ELECTRIC POWER DEPARTMENT
ANNUAL REPORT
YEAR 1955

The Electric Power Department continued to operate its generating facilities to supply the energy required by the Eastern Division of the Upper Peninsula Power Company and the mining operations of The Cleveland-Cliffs Iron Company until October 1. During that period there were delivered a total of 117,737,594 kwh, of which 65,578,599 kwh were delivered by the hydroelectric plants, 39,449,305 kwh were delivered by the Ishpeming Steam Electric Station, and 12,709,690 kwh were delivered by the Ishpeming Diesel Electric Station. In addition, during this period 7,932,000 kwh were supplied by the Presque Isle Station of the Upper Peninsula Generating Company, this energy being that which was generated during the period of start-up and trial operation of the new generating station. The total energy required by the combined operations of the two companies in this area amounted to 125,669,594 kwh for the period until October 1. Including the Humboldt Mine, 66,638,009 kwh (53.5%) of this energy were used for our operations and 59,031,585 kwh (46.5%) were used for the operations of Upper Peninsula Power Company. During this period the Upper Peninsula Power Company and The Cleveland-Cliffs Iron Company shared the cost of generating energy from all sources on the basis of a uniform unit production cost obtained by taking the actual cost of production and dividing it by the energy produced in each of the various facilities. In addition to this uniform unit production cost, the Upper Peninsula Power Company paid to our company an earning on the net book value of the various generating facilities in the proportion which the quantity of energy which they took from those facilities bore to the total amount of energy delivered by the individual plants. The unit cost to our company's operations, including wheeling charges, amounted to $.0093069 per kilowatt hour during the first nine months of the year, and during the same period $79,951.22 were obtained from the Upper Peninsula Power Company in the form of earnings on facilities used by them.

Beginning on October 1, the division of operating costs of our company's facilities which were used by the Upper Peninsula Power Company changed from the temporary basis which had been in effect since the beginning of the operating agreement with them on December 15, 1953, to the permanent basis on which these facilities will be operated in the future. This basis provides that our company will operate its facilities primarily for production of energy for its own operations, but if it is necessary for our company to operate its facilities for the use of the Upper Peninsula Power Company, our company will be paid the entire operating expense of the facilities during such a period and will also be paid a proportionate part of the fixed expense and carrying charges plus an earning on the investment which is necessary to keep these facilities available for use. During the period from October 1 to the end of the year, our company delivered 17,693,685 kwh and purchased 5,698,421 kwh from the Presque Isle Station of the Upper Peninsula Generating Company to make a total of 23,392,106 kwh supplied for our company's operations. In addition, 4,032,301 kwh were furnished by the Ishpeming steam and Diesel plants for the use of Upper Peninsula Power Company. Of the amount delivered by our company's plants, 17,675,900 kwh were delivered by the hydroelectric plants, 3,536,096 kwh were delivered by the Ishpeming Steam Electric Station, and 513,990 kwh were delivered by the Ishpeming Diesel Electric Station. Of the 23,392,106 kwh required for our company's operations, including the Humboldt Mining Company, 17,675,900 kwh were obtained from our hydroelectric generating stations, 17,785 kwh were obtained from the Ishpeming Diesel Station, and 5,698,421 kwh were purchased from the Presque Isle Station. During this period after October 1, the cost to our company amounted to $.0087131 per kilowatt hour and the Upper Peninsula Power Company paid us $38,674.98 for return on the investment in our generating facilities utilized by them.

During the year 1955 the mining operations of our company, including the Humboldt Mine, required a total of 90,030,115 kwh, which was a 16% increase over the amount of energy required during the previous year. In 1954 our company, including its Humboldt operation, utilized 48.5% of all of the energy furnished by its power plants and the Upper Peninsula Power Company utilized 51.5% of the energy furnished by our company. In 1955, however, the increase in energy consumed by the mining operations and the purchases during the last three months by the Upper Peninsula Power Company from the Upper Peninsula Generating Company reversed this trend and our company used 57.5% of the total energy furnished by our power plants whereas the Upper Peninsula Power Company used only 42.5% of the energy so supplied. This change in ratio of energy used, of course, reduced the proportionate part of fixed charges and return on the investment which were carried by the Upper Peninsula Power Company.

