01:00:06 Q: I'm at the international test centre at the University of Regina and I'm joined by Dr. Malcolm Wilson, the director of the office of energy and environment. Dr. Wilson is an internationally recognized expert in the field of carbon capture. Dr. Wilson first can you tell us a bit about your background? Where you grew up, your education, your family and why you came to Regina?

01:00:30
Certainly I actually was born in Egypt and with my father being in the British armed forces and spent a lot of my youth traveling. I have my degrees from University of Nottingham and the University of Saskatchewan and I came to Regina in 1981. I joined the provincial government and worked as a geologist and also in program development which of course led me ultimately into the area of carbon dioxide capture and storage and then finally joining the university and taking this up as a full time career in 2001.

01:01:12 Q: So, how did you get so interested in this field of carbon capture and storage?

1:01:18
I guess in some respects its one of those "life goes in a circle" type of thing. My PhD thesis was on post glacial climate change in northern Saskatchewan. I'm a geologist by training and then I got involved in program development and project development, looking at ways to increase oil recovery in the province of Saskatchewan and part of that was in 1987 becoming involved with CO2 capture for an enhanced oil recovery project at Midale and really haven't looked back since then, I mean it just became an opportunity at that time when the Bruntland report came out, Our Common Future, and so I was able to quickly put two and two together, here's a problem, here's a solution, let's keep going.

1:02:14 Q: Now you have an international reputation in this field. Can you tell us some of the travels you've been on during the past year say?

1:02:23
I do get a lot of invitations to the conferences around the world. I'm also involved on a number of the science advisory boards on a number of projects so over the last year or so I've been to Europe a number of times, Japan, mostly actually to Europe but also a number of trips to Australia and working with some of the groups down there. So, Europe that includes Germany, Italy, UK, France.

01:03:03 Q: And you've also shared a Nobel Peace Prize. Can you tell us about that.

01:03:07
In, a few years ago I was involved with the intergovernmental panel on climate change preparing a special report on carbon dioxide capture and storage, I

actually was working on the geological storage chapter and that report was publicly released in 2005 in Montreal and as a result of the work of the ITCC scientists and there are several thousand scientists in that group they were awarded, or we were awarded the peace prize along with Al Gore in 2007.

01:03:51 Q: Do you find people are sometimes surprised to know that this international level of research in carbon capture is going on in Regina Saskatchewan?

1:04:03
Sometimes, but really we've managed over the last 15 (mic pop) to 20 years to really develop something of an international reputation so you know I've kind of always used the little story if you pick up the phone and then phone somebody in Brazil or Australia and ask where in the world work is going on on carbon capture, one of the first answers they'll give is Regina and anecdotally I've even been to places where people recognized Weyburn and I've had to explain where Regina is in relation to Weyburn but generally they'll give you the answer Regina.

1:04:46 Q: Now some have said that you are the person that's largely responsible for all this work going on at the University of Regina in this field of carbon capture. Do you ever think about that, do you ever think that otherwise without you maybe this work would not have been at the level it is now?

1:05:05
I mean I think it's possible that the work wouldn't have been at the level that it is now. This is a team effort and I certainly am not in a position to do all the work so its, it really is very much a team effort. I'm the one that's been lucky enough I guess to get the reputation internationally to be invited to meetings to be on science advisory boards so I've really taken on the role of promoting this activity and using that visibility to generate funding for research and to continue to earn that profile for the university but it's not a single task, a single person task.

1:05:50 Q: What would you…ng

1:06:04 Q; Now some people have said that you are the main reason that the level of research in carbon capture is so high in Regina. Do you think that there would be this level if not for you and the work you've done?

1:06:18
I think that may be partially true. This is very much a team effort and we certainly wouldn't have been as far ahead as we are if it weren't for solid teamwork here at the university. I'm the one I guess that's been fortunate enough to be out there and more visible so with activities such as the IA greenhouse gas program and being on several science advisory boards, being invited to meetings in Europe and other parts of the world. I'm the one who gets out and meets people and so I'm able to translate that into support for research programs here at the university

but as I say it is very much a team effort here.

