#24 POET Biorefining - Hanlontown Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Ethanol Plant without CO_2 Capture						
No.	**Ethanol Plant/ Town**	**Population**	****Water Permit Value MGY**	****2023 Water Usage MGY**		**Comments**
Ethanol Plant - Near Hanlontown, Iowa			-	-		
	POET Biorefining - Hanlontown Plant		245.0	240		Without CO_2 capture water requirement
	Combined Towns All Water Usage		308.2	308.2		City residential use assumes 70 gal./person/day
1	Hanlontown	206	5.3	5.3		
2	Joice	208	5.3	5.3		
3	Kensett	257	6.6	6.6		
4	Fertile	305	7.8	7.8		
5	Manly	1,256	32.1	32.1		
6	Lake Mills	2,143	54.8	54.8		
7	Clear lake	7,687	196.4	196.4		
	Percentage of ethanol plant usage of total water usage	12062	44.3%	43.8%		
Conclusion: Without CO2 Capture						
	This ethanol plant consumes 44% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).					

#24 POET Biorefining - Hanlontown Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Ethanol Plant with CO_2 Capture						
No.	**Ethanol Plant/ Town**	**Population**	****Water Permit Value MGY**	****2023 Water Usage MGY**	**2023 Water Usage % of Total**	**Comments**
Ethanol Plant - Near Hanlontown, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Hanlontown	206	5.3	5.3	0.8%	
2	Joice	208	5.3	5.3	0.8%	
3	Kensett	257	6.6	6.6	1.0%	
4	Fertile	305	7.8	7.8	1.2%	
5	Manly	1256	32.1	32.1	5.1%	
6	Lake Mills	2143	54.8	54.8	8.7%	
7	Clear lake	7687	196.4	196.4	31.1%	
8	Ethanol plant water for Ethanol Production		245	240	38.0%	Without CO2 Capture water requirement
9	Ethanol Plant water for CO_2 Capture		84.0	84.0	13.3%	Additional CO_2 Capture water requirement
	Total Plant and Towns	12,062	637.2	632.2	100.0%	
	Percentage of ethanol plant usage of total water usage		51.6%	51.3%		
Conclusion: With CO2 Capture						
	This ethanol plant consumes 51% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)					

***Ethanol Production Capacity of Plant - MGY**	**80**
Factor: Water required to cool and compress the CO_2 for capture - MGY Water/ MGY Ethanol	1.05
Calculate additional water required for CO_2 Capture - MGY	84
Calculate ratio of gallons of water/ gallons of Ethanol	3.0
Total water requirement of towns and Ethanol plant - MGY	632.2
Total water requirement of towns - MGY	308.2
Total water requirement for ethanol plant - MGY	324.0
Ratio of ethanol plant water use vs. surrounding area	1.05
Percentage of ethanol plant usage of total water usage	51.3%
Total Population within the 10 mile radius	12,062

#24 POET Biorefining - Hanlontown Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Water Use	
Typical water use per person per day - Gallons/ person/ day	70
Equivalent # of people ethanol plant water use w/o CO2 capture	9,393
Equivalent # of people ethanol plant water use w/ CO2 capture	**12,681**
Electricity Use	
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6
Total Electricity used to produce ethanol - kWh	48,000,000
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377
Total Electricity used to capture CO2 - kWh	30,160,000
Total electricity to produce ethanol and capture CO2 - kWh	7.816E+07
Typical electrical use/ residence - kWh/year	10,476.0
Equivalent number of residences	7,460.9
Number of people / residence	2.4
Equivalent number of people	**17,906**
Natural Gas Use	
Natural gas use per gallon of ethanol for production - BTU's/ gal.	26,000
Natural gas use for ethanol plant - BTU's	2.080E+12
Natural gas use per gal. of ethanol for CO2 capture - BTU's/ gal.	0
Typical Natural Gas use/ residence - BTU's/ year	96,000,000
Equivalent number of residences	21,667
Number of people / residence	2.4
Equivalent number of people	**52,000**
* Ethanol Capacity per Iowa Renewable Fuels Association	** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.

#24 POET Biorefining Ethanol Plant (80 MGY) near Hanlontown