modern models which will be briefly discuss below

#### **3.3.1 Traditional model of regulation**

Public service obligation in franchise territory, voluntary coordination transactions of limited importance among utilities Regulated monopoly with the electric utility making all economic and technical decisions using centralized planning and operation

Under regulatory review of frequent overlap of public ownership and regulation

- **Merits of traditional model of regulation of power sector**

1. Restricted access and centralized optimal planning with more emphasis on efficiency and performance incentives and increased user participation based on adequate economic signals

2. From priority rules for capacity reservation to purely market based mechanisms in the short-term to solve for congestions
3. Very large number of facilities prevents individualized treatment and regulation is based on global performance
4. Directly connected to final users and quality of service becomes a critical issue and optimal trade-off between cost and quality of service
5. There is no widely accepted approach
6. Economic incentives to achieve a prescribed target level of losses and to meet minimum level of quality of service.
7. Specific performance-based incentives are possible and Independence with respect to the agents of the system is critical of the system.
8. Diversity of markets and contracts, both for system agents and external arbitrageur

- **Demerits of the traditional model of Regulation of power sector**

Excessive governmental intervention, conflictive role of Government as owner and regulator, inefficient management in general and Lack of public investment capacity in some specific cases

### **3.3.2 Modern model of regulation of power sector**

Unbundling of activities, with generation and retailing open to competition, meanwhile transmission and distribution remain regulated, diverse alternatives with system and market operation End consumers can choose supplier for retail market, while wholesale market is organized and bilateral, there is diverse contracts (physical, financial) to hedge the risk, the operation and investment planning is no longer a centralized activity and this give opportunity to independent regulator. Competition is possible in generation (wholesale market), hence enhanced transmission network capacity, larger relevant markets, and no economies of scale in generation. However, with this, there would be new generation technologies (CCGT), smaller size, shorter installation time, reduced

environmental impact , long-term marginal costs smaller than average generation costs and good perspectives with new capacity in theory.

- **Basic policies in Modern Regulation of power supply**

1. Liberalization of the wholesale market and the retail market
2. Restructuring of unbundling of vertically integrated activities and on horizontal concentration
3. Privatization
4. Complete eligibility of consumers reduces the problem of vertical integration and also of horizontal concentration in the distribution plus retail business Integration between electricity companies and fuel suppliers will be questionable if the fuel supply market is not fully competitive.
5. A regulation open to competition requires unbundling of regulated from liberalized activities, Regulated activities with conflicts of interest

#### **Advantages of Modern Model of Regulation of the power sector**

1. Reduce prices for more developed countries and better align prices with costs for the less developed ones
2. Stimulate retail and demand-side activities
3. Market-driven retirement of old generating plants
4. Environmental protection since the market price does not include most environmental costs
5. Universal extension of access to electricity and Technological diversification, research and development,

- **Demerits of Modern Model of Regulation of the power sector**

1. Stranded costs

2. Conceptual difference between an estimate of generation remuneration with previous regulation and the new market-based regulation:
3. Market revenues are uncertain
4. Frequent discrepancies with respect to future regulated revenues

### **3.4 Advances in generation technology and the effect on Regulation**

With advances in generation technology in the 80's the typical capacity of coal-fired & nuclear units moved to 600 to 1000 MW, with long construction time of 6 to 10 years, decisions on generation expansion were taken long before the capacity was needed, very large investments and frequent cost overruns only large, vertically integrated utilities under cost-of-service remuneration were able to make the necessary investments and with advance in technology in the 2000's led to optimal plant capacity may be less than 300 MW with construction time may be less than 2 years, much smaller investment per installed kW than other base-load technologies, wide availability of natural gas, lower environmental impact and regulatory uncertainty and investment decisions being made by smaller agents. Competition became possible in supply (retail market), Technological advances in metering, communications and information processing and facilitate multiplicity of commercial transactions led to favorable economic climate, global trend towards liberalization and interest to facilitate privatization

### **3.5 Observations and Salient point on Regulation of power sector**

Most risks are passed to consumers when there is mistakes in investment, demand forecast, technological obsolescence, etc. which led to frequent abuse of social policy obligations with the utility company acting as the tax collector. Regulation should be able to ensure adequate rate of return to investors and withstand pressure from cheap potential new entrants. Distributors is now becoming multiple purchasing agencies and thus maintain a monopoly over final consumers regulated tariffs. Issues of market power are now relevant with long term guarantee of supply is in principle left to the

market. All customers have access to competing markets either directly or through their choice of retailer and regulated tariffs only as a back-up option. Since power sector is a business of high risk, high turnover and small margin and it becomes necessary to have adequate regulatory supervision in order to prevent discriminatory behavior by any associated distribution company and the business risk depends on the specific regulation. The short-term energy market (becomes essential as a reference for the transactions and advantages of more precise metering. Strong incentive to efficiency in generation and integration of generation and retailing is no longer a problem and consumer may choose supplier.