1:07:08 Q: What would you say is the best part of you job?

1:078:12
I really enjoy working with the innovative people so I get a real kick out of being able to talk to some of the most innovative people in the world and work with some of the most innovative people in the world, work with graduate students so it's nice to have all those young minds running around and expressing their ideas so I think mostly it's really getting to know people and getting their opinions on what is a critical problem.

1:07:49 Q: Can you give me a quick example, a quick story of meeting someone very innovative like that?

1:07:56
I think I can I get the opportunity to meet with people like David Duke at the University of Calgary, people like Ed Reuben at Carnegie Mellon who are very much at the forefront of these activities and to be able to interact with them and indeed bring their ideas back to Regina, evaluate them.

1:08:24 Q: Now the other side of that question is what's the worst part of your job?

1:08:26
Travel. Ha, ha. There's a simple answer on the worst part is just so much traveling so much as it sound exotic it really is fly in go to the meeting, turn around fly out again and then try to get over the jet lag that's associated with that.

1:08:49 Q: Outside of your research what do you do for hobbies and recreation?

1:08:55
I enjoy reading and relaxing with the family but I'm also a bit of a car fanatic which sort of goes against lowering our carbon footprint but still having a British background I enjoy having British cars around so I like to collect cars and work on them.

1:09:21 Q: So what kind do you, give me examples of some of your cars?

1:09:24
I have a 1974 Mercury Capri, so a British German built Ford, and 1990 Jaguar so and I have an old Land Rover that one of these days will get fixed up but not for a few years yet.

1:09:45 Q: How do you measure your success?

1:09:49
Mostly in terms of what's happening at the university, so the level of activity at the university, the level of activity with my colleagues so fundamentally if my colleagues are successful, they are undertaking research, they're getting research funding then I'm doing an effective job.

1:10:11 Q: Now I'd like to shift focus a little bit and talk about carbon capture. Can you explain in very simple terms, what is carbon capture and storage.

1:10:22
Carbon capture really is exactly what it says, what we're trying to do is extract the carbon dioxide from the exhaust gases of major facilities whether that's coal fired electric power plants, gas fired electric power plants, refineries, steel plants, cement plants, those kinds of things and this is a non trivial task in that the carbon dioxide levels in those exhaust gases are relatively low so we have to find a way of removing the other gases, primarily nitrogen so the capture end is really the tough end and so that's where a lot of the university work goes. The storage end is again, where do we put the carbon dioxide once we've got it so we have to have both ends of the pipeline in effect and so what we're looking at is putting the carbon back in the ground, in other words kind of putting the carbon back where it came from in the first place so we can use existing or depleted oil and gas reservoirs or deep saline aquifers and by saline aquifers I mean water that's non-potable so we can push the carbon dioxide into the ground and displace fluids that are in there and store the CO2 in that environment.
(1:12:05)
We, there's a lot of use of other terminology, for example south of the border they use sequestration as opposed to storage. We prefer the term storage in Canada because that's exactly what we're doing, it's storage for an extended period of time after which it becomes permanent and then I think we can say it's truly sequestered.

1:12:30 Q; So, what is the potential for this idea of carbon capture –

1:12:44 Q: What are the risks of this carbon storage which is just buried underground?

1:12:48
When we talk about putting carbon in the ground we really are looking at putting carbon deep underground so it's going to be almost unacceptable to go anything less than a thousand meters below the surface and perhaps as much as two to three thousand meters below the surface so when the CO2 is down there it really is remarkably safe in terms of it's going to stay there….can we start that one again?

1:13:27 Q: Can you tell me what some of the risks are of storing carbon dioxide underground?

