



The Power of Electricity

December 2014

Snapshot

- ◆ World Power Generation
- ◆ Pakistan – Regional Comparison
- ◆ Pakistan Power Sector
- ◆ Success Story
- ◆ Risks

World Power
Generation

Pakistan – Regional
Comparison

Pakistan Power
Sector

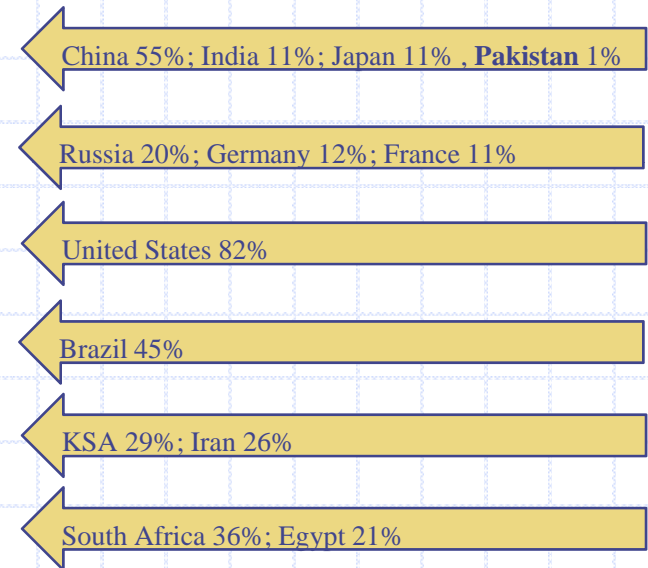
Success Story

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Electricity Generation – Regional Share

Electricity Generation MW	CY11	CY12	CY13	CY13 Change YoY	CY13 Share of Total
Asia & Asia Pacific	1,008,490	1,053,045	1,103,851	4.8%	41.8%
Europe & Eurasia	607,168	613,670	607,772	-1.0%	23.0%
North America	592,620	588,569	591,418	0.5%	22.4%
S. & Cent. America	133,426	139,024	141,157	1.5%	5.3%
Middle East	102,804	110,121	115,621	5.0%	4.4%
Africa	77,336	79,494	80,251	1.0%	3.0%
World	2,521,843	2,583,923	2,640,070	2.2%	100.0%



- ◆ World power generation stood at 23,133TWh*
- ◆ Asia – largest power generator

*1TWh = 1mln MWh

Top 10 Producers

Sr. #	Producers	TWh			% of Total World		
		CY11	CY12	CY13	CY11	CY12	CY13
1	China	4,716	4,985	5,313	21.3%	22.0%	23.0%
2	United States	4,327	4,271	4,310	19.6%	18.8%	18.6%
3	India	1,052	1,128	1,167	4.8%	5.0%	5.0%
4	Russia	1,053	1,069	1,046	4.8%	4.7%	4.5%
5	Japan	1,043	1,026	1,015	4.7%	4.5%	4.4%
6	Canada	637	634	665	2.9%	2.8%	2.9%
7	Germany	602	623	621	2.7%	2.7%	2.7%
8	Brazil	532	552	573	2.4%	2.4%	2.5%
9	France	557	559	569	2.5%	2.5%	2.5%
10	Korea	520	531	545	2.4%	2.3%	2.4%
11	Rest of the world	7,087	7,290	7,309	32.0%	32.2%	31.6%
Total World		22,126	22,668	23,133	100.0%	100.0%	100.0%

- ◆ China – the largest power producer followed by the USA
- ◆ Top 10 countries producing 68% of the world power
- ◆ Consumed domestically – nominal import/export

