

**Climate Change Meeting June 13<sup>th</sup> 2023 at Ely Field Naturalists Resource Center**

**Maggie Schuppert from CURE on “Carbon Capture Utilization and Storage” and CO2 Pipelines**

**Barb:**

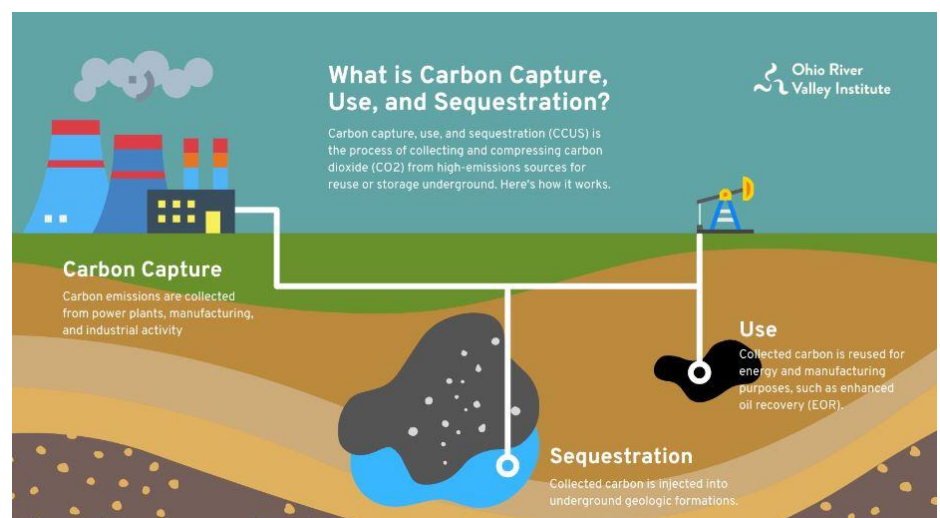
*We have Maggie Schuppert from CURE talking us talking to us today. Maggie works on CO2 pipelines among other things. CO2 capture and storage has become very controversial. Some people think that having carbon capture and storage is going to be necessary to bring the CO2 levels down beyond what we can do by not putting any more CO2 into the atmosphere. Yet we find that it's funded almost exclusively or promoted exclusively by the fossil fuel industry who clearly have other ideas about how we should proceed. Here is Maggie:*

**Maggie Schuppert:**

Hi, everyone. My name is Maggie. I am Campaign Director at CURE, Clean Up our River Environment. A few weeks ago you heard from Erik Hatlestad, my colleague at CURE, talking about our Electric Power Co-ops. CURE is an organization that works at the intersection of climate, the environment, and democracy in in rural communities in Minnesota and the Midwest. Some of our work is also at the Federal and national level. A big chunk of my work is in on the issue of carbon pipelines, and the larger issue of carbon capture, utilization and storage. And so that is what I'm going to talk about today.

My take on carbon capture utilization and storage (CCUS) is very critical. There is a lot of debate around this issue right now. There are a lot of climate policy experts, including some in the Federal government, who believe strongly that this is a required part of our response to dealing with climate change. My opinion is different and I am very critical of CCUS. I've been working deeply on this issue for approaching 2 years. I started off as an agnostic but I've become more hardened in my stance that this is not the path we should be going down to deal with climate change. My approach to being an environmental activist is grounded environmental justice and climate justice. I think our energy system has deep power imbalances with uneven and disproportionate impacts on certain communities that are mainly poor, Black or Brown. The way that we approach environmentalism must recognize this as a priority. Addressing those injustices and those power imbalances is my starting point in this work.