1:13:35
We believe that the risks of storing carbon underground are very small which doesn't mean to say the risks are zero but we do undertake a lot of activities to make sure that that risk is at it's absolute minimum so at the very least we're going to put the carbon down a kilometer or even several kilometers below the surface so for example Weyburn is 1.5 kilometers below the surface. We also look to make sure that we have multiple, what we call seals so if for some reason the CO2 does begin to leak out of the container in which we put it, then it won't get past the next seal so in effect it's kind of like having your jar of peanut butter in the fridge wrapped in a plastic bag, wrapped in another plastic bag, in another plastic bag, each sealed independently to make sure that the smell or the oil doesn't get out and contaminate anything else in the refrigerator so we look at that. We also are developing here an new institute which will specialize in understanding the risks so we have the international performance assessment centre for geological storage of CO2 which will be a truly international centre, working out of the university of Regina to make sure that the standards are appropriate and the risk from geological storage is at it's absolute minimum.

1:15:21 Q: So what is the potential as you see for carbon capture and storage in terms of the environment?

1:15:28
I think it's basically there's a huge opportunity here for carbon capture and storage. Globally we're emitting something in the order of 30 billion tons of CO2 annually and quite a considerable amount of that perhaps something in the order of 55% of that comes from large sources so the potential is for capturing a very significant amount of that CO2 and certainly the IPCC looks at those very large numbers over the remainder of this century. Climate change left unchecked will create significant hardships globally and have significant costs to us as a society as an economy and so CCS can play a very significant role in helping to mitigate that cost and those changes. (1:16:35)

1:16:46 Q: So you say there's a big potential for helping the environment. How could you relate that to …when we talk of all this work on carbon capture and storage what difference could that make to the environment?

1:17:13
As an example, Midale Weyburn will be removing about 40 million tonnes of CO2 that would otherwise have gone into the atmosphere, that's putting it in context, taking roughly speaking 8 million cars off the road for a year. So each car then putting out something in the order of 5 million tonnes of CO2. 40 million tonnes is also quite significant when it's put in the Saskatchewan context. That's 2/3 of one year's emissions from Saskatchewan so we're putting out about 60 million

tonnes a year of carbon dioxide. If we can start to make that a reality globally then we can start to make a significant dent in the 30 billion tonnes that I was talking about.

1:18:13 Q: So what could this mean for people in Saskatchewan, across Canada and around the world both environmentally and economically?

1:18:23
Economically carbon capture and storage there are really two sides to it. One is there is a cost and we can't avoid that cost. The real issue is what's the cost of not doing it and unfortunately we're a lot further ahead with the cost of doing something than with the cost of not doing something because it's very difficult to put a price on losing specific islands to sea level rise, losing coastal regions, increasing coastal erosion, the increase in the size of storms, the severity of storms and the cost when those hit a major populated center so we can expect to see more of the Hurricane Katrina or Hurricane Rita that hit the Gulf Coast (watch beeping in bg). Once we start to add those up we can start seeing the economics of taking action and how much cheaper it's going to be to take action than to not take action. Socially I think what we're doing in Saskatchewan –

1:19:43 Q: So what could this mean for, so what could carbon capture mean for people in Saskatchewan, across Canada and around the world, both economically and environmentally?

1:19:54
From an economic perspective we have to recognize there's cost to carbon dioxide capture and storage. We can also say there's a cost to not doing anything and that cost can be very significant although it's very difficult to actually put a price on losing islands in the Pacific oceans, increase in the number of forest fires, perhaps we can take an example of the state of Victoria in Australia and the brush fires that have occurred there, maybe it's an increase in the number of intense storm events that might hit the Gulf coast or northern Australia or the Indian sub-continent so those are all economic costs. On the reverse side of it I think there are also some significant benefits, particularly those who are in the game first and so we are going to be building a new industry globally that's the size of the current natural gas industry so there's going to be a lot of jobs, there's a lot of opportunities for training for building the capture units, some of that could occur in Saskatchewan so I think there's some real benefits there.
(1:21:18)
In terms of the environmental side of it then we are looking at trying to mitigate significant changes and those changes include impacts on oceans citification and really some potentially very negative impacts on the food chains in the oceans and as I say the negative benefits, or the negative impacts that come with increased severe events whether that's erosion coastal erosion, internal erosion, more events like we had at Vanguard Saskatchewan a few years ago when we had extreme rainfall and we had major flooding.

