(THIS IS A DRAFT)
Minutes

LEGISLATIVE COMMISSION ON GLOBAL CLIMATE CHANGE

Monday 27 November 2006
10:00 a.m.
Room 643 Legislative Office Building

The Legislative Commission on Global Climate Change convened Monday, November 27, 2006 at 10:00 a.m. in Room 643 of the Legislative Office Building with Mr. John Garrou, Co-Chair, presiding. Other members present were: Representative Joe Hackney, Co-Chair, Senator Charlie Albertson, Representative Pricey Harrison; Representative Alice Underhill; Representative Winkie Wilkins, Mr. Boyles, Mr. , Mr. Walter Clark, Dr. Dolores Eggers, Dr. Edward Erickson, Dr. George Everett, Mr. Preston Howard, Mr. Michael Nelson, Dr. Daniel Phaneuf, Dr. Stanley Riggs, Mr. Michael Shore, Mr. Robert Slocum, Dr. Stephen Smith, Mr. James Stephenson, Mr. Tim Toben, Mr. Ivan Urlaub, Ms. Susan Tompkins, and Mr. Will.

A copy of the meeting notice for this meeting, a copy of the agenda and the visitor's registration are attached to these minutes as **Exhibits A, B, and C**.

Mr. Garrou called the meeting to order and welcomed everyone to the meeting of the Commission of Global Climate Change. He and Representative Hackney agreed to waive introductory remarks so he called on George Givens to talk about our agenda for today.

Mr. Givens thanked the co-chair, greeted the members and visitors and gave a few brief remarks. He reminded the members to sign their reimbursements and send them forward and the visitors to sign the log in the back. Dr. Erickson has handed out two items for inclusion in the record and for your review and consideration. A memo to the Commission dated the 22nd and a paper called The Energy's Future: A Perspective (**Exhibits D and E**). Two additional meetings have been scheduled: Monday, December 11th in this room and then Friday, January 12th to consider what to do about the meeting schedule for the early part of 2007 session.

Mr. Givens received a lot of good feedback from the last meeting about the opportunity afforded to members of the Commission to interact and to discuss and so he hopes the several presentations to be heard today will prompt some discussion and you will find Item 8 to be useful and interesting.

Mr. Garrou called on Brock Nicholson to give his report on the CAPAG standards and developments among those subcommittees.

Mr. Nicholson thanked the chairman and reported on the meeting that was held following the previous meeting of the Commission on October 3rd. Copies of the slides

were passed out to members (**Exhibit F**). Their last meeting was held at N.C. State on October 12th and this meeting was primarily to complete the definition of items that we've identified for priority study and they had a follow-up call to that meeting on November 13th because there was a lot of material to go over. They have had numerous technical work group calls and even a meeting since that date also. The meetings were very well attended and very productive. The primary objectives of the CAPAG meeting and the follow-up technical calls were to continue to define the options so that the analyses by the consultant could move forward and the committee is at that point.

Mr. Nicholson focused on the adaptation and that Dr. Riggs expressed interest in our last Commission meeting in October and he took that interest back and so did George Givens when he talked to the workgroup, CAPAG on October 12th. At that meeting and subsequent workgroup meeting it was clearly acknowledged that that is an item that we could move forward in the near term in terms of making a recommendation. We had an understanding that the thrust of that recommendation would be to recommend the development of a task force or a study commission to look specifically into what sectors should be covered under such a study and a plan that the study commission or task force needs to be made up of appropriate representatives from various sectors certainly public safety, emergency management, public health, agriculture persons are necessary because of the wide ranging interest that such a plan should cover. He envisioned the recommendation developing is two-fold, one to charge such a group with understanding studying what items needs to be included in such an effort and then to develop such a plan itself and envisioning that it's very much akin to some of the work that the Emergency Management even does now. But some of the other sections that one might even think about is communication, for example, or infrastructure of various types of infrastructure that we have in this state. And if it is to be effective and we can certainly use some more science advice on this, but to the extent that climate change effects severity or frequency of storms then you might think well maybe that adaptation plan didn't run for the long term, long term look but it is also a near term look. I think we are going to suggest that it be that broader view.

The schedule and next steps certainly is to do the analyses that we have talked about with these higher priority items now that we are having them more specifically defined and that includes cost and the benefits to include jobs created in the various sectors. We think there are going to be significant economic advantages to the state in a number of sectors where we're promoting new industry and it does have job implications that are positive. The next CAPAG meeting is scheduled for January 24, 2007 and we will have the initial reports on the analyses at that meeting. Hopefully we will have some before that meeting.

The other item we've talked about is the possibility of extending the CAPAG effort to better coordinate with the extension of this Commission's schedule and while we haven't done that yet but we feel that it is important to support the effort and what analyses this Commission would like to see from the CAPAG effort. That's the short report and questions are welcomed.

Dr. Riggs: I'm glad to see that you've considered the adaptations in your meetings. It's not clear to me what the difference between your group and this group is with respect to going forward. Are we going to have a duplication of effort here, is there some sort of a tie between us?

Mr. Nicholson: I think it's the tie between us that really is important. I view that our CAPAG effort will consider maybe the sectors to be looked at but then recommend an approach such as I've outlined. Certainly our recommendations on sectors is not complete so it would be a recommendation to this body and to the administration in terms of the need of such a process. We don't see that CAPAG itself would be the one developing the adaptation plan or that there would be more other study or analyses in the traditional way that we're looking at these other mitigation options in terms of costs and benefits but that we would make our recommendation and submit to this Commission.