World Power Generation

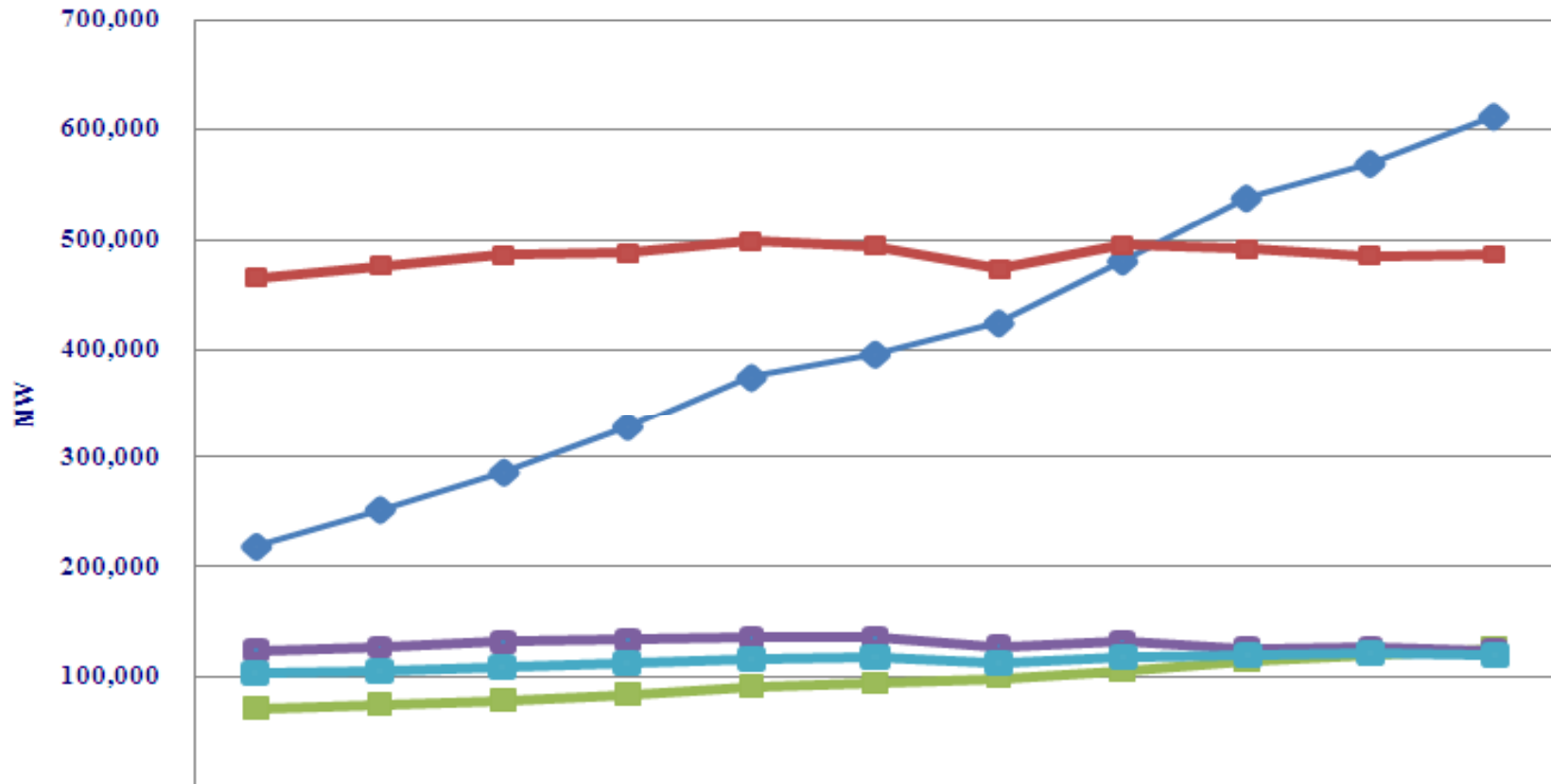
Pakistan – Regional Comparison

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Success Stories

Outlook

Electricity Generation - Top 5 Countries (MW)



