

#17 Valero Renewable Fuels - Charles City 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 Charles City, Iowa		-	-		
	Valero Renewable Fuels - Charles City		420	420		Without CO ₂ capture water requirement
	Combined Towns All Water Usage		229.9	229.9		City residential use assumes 70 gal./person/day
1	Roseville	50	1.3	1.3		Water usage too small to require a permit
2	Orchard	68	1.7	1.7		Water usage too small to require a permit
3	Colwell	55	1.4	1.4		
4	Floyd	313	8.0	8.0		
5	Rudd	358	9.1	9.1		
6	Rockford	758	19.4	19.4		
7	Charles City	7,396	189.0	189.0		
	Percentage of ethanol plant usage of total water usage	8,998	64.6%	64.6%		
Conclusion: Without CO₂ Capture						
This ethanol plant consumes 65% 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 Charles City, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Roseville	50	1.3	1.3	0.2%	Water usage too small to require a permit
2	Orchard	68	1.7	1.7	0.2%	Water usage too small to require a permit
3	Colwell	55	1.4	1.4	0.2%	
4	Floyd	313	8.0	8.0	1.0%	
5	Rudd	358	9.1	9.1	1.1%	
6	Rockford	758	19.4	19.4	2.4%	
7	Charles City	7396	189.0	189.0	23.7%	
8	Ethanol plant water for Ethanol Production		420	420	52.7%	Without CO ₂ Capture water requirement
9	Ethanol Plant water for CO ₂ Capture		147.0	147.0	18.4%	Additional CO ₂ Capture water requirement
Total Plant and Towns		8,998	796.9	796.9	100.0%	
Percentage of ethanol plant usage of total water usage			71.2%	71.2%		
Conclusion: With CO₂ Capture						
This ethanol plant consumes 71% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
*Ethanol Production Capacity of Plant - MGY		140				
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		147				
Calculate ratio of gallons of water/ gallons of Ethanol		3.0				
Total water requirement of towns and Ethanol plant - MGY		796.9				
Total water requirement of towns - MGY		229.9				
Total water requirement for ethanol plant - MGY		567.0				
Ratio of ethanol plant water use vs. surrounding area		2.47				
Percentage of ethanol plant usage of total water usage		71.2%				
Total Population within the 10 mile radius		8,998				

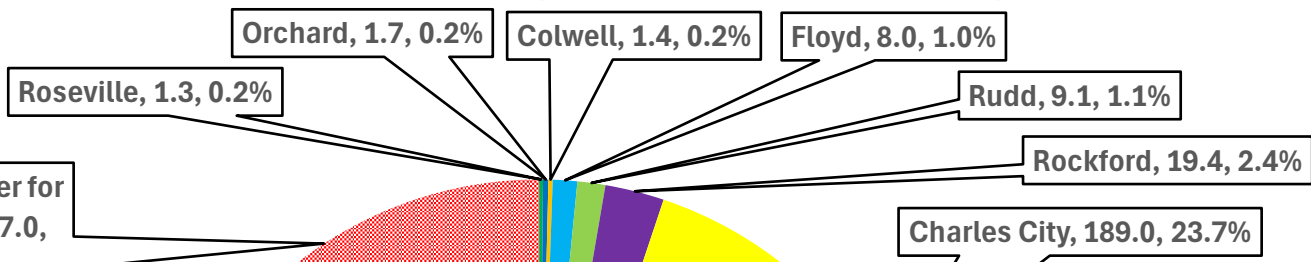
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Water Use					
Typical water use per person per day - Gallons/ person/ day	70				
Equivalent # of people ethanol plant water use w/o CO2 capture	16,438				
Equivalent # of people ethanol plant water use w/ CO2 capture	22,192				
Electricity Use					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	84,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	52,780,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.368E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	13,056.5				
Number of people / residence	2.4				
Equivalent number of people	31,336				
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	3.640E+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	37,917				
Number of people / residence	2.4				
Equivalent number of people	91,000				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

#17 Valero Renewable Fuels Ethanol Plant (140 MGY) near Charles City

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:
Roseville
Orchard



Ethanol Plant water for CO2 Capture, 147.0, 18.4%

Charles City reported 2023 water usage 867 MGY and a population of 7,396. This is 321 gal./day/ person - almost 5 times the typical residential water usage of 70 gal./ day.

This plant uses almost three times as much water as all the surrounding cities in a 10 mile radius.

Ethanol plant water for Ethanol Production, 420, 52.7%

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

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

With the proposed CO₂ capture system the Valero Renewable Fuels Plant will use 71% 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: 22,200 people.
Electricity: 31,300 People.
Natural Gas: 91,000 People

The total population of the cities within the 10 mile radius is 8,998.