Mr. Garrou: So is it the case that the CAPAG process would end first quarter of next year but the committee would stand by in case we ask it to do further things?

Mr. Nicholson: I think what we have in mind in terms of other recommendations is that we'll continue some work and either do more in-depth analyses maybe reacting to request of this body and then potentially even looking at what we call a second tier of some of the mitigation options that we've kind of put in a category of second tier which was maybe beyond what we could actually work on in this time frame. But extending the CAPAG process a certain amount anyway, this doesn't make a lot of sense to cut it off and disband it when this body is going and we could be of some help particularly with the last of our cost-cutting items to assist with the issue of looking at the impacts of various goals in terms of greenhouse gas reduction.

Mr. Smith: Brock your thoughts on CAPAG's process and the potential for some input in the interim report for this group, what is your current thinking on that, I know that there is obviously a meeting coming up in January where there will be additional work done, but what's your current thinking?

Mr. Nicholson: Well we have talked about the need to focus on that and I think that is one thing we will do in our upcoming work groups. I hesitate to just give my thoughts on it because we want it to be the product of the effort of the process but I think some likely candidates for consideration by the CAPAG in the work groups will be those major standards that the state takes on. Something that the Legislature will maybe deal with in the next term that might involve less give and take with a lot of stake holders outside some of the government agencies. That will be one fault we will pursue with the work groups.

Mr. Clark: Brock thank you very much for that. For those of us who have been interested in adaptation for a long time and sort of came to this Commission for that as an interest, we appreciate looking at your beginning to focus on that and I appreciate Dr. Riggs' letter that he wrote to the Commission which outlines some of the coastal concerns very clearly. In the group that you are going to consider, I know you had

several listed up there, but I think one of the important ones is certainly the Coastal Resources Commission. They are looking at a lot of things right now currently that would have some implications and relationships with sea level rise and some adaptations issues that we're discussing now. If our chairmen may perhaps in the future we might invite Dr. Courtney Hackney who is chair of that Commission to come and speak to us about some of the adaptation like issues that they are considering. I know one of them is the practice of hardening the estuarine shore line which we currently allow in North Carolina which a lot of people see as an issue with habitant declined with rising sea level and a lost of fringe marsh land. So perhaps we could explore some of those issues with the Commission, I know they are really going to be considering some issues within the next year so I consider it very timely that we have a dialogue with them.

Mr. Shore: The adaptation issues - I wonder if we could communicate to them and then they could have dialogue among themselves and then the chair bring discussion back to this group and if that's a good idea how would we convey that to them?

Mr. Garrou: We could certainly do that at the staff level here. Mr. Givens and others could do that. I see no reason not to.

Mr. Givens: I think Commissioner Clark's suggestion is good but let me say also that we're working on an adaptation agenda item with Mr. Stephenson and others. We've had some discussion about whether we will try to do that in December or January but within the next two meetings we will have, and I think Dr. Riggs is involved with that too, an agenda item for this Commission to look at those issues and perhaps adding Chairman Hackney of the CRC would be a good suggestion.

Rep. Hackney: Brock do you anticipate that in extending or amplifying the work of CAPAG that there will be legislative recommendations with respect to that issue to the process or is it entirely in your view something that can be handled within the Executive Branch?

Mr. Nicholson: My understanding is I think we can handle it within the Executive Branch.

Rep. Hackney: So you would not anticipate that a recommendation to this Commission for legislative actions say at one of our January meetings would involve CAPAG?

Mr. Nicholson: Maybe I mis-understood the question but I believe recommendations could come from CAPAG with the understanding of where we are in the CAPAG process.

Rep. Hackney: No I mean recommendations about CAPAG. Do you need money, what do you need to continue your work?

Mr. Nicholson: That might be a need now that you've mentioned it.

Rep. Hackney: Sorry I brought it up. Second you have quite appropriately focused in your remarks on the various significant economic development opportunities that we are presented with on this issue. Can you amplify a little bit about that and talk about what work CAPAG is doing in that direction?

Mr. Nicholson: Certainly, that is one of the areas that we think is very important to identify and put some quantification to in terms of what economic benefit may be to the state to include but not just limited to job opportunities in some of these new thrust of industry. So that is something we intend to and hope to quantify. One of the thoughts that we've also had is that part of the process in the original schedule might not have allowed as much in-depth analyses in this area that we would like to see so that might be one of the several areas that we could enhance by having an extension of the process also.

Rep. Hackney: I would certainly encourage you in that direction. I think one of the things that has become apparent to me in sitting here through our meetings is the great opportunity for economic development in these opportunities that are presented. And the more that we can identify them and the more that the Legislature can support those and we spend a lot of money on economic development and jobs and members of the House and Senate support that almost universally. And I think when you find those win-win situations, that's something we can go ahead and move on.

Mr. Nicholson: And I think we've already identified but not done as much study as we need to do. Certainly in the agriculture and forest products area are the tremendous opportunities to use the bio-waste, bio-fuels that we have quite a resource here in this state and we could in some respects revitalize some of our good products industry in terms of promoting better management, proper management, maybe different management all across the whole spectrum of that industry to promote greater growing of trees as well as the appropriate maybe even greater harvesting and use of wood products.