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	CAGR
China	218,102	251,519	285,418	327,138	374,607	395,763	424,047	480,269	538,016	569,355	612,057	10.9%
US	465,278	475,812	486,001	487,024	498,287	493,763	473,358	494,418	491,136	485,052	486,342	0.4%
India	71,243	75,083	78,717	84,327	91,089	94,115	99,292	105,280	114,860	120,304	125,899	5.9%
Japan	123,586	126,466	131,628	132,916	134,716	135,128	127,169	131,966	126,048	126,356	124,218	0.1%
Russia	104,119	106,381	108,916	113,253	116,290	118,721	113,368	118,497	120,417	122,065	121,088	1.5%

World Power Generation

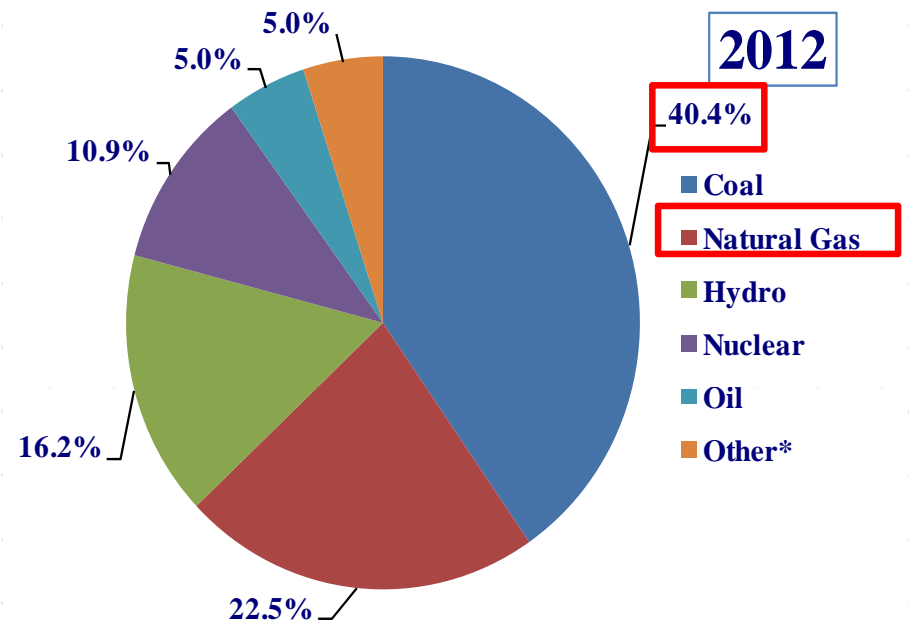
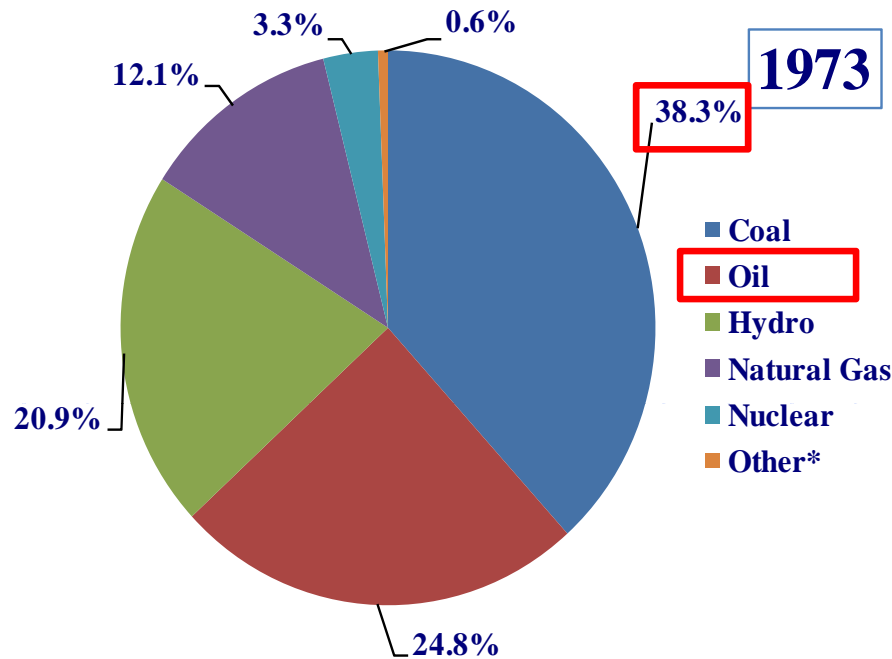
Pakistan – Regional Comparison

