

# *Effectiveness of Regulatory Governance of Electricity Power Sector of Pakistan*

## **Abstract**

*This study attempts to evaluate one of the important dimensions of regulation (i.e. regulatory governance) of National Electric Power Regulatory Authority (NEPRA). For this purpose, the study considers some of major input attributes of regulatory governance (i.e. capacity, integrity, participation, and predictability) and output attributes of regulatory governance (i.e. legitimacy and credibility). To carry out this evaluation, a survey was conducted and questionnaire based was filled by 102 professionals (dealing with regulatory affairs) of the main players of power sector of Pakistan. The data analysis involved inferential statistics using SPSS (Statistical Program for Social Sciences) software. The Pearson's product moment correlation coefficient or simply correlation technique is used to investigate the strength and direction of relationship between the variable mentioned in hypothesis, The findings indicated that the legitimacy of NEPRA has significant positive correlation with the capacity, integrity and participation. Whereas credibility of NEPRA has significant negative association with integrity. However, credibility has strong positive association with predictability. The results of this study can be helpful for strengthening the regulatory governance of NEPRA and developing confidence to the stakeholders of power sector of Pakistan.*

**Keywords:** Regulatory System; Regulatory Substance; Regulatory Governance

## **Introduction**

Electricity is considered as a major driver for economic development of any country. Energy plays key role in economic productivity, growth of industry and is vital for operation of any modern economy (Asghar, 2008). In the modern economy, energy plays at least fifty (50) percent role in industrial growth while representing less than one tenth of the cost of production. Electricity or electric power is considered to be most sophisticated form of energy and is a critical infrastructure for economic growth (Kalita and Medhi, 2011).

The electric power sector of Pakistan is suffering from severe electricity crisis. The main reason of the crises is the existing and increasing gap between demand of electricity and generating capacity which is available to meet/cater this demand. The electricity shortage has become a main political issue, and big suffering for individual consumers and industrial concerns. This issue stress the social fabric of the country and imposes threats to weaken the government's credibility and legitimacy (Kessides, 2013).

The deterioration of power infra-structure and other factors including monopoly, subsidized sector prices, governance failure, Financial and resource constraint and lower energy access rate provided the rationale for the reform of the energy sector (Bhattacharyya, 2011). Economic, social, and administrative regulations have been used to align the interest of public and private sectors. Regarding regulatory intervention, market failure and equity considerations are the two most common arguments (Kemal, 2015).

According to (Radaelli and Fritsch, 2012) performance of regulators play a key role in encouraging advancement in the economy and enhancing growth in production, through on

time processes approval, flexible ways to approach to arising problems and focusing the services. In high performing nations, existence of conducive regulatory environment provides important foundation and plays great role in making these make their country a great place to work and live and to protect their environment. Outcomes of good regulation depend on rules and regulations which effectively formulated. Good regulators, having efficient regulatory exercises, are required for enforcement of regulations. It is evident that over the time regulatory practices are improved proper arrangement of governance and strengthening of the regulatory governance re-enforce legitimacy of the regulations. Good regulatory governance is helpful in maintaining the trust and confidence of all the stakeholders.

National Electric Power Regulatory Authority (NEPRA) being a sole Regulator of the electricity sector of the country has remarkable contribution to the power sector but it still lacks many of the qualities of a good regulator. Its performance is always questioned making it responsible for deterioration of the power sector without considering the non-regulatory factors badly affecting the sector outcomes. Sector outcomes must be the ultimate benchmark for judging regulatory performance.” However, sector outcomes are also driven by other events beyond the regulatory system and outside the control of the regulator. External factors include “macroeconomic conditions, currency fluctuations, and interest rates, global conditions of the regulated market, natural disasters, and investor perception of overall country risk etc (Jarvis and Sovacool, 2011). This paper will discuss and evaluate the regulatory governance of NEPRA in the current scenario assuming different attributes, as the same plays a vital role in making a quality and performing Regulator.

The outcomes of this study will be useful for the whole power sector of the country in general and to the Regulator, Policy makers and investors in particular.

### **Problem Statement**

The power sector Regulator, performs very difficult tasks which are of national importance. The decisions of the regulator play major roles in the development of the country. However, due to lack of autonomy, transparency, required capacity, participation of public, accountability, credibility, legitimacy and predictability etc. it is very hard for the regulator to make merit based decision and to play prominent role in development of the sector.

### **Research objectives**

The objectives of this study are:

- (a). To measure the extent to which different regulatory governance attributes affect the governance of NEPRA;
- (b). To formulate suitable recommendation and suggestion to government and NEPRA regarding formulation of policies and Regulations on basis of findings of this study.

### **Significance of the study**

Like any other regulatory system, NEPRA also has two main dimensions which are regulatory governance and regulatory substance. Therefore to improve the performance of NEPRA, the understanding and evaluation of these dimensions of its regulatory system is essential. The emphasis of this study is on the regulatory governance only. Most of the literature on the subject are descriptive studies whereas empirical analysis has applied to limited (2 or 3) attributes of governance. This paper will empirically analyze all the known attributes of governance thus giving clearer picture of the matter and will focus the regulatory

governance of NEPRA which has not been evaluated (specifically) earlier. For this purpose, the paper uses the conceptual framework (Jarvis and Sovacool, 2011) regarding conceptualization and evaluation best practices of regulatory governance in electricity and water sector. Further, this study will use empirical technique to find out impact of different attributes on the regulatory governance of NEPRA and Pearson's coefficient of Correlation & Regression analysis between attributes of the regulatory governance.

### **Literature Review**

Before restructuring power sector of Pakistan was consisting of WAPDA and K-Electric Limited, previously Karachi Electricity Supply Company (KESC), which were two separate vertically integrated entities. WAPDA was established in 1958 as a semi-autonomous entity for development of the water and power sectors. K-Electric was registered under the Indian Companies Act, 1882 on September 13, 1913. Until the early 1980s, the performance of WAPDA and K-Electric remained satisfactory. Afterwards the situation started deteriorating (Malik, 2007; Kessides, 2013).

No one coherent government strategy is the reason behind the history of regulation and reforms. Rather regulation emerged in response to the altering objectives and needs in different economies, industries, and contexts of policies. The scale and scope of regulation captured rapid growth in twentieth century and the rapid growth in regulatory interventions resulted big shift in the economic environment (Malyshev, 2002).