1:22:05 Q: What do you see as some of the main obstacles in moving carbon capture from theory to reality?

01:22:15
I think there are really a couple of major barriers that are in place. The first is that industry has recognized that this cost, they recognize that there's a need to take action but until they have a firm policy in place from government that takes them down that avenue and I think we're beginning to see that now in the United States with the new president, then they're not going to risk the kinds of resources that are required and we are talking billions of dollars to take action on major power plants and so on so larger utilities could be facing really high costs. There's also the long term issue of the liability of storing CO2 in the ground. I've noted that risks are low but nevertheless risks are never zero and so we have to be able to account for that and the public sector has to play it's role as well as the private sector. The other barrier I think is a little less easy to design but boards and CEO's are always looking at the next technology and hoping it will be better so the end result of that we keep looking to the future and never actually doing what we should be doing now and that has become quite a serious barrier.

1:23:49 Q: Wouldn't it be better perhaps to research alternative sources of energy rather than relying on fossil fuels?

1:23:59
I think we have to do everything we can. We have to be looking at energy efficiency, conservation, alternative energy sources, there is no doubt that carbon capture and storage is only one of our proverbial arrows in the quiver and the University is not ignoring some of these other avenues. This has been a significant part of our research effort but not a total part so for example we've just purchased a wind turbine and we'll be working with innovation Place to install that turbine and undertake research on wind in, small scale wind in Regina. That information will be available to anybody in the city, anybody in the province to understand what it takes to install a wind turbine. We do work on bio master energy and we're certainly very keen on the area of waste energy, so can we divert material that's going to the landfill where it just basically sits for decades or even centuries and convert that into energy. And make it a useful product instead of a wasteful product. (1:25:20)

1:25:22 Q: How do you respond to those critics who say this technology is unproven and still really decades away from being commercially viable?

1:25:33
The technology that we're looking at here at the university which is called post combustion capture and in basic terms all we're doing is saying we purify the CO2 after the fossil fuel has been converted into energy as opposed to trying to remove some of the other products like nitrogen ahead of that conversion. So

this is a technology that has been available to us for probably 50 years. We used the same basic technology to produce food grade CO2 so the can of coke that you're drinking that CO2 probably originated as a lump of coal. We have the natural gas industry using this extensively so they remove carbon dioxide or hydrogen sulfide from natural gas streams to make them pure but it's the same technology. What the real issue is not a case of will the technology work. The technology will work, it's how good we are at bringing down the cost and from a university perspective we think we're very good at bringing down the cost and having lots of opportunity to bring down those costs but in order to really focus research for the future we need to get out there and demonstrate this technology at a commercial scale as soon as possible. We can do it, it is going to work. The real question is how low can we bring those costs down.

1:27:20 Q; What about the critics who say this technology is really just propping up the fossil fuel sector which ultimately causing climate change?

1:27:32
In some sense that's a very true statement. It is allowing us to continue using fossil fuels so we really have to be looking at this technology as a bridging technology, to something in the future. Personally I do not believe that alternative supplies, biomass, wind, solar is going to replace fossil fuel in the short term. There are always issues around other alternatives such as nuclear so we have to look at the next 50 to 100 years as a period of time which we phase ourselves out of fossil fuels and into a wide variety of alternatives but we are going to continue using fossil fuels so what we need to do is to use them in an environmentally friendly fashion.

1:28:26 Q: What's your prediction of how long it will be before CCS is widespread routine and commonplace and economically viable?

1:28:37
I think we're going to see the CCS being applied more and more over the next 5 to 10 years, by 2025 I think we're going to see it very broadly utilized in the fossil fuel industry, the utility sector. Within the next few years I don't think we're going to see a power plant built that isn't at least capable of having carbon capture added to is and probably by 2018, 2020 we're going to see all new power plants built with carbon capture at least in north America and Europe and probably a significant number even in the developing countries.

