#23 POET Biorefining - Gowrie 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 Gowrie, Iowa			-	-		
	POET Biorefining - Gowrie Plant		270	270		Without CO_2 capture water requirement
	Combined Towns All Water Usage		72.3	72.3		City residential use assumes 70 gal./person/day
1	Rinard	38	1.0	1.0		Water usage too small to require a permit
2	Burnside	50	1.3	1.3		Water usage too small to require a permit
3	Lanyon	50	1.3	1.3		Water usage too small to require a permit
4	Somers	128	3.3	3.3		Water usage too small to require a permit
5	Moorland	168	4.3	4.3		
6	Harcourt	264	6.7	6.7		
7	Callender	368	9.4	9.4		
8	Farnhamville	383	9.8	9.8		
9	Otho	429	11.0	11.0		
10	Gowrie	952	24.3	24.3		
	Percentage of ethanol plant usage of total water usage	2830	78.9%	78.9%		
Conclusion: Without CO2 Capture						
	This ethanol plant consumes 79% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).					

#23 POET Biorefining - Gowrie 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 Gowrie, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Rinard	38	1.0	1.0		Water usage too small to require a permit
2	Burnside	50	1.3	1.3		Water usage too small to require a permit
3	Lanyon	50	1.3	1.3		Water usage too small to require a permit
4	Somers	128	3.3	3.3		Water usage too small to require a permit
	No Permit	266	6.8	6.8	1.6%	
5	Moorland	168	4.3	4.3	1.0%	
6	Harcourt	264	6.7	6.7	1.5%	
7	Callender	368	9.4	9.4	2.2%	
8	Farnhamville	383	9.8	9.8	2.2%	
9	Otho	429	11.0	11.0	2.5%	
10	Gowrie	952	24.3	24.3	5.6%	
11	Ethanol plant water for Ethanol Production		270	270	61.8%	Without CO2 Capture water requirement
12	Ethanol Plant water for CO_2 Capture		94.5	94.5	21.6%	Additional CO_2 Capture water requirement
	Total Plant and Towns	2,830	436.8	436.8	100.0%	
	Percentage of ethanol plant usage of total water usage		83.4%	83.4%		

Conclusion: With CO2 Capture

This ethanol plant consumes 83% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)

***Ethanol Production Capacity of Plant - MGY**	**90**
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	94.5
Calculate ratio of gallons of water/ gallons of Ethanol	3.0
Total water requirement of towns and Ethanol plant - MGY	443.6
Total water requirement of towns - MGY	79.1
Total water requirement for ethanol plant - MGY	364.5
Ratio of ethanol plant water use vs. surrounding area	4.61
Percentage of ethanol plant usage of total water usage	82.2%
Total Population within the 10 mile radius	2,830

#23 POET Biorefining - Gowrie 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	10,568
Equivalent # of people ethanol plant water use w/ CO2 capture	**14,266**
Electricity Use	
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6
Total Electricity used to produce ethanol - kWh	54,000,000
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377
Total Electricity used to capture CO2 - kWh	33,930,000
Total electricity to produce ethanol and capture CO2 - kWh	8.793E+07
Typical electrical use/ residence - kWh/year	10,476.0
Equivalent number of residences	8,393.5
Number of people / residence	2.4
Equivalent number of people	**20,144**
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	2.340E+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	24,375
Number of people / residence	2.4
Equivalent number of people	**58,500**
* Ethanol Capacity per Iowa Renewable Fuels Association	** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.

#23 POET Biorefining - Gowrie Ethanol Plant (90 MGY) near Gowrie