APPENDIX D

TABLES

Table D3.1 Monthly Pattern of Country's Power Demand
(3 years of 1995-96, 1996-97 and 1997-98)

Month	Year	Country (WAPDA + KESC)			Computed Peak		Total Energy		Average of Difference	
		Peak Demand (MW)	Computed P.Demand (MW)*	Total Energy (GWh)	Linear (MW)	Differ. (%)	Linear (GWh)	Differ. (%)	C. Peak (%)	T. Energy (%)
July	1995	9,478	9,586	5,334.65	9,586	0.00	5334.65	0.00	0.00	0.00
Aug.	1995	9,152	9,284	5,302.75	9,620	-3.49	5368.21	-1.22	-1.42	-3.18
Sept.	1995	9,318	9,533	4,997.00	9,654	-1.26	5401.76	-7.49	-1.91	-8.12
Oct.	1995	9,061	9,091	4,720.38	9,688	-6.16	5435.32	-13.15	-6.22	-19.26
Nov.	1995	8,469	8,503	4,198.13	9,722	-12.54	5468.87	-23.24	-13.74	-26.22
Dec.	1995	8,502	8,562	4,498.19	9,756	-12.24	5502.43	-18.25	-12.37	-20.30
Jan.	1996	8,289	8,557	4,558.62	9,791	-12.60	5535.99	-17.65	-13.36	-17.60
Feb.	1996	8,253	8,330	4,209.44	9,825	-15.21	5569.54	-24.42	-15.36	-29.22
March	1996	8,395	8,430	4,462.37	9,859	-14.49	5603.10	-20.36	-14.33	-22.62
April	1996	8,616	9,037	4,734.58	9,893	-8.65	5636.65	-16.00	-10.10	-19.29
May	1996	8,964	9,071	5,218.16	9,927	-8.62	5670.21	-7.97	-5.27	-8.91
June	1996	9,506	9,715	5,380.94	9,961	-2.47	5703.76	-5.66	-1.88	-5.61
				57,615.21						
July	1996	9,846	9,995	5,737.32	9,995	0.00	5737.32	0.00		
Aug.	1996	9,741	9,875	5,537.15	10,040	-1.64	5767.19	-3.99		
Sept.	1996	9,864	9,945	5,298.46	10,085	-1.39	5797.07	-8.60		
Oct.	1996	9,766	9,877	4,669.11	10,130	-2.50	5826.94	-19.87		
Nov.	1996	8,822	8,878	4,303.60	10,175	-12.75	5856.82	-26.52		
Dec.	1996	8,934	8,995	4,649.83	10,220	-11.99	5886.69	-21.01		
Jan.	1997	8,743	8,845	4,838.23	10,265	-13.83	5916.57	-18.23		
Feb.	1997	8,601	8,744	4,125.61	10,310	-15.19	5946.44	-30.62		
March	1997	8,846	8,909	4,553.70	10,355	-13.96	5976.31	-23.80		
April	1997	8,684	8,959	4,643.00	10,400	-13.86	6006.19	-22.70		
May	1997	9,623	9,834	5,311.03	10,445	-5.85	6036.06	-12.01		
June	1997	9,639	10,221	5,565.81	10,490	-2.56	6065.94	-8.24		
				59,232.85						
July	1997	10,073	10,535	6,095.81	10,535	0.00	6095.81	0.00		
Aug.	1997	10,169	10,660	5,854.15	10,567	0.88	6118.83	-4.33		
Sept.	1997	10,013	10,272	5,634.68	10,598	-3.08	6141.84	-8.26		
Oct.	1997	9,297	9,567	4,638.31	10,630	-10.00	6164.86	-24.76		
Nov.	1997	8,694	8,962	4,399.41	10,662	-15.94	6187.87	-28.90		
Dec.	1997	9,138	9,317	4,867.59	10,693	-12.87	6210.89	-21.63		
Jan.	1998	9,094	9,262	5,179.27	10,725	-13.64	6233.91	-16.92		
Feb.	1998	8,872	9,069	4,216.73	10,757	-15.69	6256.92	-32.61		
March	1998	9,100	9,219	4,791.57	10,788	-14.55	6279.94	-23.70		
April	1998	9,877	9,977	5,094.51	10,820	-7.79	6302.95	-19.17		
May	1998	10,517	10,708	5,899.40	10,852	-1.32	6325.97	-6.74		
June	1998	10,634	10,816	6,163.65	10,883	-0.62	6348.98	-2.92		
				62,835.08						
			10,915	6,372.00						

Table D4.1 Base Growth Rates for Independent Variables (Country) Based on Annual GDP Growth Rate of 6%

Year	GDP Total (%)	GDP Commercial (%)	GDP Min./Mfg. (%)	GDP Agriculture (%)	GDP Per Capita (%)	*Real Increase in Tariff (%)
1996-97	1.30	1.97	1.91	0.06	-2.80	2.0
1997-98	5.44	3.54	6.50	5.90	2.62	3.0
1998-99	6.00	7.30	7.70	3.90	3.22	3.0
1999-00	6.00	7.30	7.70	3.90	3.22	3.0
2000-01	6.00	7.30	7.70	3.90	3.22	2.0
2001-02	6.00	7.30	7.70	3.90	3.22	2.0
2002-03	6.00	7.30	7.70	3.90	3.22	2.0
2003-04	6.00	7.70	8.60	3.40	3.62	0
2004-05	6.00	7.70	8.60	3.40	3.62	0
2005-06	6.00	7.70	8.60	3.40	3.62	0
2006-07	6.00	7.70	8.60	3.40	3.62	0
2007-08	6.00	7.70	8.60	3.40	3.62	0
2008-09	6.00	7.70	9.00	3.40	3.88	0
2009-10	6.00	7.70	9.00	3.40	3.88	0
2010-11	6.00	7.70	9.00	3.40	3.88	0
2011-12	6.00	7.70	9.00	3.40	3.88	0
2012-13	6.00	7.70	9.00	3.40	3.88	0
2013-14	6.00	7.70	9.00	3.40	4.16	0
2014-15	6.00	7.70	9.00	3.40	4.16	0
2015-16	6.00	7.70	9.00	3.40	4.16	0
2016-17	6.00	7.70	9.00	3.40	4.16	0
2017-18	6.00	7.70	9.00	3.40	4.16	0

* Real Increase in Tariff is based on discussion with Chief Economist of Planning Commission on 30-12-96. It was assumed that the future tariff will be so structured that there is no real price increase beyond 2003.

Source: WAPDA

Table D4.2 Base Growth Rates for Independent Variables (Country) Based on Annual GDP Growth Rate of 5%

Year	GDP Total (%)	GDP Commercial (%)	GDP Min./Mfg. (%)	GDP Agriculture (%)	GDP Per Capita (%)	*Real Increase in Tariff (%)
1996-97	1.30	1.97	1.91	0.06	-2.80	2.0
1997-98	5.44	3.54	6.50	5.90	2.62	3.0
1998-99	5.00	6.10	6.40	3.20	2.25	3.0
1999-00	5.00	6.10	6.40	3.20	2.25	3.0
2000-01	5.00	6.10	6.40	3.20	2.25	2.0
2001-02	5.00	6.10	6.40	3.20	2.25	2.0
2002-03	5.00	6.10	6.40	3.20	2.25	2.0
2003-04	5.00	6.40	7.10	2.90	2.64	0
2004-05	5.00	6.40	7.10	2.90	2.64	0
2005-06	5.00	6.40	7.10	2.90	2.64	0
2006-07	5.00	6.40	7.10	2.90	2.64	0
2007-08	5.00	6.40	7.10	2.90	2.64	0
2008-09	5.00	6.40	7.50	2.90	2.90	0
2009-10	5.00	6.40	7.50	2.90	2.90	0
2010-11	5.00	6.40	7.50	2.90	2.90	0
2011-12	5.00	6.40	7.50	2.90	2.90	0
2012-13	5.00	6.40	7.50	2.90	2.90	0
2013-14	5.00	6.40	7.50	2.90	3.17	0
2014-15	5.00	6.40	7.50	2.90	3.17	0
2015-16	5.00	6.40	7.50	2.90	3.17	0
2016-17	5.00	6.40	7.50	2.90	3.17	0
2017-18	5.00	6.40	7.50	2.90	3.17	0

* Real Increase in Tariff is based on discussion with Chief Economist of Planning Commission on 30-12-96. It was assumed that the future tariff will be so structured that there is no real price increase beyond 2003.

Source: WAPDA

Table D4.3 Analysis of Sector Growth Rates

(6% Growth Case)

Year	GDP of the Country			GDP of Manufacture Sector				GDP of Commerce Sector				GDP of Agriculture Sector				GDP Sum
	All GDP	G. Rate	Sum GDP	Min./Mfg.	G. Rate	Allocated	Growth	Commerce	G. Rate	Allocated	Growth	Agriculture	G.Rate	Allocated	Growth	
1997-98	607,325		556,011	111,413		111,413		295,242		295,242		149,357		149,357		556,012
1998-99	643,765	6.00	589,366	119,992	7.70	119,464	7.227	316,795	7.30	315,402	6.828	155,182	3.90	154,500	3.443	591,968
1999-00	682,390	6.00	624,728	129,231	7.70	128,071	7.205	339,921	7.30	336,870	6.806	161,234	3.90	159,787	3.422	630,386
2000-01	723,334	6.00	662,212	139,182	7.70	137,269	7.182	364,735	7.30	359,723	6.784	167,522	3.90	165,220	3.400	671,439
2001-02	766,734	6.00	701,945	149,899	7.70	147,097	7.160	391,361	7.30	384,045	6.762	174,056	3.90	170,802	3.379	715,315
2002-03	812,738	6.00	744,062	161,441	7.70	157,596	7.138	419,930	7.30	409,929	6.740	180,844	3.90	176,537	3.357	762,215
2003-04	861,502	6.00	788,705	175,325	8.60	169,756	7.716	452,264	7.70	437,897	6.823	186,992	3.40	181,052	2.558	814,582
2004-05	913,192	6.00	836,028	190,403	8.60	182,791	7.679	487,089	7.70	467,616	6.787	193,350	3.40	185,620	2.523	870,842
2005-06	967,984	6.00	886,189	206,778	8.60	196,763	7.643	524,595	7.70	499,186	6.751	199,924	3.40	190,241	2.489	931,296
2006-07	1,026,063	6.00	939,361	224,561	8.60	211,733	7.608	564,988	7.70	532,715	6.717	206,721	3.40	194,913	2.456	996,271
2007-08	1,087,627	6.00	995,722	243,873	8.60	227,770	7.574	608,493	7.70	568,315	6.683	213,750	3.40	199,637	2.423	1,066,115
2008-09	1,152,884	6.00	1,055,465	265,821	9.00	245,639	7.845	655,346	7.70	605,590	6.559	221,017	3.40	204,237	2.304	1,142,185
2009-10	1,222,057	6.00	1,118,793	289,745	9.00	264,822	7.810	705,808	7.70	645,097	6.524	228,532	3.40	208,874	2.271	1,224,086
2010-11	1,295,381	6.00	1,185,921	315,822	9.00	285,412	7.775	760,155	7.70	686,960	6.490	236,302	3.40	213,549	2.238	1,312,280
2011-12	1,373,103	6.00	1,257,076	344,246	9.00	307,506	7.741	818,687	7.70	731,311	6.456	244,336	3.40	218,259	2.206	1,407,270
2012-13	1,455,490	6.00	1,332,501	375,229	9.00	331,209	7.708	881,726	7.70	778,287	6.423	252,644	3.40	223,005	2.174	1,509,599
2013-14	1,542,819	6.00	1,412,451	408,999	9.00	356,632	7.676	949,619	7.70	828,033	6.392	261,234	3.40	227,786	2.144	1,619,852
2014-15	1,635,388	6.00	1,497,198	445,809	9.00	383,895	7.645	1,022,740	7.70	880,701	6.361	270,116	3.40	232,602	2.114	1,738,665
2015-16	1,733,512	6.00	1,587,030	485,932	9.00	413,124	7.614	1,101,491	7.70	936,454	6.330	279,300	3.40	237,452	2.085	1,866,722
2016-17	1,837,522	6.00	1,682,252	529,666	9.00	444,456	7.584	1,186,306	7.70	995,459	6.301	288,796	3.40	242,336	2.057	2,004,767
2017-18	1,947,774	6.00	1,783,187	577,336	9.00	478,035	7.555	1,277,651	7.70	1,057,898	6.272	298,615	3.40	247,254	2.029	2,153,602

Table D4.4 Analysis of Sector Growth Rates

(5% Growth Case)

Year	GDP of the Country			GDP of Mining & Manufacture Sector				GDP of Commerce Sector				GDP of Agriculture Sector				GDP Sum
	All GDP	G. Rate	Sum GDP	Manufacture	G. Rate	Allocated	Growth	Commerce	G. Rate	Allocated	Growth	Agriculture	G.Rate	Allocated	Growth	
1997-98	607,325		556,011	111,413		111,413		295,242		295,242		149,357		149,357		556,012
1998-99	637,691	5.00	583,806	118,209	6.10	117,670	5.616	314,137	6.40	312,704	5.914	154,136	3.20	153,433	2.729	586,483
1999-00	669,576	5.00	612,997	125,420	6.10	124,258	5.599	334,242	6.40	331,145	5.897	159,069	3.20	157,595	2.712	618,731
2000-01	703,055	5.00	643,646	133,071	6.10	131,192	5.581	355,634	6.40	350,613	5.879	164,159	3.20	161,841	2.695	652,863
2001-02	738,207	5.00	675,829	141,188	6.10	138,490	5.563	378,394	6.40	371,164	5.861	169,412	3.20	166,175	2.678	688,994
2002-03	775,118	5.00	709,620	149,800	6.10	146,170	5.545	402,612	6.40	392,854	5.844	174,833	3.20	170,596	2.661	727,245
2003-04	813,874	5.00	745,101	159,388	6.40	154,136	5.450	431,197	7.10	416,990	6.144	179,903	2.90	173,976	1.981	770,488
2004-05	854,567	5.00	782,356	169,588	6.40	162,492	5.422	461,812	7.10	442,489	6.115	185,121	2.90	177,375	1.954	816,521
2005-06	897,296	5.00	821,474	180,442	6.40	171,257	5.394	494,601	7.10	469,424	6.087	190,489	2.90	180,793	1.927	865,532
2006-07	942,160	5.00	862,548	191,990	6.40	180,448	5.367	529,717	7.10	497,871	6.060	196,013	2.90	184,229	1.901	917,721
2007-08	989,268	5.00	905,675	204,278	6.40	190,084	5.340	567,327	7.10	527,908	6.033	201,698	2.90	187,683	1.875	973,303
2008-09	1,038,732	5.00	950,959	217,351	6.40	199,746	5.083	609,877	7.50	560,477	6.169	207,547	2.90	190,736	1.626	1,034,775
2009-10	1,090,668	5.00	998,507	231,262	6.40	209,839	5.053	655,618	7.50	594,885	6.139	213,566	2.90	193,782	1.597	1,100,445
2010-11	1,145,202	5.00	1,048,432	246,063	6.40	220,381	5.024	704,789	7.50	631,229	6.109	219,759	2.90	196,823	1.569	1,170,611
2011-12	1,202,462	5.00	1,100,854	261,811	6.40	231,388	4.995	757,648	7.50	669,610	6.080	226,132	2.90	199,856	1.541	1,245,591
2012-13	1,262,585	5.00	1,155,897	278,567	6.40	242,881	4.967	814,472	7.50	710,134	6.052	232,690	2.90	202,881	1.514	1,325,728
2013-14	1,325,714	5.00	1,213,691	296,395	6.40	254,878	4.939	875,557	7.50	752,915	6.024	239,438	2.90	205,899	1.487	1,411,390
2014-15	1,392,000	5.00	1,274,376	315,364	6.40	267,399	4.913	941,224	7.50	798,069	5.997	246,382	2.90	208,908	1.462	1,502,970
2015-16	1,461,600	5.00	1,338,095	335,547	6.40	280,465	4.887	1,011,816	7.50	845,720	5.971	253,527	2.90	211,909	1.436	1,600,890
2016-17	1,534,680	5.00	1,405,000	357,022	6.40	294,099	4.861	1,087,702	7.50	896,000	5.945	260,879	2.90	214,901	1.412	1,705,603
2017-18	1,611,414	5.00	1,475,250	379,872	6.40	308,323	4.836	1,169,279	7.50	949,044	5.920	268,445	2.90	217,883	1.388	1,817,596