1:29:31 Q: Now that we know a bit more about you and a bit more about carbon capture, I'd like to talk a bit more about some of the research that's going on here at the University. Can you just sort of explain in general terms what all is being done at the university in the area of carbon capture.

1:29:48
The University has a very broad ranging program in carbon dioxide capture

focusing primarily on ? based capture, so chemically based capture systems which as I say are the ones that are most commercially ready today so we do everything from fundamental work, so design of new aimings that have performance, lower energy costs. We do new additives for the aimings such as using greener corrosion inhibitors, so we're looking at reducing the overall environmental footprint of the technology. We've got the ability to take that right through from bench scale so if you like, from the test tube level, right through to pre commercial demonstration in our pilot plants so at the larger scale we have a pilot plant in Estevan attached to one of Saskpower's coal fired power plants that puts everything out in the weather so we can test that in minus 30, we can test at plus 30 and we can test based on a coal fired power plant which of course if one of the key areas to be so we have that ability to go from graduate student work right through to pre-commercial testing and we hope at some point in the near future to go right through to commercial testing.

1:31:28 Q: I imagine any university with a university school could have got into this school. Why did it start at the university of Regina, what's some of the history of why carbon capture is such a big project here?

1:31:43
Saskatchewan as a whole has been involved since about 1987 in carbon capture. And even at that time the university had the energy research unit and the provincial government was support activity there, learning more about coal, so really trying to understand all the aspects of carbon capture and at that time it was primarily looking at the Co2 for a enhanced oil recovery. In 1991 the current dean of engineering, Dr. Patoon arrived and he brought his expertise in gas separation and so we were able to build the program at the university so part of it was I guess in a way serendipity, we had a need for the CO2. We had good oil fields that could take the CO2 so there was a keen interest in the province and we combined that with getting very innovative people into the university, an ability work between university and government. We were able to develop this program.

1:33:06 Q; Can you explain what the Weyburn Midale project is?

1:33:11
The Weyburn project and now the Weyburn-Midale project was originally proposed by Pan Canadian now Encana to take CO2 from North Dakota and at the time that was the chief source of CO2, we did as government look at the alternatives including Saskatchewan sources but were unable to find a competitive source but what that project did allow us to do was to develop a research program that would understand what happened to the CO2 as it was injected and look at the integrity of storage. So in the late 90's we recognized that we couldn't afford to make the mistakes of the past. We had to recognize that people had legitimate concerns about geological storage and we needed to do sound science in order to answer those questions so that project was set up

to start answering the questions using good scientists good science, before people actually started asking questions about the integrity of storage and I think in that respect that was an extremely effective program and really has been very well received.

1:34:41 Q: Now how is that different from the Saskatchewan/Montana project?

1:34:47
The Saskatchewan/Montana project is designed to look at really where we are today if we're going to make a significant dent (mic pops) in CO2 admissions to the atmosphere so it will take flu gas or exhaust gas off a coal fire power plant extract that, move it down to a storage location on Montana and there has been considerable work down in Montana looking at good options, at good opportunities for storage so we know that some of the preliminary work has been done one the site. For the Weyburn project, the CO2 comes from a plant where the CO2 is almost a pure by product so capturing it is extremely easy. That's still valuable in the sense of what we're learning about pipelining and storage but it's not a wide spread situation so we need, the Sask/Montana project is designed to look at a far more common set of circumstances and start overcoming this resistance to testing carbon capture and storage and implementing carbon capture and storage at commercial scale.

1:36:11 Q: President Obama has said he supports the idea of carbon capture and storage. What impact have his comments had here on the work at the University of Regina?

1:36:24
Having the president of the United States take a firm stand in the area of carbon capture and storage and recognize that it is a significant part of our efforts to reduce emissions really I think increases the focus on what we're doing here at the university. And any move made by the United States is really going to drive policy and regulation in other countries as well so we're going to see I hope the benefits of that in terms of yet another increase in the level of work that we're doing and it's all ready very high and new opportunities for funding research if we continue to improve the technology I can see nothing but good coming of it.

