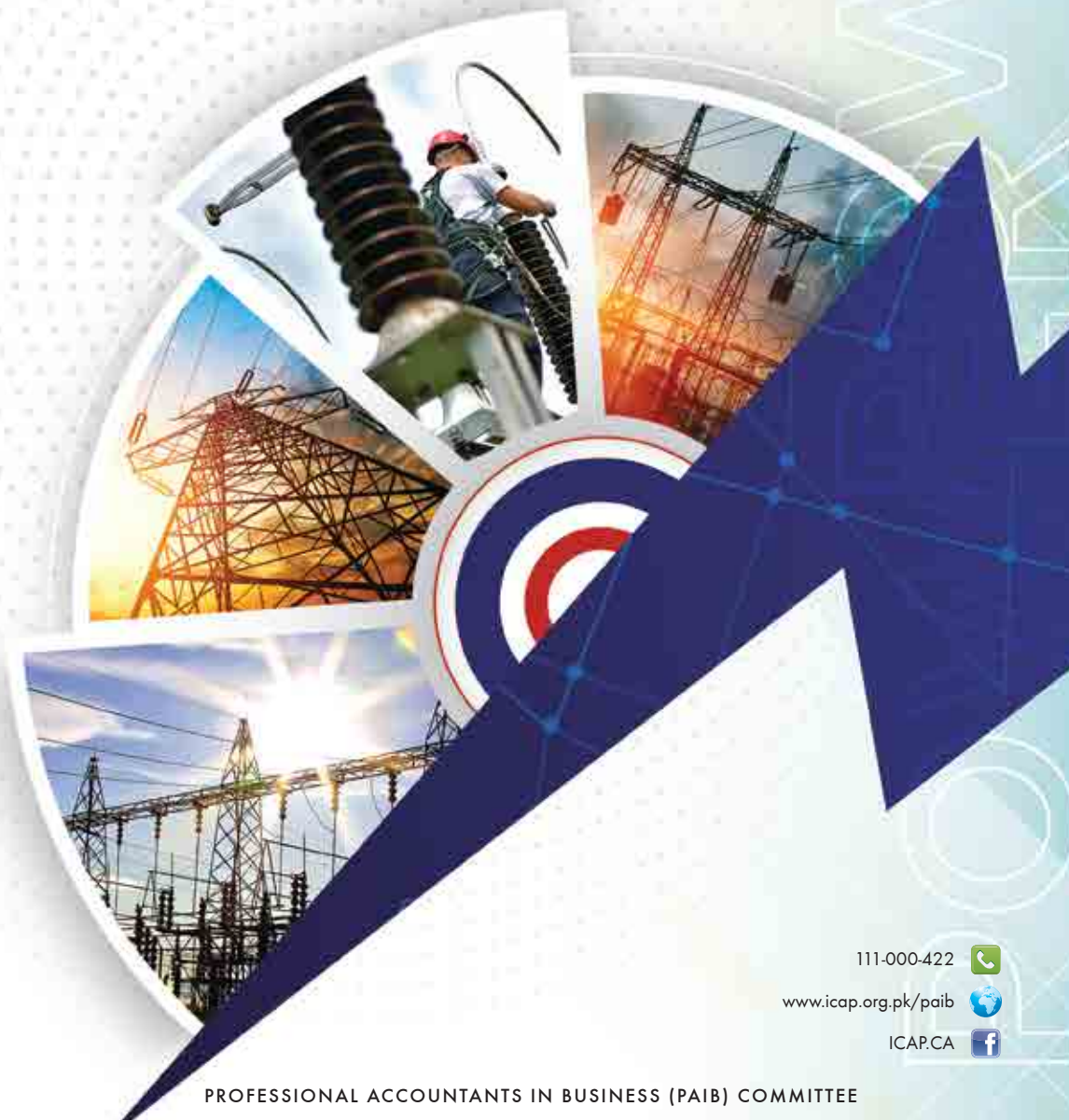
The Institute of Chartered Accountants of Pakistan