In Pakistan, the poor performance of the power sector provided basis for restructuring of the sector. In 1992 the cabinet committee approved the strategic plan which envisaged reorganization of the whole power sector in the country. Government of Pakistan took policy decision to de-regulate the power sector, to promote IPPs, restructure WAPDA and to privatize other main entities. A one window facilitator was established in 1994 in the name of PPIB to promote participation of private sector in the power sector of the country. The key functions of PPIB include providing facilitation to investors to establish private power projects and other related infrastructure, execution of implementation agreement with project's sponsors and issuance of guarantees on behalf of the Government.

The power wing of WAPDA which was vertically integrated was disintegrated into ten separate distribution companies (DISCOs), one transmission company (NTDC) and four generation companies (GENCOs). The development and operation of hydropower plants remained with WAPDA. In order to restructure and preparation for privatization of the newly created GENCOs and DISCOs, PEPCO was created as a separate company in the name of PEPCO was created. In other words, PEPCO was made custodian of GENCOs, DISCOs and NTDC. Two public sector entities K-Electric and KAPCO were privatized. In order to oversight the power sector, to promote competition and to protect the rights of stakeholders, the power sector regulator i.e. NEPRA was established in December 1997 (Malik, 2012).

The market structure of generation segment of power sector of Pakistan is semi-private /semi-public. Initially, WAPDA, K-Electric or and Pakistan Atomic Energy Commission (PAEC) have been dominating the power sector of the country. After 1994, Independent Power Producers (IPPs) have also entered the market with considerable volume (Kessides, 2013). K-Electric at the same time generates, transmits and distributes electricity in the entire metropolitan area of Karachi where as responsibilities of PAEC inter alia include operation the nuclear power plants of the country. The major portion of generation is covered by

thermal IPPs. Further, several renewable energy based IPPs, CPPs and SPPs are also imparting their shares in electricity supply of the country (Report, 2015).

According to NEPRA State of Industry Report 2015, the gross installed generation capacity of the country was 24,823MW. The contribution of thermal power generation in the total installed capacity was composed of 16,814 MW (67.74%) whereas hydropower contributed 7,116MW (i.e. 28.67%). In addition, nuclear power generation and wind power plants contributed 787 MW (3.14%) and 106 MW (0.43%) respectively.

The system wise installed capacity is segregated as PEPCO system 22,360 MW (90.08%) and E-Electric System, 2,463 MW (9.92%). In the system of PEPCO, GENCOs provide 5,762 MW of the installed capacity whereas the share of thermal IPPs is 8,726 MW and that of renewable energy projects/wind power plants is 106 MW. In the K-Electric system, K-Electric owns 1,874MW of installed capacity, 252MW is accounted for thermal IPPs connected with K-Electric and the remaining 200 MW is supplied by other power plants connected to K-Electric. The major portion of the hydropower generation (i.e. 6902 MW out of 7116MW) is captured by WAPDA's hydel stations and the balance of 214 MW hydel power generation is counted for IPPs (Kessides, 2013; Report, 2015).

NTDC and K-Electric are the main players in the power transmission sector of Pakistan. NTDC is the national transmission company which is exclusively responsible to cater the requirement of transmission, planning, coordination, and overall reliability of electric power in the entire country except for the area served by K-Electric. K-Electric is an entity which is integrated vertically, and covers the metropolitan area of Karachi. In addition to NTDC and K-Electric, special purpose transmission licences have also been granted to Fatima Transmission Company Limited and Sindh Transmission Company (Pvt.) Limited. Further a  $\pm$  660 KV 878 km long HVDC transmission line from Matiari to Lahore is also underway for which tariff has been determined by NEPRA (NEPRA, 2016).

In the distribution segment there are ten public DISCOs. Eight of the DISCOs including (FESCO, HESCO, GEPCO, IESCO, LESCO MEPCO PESCO and QESCO) were created as a by unbundling the WAPDA's power wing. Later on SEPCO and TESCO were created by bifurcation of HESCO and PESCO respectively. These DISCOs serve end consumers in all Pakistan and FATA except the area of Karachi and its suburbs where K-Electric provides distribution services under its distribution license issued by NEPRA. Further, NEPRA has issued nine distribution licences to small power producers and one distribution licence to a captive power plant for selling electricity to designated bulk power consumers. Further, one distribution licence has also been granted to Bahria Town Islamabad, in the category of housing colonies distribution (Kessides, 2013; NEPRA, 2011; NEPRA, 2013).

The power sector of Pakistan transformed from exclusive centralized model to single buyer model by introduction of NTDC by unbundling of power wing of WAPDA. NTDC acted as national grid and as single buyer for major power producers through Central power Purchasing Agency. Further, some of the generation companies have direct supply contracts with DISCOs and Bulk Power Consumers (BPCs). Lately, in 2015 the function of purchase of power from producers has been entrusted to newly created Central Power Purchasing Agency (Guarantee) Limited (CPPA-G). Now CPPA-G is acting as market operator and NTDC holds the wired transmission business and acts as national grid. The proposed future model/configuration of power sector of Pakistan encompasses the attributes of open access and retail competition.

The creation of NEPRA was aimed to have an autonomous regulator to improve the performance of power sector, enhance competition and to deregulate the part of electric sector where competition existed. It further aimed to protect the interests of all the stakeholders of power sector. At the beginning of its establishment, NEPRA was attached with Ministry of Water & Power and Ministry of Law and Justice. Later on in 2000, NEPRA was attached with the Cabinet Division. Since then it is working in that setup (NEPRA, 2013). The top management or the Authority of NEPRA consists of a Chairman and four members (representatives of each province). The chairman is directly appointed by Federal Government. Whereas the members are also appointed by the Federal Government after considering the recommendation of the respective provincial governments. One amongst the members is appointed as a Vice-Chairman of the Authority, for one year period, by rotation. In order to streamline different activities and address different issues of power sector, NEPRA has formulated various Rules, Regulations and Guidelines (GOP, 1997).

### **Regulatory Governance and Performance**

According to (Stern, 2010) in general, recent studies confirm that due to good regulation investments and productivity performance of telecoms and electricity sector of developing countries are improving day by day. The quality of regulatory decision-making is improved by higher quality regulatory governance and hence, other things equal, the outcomes of regulated industries (Brown *et al.*, 2006). Higher economic growth and promotion of international business in any country is associated with good regulation in that country (Jalilian, Parker and Wilson, 2003). The foundation of regulatory system is based on the elements of clarity of its roles, independence, and procedure for ensuring accountability. Similarly, predictability, participation of stakeholders and transparency of regulatory process will enhance the credibility of the agency (Berg, 2000).

### **Evaluation of Regulatory Governance**

Performance of regulating entities can be evaluated by applying cost benefit analysis and other standard methods for evaluation of economics. For evaluation of governance, a relatively standard method has been developed which uses a hierarchy of three 'Meta-Principles', ten 'Principles', and fifteen 'Critical Standards' (Stern, 2010).

