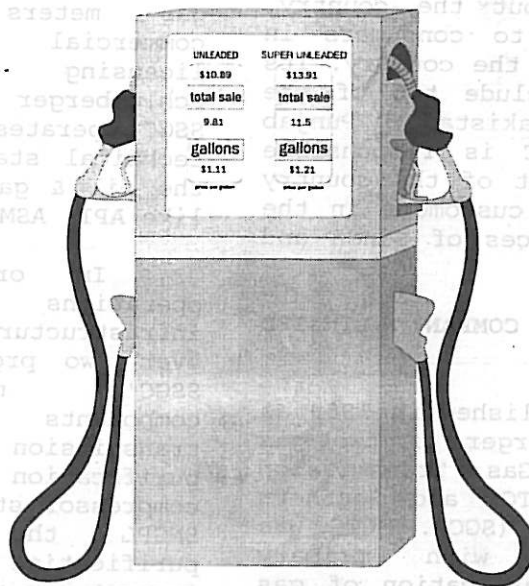


OIL AND GAS



GAS INDUSTRY

The gas industry in Pakistan is the oldest natural gas industry of the world outside the North American continent. At the time of independence in 1947, there was no Natural Gas available in the areas that then formed "Pakistan". The first gas field was discovered in 1952 at Sui in the province of Balochistan. Soon after this discovery, a 16 inch diameter, 558 kilometer long gas transmission pipeline was laid from Sui to Karachi. This pipeline was commissioned in 1955. Karachi was the only major consumer centre at that time and the sales were of the order of 10 million cubic feet per day (MMCFD). At present the gas sales in Pakistan is about 1700 MMCFD and the share of natural gas is more than 37%. Sui Northern Gas Pipelines Limited (SNGPL) and Sui Southern Gas Company Limited (SSGC) are the two major companies of the country which are involved in purification, transmission and distribution of natural gas throughout the country. SNGPL supplies gas to consumers in the northern part of the country. Its franchised areas include two of the four provinces of Pakistan - Punjab and Frontier. SSGC is responsible for the southern part of the country and supplies gas to customers in the remaining two provinces of Sindh and Balochistan.

SUI SOUTHERN GAS COMPANY LIMITED (SSGC)

SSGC was established in 1989 as a result of the merger of two gas companies - Sui Gas Transmission Company Limited (SGTC) and Southern Gas Company Limited (SGC). SGTC was formed in 1954 with primary responsibility of purification of gas at Sui field and to transmit the sweet gas to the consumer centres in

the Southern part of the country. Two distribution companies, Karachi Gas Company & Indus Gas Company, established in 1955, were responsible for the distribution of gas to consumers in Karachi and in towns enroute to the transmission pipeline between Sui and Karachi. These two distribution companies were first merged in 1985 to form SGC and latter in 1989, SGC & SGTC were merged together to form SSGC. SSGC is primarily involved in operations and maintenance of:

- Gas purification facilities at Sui,
- Gas transmission pipelines,
- Gas compression facilities, and
- Gas distribution pipelines

It purchases natural gas from 5 different sources and sells this gas to its customers in Sindh and Balochistan. SSGC also distributes liquefied petroleum gas (LPG) throughout Pakistan and manufactures gas meters for domestic and commercial consumers under a licensing arrangement with Schlumberger of France since 1976. SSGC Operates under well established technical standards and practices of the oil & gas industry institutions, like API, ASME, ANSI and NACE.

In order to support its operations SSGC has appropriate infrastructural facilities, spread over two provinces of the country. SSGC's major infrastructure components comprise of gas transmission /distribution pipelines, purification facilities and compressor stations. SSGC shares with SNGPL the ownership of gas purification facilities at Sui. The present gas purifying capacity of Sui plant is 550 MMCFD and another 240 MMCFD purification facilities are

under construction. SSGC gas transmission system comprises of 2570 kilometers long high pressure pipelines of 12 to 24 inches diameters. A total of 62600 horse power compression facilities are installed on these transmission pipelines at 6 different locations. The gas distribution network of SSGC include more than 18468 kilometers pipelines mains and services lines, ranging from 1 to 24 inches in diameters. All transmission pipelines are monitored through a comprehensive telecommunication system and the distribution system is controlled through a Supervisory Control, And Data Acquisition (SCADA) system.