POWER SECTOR OF PAKISTAN

CA PAKISTAN



111-000-422

www.icap.org.pk/paib

ICAP.CA

PROFESSIONAL ACCOUNTANTS IN BUSINESS (PAIB) COMMITTEE

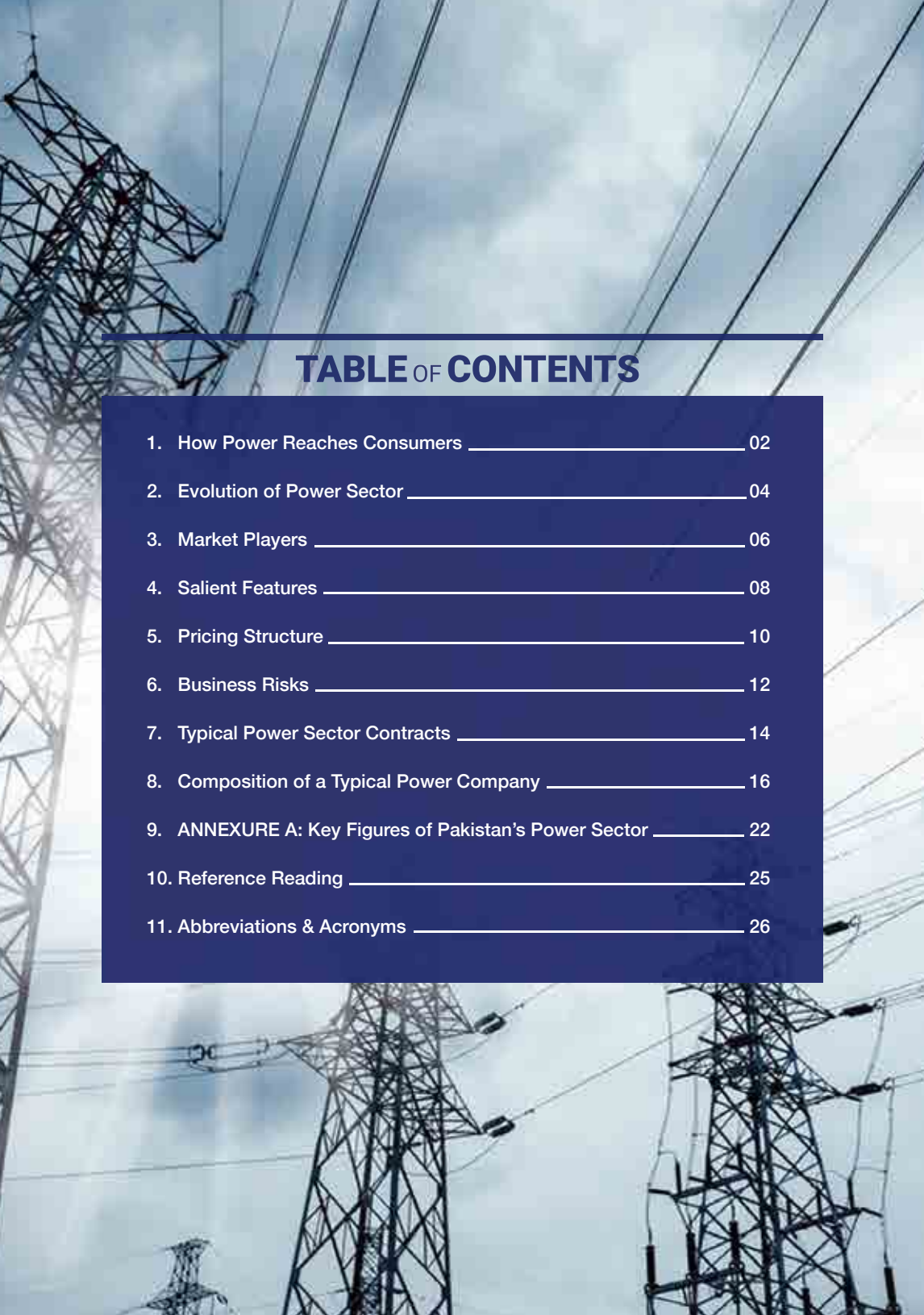


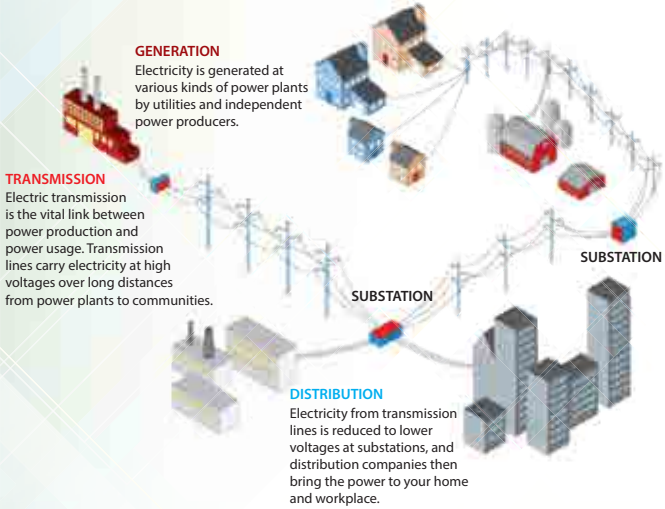
TABLE OF CONTENTS

1

HOW POWER REACHES CONSUMERS?

Electric power supply has a direct positive correlation with economic development and growth of a country. Consequently, power shortage has an adverse impact on the country's GDP through lost productivity.

The value chain of the power sector is depicted in the following diagram:



Generation

The upstream part of the value chain is called Generation or Generators. Different technologies and fuel sources are used for this purpose. Thermal technologies use different sources of fuel, such as natural gas, coal, furnace oil etc. On the other hand, renewable technologies include hydro, solar, wind etc.

Transmission

When the turbines generate electricity, its voltage is significantly increased by passing it through step-up transformers. Once the high-voltage electricity reaches the grid, electricity is reduced in voltage, again through the use of transformers, to make it safe for use by households and end users.

Distribution

When electricity leaves the Grid Station's transformer, it enters distribution power lines on its way to the final destination. Once it reaches the neighbourhood, electricity passes through another transformer (usually pole-mounted, called PMT) for further voltage reduction. This ensures that it is safe to use in homes and offices.

