#14 Valero Renewable Fuels - Albert City 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 Albert City, Iowa			-	-		
	Valero Renewable Fuels - Albert City Plant		610	405		Without CO_2 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%		
Conclusion: Without CO2 Capture						
	This ethanol plant consumes 88% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).					

#14 Valero Renewable Fuels - Albert City Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Ethanol Plant with CO_2 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 CO2 Capture water requirement
6	Ethanol Plant water for CO_2 Capture		141.8	141.8	23.5%	Additional CO_2 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%		
Conclusion: With CO2 Capture						
	This ethanol plant consumes 91% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)					

***Ethanol Production Capacity of Plant - MGY**	**135**
Factor: Water required to cool and compress the CO_2 for capture - MGY Water/ MGY Ethanol	1.05
Calculate additional water required for CO_2 Capture - MGY	141.75
Calculate ratio of gallons of water/ gallons of Ethanol	3.0
Total water requirement of towns and Ethanol plant - MGY	604.0
Total water requirement of towns - MGY	57.2
Total water requirement for ethanol plant - MGY	546.8
Ratio of ethanol plant water use vs. surrounding area	9.56
Percentage of ethanol plant usage of total water usage	90.5%
Total Population within the 10 mile radius	2,239

#14 Valero Renewable Fuels - Albert City Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Water Use	
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**
Electricity Use	
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**
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	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