Dr. Smith: Brock it is my understanding that both the state of Arizona and New Mexico have recently completed somewhat very similar processes to this and that particularly in the case with Arizona, I think there was some very significant economic development opportunities that came through. I'm just wondering if it wouldn't make sense at a future meeting to at least summarize some of the work that has taken place in some of these other states because I do believe there are some parallels that are appropriate and I think states can learn from each other and there are a couple that are a couple of steps further down the road and some of that analyses I think was pretty encouraging that they came out with. I take it that would not be that difficult to share with this group and summarize it.

Mr. Nicholson: I think that's right. I haven't studied the Arizona report as much as perhaps I need to but I do have the same understanding that what they ended up with were very significant both reductions and greenhouse gases and economic opportunities. As the Commission knows the same consultants that are helping us with our work in fact helped Arizona with that project also so I think we can definitely do that.

Mr. Garrou: I guess two points about that, the California legislation that just passed global warming legislation was supported strongly by Sicilian Valley because they saw it as an economic development issue. And the new governor of Massachusetts ran part of his platform on the economic opportunities for global warming mitigation for Massachusetts. So a lot of people figured this out.

Mr. Givens: I think there may have been one point at one legislative meeting when we asked representatives of the executive branch if they needed more money and they said no but that's lost in the mist of time. I would have expected you to say yes but at any rate Chairman Hackney raises an interesting question about report on what the CAPAG itself needs on a related matter or more directly, it has been my understanding that we've had a lot of conversation about low hanging fruit in terms of recommendations coming forward from the CAPAG to this group for recommendation as legislation to the 2007 session. Are we on track for that - is that going to happen?

Mr. Nicholson: George we certainly are looking at that, one of our considerations is one of sequencing here in timing in terms of when our analysis is done. One of the reasons I mentioned perhaps an area of potential low hanging fruit or options for the state is that perhaps we might be able to get through that a little quicker than some of the others. But I would want to have these discussions within our work groups in CAPAG specifically before we actually come forward with recommendations there. Adaptation – I think we did have sufficient discussion that we have a broad interest in moving it forward as a recommendation for the near term.

Mr. Shore: Brock if I could request that the CAPAG at its January meeting be very intentional on taking up this issue, set aside some time to identify which might be the low hanging fruits and you just mentioned a few that could be put forward to this Commission for its consideration and perhaps set the stage for legislation.

Mr. Nicholson: We will.

Mr. Garrou: Thank you Mr. Nicholson. Our next presenter is Franz T. Litz, who is the Climate Change Policy Coordinator with the New York State Department of Environmental Conservation. Welcome.

Mr. Litz: My name is Franz Litz, I am the Climate Change Policy Coordinator for the NY State Dept. of Environmental Conservation and I am here with great pleasure to talk with you today right after the holiday weekend. I want to thank the Commission for the invitation to have me here and hope that what I have to say will be interesting to you. Before I start I do want to commend you for just the fact that this Commission exists and that you're having these conversations. Last night in my hotel room I searched through your previous meeting agendas and presentations and it's very clear to me that you're approaching this in a very thoughtful measured way and something that we could have and could use in New York but we have no such commission of this sort. You really deserve a lot of credit for undertaking this process. I don't want to leave without mentioning the leadership that North Carolina exhibited through the North Carolina

Clean Smoke Stack Act and now through the CAPAG process that Brock is leading and his staff at DAQ. It's really remarkable and again a very thoughtful measured process that I think will withstand the model for other states as they undertake similar initiatives. Congratulations and great work!

I want to just clarify where I sit in our organization. I am the senior most bureaucrat, I'm a lawyer and bureaucrat, two strikes against me. Senior most bureaucrat in the environmental agency working on climate issues which means I'm not a political appointee, but somebody who has chosen this role. As a career measure I'm really showing my poor judgment before I even get to the substance of my talk. But I say this because I want you to know that I am a staff level representative and I will talk about things that other states are doing but one rule that we've established very early on in our Northeast process is that no one state will speak for another state. We can speak about the other state and we each speak about each other usually positively I hope. All of my remarks are either personal or represent a New York view and not necessarily a view of the other states.

I am climate scientist – I am not a scientist as I mentioned I've trained as a lawyer and I work primarily in the policy area but I struggle with the science as many of you who are on this Commission who aren't scientist struggle with the science and I look for ways to reduce the science to map this body of complex science down to nuggets that we can use to make policy decisions on. I think it boils down to these words up here, these six words: we know enough to act now. It doesn't mean there are no uncertainties, there are uncertainties, there will always be uncertainties if we wait to act until after all uncertainty is left from this screen it will be the day after the event, because we will not know. We will not know for sure what will happen until it happens. As a non-scientist I look for proxies. I found in going from conference to conference and talking from scientist to scientist, you get a slightly different take from each scientist. And so I listen to bodies of scientists like the National Academy of Sciences, like the Union of Geophysical Scientists, you name it, every scientific union that's taken on this issue, and look for proxies, I look to them for these little nuggets that help in policy making. Probably foremost in that is the joint statement from the National Academies of Science that was issued in June 2005, these are eleven science academies from eleven industrialized countries including the US and they issued a statement that the scientific understanding is not sufficiently clear to take action. We know enough to act now in other words. I find these issues of science an uncertainty very fascinating. I was watching on C-SPAN the science subcommittee in DC and the president of the National Academy was testifying and he testified that the scientific certainty around climate science in his opinion is far greater than the scientific certainty around cigarettes causing cancer. I've been trying to get a copy of that transcript because I think for those of us trying to wrestle with the uncertainty and focus on risk and what measured responses are appropriate in the face of that risk, those kinds of context placing comments are important.