2

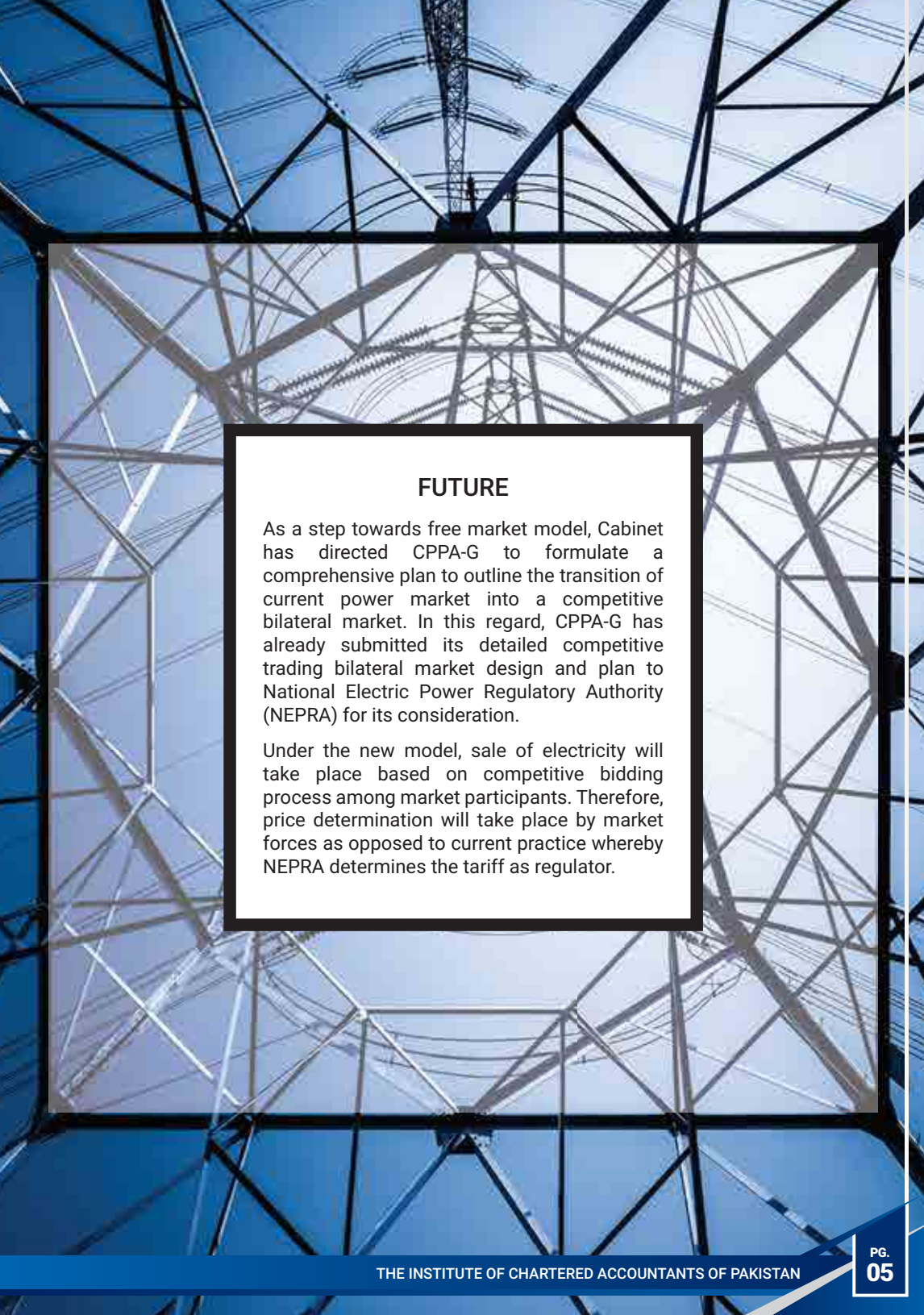
EVOLUTION OF

POWER SECTOR

Historically, Pakistan's power sector consisted of two vertically-integrated government owned utilities, WAPDA and K-Electric (previously, KESC). While K-Electric was responsible for power distribution in Karachi and adjacent areas; WAPDA, a semi-autonomous statutory body, was mandated to regulate and distribute power in the remaining country. In addition, water and hydropower resources came under the umbrella of WAPDA.

Due to the economic burden, inefficiencies in sector and customer dissatisfaction, this arrangement was reconsidered and following major steps were taken over the time:

- KESC was privatized in 2005 as K-Electric (KE)
- WAPDA was unbundled into various Generation Companies (GENCOs), National Transmission & Despatch Company (NTDC) and Distribution Companies (DISCOs), while the functions of its power wing were redefined as Hydel Power Generation and Operation & Maintenance (O&M) of power houses. Following unbundling of its power wing, WAPDA's mandate is now development of water and hydropower resources and to operate as hydro electric utility
- An independent regulatory authority, National Electric Power Regulatory Authority (NEPRA) was formed in 1997
- Centre for Power Purchase Agency (CPPA-G) was formed as market operator



FUTURE

As a step towards free market model, Cabinet has directed CPPA-G to formulate a comprehensive plan to outline the transition of current power market into a competitive bilateral market. In this regard, CPPA-G has already submitted its detailed competitive trading bilateral market design and plan to National Electric Power Regulatory Authority (NEPRA) for its consideration.

Under the new model, sale of electricity will take place based on competitive bidding process among market participants. Therefore, price determination will take place by market forces as opposed to current practice whereby NEPRA determines the tariff as regulator.

3 MARKET PLAYERS

Core Value Chain – (Generation, Transmission and Distribution) – KE

Karachi and its adjacent areas are served by K-Electric; a privately owned utility company. This is the only vertically integrated company in the power sector involved in generation, transmission and distribution segments.

Rest of Pakistan's power sector is the sum of generation, transmission and distribution companies, working in each segment. Transmission and distribution sector is almost wholly operated by government owned companies; with private sector (Independent Power Producers IPP's) having a share in power generation and a small portion of transmission.

Market Operator – CPPA – G

Other than Karachi and its adjacent areas, power market is operated by Central Power Purchasing Agency (CPPA-G). It procures power on behalf of DISCOs and settles the balances among all the market players. Its objective is to facilitate the power market transition from current single buyer model to competitive market.

