



Ethanol Case Study: Systems Condition Review

The following analysis identifies possible ways in which the proposed ethanol facility may be evaluated using the Natural Step system conditions (written as 'the four principles of sustainability').

System Condition #1: Eliminate our contribution to the progressive buildup of substances extracted from the Earth's crust.

Potential concerns

1) Energy Balance: will there be less fossil fuel use in the ethanol production cycle relative to extraction of fossil fuels? What is the overall energy balance, taking into account the production of corn, which utilizes fertilizer, irrigation, and tractor tillage? A LCA of this facility may be warranted.

Potential positive impacts

- 1) The state-of-the art technologies and production efficiencies that will be utilized by the facility could result in reduction of extraction (of fossil fuel, water) and reduced amounts of energy required for the process.
- 2) Future use of alternative (cellulosic) feedstocks would be a positive, as production of alternative feedstocks are potentially less extractive and less resource intensive.

System Condition #2: Eliminate our contribution to the progressive buildup of chemicals and compounds produced by society.

Potential concerns

- 1) Greenhouse gas emissions: What is the net decrease or increase in CO₂ and nitrous oxide emissions (life cycle assessment, including corn production)?
- 2) Water quality: corn production has a negative impact on water quality (surface and groundwater) because of the use of fertilizers and chemicals. Increasing the demand for corn can negatively impact water resources.
- 3) Chemical buildup in soils – current corn production results in chemical buildup in soils (as well as water resources); increased corn production will increase this negative impact.

Potential positive impacts

1) Utilization of methane gas from area dairies would be a net positive, as it would displace fossil fuel utilization and contribute to climate change mitigation. Would require a full facility engineering and economic analysis to assure viability – would it increase the need for transportation of manure to a regional facility? How would methane be transported to the ethanol production facility?

System Condition #3: Eliminate our contribution to the progressive physical degradation and destruction of nature and natural processes.

Potential concerns

1) Water draw-down: these facilities use a lot of water. If water draw down from the industrial well pulls from the water table, this could have a significant impact on neighbors and general water quality and availability.

- 2) Water discharge: water quality would need to go beyond regulatory compliance. Water temperature upon discharge must be similar to that of the water body it is being discharged into. Aim should be zero discharge of any material or chemistry from the operation.
- 3) Air emissions and odor: emissions permitted should go “beyond” regulatory compliance. Aim should be zero discharge of any material or chemistry from the operation.
- 4) Dust: impact assessment should be done, and reviews of similar facilities. Aim should be zero discharge of any material or chemistry from the operation.
- 5) The Gulf Coast Dead Zone – will potential increase in corn production (by increasing demand for corn) lead to increased negative pressure on the already deteriorated Gulf ‘dead zone’?

System Condition #4: Eliminate our contribution to conditions that undermine people’s capacity to meet their basic human needs.

Potential concerns

1) If society switches from fossil fuels to petroleum, now will this impact global availability of corn to the world’s people? Will this negatively impact price of corn and other grains in the developing world? What percent of corn crop production can be diverted from food to fuel without negative economic, social, and political repercussions?

2) Air emissions and odor: air emissions from industrial process will affect neighbors. Complaints have been received from neighbors of other facilities that these plants are associated with increased incidence of respiratory ailments and headaches. Truck traffic also increases emissions, especially if the trucks are diesel and left idling.

Odors are common with many other facilities, where scrubbing technology has not been utilized despite promises to the community. The DNR has record of many infractions but few resolutions. Plant should be at least 5 miles from schools, hospitals, and other public facilities (ideally, from residential areas). While this does not technically violate system condition #4, it could result in reduced quality of life for residents proximate to the plant.

3) Noise and truck traffic: The increased amount of truck traffic (and rail traffic) will have a great impact on noise level and will impact people who live near the plant. While this does not technically violate system condition #4, it could result in reduced quality of life for residents proximate to the plant

4) Economics and taxes: There are public consequences to the tax deferment requested and the cost of public services to the facility. The 10 year tax deferment should be analyzed. Commercial/industrial normally draws heavily on public service/infrastructure. The public needs to be assured of an overall gain (re public funds/tax revenue) on this project. The economic viability of the industry has to be analyzed: many ethanol facilities are closing because of the currently poor economic environment for ethanol

Potential positive impacts

1) Future use of alternative (cellulosic) feedstocks would be a positive, as alternative feedstocks can be produced on fallow or degraded land unsuitable for agriculture, and these feedstocks for energy would not compete with food for people.

2) job creations helps people meet their basic human needs

3) less energy spending leakage from community creates jobs.