Energy in the amount of 75,338,826 kwh was produced for mining operations of the Company and delivered to the Company's operations at a cost of $.0091431 per kilowatt hour. Energy produced for the Humboldt Mining Company amounted to 14,691,289 kwh, upon which a revenue of $77,146.30 was realized. The return on the value of generating facilities used for production of energy used by Upper Peninsula Power Company amounted to $118,626.20. Net Profit and Loss for the Department during the year amounted to $166,405.75. This was a decrease from $201,476.37 in 1954, the reduction being caused by the decreased earnings on production facilities resulting from Upper Peninsula Power Company purchasing its energy requirements from the Upper Peninsula Generating Company rather than from our company after October 1, 1955.

Construction of the Upper Peninsula Generating Company's Presque Isle Station progressed in accordance with schedule with the result that the plant was capable of being placed in commercial operation on October 1. As with any new generating station, there were a certain number of operating difficulties encountered at the time that the station was first placed into service, but these difficulties are rapidly being overcome. The continuity of service obtained from this station since it was placed in operation has been good and the economy has been slightly better than was anticipated. Due to load conditions on the system, it has been necessary to operate the plant at slightly below its most economical point of operation, but it is felt that with the load growth which is expected for the coming year, the plant will soon be operating at practically full load and economy and over-all energy cost will both be improved.

During the period until October 1, when the Presque Isle Station was placed in operation, load conditions were very critical on the entire system for which the Company was furnishing energy. This required heavy operation of both the Ishpeming Steam Electric Station and the Ishpeming Diesel Electric Station. Several small difficulties were experienced in these stations requiring temporary periods of shutdown which, though inconvenient and sometimes resulting in deterioration of service, were not serious enough at any time to require actual curtailment of load. The Ishpeming Steam Station was out of service for short periods during the month of January due to difficulties which were caused by a fire occurring in the cinder hopper of the first pass of the boiler. During February there was a shutdown necessitated by the failure of the bearing on the forced draft fan. This particular shutdown resulted in low voltage conditions on the system, but no serious difficulties were experienced. During March one of the fans on the cooling tower of the Ishpeming Steam Station failed and necessitated the removal of fifty per cent of the cooling tower from service. This increased

the temperature of the cooling water with a resulting limitation on the amount of energy which could be generated in the station. In August a serious water leak occurred in the coal feeder. This leak had been in existence for several days, but on August 17 it reached the point where the station could no longer be operated until the leak was repaired. It took about one and one-half hours to make the necessary repairs and although conditions were critical throughout the system during the period, no serious difficulties were experienced.

Although the Presque Isle Station began actual commercial operation on October 1, there were a number of difficulties being experienced and it was thought advisable to keep the Ishpeming Steam Station operating during most of the month. On October 28, however, it was felt that the Presque Isle Station operation had been stabilized to the point that the Ishpeming Steam Station could be shut down. Accordingly, the plant was taken out of operation on October 28, and all energy necessary for system operation was furnished from that time on by the operation of the hydraulic plants of The Cleveland-Cliffs Iron Company and the Presque Isle Station.

Trouble had been experienced for a number of years with corrosion of the steel pipeline to the Escanaba Power Plant. In February an inspection of this pipeline was made by the Koppers Company, and they made recommendations and quoted prices on treating the inside of the pipeline with a bitumastic enamel. On July 5, the plant was shut down and the contractor began the application of this enamel. All told, there were over 400 small holes that appeared in the pipe after it was cleaned by sandblasting. These small holes were repaired by welding and the contractor proceeded to apply the bitumastic enamel. Work was completed on October 12 and the plant was placed back into operation October 15. In order to gain entrance to the pipeline, it had been necessary to cut several large holes in the pipe which were closed by welding in new sections, and also the weaker places were repaired by placing patches in the pipe. When the pipe contracted at the beginning of winter due to the colder temperatures to which it was exposed, several of the welded joints which had been made during the summer cracked and it was necessary to make further repairs on the pipeline. These repairs, of course, had the effect of destroying the bitumastic coating immediately under them. It will be desirable next summer, therefore, to inspect the pipe throughout and replace the bitumastic coating at any points where it has been destroyed or where improper coverage was obtained during the application of the material last summer.