I was struck by the remarks and some of the questions to Brock just now understanding that this date with climate impact is really at just the very beginning. Especially when you're talking about how it impacts a particular state or area of the state. We were

fortunate to get a study that was issued earlier this month and we have no claim or credit for it, none of the states in the northeast. This was done by a group of 40 independent scientists bought together by the Union of Concerned Scientists and they took the global science and they brought it down to a regional scale. This is the kind of study and it is not the first of its kind, there was one done for the Great Lakes region, one for California, one for the Gulf Coast, so we were the fourth to benefit and you really ought to push them to do one for the southeast because it is helpful. Not to overstate the merit of this study but the point I would like to leave you with is that we could benefit from more study that takes place closer to the ground so that we can get a better understanding about how climate change is going to affect all of our states and constituencies. Only then will we have the political backing that we need to really take steps toward solving the problem. This is a diagram (**Exhibit G**) from that study that shows two different paths, one with a lower emissions path and one with a higher emissions path, selected from the various models that have been run internationally and they show quite a difference in the climate changes that would occur if we take a lower emissions path versus a higher emissions path. The point here is that the steps we take to address our emissions pathway will have a significant impact on climate change even while recognizing that the climate is already changing. So we are working now with a climate that's changing and those of you who made comments about a better understanding are right on it and I know we in New York are really just starting to grasp that issue as well.

For some of the potential impacts that have been identified and yours will probably be slightly different here in North Carolina than the impacts out in the west. They're looking at potential long term droughts which will have serious impacts on their way of life in the west. We're understand those impacts will be important and perhaps not surprisingly in our country the businesses were the first to pick up on this, not politicians and not bureaucrats. This is a couple years old cover of Business Week. This is this year's cover from Time, businesses and normal everyday people are starting to read these issues. The economists recently, just more than a month ago, came out with this article where they essentially said in their editorial, we know enough about the science to act now; interestingly they also said not only do we know enough to act now, but the cost some of those dramatic estimates about how much it is going to cost are just as looney as some of the domes sayers projections, so they are basically saying we need to go to the middle on this issue. I'm a member of the Advisory Board to the Climate Group which is an international group focused on highlighting climate change actions and they issue every year a carbon down profit which focuses on businesses which have taken this mission and actually improved their bottom line while reducing their carbon emissions.

This is an economic issue and we shouldn't be surprised that businesses have been the first to figure this out. New York spent 55 billion on energy in 2005. Most of those dollars left our state. Two years earlier we spent 38 billion dollars on energy. When we talk about changing that dependence and moving toward policies that promote renewable energy and low emitting electricity generation we are quivering over a very small amount of dollars. I like to think of the state climate policies falling into four baskets, one is to reduce energy consumption, the next is to promote non-carbon emitting energy, de-

carbonized fossil fuel energy, and last increase sequestration in carbon sinks, moving in the forestry area, moving in the agricultural area.

Most of us have undertaken climate action plan maybe with the exception of Connecticut, none of them were as well carried out as what you're doing here with the CAPAG. Other states will learn from that process. We have in most of the northeast states renewable portfolio standards and we're seeing all kinds of development as a result of these RPS's. In parts of New York State we are now seeing hundreds of billion dollar projects going in wind projects, bio-fuel projects that are simulating areas of our state that really badly need that stimulus and the tax base for these local governments. Those have been very positive in their economic impact and we hope in their environmental impact. Greenhouse tailpipe standards, all of these things I know you have on the CAPAG docket you've been picking up in some form or another.

RGGI – Regional Greenhouse Gas Initiative

RGGI will be the nation's first mandatory cap and trade program for carbon dioxide. It covers only power plants and there are a number of reasons for that. One is as you have good data from your power plants, so do we and that's the function of the Federal Clean Air Act requiring that some of those emissions be monitored and reported. So we had a very good sense of where the base lines were for those sources and it seemed like a logical place to start. The governor sent invitations to 11 other governors and of the nine that responded positively six were Republican and three were Democrats. This is really not a partisan issue in the northeast as it is in much of other parts of the world. We had a three year design process so again this wasn't something we did overnight. I was the chair of the working group that bought the states together and was chair over the course of three years. We had initially hoped to get it done in two years. Back in December 2005 we reached an agreement with seven of the states, we lost two, we hope to get them both back and expect to (Massachusetts and Rhode Island). The Massachusetts governor elect said he will sign RGGI as one of his first things next year so we will have Massachusetts back early next year. Maryland has legislation that brings them on board. So we will be back up to nine states next year and we hope to have Rhode Island and Pennsylvania which will bring us up to the original 11.

What does this mean and what do you really expect to accomplish as a group of states? This is a global issue. Just to give some quantitative sense, the region at a glance is about 40 million people which is before we add Massachusetts and Maryland, that 13 percent of the US population. If we were considered a country, we would be the 11th largest emitter in the world. Our economy represents 15 percent of the US economy or 1.8 trillion dollars so that gives you a sense of the economic breadth. And when we start them talking about linking this effort with other state efforts like perhaps what you're doing here in North Carolina, what they're doing out west and New Mexico, Arizona, and California then you start really adding mass to your effort and not only do you point the way for the federal government but you also just make your actions more meaningful than just going it alone as one state.