Table D4.5 JICA Power Demand Forecast (1)
(Country Demand)

Year	Normal Growth Case			Low Growth Case		
	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)
1997-98	45,035	5.44		45,035	5.44	
1998-99	48,007	6.00	6.60	47,512	5.00	5.50
1999-00	51,176	6.00	6.60	50,125	5.00	5.50
2000-01	55,168	6.00	7.80	53,383	5.00	6.50
2001-02	59,471	6.00	7.80	56,853	5.00	6.50
2002-03	64,823	6.00	9.00	61,117	5.00	7.50
2003-04	70,657	6.00	9.00	65,701	5.00	7.50
2004-05	77,016	6.00	9.00	70,628	5.00	7.50
2005-06	83,948	6.00	9.00	75,926	5.00	7.50
2006-07	91,503	6.00	9.00	81,620	5.00	7.50
2007-08	99,738	6.00	9.00	87,742	5.00	7.50
2008-09	108,715	6.00	9.00	94,322	5.00	7.50
2009-10	118,499	6.00	9.00	101,396	5.00	7.50
2010-11	129,164	6.00	9.00	109,001	5.00	7.50
2011-12	140,788	6.00	9.00	117,176	5.00	7.50
2012-13	153,459	6.00	9.00	125,964	5.00	7.50
2013-14	167,271	6.00	9.00	135,412	5.00	7.50
2014-15	182,325	6.00	9.00	145,567	5.00	7.50
2015-16	198,734	6.00	9.00	156,485	5.00	7.50
2016-17	216,621	6.00	9.00	168,221	5.00	7.50
2017-18	236,116	6.00	9.00	180,838	5.00	7.50

Table D4.5 JICA Power Demand Forecast (2)
(Domestic Demand)

Year	Normal Growth Case			Low Growth Case		
	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)
1997-98	18,667	5.44		18,667	5.44	
1998-99	20,459	6.00	9.60	20,160	5.00	8.00
1999-00	22,423	6.00	9.60	21,773	5.00	8.00
2000-01	24,576	6.00	9.60	23,515	5.00	8.00
2001-02	27,230	6.00	10.80	25,631	5.00	9.00
2002-03	30,171	6.00	10.80	27,938	5.00	9.00
2003-04	33,701	6.00	11.70	30,662	5.00	9.75
2004-05	37,644	6.00	11.70	33,652	5.00	9.75
2005-06	42,048	6.00	11.70	36,933	5.00	9.75
2006-07	46,589	6.00	10.80	40,257	5.00	9.00
2007-08	51,621	6.00	10.80	43,880	5.00	9.00
2008-09	57,196	6.00	10.80	47,829	5.00	9.00
2009-10	63,373	6.00	10.80	52,134	5.00	9.00
2010-11	69,457	6.00	9.60	56,304	5.00	8.00
2011-12	76,125	6.00	9.60	60,809	5.00	8.00
2012-13	83,433	6.00	9.60	65,673	5.00	8.00
2013-14	91,442	6.00	9.60	70,927	5.00	8.00
2014-15	99,672	6.00	9.00	76,247	5.00	7.50
2015-16	108,642	6.00	9.00	81,965	5.00	7.50
2016-17	118,420	6.00	9.00	88,113	5.00	7.50
2017-18	129,078	6.00	9.00	94,721	5.00	7.50

Table D4.5 JICA Power Demand Forecast (3)
(Industrial Demand)

Year	Normal Growth Case			Low Growth Case		
	Demand (GWh)	GDP GR. (%)	Demand GR. (%)	Demand (GWh)	GDP GR. (%)	Demand GR. (%)
1997-98	12,300			12,300		
1998-99	12,744	7.227	3.614	12,645	5.616	2.808
1999-00	13,387	7.205	5.044	13,141	5.599	3.919
2000-01	14,253	7.182	6.464	13,801	5.581	5.023
2001-02	15,273	7.160	7.160	14,569	5.563	5.563
2002-03	16,363	7.138	7.138	15,377	5.545	5.545
2003-04	17,752	7.716	8.488	16,298	5.450	5.995
2004-05	19,252	7.679	8.447	17,271	5.422	5.964
2005-06	21,017	7.643	9.172	18,388	5.394	6.473
2006-07	22,936	7.608	9.130	19,573	5.367	6.440
2007-08	25,194	7.574	9.846	20,931	5.340	6.942
2008-09	27,764	7.845	10.199	22,315	5.083	6.608
2009-10	30,583	7.810	10.153	23,780	5.053	6.569
2010-11	33,674	7.775	10.108	25,334	5.024	6.531
2011-12	37,063	7.741	10.063	26,979	4.995	6.494
2012-13	40,776	7.708	10.020	28,721	4.967	6.457
2013-14	44,845	7.676	9.979	30,565	4.939	6.421
2014-15	49,302	7.645	9.939	32,517	4.913	6.387
2015-16	54,182	7.614	9.898	34,583	4.887	6.353
2016-17	59,524	7.584	9.859	36,768	4.861	6.319
2017-18	65,370	7.555	9.822	39,080	4.836	6.287

Table D4.5 JICA Power Demand Forecast (4)
(Commercial Demand)

Year	Normal Growth Case			Low Growth Case		
	Demand (GWh)	GDP GR. (%)	Demand GR. (%)	Demand (GWh)	GDP GR. (%)	Demand GR. (%)
1997-98	2,301			2,301		
1998-99	2,490	6.828	8.194	2,464	5.914	7.097
1999-00	2,693	6.806	8.167	2,639	5.897	7.076
2000-01	2,949	6.784	9.498	2,856	5.879	8.231
2001-02	3,228	6.762	9.467	3,090	5.861	8.205
2002-03	3,571	6.740	10.649	3,376	5.844	9.234
2003-04	3,957	6.823	10.780	3,703	6.144	9.708
2004-05	4,381	6.787	10.723	4,061	6.115	9.662
2005-06	4,848	6.751	10.667	4,452	6.087	9.617
2006-07	5,363	6.717	10.613	4,878	6.060	9.575
2007-08	5,929	6.683	10.559	5,343	6.033	9.532
2008-09	6,543	6.559	10.363	5,864	6.169	9.747
2009-10	7,218	6.524	10.308	6,432	6.139	9.700
2010-11	7,958	6.490	10.254	7,053	6.109	9.652
2011-12	8,770	6.456	10.200	7,731	6.080	9.606
2012-13	9,660	6.423	10.148	8,470	6.052	9.562
2013-14	10,635	6.392	10.099	9,276	6.024	9.518
2014-15	11,704	6.361	10.050	10,155	5.997	9.475
2015-16	12,875	6.330	10.001	11,113	5.971	9.434
2016-17	14,156	6.301	9.956	12,157	5.945	9.393
2017-18	15,559	6.272	9.910	13,294	5.920	9.354

Table D4.5 JICA Power Demand Forecast (5)
(Agricultural Demand)

Year	Normal Growth Case			Low Growth Case		
	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)	Demand (GWh)	GDP G.R. (%)	Demand G.R. (%)
1997-98	6,936			6,936		
1998-99	7,199	3.443	3.787	7,144	2.729	3.002
1999-00	7,470	3.422	3.764	7,357	2.712	2.983
2000-01	7,774	3.400	4.080	7,595	2.695	3.234
2001-02	8,090	3.379	4.055	7,839	2.678	3.214
2002-03	8,421	3.357	4.096	8,094	2.661	3.246
2003-04	8,684	2.558	3.121	8,289	1.981	2.417
2004-05	8,951	2.523	3.078	8,487	1.954	2.384
2005-06	9,223	2.489	3.037	8,687	1.927	2.351
2006-07	9,499	2.456	2.996	8,888	1.901	2.319
2007-08	9,780	2.423	2.956	9,091	1.875	2.288
2008-09	10,055	2.304	2.811	9,272	1.626	1.984
2009-10	10,334	2.271	2.771	9,452	1.597	1.948
2010-11	10,616	2.238	2.730	9,633	1.569	1.914
2011-12	10,901	2.206	2.691	9,814	1.541	1.880
2012-13	11,190	2.174	2.652	9,996	1.514	1.847
2013-14	11,483	2.144	2.616	10,177	1.487	1.814
2014-15	11,779	2.114	2.579	10,359	1.462	1.784
2015-16	12,079	2.085	2.544	10,540	1.436	1.752
2016-17	12,382	2.057	2.510	10,722	1.412	1.723
2017-18	12,716	2.209	2.695	10,903	1.388	1.693

Table D.4.5 JICA Power Demand Forecast (6)

(Summary and Sum of Demand)

Year	Normal Growth Case						Low Growth Case(GWh)					
	Domest.	Industry	Com.	Agri.	Sum	Country	Domest.	Industry	Com.	Agri.	Sum	Country
1997-98	18,667	12,300	2,301	6,936	45,028	45,035	18,667	12,300	2,301	6,936	45,028	45,035
1998-99	20,459	12,744	2,490	7,199	48,039	48,007	20,160	12,645	2,464	7,144	47,503	47,512
1999-00	22,423	13,387	2,693	7,470	51,490	51,176	21,773	13,141	2,639	7,357	50,299	50,125
2000-01	24,576	14,253	2,949	7,774	55,498	55,168	23,515	13,801	2,856	7,595	53,499	53,383
2001-02	27,230	15,273	3,228	8,090	60,280	59,471	25,631	14,569	3,090	7,839	57,264	56,853
2002-03	30,171	16,363	3,571	8,421	65,549	64,823	27,938	15,377	3,376	8,094	61,359	61,117
2003-04	33,701	17,752	3,957	8,684	71,785	70,657	30,662	16,298	3,703	8,289	66,026	65,701
2004-05	37,644	19,252	4,381	8,951	78,655	77,016	33,652	17,271	4,061	8,487	71,088	70,628
2005-06	42,048	21,017	4,848	9,223	86,392	83,948	36,933	18,388	4,452	8,687	76,675	75,926
2006-07	46,589	22,936	5,363	9,499	94,513	91,503	40,257	19,573	4,878	8,888	82,428	81,620
2007-08	51,621	25,194	5,929	9,780	103,627	99,738	43,880	20,931	5,343	9,091	88,754	87,742
2008-09	57,196	27,764	6,543	10,055	113,745	108,715	47,829	22,315	5,864	9,272	95,514	94,322
2009-10	63,373	30,583	7,218	10,334	124,889	118,499	52,134	23,780	6,432	9,452	102,814	101,396
2010-11	69,457	33,674	7,958	10,616	136,310	129,164	56,304	25,334	7,053	9,633	110,123	109,001
2011-12	76,125	37,063	8,770	10,901	148,802	140,788	60,809	26,979	7,731	9,814	117,973	117,176
2012-13	83,433	40,776	9,660	11,190	162,466	153,459	65,673	28,721	8,470	9,996	126,403	125,964
2013-14	91,442	44,845	10,635	11,483	177,414	167,271	70,927	30,565	9,276	10,117	135,391	135,412
2014-15	99,672	49,302	11,704	11,779	193,152	182,325	76,247	32,517	10,155	10,359	144,791	145,567
2015-16	108,642	54,182	12,875	12,079	210,311	198,734	81,965	34,583	11,113	10,540	154,785	156,485
2016-17	118,420	59,524	14,156	12,382	229,020	216,621	88,113	36,768	12,157	10,722	165,491	168,221
2017-18	129,078	65,370	15,559	12,716	249,450	236,116	94,721	39,080	13,294	10,903	176,958	180,838

Table D6.1 List of Existing Hydel Power Stations

WAPDA SYSTEM (In MW)

Sr. No.	Name of Power Station	Type of Power Station	Year of Commis-sioning	Number and Capacity of Units	Total Installed Capacity(MW)	Effective Capability (maximum)	Effective Capability (minimum)
Major Hydel Stations							
1.	Tarbela	Reservoir	1977	2 x 175	3,478	3,620	1,817
			1977	1 x 175			
			1977	1 x 175			
			1982	1 x 175			
			1982	2 x 175			
			1982	1 x 175			
			1985	1 x 175			
			1985	1 x 175			
			1992	1 x 432			
			1992	1 x 432			
			1993	1 x 432			
			1993	1 x 432			
2.	Mangla	Reservoir	1967	2 x 100	1,000	1,070	870
			1968	1 x 100			
			1969	1 x 100			
			1973	1 x 100			
			1974	1 x 100			
			1981	2 x 100			
			1993	1 x 100			
			1994	1 x 100			
3.	Warsak	Reservoir	1960	2 x 40	240	190	114
			1960	1 x 40			
			1960	1 x 40			
			1980	2 x 40			
			Sub Total (Major Hydels)		4,718	4,880	2,801
Small Hydel Stations							
4.	Dargai	Canal	1952	4 x 5	20		
5.	Malakand	Canal	1938	3 x 3.2			
			1952	2 x 5	20		
6.	Rasul	Canal	1952	2 x 11	22	68	29
7.	Chichoki-Mallian	Canal	1959	1 x 4.4			
			1959	1 x 4.4	13		
			1959	1 x 4.4			
8.	Shadiwal	Canal	1961	2 x 6.75	13		
9.	Nandipur	Canal	1963	3 x 4.6	14		
10.	Kurram Garhi	Canal	1958	4 x 1.00	4		
11.	Renala	Canal	1925	5 x 0.22	1		
			Sub Total (Small Hydels)		107	68	29
			Total Hydel		4,825	4,948	2,830

Table D6.2 List of Existing Thermal Power Stations

WAPDA and KESC SYSTEMS (In MW)

Sr. No.	Name of Power Station	Type of Power Station	Date of Commiss-ioing	No. and capacity of units	Total installed Capacity	Effective Capability	
						Max.	Min.
WAPDA Stations							
1.	Multan	Steam	Jun. 1960	2 x 65 }			
			Dec. 1963	2 x 65 }	260	200	200
2.	Faisalabad	Steam	Jun. 1967	1 x 66 }			
			Nov. 1967	1 x 66 }	132	100	100
3.	Faisalabad	Gas Turb.	Mar. 1975	2 x 25 }			
			Jun. 1975	2 x 25 }			
			Sep. 1975	1 x 25 }	200	152	136
			Oct. 1975	2 x 25 }			
			Nov. 1975	1 x 25 }			
		Comb. Cyc.	Dec. 1994	1 x 44 }	44	38	34
4.	Shahdara	Gas Turb.	Aug. 1966	2 x 13.25 }			
			Oct. 1969	4 x 14.75 }	85	64	54
5.	Guddu	Steam	Mar. 1974	1 x 110 }			
			Oct. 1974	1 x 110 }			
			Dec. 1980	1 x 210 }	640	480	480
			Jan. 1986	1 x 210 }			
6.	Guddu	Gas Turb.	Dec. 1985	1 x 100 }			
			Jan. 1986	1 x 100 }			
			Mar. 1986	1 x 100 }	600		
			Apr. 1986	1 x 100 }			
		Comb. Cyc.	Jan. 1988	2 x 100 }		920	868
	Guddu Addl.	Comb. Cyc. (Gas Turb.)	Jan. 1993	2 x 135 }	415		
	Guddu	Comb. Cyc.	May 1984	1 x 145 }			
7.	Sukkur	Steam	Mar. 1965	2 x 12.5 }			
			Apr. 1967	2 x 12.5 }	50	36	36
8.	Kotri	Gas Turb.	Feb. 1970	1 x 15 }			
			Apr. 1970	1 x 15 }			
			Dec. 1978	2 x 25 }	130	100	90
			May 1981	2 x 25 }			
		Comb. Cyc.	Dec. 1994	1 x 44 }	44	40	37
9.	Quetta	Steam	Sep. 1964	2 x 7.5 }			
		Gas Turb.	May 1972	1 x 5.7 }			
		Gas Turb.	Jun. 1973	1 x 12.3 }	83 *	72	55
		Gas Turb.	Jan. 1975	1 x 25.0 }			
		Gas Turb.	Nov. 1984	1 x 35.0 }			