1:37:16 Q; Now there's also research into carbon capture at other Canadian universities. What sets the University of Regina apart from other Canadian universities, for example the University of Calgary?

1:37:27
The University of Regina has been in carbon capture and also geological storage longer than many other universities and certainly most of the Canadian universities. I think the thing that really sets us apart from the rest is that we're ready to go to the commercial scale. Our technology is ready to go to the next

level and really demonstrate that we can bring down the costs and that this is viable whether we use the CO2 for non-store recovery or for geological storage. This is the next critical step and we're ready to take it.

1:38:14 Q: At the University of Regina there are a number of facilities looking at carbon capture and the whole idea of the environment. I wonder if you can explain the relationships of each of these organizations and their involvement in carbon capture and storage. First of all the PTRC, the Petroleum Technology Research Centre.

1:38:35
The university either directly owns or is part of a number of efforts looking at carbon capture and storage. So the university is one of the two research partners of the petroleum technology research centre and as such we are undertaking research into enhanced oil recovery and geological storage. The PTRC is leading a number of projects such as the final phase at the Weyburn/Midale project, looking at storage in an oil reservoir, it's initiated work on aquastore which will take CO2 from the upgrader and look at storage in the Regina area. In addition to that we have the international test centre and we're sitting in the control room of the international test centre now. This is undertaking work on carbon capture. This is part of a large exercise within the university going from fundamental research into capture with the ITC doing work at the pre-commercial scale so pilot plant scale where we can actually see what's going to happen if we scale up to commercial. And really understand the implications of carbon capture on a power plant in real weather environments and so on.
(1:40:16)
We also have a number of other centres and institutes that are doing work for example prairie adaptation research collaborative looking at the impacts of climate change in a dry land environment and what might be adaptive technologies that need to be undertaken. In my own group, the office of energy and environment is there to try and coordinate all these activities and try to bring more research into the university and get the money flowing, get the research undertaken, get the results out. And our final new venture is the international performance assessment centre which will be designed to look at the risks associated with geological storage and to make sure that there's an objective transparent group globally to which companies governments, environmental groups can come to for unbiased information.

1:41:26 Q: It seems like there's a lot of organizations at the university of Regina looking into this area. Would it be more efficient if there were just one organization looking at carbon capture?

1:41:38
I think the consolidation is something that's underway at the university. There's a recognition that we have a number of groups that are undertaking research. We are trying to bring those together as much as possible and encourage

collaboration. I think also there's a value to having groups that specialize rather than having one group that tries to undertake all the activities. It's sometimes better to compartmentalize it a bit and yes encourage collaboration but no I don't think we have too many centres and institutes. We're doing a good job.

1:42:25 Q: What else would you like to share about the potential for carbon capture and the work being done at the University of Regina?

1:42:35
I think where the university's really at a very exciting point right now. The technology's ready to go to commercial testing, and if we're successful there and I firmly believe we will be completely successful, then there's an opportunity to increase our profile, increase the funding that comes in for research and to continue the good work that we're doing. Just because we're out of the commercial arena doesn't mean to say that research stops. In fact, being able to get out and test commercial will help guide us into further research and future opportunities so I think that's all very exciting. It's going to be good for the university and allow the university to continue expanding its research and profile in this area. I think it's going to be good for Saskatchewan, first in, what are the opportunities for economic development in Saskatchewan, what about the profile of Saskatchewan, new jobs in the province and so on so I think it's we're really at a very exciting point in our history and we're really looking forward to moving forward and increasing our overall profile.

1:44:04 Q: You talked about research dollars –

1:44:15 Q: What is the potential for this? What's the long term potential for carbon capture in terms of jobs and the economy in Regina, in Saskatchewan?

1:44:26
Figuring out what this means in terms of jobs is going to be a little tricky. At the moment we can certainly be looking forward to significantly expanding our program at the university, whether that means more professors, more graduate students and so on. If we're truly successful and I certainly have every confidence that we will be then there's an opportunity for significant economic development in the Regina area with jobs in construction certainly if we're able to move ahead with the Sask/Montana project there are going to be jobs involved in construction (cough) –

1:45:25 Q: So in the long term what's the potential for carbon capture here in terms of the economy and jobs.