Regulator – NEPRA

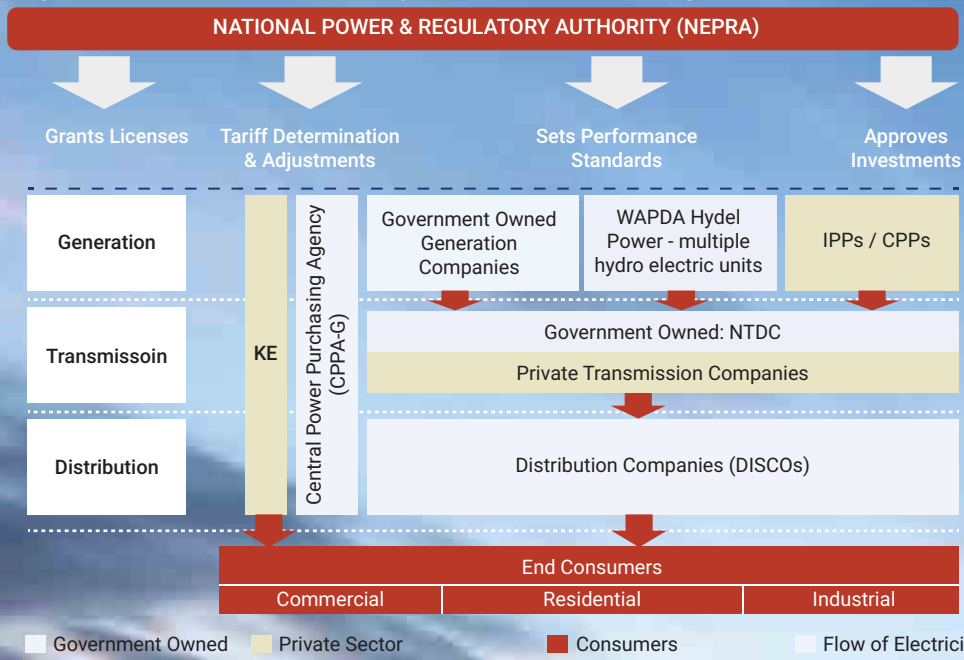
Power Sector is a highly regulated sector. Regulatory authority for this purpose is NEPRA, which is an autonomous body mandated by law to regulate the power sector to ensure that the interests of investor and customer are protected and the sector moves towards a competitive environment.

Governance – Ministry of Energy (Power Division)

Power division oversees the entire power sector of Pakistan. This task is accomplished by various boards and authorities. Main functions of power division are as follows:

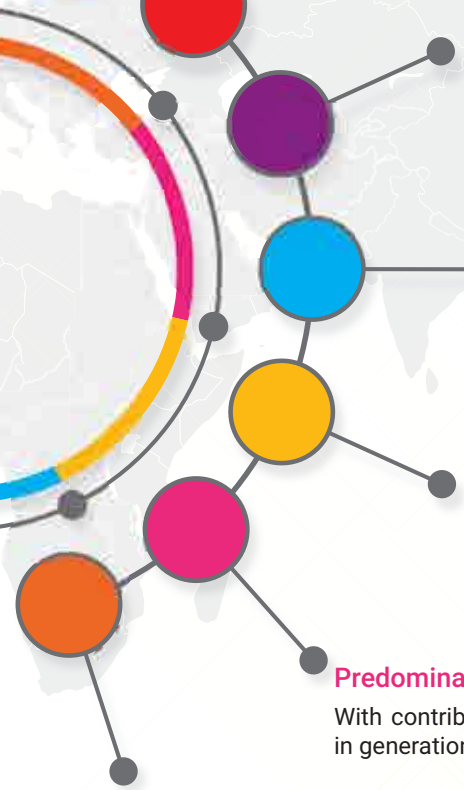
- Providing strategic inputs in the master plan, 5 year plans and ADP in the power sector as well as financial planning for various ongoing projects
- Co-ordinating among various federal agencies such as WAPDA and other electricity departments for development and operation of the projects in power sector
- Supervising orgnaizations working in power sector such as Central Electricity Authority (CEA), WAPDA, NEPRA, Private Power and Infrastructure Board (PPIB), Pakistan Commissioner for Indus Waters (PCIW), National Projects Construction Corporation Limited (NPCC), and National Engineering Services Pakistan (NESPAK) for their performances
- General monitoring of activities in the field of power generation, transmission and its distribution and power projects in the implementation stages

Diagram below illustrates how Pakistan's power sector is intertwined together:



4

SALIENT
FEATURES



Capital intensive

Particularly in electricity generation

Tariff (pricing)

Determined by the regulator mainly based on cost plus return model

Subsidy in tariff

Provided by government in different segments of tariff

Fixed return ensured to investors

A tariff on the basis of fixed rate of return on investment over plant life/contract period is determined by the regulator; and is contracted. All cost variations are also admissible.

Government guarantee

GOP issues guarantee to IPPs, backing up the payment obligation of the power purchaser

Predominated by government

With contribution of private sector mainly in generation segment

Highly regulated

Through an autonomous body with minimal market influence

5

PRICING STRUCTURE

Except for KE, the process of buying and selling electricity is done by the market operator i.e. CPPA-G. This trading within the value chain takes place at the tariff which is determined by the regulator i.e. NEPRA.