If a regulatory system is compliant with three basic meta or higher-order principles of governance (i.e. Credibility, Legitimacy and Transparency) then it is an effective regulatory system, regardless of organizational forms of the regulatory governance systems. The higher-order or Meta-Principles are deemed to be applicable to all regulatory entities (Brown *et al.*, 2006).

The ten principles or ten key principles which include accountability, independence, transparency, participation of public, role clarity, predictability, clarity and completeness in rules, application scale, appropriate institutional characteristics, requisite powers and integrity of conduct are relatively standard and similar to other specifications of regulatory entities principles. Whereas the *critical standards* are a new departure and are specify the appropriate method to achieve the principles in practice by regulatory bodies, which have regulatory 'independence to some extent (Robert, Martin and Martin, 2015).

(Jarvis and Sovacool, 2011) present a conceptual framework that can be used for evaluation of regulatory systems of water and electricity sectors. It proposes an integrated framework which combines the metrics of two main dimension of regulatory system (i.e. regulatory substance and regulatory governance) to evaluate regulatory effectiveness with reference to performance based outcomes in the provision of water and energy related services. For effective governance, this study has identified eight structural based elements and two output

attributes. The frameworks come across at regulatory outcomes and governance at all levels (i.e. industry level, provincial level and national level).

To implement regulatory policies, different institutional arrangements have been in place, a separate agency from the government with sound levels of independence and technical capability has emerged as the paradigm of a regulatory institution (Guasch, 2007).

Since 1980s, different countries of Latin America have started reforms in the telecommunications sector for the creation regulatory environments for encouragement of private investment, with special focus on foreign investment. The trends of reforms of 25 Caribbean and Latin American countries during 1980–2001 provide an index based on autonomy, transparency, accountability, participation, clarity of objectives and the legal power that are necessary for creating a regulatory body. The index clearly provides that generally, well-built regulatory reforms have been achieved by most of the countries by following the recommendations of practitioners and experts (Gutiérrez, 2003).

In Pakistan power sector, effectiveness of regulatory structure has been presented by (Malik, 2007) wherein regulatory environment in the electric power sector of Pakistan has been discussed. NEPRA was created in 1997 to guarantee an efficient and competitive environment for the distribution and generation companies, look after consumer interests in the regarding provision of electric power. But NEPRA has failed to achieve its target so far. The organizational weaknesses, less efficient electricity tariff, high line losses and prevailing corruption are still affecting the power sector of the country. Lack of autonomy has weakened the regulatory governance of NEPRA which resulted in overall institutional inability of NEPRA to perform its functions in effective and desired manner. Further, NEPRA has failed develop the professional expertise which are required for effective supervision and control of power sector. In addition, NEPRA has also failed to set up a rational and equitable pricing regime.

The process of creation of regulator and competitive environment has been evaluated by (Cook, 1999) by reviewing case studies from developing countries and the outcomes were that the regulatory culture development is constrained due to the lack of capacity of government to enforce regulatory rules and monitoring contracts. Further, fostering conditions that encourage competition and lessen anti-competitive behavior is a beneficial but slow process. (Dubash, 2005) has reviewed the institutional arrangement and structure of governance of the regulatory agencies in Indonesia, Philippines, India and Thailand and the main findings were that capacity of institution systematic features of the sector in the country need proper consideration and need to be addressed while designing the reforms.

In their study "Electricity Sector Reform in Developing Countries" (Zhang et. al, 2008) have carried out an econometric assessment of the effects of regulation model, privatization, and competition. Methodology used was using panel data for fifty one developing countries to assess the effects of regulation, privatization and competition on the performance of electric power generation companies. The main findings were that competition plays effective role in motivating performance improvements, regardless of changes in regulation or ownership.

In a survey of selected transition and developing economies (Zhang et. al, 2009) have found that regulatory reform is critical for better governance. The results showed that regulatory reform in developing countries has not adopted systematic approach for promotion and enhancement of regulatory governance. The paper suggests focusing the regulatory policies,

tools and institutions, and that centralized and concerted efforts are needed to integrate the elements, for improvement of the regulatory governance.

(Steiner, 2000) empirically evaluates the effect on performance of electricity generation industry in OECD caused by liberalization and privatization. The main findings were that privatization, unbundling of generation, open access to transmission networks, and the introduction of electricity markets have significant impact of on the performance and create favourable conditions for international expansion of business.

The Impact of regulation on growth of economy in developing countries has been demonstrated by (Jalilian, Parker and Wilson, 2003) . The study has used an econometric model and explores the effect of regulatory governance on economic outcomes. The main findings showed that there is well established link between economic performance and regulatory quality. The study further find out that impact of reforms are constrained/limited due to weakness in public policy.

Electricity and Telecommunication Regulation in Small and Developing Countries has been presented by (Stern, 2000). Methodology used was the survey of evidence from telecom and electricity industries in Asia, Latin America and Sub Saharan Africa. The main findings were that the creation of effective and independent regulatory agencies plays an important in the success and sustainability of the reform process. Further, regulatory agencies can be strengthened by better educational infrastructure.

Utilities regulation in Ghana Centre on Regulation and Competition (CRC) has been evaluated in by (Aryeetey and Ahene, 2005). In this study the methodology used was case study of telecommunication, electricity and water utilities (i.e. three main public utilities in Ghana). It has been concluded that regulatory reform process are hampered by insufficient regulatory expertise; non-cooperative attitude by some key industry actors; and lack of sufficient funding hampered the.

To determine the performance of a regulatory framework in Asian developing countries a set of six elements as criteria has been developed by Stern and Holder in 1999. This set of criteria consist formal and informal aspects. The formal aspect mainly relates to institutional design and includes clarity of roles, autonomy and accountability while the informal aspect relates to regulatory practices and processes. The informal aspect consists of participation, transparency and predictability (Zeb, Haider and Shaheen, 2015).

According to (Kemal, 2015) various regulatory authorities have been established in Pakistan for regulating utilities. Although, regulators are created to protect the right of consumers as well as investors, but over a period of time where the regulators degenerate into protecting the organizations which they are supposed to regulate. Therefore, accountability of regulatory bodies must be in place to avoid corrupt persons in key positions in regulatory bodies. The professionals of regulators must be of competent and well-versed with the latest regulatory measures.

The study of (Zeb, Haider and Shaheen, 2015) reveals that there is inconsistency of regulations between the energy sector regulators of Pakistan (i.e. NEPRA and OGRA) and the same conveys a confused message to investors. This kind of inconsistency causes disharmony in pricing strategies in the energy sectors and displays lack of autonomy and clarity of roles in NEPRA and OGRA.