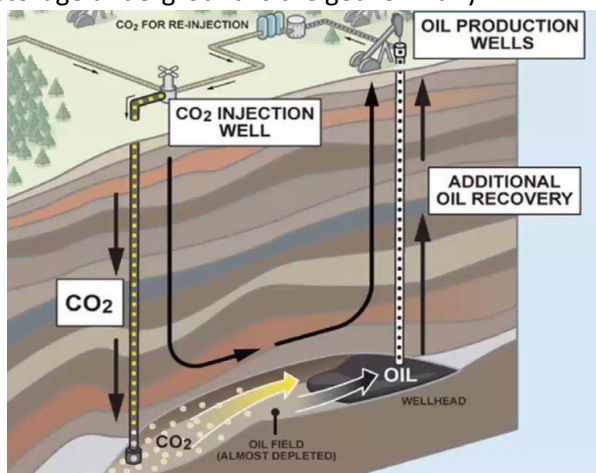
I think this is a new and rapidly changing topic for a lot of people, even those who are in the climate space. I think the knowledge about this technology when I started doing this work a couple of years ago was pretty specialized. No one was familiar with the topic outside of very specific industries. That is changing rapidly for a variety of reasons.



But what does CCUS “carbon capture utilization and storage” mean? It is a mechanical and chemical technology to capture the carbon emissions from the smoke stacks of high emitting power plants and industrial facilities. The captured carbon is in the form of CO<sub>2</sub>. It is compressed and manipulated so it can be transported to a site where it can be used by industry or sequestered permanently in the ground.

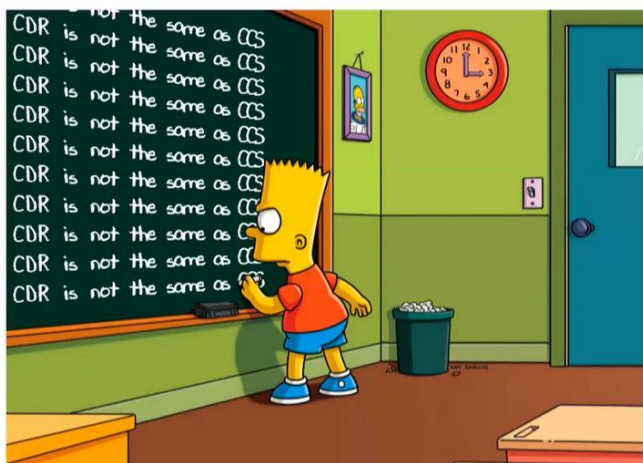
A mechanical and/or chemical process is used to remove the CO<sub>2</sub> from the waste gas stream. The CO<sub>2</sub> is then compressed for transportation by pipelines to a supercritical phase where it is in between a gas and a liquid. This needs very high pressure, much higher than normal gas pipelines. It does not need to be cooled. Considerable electrical energy is needed to extract and treat the CO<sub>2</sub> from the flue gas.

There is an important distinction between CCU and CCS. Once captured and transported the CO<sub>2</sub> can either be stored underground (that is CCS) or used by industry (that is CCU) where the captured carbon is almost all returned to the atmosphere. Permanent storage underground is the goal of many environmentalists, but in reality almost all the carbon captured is used by industry in enhanced oil recovery (EOR). In EOR the CO<sub>2</sub> is injected into nearly depleted oil wells as a method to force out the remaining oil. Within the fossil fuel industry arguments are made that using captured CO<sub>2</sub> for EOR is better than not capturing the carbon at all. Environmentalists are skeptical of this story with calculations that the whole process adds more carbon to the atmosphere. They also note that it is the fossil fuel industry that is the main driver pushing for government subsidies for CCUS.



The IPCC uses yet another term – CDR Carbon Dioxide Removal. CDR includes a range of approaches, not all of them technological or chemical, that are about removing carbon dioxide from the atmosphere.

