# #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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|---|---|---|---|---|---|---|
| **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 CO2 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)** | | | | | |

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| ***Ethanol Production Capacity of Plant - MGY** | **80** |
| **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** | 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