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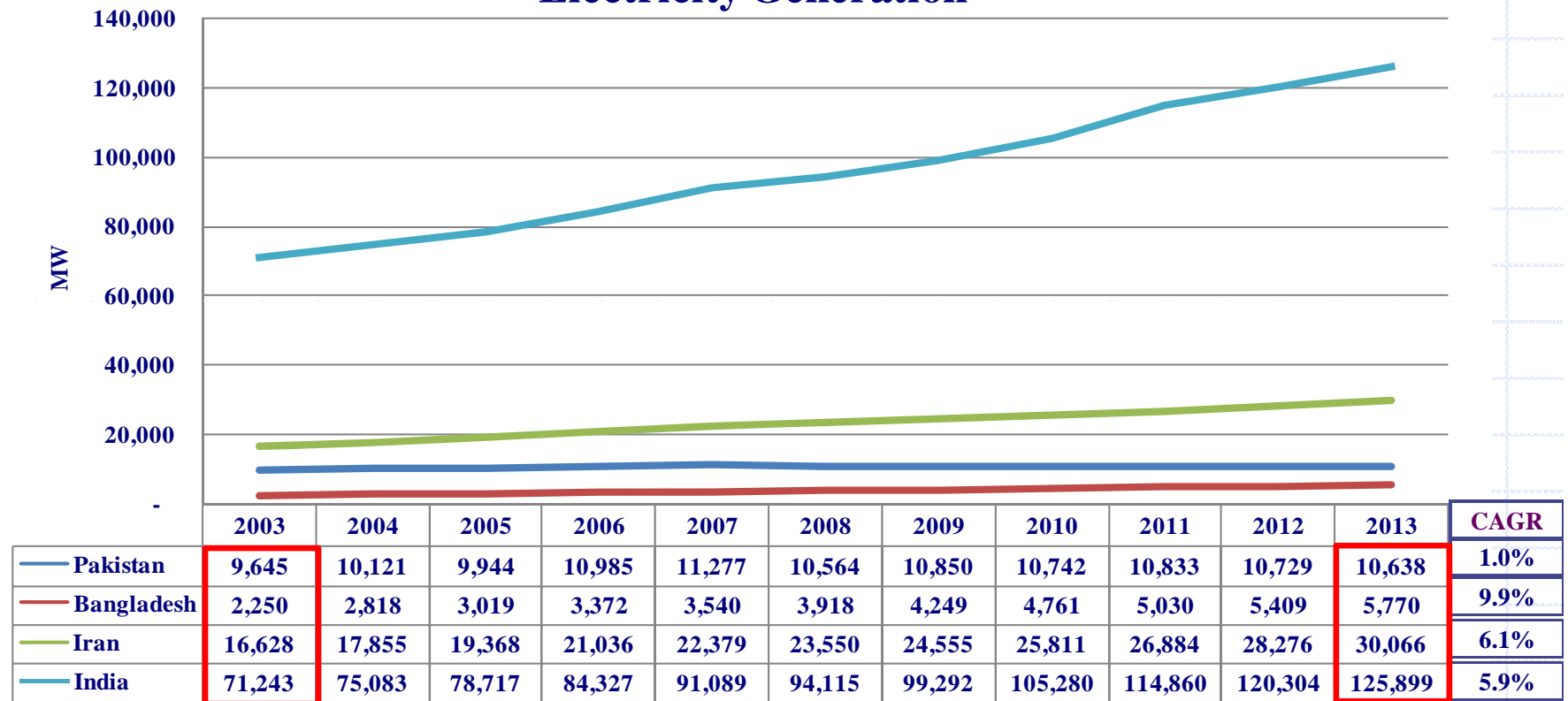
Electricity Generation - Fuel Mix