**Note:**

- Both integration of distribution and retailing has to be closely supervised
- Stand-alone retailing is high-risk with low-return and demand may respond to market prices
- Adequacy of market economic signals in relation with reliability and security of the power system and market price when there is loss of supply
- Comparatively low cost in general and with the larger the costs and the need for new costly investments, the higher the regulatory complexity
- Synergies vs. conflicts of interest is a major regulatory issues
- Quality of service standards must be realistic, affordable, monitor-able and enforceable

**Conclusions**

The role of the regulator is complex. Ensuring reliable service at reasonable cost involves balancing the interests of utility investors, energy consumers, and the entire economy. The lowest possible cost generally sacrifices important public goals, so this is generally not the result, and regulation is about managing the balance of important public goals. Limiting the environmental impacts of the utility system while also assuring reasonable prices, reliability, and safety is the daunting challenge that

utility regulators face. Evolving technology provides new opportunities, but also creates new challenges.

In a general rate case, all aspects of utility service are reviewed. Often, issue-specific cases are docketed as well, to provide limited review of a particular topic. Participating in any of these cases offers opportunities to make important changes, but also obliges one to educate oneself about both technical issues and the policy framework of regulation.

Most utility regulators welcome public involvement, and are tolerant of the limited experience of new participants. In exchange, they expect respect for regulatory principles and for the dignity of the process. Regulators also expect participants to focus on facts and reasonable theories, and not simply rant about high prices.

When a major proceeding begins, all parties need to do their best to identify the issues they wish to address, and to make sure the commission agrees that those are appropriate for resolution. This avoids costly and time-consuming misunderstandings that can become very challenging if left unresolved until later in the proceeding.

The end result of progressive regulation should be a constructive working relationship among the various participants, and an efficient, thorough, open, and complete resolution of important issues. As regulation of the power sector will bring improve access to electricity, one of the major obstacles to energy sustainability is the lack of access to it in Nigeria. A political commitment to improve access to electricity by poor is desirable.

Market-led reforms on improved efficiency, with a reduced role for governments and with no direct program focused on increased access, cannot address the energy problems of the country

The country whose reform is not at an advanced stage should make provisions for increased rural electrification before embarking on large scale privatization. Models which appear to work well in some circumstances and places may not be easily transferable to countries facing different challenges

“When structure is not conducive to competition, the regulator and pool operator will find themselves unsuccessfully chasing after conduct. The solution is not a better rule, but a change in structure or a gradual introduction of competition, with rules that restrict the freedom of the market agents and prevent market power abuse. The successful development of electric power infrastructure in Nigeria depends on the adoption of appropriate public policies and the effective implementation of these policies. The regulatory apparatus that provides stability, protects consumers from the abuse of market power, guards consumers and operators against political opportunism, and provides incentives for service providers to operate efficiently and make the needed investments.

## REFERENCES

- Alfred Kahn* (2010): *The economics of regulation*
- Barker, J.(2009): Governance and regulation of power pools and system operators
- I.J. Pérez-Arriaga, H. Rudnick & M. Rivier (2011); Electric energy systems (An overview)
- Gómez-Expósito, A., Conejo, A.J.; Cañizares, C.(2009): *Electric energy systems*
- Taylor & Francis Group (2009):*Analysis and Operation*. CRC Press,
- Eurelectric, 2007: “The role of electricity”
- Electric Power Research Institute “EPRI PRISM study” (2007): The power to reduce CO<sub>2</sub> emissions”(EPRI), 2007
- P. Joskow, (2003): “The difficult transition to competitive electricity markets in the US”, 2003
- P. Joskow, (2006)“Incentive regulation for electricity networks”, 2006
- J. Peco,(2007): IIT-report, A network reference model.
- M. Ventosa,(2005) “Electricity market modeling trends”, 2005
- F. Galiana ; A. Conejo,(2006): “Economics of electricity generation”,
- A. Gomez, (2009): Electric energy systems”
- Kenneth Rose, (2005):“Market power in the emerging competitive electric supply industry”
- U.S. Department of Energy (2002): *A Primer on Electric Utilities, Deregulation, and Restructuring of U.S. Electricity Markets*.
- Phillips, (1984): *The Regulation of Public Utilities*, pp 75-78.
- The Brattle Group (2007) “Review of PJM’s Market Power Mitigation Practices”, 2007
- The International Energy Regulatory Network <http://www.iern.net/> International Directory of Utility Regulatory Institutions