WAPDA and KESC SYSTEMS

(In MW)

Sr. No.	Name of Power Station	Type of Power Station	Date of Commiss-ioing	No. and capacity of units	Total installed Capacity	Effective Capability	
						Max.	Min.
10.	Jamshoro oil Fired Unit-1	Steam	Mar. 1990	1 x 250	250		
11.	Jamshoro oil Fired Unit-2	Steam	Jan. 1990	1 x 210	210	710	710
12.	Jamshoro oil Fired Unit-3&4	Steam	Oct. 1990 Mar. 1991	1 x 210 1 x 210	420		
13.	Pasni	Diesel Generators	Oct. 1991	4 x 4.25	17	15	15
14.	Muzaffargarh units 1-6	Steam	Sep. 1993 Mar. 1994 Feb. 1995 Dec. 1995 Dec. 1995 Jan. 1997	1 x 210 1 x 210 1 x 210 1 x 210 1 x 210 1 x 320	1,370	1,300	1,300
15.	Lakhra Coal Fired Fuidized Bed units 1,2&3	Steam	Jun. 1995 Oct. 1995 Jan. 1996	1 x 50 1 x 50 1 x 50	150	135	135
16.	MESCO (Taken over)	Steam	May 1981	2 x 10	20	16	16
			Subtotal (Thermal)		5,120	4,378	4,266
Private							
1	HUBCO		June 1996		1,292		
2	KOHINOOR		1997		131		
3	KAPCO		May 1996		1,621		
4	AES Lalpir		Nov. 1997		362		
5	AES Pak. Gen.		Feb. 1997		365		
			Total Private		3,771		
			Total (WAPDA+Private)		8,891		

WAPDA and KESC SYSTEMS

(In MW)

Sr. No.	Name of Power Station	Type of Power Station	Date of Commiss-ioing	No. and capacity of units	Total installed Capacity	Effective Capability	
						Max.	Min.
KESC Power Stations							
1.	Korangi	Steam	1965 1970 1977	1 x 66 } 1 x 125 } 1 x 125 }	316	215	
2.	Korangi Town	Gas Turbine	1978	4 x 25 }	100*	80	
3.	SITE	Gas Turbine	1979 1980	3 x 25 } 2 x 25 }	125*	80	
4.	Bin Qasim	Steam	1983 1984 1989 1990 1991 1997	1 x 210 } 1 x 210 } 1 x 210 } 1 x 210 } 1 x 210 } 1 x 210 }	1,260	1,000	
5.	Diesel Stations	Diesel			125	80	
			Subtotal (Thermal)		1,926	1455	
	* Gas Turbine Installed Capacity at ISO Conditions						
Private							
1	Diesel Stations	Diesel			160	130	
			Total (KESC + Private)		2,086	1,585	

Table D7.1 Generation Development Program (May 1999)

(Based on Normal Growth Scenario)

Sr. No.	Station Name	Unit No.	Installed Capacity (MW)	Date of Commissioning
1.	Southern Electric on FO	Pvt	115	Apr. 1999
2.	Japan Power on FO	Pvt	120	Apr. 1999
3.	Jagran (AJ&K) HPP	1	30	Apr. 1999
4.	Habibullah Coast on Gas	Pvt	140	May 1999
5.	Rousch Power on FO	Pvt	412	May 1999
6.	Reshun (Chitral) HPP	1	3	June 1999
7.	Fauji Kabirwala on Gas	Pvt	157	July 1999
8.	Altern Energy on Gas	Pvt	14	July 1999
9.	Uch Power (CC) on Gas	Pvt	586	Aug 1999
10.	Liberty Power on Gas	Pvt	235	Dec. 1999
11.	Saba Power on FO	Pvt	114	Dec. 1999
12.	Chashma Nuclear	1	325	Dec. 1999
13.	Sabah Shipyard (KESC)	Pvt	288	Jan. 2000
14.	Davis Energy on Gas	Pvt	10	Jan. 2000
15.	Chashma Low Head Hydel	1 - 8	184	Aug. 2000
16.	Ghazi Barotha Hydel	No. 1	290	Oct. 2002
17.	Ghazi Barotha Hydel	No. 2	290	Dec. 2002
18.	Ghazi Barotha Hydel	No. 3	290	Feb. 2003
19.	Ghazi Barotha Hydel	No. 4	290	Apr. 2003
20.	Ghazi Barotha Hydel	No. 5	290	June 2003
21.	Malakand III HPP	1 - 3	81	July 2003
22.	Matil-tan Dist. Swat HPP	1	84	Aug. 2003
23.	New Bong Escape HPP	1	45	Sep. 2003
24.	Golan Gol HPP	1	106	Oct. 2003
25.	Summer Gah HPP	1	28	Nov. 2003
26.	Daral Khwar HPP	1	25	Dec. 2003
27.	Duber Khwar HPP	1	160	Dec. 2003
28.	Madar Batdara HPP	1	10	Jan. 2004
29.	Lower UCC HPP	1	6	Jan. 2004
30.	Main Line UCC HPP	1	6	Feb. 2004
31.	B.S. Link (Head) HPP	1	10	Feb. 2004
32.	Riali Saidpur – Jari Mirpur HPP	2 Proj	3	Mar. 2004
33.	Batal Khwar – Sai – Nomal HPP	3 Proj	22	Mar. 2004
34.	Doarian – Laut – Nagdar HPP	3 Proj	50	Apr. 2004
35.	Ronalia HPP	1	12	Apr. 2004
36.	Swat Scheme A1 HPP	1	105	May 2004
37.	Allai Khwar HPP	1	163	May 2004
38.	Khan Khwar HPP	1	70	June 2004
39.	Kotli HPP	1	97	June 2004
40.	Chakothi HPP	1	139	July 2004
41.	Gul Pur (Poonch River)	1	116	July 2004
42.	Jinnah Low Head Hydel	1 - 8	96	Aug. 2004
43.	Rajdhani (Poonch River)	1	86	Aug. 2004
44.	Harighel HPP	1	53	Sep. 2004
45.	Battar (AJ&K) HPP	1	5	Oct. 2004
46.	Sehra	1	65	Oct. 2004
47.	Taunsa Low Head Hydel	1 - 8	120	Nov. 2004
48.	Swat Scheme B1 HPP	1	429	Dec. 2004
49.	Ghakar G.T. on Gas	1 & 2	400	Apr. 2005
50.	Ghakar G.T. on Gas	3 & 4	400	Aug. 2005
51.	Bhikki C.C. on Gas	1	630	Oct. 2005
52.	Thar Coal	1	600	Jan. 2006
53.	Ghakar G.T. on Gas	5	200	Apr. 2006
54.	Chashma Nuclear	2	325	July 2006
55.	Bhikki C.C. on Gas	2	630	Oct. 2006
56.	Thar Coal	2	600	Jan. 2007
57.	Sargodha G.T. on Gas	1 & 2	400	Apr. 2007
58.	Kohala HPP	1 - 5	590	June 2007

Sr. No.	Station Name	Unit No.	Installed Capacity (MW)	Date of Commissioning
59.	Sargodha G.T. on Gas	3	200	Aug. 2007
60.	Bhikki C.C. on Gas	3	630	Oct. 2007
61.	Thar Coal	3	600	Jan. 2008
62.	Kalabagh Hydel	1 - 4	1,200	Sep. 2008
63.	Bhikki C.C. on Gas	4	630	Dec. 2008
64.	Thar Coal	4	600	Jan. 2009
65.	Kalabagh Hydel	5 - 8	1,200	Sep. 2009
66.	Thar Coal	5	600	Jan. 2010
67.	Bhikki C.C. on Gas	5	630	Feb. 2010
68.	Tarbela Hydel	15 & 16	960	May 2010
69.	Neelum Jhelum Hydel	1	969	Sep. 2010
70.	Thar Coal	6	600	Jan. 2011
71.	Munda Dam Hydel Project	1 - 4	600	June 2011
72.	Chashma Nuclear	3	600	July 2011
73.	D.I. Khan C.C. on Gas	1	630	Oct. 2011
74.	Suki Kinari HPP	1	652	Dec. 2011
75.	Thar Coal	7	600	Jan. 2012
76.	Abbasian (Jhelum River)	1 - 3	245	June 2012
77.	Basha Hydel Project	1 - 3	840	July 2012
78.	Sargodha G.T. on Gas	4	200	Aug. 2012
79.	D.I. Khan C.C. on Gas	2	630	Oct. 2012
80.	Karrang HPP	1	454	Dec. 2012
81.	Thar Coal	8	600	Jan. 2013
82.	Gatti G.T. on Gas	1	200	Apr. 2013
83.	Kaigah HPP	1 - 4	549	June 2013
84.	Basha Hydel Project	4 - 6	840	July 2013
85.	Thar Coal	9	600	Aug. 2013
86.	Haveli C.C. on Gas	1 & 2	1,260	Oct. 2013
87.	Thar Coal	10	600	Jan. 2014
88.	Gatti G.T. on Gas	2 & 3	400	Apr. 2014
89.	Basha Hydel Project	7 - 9	840	July 2014
90.	Gatti G.T. on Gas	4 & 5	400	Aug. 2014
91.	Haveli C.C. on Gas	3 & 4	1,260	Oct. 2014
92.	Spath Gah HPP	1	851	Dec. 2014
93.	Thar Coal	11	600	Jan. 2015
94.	Bunji Hydel Project	1 - 4	1,290	June 2015
95.	Basha Hydel Project	10 - 12	840	July 2015
96.	Dasu Hydel Project	1 - 4	1,200	Dec. 2015
97.	Haveli C.C. on Gas	5	630	Mar. 2016
98.	Mid Country G.T. on Gas	1	200	Apr. 2016
99.	Dasu Hydel Project	5 - 8	1,200	June 2016
100.	Chashma Nuclear	3	600	July 2016
101.	Mid Country C.C. on Gas	1 & 2	1,260	Oct. 2016
102.	Thar Coal	12 & 13	1,200	Jan. 2017
103.	Mid Country G.T. on Gas	2	200	Apr. 2017
104.	Thakot Hydel Project	1 - 4	1,135	June 2017
105.	Mid Country G.T. on Gas	3 & 4	400	Aug. 2017
106.	Mid Country C.C. on Gas	3 & 4	1,260	Oct. 2017
107.	Thakot Hydel Project	5 - 8	1,135	Dec. 2017
108.	Thar Coal	14 & 15	1,200	Jan. 2018

Source: WAPDA

Table D7.2 Generation Development Program (May 1999)
(Based on Low Growth Scenario)

Sr. No.	Station Name	Unit No.	Installed Capacity (MW)	Date of Commissioning
1.	Southern Electric on FO	Pvt	115	Apr. 1999
2.	Japan Power on FO	Pvt	120	Apr. 1999
3.	Jagran (AJ&K) HPP	1	30	Apr. 1999
4.	Habibullah Coast on Gas	Pvt	140	May 1999
5.	Rousch Power on FO	Pvt	412	May 1999
6.	Reshun (Chitral) HPP	1	3	June 1999
7.	Fauji Kabirwala on Gas	Pvt	157	July 1999
8.	Altern Energy on Gas	Pvt	14	July 1999
9.	Uch Power (CC) on Gas	Pvt	586	Aug 1999
10.	Liberty Power on Gas	Pvt	235	Dec. 1999
11.	Saba Power on FO	Pvt	114	Dec. 1999
12.	Chashma Nuclear	1	325	Dec. 1999
13.	Sabah Shipyard (KESC)	Pvt	288	Jan. 2000
14.	Davis Energy on Gas	Pvt	10	Jan. 2000
15.	Chashma Low Head Hydel	1 - 8	184	Aug. 2000
16.	Ghazi Barotha Hydel	No. 1	290	Oct. 2002
17.	Ghazi Barotha Hydel	No. 2	290	Dec. 2002
18.	Ghazi Barotha Hydel	No. 3	290	Feb. 2003
19.	Ghazi Barotha Hydel	No. 4	290	Apr. 2003
20.	Ghazi Barotha Hydel	No. 5	290	June 2005
21.	Malakand III HPP	1 - 3	81	July 2005
22.	Matil-tan Dist. Swat HPP	1	84	July 2005
23.	New Bong Escape HPP	1	45	Aug. 2005
24.	Golan Gol HPP	1	106	Aug. 2005
25.	Summer Gah HPP	1	28	Sep. 2005
26.	Daral Khwar HPP	1	25	Sep. 2005
27.	Duber Khwar HPP	1	160	Oct. 2005
28.	Madar Batdara HPP	1	10	Oct. 2005
29.	Lower UCC HPP	1	6	Nov. 2005
30.	Main Line UCC HPP	1	6	Nov. 2005
31.	B.S. Link (Head) HPP	1	10	Dec. 2005
32.	Riali Saidpur – Jari Mirpur HPP	2 Proj	3	Dec. 2005
33.	Batal Khwar – Sai – Nomal HPP	3 Proj	22	Jan. 2006
34.	Doarian – Laut – Nagdar HPP	3 Proj	50	Jan. 2006
35.	Ronalia HPP	1	12	Feb. 2006
36.	Swat Scheme A1 HPP	1	105	Feb. 2006
37.	Allai Khwar HPP	1	163	Mar. 2006
38.	Khan Khwar HPP	1	70	Mar. 2006
39.	Kotli HPP	1	97	Apr. 2006
40.	Chakothi HPP	1	139	Apr. 2006
41.	Gul Pur (Poonch River)	1	116	May 2006
42.	Jinnah Low Head Hydel	1 - 8	96	May 2006
43.	Rajdhani (Poonch River)	1	86	June 2006
44.	Harighel HPP	1	53	June 2006
45.	Chashma Nuclear	2	325	July 2006
46.	Battar (AJ&K) HPP	1	5	Sep. 2006
47.	Sehra	1	65	Dec. 2006
48.	Taunsa Low Head Hydel	1 - 8	120	Mar. 2007
49.	Ghakar G.T. on Gas	1 & 2	400	Apr. 2007