Generation

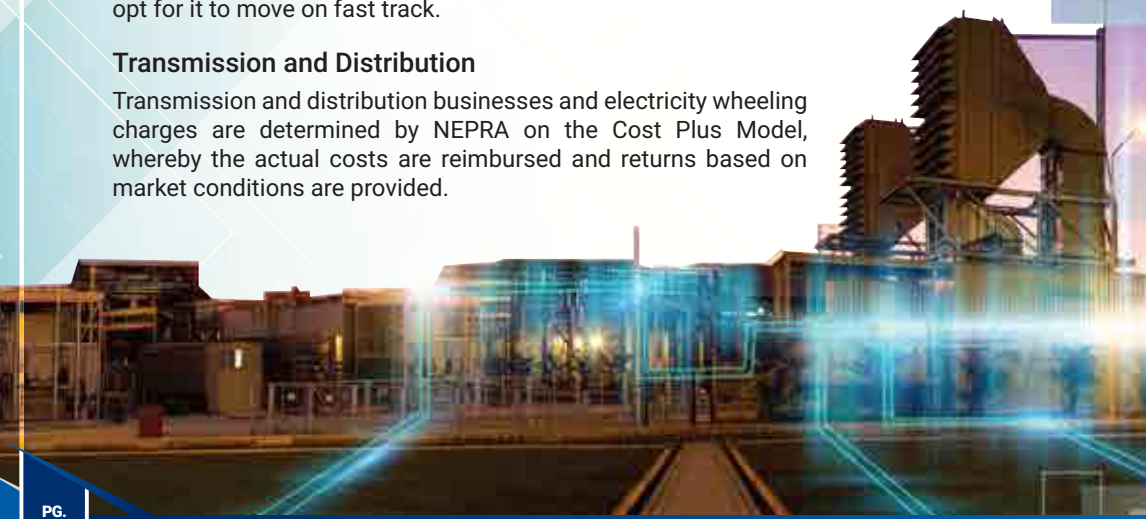
Electricity generation requires major part of the capital investment and onwards operational costs in electricity value chain. It is therefore the main contributor of final tariff at consumer end. Broadly, there are three major pricing models that are used for tariff determination in Pakistan:

1. Cost Plus Model	**Tariff = Approved NEPRA Cost + Return on Equity** Pricing is fixed such that all costs incurred by power seller are reimbursed including operations and maintenance, debt-servicing, and working capital costs etc. On top of that cost of return is provided which is the profit margin of the power seller.
2. Efficiency Based Tariff	Efficiency based tariff is designed to encourage the power seller to upgrade its infrastructure and performance to earn a return. It is designed based on pre-defined efficiency targets such as transmission and distribution losses, heat rates, and auxiliary consumptions. If the power seller beats those targets, it earns a return on selling electricity.
3. Competitive Bidding	Sale and purchase of electricity takes place via competitive bidding process among the investors/bidders.

NEPRA also determines tariffs for certain fuels / technologies based on industry benchmarking and offers it to investors. This is called **Upfront Tariff** and investor can opt for it to move on fast track.

Transmission and Distribution

Transmission and distribution businesses and electricity wheeling charges are determined by NEPRA on the Cost Plus Model, whereby the actual costs are reimbursed and returns based on market conditions are provided.



6

BUSINESS RISKS

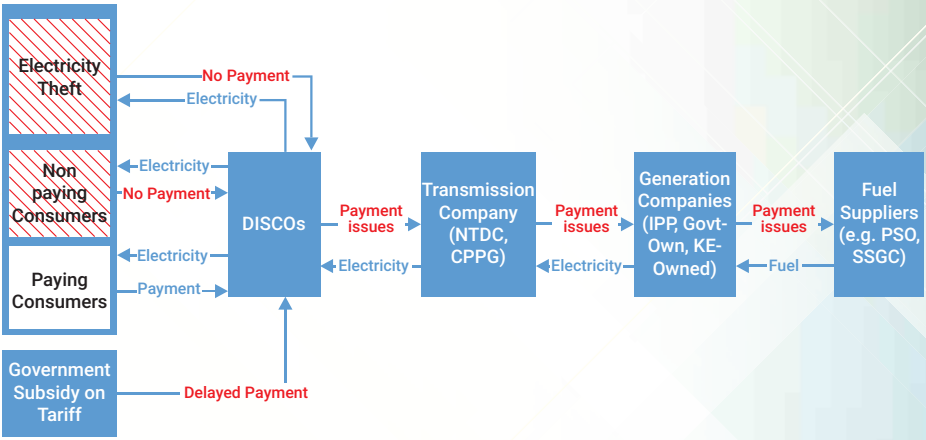
Business Risks	Management
a. Fuel shortage Local fuel demand is mostly met through imports; hence there is always a risk of non-availability or less than required availability of fuel.	These risks are mitigated by signing long term fuel supply agreements.
b. Unstable operations This is particularly due to ageing power infrastructure in the country which results in problems such as forced shutdowns of generation facilities, low voltage and excessive tripping.	Regular maintenance of assets and equipment and their timely replacement.
c. Electricity theft and recovery issues This directly starves the distribution sector of liquidity and indirectly affects the entire value chain creating circular debt situation.	• Strong follow-ups and disconnection of non-paying consumers. • Employing smart technologies. • Load shed regime as per area losses.
d. Health and safety risk From generation to final delivery, this sector is packed with various health and safety hazards.	Implementation of international safety management systems.
e. Law and order situation It poses a risk to damage infrastructure of power utility companies. This also affects electricity supply situation in the area.	Such risks are addressed by providing increased security to personnel, insurance of manpower and assets.
f. Loss of trained and highly skilled manpower Power sector is based on high-tech machinery and equipment. A trained worker is therefore a great asset for the company. There is always risk of losing such employees due to high demand at both national and international level.	Market based packages with conducive working environment.
g. Regulatory approvals Energy, being a closely monitored sector, requires various approvals for various activities such as right of way, EPA etc.	Closely working with government bodies to identify and obtain necessary approvals for projects / maintenance work.