The connection between the Houghton electric transmission system, the transmission system formerly operated by The Cliffs Power & Light Company, and the Presque Isle Station was completed and energized on June 16. This connection was used intermittently during ensuing months but was not placed into steady operation until the trial operation of the Presque Isle Station was commenced. At this time the line was closed in and considerable amounts of energy were transmitted over it from time to time thereafter. This connection consists of a 69000 volt transmission line from the Atlantic Substation in Houghton County 79 miles to the Cedar Substation in the southeast corner of the City of Ishpeming. This substation contains the switching and transformer equipment necessary to connect the 69000 volt line to the 33000 volt transmission lines formerly operated by our company. From the Cedar Substation the 69000 volt line extends 17 miles to connect with the Presque Isle Station of the Upper Peninsula Generating Company. At the time this line was planned, it was not thought advisable to make a connection for the operation of the Humboldt Mine. However, the plans for the placing in operation

of the Republic Mine early in 1956 indicated that low voltage would be experienced due to the power requirements of the Humboldt and Republic operations, and it was agreed that it was desirable to convert the line from Humboldt to Republic to 69000 volts and connect it with the 69 kv line between the Atlantic and Cedar Substations. Accordingly, work was started in the latter part of the year on the construction of the tie line and the insulating of the Humboldt-Republic line for operation at 69000 volts instead of 33000 volts. It is anticipated that this tap and the conversion of the Republic Mine substation to 69000 volts will be accomplished early in 1956, prior to the commencement of operation of the new mine and ore beneficiating plant at Republic.

Due to the increase in mining operations being more rapid than had been anticipated and due also to changes in the energy requirements of the Upper Peninsula Power Company, it was thought that additional capacity on this system would be required by the first of the year 1958. Studies of this load growth had been made earlier in the year and discussions following this study resulted in a meeting in September of members of our company, Stone & Webster Service Corporation, Stone & Webster Engineering Corporation, and the Upper Peninsula Power Company for the purpose of discussing the advisability of starting immediately upon the addition of a second unit in the Presque Isle Station. Consideration of this matter continued and a meeting was held in the early part of December at which the results of the studies were further discussed. The Upper Peninsula Power Company had made arrangements with the City of Escanaba for the operation on a rental basis of a new 24000 kw power plant to be constructed by the City of Escanaba. It was the general opinion at the meeting in December that the additional capacity which would be made available by tying this new Escanaba power plant to the Eastern Division of the Upper Peninsula Power Company at Gwinn would permit the postponement of the commencement of operation of the second unit at Presque Isle until the early part of 1959. Since the December meeting, however, further analyses and estimates have been made and there is still consideration being given to proceeding with the second unit at Marquette this year. One factor entering into the discussions is the advantage which would be gained by purchasing equipment on firm price quotations which were made by some manufacturers last fall prior to an increase in equipment costs. The purchase of equipment under these quotations would result in a material saving in first cost of the new unit, and this advantage, together with reconsideration of the possible system demands, makes further consideration of starting construction in the near future advisable.

ELECTRIC POWER DEPARTMENT
ANNUAL REPORT
YEAR 1955

STATISTICAL DATA - 1955

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Precipitation -	0.96	0.89	2.65	2.84	4.24	1.24	3.75	3.61	2.21	4.01	2.32	2.10

Total precipitation at Ishpeming during 1955 - 30.82" (2.568 ft.)
Average " " Marquette - 32.80" (46 year record)

CARP RIVER PLANT:

Drainage area above intake dam		66.66 sq. miles
Cubic feet precipitation in 1955	4,772,304,801	
Kilowatt hours generated in 1955	15 993 000	
Cubic feet water utilized in 1955 (90 cu. ft. - 1 kwh)	1 439 370 000	
" " " wasted over intake dam in 1955	579 600 000	
" " " in Carp storage Dec. 20, 1954	389 076 950	
" " " " " " Dec. 20, 1955	337 164 874	
" " " taken from Carp storage in 1955	51 912 076	
Total run-off in 1955 (cubic feet)	1 967 057 924	
Run-off per square mile of drainage area (cubic feet)	29 508 820	
Second-feet run-off		0.936

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925
Total Precip.	30.11	26.53	38.40	36.83	25.46	31.05	29.50	27.40	30.38	33.67	21.90	22.95	20.71
Sec.-ft. Run-off	1.03	0.67	0.93	1.29	0.70	0.79	0.83	0.73	0.68	1.06	0.59	0.50	0.25

	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938
Total Precip.	35.69	29.86	36.06	32.28	23.14	36.70	31.20	32.72	32.87	27.10	30.23	30.10	35.32
Sec.-ft. Run-off	0.85	0.98	1.11	0.67	1.10	0.83	1.13	1.14	1.00	0.79	0.89	0.86	1.33

	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951
Total Precip.	33.58	30.34	32.20	34.26	32.04	32.77	30.81	26.12	32.88	22.87	37.23	30.64	43.50
Sec.-ft. Run-off	1.47	1.05	0.83	0.84	1.17	0.70	0.81	0.56	0.88	0.44	0.77	1.09	1.54