(Tsaplin, 2001) empirically tested the Ukrainian energy regulatory system to check its compliance with requirements of good regulation and found major deficiencies in the regulatory system. The main reasons were that the specifications of legislative frame work were improper and incomplete. The process of compliance with requirement of regulations is also affected by lack of coordination between administrative & regulatory reform and the development of constitution.

(Thomas, 2016) argues that the introduction of incentive regulation was main element in the UK reform process. The main findings of this study were that to avoid the abuse of market power, regulatory interventions is necessary. With transformed market mechanism, the UK generation market is competitive, but it remains to be seen whether this will be sufficient to make generation truly competitive.

Based on the literature of institutional economics and incentive regulation , study has been carried out to construct an empirical model to investigate the impact on the degree of best practice regulation by industry size, political and economic institutions.. The outcomes of the study prima facie recommend that for best practice regulation, the most important institutional determinant is the existence and experience of an autonomous regulator (Haney and Pollitt, 2011).

Much of the work in UK, the European Union and the USA has been on infrastructure regulation in developing countries. The paper discusses the evaluation issues involved and covers the use of case studies, econometric techniques and, briefly, randomized experiments. The paper also discusses the origin, contents and lessons from the 2006 World Bank Handbook on evaluating infrastructure regulatory frameworks. The conclusion of the paper contents some general comments on the role of evaluation both for establishing the accountability of regulatory arrangements as well as for providing a process by which they and others can systematically learn from experience (Stern, 2010).

A regulatory system can be termed as effective only if three basic meta- or higher-order principles of credibility, legitimacy and transparency are satisfied y that system (Stern, 2010). (Trillas and Montoya, 2013) finds that once de facto issues and endogeneity are taken into account, the autonomy of regulator has a significantly positive but modest impact on network penetration. The survey of new empirical evidence plus the literature on de facto autonomy. It is argued that a utility regulatory institute is effective if it provides transparency and predictability (Stern and Holder, 1999a).

(Cubbin and Stern, 2005) assess whether superior electricity outcomes are significantly associated with the existence of a regulatory law and higher quality regulatory governance. The study uses theoretical and empirical work on the impact of independent central banks and telecommunications regulators of twenty eight developing countries over the period 1980-2001. The results of the empirical analysis conclude that higher per capita generation capacity levels have significant positive association with regulatory law and higher quality governance.

### **Levels of Evaluation of Regulatory Governance**

According to (Robert, Martin, and Martin, 2015), the evaluation of Regulatory governance has three levels i.e. short or basic evaluation, mid-level evaluation and in-depth evaluation. The short evaluation uses a structured questionnaire and is taken as a diagnostic check on the

basic characteristics of the sector. The short level evaluation reports the issues of regulatory governance and industry structure in excellent manner, while it has relatively little emphasis on outcomes. The mid-level evaluation also uses questionnaire and interviews and intends deeper exploration of regulatory governance issues. In the mid-level evaluation outcomes of regulatory systems are also taken into consideration. The in-depth evaluation is essentially the mid-level evaluation but with much more probing and a wider remit.(Brown *et al.*, 2006) and (Stern, 2010).

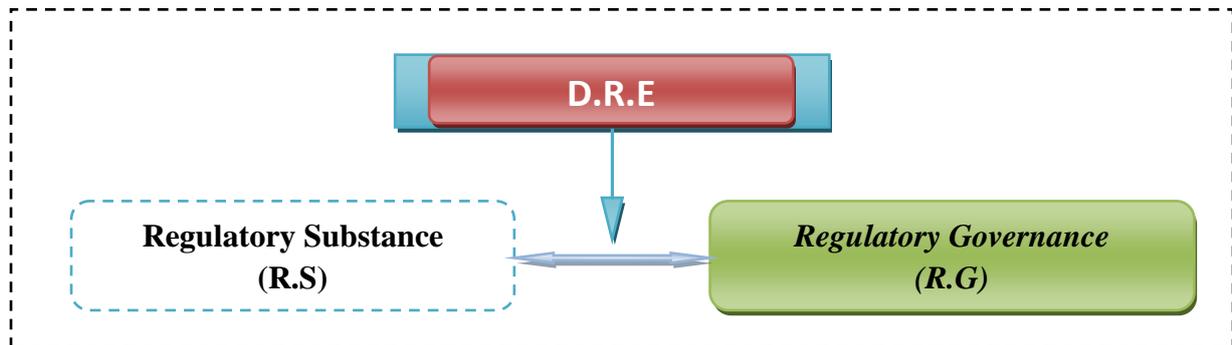
In Pakistan, when the government felt that the required expansion and efficiency in the power generation and capacity to transmit the same cannot be achieved without the involvement of private sector, a strategic plan was framed in 1992, for the privatization of the power sector. Further, in order to introduce a transparent and judicious economic regulation to the power sector, it was decided to create an autonomous regulatory agency. Accordingly, NEPRA was created in December 1997 as an independent regulatory body (Kemal, 2015).

### Research Methodology

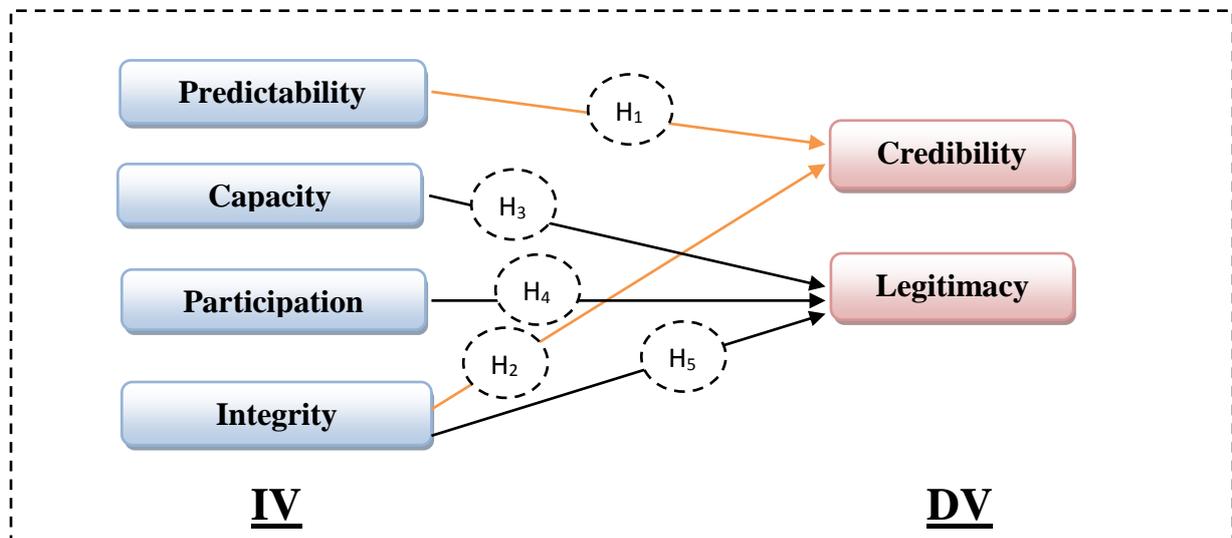
This section describes the research methodology of the study including instrument development/selection, methods of sampling, data collection, data processing, data analysis technique, variables and their measures, reliability and validity of data.