Essentially in a cap and trade program you have a source space. So you figure out which sources are covered and you say as of a certain date that source must have a permit for every ton of emissions that comes out of its smoke stack. Then the government or the regional authority determines the total emissions that will be coming out of those sources and establishes a cap, issues permits one per ton up to the limit of the cap, distributes them in some way. Each source at the end of each compliance period has an emissions account, it then looks at its allowance account, it spends those allowances or it goes out on the market and buys allowances to cover it. What happens is that sources that can cost effectively reduce their emissions will do so, those for whom it is cheaper to buy allowances on the open market will go and buy them. Then the carbon context because we don't have a commercially available scrubber technology, we have added this concept of offsets but project based offsets where you allow the sources to purchase certified reductions outside of the covered sectors and they can use those credits interchangeably with allowances. What do we plan to do? RGGI does not purport to seek to solve the problem, it's a first step. That is why for the first five years we have a stabilization target which caps emissions at current levels and then we reduce by ten percent over the following four years. Stabilizing emissions accomplishes more than that ten percent reduction because without the program emissions it would go up 25 percent in this sector based on our moderate business as usual projections. By capping emissions just at current levels we would be avoiding a 25 percent increasing by reducing them ten percent we will end up 35 percent below business as usual.

Some interesting things about the RGGI cap and trade program other than its multistate, there are a couple of things that we had to do differently this time around. One is allowance allocations in many cases will be sold instead of handed out to generators and this is due in large part to the fact that our electricity markets are not deregulated and the regulators no longer have control over the rates that are charged by the generators. New York will be proposing this week of 100 percent allowance of options for our RGGI cap and trade program. Vermont will do the same, it sounds like New Jersey will also do the same. So this is different than previous cap and trade programs where the allowances were largely handed out to generators based on past emissions.

One very important thing and this is something that the Europeans experience with their cap and trade program, biomass and bio-fuel can be used as a control method. Now it is not a typical control method like a scrubber on a stack but if you allow your sources to coal fire biomass using carbon neutral fuels, you can give them a control method. I know you're 61 percent coal here in terms of your generation in North Carolina. If you allowed those coal fired generators to burn biomass on a coal fired basis and did not require them to convert those emissions with allowances you're effectively giving them a control path that is a win-win. That's what we have in RGGI and that's what they have in Europe for their trading program and they're finding that the generators are using that pathway very quickly and after the first year in Europe they saw a large increase in biomass coal firing. We picked five initial types of offsets and we would like to expand those types. You can earn those reduction credits by going out and proving reductions, accomplishing reductions through natural gas, propane or heating oil efficiency. You can convert land

to forest and prove a reduction, you do land fill gas capturing combustion and this for the smaller sub and SPS for performance standard landfills.

Methane capture from animal operations – we've gotten a lot of interest from our farms in New York and Delaware (mostly New York) where we've had a lot of interest in that offset type. We chose that one because we were going first to the electric sector and we thought we ought to find offset categories that likewise benefit the electric sector. What we've established in the program is that offsets are increasingly allowed in the program based on the cost of the allowance. So if the cost of the program ends up being higher than we anticipated, then we allow more offsets in to reduce that price pressure. We call it an offset release style and that includes if the price gets higher than $10 we can bring in credits from the outside. Our objective there was to see investment in our region primarily and in the country because these credits can be generated anywhere including North Carolina.

So what does this accomplish? A few slides ago I showed this that there are really basically four baskets for reducing carbons. A well designed cap and trade program will hit every single one of those baskets. The carbon price will reduce energy consumption at generators and to some degree at the consumer end. It will promote non-carbon emitting energy because nuclear generators and renewable generators who have no compliance obligation under the program are better off than they were without the program. We've already seen since the proposal of RGGI pilot projects in our state that are aimed at scrubbing carbon from the emission train and using some very innovative technologies one of which is an algae scrubber, which actually yields bio-diesel at the end. And of course through offsets you bring in the carbon sinks elements. So a well designed cap and trade program really hits all four bases and it does it using market to drive innovation. It doesn't say the government is not out there picking the winners by and largely putting a price on carbon you allow the market to then pick the winners. You let innovation take its course. One thing as we stand here today many of us are hoping for that innovation that we don't even know about yet. That innovation that some savvy entrepreneur in the Research Triangle, or up at MIT in Cambridge or you name it, Silicon Valley where there is just billion of dollars of investment being made, that break-through that is yet to come forth.

So that is the carbon market and what we're trying to do is expand that market whether through linking to other states or other markets or having other states join us in RGGI. The governor of California came to New York about a month ago and signaled his interest in joining or linking RGGI and we're currently in discussions with them on that subject but I threw up these numbers just to give you a sense of what happens as you start to add states working together. With California we're a quarter of the US population, we would be the third largest economy behind the rest of the US and Japan. We would be 15 percent of the US emissions and the sixth largest emitter. So if it makes sense for some of these large industrial countries to act on this problem, it makes sense for a group of states to act on this problem. I would encourage you through your leadership to bring in a group of southeast states in a program and then later we could talk about linking up to the northeast and to the west, but my only request is to do the analyses and figure out

whether it makes sense for you to do that. I think you will find a much most cost effective program to add as many states as possible.