**Includes geothermal, solar, wind, heat, etc.*

- ◆ Coal – main source of electricity production
- ◆ Significant decline in oil consumption (5% from 25%)
- ◆ Increased share of Natural Gas and Nuclear fuel –12% to ~23% and 3% to 11%, respectively

Electricity Generation

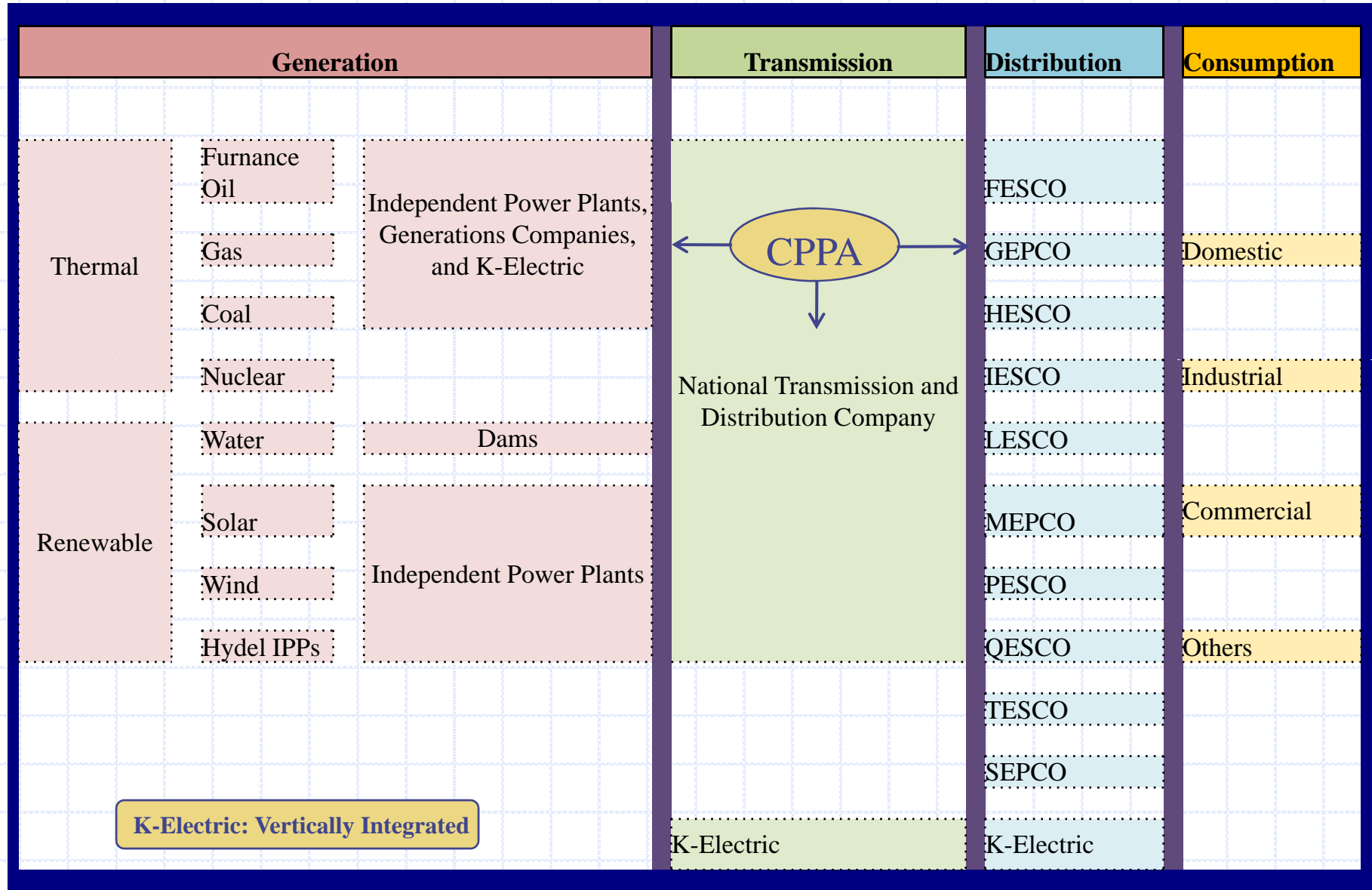


◆ Considerable and consistent addition in the generation of neighboring countries

◆ Pakistan – stagnant generation



Pakistan – Power Sector Supply Chain



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Pakistan – Capacity Facts

- ◆ Largely stagnant YoY capacity
- ◆ Thermal – the largest source of electricity generation
- ◆ 50% capacity utilization in FY14

Source of Generation		Installed Capacity (MW)		Mix	
		End-Jun13	End-Jun14		
Thermal	IPPs	8,560	8,560	37%	68%
	GENCOs	4,720	4,720	20%	
	K-Electric	2,381		10%	
	Others (CPPs/SPPs)	324	324	1%	
Hydel	WAPDA	6,612	6,655	28%	29%
	IPPs	213	213	1%	
Nuclear	Two Nuclear plants	787	787	3%	3%
Wind	IPPs	50	50	0%	0%
Import	Mainly from Iran	-	-	0%	0%
Total		23,647	23,857	100%	100%

	FY10	FY11	FY12	FY13	FY14
Generation (GWh)	99,766	100,582	98,664	102,989	103,857
Growth (%)	3.2%	0.8%	-1.9%	4.4%	0.8%
Generation(MW)	11,389	11,482	11,263	11,757	11,856
Capacity Factor (Utilization)	53%	49%	48%	50%	50%