SSGC's domestic meter manufacturing plant is located in Karachi which has an annual capacity of manufacturing 300,000 meters of two different types G-1.6 and G-4.

LPG marketing operation of the company comprises storage facilities at four location with total capacity of 900 metric tons (MT), and LPG filling plants at three location with a capacity of 90 MT per day.

SSGC serves more than one million consumers of natural gas in Sindh and Balochistan provinces since 1993. The customers growth rate has been around 11 per cent per annum. Majority of customers, about 74 per cent, are in the household category and are located within Karachi. New connections are provided to consumers each year. About 310,000 new gas connections have been provided to consumers till August, 1997.

SSG employs and maintains a team of competent professional staff to run its operations effectively. Its staff is well experienced in their respective field. The present strength of SSGC staff is 5527 which comprises of 1373 executive and 4154 non executive staff. SSGC helps its staff to improve and update their expertise in respective fields based on worldwide gas industry practices by arranging specialized training programme locally and abroad. In 1995-96 SSGC has arranged 60 man-months of foreign training programmes

for its staff through Canada and U.K. based industry firms.

Sector Wise Gas Consumption

Consumers of natural gas in Pakistan have been divided in five major categories based on the nature of their socio-economic impact. These sectors and their share in consumption is as follow.

• Domestic	16.9%
• Commercial	3.0%
• Fertilizer	25.9%
• Power	33.7%
• General Industry	20.5%

Telecommunication and SCADA System

For control of its transmission network, SSGC operates and maintains its telecommunication and Supervisory Control And Data Acquisition (SCADA) system. This system allows pipelines related data like gas flows pressure etc. along the pipeline to be transmitted to Karachi gas control centre for monitoring and control of the gas network. It also makes it possible to initiate action for closing sections of the pipeline if any unforeseen event occurs.

Following is the list of major SSG's consumers. Gas supplied to these consumers is being monitored/controlled by Karachi terminal gas control on 24 hours basis.

- ACPL,
- Pak Steel,
- Malir,
- Karachi,
- Landi
- Two power station at KESC,
- Jamshoro,
- Kotri,
- Sukkur and
- Quetta

Marketing and Consumer Services

Presently SSGC serves more than 1.26 million consumers, in its area

of franchise in the provinces of Sindh and Balochistan where there are 350 towns and villages commissioned on gas as against 30 in 1989-90.

SSGC has a computerized in company staggered/cyclic billing system which involved reading of 1.26 million meters, data processing, printing of gas bills and delivery of the bill to each consumer on a monthly basis. SSGC has also set up a consumer service, telephone No.119, which operate round the clock on 24 hours basis where consumer can logge their complain at any time. This is a computer based system which enable the company and consumer to track the complain and ensure prompt rectification and follow up. SSG has also successfully launched a pilot project for hand-held electronic meter reading device which when fully employed will not only ensure 100% accuracy but would aslo substantially reduce billing down-time.

SSG Progress as on June, 1997

• Transmission Pipeline(km)	2570
• Distribution Mains(km)	14427
• Distribution Service Line(km)	4041
• Gas Compression Capacity(HP)	62600
• Gas purification Capacity(MMCFD)	550
• Total number of Gas Consumer (Mil)	1.26
• Average Gas Sales(MMSCFD)	515
• Average Gas Internal Use (MMSCFD)	5

SUI NORTHERN GAS PIPELINE LIMITED (SNGPL)

SNGPL was incorporated as a private limited company in June, 1963 and was converted to a public limited company in January 1964 under the Companies Act 1913 now companies Ordinance 1984, with the subject of transmission and distribution of natural gas in the provinces of Punjab and North West Frontier. For this purpose the company took over the existing "Sui- Multan Pipeline System" from PIDC and the "Rawalpindi - Wah System" form the Attock Oil Company Limited. The company's

commercial operation commenced by selling an average of 47 million cubic feet per day (MMCFD) of gas to 67 consumers in two regions, namely Multan and Rawalpindi.

Expansion

SNGPL undertook five major expansion projects from 1964 to 1990 with the world Bank financing as a result of which the system capacity increased progressively from 90 MMCFD of gas to 450 MMCFD from Sui region. The sixth expansion project is nearing completion after which the capacity at Sui region would increase to 980 MMCFD.