## CARBON DIOXIDE REMOVAL (CDR) VS CCUS



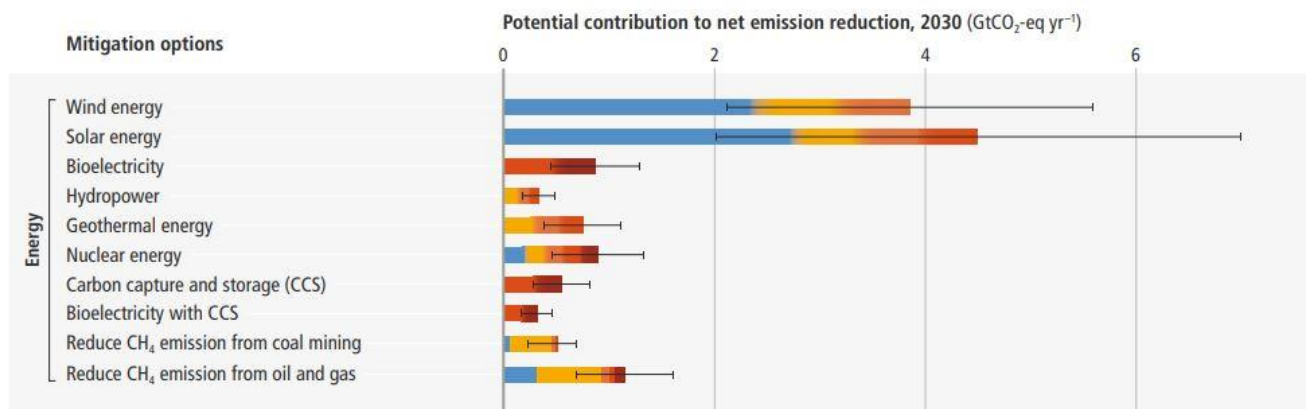
IPCC Working Group III Technical Summary:

“Carbon Dioxide Removal (CDR) is necessary to achieve net zero CO<sub>2</sub> and GHG emissions both globally and nationally, counterbalancing ‘hard-to-abate’ residual emissions...

**CCS and CCU applied to fossil CO<sub>2</sub> do not count as removal technologies.”**

These are also called negative emissions technology. CDR includes afforestation and reforestation, farming to sequester carbon in the soil, bioenergy with CCS, ocean fertilization, direct air capture and more. Direct air capture is being pioneered in Iceland at a very small scale and it works, but uses large amounts of energy. In contrast CCUS happens only at facilities where huge amounts of CO<sub>2</sub> are generated. Even there it never captures all the CO<sub>2</sub> in the flue gas.

Here is one of the graphs from the IPCC report which demonstrates how marginal CCUS is both in terms of its ability to deal with the emissions, and also how expensive and how resource intensive it is. The length of each bar shows the relative amount CCUS removes and the redder the color the more expensive the technique. The short red bars represent CCUS.



Proponents of CCUS like to point out it is not a new technology, it has been around for decades. It does work, but it takes a lot of energy which makes it expensive. A lot of funding and a lot of effort has been invested in it. Using CCUS on coal plants resulted in the “clean coal” claims some years ago. In the USA almost all the funding has come from the Federal government. Other countries are also investing, notably Canada and Australia and some of the Middle East states, all are fossil fuel driven economies.

To be successful it must be done on a huge scale to start to draw down the vast amount of CO<sub>2</sub> in the atmosphere. In addition to energy it also needs a lot of water to compress the gas without overheating it. The Department of Energy invested over a billion dollars into 11 CCUS facilities from 2010 to 2017. Only 2 of these are still in operation. None met their goals. The 2 surviving plants are used for enhanced oil recovery.

