

## #14 Valero Renewable Fuels - Albert City 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 Albert City, Iowa						
	Valero Renewable Fuels - Albert City Plant		610	405		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		57.2	57.2		City residential use assumes 70 gal./person/day
1	Varina	68	1.7	1.7		Water usage too small to require a permit
2	Marathon	230	5.9	5.9		
3	Albert City	677	17.3	17.3		
4	Laurens	1,264	32.3	32.3		
	Percentage of ethanol plant usage of total water usage	2,239	91.4%	87.6%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
<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>						

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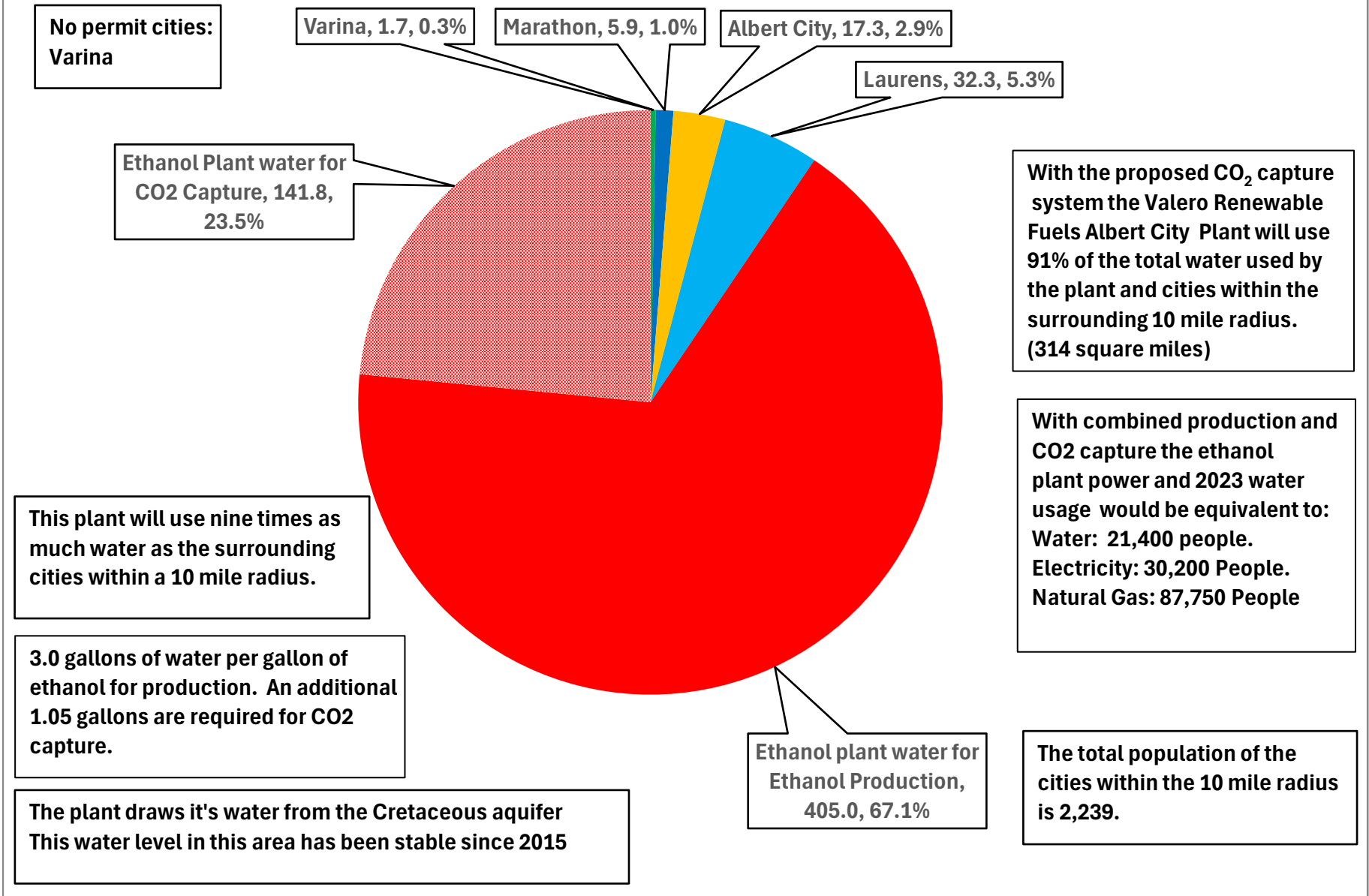
Ethanol Plant with CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Albert City, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Varina	68	1.7	1.7	0.3%	Water usage too small to require a permit
2	Marathon	230	5.9	5.9	1.0%	
3	Albert City	677	17.3	17.3	2.9%	
4	Laurens	1264	32.3	32.3	5.3%	
5	Ethanol plant water for Ethanol Production		610.0	405.0	67.1%	Without CO <sub>2</sub> Capture water requirement
6	Ethanol Plant water for CO <sub>2</sub> Capture		141.8	141.8	23.5%	Additional CO <sub>2</sub> Capture water requirement
Total Plant and Towns		2,239	809.0	604.0	100.0%	
Percentage of ethanol plant usage of total water usage			92.9%	90.53%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 91% 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>135</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>141.75</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>604.0</b>				
<b>Total water requirement of towns - MGY</b>		<b>57.2</b>				
<b>Total water requirement for ethanol plant - MGY</b>		<b>546.8</b>				
<b>Ratio of ethanol plant water use vs. surrounding area</b>		<b>9.56</b>				
<b>Percentage of ethanol plant usage of total water usage</b>		<b>90.5%</b>				
<b>Total Population within the 10 mile radius</b>		<b>2,239</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	15,851				
Equivalent # of people ethanol plant water use w/ CO2 capture	21,399				
<b>Electricity Use</b>					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	81,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	50,895,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.319E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	12,590.2				
Number of people / residence	2.4				
Equivalent number of people	30,216				
<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	3.510E+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	36,563				
Number of people / residence	2.4				
Equivalent number of people	87,750				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

# #14 Valero Renewable Fuels Ethanol Plant (135 MGY) near Albert 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:  
Varina

Ethanol Plant water for CO2 Capture, 141.8, 23.5%

With the proposed CO<sub>2</sub> capture system the Valero Renewable Fuels Albert City Plant will use 91% 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: 21,400 people.  
Electricity: 30,200 People.  
Natural Gas: 87,750 People

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

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

The plant draws it's water from the Cretaceous aquifer  
This water level in this area has been stable since 2015

Ethanol plant water for Ethanol Production, 405.0, 67.1%

The total population of the cities within the 10 mile radius is 2,239.