

## #21 POET Biorefining - Fairbank 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 Fairbank, Iowa						
	POET Biorefining - Fairbank Plant		578	396		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		307.6	307.6		City residential use assumes 70 gal./person/day
1	Littleton	50	1.3	1.3		Water usage too small to require a permit
2	Oran	50	1.3	1.3		Water usage too small to require a permit
3	Hazelton	713	18.2	18.2		Water usage too small to require a permit
4	Dunkerton	842	21.5	21.5		
5	Readlyn	845	21.6	21.6		
6	Fairbank	1,111	28.4	28.4		No DNR Water Permit
7	Jesup	2,508	64.1	64.1		
8	Oelwein	5,920	151.3	151.3		
	Percentage of ethanol plant usage of total water usage	12039	65.3%	56.3%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 56% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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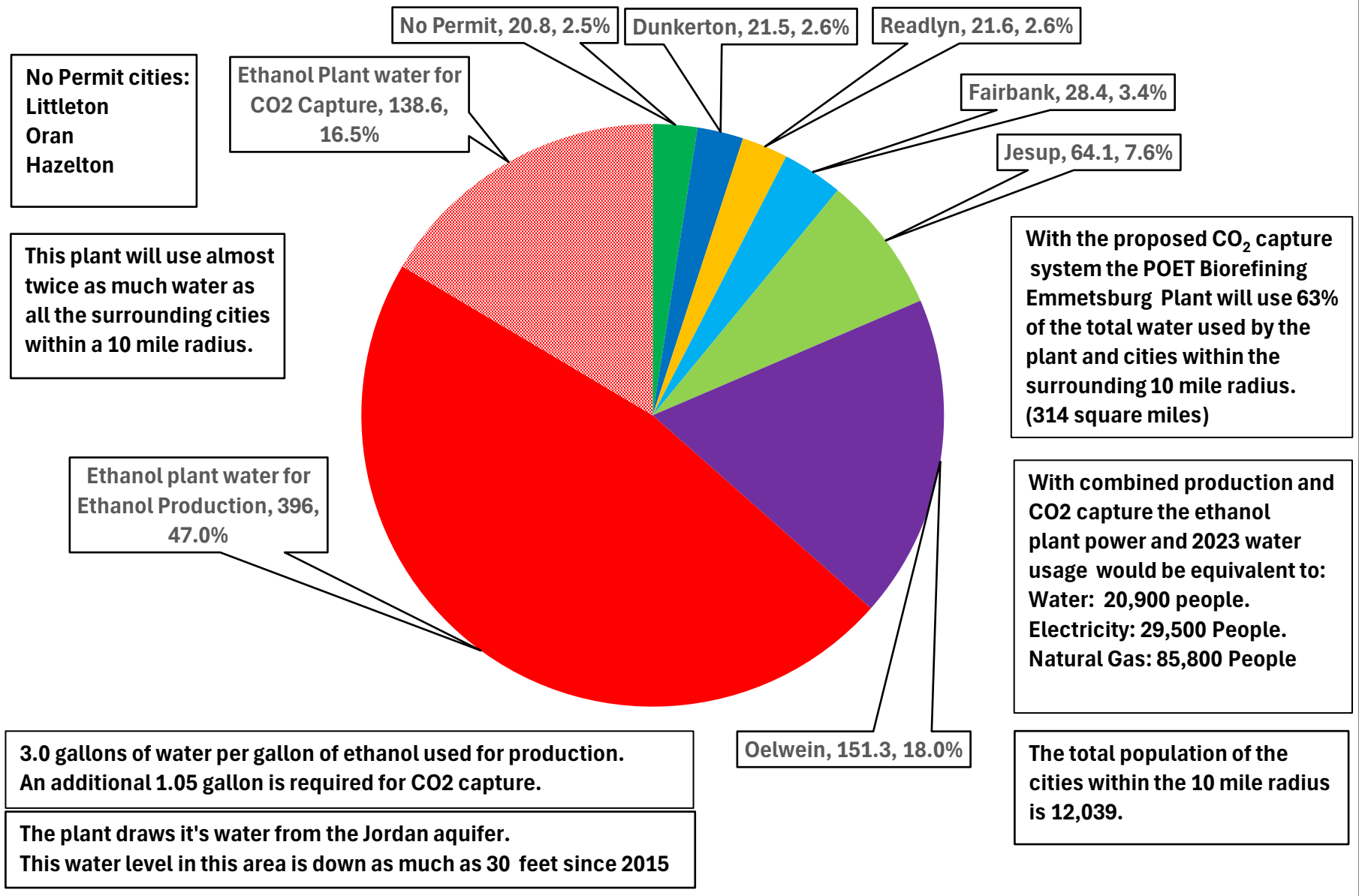
Ethanol Plant with CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Fairbank, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Littleton	50	1.3	1.3		Water usage too small to require a permit
2	Oran	50	1.3	1.3		Water usage too small to require a permit
3	Hazelton	713	18.2	18.2		Water usage too small to require a permit
	No Permit	813	20.8	20.8	2.5%	
4	Dunkerton	842	21.5	21.5	2.6%	
5	Readlyn	845	21.6	21.6	2.6%	
6	Fairbank	1111	28.4	28.4	3.4%	No DNR Water Permit
7	Jesup	2508	64.1	64.1	7.6%	
8	Oelwein	5920	151.3	151.3	18.0%	
9	Ethanol plant water for Ethanol Production		578	396	47.0%	Without CO <sub>2</sub> Capture water requirement
10	Ethanol Plant water for CO <sub>2</sub> Capture		138.6	138.6	16.5%	Additional CO <sub>2</sub> Capture water requirement
Total Plant and Towns		12,039	1024.2	842.2	100.0%	
Percentage of ethanol plant usage of total water usage			70.0%	63.48%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 63% 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>132</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>		138.6				
<b>Calculate ratio of gallons of water/ gallons of Ethanol</b>		3.0				
<b>Total water requirement of towns and Ethanol plant - MGY</b>		863.0				
<b>Total water requirement of towns - MGY</b>		328.4				
<b>Total water requirement for ethanol plant - MGY</b>		534.6				
<b>Ratio of ethanol plant water use vs. surrounding area</b>		1.63				
<b>Percentage of ethanol plant usage of total water usage</b>		61.9%				
<b>Total Population within the 10 mile radius</b>		12,039				

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<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	15,499				
Equivalent # of people ethanol plant water use w/ CO2 capture	20,924				
<b>Electricity Use</b>					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	79,200,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	49,764,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.290E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	12,310.4				
Number of people / residence	2.4				
Equivalent number of people	29,545				
<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	3.432E+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	35,750				
Number of people / residence	2.4				
Equivalent number of people	85,800				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

# #21 POET Biorefining - Fairbank Ethanol Plant (132 MGY) near Fairbank

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



With the proposed CO<sub>2</sub> capture system the POET Biorefining Emmetsburg Plant will use 63% 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: 20,900 people.  
 Electricity: 29,500 People.  
 Natural Gas: 85,800 People

The total population of the cities within the 10 mile radius is 12,039.

This plant will use almost twice as much water as all the surrounding cities within a 10 mile radius.

Ethanol plant water for Ethanol Production, 396, 47.0%

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

The plant draws it's water from the Jordan aquifer. This water level in this area is down as much as 30 feet since 2015