

#20 POET Biorefining - Emmetsburg 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 Emmetsburg, Iowa						
	POET Biorefining - Emmetsburg Plant		350	211.1		Without CO ₂ capture water requirement
	Combined Towns All Water Usage		123.3	123.3		City residential use assumes 70 gal./person/day
1	Rodman	31	0.8	0.8		Water usage too small to require a permit
2	Curlew	37	0.9	0.9		Water usage too small to require a permit
3	Cylinder	87	2.2	2.2		Water usage too small to require a permit
4	Ayrshire	133	3.4	3.4		Water usage too small to require a permit
5	Graettinger	832	21.3	21.3		
6	Emmetsburg	3,706	94.7	94.7		
	Percentage of ethanol plant usage of total water usage	4,826	73.9%	63.1%		
Conclusion: Without CO₂ Capture						
	This ethanol plant consumes 63% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).					

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No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Emmetsburg, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Rodman	31	0.8	0.8		Water usage too small to require a permit
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3	Cylinder	87	2.2	2.2		Water usage too small to require a permit
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	No Permit	288	7.3584	7.3584	1.8%	
5	Graettinger	832	21.3	21.3	5.2%	
6	Emmetsburg	3706	94.7	94.7	23.3%	
7	Ethanol plant water for Ethanol Production		350	211.1	52.0%	Without CO ₂ Capture water requirement
8	Ethanol Plant water for CO ₂ Capture		71.4	71.4	17.6%	Additional CO ₂ Capture water requirement
	Total Plant and Towns		4,826	544.7	405.8	100.0%
	Percentage of ethanol plant usage of total water usage			77.4%	69.6%	
Conclusion: With CO₂ Capture						
This ethanol plant consumes 70% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
*Ethanol Production Capacity of Plant - MGY		68				
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		71.4				
Calculate ratio of gallons of water/ gallons of Ethanol		3.1				
Total water requirement of towns and Ethanol plant - MGY		413.1				
Total water requirement of towns - MGY		130.7				
Total water requirement for ethanol plant - MGY		282.5				
Ratio of ethanol plant water use vs. surrounding area		2.16				
Percentage of ethanol plant usage of total water usage		68.4%				
Total Population within the 10 mile radius		4,826				

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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	8,261				
Equivalent # of people ethanol plant water use w/ CO2 capture	11,056				
Electricity Use					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	40,800,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	25,636,000				
Total electricity to produce ethanol and capture CO2 - kWh	6.644E+07				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	6,341.7				
Number of people / residence	2.4				
Equivalent number of people	15,220				
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	1.768E+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	18,417				
Number of people / residence	2.4				
Equivalent number of people	44,200				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

#20 POET Biorefining Ethanol Plant (68 MGY) near Emmetsburg

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