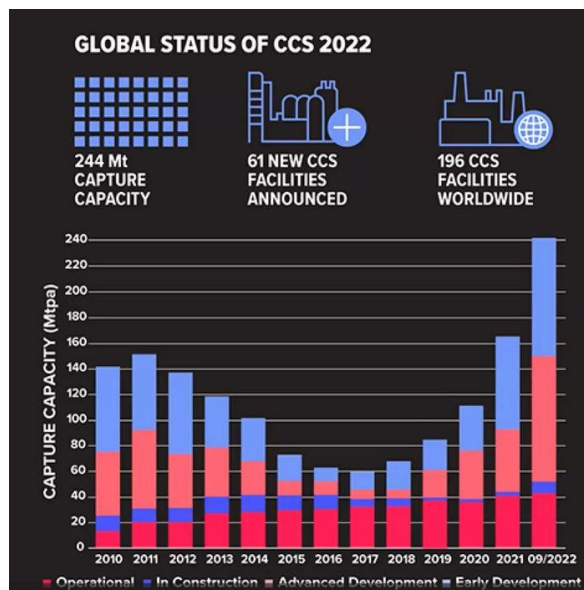
**Brian:**

*The scale of this problem is huge. When a train load of coal is burnt 3 train loads of CO<sub>2</sub> are generated measuring by weight. To separate the CO<sub>2</sub> from the flue gas takes energy and effectively reduces the efficiency of the power plant. The coal sequesters carbon in the ground for free until we dig it up and burn it. You also need a larger land footprint to have the carbon capture machinery next to the plant.*

**Maggie:**

This is from a report of a pro-CCUS think tank. Back in 2010 we had all of these projects supposedly on the horizon. This was the “clean coal” era. Many projects were not built and few new projects were planned from 2014 to 2018. Now the cycle has brought us back to an active period again. There are now 13 active CCUS facilities in the USA, all but 2 are used for enhanced oil recovery. 60 facilities are being planned. Industries involved are liquid natural gas, ethanol, fertilizer, hydrogen and others.

We are in a phase of rapid development because there is a lot of money available. The Infrastructure Bill and the Inflation Reduction Act (IRA) both ramped up funding. The IRA offers tax credits known as 45Q credits for captured carbon. 45Q credits are available for carbon captured for both use and storage with slightly higher reimbursements for storage. Low carbon fuel standards are an incentive, especially in California. In Minnesota the corn to biofuel market is important.



**Hudson:**

*So if I'm developing one of these projects, can I stack all of these incentives and get money from California, and from grants, and from the IJIA, and can I get a tax credit from the Federal Government?*

**Maggie:**

Yes, in large part you can combine the incentives. It's a lot of money. And there is a voluntary carbon market as well. There are ridiculous numbers of ways for industries to make money off this right now. There are voluntary markets and private sector investments. With the Federal Government providing such a large amount of public money the field is attracting more and more private money. For those of us who are deeply concerned about it this is not the way that we should be using our federal and public taxpayer money to address climate change.

**Gerry, Brian:**

*I've been reading about the pipeline that crosses part of Minnesota and goes to Illinois. Do they have oil wells there?*

**Maggie:**

Yes, they have oil wells in Illinois. This illustrates that the CO2 pipeline build out is not just about ethanol plants and sequestration. CURE became interested in this CO2 pipeline issue because it is local, it involves carbon capture and it is a major effort to use public money to build infrastructure to support fossil fuels.



Princeton University issued a report in 2022 showing maps of planned pipelines. Since the places where we are capturing CO2 are not the same places where you are either able to store it in the ground or use it an enhanced oil recovery, although those geological regions tend

