

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

Ethanol Plant without CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY		Comments
Ethanol Plant - Near Jewel. Iowa						
	POET Biorefining - Jewel Plant		270	270		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		166.9	166.9		City residential use assumes 70 gal./person/day
1	Randall	154	3.9	3.9		
2	Kamrar	179	4.6	4.6		Water usage too small to require a permit
3	Stanhope	364	9.3	9.3		
4	Radcliffe	555	14.2	14.2		
5	Blairsburg	713	18.2	18.2		
6	Jewell	1,216	31.1	31.1		
7	Story City	3,352	85.6	85.6		
	Percentage of ethanol plant usage of total water usage	6533	61.8%	61.8%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 62% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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

Ethanol Plant with CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Jewel. Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Randall	154	3.9	3.9	0.7%	
2	Kamrar	179	4.6	4.6	0.9%	Water usage too small to require a permit
3	Stanhope	364	9.3	9.3	1.8%	
4	Radcliffe	555	14.2	14.2	2.7%	
5	Blairsburg	713	18.2	18.2	3.4%	
6	Jewell	1216	31.1	31.1	5.8%	
7	Story City	3352	85.6	85.6	16.1%	
8	Ethanol plant water for Ethanol Production		270	270	50.8%	Without CO <sub>2</sub> Capture water requirement
9	Ethanol Plant water for CO <sub>2</sub> Capture		94.5	94.5	17.8%	Additional CO <sub>2</sub> Capture water requirement
Total Plant and Towns		6,533	531.4	531.4	100.0%	
Percentage of ethanol plant usage of total water usage			68.6%	68.6%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 69% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
<b>*Ethanol Production Capacity of Plant - MGY</b>		<b>90</b>				
<b>Factor: Water required to cool and compress the CO<sub>2</sub> for capture - MGY Water/ MGY Ethanol</b>		<b>1.05</b>				
<b>Calculate additional water required for CO<sub>2</sub> Capture - MGY</b>		94.5				
<b>Calculate ratio of gallons of water/ gallons of Ethanol</b>		3.0				
<b>Total water requirement of towns and Ethanol plant - MGY</b>		531.4				
<b>Total water requirement of towns - MGY</b>		166.9				
<b>Total water requirement for ethanol plant - MGY</b>		364.5				
<b>Ratio of ethanol plant water use vs. surrounding area</b>		2.18				
<b>Percentage of ethanol plant usage of total water usage</b>		68.6%				
<b>Total Population within the 10 mile radius</b>		6,533				

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

<b>Water Use</b>					
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				
<b>Electricity Use</b>					
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				
<b>Natural Gas Use</b>					
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.			

# #28 POET Biorefining Ethanol Plant (90 MGY) near Jewel

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:  
Kamrar

Kamrar, 4.6, 0.9%

Stanhope, 9.3, 1.8%

Radcliffe, 14.2, 2.7%

Blairsburg, 18.2, 3.4%

Jewell, 31.1, 5.8%

Randall, 3.9, 0.7%

Ethanol Plant water for CO2 Capture, 94.5, 17.8%

This plant will use 2.2 times as much water as all the cities within a 10 mile radius.

Ethanol plant water for Ethanol Production, 270, 50.8%

With the proposed CO<sub>2</sub> capture system the POET Biorefining Jewel plant will use 69% of the total water used by the plant and cities within the surrounding 10 mile radius. (314 square miles)

With combined production and CO<sub>2</sub> 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

3.0 gallons of water per gallon of ethanol is used for production. An additional 1.05 gallon is required for CO<sub>2</sub> capture.

This plant does not have a DNR water permit. It is not known where this plant draws it's water from. This water level in this area is down 30-40 feet since 2015

Story City, 85.6, 16.1%

The total population of the cities within the 10 mile radius is 6,533.

