

## #29 Valero Renewable Fuels - Lakota 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 Lakota, Iowa						
	Valero Renewable Fuels Lakota Plant		330	330		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		60.5	60.5		City residential use assumes 70 gal./person/day
1	Pilot Grove Mn.	167	4.3	4.3		Minnesota Town
2	Elmore Mn.	549	14.0	14.0		Minnesota Town
3	Ledyard	121	3.1	3.1		
4	Lakota	267	6.8	6.8		
5	Swea City	566	14.5	14.5		
6	Bancroft	699	17.9	17.9		
	Percentage of ethanol plant usage of total water usage	2369	84.5%	84.5%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 84% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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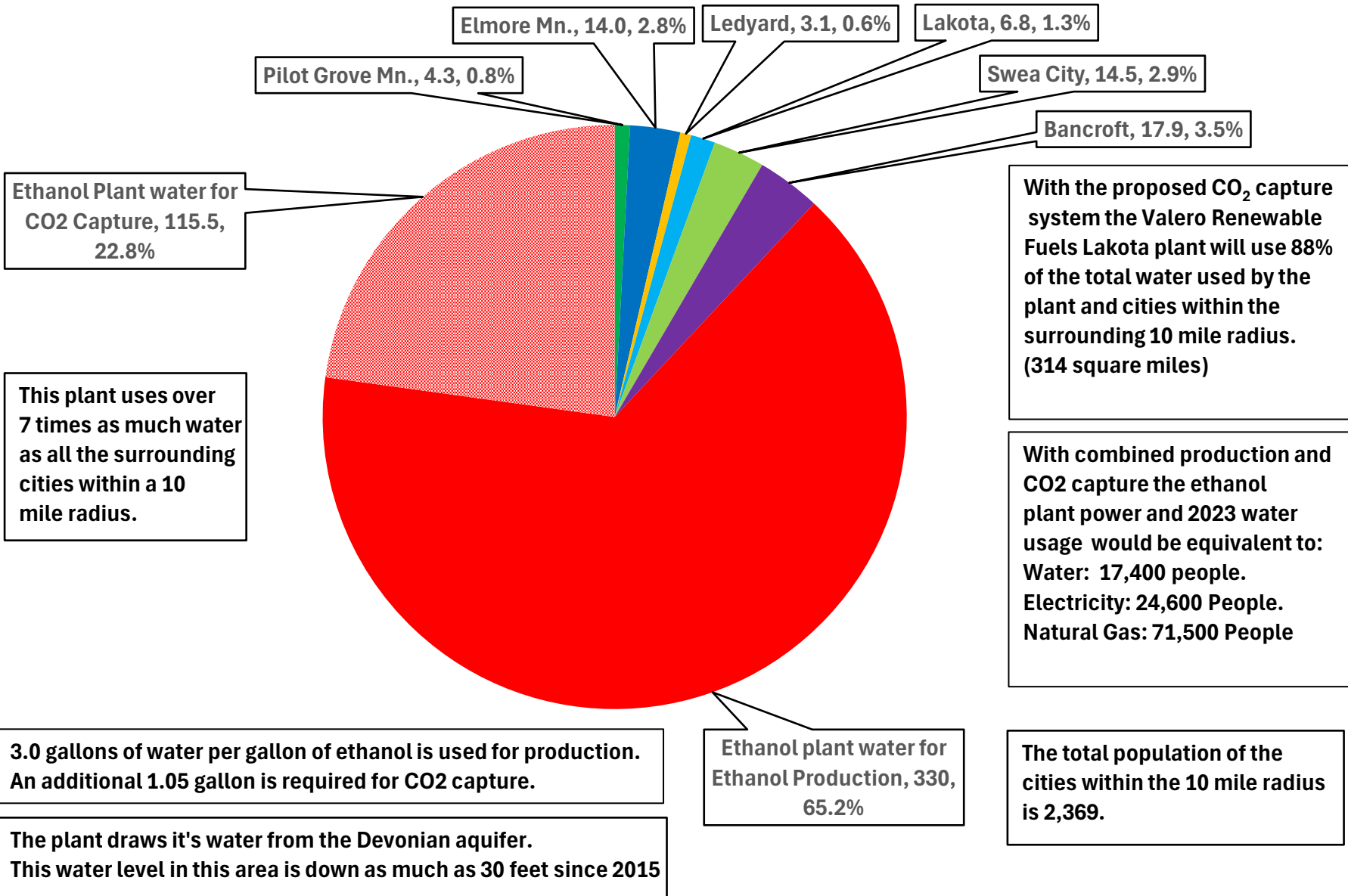
Ethanol Plant with CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Lakota, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Pilot Grove Mn.	167	4.3	4.3	0.8%	Minnesota Town
2	Elmore Mn.	549	14.0	14.0	2.8%	Minnesota Town
3	Ledyard	121	3.1	3.1	0.6%	
4	Lakota	267	6.8	6.8	1.3%	
5	Swea City	566	14.5	14.5	2.9%	
6	Bancroft	699	17.9	17.9	3.5%	
7	Ethanol plant water for Ethanol Production		330	330	65.2%	Without CO <sub>2</sub> Capture water requirement
8	Ethanol Plant water for CO <sub>2</sub> Capture		115.5	115.5	22.8%	Additional CO <sub>2</sub> Capture water requirement
Total Plant and Towns		2,369	506.0	506.0	100.0%	
Percentage of ethanol plant usage of total water usage			88.0%	88.0%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 88% 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>110</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>						
		<b>115.5</b>				
<b>Calculate ratio of gallons of water/ gallons of Ethanol</b>						
		<b>3.0</b>				
<b>Total water requirement of towns and Ethanol plant - MGY</b>						
		<b>506.0</b>				
<b>Total water requirement of towns - MGY</b>						
		<b>60.5</b>				
<b>Total water requirement for ethanol plant - MGY</b>						
		<b>445.5</b>				
<b>Ratio of ethanol plant water use vs. surrounding area</b>						
		<b>7.36</b>				
<b>Percentage of ethanol plant usage of total water usage</b>						
		<b>88.0%</b>				
<b>Total Population within the 10 mile radius</b>						
		<b>2,369</b>				

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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	12,916				
Equivalent # of people ethanol plant water use w/ CO2 capture	17,436				
<b>Electricity Use</b>					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	66,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	41,470,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.075E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	10,258.7				
Number of people / residence	2.4				
Equivalent number of people	24,621				
<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	2.860E+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	29,792				
Number of people / residence	2.4				
Equivalent number of people	71,500				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

# #29 Valero Renewable Fuels Ethanol Plant (110 MGY) near Lakota

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 Valero Renewable Fuels Lakota plant will use 88% 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: 17,400 people.  
 Electricity: 24,600 People.  
 Natural Gas: 71,500 People

The total population of the cities within the 10 mile radius is 2,369.

Ethanol Plant water for CO<sub>2</sub> Capture, 115.5, 22.8%

This plant uses over 7 times as much water as all the surrounding cities within a 10 mile radius.

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.

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

Ethanol plant water for Ethanol Production, 330, 65.2%