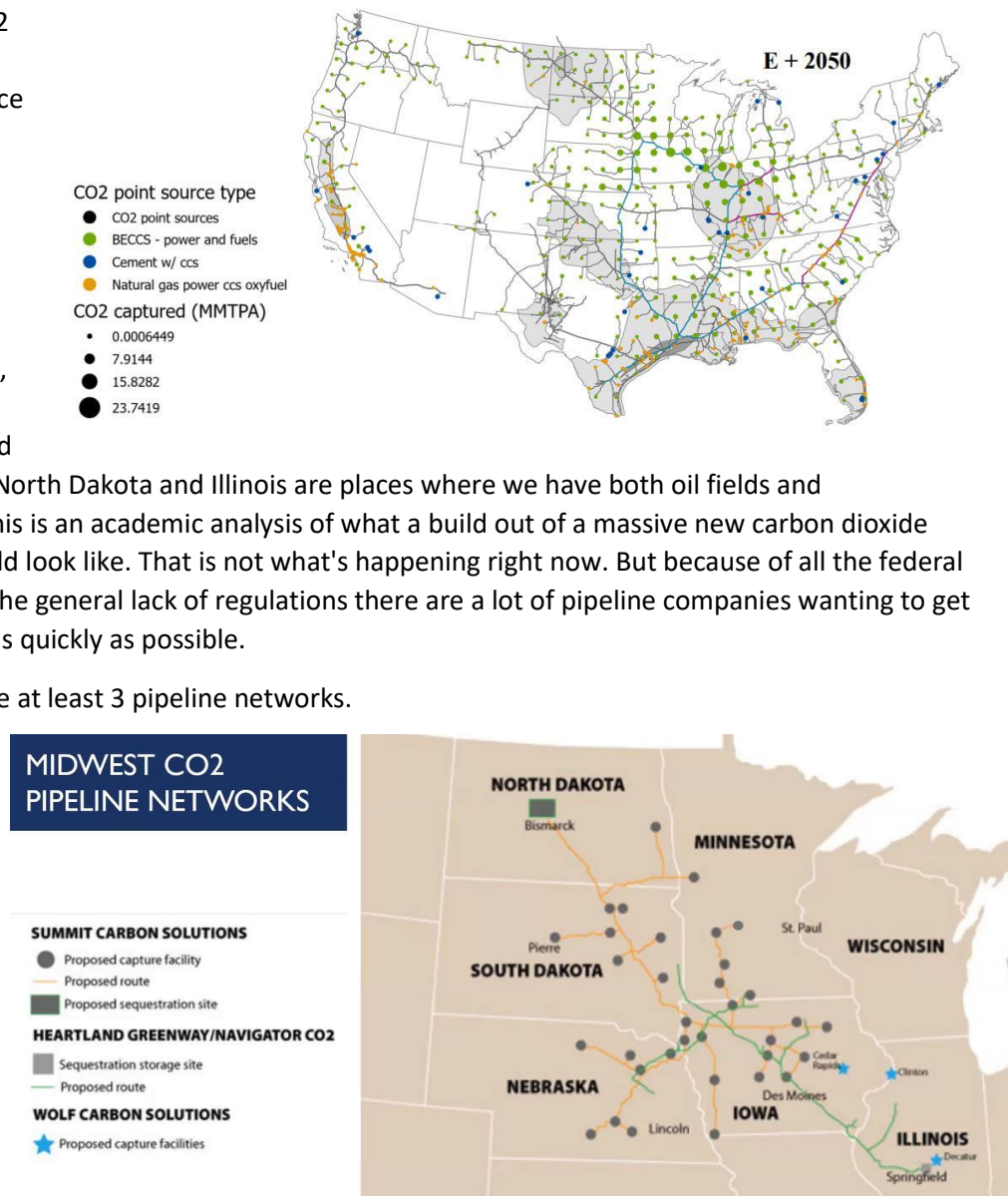
to be the same. Both North Dakota and Illinois are places where we have both oil fields and sequestration sites. This is an academic analysis of what a build out of a massive new carbon dioxide pipeline network would look like. That is not what's happening right now. But because of all the federal money available and the general lack of regulations there are a lot of pipeline companies wanting to get pipe into the ground as quickly as possible.

In Minnesota there are at least 3 pipeline networks.

Summit Carbon Solutions (shown in orange) has the biggest footprint. The Navigator pipeline, shown in green, goes to Illinois. Right now it has only one facility in the MN. We expect that to change because they

have partnered with POET which is a big ethanol producer with a lot of facilities in Minnesota. These pipeline networks are largely attached to these little gray dots which are planned ethanol and biofuel facilities. This has not been built yet, this shows the size of the proposed project. This is a huge planned build out of new pipelines of a scale far larger than anything we have now. Right now have about 5000 miles of carbon dioxide pipelines in this country, none so far in the Midwest. You can't use natural gas pipelines to transport CO2, because it has to be done at really high pressures.