Sr. No.	Station Name	Unit No.	Installed Capacity (MW)	Date of Commissioning
50.	Swat Scheme B1 HPP	1	429	June 2007
51.	Kohala HPP	1 - 5	590	Dec. 2007
52.	Thar Coal	1	600	Jan. 2008
53.	Ghakar G.T. on Gas	3	200	Apr. 2008
54.	Ghakar G.T. on Gas	4	200	Aug. 2008
55.	Bhikki C.C. on Gas	1	630	Oct. 2008
56.	Thar Coal	2	600	Jan. 2009
57.	Kalabagh Hydel	1 - 4	1,200	Sep. 2009
58.	Thar Coal	3	600	Jan. 2010
59.	Kalabagh Hydel	5 - 8	1,200	Sep. 2010
60.	Thar Coal	4	600	Jan. 2011
61.	Bhikki C.C. on Gas	2	630	May 2011
62.	Chashma Nuclear	2	600	July 2011
63.	Thar Coal	5	600	Jan. 2012
64.	Tarbela Hydel	15 & 16	960	May 2012
65.	Ghakar G.T. on Gas	5	200	May 2012
66.	Neelum Jhelum Hydel	1	969	Dec. 2012
67.	Thar Coal	6	600	Jan. 2013
68.	Sargodha G.T. on Gas	1	200	Apr. 2013
69.	Munda Dam Hydel Project	1 - 4	600	July 2013
70.	Basha Hydel Project	1 - 3	840	July 2013
71.	Bhikki C.C. on Gas	3	630	Oct. 2013
72.	Thar Coal	7	600	Jan. 2014
73.	Sargodha G.T. on Gas	2	200	Apr. 2014
74.	Basha Hydel Project	4 - 6	840	July 2014
75.	Suki Kinari HPP	1	652	Sep. 2014
76.	Bhikki C.C. on Gas	4	630	Oct. 2014
77.	Thar Coal	8	600	Jan. 2015
78.	Sargodha G.T. on Gas	3	200	Apr. 2015
79.	Abbasian (Jhelum River)	1 - 3	245	June 2015
80.	Basha Hydel Project	7 - 9	840	July 2015
81.	Bhikki C.C. on Gas	5	630	Oct. 2015
82.	Karrang HPP	1	454	Dec. 2015
83.	Thar Coal	9	600	Jan. 2016
84.	Chashma Nuclear	3	600	July 2016
85.	Basha Hydel Project	10 - 12	840	July 2016
86.	D.I. Khan C.C. on Gas	1	630	Oct. 2016
87.	Thar Coal	10	600	Jan. 2017
88.	Kaigah HPP	1 - 4	549	Feb. 2017
89.	Sargodha G.T. on Gas	4	200	Apr. 2017
90.	Bunji Hydel Project	1 - 4	1,290	July 2017
91.	D.I. Khan C.C. on Gas	2	630	Oct. 2017
92.	Thar Coal	11	600	Jan. 2018
93.	Spath Gah HPP	1	851	Apr. 2018

Source: WAPDA

Table D8.1 Hydel Stations in Operation with WAPDA

	LARGE	
1.	Tarbela	3,478 MW
2.	Warsak	240 MW
3.	Mangla	1,000 MW
	MEDIUM/SMALL	
4.	Dargai	20 MW
5.	Malakand	20 MW
6.	Karram Garhi	4 MW
7.	Chitral	1 MW
8.	Rasul	22 MW
9.	Chichoki Mallian	13 MW
10.	Shadiwal	13 MW
11.	Nandipur	14 MW
12.	Renala	1 MW
	TOTAL	**4,826 MW**

Table D8.2 Hydel Projects at Implementation

S.No.	Projects	River/Location	Capacity (MW)	Formation Involved
	UNDER IMPLEMENTATION			
1.	Chashma	Indus/Chashma	184	WAPDA
2.	Ghazi Barotha	Indus/Tarbela Attock	1,450	WAPDA
3.	Reshum	Chitral	2.8	SHYDO
4.	Battar	AJK	4.8	Private Sector
5.	Rohri	Rohri Canal	16	WAPDA
		Subtotal	1,658	
	READY FOR IMPLEMENTATION			
6.	Sai	Sai/Gilgit	10.5	M/O KANA (PPIB)
7.	Nomal	Nomal/Gilgit	3	M/O KANA (PPIB)
8.	Golen Gol	Chitral/Golen	106	WAPDA
9.	Kalabagh	Indus/Kallabagh	3,600	WAPDA
10.	Neelum-Jhelum	Neelum/MZD.AJK	969	WAPDA/Norconsult
11.	Jinnah	Indus	144	Private Sector
12.	Duber Khwar	Dubair Indus	160	Private Sector
13.	Allai Khwar	Allai Indus	125	Private Sector
		Subtotal	5,118	
		GRAND TOTAL	**6,775 MW**	

Table D8.3 Hydro Projects at Feasibility/Pre-feasibility Stage

Sr. No.	Projects Name	River Location	Capacity (MW)	Formation Involved	Status
	A. FEASIBILITY STUDY				
1.	3rd Malakand	Upper Swat Canal/Malakand	75	Wapda/Swabi Consultants	Feasibility study in progress
2.	Munda Dam	Swat	600	Wapda	PC-II Proforma submitted to GONWFP for ECNEC approval for feasibility study
3.	Kurram Tangi Dam	Kurram	40	Wapda	PC-II updated and being submitted to GONWFP for feasibility study
4.	Gomal Zam	Gomal	17.4	Wapda	PC-II for Detail engineering Design and Project Planning Report submitted to GONWFP for ECNEC approval
5.	C.J. Link	C.J. Link	33	Wapda/GTZ	Feasibility study in progress
6.	Taunsa Barrage	Indus/Tanunsa	120	Wapda/ SOGEX/GTZ	-do-
7.	D.G.Khan Link-III	D.G.Khan Canal	7	Wapda/GTZ	-do-
8.	Kohala	Jhelum/	500	AJKHB	-do-
9.	Chakothi-Hattian	Jhelum	139	Wapda/Shatkraft, Norway	PC-II submitted for approval for F.S.
10.	Harighel-Dhalkot	Jhelum	53	Wapda/Shatkraft, Norway	-do-
11.	Guddu Barrage	Indus/Guddu	34	Wapda/GTZ	F.S. in progress
12.	Doyian	Astore	425	Wapda/GTZ	PC-II submitted for approval
13.	Phandar	Phandar(Chizar)	87	Wapda/GTZ	-do-
14.	Naltar Phase-III	Naltar Gah	22	Wapda/GTZ	-do-
15.	Basho Phase-II	Basho (Skardu)	9	Wapda/GTZ	-do-
16.	Harpo Phase-II	Harpo(Rondu)	41	Wapda/GTZ	-do-
		Sub-Total	2,202		
	B. PRE-FEASIBILITY STUDY				
17.	Bunji	Indus/Near Gilgit	1,500	Wapda	Pre-Feasibility study in progress
18.	Hamuchal	Gilgit	16	Wapda	Pre-Feasibility study in progress
19.	Tarbela Extension	Indus/Tarbela Dam	960	Wapda	Inception
20.	Basha Dam	Indus/Chilas	3,360	Wapda	Pre-Feasibility study in progress
		Sub-Total	5,836		
		GRAND TOTAL	8,038		

Table 8.4 Identified Projects with WAPDA

S. No.	River/Location		No. of Schemes	Total Capacity (MW)	Remarks
	INDUS				
	i) Major Schemes :		8	7,142	Inventory and Ranking by Wapda/MECO 1984.
1.	Dassu	2712			PC-II for Dassu submitted in 1990.
2.	Thakot	1043			
3.	Pattan	1172			
4.	Rakhiot	670			
5.	Yulbo	710			
6.	Tungas	625			
7.	Kanch	122			
8.	Sher Qila	88			
9.	ii) Medium Schemes		12	500	Ranking by WAPDA/ GTZ, 1992-97, Details in Annex-I.
	JHELUM				
	i) Major Schemes		6	973	Ranking by WAPDA/GTZ, 1995
10.	Abbassian	245			
11.	Mahl	245			
12.	Azad Pattan	222			
13.	Karot	240			
14.	Harivola	12			
15.	Nakar	9			
16.	ii) Small Schemes in Jhelum Basin		17	30	Ranking by WAPDA/GTZ, 1993-96
	PUNCH				
	i) Medium Schemes :		5	430	Ranking by WAPDA/GTZ, 1992
17.	Sehra	65			
18.	Kotli	97			
19.	Rajdhani	86			
20.	Gulpur	116			
21.	Barali	66			
22.	CANAL FALLS		593	565	Ranking by WAPDA/GTZ, 1982-92 (Annex-II)
			TOTAL	**9,640**	

Table D8.5 SHYDO Projects

Sr.No.	Projects	Tributary/River/Location	Capacity (MW)
	Indus		
1.	Kaigah	Kandiah-Indus	549
2.	Karrang	Kandiah-Indus	454
3.	Spat Gah Chor Nala	Spat-Indus	819
4.	Dongai Gah	Spat-Indus	32
5.	Summer Gah	Summer-Indus	22
6.	Ranolia	Renolia-Indus	12
7.	Jabori	Siran-Indus	8
8.	Karora New	Khan Khwar-Indus	8
9.	Ushiri	Ushiri-Indus	6
10.	Khan Khwar	Khan Khwar-Indus	70
	Swat		
11.	Mirkhani-Khazana	Panjkura-Swat	110
12.	Mirkhani-Kalangai	Swat	256
13.	Gabral - Kalam	Swat	105
14.	Kalam - Kedam	Swat	429
15.	Kedam - Madyam	Swat	147
16.	Shermai-Darora	Panjkura-Swat	115
17.	Matiltan (Ushu)	Ushu-Swat	85
18.	Daral Khwar	Daral-Swat	25
19.	Batal Khwar	Batal-Swat	8
20.	Kedam Khwar	Kedam Khwar-Swat	7
	Kunhar		
21.	Patrind	Kunhar	133
22.	Naran	Kunhar	219
23.	Suki Kinari	Kunhar	652
24.	Bhimbal	Bhimbal-Kunhar	8
25.	Tangar	Bhimbal-Kunhar	13
		Total	**4,292**

N.B. Latest status to be confirmed with SHYDO

Table D8.6 Medium Schemes Identified in Northern Areas

Sr. No.	Name of Scheme	Location	Capacity (MW)	Formation
1.	Baru	Baru (Ghizar)	30	HEPO/GTZ
2.	Chhantir	Chhantir (Ishkuman)	16	HEPO/GTZ
3.	Naltar Phase-V	Naltar Gilgit	32	HEPO/GTZ
4.	Jaglot	Jaglot (Gilgit)	16	HEPO/GTZ
5.	Daintar	Daintar (Nagar)	18	HEPO/GTZ
6.	Altit	Ayeenabad (Hunza)	250	HEPO/GTZ
7.	Skardu Phase-III	Satpara (Skardu)	14	HEPO/GTZ
8.	Kachura Phase-V	Kachura (Skardu)	32	HEPO/GTZ
9.	Basho Phase-III	Basho (Skardu)	13	HEPO/GTZ
10.	Tormic Phase-II	Tormic (Rondu)	41	HEPO/GTZ
11.	Talu	Talsalo (Rondu)	25	HEPO/GTZ
12.	Parishing Phase-IV	Parishing (Astore)	13	HEPO/GTZ
		Total	**500**	

Table D8.7 List of Low Head Sites

The schemes are included in Final Draft Report on Inventory of Low Head Hydropower Potential at Barrages and Canal Falls in Pakistan publised by WAPDA in collaboration with GTZ of Germany in June 1992.
They include all the rivers and canals of Pakistan. The capacity varies from below 1 MW to 14 MW. To give a fair idea of the potential a break up is given as below.

Capacity MW	Number of Schemes		
	Perenial	Non-Perenial	Total
0 - 1	381	75	456
1 - 2	53	10	63
2 - 3	20	7	27
3 - 4	10	1	11
4 - 5	10	--	10
5 - 6	3	--	3
6 -7	6	1	7
7 - 8	3	2	5
8 - 9	--	--	--
9 - 10	3	--	3
10 - 11	1	1	2
11 - 12	--	--	--
12 - 13	2	1	3
13 - 14	--	1	1
6 B.S. Link (Tail)	1	--	1
9 B.S. Link (RD-106)	1	--	1
Total	**494**	**99**	**593**

Table D8.8 Prospective WAPDA Hydropower Project for Implementation under New Power Policy
(Ready for Implementation)

Sr. No.	Project	River/Location	Capacity	Estimated Cost	Annual Energy	Cost/kWh	Remarks
			MW	(Million US $)	(GWh)	Rs.	
1	Kalabagh Dam Proje	Indus/Kalabagh	3,600	5,701	11,749	0.63	Ready for Implementation
2	Neelum Jhelum	Neelum/Azad Kash	930	2,563	5,060	2.31	-do-
3	Golen Go	Golen/Chitral	106	99	437	2.97	Detailed engineering in hand
4	Nomal (N.A.)	Nomal/Gilgit	3	3	17	-	Ready for Implementation
5	Sai (N.S.)	Sai/Gilgit	10.5	16	85	2.41	-do-
6	Jinnah	Indus/Jinnah Barrag	144	387	868	5.54	-do-
7	Duber Khwar	Dubair Indus	160	147	-	-	
8	Allai Khwar	Allai Indus	125	93	-	-	

Table D8.9 Prospective WAPDA Hydropower Project for Implementation under New Power Policy (Feasibility/Pre-feasibility Stage)

Sr. No.	Project	River/Location	Capacity	Estimated Cost	Annual Energy	Cost/kWh	Remarks
			MW	(Million US $)	(GWh)	Rs.	
1	Gomal Zam	Goma	17	N.A.	84	-	Feasibiity completed.
2	Basha Dam Project	Indus/Chilas	3,360	4,234	14,510	3.74	Pre-feasibiity completed.
3	Munda Dam Project	Swat	600	930	1,845	3.39	Feasibiity in progress
4	Kohala	Jehlum/Azad Kashmir	1,000	2,250	5,470	5.14	-do-
5	C.J. Link	C.J. Link Canal Tail	33	30	95	4.15	-do-
6	Taunsa	Indus/Taunsa Barrage	120	296	624	5.91	-do-
7	Guddu	Indus/Guddu Barrage	34	140	164	-	-do-
8	Kurram Tangi Dam	Kurram	40	N.A.	193	-	PC-II being submitted for feasibility study
9	Dasu	Indus/Dasu	2,712	3,107	16,781	2.70	PC-II submitted for feasibility study
10	Chakothi - Hattian	Jhelum	139	425	1,119	4.70	-do-
11	Harigehl - Dalkot	Jhelum	53	102	274	4.68	-do-
12	Doyian	Astore (N.A.)	425	346	1,939	2.34	-do-
13	Phander	Phander (N.A.)	87	76	386	2.60	-do-
14	Naltar Phase-III	Naltar Gah (N.A.)	22	24	116	2.70	-do-
15	Basho Phase-II	Basho (Skardu)	10	9	49	2.51	-do-
16	Harpo Phase-II	Harpo (N.A.)	41	33	219	1.99	-do-
17	Hamuchal	Gilgit (N.A.)	16	26	77	-	Pre-feasibiity completed.
18	Bunji	Indus/near Gilgit	1,290	2,689	8,205	5.80	PC-II approved by CCE

Table D8.10 Prospective WAPDA Hydropower Project for Implementation under New Power Policy (Identification/Ranking Stage)