In-House Capabilities

Until 1972 all the major pipelines in Pakistan were constructed by foreign contractors. SNGPL, however, from the very beginning, had maintained a small construction group for construction of small spurs on transmission system not big enough to be contracted out. By 1973 SNGPL crew had attained sufficient experience and expertise to undertake bigger jobs and SNGPL undertook construction of 70 miles of 10 inch diameter pipeline and a major river crossing. After successful completion of this undertaking, the World Bank also recognized SNGPL's construction capabilities. SNGPL had now entered the age of self sufficiency as far as designing and construction of high pressure gas pipeline systems were concerned. In addition to designing and construction of its own compressor stations, high pressure transmission pipelines and low pressure distribution network, SNGPL has also acted as a contractor for outside agencies such as Oil & Gas Development Corporation (OGDC), Pak. Saudi Fertilizer, Fauji Fertilizer and Pak Arab Refinery Company (PARCO). SNGPL also constructed a substantial and one of the most difficult portions of Quetta Natural Gas Pipeline. The construction of about 310 miles of PARCO and 105 miles of Quetta pipeline was a

tremendous challenge as these pipelines traversed all sorts of terrain which can be encountered during the construction of a cross country pipeline, including long stretches of water logged areas and steep rocky inclines.

Achievements

The five year-wise details of the physical achievements of the Company since its inception are provided below. Sui Northern is now more than 33 years old. How much has the Company progressed can be gauged from the fact that during these years the high pressure transmission system increased from 625 to 4630 Km and the

low pressure distribution network from 126 to over 26218 Km. An average of about 628 MMCFD gas supplied to about 1,528 thousand consumers in 125 towns and cities in 8 regions during 1996-97 as compared, at inception to an average of 47 MMCFD gas to 67 consumers in 3 cities and 2 regions. This achievement is noteworthy by any standard but the Company has tried to guard against complacency. It believes that the final yardstick is not merely the size of undertaking but the quality and promptness of service to the people, not just expansion but the maintenance of the high standard coupled with reliability of service.

Table 8.1 FIVE YEAR-WISE DETAILS OF SUI NORTHERN GAS PIPELINE LIMITED

Years	Gas Sales (MMCF)	Consumers (Nos)	Transmission Pipelines (Km)	Distribution Mains (Km)	Installed Comp- ression BHP-ISO
1964	13683	67	625	126	0
1969	38583	22726	1205	962	13020
1974	82164	91487	1872	2287	32550
1979	90298	274290	2312	5441	67020
1984	123923	473847	2395	7659	86170
1989	149084	679635	2808	10028	98815
1994	185219	1136803	3614	18375	111460
1997	229362	1582796	4630	26218	152185

Source: Sui Northern Gas Pipelines Limited

Table 8.2a OIL RESERVES BY FIELD
ON JUNE 30, 1997.

(Million US Barrels)

Field	Commula- tive Pro- duction	Balance Recover- able	Original Recoverable Reserves
Kharur	3.91	0.40	4.31
Dhulian	5.88	35.52	41.40
Joyamair	0.43	10.02	10.45
Balkassar	0.09	33.17	33.26
Total	10.31	79.11	89.42

Source: M/O Petroleum and Natural Resources

Table 8.2b GAS RESERVES ON JUNE 30,
1997.

(Trillion Cubic Feet)

Source	Original Recoverable Reserves	Recover- able
Natural Gas Reserves	27.314	17.238
Associated Gas Reserves	1.161	0.647
Total	28.475	17.885