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Pakistan – Generation Cost

Source	FY13			FY14		
	Generation	Cost	Cost/Unit (PKR/KWh)	Generation	Cost	Cost/Unit (PKR/KWh)
IPPs	45.4%	72.9%	12.1	45.9%	71.4%	12.28
WAPDA Hydel	33.2%	0.3%	0.1	32.8%	0.3%	0.1
GENCOs	14.6%	23.6%	12.2	13.6%	25.4%	14.6
Two Nuclear plants	4.1%	0.7%	1.2	4.6%	0.8%	1.3
Others (CPPs/SPPs)	1.4%	1.8%	9.8	1.3%	1.5%	9.4
Hydel IPPs	0.8%	0.1%	0.9	1.1%	0.1%	0.4
Mainly from Iran	0.4%	0.6%	9.8	0.4%	0.5%	9.3
Wind / IPPs	0.1%	0.0%	0.5	0.3%	0.0%	0.0
Average			7.5			7.8

- ◆ IPPs – Major source of electricity generation followed by WAPDA
- ◆ GENCOs – Most expensive source of generation due to inefficiencies
- ◆ Increased cost / unit



Pakistan – Generation Cost

	Fuel	FY13			FY14		
		Generation	Cost	Cost/Unit (PKR/KWh)	Generation	Cost	Cost/Unit (PKR/KWh)
◆ Heavy reliance on RFO generation	RFO	35.1%	76.8%	16.5	37.9%	79.1%	16.4
◆ HSD – most expensive source of generation	Hydel	34.0%	0.4%	0.1	33.9%	0.4%	0.1
	Gas	23.4%	15.7%	5.1	19.9%	12.9%	5.1
	Nuclear	4.1%	0.7%	1.2	4.6%	0.8%	1.3
	HSD	1.5%	4.1%	21.1	1.7%	4.9%	22.3
◆ Hydel – cheapest source of generation	Mixed	1.3%	1.7%	9.9	1.2%	1.4%	9.3
	Import	0.4%	0.5%	9.7	0.4%	0.5%	9.3
	Coal	0.0%	0.0%	4.4	0.1%	0.1%	4.2
	Wind	0%	0%	0.5	0%	0%	0.0
	Average			7.5			7.8

