

#26 POET Biorefining - Hudson S.D. 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 Hudson, South Dakota						
	POET Biorefining, Hudson S.D. Plant		240	240		Without CO ₂ capture water requirement
	Combined Towns All Water Usage		202.9	202.9		City residential use assumes 70 gal./person/day
1	Fairview SD	65	1.7	1.7		South Dakota
2	Hudson SD	329	8.4	8.4		South Dakota
3	Alcester SD	787	20.1	20.1		South Dakota
4	Hawarden	2,700	69.0	69.0		
5	Rock Valley	4,059	103.7	103.7		
	Percentage of ethanol plant usage of total water usage	7940	54.2%	54.2%		
Conclusion: Without CO₂ Capture						
This ethanol plant consumes 54% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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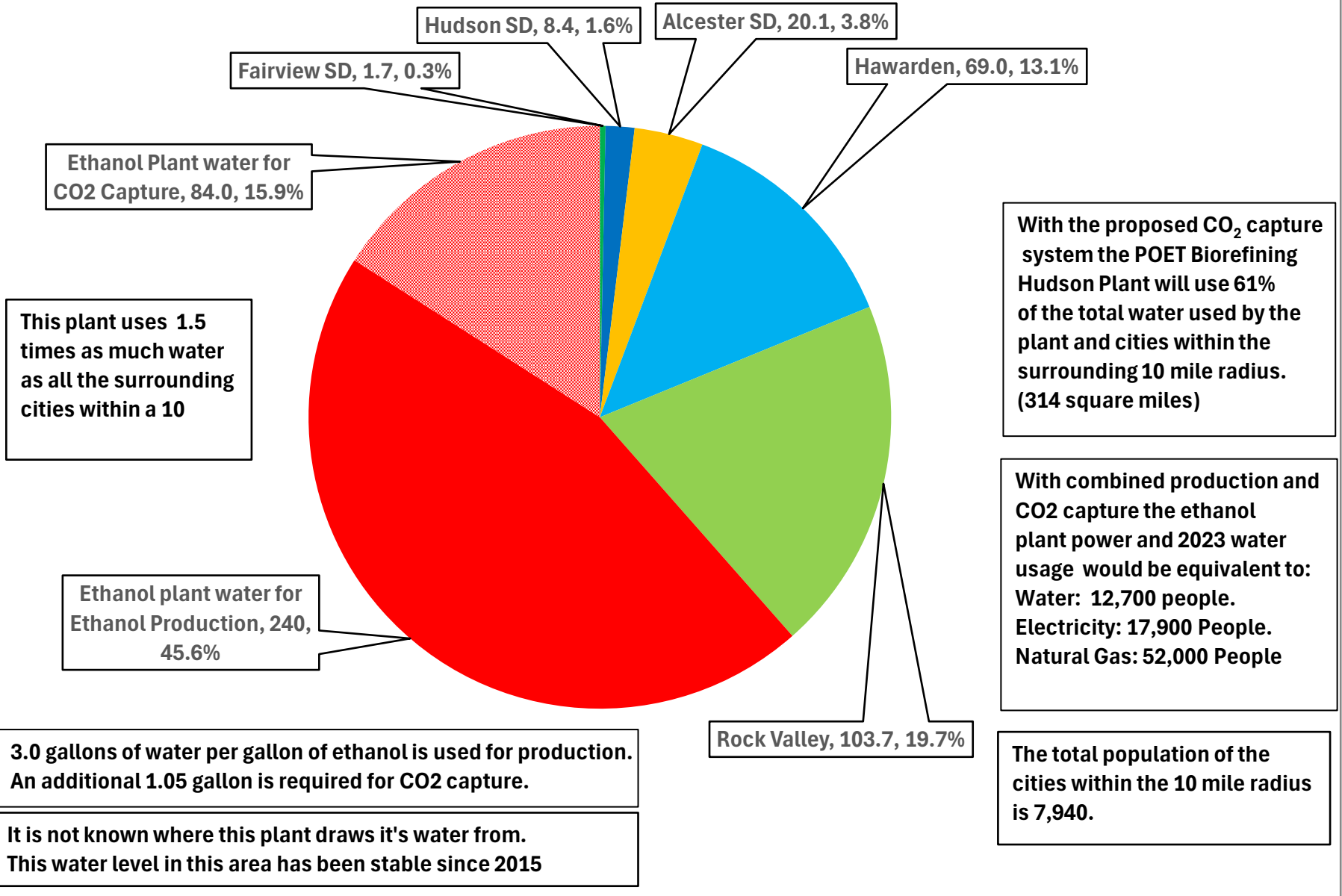
Ethanol Plant with CO ₂ Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Hudson, South Dakota		-	-	-	-	City residential use assumes 70 gal./person/day
1	Fairview SD	65	1.7	1.7	0.3%	South Dakota
2	Hudson SD	329	8.4	8.4	1.6%	South Dakota
3	Alcester SD	787	20.1	20.1	3.8%	South Dakota
4	Hawarden	2700	69.0	69.0	13.1%	
5	Rock Valley	4059	103.7	103.7	19.7%	
6	Ethanol plant water for Ethanol Production		240	240	45.6%	Without CO ₂ Capture water requirement
7	Ethanol Plant water for CO ₂ Capture		84.0	84.0	15.9%	Additional CO ₂ Capture water requirement
Total Plant and Towns		7,940	526.9	526.9	100.0%	
Percentage of ethanol plant usage of total water usage			61.50%	61.5%		
Conclusion: With CO₂ Capture						
This ethanol plant consumes 61% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
*Ethanol Production Capacity of Plant - MGY		80				
Factor: Water required to cool and compress the CO₂ for capture - MGY Water/ MGY Ethanol		1.05				
Calculate additional water required for CO₂ Capture - MGY		84				
Calculate ratio of gallons of water/ gallons of Ethanol		3.0				
Total water requirement of towns and Ethanol plant - MGY		526.9				
Total water requirement of towns - MGY		202.9				
Total water requirement for ethanol plant - MGY		324.0				
Ratio of ethanol plant water use vs. surrounding area		1.60				
Percentage of ethanol plant usage of total water usage		61.5%				
Total Population within the 10 mile radius		7,940				

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Water Use					
Typical water use per person per day - Gallons/ person/ day	70				
Equivalent # of people ethanol plant water use w/o CO2 capture	9,393				
Equivalent # of people ethanol plant water use w/ CO2 capture	12,681				
Electricity Use					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	48,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	30,160,000				
Total electricity to produce ethanol and capture CO2 - kWh	7.816E+07				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	7,460.9				
Number of people / residence	2.4				
Equivalent number of people	17,906				
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	2.080E+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	21,667				
Number of people / residence	2.4				
Equivalent number of people	52,000				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

#26 POET Biorefining Ethanol Plant (80 MGY) near Hudson South Dakota

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 CO₂ capture system the POET Biorefining Hudson Plant will use 61% 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: 12,700 people.
Electricity: 17,900 People.
Natural Gas: 52,000 People

The total population of the cities within the 10 mile radius is 7,940.

This plant uses 1.5 times as much water as all the surrounding cities within a 10

Ethanol plant water for Ethanol Production, 240, 45.6%

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

It is not known where this plant draws it's water from. This water level in this area has been stable since 2015