How safe is this? We may hear proponents say “We breathe out carbon dioxide, what's big deal? It's all around us.” The fact is that at these kinds of pressures and concentration CO2 is very dangerous. We know that CO2 is an asphyxiant that can kill at high concentrations. If you were to have a pipeline rupture with carbon dioxide coming out at very high pressures that would be a huge risk to the people, the livestock, the vegetation anywhere in the in the vicinity. It is colorless, has no smell and is heavier than air. There's been very little study about what happens when carbon dioxide is released from these



kinds of pipelines. Folks in the sector talk about “CO2 plume modeling” to plan for pipe breaks, but there is little practical experience with the effects.

**Barb:**

*Are these pipelines on the ground or below ground? What size are they?*

**Maggie:**

They are definitely narrower than oil pipes. Typically they are from 4 inch diameter to 10 inches. They have pumping stations along the line. Pressures are over 100 times atmospheric pressure.

There have been ruptures. In 2021 one of these pipelines broke in Satartia, Mississippi. It's a small rural predominantly black town. A lot of people were taken to the hospital. There are people still dealing with the health impacts. Some of the issues that first responders dealt with include that cars stop running in high concentrations of CO2. So your gas combustion car isn't going to help you escape a carbon dioxide emergency.

Those are some of the issues you hear from first responders, especially in rural communities, where we know our first responders are already stretched thin. CO2 is also heavier than air and hugs the ground in a way that is really not good for humans or other mammals. It rolls downhill into low-lying areas and accumulates there. The claims that are made about how safe these pipelines are not really based on a lot of knowledge about what's actually going to happen in the case of emergency. CO2 combined with water, creates carbonic acid. Pipelines will also go under waterways, ground water and aquifers. Issues of safety can and should be addressed. But there is a rush to build them because a lot of the tax incentives have time limits on them.

**Question:**

*It sees that the source of CO2 for the pipelines is the ethanol facilities. Why?*

**Maggie:**

Yes, the easiest sources for CO2 are largely ethanol, and other biofuel and agriculture related facilities. They capture relatively pure CO2 from the fermentation process alone, not from the energy used to run the ethanol plant. It's considered the low hanging fruit of carbon capture. But it is also the way that they get the pipeline infrastructure in the ground, based on the biofuel sector. But you don't build this kind of massive infrastructure just for biofuels, you build it for LNG and other high carbon emitting facilities.

**Gerry:**

*If the capital costs are coming from the government public sources, where does the revenue come from to operate it, to maintain it, to buy the energy to pump it?*