The next steps on RGGI - we are currently implementing RGGI, we're proposing our role making this week. Other states are on similar paths in the northeast. Early next year we will be bringing Maryland and Massachusetts on board and the launch date is January 1, 2009. Pennsylvania - we have hope for, they've been on a path toward more and more action on climate change, much like North Carolina, and we're hoping since they were one of the original responders to the invitation that they will eventually jump on. We're looking for ways to increase this multistate cooperation because it makes sense and whether that is harmonizing our RPS standards or working on an energy efficiency portfolio standard, we don't know where the next step will take us but we would like to build on this state cooperation that has been slow but has been fruitful so far.

Incidentally I understand you're looking at environmental portfolio standards which already combines the RPS and the energy efficiency portfolio standard and that makes good sense and I wish we had thought about that.

Just in summary – we know enough about the science to take some actions and those actions make a lot of sense in terms of improving our economic posture relative to the energy that we consume. We would rather buy our energy from inside our borders than spend those dollars outside and also be at the mercy of those fluctuating fuel markets. The states that are acting are also prospering, in the northeast our biggest area of growth is in renewable energy development, renewable energy technologies. These policies have immediate economic benefits not to mention the long term economic benefit that comes from relying on energy that you can produce yourself.

Regional and multi-state cooperation really makes a whole sense. We would look forward to any avenues of potential cooperation with North Carolina. We applaud you for the Commission's efforts, the CAPAG's efforts and wish you well on this. Thank you.

Mr. Garrou: Thank you Mr. Litz.

Dr. Eggers: Thank you so much for coming down Franz and thank you for also mentioning algae because I love to talk about that to anybody who will listen. It might get us out of this mess. Another thing I think is not getting enough attention is the possibility of building our soils and in North Carolina sequestration is always the last on the list. But sequestration I think should be considered a very high priority opportunity and we have a tremendous opportunity here in re-building our soils which we need to do anyways and a tremendous amount of carbon could be sequestered that way, but I didn't see that on your list in terms of offsets. Could you talk about opportunities there under RGGI?

Mr. Litz: Sure – conservation tillage is on our next short list of offsets. The way we've approached it is the design standard up front so that a project proponent could look at the

standards and know what kind of project would yield credit. That's a very front loading time consuming process because you have to establish the standards up front. But once you're set the standards you then have the regulatory agency in a position where it just needs to go down and check a bunch of boxes before it issues the credit. We're moving toward other types of offsets and conservation tillage is high on the list, forest preservation is one that we've had a lot of interest in. We do need to focus more on sequestration, at most conferences it doesn't even get mentioned.

Dr. Eggers: Just a follow-up on soil – what can North Carolina be doing right now to prepare ourselves to participate in getting to this market quickly?

Mr. Litz: In order to do offset credits in North Carolina that would be redeemable in RGGI we need a cooperating agency in North Carolina. That would probably be Brock's agency and that agency would just agree to do random spot checks on projects as they go into effect. We need someone to stand in our shoes because we have no jurisdiction in North Carolina. Probably early next year we will be able to start hammering out those MOUs that will bring in cooperating offset states. That's the way to get the benefits of the carbon program in those non-sector areas.

Representative Harrison: Of the states in RGGI do all of them have renewable portfolio standards and if not are they on their way?

Mr. Litz: All except for New Hampshire and Maine and it's on their dockets for the next legislative session in both of those states.

Representative Harrison: How about the clean cars?

Mr. Litz: That is every state except New Hampshire I believe has the lower emission vehicle because Rhode Island came on, Pennsylvania is now looking to do it, Maryland just announced their intention to do it. New Hampshire and Maine are actually seeing a lot of renewable generation because the RPSs in Massachusetts and Connecticut will allow the credits to come from those states. So in some ways they have been benefiting from the RPS without actually having one in their state. They are paying for it because they are part of the same power ball.

Mr. Toben: Wonderful presentation. You mentioned in these offsets natural gas, propane and heating oil efficiency as one of the categories, can you say a little bit more about how that works, how you set that up and measure that and qualify for credits.

Mr. Litz: Sure – one thing in energy efficiency we have up to date, governments investing in energy efficiency whether its through system benefit charge or by mandating that utilities invest in energy efficiency. We have had some success with that and a lot of failure too. What we were trying to do with this offset and what you would do with your EPS or energy efficiency portfolio standard would be to attempt to inject market forces into this mix and have entrepreneurs go out and actually generate these projects. We have energy efficiency providers which right now say in New York City would go and

sign up a building and say I will retrofit your oil boiler make it state of the art natural gas, give you smart thermostats and the like in your building. And they say to the building owner, we will pay for all of that but we will recoup our cost over time through your bill savings. We wanted to spur that a little more and make more of those projects economically feasible. Primarily the credits are going to these energy service companies that are acting as sort of an intermediary between the end user and the state. We're the buyer of the credit and they're both generating a return on the energy savings and the credits are being sold to supplement that.

Senator Albertson: Its great interest to hear you talk about the jobs that's being created around renewable energy in your area. Is that one or two sources or is it a variety of sources? Can you talk to us a little bit more about that?

Mr. Litz: Sure – I can do the written study that was done by the Univ. of Massachusetts a Professor by the name of David Levy that looked into job growth in various areas across the economy that concluded that job growth was highest in these clean energy technology fields. That's what I was basing that statement on.

