This project is a very large experiment.

This permit to authorize underground injection of CO2 must acknowledge the experimental nature of this project. The experimental nature of this project has not been addressed.

Permanent geologic storage of CO2 is an experiment on a grand scale. Much research and development has gone into figuring out how to get the CO2 into the geologic formation. Once it's there, it's out of sight. Nearly all monitoring of its location, movement, and activity is only possible indirectly. There is no historical experience with storing CO2 in the Mt. Simon formation except for ADM at Decatur, and that has been for a limited time with catastrophic problems. Events at ADM are totally relevant to this project as it provides the only data with which to verify models, and the only real-world testing of materials and methods. The fourteen years of experience at ADM are miniscule compared to the thousands of years that CO2 will remain active. Current technology at ADM proved inadequate to be safe for even fourteen years.

This experiment is on a huge scale. It impacts thousands of acres of land and resources, in addition to the thousands of people residing there. Most of these people will be participants without even knowing they are being used. This project has an AoR of approximately 2640 square miles—determined by modeling—but the pressure front would actually extend to an even larger area. Modeling found the actual pressure front from an injection well extended approximately 160 km. (Birkholzer etal. 2009)

No one has any actual knowledge of what will happen to the stored CO2, and the altered environment within the Mt. Simon formation. Super-critical CO2 will not become inert for thousands of years. Everything about the future of the stored CO2 is largely speculation.

Most of the aspects of planning and design for this project are based on models. These are actually "best guesses." Characterization of the 29 mile radius AoR (USEPA 2025) is largely based on a 9" or less core sample. The characteristics of the rock might be very different ten feet, one hundred feet, one thousand feet, or ten miles from that point. Modeling uses assumptions about how homogeneous the formation is, for instance. Modeling is based on limited actual data, and a lot of assumptions. The relatively small-scale projects at ADM provide some short-term data, but the relevance is questionable, as **this** project proposes to inject at about three times the rate achieved at ADM. There is no long-term data with which to verify the models.

Modeling determines the fracture threshold of the rock. If the assumptions used in the modeling are incorrect, CO2 could be injected at a pressure such that the rock is fractured.

Preliminary seismic studies of the AoR use models to analyze the seismic data collected. Plume modeling is used to determine the location of the CO2 plume. Modeling is used to determine

how the pressure front will dissipate over time. Modeling is used to determine when the CO2 plume is "stable" and monitoring can cease. Data produced by one model may be plugged into another model. Everything is based on guessing.

The proximity of the J&L pickle well adds a whole dimension of experimentation to the project. The well was plugged and sealed to survive in the underground environment existing at that time. The environment will be changed to one of greatly increased pressure, and there is possibility of the two plumes mixing. The materials used to construct the original well, and the materials used to plug it were not specifically designed to withstand CO2 and carbonic acid. The J&L well will need to be monitored some way to be certain that it isn't being deteriorated by the new formation environment. The J&L plume needs to be monitored to see how it interacts or moves due to the injection-caused pressure front. There needs to be a monitoring well between the J&L well, and the injection well, to monitor the convergence. Except then that would mean the introduction of yet another hole through the confining zone, which creates **another** opportunity for corrosion and migration of fluids upwards.

Studies have shown that the risk of injection-induced seismic events is more affected by the rate of injection, than by total volume injected. (Alghannam etal. 2020) This project is proposing to inject at a rate that is three times the rate that has been done at ADM Decatur, so this is another significant experiment. Seismic activity must be closely monitored, and injection rate reduced if necessary. Another experiment. If seismic activity is triggered, it may not stop when injection rate is decreased. Seismic activity from the first injection well at ADM is ongoing, even after injection ceased and the well was plugged.

This is the first CO2 injection project in Illinois proposing to inject near a natural gas storage field, where natural gas is stored in the same geologic formation. The pressure fronts will likely overlap. The Troy Grove gas field has had issues with leakage and this experiment will require close monitoring of the pressures. Should the advancing pressure front from the CO2 injection increase the pressure at the Troy Grove site, natural gas could be pushed upwards into shallow aquifers. In 1960 the storage capacity at Troy Grove was 11 billion cu.ft. (Bell 1961)

What plan is in place to monitor the pressure changes withing the Troy Grove gas field? Who will be responsible for that monitoring? If NICOR is expected to monitor it, are they being compensated, and is there a clear and expedient path for communication both between Marquis and EPA? Since NICOR alternately injects and extracts, does the plan include special monitoring when those parameters change?

Each carbon sequestration project that EPA approves is a plan to put additional holes in the confining Eau Claire shale. This shale layer was purposefully designed by an intelligent designer to isolate the toxic heavy metals, halides, and other substances in the Mt. Simon from water sources. There is no construction materials with which to build these wells that has the known ability to function for a long enough period to assure the integrity of the seal