CIRCULAR DEBT – DOMINO EFFECT

Circular debt situation is created in the value chain of power sector when market players are starved-off the cash to make payments to their suppliers. There are three main factors that contribute towards creation of circular debt:

1. Nonpayment of electricity bills by consumers
2. Electricity theft (which is never billed)
3. Delayed payments of government subsidies to distribution companies

Below image illustrates how an adverse effect on cash recovery at the tail of the chain travels through the whole sector and ultimately paralyzes its ability to run the business as usual:



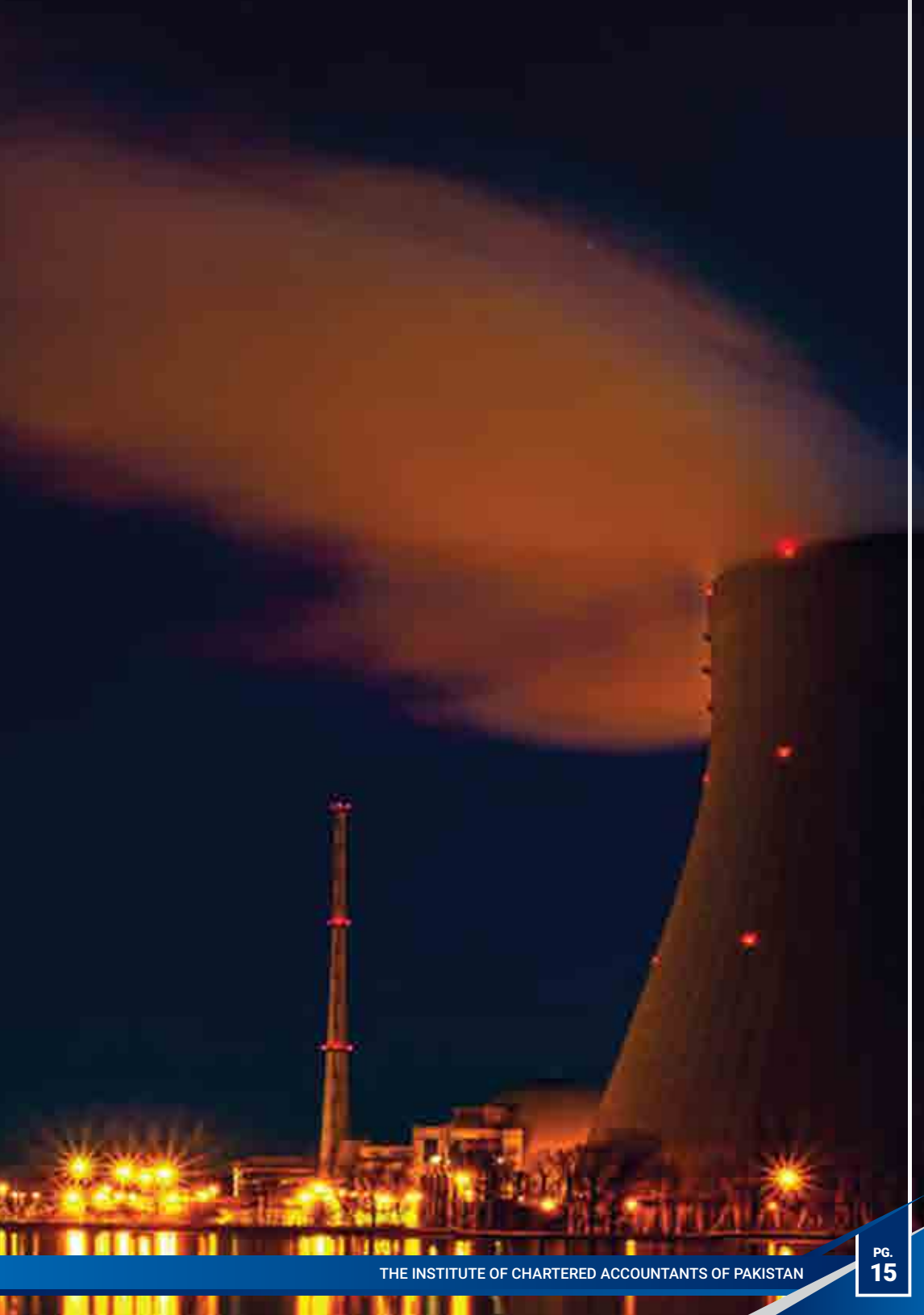
7

TYPICAL POWER SECTOR CONTRACTS

Considering the capital intensive nature of power sector; long term contracts and agreements for critical matters act as a risk cover for investors and improve the bankability of power projects.

Some of the major contracts and their purpose in the power sector are discussed below:

Name	Purpose	Parties Involved
Power purchase agreement	Sale and purchase of electricity between a buyer and seller	• Generation companies • Market operator • Transmission & distribution companies • Bulk consumers
Fuel supply agreement	Procurement of fuel	• Generation companies • Fuel supplier (e.g. SSGC, PSO)
Implementation agreement	To provide a sovereign guarantee to power producers for their dues recovery	• Government • Independent Power Producers (IPPs)
Long term supply/ services contracts	Secure maintenance and overhauling of plant and equipment	• Power sector companies • Original equipment manufacturers / service providers
Operations & maintenance agreements	O&M of plant and equipment	• Power sector companies • Original equipment manufacturers / service providers
Wheeling agreements	Transmission of electricity from one point to another	• Generation companies • Transmission companies
EPC contracts	Construction of a facility such as power plant, grids etc.	• EPC contractor • Generation and transmission companies
Financing agreements	Particularly for financing major projects such as building a new power plant, transmission lines upgradation, building new grids	• Bank / financing institutions • Generation, transmission & distribution companies



8 COMPOSITION OF A TYPICAL POWER COMPANY

CORE BUSINESS FUNCTIONS

Includes main plant and network operations and maintenance side. An integrated company would have these functions distributed into generation, transmission and distribution, while others will be confined to their relevant area. This mostly deals with technical side of the business.