Source: M/O Petroleum and Natural Resources

Table 8.3 OIL AND GAS PRODUCTION

Year	Oil	Gas	Consumption of POL Products (000MT)^
1947-48	880	.	342
1948-49	1594	.	451
1949-50	2141	.	727
1950-51	2672	.	962
1951-52	3444	.	1019
1952-53	4122	.	1021
1953-54	4634	.	1097
1954-55	4870	.	1250
1955-56	5238	14	1260
1956-57	5389	56	1358
1957-58	5561	47	1021
1958-59	5666	56	1097
1959-60	6126	69	1250
1960-61	6898	99	1260
1961-62	7684	95	1358
1962-63	8715	108	2106
1963-64	9370	129	2234
1964-65	9546	154	2549
1965-66	9774	183	2815
1966-67	9183	199	2913
1967-68	8875	211	3179
1968-69	9380	262	3258
1969-70	9318	307	3769
1970-71	8874	330	3345
1971-72	7964	348	3445
1972-73	7703	400	3514
1973-74	6534	456	3445
1974-75	5355	496	3445
1975-76	5594	490	3769
1976-77	9799	540	3622
1977-78	9674	564	4000
1978-79	10274	610	4520
1979-80	9920	728	4581
1980-81	9815	836	4880
1981-82	10862	901	5497
1982-83	12981	951	5955
1983-84	13343	950	6611
1984-85	26097	991	7321
1985-86	39310	1042	7478
1986-87	41094	1103	8398
1987-88	44562	1198	8899
1988-89	46767	1248	9843
1989-90	53481	1363	10501
1990-91	64348	1421	10609
1991-92	61390	1505	12090
1992-93	59987	1599	13090
1993-94	56643	1710	13825
1994-95	54405	1721	
1995-96	57549	1821	
1996-97	58275	1912	

Source: M/O Petroleum and Natural Resources

Note: ^ Data are on Fiscal year basis. Oil: Avg/day (Barrels), Gas: Avg/day (MMCFD)