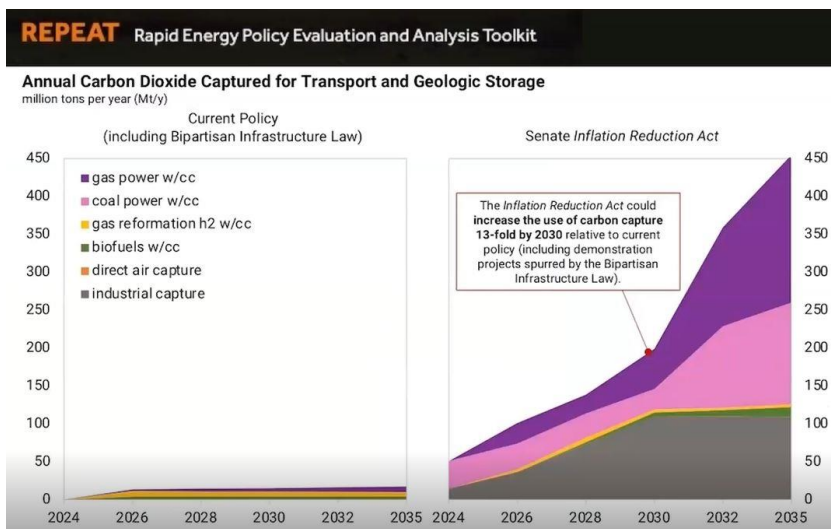
**Maggie:**

The tax credits come from the ongoing capture of CO2. The 45Q tax credit depends on the amount of gas captured and supplies operating funds. There are many types of investors – fossil fuel companies, pipeline developers, the biofuel sector, venture capitalists. They all plan to make money from the federal incentives. The system is under regulated at every level, local, state and federal, and it forms a large amount of the work that I do. Hudson has worked on it a lot at the State level and is beginning to

change the regulatory structure around these pipelines in the State of Minnesota. We've been pretty successful. When we started this work there was no state agency that saw themselves having regulatory authority over these kind of pipelines.

Because of our advocacy and legal interventions and with discussions with folks from the areas involved, the PUC has asserted their authority. We are going through a permitting process right now. PHMSA the Pipeline Hazardous Material Safety Administration who are in charge of pipeline operations and safety in the country right now, have realized that their guidelines are inadequate and are going through a whole process to update them.

Here is an example of a CCUS project: ADM's (Archer Daniel Midland) Illinois Decatur Ethanol Facility. This is where carbon capture should work. The fermentation of corn generates almost pure CO<sub>2</sub> that is easy to capture. The facility began operation in 2017 with a \$141 million assist from DOE. It captures 50% of the CO<sub>2</sub> from fermentation process and 11% of the total emissions of the plant. For an overview this operation, at best, would capture 0.01% of the US CO<sub>2</sub> emissions. The overall facility emissions went UP slightly when the carbon capture was started as the carbon capture itself needs energy. Nevertheless it is regarded as a big success story.



This comes from a Princeton report and is their analysis of where carbon capture would be applied from the present time and going through 2035. The green section is biofuels, all the rest is gas and coal fossil fuel and industry. You can see that this reveals that we are actually building these pipelines for the fossil fuel industry.

You also see that in terms of who's investing in these things. You can ask why Continental Resources, which is a big fossil fuel company, is investing in a pipeline network for the biofuel sector. They're doing it because this is infrastructure that they need and want, the biofuel sector provides a convenient justification.

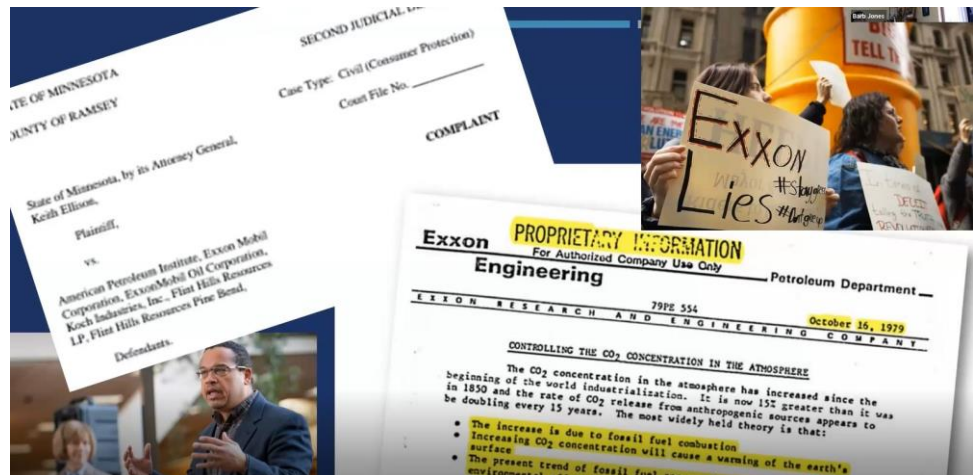
This brings me to my closing argument. The fossil fuel industry would like us to believe that we could clean up the emissions from the fossil fuel sector by taking the CO<sub>2</sub> out of the smoke stacks and out of the air. That would make it possible to have a clean fossil fuel world. We know it's not working right now, only a cartoon version exists.