Challenges

- Availability of machines and network and their efficient operation
- Reliable and safe operations
- Uninterrupted power supply to consumers
- Prompt response to customer complaints

FINANCE

As with all other industries, finance department oversees the entire financial management of the organization. Typical finance functions include:

- General Accounting & Financial Reporting
- Taxation & Insurances
- Business Partnering
- Accounts Payable
- Receivables
- Budget Monitoring & Control
- Treasury
- Management Reporting

Challenges

Accounting

- Involvement of various high value fixed assets require their proper recognition, useful lives, impairment and decommissioning issues
- Revenue recognition of large volume of consumers by distribution companies
- Proper recognition and measurement of rights and obligations under long term contracts
- Accounting of long term projects

Taxation

Tariff Adjustment Subsidy (TAS) – Specific to Distribution Companies:

- Tax authorities consider TAS as separate head of income and disallows the portion of expenses allocable to TAS being exempt income. Tax authorities do not consider the fact that the only business of a utility company is supply of electricity and TAS is part of that supply. In addition, tax authorities endeavor to impose minimum tax on TAS under section 113 of ITO.
- Tax authorities consider that TAS received from Federal Government is subject to levy of sales tax.
- At times, authority takes another view that input tax adjustment in proportion to TAS is not allowable as adjustment against output tax liability.

Transmission and Distribution Losses (T&D Losses)

Tax authorities do not allow any T&D losses (which are more than 22% for a DISCO) to power utility companies, thus any input tax adjustment to the extent of such T&D losses (units lost) are suffered by the company during distribution of electricity to its consumers.

Business Partnering

Here finance works in business mainstream and provides support in business decision making. They work in close liaison with business to guide them on commercial grounds and monitor their budgets.

PROCUREMENT AND LOGISTICS

Procurement and logistics strives to ensure that required item is timely available to business unit at a competitive price. Its inventory management segment ensures that stores and spares are kept in pristine condition and are ready for use when the need arises.

Challenges

- A large portion of the procurement (especially generation related) involves imports which require a robust import and clearance function.
- The maintenances of plant and machinery are scheduled during low demand season i.e. winters; hence the overall logistics cycle is to be planned accordingly.
- A delicate balance is required to ensure that inventories are kept within range so the working capital is not tied up while spares are available when needed.

REGULATORY

Regulatory function ensures that the organization is in compliance with laws and regulations and their application.

Challenges

- To keep close coordination with the regulatory body.
- Timely clearance of subsidies from Government.

HEALTH, SAFETY AND ENVIRONMENT (HSE)

Operating in a sector where the primary product poses a hazard to life, HSE is of utmost importance. Companies are required to abide by safety requirements of various documents including Power Safety Code, Distribution Code, Power Safety Manual and other applicable documents.

Challenges

- Compliance with legal and regulatory requirements related to HSE
- Ensure HSE requirements are embedded in routine and non-routine activities
- Prevention of injuries and ill-health through proactive system of risk management
- Conservation of natural resources and reduction of carbon footprint by assessment to environmental impact and mitigation of adverse effects
- Employee trainings and supervision
- Continuous improvement through a system of performance planning, measurement and regular reviews

HUMAN RESOURCES

Driven by the need to succeed in today's volatile business environment, organizations require right and ready talent to successfully execute business strategy.

Challenges:

- Source and retain manpower with required skillset to work on plant and network
- Maintaining industrial relations for labor
- Learning and development of talent
- Mapping the needs of employees in various segments and expectations of the company

INFORMATION TECHNOLOGY

The value of real time information is ever more with fast paced business realities of today. Information technology function facilitates via use of software and hardware to provide its users with the tools to extract, utilize, analyze & present data in meaningful way.

Challenges:

- Infrastructure development and maintenance over large geographical area
- Integrity and security of customers' / suppliers' information
- Provide need based hardware & software solutions along with integration of information such as plant management, finance and customer account management

BILLING FUNCTION

Billing function ensures timely issuance of accurate bills to customers and their subsequent recovery.

Challenges:

- Management of a large volume of various consumer segments of a distribution company
- Customer account maintenance
- Loss minimization and timely recoveries
- Addressing customer complaints

MARKETING AND COMMUNICATION

Due to monopolistic nature of business with long term secured contracts and exclusive area licenses available, marketing function in power sector is limited to:

- Media and PR management; as power related issues directly affect the lives of people
- Uplift and secure the corporate image
- Communication for corporate affairs

9

ANNEXURE A:

KEY FIGURES

OF PAKISTAN'S POWER SECTOR

ELECTRICITY CAPACITY & ENERGY SERVED

Particulars	2015-16				2016-17			
	Installed Capacity		Energy Served		Installed Capacity		Energy Served	
	MW	%	GWh	%	MW	%	GWh	%
Government Owned	14,403	57%	55,228	48%	15,406	54%	59,029	49%
IPPs	8,857	35%	46,518	41%	10,780	38%	49,231	41%
Imports	-	0%	463	0%	-	0%	496	0%
K-Electric								0%
Own	1,874	7%	10,323	9%	1,874	7%	10,147	8%
IPPs	287	1%	1,560	1%	339	1%	1,718	1%
K-Electric Total	2,161	9%	11,883	10%	2,213	8%	11,865	10%
Total Generation	**25,421**	**100%**	**114,092**	**100%**	**28,399**	**100%**	**120,621**	**100%**

Source: NEPRA State of Industry Report 2017

DEMAND VS SUPPLY FORECASTING

MW

Fiscal Year	Available Generation Capacity	Projected Demand	Surplus / (Deficit)
NTDC			
2018	26,135	25,227	908
2019	28,357	26,348	2,009
2020	29,314	27,420	1,894
2021	34,124	28,601	5,523
K-Electric			
2018	3,046	3,435	(389)
2019	3,833	3,601	232
2020	3,978	3,791	187
2021	4,615	4,011	604

Source: NEPRA State of Industry Report 2017

FUEL MIX IN POWER GENERATION

Fuel used for electricity generation is the major contributor of operational cost. This is the reason that electricity generated through renewable sources such as wind, solar, hydel, have relatively less operational cost.