Figure 8.1 PRODUCTION OF OIL AND COAL

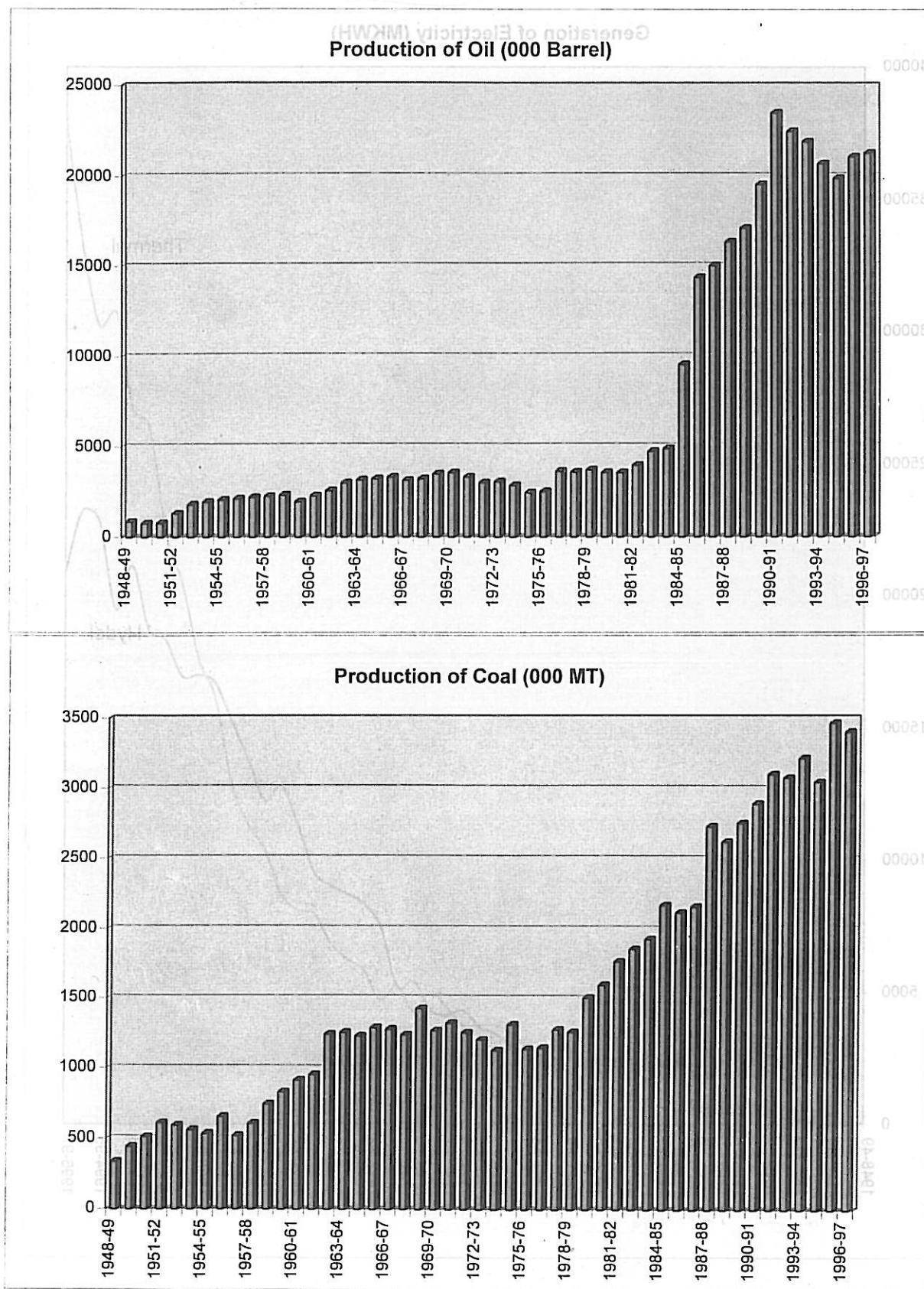


Figure 8.2 GENERATION OF ELECTRICITY

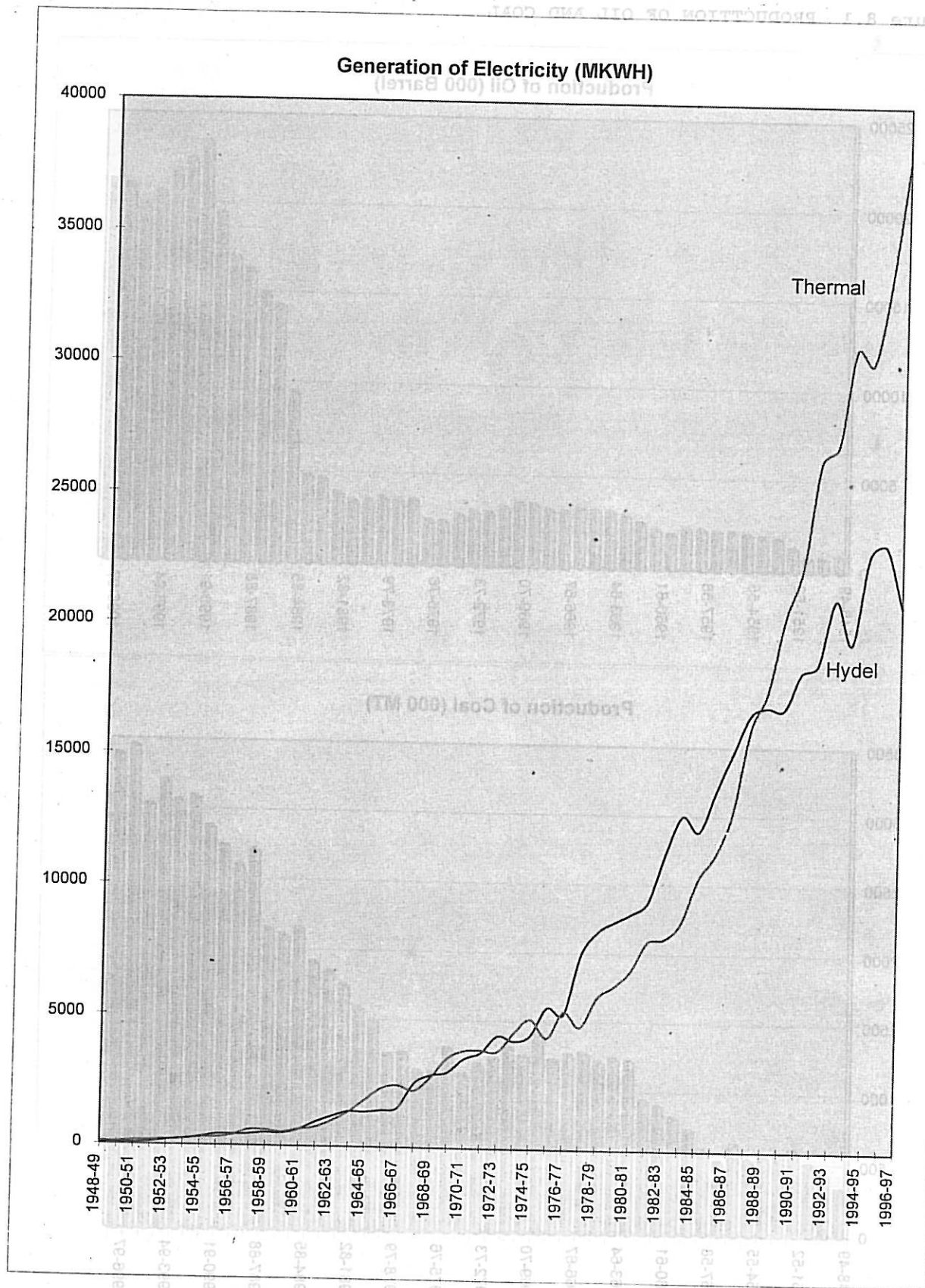


Table 8.4 PRODUCTION OF OIL, COAL, NATURAL GAS AND
GENERATION OF ELECTRICITY BY SOURCE

Year	Oil	Coal	Natural Gas	Power		
	Domestic	(000 MT)		Hydel	Thermal	Nuclear
	Production (000 Barrel)		(Billion Cubic Metres)		(Million Kwts)	
1948-49	854	337	-	36	115	-
1949-50	752	444	-	50	106	-
1950-51	768	513	-	59	148	-
1951-52	1300	610	-	102	180	-
1952-53	1801	593	-	185	200	-
1953-54	1938	563	-	242	227	-
1954-55	2060	538	0.1	307	286	-
1955-56	2113	655	0.2	418	308	-
1956-57	2196	523	0.3	437	393	-
1957-58	2257	606	0.4	450	616	-
1958-59	2326	745	0.5	511	615	-
1959-60	1961	830	0.6	507	540	-
1960-61	2280	915	0.7	645	653	-
1961-62	2569	955	0.8	945	747	-
1962-63	3002	1243	0.9	1176	995	-
1963-64	3162	1257	1.2	1366	1346	-
1964-65	3222	1231	1.5	1362	1814	-
1965-66	3314	1291	1.8	1425	2273	-
1966-67	3139	1280	2.0	1530	2395	-
1967-68	3222	1239	2.1	2482	2195	-
1968-69	3488	1428	2.5	2792	2726	-
1969-70	3564	1269	2.9	2915	3465	-
1970-71	3321	1324	3.1	3449	3752	1
1971-72	3007	1255	3.5	3679	3789	104