Sr. No.	Project	River/Location	Capacity	Estimated Cost	Annual Energy	Cost/kWh	Remarks
			MW	(Million US $)	(GWh)	Rs.	
1	High Thakot	Indus/Thakot	2,415	5,200	18,109	6.4	Inventory and Ranking by WAPDA/MECO. 1984
2	Rakhiot	Indus/Rakhiot	670	2,216	4,357	9.7	-do-
3	Yulbo	Indus/Yulbo	710	2,852	4,532	13.5	-do-
4	Tungas	Indus/Tungas	625	3,472	3,956	2.2	-do-
5	Kanch	Indus/Kanch (N.A.)	122	-	588	-	-do-
6	Sher Qila	Indus/Sher Qila (N.A.)	88	-	424	-	-do-
7	Baru	Ghizar/Baru	30	32	157	2.71	Identification and Ranking, GTZ/WAPDA, 1992-
8	Chhantir	Ishkuman/Chhantir(N.A.)	16	29	81	4.66	-do-
9	Nalter Phase-V	Nalter Gah/Nomal (N.A.)	32	40	165	3.16	-do-
10	Jaglot	Jaglot/Gilgit	16	18	80	2.99	-do-
11	Daintar	Daintar (Nagar)	18	17	91	2.51	-do-
12	Altit	Ayeenabad (Hunza)	250	454	1,248	4.78	Identification and Ranking, GTZ/WAPDA, 1992-97
13	Skardu	Satpana (Skardu) N.A.	14	18	58	4.18	-do-
14	Kachura Phase-V	Kachura (Skardu)	32	-	154	-	-do-
15	Pasho - Phase-III	Basho (Skardu)	14	13	67	2.51	-do-
16	Tormic	Tormic (N.A.)	41	32	221	1.89	-do-
17	Talu	Talsalo (N.A.)	25	22	129	2.21	-do-
18	Parishing Phase-IV	Parishing (Astore) N.A.	13	18	64	3.65	-do-
19	Abbassian	Jhelum/Abbasian	245	818	1,593	6.34	Ranking by WAPDA/GTZ
20	Mahl	Jhelum/Mahl	245	997	1,631	7.52	-do-
21	Azad Pattan	Jhelum/Azad Pattan	222	977	1,485	8.7	-do-
22	Karrot	Jhelum/Karrot	240	869	1,614	6.63	-do-
23	Hariyola	Jhelum	12	N.A.	58	-	-do-
24	Natar	Jhelum	9	N.A.	43	-	-do-
25	Sehra	Punch	65	158	398	4.94	Ranking by WAPDA/GTZ
26	Kolti	Punch	97	213	597	4.46	-do-
27	Gulpur	Punch	116	386	703	6.78	-do-
28	Barali	Punch	66	222	399	6.87	-do-

Table D8.11 Identified and Planned Hydropower Projects in Pakistan

	Projects	Capacity (MW)	Capital Cost (Mill. U.S $)	Installed Cost (U.S $/kW)	Annual Energy (GWh)	Energy Cost (cent/kWh)	Comm. Year	Project Status
	MULTI PURPOSE							
1	Karrang	454	422	930	1,635	3.40	2008	Identified
2	Basha	3,360	4,234	1,260	14,510	3.74	2012	Pre-Feasibility
3	Kalabagh	3,600	5,701	1,500	11,800	0.63	2007	Ready for const.
4	Tarbela 4th Extension	960	509	530	1,610	4.40	2009	Identified
5	Kachura-V	32	50	1,568	146	4.51	2004	Identified
6	Swat scheme A1	105	138	1,310	390	4.51	2004	Identified
7	Munda	600	930	1,550	1,845	3.39	2008	Identified
8	Kai Gah	549	1,038	1,890	1,942	6.71	2007	Identified
9	Naran	219	867	3,960	866	12.34	2007	Identified
	Subtotal	9,879	13,889	1,375	34,744			
	HIGH HEAD ON TRIBUTARIES OF INDUS RIVER IN NWFP AND NORTHERN AREAS							
1	Allai Khwar	124	112	900	518	2.83	2003	Feasibility
2	Golen Gol	106	99	934	437	2.97	2003	Feasibility
3	Duber Khwar	170	182	1,070	750	3.15	2003	Feasibility
4	Doyain	425	346	815	1,939	2.34	2005	Identified
5	Phandar	86	76	889	386	2.60	2005	Identified
6	Summer Gah	28	21	750	105	2.63	2001	Feasibility
7	Tormie-II	41	32	777	221	1.89	2005	Identified
8	Harpo-II	41	33	810	219	1.99	2005	Identified
9	Talu	25	22	870	129	2.21	2005	Identified
10	Basho-II	10	9	938	49	2.51	2005	Identified
11	Daintar	18	17	967	91	2.51	2005	Identified
12	Basho-III	14	13	913	67	2.51	2005	Identified
13	Naltar-III	22	24	1,085	116	2.70	2005	Identified
14	Baru	30	32	1,079	157	2.71	2005	Identified
15	Sai	10	16	1,560	85	2.41	2005	Feasibility
16	Jaglot	16	18	1,140	80	2.99	2005	Identified
17	Naltar-V	32	40	1,239	165	3.16	2005	Identified
18	Malakand-III	81	112	1,384	425	3.46	2002	Feasibility
19	Parishing	13	18	1,369	64	3.65	2005	Identified
20	Swat scheme B1	429	489	1,140	1,783	3.55	2006	Identified
21	Suki Kinari	652	795	1,220	2,797	3.66	2007	Identified
22	Khan Khwar	73	80	1,100	281	3.70	2002	Feasibility
23	Spath Gah	851	1,064	1,250	3,661	3.73	2010	Identified
24	Matiltan	84	110	1,310	346	4.08	2003	Feasibility
25	Skardu-IV	13	18	1,421	58	4.18	2005	Identified
26	Chhantir	16	29	1,797	81	1.66	2005	Identified
27	Altit	250	454	1,817	1,248	4.78	2006	Identified
	Subtotal	3,660	4,261	1,165	16,258			
	HIGH HEAD IN JHELUM RIVER BASIN							
1	Neelum Jhelum	930	2,563	1,580	5,060	2.31	2008	Ready for const.
2	Kotli	97	213	2,200	597	4.46	2004	Identified
3	Hari ghel	53	102	1,920	274	4.68	2004	Identified
4	Ghakothi-Hattian	139	425	3,060	1,119	4.70	2003	Identified
5	Schra	65	158	2,430	398	4.94	2005	Identified
6	Kohala	1,000	2,250	2,250	5,470	5.14	2007	Pre-Feasibility
7	Abbasian	245	818	3,340	1,593	6.34	2008	Identified
8	Rajdhani	86	261	3,040	507	6.36	2005	Identified
9	Karot	240	869	3,620	1,614	6.63	2011	Identified
10	Gulapur	116	386	3,330	703	6.78	2005	Identified
11	Barali	66	222		399	6.87	2006	Identified
12	Mahl	245	997		1,631	7.52	2009	Identified
13	Azad Patan	221	977		1,485	8.07	2010	Identified
	Subtotal	3,503	10,241	1,985	20,850			
	HIGH HEAD ON MAIN INDUS RIVER				(CAPACITIES NEED TO BE UPGRADED)			
1	Dasu	2,712	3,107	1,146	16,781	2.70	2014	Identified
2	Bunji	1,290	2,689	2,084	8,205	5.80	2012	Identified
3	High Thakot	2,415	5,200	2,153	18,109	6.40	2016	Identified
4	Raikot	670	2,216	3,307	4,357	9.70	2020	Identified
5	Yulbo	710	2,852	4,017	4,532	13.50	2022	Identified
6	Tangus	625	3,472	5,555	3,956	20.20	2024	Identified
	Subtotal	8,422	19,536	2,320	55,940			
	LOW HEAD							
1	Bong H.P.P	45	70	1,556	290	3.17	2002	Feasibility
2	Chashma-Jhelum Link	23	30	1,304	95	4.15	2003	Feasibility
3	Jinnah	144	387	2,688	868	5.54	2003	Feasibility
4	Taunsa	120	296	2,467	624	5.91	2003	Feasibility
5	Rohri	16	46	2,875	102	5.92	2002	Feasibility
	Subtotal	348	829	2,383	1,979			
	TOTAL	25,812	48,756	1,845	129,771			

APPENDIX D

FIGURES

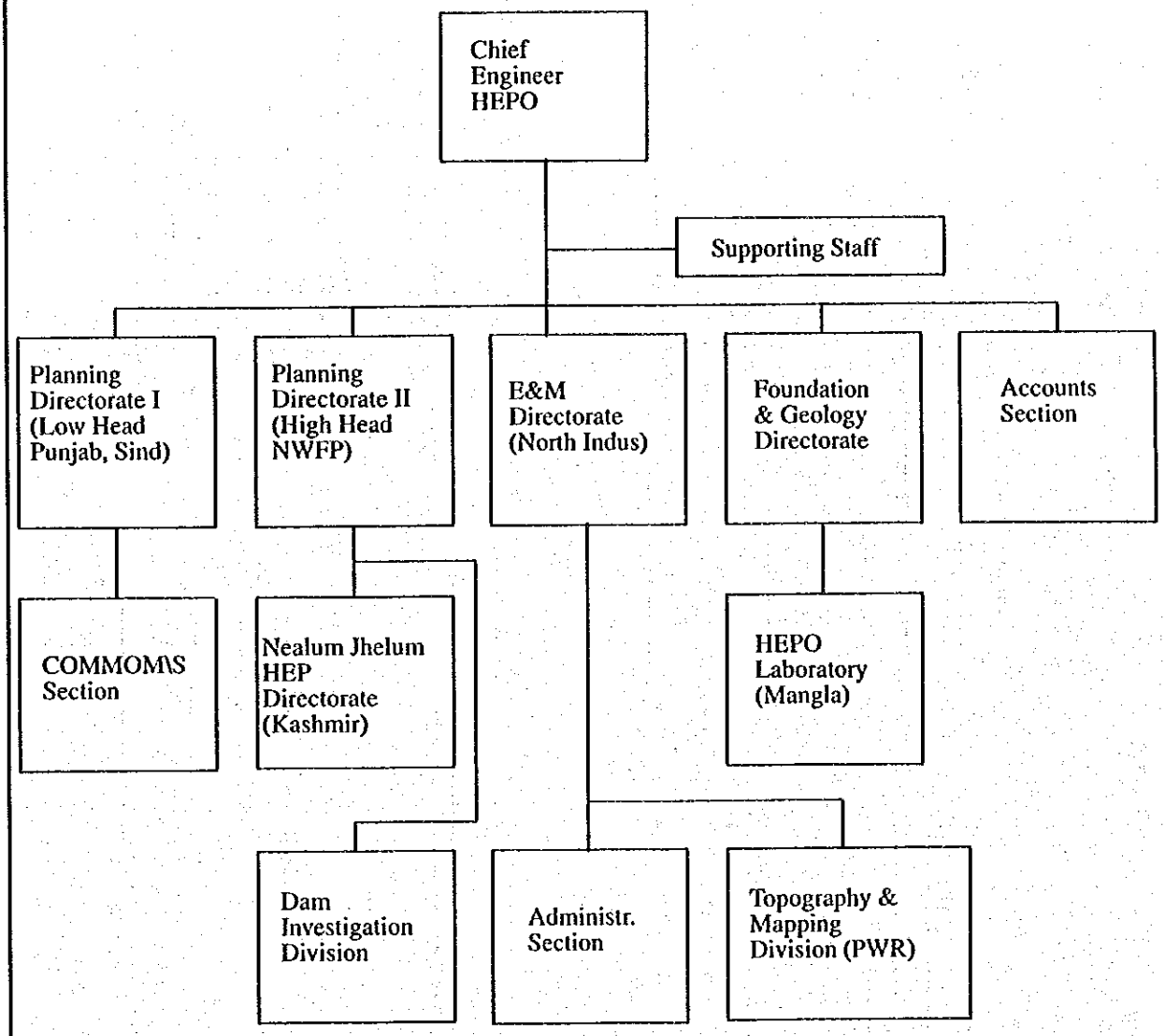

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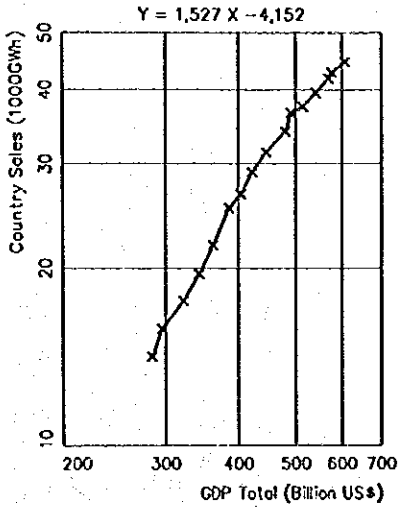
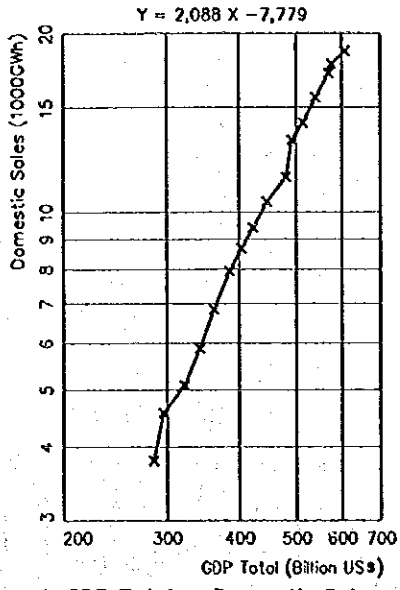
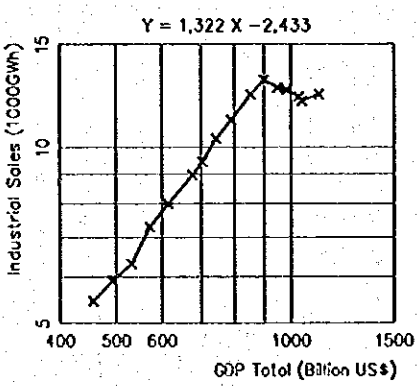
Figure D1.1
Organization of HEPO