1:45:35
Figuring out what this means in terms of jobs and other activities is a little tough at the moment. Certainly we're going to see an expansion in faculty and graduate students at the university and hopefully that's then going to translate

into SaskPower. If we're truly successful and I believe we will be, then we can also expect to see jobs in construction in Saskatchewan whether that's building for SaskPower or even building for export and taking our technology and moving it across North America so I think there are some pretty exciting opportunities there for the province, for the city and certainly for the university.

1:46:24 Q: In light of the global recession do you think that could cause any slowing down in this research in terms of large corporations and governments having less money to spend on research?

1:46:41
The global recession is certainly a problem. There's no doubt about that, there's less money, in talking to some industrial sponsors of activity we've been given some warnings that money may be a little tougher to come by but on the other side of it I'm certainly one of the optimists and hope that this recession will be a fairly short one and that we'll start out of that in the next year or two and start to see the money flowing again but I think it's also worth noting that the US in particular has not let up so we're seeing major economies, the US economy, the European economy saying that carbon capture and storage is something we do have to move into, that the recession is not an excuse for delaying so I think we are going to see companies wanting to invest and be ready for when the turnaround comes back cines again. (1:47:48)

1:47:56
One of the, one of the things that the president of the United States has talked about of course if cap and trade, the development of carbon credits. What that's going to do is not only force reductions in emissions, it's also going to force a value on CO2 or a cost if you're emitting that CO2 depending on how you look at it. That's really essential, putting a cost, a price on CO2 is essential to creating the economic environment within which utilities and other major emitters can take action to reduce their carbon emissions to the atmosphere so for example in Norway they've had a carbon tax in place for a decade or more now and so it was cheaper for ? to capture the CO2, perform a gas ? and then eject it into the subsurface rather than emitting it and paying the tax so at Slightner the first geological storage project in the world they've been injecting a million tons a year since 1996 and the reason for that is the $50 a ton tax on carbon dioxide so when we start seeing a value then we start seeing more emphasis placed on carbon capture and storage and it becomes more of a viable technology for wide spread implementation. (1:49:38)

1:49:45
One of the other points that really makes it good for the university and increases jobs is that if we're able to go ahead with the Saskatchewan/Montana project we'll actually create a major practical training facility in fact this will probably be the biggest and the best training facility anywhere in the world, certainly in North America so the university has the chance along with its partners south of the

border to move into training and start to fill some of the gaps as I mentioned earlier, we're trying to create a new natural gas industry in effect. That means thousands and thousands of new jobs globally and we can be part of the training that goes into developing the people for that global industry (1:50:49)

1:50:48 Q: So when one looks at all the work being done on carbon capture globally where does the university of Regina fit in?

1:50:56
Globally, there's a huge amount of work started up in carbon capture and storage in the last 5 to 10 years. I think what's really exciting is that the university is still very much in a leadership role in that area. We've been able to translate the early start and our ability to be able to work with large scale projects into very much of a leadership role and certainly the work we're doing on carbon capture is very much at the leading edge and very much at the commercial edge so this is the technology that will be applied first and we're a leader in that area so I think the university has done a good job of positioning itself to be a global leader, positioning Saskatchewan to be a global leader and we really just need to keep moving forward and retaining that position.

1:52:01 Q: So when you're traveling in Australia or Vienna, what do people there know about the University of Regina and carbon capture?

1:52:12
When I'm traveling and talking to people there's certainly wide recognition that the University of Regina is very much in a leadership role for carbon capture. The Weyburn project is on the tips of tongues of people that are well versed in these areas of research and understanding so companies globally recognize our name, governments globally recognize our name so we really have developed a significant reputation in the global arena and it's our job now to make sure we keep that going and I think the work we're doing here, the potential for the Sask/Montana project, things like aquastore for PTRC things, like the new IPAC venture will keep us in the global eye. (1:53:16)