1972-73	3061	1204	4.1	4335	3738	304
1973-74	2854	1129	4.6	4141	4464	459
1974-75	2443	1314	5.0	4359	4977	605
1975-76	2512	1138	5.1	5436	4274	610
1976-77	3643	1147	5.6	5183	5271	421
1977-78	3583	1279	5.8	7466	4702	231
1978-79	3710	1261	6.3	8353	5836	106
1979-80	3567	1504	7.5	8718	6258	2
1980-81	3554	1597	8.6	9046	6869	150
1981-82	3956	1765	9.3	9526	7983	183
1982-83	4738	1855	9.8	11366	8104	228
1983-84	4883	1926	9.8	12822	8723	324
1984-85	9522	2168	10.3	12245	10416	346
1985-86	14348	2115	10.8	13804	11355	430
1986-87	14999	2157	11.2	15251	12951	502
1987-88	16310	2727	12.4	16689	16147	254
1988-89	17069	2619	12.9	16974	17562	30
1989-90	19520	2751	14.1	16925	20442	292
1990-91	23485	2888	15.0	18298	22354	385
1991-92	22469	3099	15.6	18647	26375	418
1992-93	21895	3074	16.5	21111	27057	582
1993-94	20675	3214	17.7	19436	30707	497
1994-95	19858	3043	17.8	22858	30176	511
1995-96	21063	3465	18.9	23206	33257	483
1996-97	21262	3401	19.8	20858	37915	346

Note: Figures for Oil, Gas and Hydel Source: Ministry of Petroleum and Natural Resources and Wapda and HDIP are on calendar year bases up to 1958-59. Coal production is on calendar year basis upto 1972-73.