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Pakistan – IPPs

- ◆ 30 IPPs in Pakistan
- ◆ KAPCO – the largest and oldest power plant
- ◆ RFO based net capacity – 5,118 MW (62% of the total net capacity)

Sr. #	IPP	Fuel	Gross Capacity (MW)	Net Capacity (MW)	COD
1	KAPCO	RFO	1,638	1,336	Dec-96
2	HUBCO	RFO	1,292	1,200	Mar-97
3	Pakgen	RFO	365	349	Feb-98
4	Lalpir	RFO	362	350	Nov-97
5	Hubco Narowal	RFO	225	214	Apr-11
6	Atlas	RFO	224	214	Dec-09
7	Nishat	RFO	202	195	Jun-10
8	Nishat Chunian	RFO	202	196	Jul-10
9	Librerty Powertech	RFO	202	196	Jan-11
10	Gul Ahmed	RFO	136	125	Nov-97
11	Japan Power	RFO	135	107	Mar-00
12	Saba Power	RFO	134	126	Dec-99
13	Kohinoor	RFO	131	124	Jun-97
14	Tapal Energy	RFO	126	120	Junn-97
15	Southern Power	RFO	117	110	Jun-99
16	Attock-Gen	RFO	164	156	Mar-09

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Pakistan – IPPs

◆ Gas based net capacity – 2,028 MW (25% of the total net capacity)

◆ Dual fuel based net capacity – 1,039 MW (13% of the total net capacity)

Sr. #	IPP	Fuel	Gross Capacity (MW)	Net Capacity (MW)	COD
17	Uch	Gas	586	551	Oct-00
18	Rousch	Gas	450	395	Dec-99
19	Uch II	Gas	404	381	Apr-14
20	TNB Librerty	Gas	235	212	Sep-01
21	Foundation Power	Gas	183	171	May-11
22	Fauji Kabirwala	Gas	157	151	Oct-99
23	Habibullah	Gas	140	129	Sep-99
24	Altern	Gas	31	27	Jun-01 (Phase 1) Sep-08 (Phase 2)
25	Davis Energen	Gas	11	10	
26	Saphire	Gas HSD	235	208	Oct-10
27	Engro Powergen	Gas	227	214	Mar-10
28	Orient	Gas HSD	225	213	May-10
29	Saif	Gas HSD	225	205	Apr-10
30	Halmore	Gas HSD	225	199	Jun-11
Total			8,989	8,184	

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Pakistan – Distribution (Transmission, Distribution and Recovery Losses)

As at 30-June 2013

	As at 30-June 2013			FY13		
	Allowed	Actual	Delta (%)	Recovery Ratio (%)	Loss in Recovery (%)	Total Loss
			(A)		(B)	(A+B)
FESCO	11	11	(0)	99	1	1
IESCO	9	10	(1)	94	6	6
GEPCO	11	11	(1)	98	2	2
LESCO	12	14	(2)	98	2	4
QESCO	18	21	(3)	32	68	71
MEPCO	15	18	(3)	92	8	11
HESCO	22	28	(6)	81	19	25
PESCO	28	36	(8)	85	15	23
K-Electric	21	30	(9)	85	15	24
SEPCO	28	40	(12)	54	46	58
TESCO	-	-	-	119	(19)	(19)

- ◆ Mostly inefficient DISCOs
- ◆ SEPCO – the most inefficient DISCO

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Power | How much it costs?