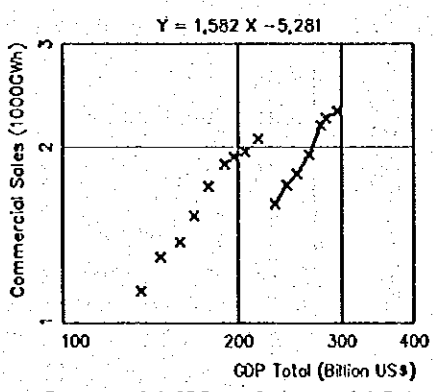
GDP Total vs Country Sales



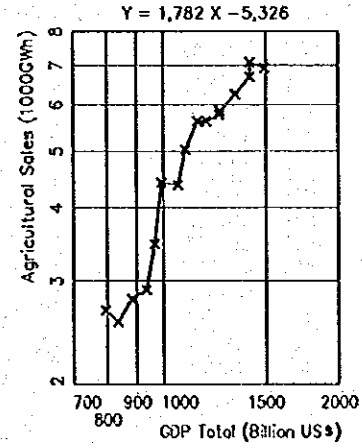
GDP Total vs Domestic Sales



Min.& Mfg. GDP vs Industrial Sales

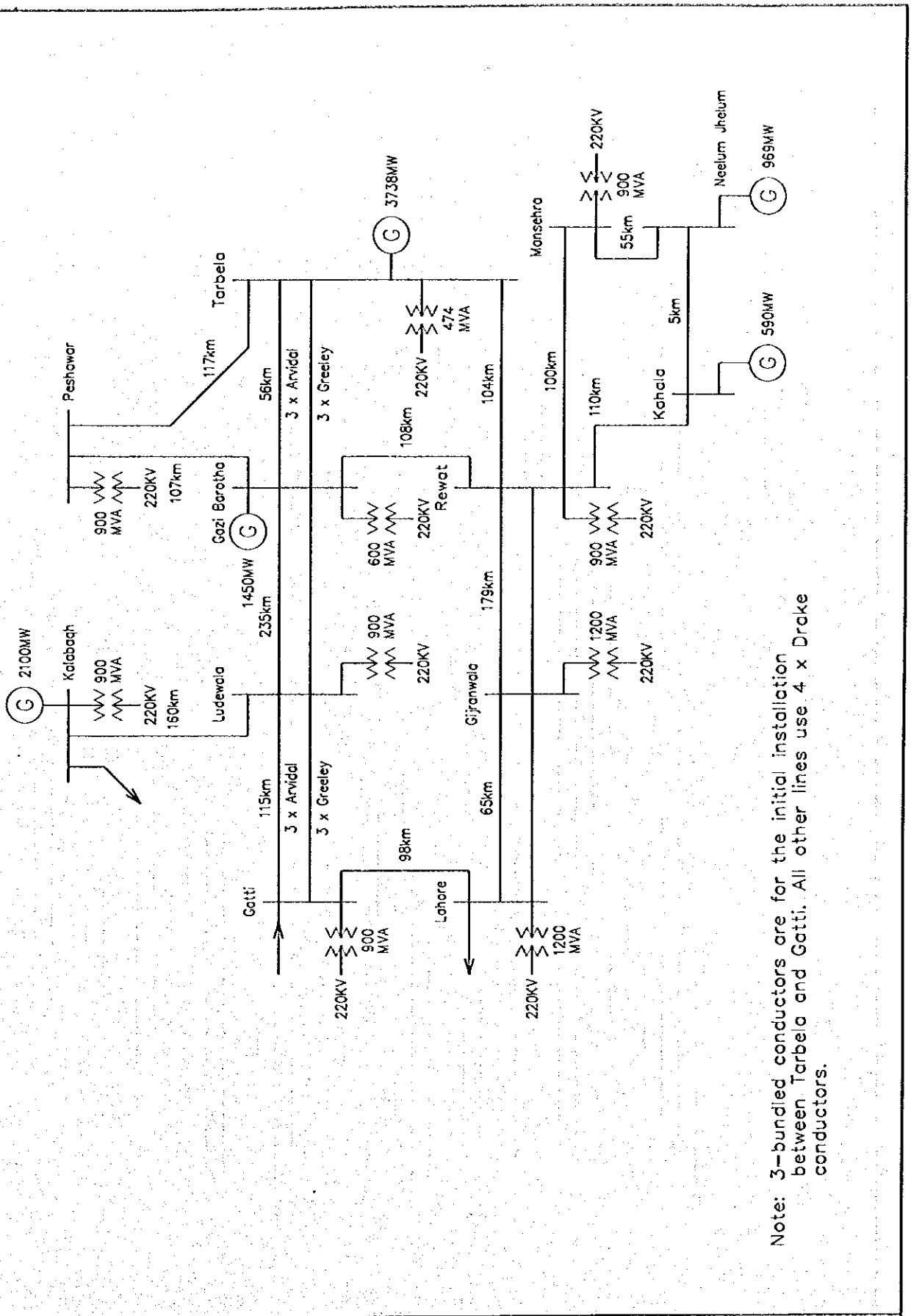


Commercial GDP vs Commercial Sales



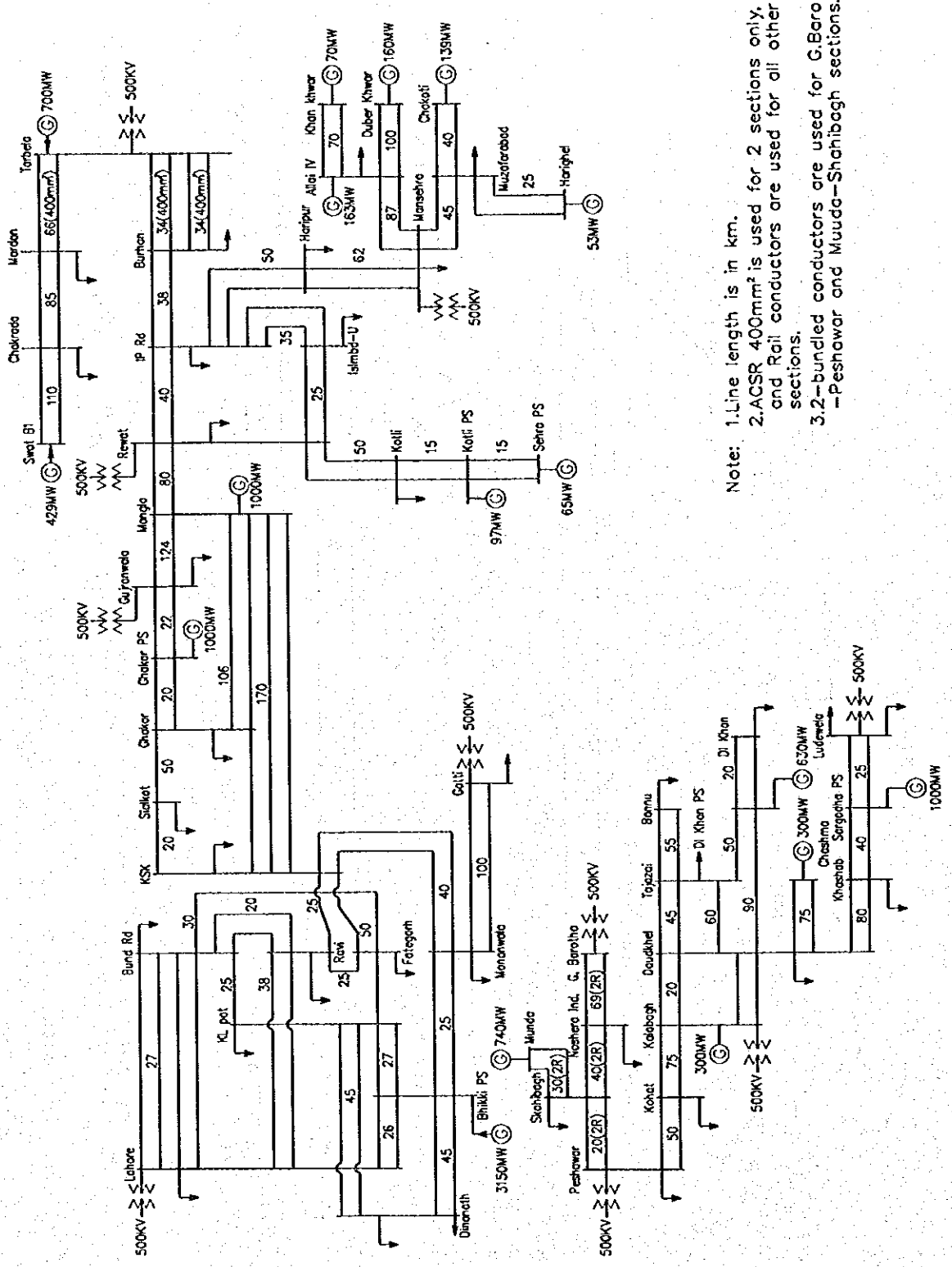
Agricultural GDP vs Agricultural Sales

FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D4.1** **GDP vs Energy Sales Past Correlation**



Note: 3-bundled conductors are for the initial installation between Tarbela and Gatti. All other lines use 4 x Drake conductors.

FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.1** **Configuration of 500 kV System in 2010**



FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.2** **Configuration of 220 kV System in 2010**

