

Water Consumption

- Actual water consumption to electrolyze water or to reform natural gas to make hydrogen is less than the water used to refine gasoline. Gasoline ICVs are estimated to consume approximately 0.16 gallons of water per mile, compared to 0.11 gallons/mile for FCEVs.
- Some analysts have attributed huge water consumption rates to making hydrogen by electrolysis; however, these calculations are dominated by the water used in cooling towers at electric utility plants, even though most of that water is returned to the river or lake. Actual water *consumption* at thermal power plants is approximately 0.6 gallons/kWh, while water withdrawals average 25 times more or 15 gallons/kWh that is returned to the water source.
- Irrigating corn fields to produce ethanol does require substantial water. In Nebraska, 2,100 gallons of water are used to produce one bushel of corn yielding 2.7 gallons of ethanol, or 780 gallons of water per gallon of ethanol from irrigated corn fields. Assuming that 20% of all corn is irrigated in the US, this corresponds to an average of 11.2 gallons of water per mile traveled in an ethanol ICV, or 70 times more water than a gasoline ICV.
- Ethanol plants require only 3.6 gallons of water per gallon of ethanol, or 200 times less than that required for irrigated corn fields.
- Cellulosic ethanol should cut water consumption significantly. For example, using agricultural waste such as corn stover to make ethanol would increase the ethanol yield without requiring any more water. However, even if ethanol yield was doubled, cellulosic ethanol would still require 35 times more water than gasoline ICVs.
- Cellulosic ethanol from other non-irrigated crops or waste agriculture sources should have much lower water requirements.
- Because of the water that is actually consumed at thermal power plants, using electricity to charge car batteries does consume approximately twice the water as gasoline or three times hydrogen in a FCV. Therefore PHEV's consume more water than HEVs for gasoline or hydrogen. However, ethanol-powered PHEVs consume less water than ethanol-powered HEVs, since electricity is displacing water-hungry ethanol for part of the travel.
- The water consumption ratios are approximately ethanol ICV = 70 X Gasoline ICV; BEV = 2X Gasoline ICV; and FCEV = 0.7 X gasoline ICV.