Mr. Shore: Thank you for your presentation, I have two questions first just looking at how you constructed the program with the coal firing of biomass and bio-fuels as a control method and also some of that ag. and forestry offsets, do you have an estimate of the magnitude of the benefits to those sectors of the ag. and forestry sectors just to give us some sense of what might be possible here in North Carolina and then my second question is about how you in New York embarked on this coordination with the neighboring states, how did that process start and any guidance for us in addition to your points about analyses that could be helpful as we think about this.

Mr. Litz: I have to point you to our website we have some quantifications that were done in the offset context - I will say that what we've done so far doesn't amount to enough because we only have the Landa Forest and we have the ag. methane and there are lots of other categories of conservation tillage that could be added to expand the opportunities and we intend to do that. I'll point you to the information but I think you'll be a little disappointed with it up front but then you have to bear in mind that there's a lot of room for expansion and we're just getting started.

Mr. Shore: In terms of how this began and it really goes to the point of analyses, the governor established a task force in 2001 that wasn't a legislative commission it was an agency and state co-commission, more like CAPAG but not as well organized version of CAPAG and one of the analyses that was conducted as part of that task force was a regional cap and trade versus the state only cap and trade and the differences were quite striking in terms of both the benefits and the cost, that's why I say do the analyses and see whether it makes sense.

Mr. Litz: Well the governor was prepared to do a state only cap and trade. We have one which is sort of a pre-care cap and trade program but before he did that he wanted to see whether there would be takers and in New England you had this band of governors that

had agreed to work on climate action plan so the ground was pretty fertile for growing this kind of a regional initiative plus the previous operation we had together. In terms of reaching out to the rest of the southeast, I would have to do some brain storming with you about what to do but I could do analyses, probably the best way to win people over, show that it cheaper and more cost effective, focus on the benefits that you can reap. Of course in the short term there are going to be cost and some of these benefits are more long term in nature that if you can rely on locally generated energy those are benefits that are in some cases intangible.

Representative Hackney: What were the three obstacles to your implementation of a cap and trade system?

Mr. Litz: The biggest obstacle was that each state was a sovereign state and used to making its own decisions and it's still the biggest obstacle. Walking that fine line and you probably heard it a little bit with my comment about we don't speak for others but we'll speak about them. Figuring out how to communicate in those ways and trying not to step on others toes is a big part of it because governors get elected and they want domain over their state and they don't like to answer to other governors and I would say that is one of the biggest challenges coordinating a bunch of sovereigns. The fact that when it comes time to implement it you each have separate legal structures, so right now we have to go back to every RGGI state and put it on the books separately unlike the national government where they can just put in on one set of books and it would apply to everybody, there is no regional authority so that's a problem. I guess the other issue I would say is that its very time consuming, there are a lot of different interest at the table, a lot of different stake holders, some of whom have very good channels in their individual state and not necessarily in the other states, so you have a lot of competing.

Representative Hackney: What sort of buy in did you get from the utilities?

Mr. Litz: We have a website (www.RGGI.org) and from the beginning I would say there was a general sense that this was coming and it wasn't really a question about whether it would happen. We got a lot of constructive input from our stake holder process. In the end we had support from some utilities the nuclear generators were supportive almost straight through, because this is a win for them, renewable generators likewise. Most companies have a mixed portfolio they have some nuclear, some renewable and some fossil so the perspectives ran the gamut. ES Corporation and NRG were less positive but they were very constructive.

Representative Hackney: Should I assume that the more coal oriented utilities the less positive?

Mr. Litz: I would say that probably to the extent that nuclear was very positive, coal was at the other extreme, yes it's the most carbon intensive generation. But I would also say NRG is the company that's doing a pilot project for the algae scrubber in one of their western New York coal plants and they will be taking the carbon from the exhaust stream generating algae and actually making a profit off the diesel fuel. I say that by way of

illustrating that while they were the most weary coming in, they are also poised to capitalize on the opportunity.

Mr. Urlaub: Thank you very much for your presentation you've answered a lot of questions for me personally. You illustrated for us RGGI and California combined being very sizeable, the third largest world economy, how soon do you see just RGGI and California combined having an impact on the rest of the country doing offset projects or some how participating in or doing projects for RGGI in California and specifically if you could speak to new power plants throughout the southeast region and coal and nuclear are the two leading proposals right now, if an IGCC plant was built in the southeast would that somehow qualify as an offset project if there was a way to sequester the carbon in the southeast?

Mr. Litz: Not currently, I'll answer your last question first. There is no offset for other combustion sources that are not covered by the cap but that wasn't on the list. The concern there was that if you get some of the benefit of that reduction without having to be under a cap then when will they ever be under a cap. I think states will always have a rule on this issue particularly in certain areas, renewable portfolio standards doesn't make sense to implement an RPS on a national level. We've always regulated energy on the state level and probably will remain that way so renewable portfolio standards must have been the bigger investor in energy efficiency, California being the lead in terms of its investment and energy efficiency. I don't see that turning into a federal exercise, I may be wrong so I think there will always be state rules and those are two examples where I think the states will always be relevant. On the cap and trade front we are already seeing what the new Congress movement toward a federal cap and trade system that I am a little less certain about. That RGGI may be obsolete in five years there may be a federal program that preempts it in which case it makes our joint effort with California no longer necessary and that's perfectly fine with us. Everyone at the table has always said we would rather have a federal program but we also recognize our role as a laboratory of democracy where we can try some things and we'll probably make some mistakes that the feds can learn from and we'll have some successes that they can likewise take and make part of their program.