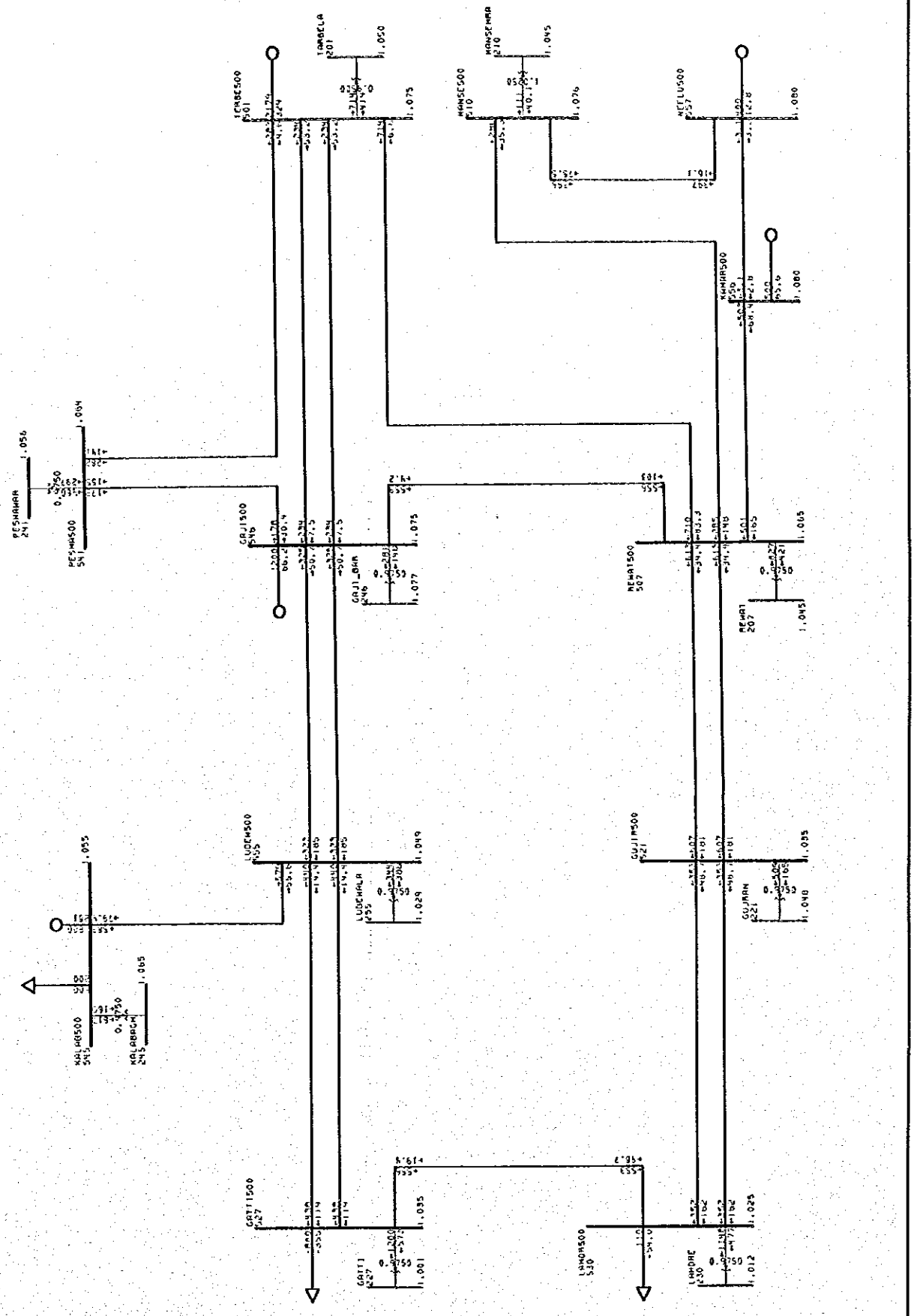


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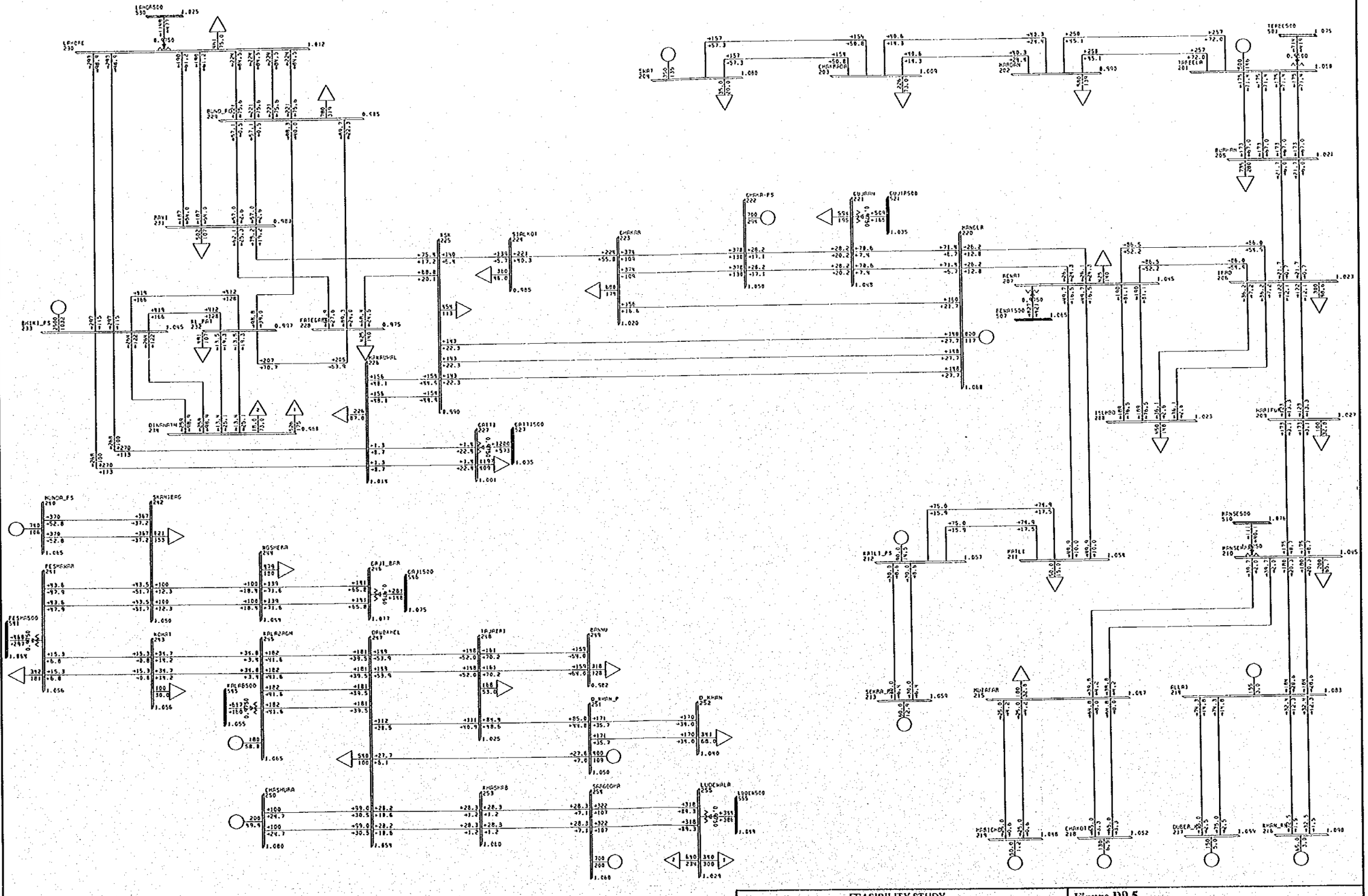
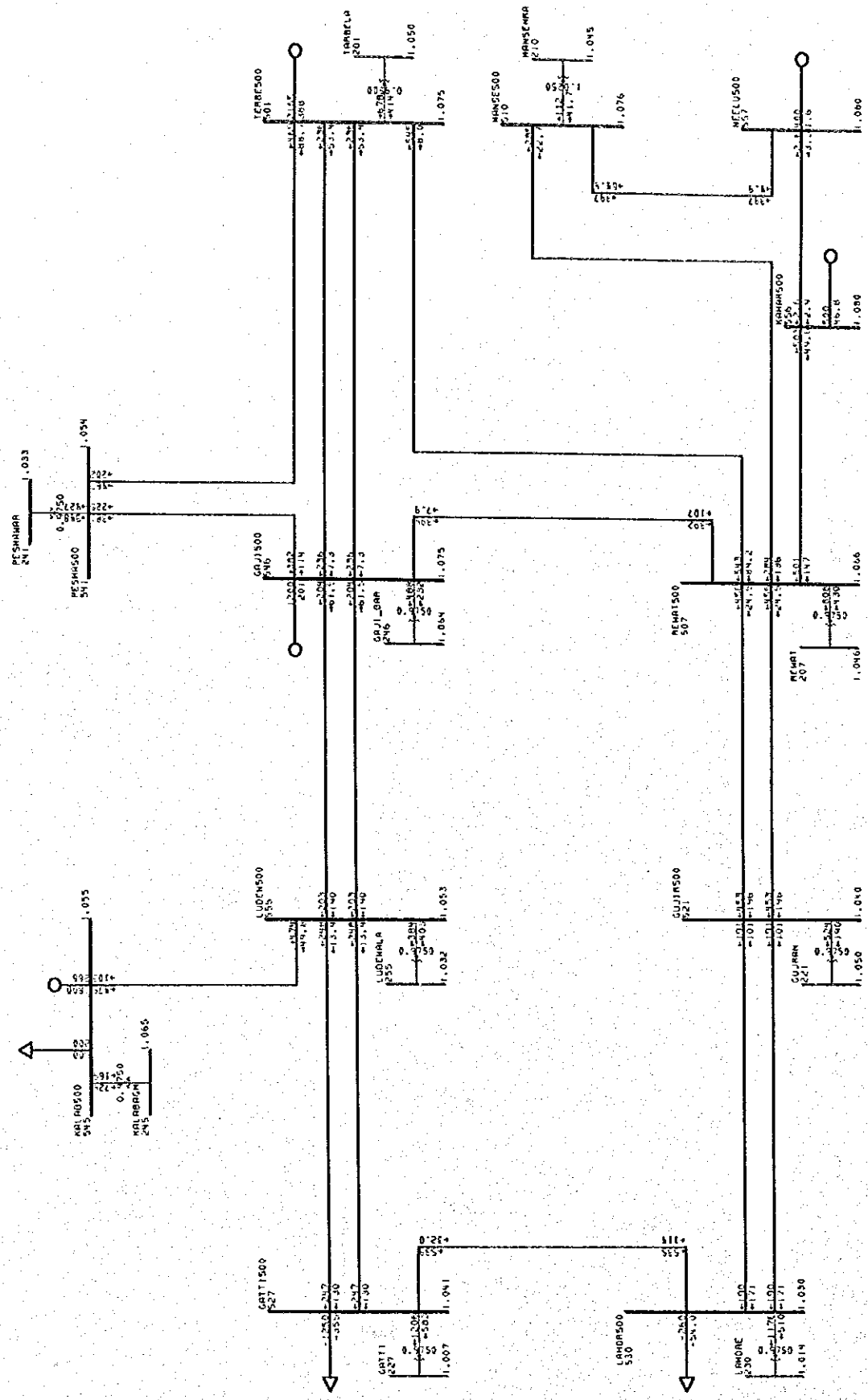
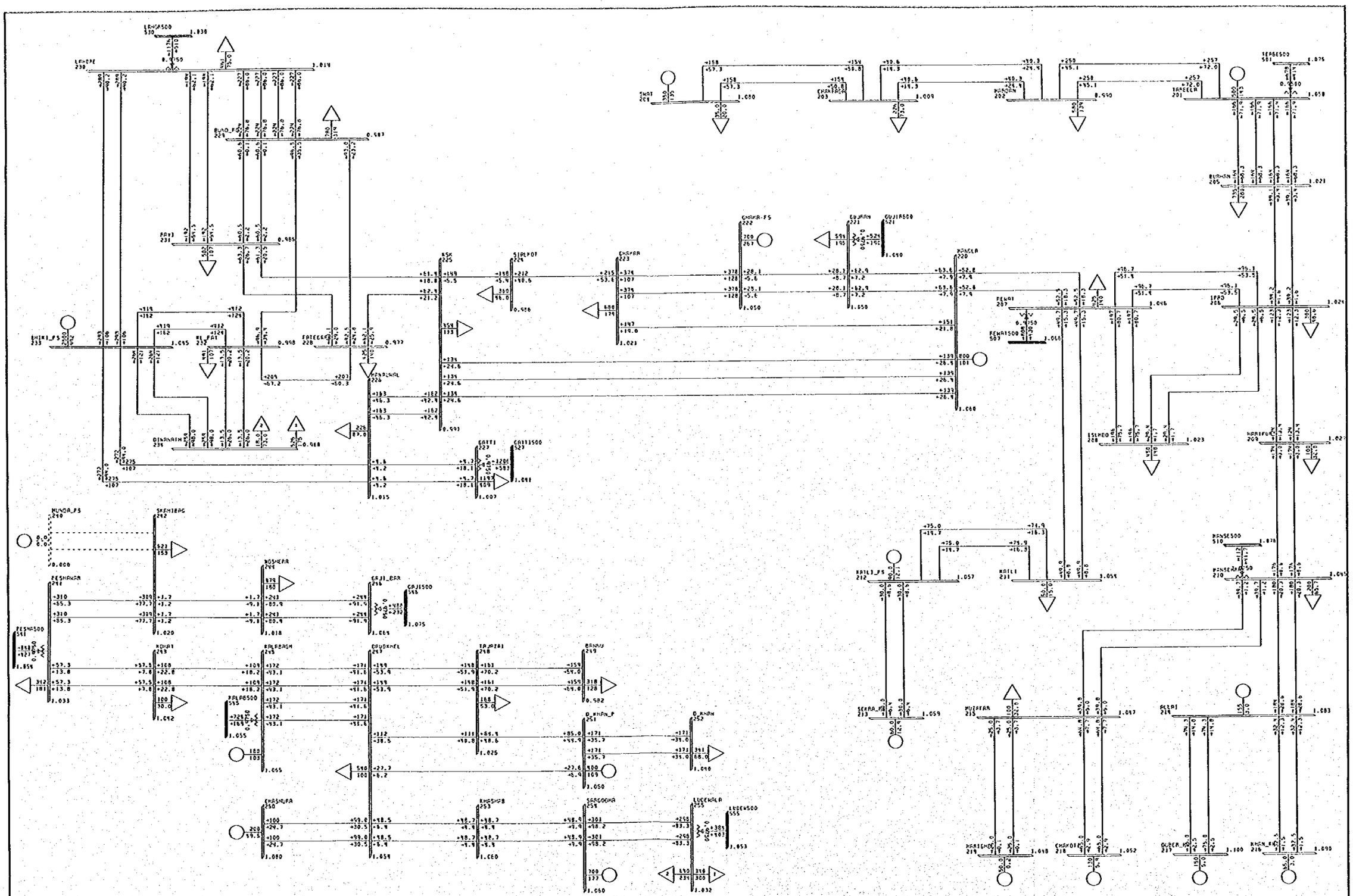
Figure D9.4
Power Flow on 500 kV System (1)
Connection to Shahibagh Substation Munda Output is 740 MW



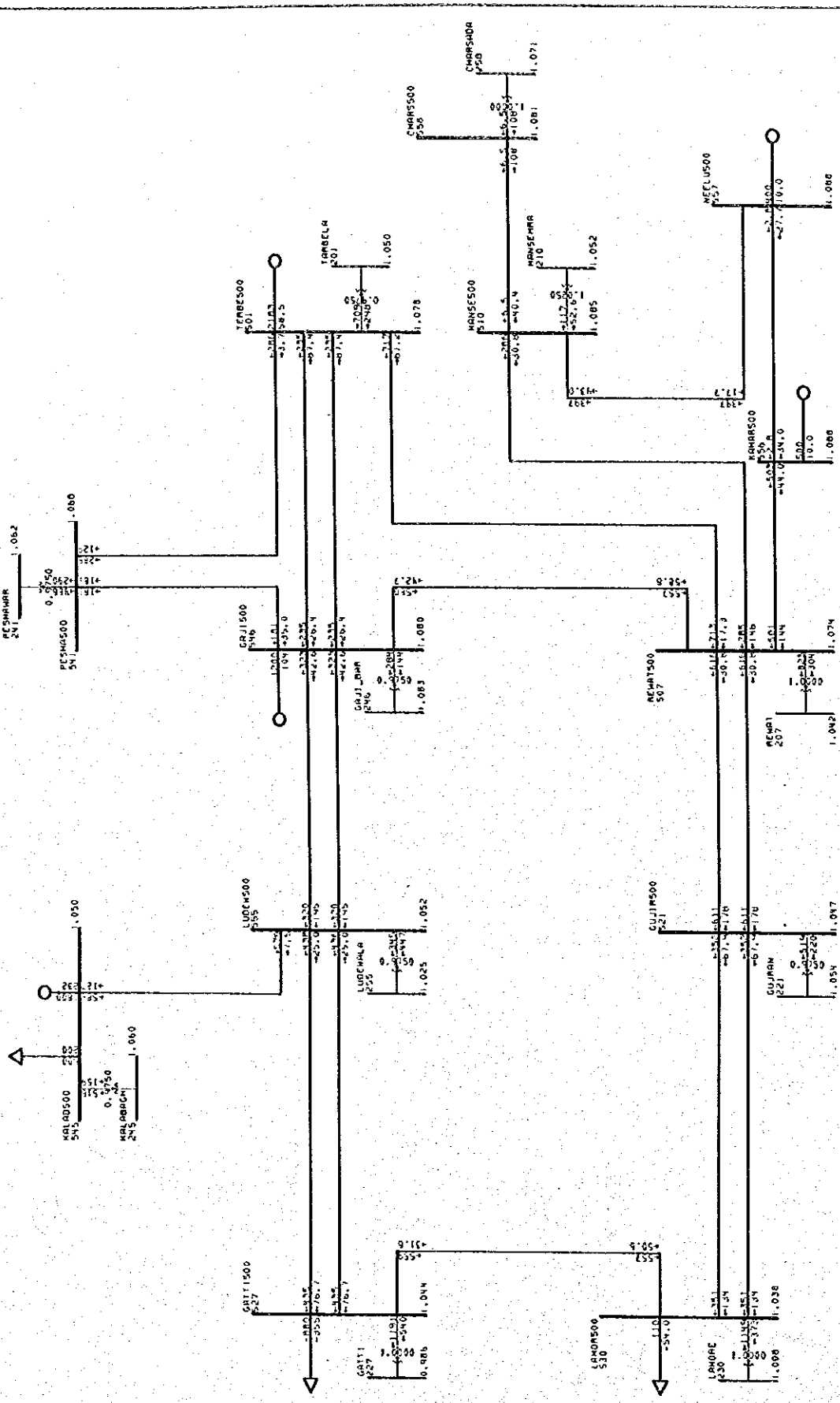
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.5** **Power Flow on 220 kV System (1)** **Connection to Shahibagh Substation** **Munda Output is 740 MW**



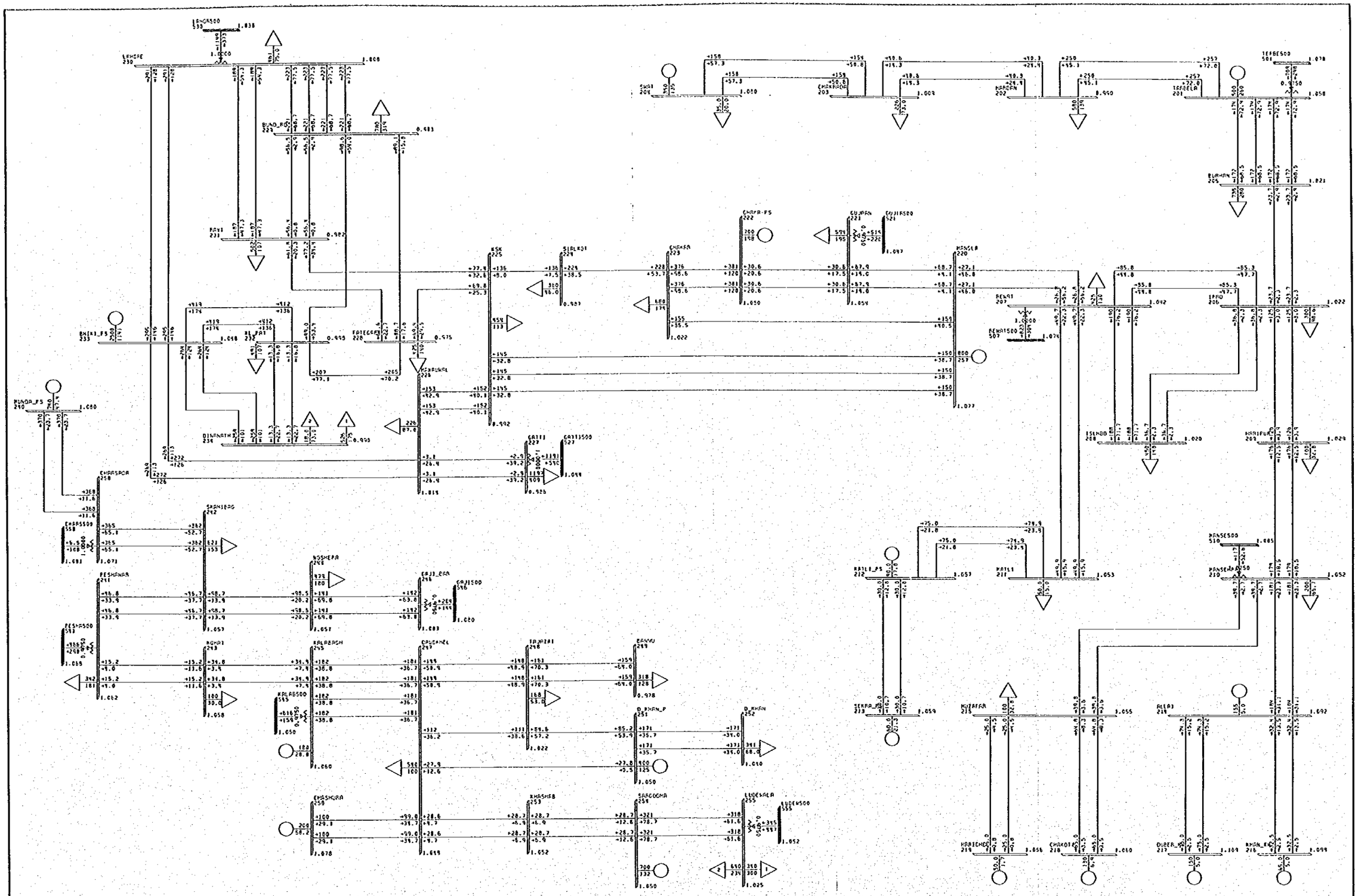
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.6** **Power Flow on 500 kV System (2)** Connection to Shahibagh Substation Munda Output is 0 MW