In Pakistan, major sources of power have been gas and oil with hydroelectricity being the primary contributor in the renewable energy segment. Their amalgamation is referred to as fuel mix:

Description	2015-16		2016-17	
	GWh	%	GWh	%
Hydel	34,633	31%	32,183	26%
Oil	35,362	32%	39,563	32%
Gas	35,001	31%	41,426	34%
Coal	148	0%	279	0%
Nuclear	4,605	4%	6,999	6%
Renewable	1,549	1%	2,668	2%
Total	**111,298**		**123,118**	

Source: Pakistan Energy Yearbook 2017

TRANSMISSION & DISTRIBUTION HIGHLIGHTS

PARTICULARS	TRANSMISSION		DISTRIBUTION		
	500kV	220kV	132kV	11kV	Low Tension
Electricity Lines (km)					
NTDC	5,197	9,814	N/A	N/A	N/A
DISCOs	N/A	N/A	25,068	323,961	232,042
K-Electric	N/A	338	766	9,363	19,962
Grid Stations					
NTDC	14 Grids with capacity of 18,624 MVA	38 Grids with capacity of 25,660 MVA	N/A	N/A	N/A
DISCOs	N/A	N/A	760 Grids with capacity of 46,324 MVA	N/A	N/A
K-Electric	N/A	8 Grids with capacity of 3,080 MVA	63 Grids with capacity of 5,648 MVA	N/A	N/A

Source: NEPRA State of Industry Report 2017

TRANSMISSION & DISTRIBUTION LOSSES

In an ideal scenario, electricity that has left the power plant and the energy billed should be equal. However, that is not the case. The shortfall of electricity between energy generated and energy billed is called transmission and distribution losses.

Recovery ratio is the percentage of recovery of the amount billed and amount received.

Below table summarizes the T&D losses and recovery ratios of the sector.

DISCO	T&D Losses (%age) FY 16-17	Recovery Ratio (%age) FY 16-17
PESCO	32.60	89.29
TESCO	15.40	82.90
IESCO	9.03	91.87
GEPCO	10.23	95.99
LESCO	13.77	99.20
FESCO	10.57	97.24
MEPCO	16.91	96.21
HESCO	30.75	93.68
SEPCO	37.90	109.98
QESCO	23.08	43.55
K-Electric	20.90	90.04

Source: NEPRA State of Industry Report 2017

10

REFERENCE

READING

Below are some of the sources to approach for further knowledge on the subject:

- NEPRA State of Industry Reports: **(https://www.nepra.org.pk/industryreports.htm)**
- Pakistan Energy Yearbook published by Hydrocarbon Development Institute of Pakistan **(https://www.hdip.com.pk/contents.php?cid=32)**
- Pakistan Power Infrastructure Board **(http://www.ppib.gov.pk/N_archive.htm)**
- Ministry of Water & Power **(http://www.mowp.gov.pk/pubDetails.aspx)**
- Alternate Energy Development Board **(www.aedb.org)**

11 ABBREVIATIONS & ACRONYMS

CPP	Captive Power Producers
CPPA	Central Power Purchasing Agency
DISCO	Distribution Companies
FESCO	Faisalabad Electric Supply Company
FO	Furnace Oil
GENCO	Electricity Generation Company
GEPCO	Gujranwala Electric Power Company
GWH	Gigawatt Hours
HESCO	Hyderabad Electric Supply Company
HSD	High Speed Diesel
HUBCO	Hub Power Company
IESCO	Islamabad Electric Supply Company
IPP	Independent Power Producers
KAPCO	Kot Addu Power Company
LESCO	Lahore Electric Supply Company
LNG	Liquefied Natural Gas
MEPCO	Multan Electric Power Company
MW	Megawatt
NTDC	National Transmission & Despatch Company (a government entity that is responsible for supply of high voltage electricity to Distribution Companies)
PESCO	Peshawar Electric Power Company
QESCO	Quetta Electric Supply Company
SEPCO	Sukkur Electric Power Company
TESCO	Tribal Electric Supply Company

Author

Mr. Muhammad Ali, FCA
Head of Financial Reporting & Business Finance (Generation & Enabling), K-Electric Limited

Mr. Yasir Ali, ACMA
Manager, Business Finance – Generation Projects, K-Electric Limited

Reviewers

Mr. Khalilullah Shaikh, FCA
Chief Financial Officer, Pakistan International Airlines

Mr. Ajmal Ilyas Nagaria, ACA
Manager Finance, Asia Petroleum Limited

Mr. Aurangzeb, ACA
Manager Accounts & Budgeting,
National Power Parks Management Company (Private) Limited

Mr. Huzaifa Ahmed, ACA
Assistant Manager Accounts, Mari Petroleum Company Limited

Mr. Waqas Latif, ACA
DGM Finance & Budgeting, K-Electric Limited

Approved by

Professional Accountants in Business (PAIB) Committee