

#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).					

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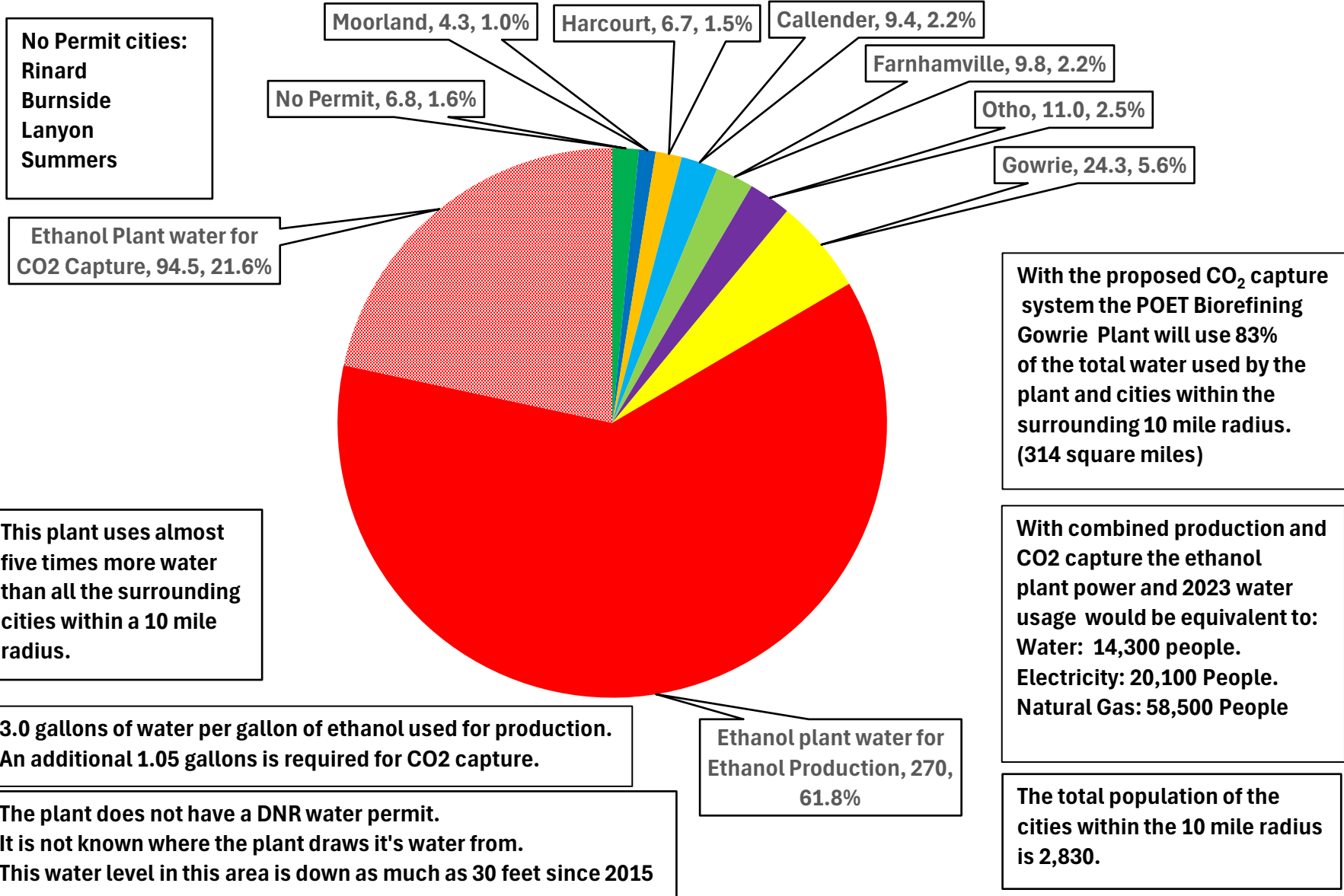
Ethanol Plant with CO ₂ Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Gowrie, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Rinard	38	1.0	1.0		Water usage too small to require 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 CO ₂ 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 CO₂ for capture - MGY Water/ MGY Ethanol		1.05				
Calculate additional water required for CO₂ 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				

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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

Ethanol plant 2023 water usage vs. surrounding residential water usage of towns within a ten mile radius MGY (Millions of Gallons per Year).



No Permit cities:
 Rinard
 Burnside
 Lanyon
 Summers

Ethanol Plant water for CO2 Capture, 94.5, 21.6%

With the proposed CO₂ capture system the POET Biorefining Gowrie Plant will use 83% of the total water used by the plant and cities within the surrounding 10 mile radius. (314 square miles)

With combined production and CO2 capture the ethanol plant power and 2023 water usage would be equivalent to:
 Water: 14,300 people.
 Electricity: 20,100 People.
 Natural Gas: 58,500 People

The total population of the cities within the 10 mile radius is 2,830.

This plant uses almost five times more water than all the surrounding cities within a 10 mile radius.

3.0 gallons of water per gallon of ethanol used for production. An additional 1.05 gallons is required for CO2 capture.

The plant does not have a DNR water permit. It is not known where the plant draws its water from. This water level in this area is down as much as 30 feet since 2015

Ethanol plant water for Ethanol Production, 270, 61.8%