	1952	1953	1954	1955
Total Precip.	24.35	35.42	33.77	30.82
Sec.-ft. Run-off	0.69	0.85	0.84	0.93

McCLURE PLANT:

Drainage area above intake dam		140.52 sq. miles
Cubic feet precipitation in 1955 (Hoist Plant - 35.70"-2.97')	11,654,481,484	
Kilowatt hours generated in 1955	42 091 000	
Cubic feet water utilized in 1955 (125 cu. ft. - 1 kwh)	5 261 375 000	
" " " wasted over intake dam in 1955	0	
" " " in Hoist storage basin Dec. 20, 1954	1 962 348 484	
" " " " " " " Dec. 20, 1955	1 298 780 969	
" " " decrease in 1955	663 567 515	
" " " in Silver Lake Dec. 20, 1954	0	
" " " " " " Dec. 20, 1955	0	
" " " taken from Silver Lake in 1955	0	
Total run-off in 1955 (cubic feet)	4 597 807 485	
Run-off per square mile of drainage area (cubic feet)	32 719 951	
Second-feet run-off		1.038

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Total Precip.	35.10	42.03	26.60	30.49	24.06	43.95	35.51	43.80	38.75	30.81	37.02	32.54	35.07
Sec.-ft. Run-off	1.02	1.54	0.85	0.92	0.52	1.52	1.80	2.22	1.36	1.45	1.10	1.23	1.30

	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
Total Precip.	35.02	29.96	32.16	38.18	40.93	41.22	36.59	38.15	40.20	35.64	37.62	37.94	31.91
Sec.-ft. Run-off	1.16	0.90	1.05	1.19	1.75	1.69	1.47	1.28	1.15	1.43	1.17	1.36	0.86

	1947	1948	1949	1950	1951	1952	1953	1954	1955
Total Precip.	37.27	28.81	43.28	40.65	50.90	29.27	41.56	38.13	35.70
Sec.-ft. Run-off	1.22	0.78	1.24	1.37	2.09	0.97	1.33	1.29	1.03