### Conceptual Framework/Research Model

*Figure-1 Dimensions of Regulatory Effectiveness (DRE)*



*Figure-2 Conceptual Framework*



### **Research Methodology/Design**

The research method used to conduct this study is a field survey research. The nature of data of this research is cross-sectional primary data which was obtained from power sector professionals of Pakistan mainly dealing with regulatory affairs, through a close-ended questionnaire. There are three main types of research methods i.e. qualitative research, quantitative research, and a mixed research method, which is the combination of both qualitative and quantitative methods (Johnson and Larry, 2003). For the purpose of this study, quantitative techniques are used to measure all the independent and dependent variables. The data was empirically tested using IBM SPSS 23.00. The hypothesis testing of this study consider the impacts of independent variables on the dependant variable.

### **Population frame**

The population is composed of main players of power sector of Pakistan. The population frame consist of NEPRA, Ministry of Water & Power (MoW&P), Private Power and Infrastructure Board (PPIB), Alternative Energy Development Board (AEDB), Ministry of Planning, Development and Reforms (MoPDR), Distribution Companies (DISCOs), Transmission Companies, Generation Companies, Energy Departments, Power & Legal Consultants dealing with the Regulator and individual experts of the field. The targeted respondents were the middle and upper level management and employees of these organizations dealing with policy and regulatory affairs.

### **Sample Design**

The study is in the form of cross sectional in which data will be collected once across a population through the purposive (non-probability) sampling technique. The reason for selecting purposive sampling is that regulatory governance is a specialized field and choosing the respondents randomly would not serve the purpose. Therefore, participants having sound knowledge of power sector and dealing with regulatory affairs were included in the sample. These participants were middle or upper level management. The sample frame consist of two transmission companies, three distribution companies, ten generation companies, three energy departments, existing and ex-professionals of regulator, seven power sector consultants, MoW&P, PPIB, AEDB energy wing of planning commission and senior faculty members of energy management. In Purposive sampling the sample size is usually small, often fewer than 30 cases (Onwuegbuzie and Collins, 2007). The questionnaire was distributed to a total of one hundred and twenty (120) participants/professionals of the above mentioned organization using the purposive (non-probability) sampling technique. The sample size has been calculated using Creative Research System and Raosoft online sample size calculator. The questionnaire was administered personally and via email guidance when required. Further, a comprehensive questionnaire was also prepared on Google docs and shared with the respondents. The sample size was restricted due to time and resources constraints. Total 91 responses were received and the response rate was 75.83%.

### **Instrument Development/Selection**

The Questionnaires for this study was adapted from the study carried out by Jarvis and Sovacool which provides conceptual framework for evaluation of regulatory systems (Jarvis and Sovacool, 2011) and study of (Stern and Holder, 1999b).

### **Variables and their measures**

In this study, independent and dependent variables have been used. In this research design, structural attributes of regulatory governance (i.e. capacity, predictability, integrity, participation and transparency) are independent variables whereas output attributes of

regulatory governance (i.e. legitimacy and credibility) are dependent variables. To measure these variables different items are associated with each construct in the questionnaires. This research is quantitative and questionnaires are commonly used to collect data in a quantitative research. Advantages of using questionnaire for data collection includes are that it is economical, relatively simple to administer, straightforward and easier to analyze. The questionnaire is prepared by using a five point Likert scale, whereas- 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

#### **Data collection procedures:**

The purposive (non-probability) method of sampling is used in this study. In the purposive sampling a group is selected from the population frame on the basis of available information thought. The design of the questionnaire involves close ended questionnaires.

#### **Data analysis techniques**

The data analysis involves inferential statistics using SPSS (Statistical Program for Social Sciences) software. In this study, SPSS 23.0 is used to analyze the data. Correlation design has been used in this study which determines the relationship among dependent variable and independent variables (Pearson's product moment correlation coefficient and simple regression). Correlation is used to report the findings as Correlation tells about the strength and direction of relationship between the variable mentioned in hypothesis. Value of r (coefficient of correlation) explains relationship between the variables of interest. Positive or negative sign value of r gives a clear idea that about relationship between the variables of interest.

#### **Data Screening (missing values, outliers and normality etc.)**

Histogram scatter plots were used to compare the data distribution with or without outliers and to analyze normality of the data. The results show that the data is normal and not skewed with no outliers.

#### **Validity**

The extent of accuracy of the results a the study is referred as validity. The validity can either be external or internal. The accuracy of the obtained results is referred to as internal validity whereas external validity refers to the analysis of the results regarding whether they can be generalized (Ghauri, & Gronhaug, 2005). If measurements are used, then different types of validity exist the including: face validity, convergent validity and divergent validity. Face validity explains the degree to which the measure used is reasonably capable of what is due to measure, convergent validity provides the extent to which the measurement used can bring similar results if used elsewhere and divergent validity that describes the extent to which one construct is distinguished from another.

For the purpose of this study, face validity and content validity was checked to confirm the validity of the collected data and there search instrument. The questionnaire was shared and discussed with senior professionals and potential respondents to check its validity at face value. However, now significant change or ommission was suggested. To check the validity of the content, the items of questionnaire were checked with reference to the theoretical framework. Two questions were deleted to avoid repetition to ensure the validity of the instrument.

#### **Reliability**

Reliability is the stability of the measure used to study the relationships between variables. The Cronbach's alpha is most commonly used measure of reliability, which provides a measure of the internal consistency of a scale. The value of Cronbach's alpha is expressed as

a number between 0 and 1. The extent to which all the items in a test measure the same construct is described by internal consistency which is linked to the inter-relatedness of the items within the test (Tavakol and Dennick, 2011). Cronbach's Alpha coefficient must be greater than 0.7 (Nunnally, 1978; Panayides, 2013). According to the thumb rule of George and Mallery (2003) the value of Cronbach's Alpha: " $\geq 0.9$  is Excellent,  $\geq 0.8$  is Good,  $\geq 0.7$  is Acceptable,  $\geq 0.6$  is Questionable,  $\geq 0.5$  is Poor, and  $< 0.5$  is Unacceptable (Gliem and Gliem, 2003).

