

Electrical Distribution System Review

The electric distribution system consists of 19 different feeders with 4 different voltage systems. They are 22.9kV, 13.8kV, 4.16kV and 2.4kV that have both overhead and underground lines that total 112.7 miles with 7,873 active customers.

The overhead conductors range from 336MCM to #2 ACSR aluminum and 4/0 to #6 copper. The underground conductors range from 750 MCM to 1/0 aluminum.

The secondary system consists of mainline and secondary services wires that are both overhead and underground with a total of 21.77 miles.

The street lighting system consists of both overhead and underground wires with a total of 38.96 miles. The conductors for both range from 500 MCM to #6.

HPU owns and operates 9 different substations which consist of the Power Plant Interconnect, Beltline, Gas Plant (2), Wegner, Main Pump Station, Firehall, Greenhaven, and Ansley.

The age of the electric distribution infrastructure ranges from the 1950's to current.

HPU Electric Service Territory consists of approximately 22 square miles in the Southwest portion of St. Louis County. It includes the cities, town and areas of Hibbing, Burton Townsite, Mitchell, Kitzville, and portions of Balkan Township. The territory is bordered on the North by the Mahoning-Hull Rust Mine. The Western boundary starts on the Western edge of South Agnew Mine and South to a point one-quarter mile North of Highway 169 and South to the Maple Hill Road. The boundary then heads East to a point one-eighth mile East of Highway 73 and South at a South-Southwesterly direction up to the South side of Townline Road. The boundary heads East on Townline Road for one-quarter mile then South for three-quarters of a mile, East to the DM&IR Railroad tracks, one-quarter mile East of Bunker Road. The Eastern boundary follows the DM&IR Railroad tracks in a North-Northeasterly direction across the intersection of Wegner Road and O'Rourke Road to a point one-half mile East of First Avenue Road. The boundary then heads North-northeasterly to a point one-quarter of a mile. It then heads in a northerly direction to a point three-quarters of a mile North of the Mitchell Bridge. The boundary heads West on Township line 57, one-quarter mile, North one-eighth mile, then West across the South edge of the Pillsbury Mine.

The electric distribution system is tied in with Minnesota Power (MP) directly at the Hibbing Substation located East of Kerr location. HPU owns breakers FM 307, FM 309, and

the locations in the MP Substation. Feeder 307 follows a route along Highway 63 East to West 5th Ave., then North to Grant Street, and East to the Power Plant. Feeder 309 heads South to Ansley Road, then East to W. 9th Ave., then South to Highway 169, the East to Veteran's Park. It branches out and heads south along 1st Ave. to Townline Road and ends at the Water Treatment Plant. It continues east from Veteran's Park along Highway 169 to the roundabout and heads north along the Beltline to E. 15th Street, then West to Michigan Street Alley to the Power Plant.

Feeders 307 and 309 are on a closed loop system with breakers located at both MP Hibbing Substation and HPU Power Plant Interconnect Substation.

Lake Country Power (LCP) and Minnesota Power (MP) both have electrical service territory inside the city limits of Hibbing. This makes Hibbing unique in Minnesota. HPU has other utilities in these areas of LCP Electric Service Territory: (1.9 square miles wastewater Treatment Plant, Country Estates, Rivercreek); (0.8 square miles W. Old Highway 169, Pintar Road, W. Townline Road); (0.6 miles N. Hughes Road). HPU has other utilities in two MP Electric Service Territories (3.21 square miles & Elm Lake); (1.78 square miles down Highway 37).

HPU does not have any Interruptible Rate customers and currently does not offer Off-Peak Rates. Through AMI development, HPU can start efforts to improve system load and power quality.

One example of the electrical system load is shown for July 2018. Note the "On-Peak" sales and the "Off-Peak" valleys.

Finally, attached are projects that we have completed the design work.

- North Howard Alley
- 5th & 6th Ave. E. 2500-3100 Blocks

TOTAL LENGTH OF PRIMARY LINES

<u>Feeder No.</u>	<u>Voltage</u>	<u>Length in Miles</u>	<u>Approx. Number of Active Meters</u>
307	22kV Delta	2.6	7,873
309	22kV Delta	12.2	7,873
1	13.8kV Wye	13.4	1500
2	13.8kV Wye	17.7	1500
3	13.8kV Wye	13.1	850
4	13.8kV Wye	15.4	1500
5	13.8kV Wye	6.0	800
15	2.4kV Wye	3.4	150
35	4.16 kV Wye	7.7	100
40	2.4kV Delta	0.4	3
41	2.4kV Delta	1.9	150
50	2.4kV Delta	1.6	250
51	2.4kV Delta	2.8	360
60	2.4kV Delta	2.6	230
61	2.4kV Delta	0.2	230
70	2.4kV Delta	2.4	290
81	4.16 kV Wye	4.6	250
90	4.16 kV Wye	4.4	150

HPU ELECTRIC DISTRIBUTION SUBSTATIONS

<u>Name of Substation</u>	<u>Voltage</u>	<u>Feeder Numbers</u>
Power Plant Interconnect	22kV/13.8kV	Power Plant, 1-5 & 15
Beltline 13.8kV	22kV/13.8kV	2
Beltline 2.4kV	22kV/2.4kV	60 & 61
Gas Plant 13.8kV	22kV/13.8kV	4
Gas Plant 4.16	22kV/4.16kV	81
Wegner	22kV/4.16	35
Main Pump Station 4.16kV	22kV/4.16kV	90
Main Pump Station 480V	22kV/480V	Water Treatment Pumphouse
Fire Hall	13.8kV/2.4kV	40 & 41
Greenhaven	13.8kV/2.4kV	50 & 51
Ansley	13.8kV/2.4kV	70