T & D Losses	IESCO	FESCO	GEPCO	LESCO	MEPCO	PESCO	Total
Sold Actual 2013 (mln Units)	7,763	8,586	5,920	14,285	9,913	7,162	53,629
Actual Purchased	8,573	9,622	6,633	16,458	14,660	10,892	66,838
T&D Loss (units)	810	1,036	713	2,173	4,747	3,730	13,209
T&D Loss	9.4%	10.8%	10.7%	13.2%	32.4%	34.2%	
T&D Loss Allowed (%)	9.0%	10.8%	10.5%	12.0%	15.0%	28.0%	
Loss to the Govt.	0.4%	-0.1%	0.2%	1.2%	17.4%	6.2%	
Loss to the Govt.(PKR* Units)(mln)	524.88	-	190	2,951	84,525	14,980	103,172

Share %	14.5%	16.0%	11.0%	26.6%	18.5%	13.4%	
DISCO's Tariff charged for FY14 (PKR) /Unit	13	13	14	14	15	18	Weighted Average Tariff
	1.9	2.1	1.6	3.6	2.8	2.4	14.4

	FY13	FY14
Cost to GoP (PKR) /Unit	12.2	14.4
Consumer Price (PKR) /Unit	10.5	11.5
Subsidy (PKR) /Unit	1.7	2.8
No. of Units (mln Units)	81,361	82,047
Subsidy (PKR in bln)	142	233
Actual (PKR in bln)	264	245

Share is based on weighted average sales mix of 6 DISCOS (LESCO, FESCO, MEPCO, PESCO, IESCO, and GEPCO : ~75% of sanctioned load) as reported in Form-27 of regulatory accounts/ Annual Petition filed by each DISCO for FY14

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Going Forward – Coal

Issues Causing Problems	<ul style="list-style-type: none"> • Heavy inclination of Fuel Mix towards expensive RFO, which has increased Pakistan’s sensitivity to international oil prices (oil bill accounts for 35% of import receipts). • High subsidy resulting in circular debt. • Inefficient generation. • Coal contributes to just 0.1% of Electricity generation in Pakistan. In Contrast, China and India generate 65% and 57% of their electricity from coal respectively.
Positive Implications for Economy	<ul style="list-style-type: none"> • Higher proportion of cheaper coal mix can reduce the country’s external account sensitivity to global commodity prices. Approximately 25-30% of oil bill is attributed to Furnace Oil, which accounts for 10% of total import receipts. • Overall reduction in cost of electricity production can help in reducing the subsidy the GoP has to pay. This can help in controlling the circular debt as well.
Drawbacks	<ul style="list-style-type: none"> • Low efficiency benchmarks for coal IPPs as compared to RFO based plants. This would result in more fuel consumption and more carbon emission (CO2 Emission; Coal: 95.2 kg/mmbtu; Gas: 53.1 kg/mmbtu; RFO: 78.8 kg/mmbtu). • Financing despite high ROE. • Coal availability.



Success Story

K-Electric

The company has **28 business centers** in Karachi, each responsible for curtailing/ improving T&D losses and improving recovery ratio of its designated area. This has led to greater accountability for each geographical division.

Furthermore, the company is in the **pilot stage of installing smart meters** to improve the accuracy and efficiency of the meter reading process. The digitally recorded meter readings would be transmitted wirelessly from the field, thereby eliminating time wastage and human interference.

At the same time the company has been able to identify the low loss, average loss, and high loss areas.

Post implementation, the loss ratio has witnessed visible improvement (more than 6 percentage point in less than 4 years).

T&D losses were reduced by **1.9% YoY during FY13**.

The T&D losses improved to **25.1% in 9MFY14 during FY13** as compared to **27.8% during FY13**.

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Business Risk | Key Performance Indicators

1. Generation Efficiency
2. Transmission & Distribution losses
3. Recovery of bills/receivables

Financial Risk [Key Performance Indicators]

1. Working Capital Management
2. Debt Repayment Behavior

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Note : All year wise Electricity Statistics of Pakistan relate to Fiscal Year (which starts from Jul and ends in Jun)



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