### Data Analysis and Discussion

Following the conceptual framework, research methodology and data analysis techniques as discussed in the forgoing chapter, this chapter provides descriptive analysis of data, results of Correlation and Regression and interpretation of these results.

### Descriptive Analysis:

Frequency tables and descriptive etc. are covered under this section of the study examining the variables thoroughly for better understanding and comprehension of the data. The 44 questions in the questionnaire out of which only research question no.1 has been measured using a different scale in the attempt to understand from which organization the respondents belong;

**Table-1 Organization Type**

		<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
Valid	1	6	6.6	6.6	6.6
	2	5	5.5	5.5	12.1
	3	15	16.5	16.5	28.6
	4	20	22.0	22.0	50.5
	5	18	19.8	19.8	70.3
	6	12	13.2	13.2	83.5
	7	15	16.5	16.5	100.0
Total		91	100.0	100.0	

1 – Transmission 2 – Distribution 3 – Generation 4 – Energy Department 5 – Regulator 6 – Consultant 7 – Others

According to the frequency table, the minimum responses for question 1 -What is your organization type, was 1 while maximum responses was 7. Table 1 concludes that most of the respondents belonged to the Energy Department (22%) and Regulatory body which is NEPRA (19.8%) while only a few belonged to Transmission (6.6%) and Distribution companies (5.5%).

**Table 2: Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
PRDAVG	91	1.00	5.00	2.9863	.83530
INTAVG	91	1.25	5.00	3.5522	.66093
CRDAVG	91	1.00	5.00	2.8938	.87468
LEGAVG	91	2.00	5.00	3.7619	.72741
PARAVG	91	2.00	4.83	3.9469	.60549
CAPAVG	91	2.50	5.00	3.8159	.72153
Valid N (listwise)	91				

### Predictability

Descriptive statistics for predictability variable show that most of the respondents chose answers 2 or 3 on the Likert Scale which is why the mean is around 3.

### Integrity

On the topic of integrity, the respondents were asked to provide their view regarding the following aspects:

- a. Disclose conflicts of interest by the members of NEPRA;

### **Credibility**

Three items were used to measure the variable, credibility. Out of the three, item 2 got most of the responses around 2 as the mean is 2.69 while for the other two it is 3.10 and 2.89 which is closer to 3 meaning thereby that the respondents mostly answered neutrally for these two questions. The overall response for credibility lies on negative side.

### **Legitimacy**

Three important items were added in order to measure legitimacy for this study.

- a. *NEPRA is considered to be fair in its treatment of stakeholders;*
- b. *NEPRA displays impartiality and even-handedness in its decision making and rule determination;*
- c. *Multiple stakeholders are engaged with NEPRA to prosecute their concerns and agenda;*

The data shows that most of the respondents chose 3 and 4 for these three items. From the said results it can be inferred that perception of stakeholders regarding legitimacy of NEPRA is on positive side.

### **Participation**

The data shows varied results of the respondents according to the mean for the variable, participation. The questions included for this variable inquired regarding:

- a. Placement of proper mechanism and procedures in NEPRA for consultation regarding major decisions
- b. Holding of public meetings/hearings by NEPRA
- c. Provision provided by NEPRA to allow written and oral submissions to its decision making bodies and formal response to these submissions.
- b. Appointments of members of the NEPRA;
- c. Perception of stakeholders regarding impartiality of NEPRA;
- d. Perception of stakeholders regarding adherence of NEPRA to the broader principles of its mandate.

### **Capacity**

For the variable, capacity most of the responses are on positive side and the mean is around 4 which means that the respondents went for positive answers.

According to the mean, the responses were mainly around 3 which is neutral on the Likert Scale.

### **Reliability of the research Instrument**

To check the reliability of the research instrument, a pilot test based on thirteen responses was conducted to analyze the items of the constructs. Based on the pilot testing some items of the construct were eliminated. In order to test the questionnaire's reliability, IBM SPSS 23.0 software was used to find out Cronbach's Alpha of all the variables of the study. The Cronbach's Alpha coefficients for different variable of this study were found out to be: capacity: 0.767, integrity: 0.646, participation: 0.779, predictability: 0.742, legitimacy: 0.740 and credibility: 0.739. As Cronbach's Alphas of most of the construct are above 0.7 and the responses and results from this study can be considered reliable.

Further, the data was tested for Reliability of Questionnaire, Multi Co-linearity, Heteroscedasticity and Normality. The results of the test confirmed that the data is normal, linear and encompass no heteroscedasticity.

### Correlation Analysis:

Correlation analysis primarily shows the direction and strength of variables with each other. In statistics Pearson correlation coefficient is denoted by “r” used to measure the association between independent variables (IV) or between independent and dependent variable (DV). Pearson correlation coefficient concerned with the strength of the relationship and is always between -1 and 1. The value 1 says that there exists perfectly strong positive linear relationship between two variables and -1 means a perfectly negative linear relationship between two variables and it means they’re exactly on the same line. In order to study the relationships between independent variables, clarity of role, capacity, autonomy, accountability, transparency, predictability, participation and integrity with each other and with the dependent variables, credibility and legitimacy, this Pearson correlation analysis has been carried out.

*Table-3 Correlation Analysis*

	CAP	PRED	PART	INTE	CRED	LEG
CAP	1					
PRED	-.043	1				
PART	.339**	-.217*	1			
INTE	.247*	-.102	.447**	1		
CRED	-.219*	.289**	-.311**	-.386**	1	
LEG	.353**	-.150	.502**	.612**	-.304**	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

The computed result of correlation analysis concludes that all the ten variables are either positively correlated with each other or negatively. Most notably, it can be seen that the results are significant too. There is a positive relationship between predictability and credibility (r = .289) whereas, there is a negative relationship between integrity and credibility (r = -.386). Capacity has positive relationship with legitimacy (r=.353). Participation has positive relationship with legitimacy (r=.502). Importantly, the strongest and positive relationship is among integrity and legitimacy (r =.612).