Table 8.5 RESERVES AND EXTRACTION OF PRINCIPAL MINERALS

Minerals	Magn- esite MT	Rock Salt 000MT	Silica Sand 000MT	Ochre (MT)	Sul- phur (MT)	Soap Stone 000MT	Bar- yte 000MT	Bauxite/ Laterite (MT)	Iron Ore (MT)	Chro- mite (000 MT)	Lime Stone (000 MT)	Gyp- sum (000 MT)
Reser- ves/ Year	Over 100 MH MT	Very Large dpts.		0.8 MH. MT	0.6 MH. MT	5 MH MT	Over 74 MH MT	Over 430 MH MT	Fairly large depot.	Very large depot.	350 MH. MT	
1947-48	-	163	1	-	-	-	-	-	19	344	16	
1948-49	-	206	1	-	-	-	-	-	18	313	15	
1949-50	-	169	3	-	-	-	-	-	18	391	16	
1950-51	-	139	5	-	-	-	-	-	18	324	20	
1951-52	-	134	5	-	-	-	-	-	18	451	26	
1952-53	-	136	6	-	-	-	-	-	19	780	28	
1953-54	-	149	10	-	-	-	-	-	23	861	32	
1954-55	-	140	13	-	-	-	-	-	26	815	28	
1955-56	-	156	13	-	-	-	-	-	28	808	31	
1956-57	-	159	12	-	1	1	-	-	16	821	64	
1957-58	-	166	22	-	-	-	-	-	22	948	52	
1958-59	-	161	19	-	-	1	-	-	21	1097	90	
1959-60	-	169	28	331	-	2	-	540	16	927	90	
1960-61	-	210	18	607	-	1	-	911	23	1073	94	
1961-62	-	191	15	246	-	1	-	68	23	1197	103	
1962-63	-	220	19	578	-	1	-	-	22	1154	237	
1963-64	-	212	25	595	-	1	-	-	8	1651	172	
1964-65	632	247	28	196	-	3	11	-	17	2026	183	
1965-66	666	289	25	533	-	2	9	-	20	1890	115	
1966-67	786	231	78	635	-	3	6	-	38	2432	122	
1967-68	1251	273	86	777	-	2	9	477	24	1695	60	
1968-69	1325	365	148	449	-	3	11	2410	26	2232	234	
1969-70	522	305	43	390	-	3	1	949	26	1817	204	
1970-71	648	350	35	2750	-	4	3	337	28	2897	164	
1971-72	103	358	44	5332	2347	4	2	140	34	2628	22	
1972-73	2504	354	27	3780	2885	6	2	516	18	2846	132	
1973-74	3217	375	67	9694	1657	7	2	294	13	3258	282	
1974-75	2087	427	32	12511	1661	5	6	20	10	3008	599	
1975-76	8118	427	43	11835	1552	26	11	125	12	2968	324	
1976-77	1575	336	51	12910	1167	12	17	90	10	3888	282	
1977-78	2344	435	93	7554	1075	27	19	880	10	4029	356	
1978-79	3042	486	84	790	1068	33	32	1726	5	3298	234	
1979-80	1635	495	104	267	294	31	19	2044	4	2798	368	
1980-81	397	514	84	445	403	28	21	1754	1	3464	554	
1981-82	1668	534	99	1460	650	23	28	2755	3	3682	303	
1982-83	1687	548	141	558	824	19	20	2772	4	4232	341	
1983-84	3338	581	99	1086	570	16	36	4173	4	4696	339	
1984-85	3137	573	111	697	884	17	21	2035	3	4634	400	
1985-86	3266	619	193	563	1337	21	42	21749	10	6313	381	
1986-87	2692	503	127	1237	1176	25	20	15645	7	6885	412	
1987-88	3092	502	164	1730	600	33	13	31440	9	7610	404	
1988-89	6754	620	165	936	310	38	30	16618	12	7249	426	
1989-90	7285	735	136	2337	342	31	25	16351	33	7736	491	
1990-91	4242	736	143	1285	295	32	26	24644	24	9009	468	
1991-92	6333	833	132	1001	215	37	30	21818	28	8528	471	
1992-93	5047	895	158	1000	510	48	26	18682	23	9015	533	
1993-94	7000	916	169	745	715	44	18	34984	11	9125	666	
1994-95	5227	890	152	4623	510	34	20	32214	14	9682	620	
1995-96	14981	958	184	8081	20	40	14	19554	32	9740	420	
1996-97	6589	1066	155	2047	290	45	30	34791	34	9488	521	

Sources: Provincial Directorates of Industries and Mineral Developments, Pakistan Mineral Development Corporation and Ministry of Petroleum and Natural Resources.