ELECTRIC POWER DEPARTMENT

STATISTICAL DATA - 1955

Energy Delivered to Transmission System by C.C.I.Co. and U.P.G.Co. Plants

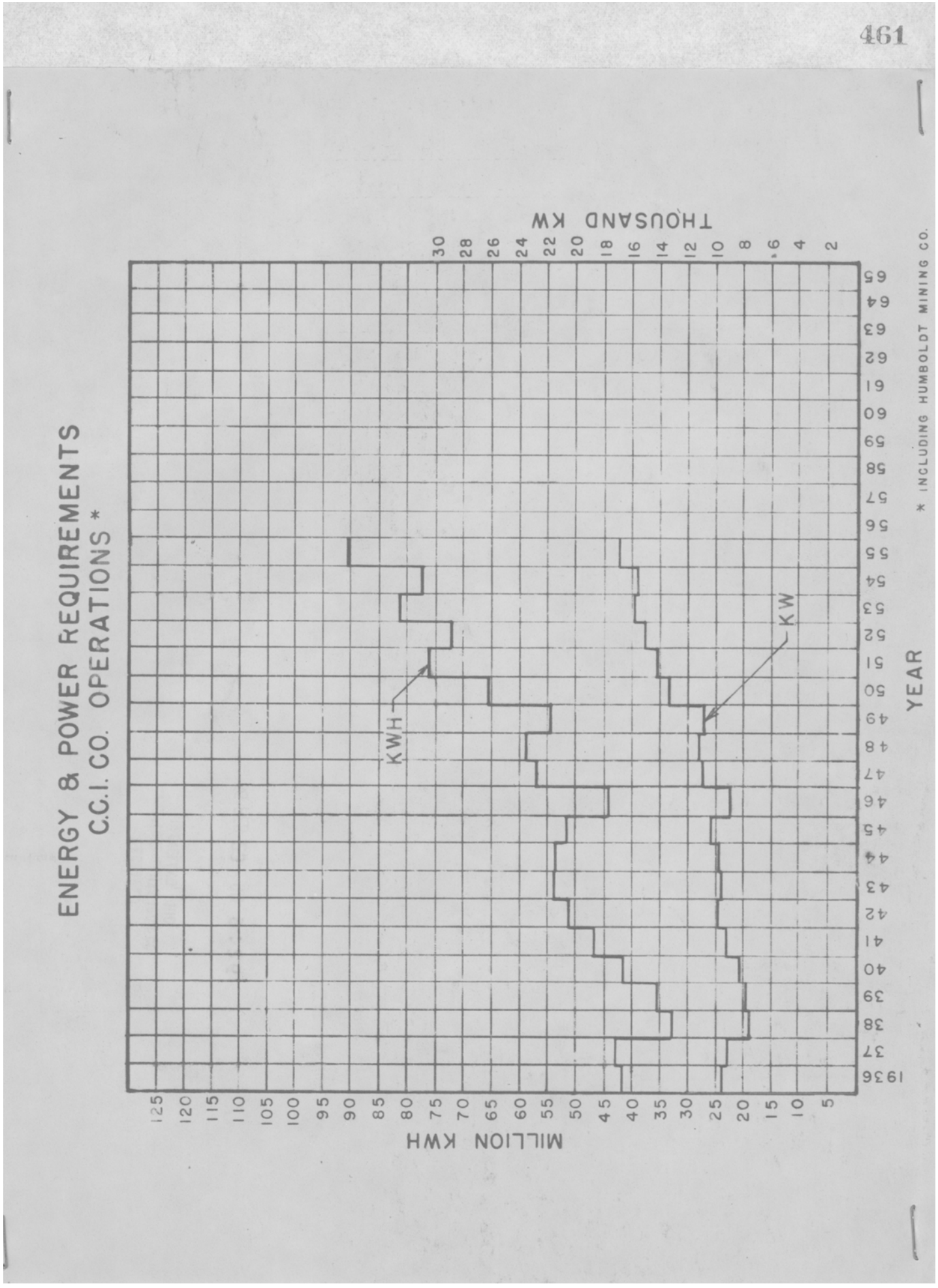
	Kwh Delivered to Lines				
	CCICo. Steam	CCICo. Hydro	CCICo. Diesel	UPGCo. Steam	Total
Jan.	4,996,478	6,373,385	1,635,220	--	13,005,083
Feb.	4 467 263	7 245 370	1 225 180	--	12 937 813
Mar.	4 867 589	7 778 235	964 980	--	13 610 804
Apr.	3 832 840	8 604 495	1 165 690	--	13 603 025
May	4 265 270	8 652 280	1 639 850	--	14 557 400
June	4 426 130	8 372 090	1 692 890	--	14 491 110
July	4 525 348	6 885 550	1 928 630	--	13 339 528
Aug.	4 541 737	6 986 705	1 813 600	467,000	13 809 042
Sept.	3 526 650	4 680 489	643 650	7 465 000	16 315 789
Oct.	3 063 556	5 313 810	474 905	3 533 655	12 385 926
Nov.	472 540	6 195 140	3 755	1 952 259	8 623 694
Dec.	--	6 166 950	35 330	212 507	6 414 787
Total	42,985,401	83,254,499	13,223,680	13,630,421	153,094,001

ELECTRIC POWER DEPARTMENT

STATISTICAL DATA - 1955

Utilization of Energy Delivered to
Transmission System by C.C.I.Co. and U.P.G.Co. Plants

	Kwh Utilized			
	C.C.I.Co.	Humboldt Mining Co.	U.P. Power Co.	Total
Jan.	5,463,004	1,150,737	6,391,342	13,005,083
Feb.	5 609 773	1 082 827	6 245 213	12 937 813
Mar.	5 561 923	1 517 913	6 530 968	13 610 804
Apr.	5 880 665	1 412 045	6 310 315	13 603 025
May	6 358 465	1 329 677	6 869 258	14 557 400
June	6 317 663	1 395 193	6 778 254	14 491 110
July	6 275 752	1 335 465	5 728 311	13 339 528
Aug.	6 474 115	1 443 530	5 891 397	13 809 042
Sept.	6 604 534	1 424 728	8 286 527	16 315 789
Oct.	7 325 332	1 522 133	3 538 461	12 385 926
Nov.	7 297 557	853 597	472 540	8 623 694
Dec.	6 170 043	223 444	21 300	6 414 787
Total	75,338,826	14,691,289	63,063,886	153,094,001


ENERGY & POWER REQUIREMENTS
C.C.I. CO. OPERATIONS *
* INCLUDING HUMBOLDT MINING CO.
THOUSAND KW
30 28 26 24 22 20 18 16 14 12 10 8 6 4 2
MILLION KWH
125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
YEAR
1936 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
KWH
KW