### Regression Analysis:

The regression equation principally explicates the impact of change in IV (independent variable) on DV (dependant variable). For linear regression the equation given by:  $y = b x + a$ . In this equation "y" is DV, “b” is the slope, “x” is IV and “a” is a constant. However, talking about R-squared or “R<sup>2</sup>” note that it is the coefficient of determination and its value ranges from 0 to 1. If the value of R<sup>2</sup> is 1 then there is a perfect linear relationship between DV and IV which means that there is a 100% variation in the DV because of the variation in IV. If R<sup>2</sup> is near to zero there is weak linear relationship between the variables. "0" value of R<sup>2</sup> says that there is no linear relationship between the variables (Hair *et al.*, 2010). In some situation high value of R<sup>2</sup> is not necessary and R<sup>2</sup> becomes less important. For example if the point of interest is relationship between variables, not prediction.

In order to analyze the impact of independent variables; capacity, predictability, participation and integrity on the dependent variables; credibility and legitimacy, regression analysis was carried out.

### The Regression Model

For the  $i^{\text{th}}$  observation the linear regression model can be written as

$$y_i = \beta_1 + \beta_2 x_{i2} + \dots + \beta_k x_{ik} + \dots + \beta_K x_{iK} + \varepsilon_i$$

Wherein  $y$ : dependent variable,  $x$ 's : independent variables, and  $\varepsilon$ : error in equation,  $\beta_2$  through  $\beta_K$ : parameters that indicate the effect of a given  $x$  on  $y$ ;  $\beta_1$  is the intercept. For the purpose of the study, the linear regression model can be expressed as

$$Y_{\text{CRD}} = \beta_1 + \beta_2 X_{\text{PRD}} + \beta_3 X_{\text{INT}} + \varepsilon_{\text{CRD}}$$

$$Y_{\text{LEG}} = \beta_1 + \beta_2 X_{\text{CAP}} + \beta_3 X_{\text{PAR}} + \beta_4 X_{\text{INT}} + \varepsilon_{\text{LEG}}$$

In the above equation  
 $Y_{\text{CRD}}$  is the Credibility

$Y_{\text{LEG}}$  is Legitimacy

} Dependent Variables

$X_{\text{CAP}}$  is Capacity,  
 $X_{\text{PRD}}$  is Predictability  
 $X_{\text{PAR}}$  is Participation and  
 $X_{\text{INT}}$  is Integrity

} Independent Variables

$\varepsilon_{\text{LEG}}$  and  $\varepsilon_{\text{CRD}}$  are the errors in equations.  $\beta_2$  through  $\beta_7$  are parameters that indicate the effect of a given independent variable  $x_i$  on dependant variable  $y_i$ ;  $\beta_1$  is the intercept.

The following tables present the coefficients, ANOVA and model summary for the impact of independent variables on the dependent variable credibility.

**Table-4 ANOVA results for dependent variable: Credibility**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.607	2	7.304	11.848	.000 <sup>b</sup>
	Residual	54.248	88	.616		
	Total	68.855	90			

a. Dependent Variable: CRDAVG

b. Predictors: (Constant), INTAVG, PRDAVG

F-statistics gives the overall goodness of the fit of model ( $F=11.848 > F_c=2.21$ ) at 5% significant level so the model is good enough) Whereas Sig. or p-value helps regarding Null Hypothesis. If p-value or Sig. is less than  $\alpha$  ( $\alpha=0.05$  in this case), null hypothesis is rejected.

**Table 3: Model Summary for dependent variable: Credibility**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.461 <sup>a</sup>	.212	.194	.78515

a. Predictors: (Constant), INTAVG, PRDAVG

**Table 4: Coefficients of regression for dependent variable: Credibility**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.796	.568		6.688	.000
	PRDAVG	.265	.100	.253	2.658	.009
	INTAVG	-.477	.126	-.360	-3.786	.000

a. Dependent Variable: CRDAVG

According to the results, predictability and integrity have a significant impact on credibility (0.009 and 0.000). There is 0.25 unit and 0.36 unit change in credibility which can be explained by a unit change in predictability and integrity respectively. According to the value of R-squared, unit (1%) change in each of the IV in the model explains 0.25 unit (25%) changes in the DV that is credibility, whereas according to the value adjusted R<sup>2</sup> (36%) change in DV (Credibility) is explained by those IVs which have significant effect on it (i.e. predictability and integrity). It is to be noted that "R<sup>2</sup>" assumes that each IV in the model explains the changes in the DV. It gives the percentage of explained variation as if all IVs in the model affect the DV, whereas the adjusted R<sup>2</sup> provides the percentage of variation explained by only those IVs that in reality affect the DV (Tabachnick and Fidell, 2007).

The following tables present the coefficients, ANOVA and model summary for the impact of independent variables on the dependent variable Legitimacy.

**Table 5: ANOVA results for dependent variable: Legitimacy**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.973	3	7.324	24.845	.000 <sup>b</sup>
	Residual	25.648	87	.295		
	Total	47.621	90			

a. Dependent Variable: LEGAVG

b. Predictors: (Constant), INTAVG, CAPAVG, PARAVG

The model is good as the value of F=24.845 is much greater than F<sub>critical</sub>=2.32, and significant level is also good, i.e. p-value=0.000 << α =0.05.

**Table 6: Model Summary for dependent variable: Legitimacy**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.679 <sup>a</sup>	.461	.443	.54296

a. Predictors: (Constant), INTAVG, CAPAVG, PARAVG

**Table 7: Coefficients of regression for dependent variable: Legitimacy**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.195	.443		.440	.661
	CAPAVG	.159	.085	.158	1.877	.064
	PARAVG	.289	.110	.240	2.632	.010
	INTAVG	.512	.097	.465	5.260	.000

a. Dependent Variable: LEGAVG

According to the results, capacity, participation and integration have a significant effect on legitimacy with the R-squared of 0.443 which concludes that there is a 44% variation in the variable legitimacy due to the above mentioned variables. There is 0.158, 0.240 and 0.465 unit changes in the dependent variable Legitimacy due to unit changes in IVs i.e. Capacity, Participation and Integrity, respectively.

## Hypothesis Testing and Discussion

### H1: There is a significant relation between predictability and credibility:

The results show that there is significant relation between predictability and credibility of NEPRA as found by (Brunetti, Kisunko & Weder, 1997) in their worldwide survey of the Private Sector regarding Credibility of Rules and Economic Growth.

### H2: There is a significant relation between integrity and credibility:

Integrity is corner stone of professionalism and absence of integrity causes loss of credibility (FEE, 2009). To measure the extent to which reputation and credibility remain intact, professional integrity is considered to be a good measure. The perception of dishonesty or

lack of integrity undermines the credibility (Medical Protection Society, 2011). The results of this study also show significant relationship between integrity and credibility of NEPRA.

**H3: There is a significant relation between capacity and Legitimacy:**

Capacity of an organization is an tool to increase its legitimacy and to achieve reputation (Five *et al.*, 2011). The results of this study affirm that the capacity of NEPRA has also positive relationship and play role in enhancing its legitimacy.