There are 1 million plus one reasons why we need to be drawing down our fossil fuel, use and production as quickly as possible in a planned, managed way. And those are reasons of human rights and good governance, indigenous sovereignty and environmental justice.

This is an industry that has lied and fought every point along the way to convince us that fossil fuels were not a problem, that they were not harming people or our environment. The State of Minnesota is suing them right now along with many other States. And yet there are folks that are making the argument that the same fossil fuel industry is going to be our partners in

dealing with the emissions and dealing with the climate crisis. We would be naïve to believe this. We know it's an industry that creates harm at every point along the supply chain from points of extraction to the transport, production and use of petrochemicals. As climate activists we really need to keep in mind that the real drawdown of fossil fuels is a priority for a lot of reasons, including emissions and the climate and justice implications. Carbon capture falsely implies that we can continue to use fossil fuels.

Thank you. We have time for questions.



**Bill:**

*Where and how is the permanent sequestration done?*

**Maggie:**

We need to build out these pipelines is because the sequestration sites are not in the same place as most of the CO2 is generated. We don't have any sequestration sites in Minnesota. They are typically in oil fields like the Dakotas, Louisiana and Texas. These places will have many CO2 pipelines with potential ground water implications. What kind of geological instability does this cause? No one actually knows what the term “permanently stored” means. Proponents of CCUS talk about how carbon capture sequestration is a proven technology that has been studied and found to be successful. But if you actually look at the studies, what they're talking about is that they have successfully managed to use it for enhanced oil recovery. All of the studies done so far are by the fossil fuel industry and are not peer reviewed. We don't have the depth of academic and scientific study that looks at the permanent sequestration.

**Gerry:**

*We had 3 years of talking about using nuclear power to generate electricity. I think we should take a victory lap because I've finally seen it. What are your views regarding the use of nuclear energy to produce electricity?*



**Maggie:**

I come to this work from an environmental justice perspective. I have not seen an adequate response to the waste issue. The State of Minnesota has forced or coerced the Prairie Island community to accept nuclear waste close to their homes. Until we deal with those issues it's going to be very hard for me as an environmental justice advocate to be okay with that sector.

**Gerry:**

*You're certainly aware of Bill Gates developing fourth generation nuclear technology. They're building small nuclear power plants using sodium to cool. No risk and very little waste.*

**Barb:**

*Both nuclear and fossil fuels have waste. Fossil fuels put their waste into the atmosphere where it is doing harm to all of us through climate change. Is nuclear waste worse than this?*

*We should ask the online audience if they're does anyone want to unmute and ask a question?*

*I have a question on ethanol as a fuel. I have heard somewhere that about one third of the corn that's grown in Minnesota and Iowa goes to ethanol which just amazed me. And we're hearing about lack of food because of global conflict.*

**Maggie:**

The State of Minnesota is really pushing biofuels. Governor Walz has not come out with a position on carbon capture. It is one of the things the corn ethanol industry thinks is necessary for their continued viability to compete with other low-carbon fuels like sustainable aviation fuel and the other advanced biofuels. The state wants to support agriculture jobs.

**Gerry:**

*Does anyone know how many billions of dollars of funding for CCUS are in the Inflation Reduction Act?*

**Maggie and Hudson:**

It's a lot of money. The Infrastructure and Jobs Act committed large amounts of money to grants generating funding for research. In the Inflation Reduction Act there are tax credits. These can be unlimited in scope, the amount of funding involved depends on the amount of activity generated. For example, if 3 million of us buy an electric car they will have to give out 3 million tax credits. If 300 million of us buy an electric car there has to be 300 million tax credits. So it's kind of hard to say what the limit of the IRA is. This made a few members Congress very angry but so far attempts to repeal it have failed.

**Final applause thanking Maggie for talking today.**