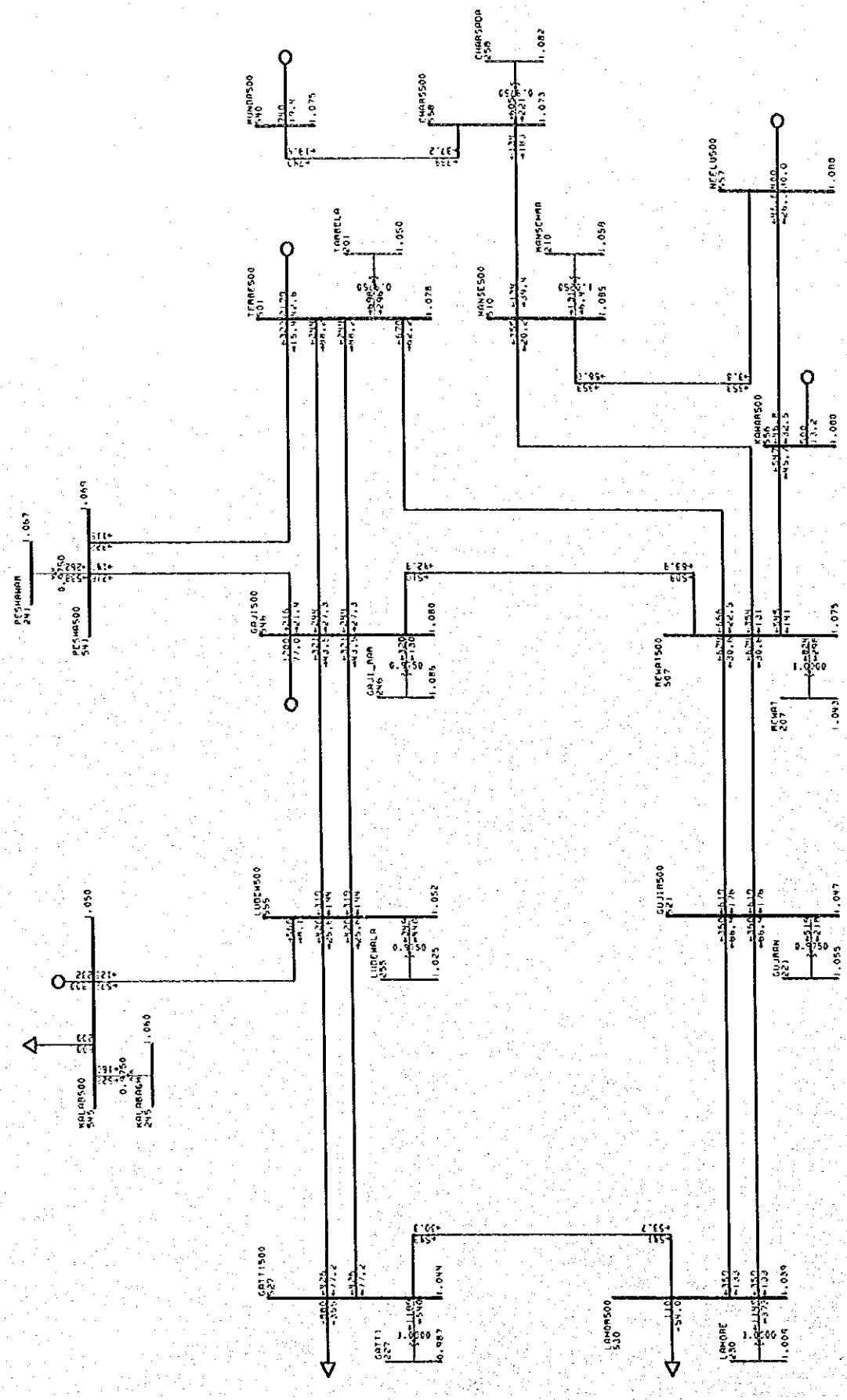
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN	**Figure D9.7** **Power Flow on 220 kV System (2)** Connection to Shahibagh Substation Munda Output is 0 MW
JAPAN INTERNATIONAL COOPERATION AGENCY	



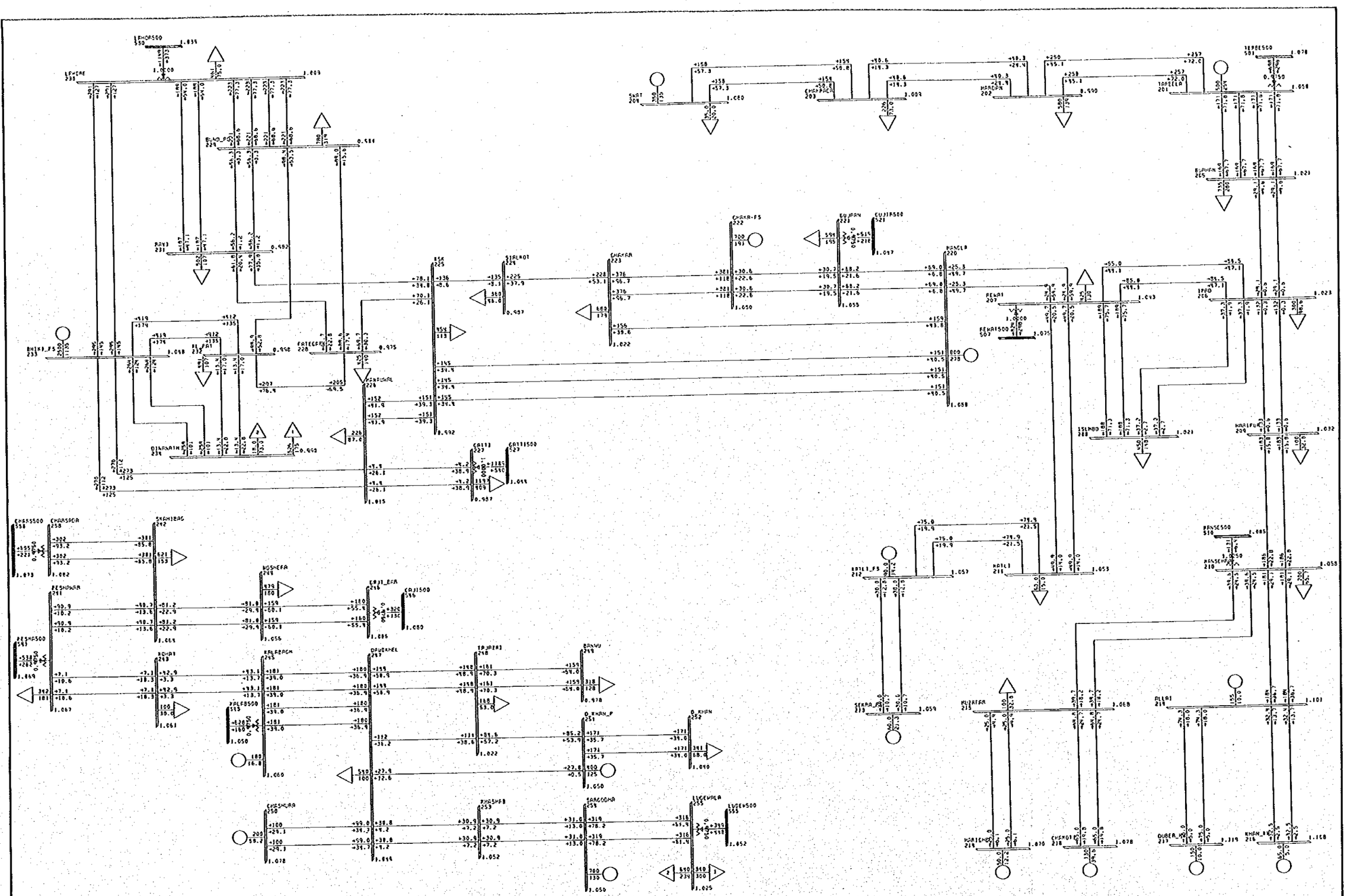
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.8** **Power Flow on 500 kV System (3)** Connection to Charsada Substation (220 kV side) Munda Output is 740 MW



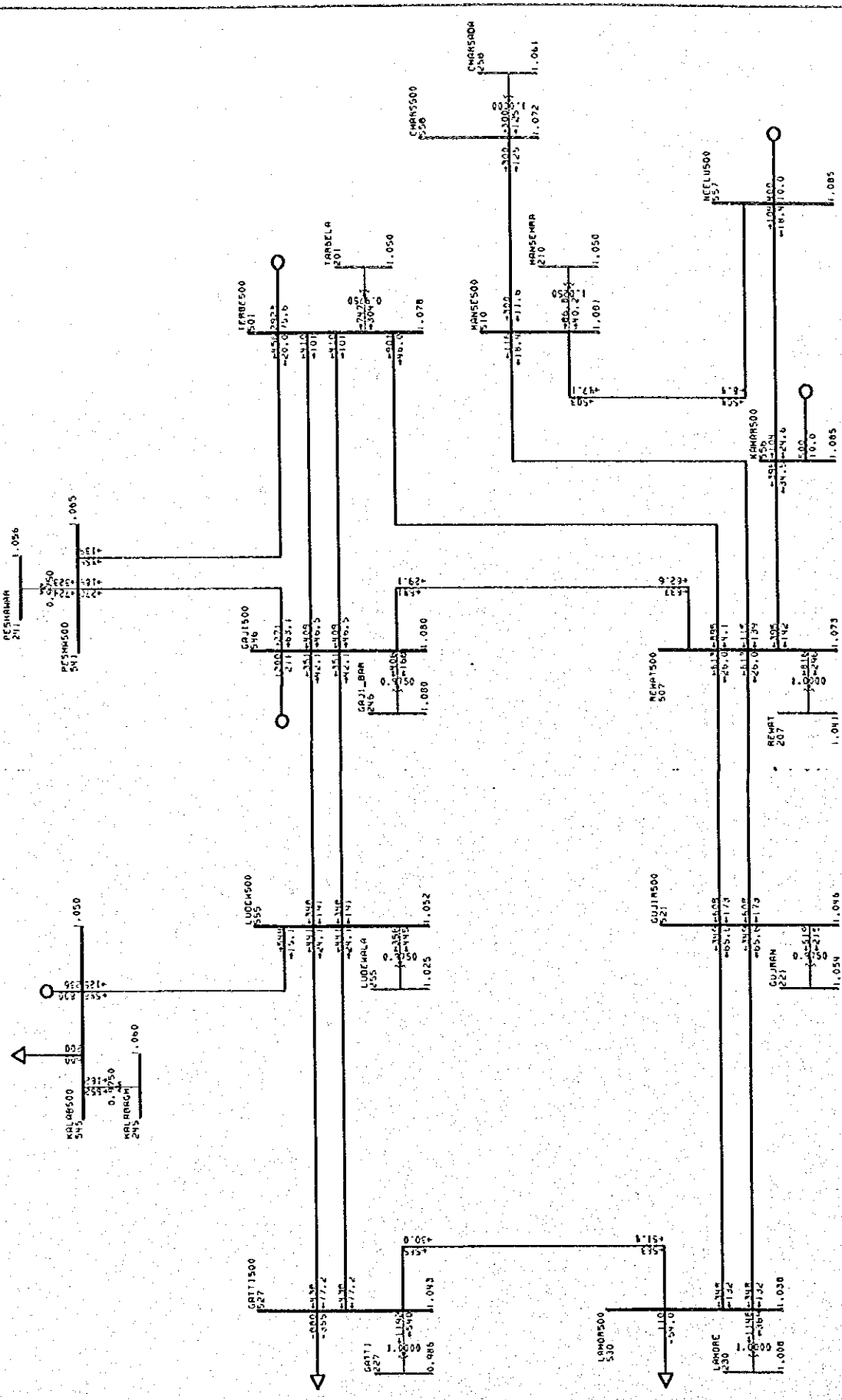
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.9** **Power Flow on 220 kV System (3)** Connection to Charsada Substation (220 kV side) Munda Output is 740 MW



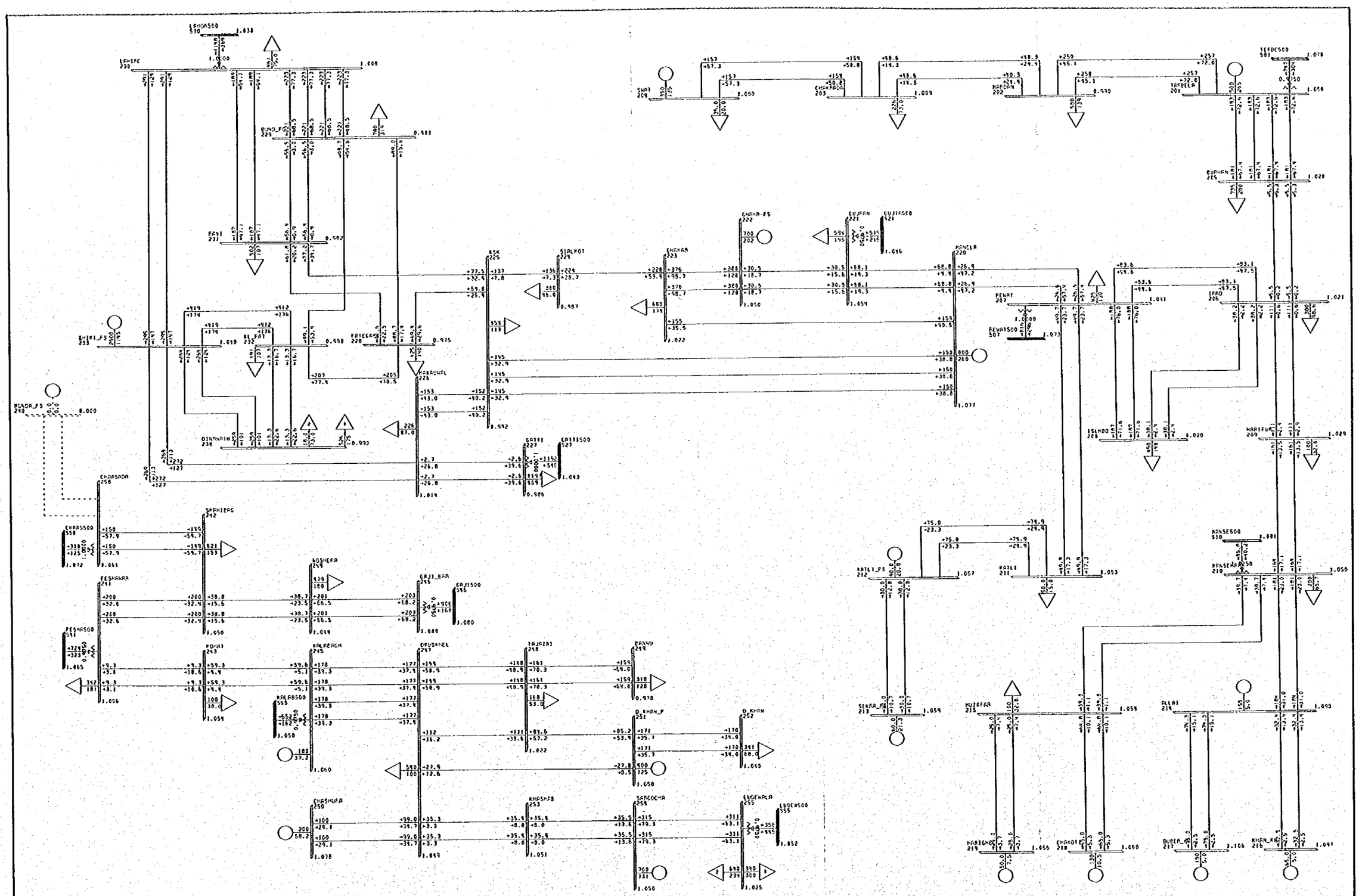
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.10** **Power Flow on 500 kV System (4)** Connection to Charsada Substation (500 kV side) Munda Output is 740 MW



FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN	**Figure D9.11** **Power Flow on 220 kV System (4)** **Connection to Charsada Substation (500 kV side)** **Munda Output is 740 MW**
JAPAN INTERNATIONAL COOPERATION AGENCY	



FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.12** **Power Flow on 500 kV System (5)** Connection to Charsada Substation Munda Output is 0 MW



FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure D9.13** **Power Flow on 220 kV System (5)** **Connection to Charsada Substation** **Munda Output is 0 MW**