**H4: There is a significant relation between participation and Legitimacy:**

The public participation in decision making is meant to improve the legitimacy of decisions (National Research Council, 2008). The study of Yves Bonzon on "Public Participation and Legitimacy in the WTO" has mentioned that the legitimacy of the decision-making process of WTO has always been questioned, and public participation has been advocated as a remedy (Bonzon, 2014). The results of this study show that public participation has also significant correlation with legitimacy of NEPRA as provided in the results of this study.

**H5: There is a significant relation between integrity and Legitimacy:**

Integrity is proposed as precondition for gaining legitimacy and a motivation for seeking it (Kimakowitz, 2012). The sense of integrity of an organization provides positive feelings regarding its legitimacy (Slim, 2002). In conformity to the said, the outcomes of this study show a very significant positive relationship between legitimacy and integrity in the case of NEPRA.

**Table-8 Hypothesis results**

<b>HYPOTHESIS</b>	<b>Results</b>	<b>H<sub>0</sub> Accepted/Rejected</b>	<b>Alternative</b>
<b>H1:</b> There is a significant relation between predictability and credibility.	Significant relationship exist	<b>H<sub>0</sub></b> Rejected and Hypothesis Accepted	Alternative
<b>H2:</b> There is a significant relation between Integrity and credibility	Significant relationship exist	<b>H<sub>0</sub></b> Rejected and Hypothesis Accepted	Alternative
<b>H3:</b> There is a significant relation between Capacity and legitimacy	Significant relationship exist	<b>H<sub>0</sub></b> Rejected and Hypothesis Accepted	Alternative
<b>H4:</b> There is a significant relation between Participation and legitimacy	Significant relationship exist	<b>H<sub>0</sub></b> Rejected and Hypothesis Accepted	Alternative
<b>H5:</b> There is a significant relation between Integrity and legitimacy	Significant relationship exist	<b>H<sub>0</sub></b> Rejected and Hypothesis Accepted	Alternative

### **Conclusions and Recommendations**

The determination and evaluation of the factors which effect the regulatory governance and in turn the regulatory effectiveness of the power sector regulator was main objective this study. The literature review provided understanding and identification of these these determinants. The results show that predictability and integrity have a strong and significant impact on credibility while capacity, participation and integrity have an effect on legitimacy of NEPRA.

Being the sole regulator of power sector in Pakistan, NEPRA has main role in development of the country in general and development of power sector, in particular. Further the responsibilities of NEPRA are unique and sensitive nature. Although, the regulatory governance of NEPRA is good, but to carry out its responsibilities in a meaningful and effective manner and to meet the emerging challenges and evolution in the electricity market, NEPRA need further improve its regulatory governance by adhering to the well established attributes of regulatory governance.

Previous study on regulatory effectiveness of NEPRA carried out in 2007 (Malik, 2007) referring to the outcomes of power sector, the regulatory governance of NEPRA has been termed as very weak. In this regard it is to be noted that in Pakistan the power sector outcomes badly affected by non-regulatory factors. Therefore, based on overall sector factors it cannot be determined that the regulatory governance is weak. Evaluation of regulatory governance requires specific considerations. Therefore, considering the results of this study based on responses of the participants regarding different specific attributes of regulatory governance it can be concluded that over all regulatory governance of NEPRA is quite acceptable as it fulfils most of the key attributes which are specifically related to the regulatory governance, which is further clarified in the following Paragraphs.

The observation of respondents regarding the governance attribute of clarity of role in NEPRA is very positive as Legislation of NEPRA provides clear description of its roles, responsibilities, objectives and other functions. Further, in the legislation the role of different regulating entities regarding their functions (i.e. Licensing, Tariff and Monitoring) are well established.

Capacity of an organization also a part of its regulatory governance the capacity refers to availability of sufficient human and financial resources which are required to carry out the organizational responsibilities. With the passage of time, NEPRA has attained good health and independent revenue stream guaranteeing its operations without any constraints and enjoys budget stability year by year. Further, professional capacity of NEPRA has also enhanced. Due to all these reasons, the response of respondents regarding capacity of NEPRA is on positive site.

NEPRA maintains well established set up and procedures regarding its accounts and rendering reports to relevant stakeholders. The existence of mechanism of accountability, dispute resolution and provision for judicial review in case of dispute, depicts that the attribute of accountability is prevailing in NEPRA.

Similarly, the results have shown good perception in stakeholders regarding transparency of process, involvement of public and integrity of NEPRA. Further, the decisions/orders of NEPRA are honoured and accepted by stakeholders, which highlights legitimacy of its decisions. The respondents have appreciated the adherence of NEPRA to the attributes of regulatory governance including integrity, capacity, predictability, participation, credibility and legitimacy. However, the perception of stakeholders regarding predictability and credibility of NEPRA is not satisfactory. These two attributes of regulatory governance need to be focused and improved to build good image and attain the trust of stakeholders.

### **Recommendations**

As per the result of this study, some recommendations are being put forth for regulatory authority, policy makers and researchers. Although NEPRA has quite acceptable levels of some of the governance attributes but the same can be further refined by putting little focus on them. One of the good things is that NEPRA has already developed Standard Operating Procedures (SOPs) for inspection, examination and provision of copies of documents but it is out of the eyes of most of the stakeholder. Therefore, NEPRA must highlight these SOPs while publicizing any major decision to enhance transparency. Further, some of the stakeholders have shown reservation on interventions of government in the processes of regulator, therefore the government should not interfere with the mandate of regulator and need to notify its decisions in true spirit and timely manner. It is recommended that NEPRA may develop mechanism to bring in consistency, stability and certainty in its rules/regulations and decisions to enhance its predictability. Further, NEPRA may take measures to ensure the stakeholders regarding honoring its commitments, agreements and obligations, to enhance its credibility. This research has been carried out with empirical tests; researchers are advised to take up the task of carrying out interviews so as to better understand the regulatory governance in various regulatory bodies across the globe.

### **Limitations of the study:**

This study is specifically related to NEPRA, implying the findings to other regulating entities, ground realities and other differences in culture and structure must be considered. Although, this study has been carried out in a careful way yet some limitations exist regarding data as the same was collected only from the professionals of power sector mainly having offices in Islamabad, Lahore, Peshawar, Karachi and some other cities, using purposive sampling. Whereas, there are more prospects of acumens to examine and analyze.

### **Future Research**

General review of the literature shows that the structural attributes of governance have significant positive correlation with credibility whereas, in the case of NEPRA, the results show that most of the attributes have significant negative correlation with its credibility. This aspect needs further investigation.

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