Representative Wilkins: It appears that your region has had a bit of southward movement I was wondering if there has been any interaction with your neighbors to the north?

Mr. Litz: Are you referring to the diagram or are you talking about the population pattern?

Representative Wilkins: Canadian.

Mr. Litz: Canada – yes in fact north of the New England states have a long standing relationship with the eastern Canadian products such a Quebec and Maritimes. We in New York have a relationship that is primarily with Ontario. The fact that Canada is a Keota signatory has hampered their movement toward cooperating with us because any

reduction that they would get from us would not be valid to meet their Keota obligation. But now that the new government has really sort of said he's not going to worry about Keota and he's pushing it to the side but he's going to do X,Y, and Z anyway, we have had renewed interest from them. That's just about the extent of it not really any serious discussions or figuring out how we would connect the two programs.

Dr. Smith: Couple of questions. I'm just curious about the base line - it seems to me that given this flurry of activity identifying a good solid baseline that you can trend off of. It's got to be really critical early on in the process can you talk a little about that because it seems to be that as we begin to look at linking up across multi-states, across regions that have a common set as much as possible.

Mr. Litz: This speaks to Brock's and the CAPAG's crosscutting issues with the inventory registry and the reporting. You are right you cannot overstate the importance of getting good numbers in your inventory. I wish we were better about it, our inventory is in a dark room in Albany somewhere and I don't have good access to it and it's not well updated. You have to get your numbers, figure out the way to do it, there are plenty of common protocols that you can use, there's a lot of assistance in coming up with those numbers.

Dr. Smith: In a follow up question, I followed this from a distance but the way you did the auction with the allowances could you talk a little more about that, my understanding is that was very innovative and it was a little controversial at first but its played out quite well and it created a dedicated pot of potential money to really go in and do some strategic work on efficiency and renewables and others like that.

Mr. Litz: That's absolutely right it is probably the chief innovation in the program. We will be selling the allowances and that will generate a pot of cash. The reason we are doing that is we have a deregulated electricity market and it became very clear to us that if we give the allowances away the generators are still going to charge for those allowances. Its kind of like if you give the generators a year's supply of fuel to run their plants and then you ask yourself the question, well are they then going to fit in a zero cost, are they going to provide the electricity for free to consumers, the answer is no of course because they can take that fuel and sell it to their competitor. The opportunity cost of burning the fuel leads them to put the cost into their price. The same thing is true for a commodity like an emissions allowance. So it's kind of counter-intuitive but if you give that allowance to the generator you're not lowering the cost of the program at all it stays the same and the benefit of that allowance goes in the pocket for the shareholders of the generator and the consumer pays for it either way. So we should charge for the allowance and let the consumer get the benefit of what the consumer is paying for and that does result in a pot of money that can be used to help sustain the program where we in New York intend to use it for energy efficiency investments to attempt to capture some of that low hanging fruit.

Dr. Smith: Pardon my lack of understanding completely but would that be limited only to a deregulated market or could that allowance selling allegation be appropriate to apply in a regular market?

Mr. Litz: This is really states specific so I think you would have to do the analyses for North Carolina to figure out how the market works. Theoretically, my answer would depend on whether the cost gets passed on to the consumer whether or not the generator pays if the consumer is paying for it either way, then the consumer better get their benefit for it otherwise you're just lining the pockets of the wrong entities. But if you're able to control that to keep from passing on the cost through regulatory bodies the argument is much less compelling.

Mr. Garrou: I assume that each state in the compact has a different regulatory balance for its utilities so how did you deal with that?

Mr. Litz: We are all deregulated with one exception and that's New Hampshire and we generally designed around the majority of the states. The auction provision is so broad New Hampshire has a lot of leeway so we can actually benefit those regulated sources.

Mr. : Two questions about slide 25 – the first board is implement of RGGI, could you explain what that means specifically and #2 what reservations have Rhode Island and Pennsylvania raised as to why they are not willing to participate at this time?

Mr. Litz: Implement RGGI in most of the states means a rule making through the Environmental Agency so we have a model set of regulations which we put together and other states have conformed that model to their state's guidelines and they have to propose it to their state procedures. In two cases New Hampshire and Maine that will go through the legislature, in New Hampshire that will go full fledged to the legislature and in Maine they have this kind of legislative review process where the legislature can grab a rule making and hold hearings on the rule making as part of the rule making process and that sometimes leads to counter legislative measures. Rhode Island followed Massachusetts because they're the small neighbor to the south. Once you get Massachusetts in the mix Rhode Island pays for the program without getting any of the benefits so very clearly they are going to want some of the allowances so that they can recoup some of the benefit of the program and not just have their consumers pay for it. Pennsylvania just hadn't done much thinking about this issue they had a new administration when this first came about and they were new and still getting used to things in Harrisburg and they had other things higher on their agenda. They wanted to do an RPS first which they've done, they wanted a clean coal initiative which they've done but now I think in terms of going down their priority list we're closer to the top and I'm just guessing.

Dr. Everett: If you break that 55 billion dollars now what does that look like.

Mr. Litz: I have no idea. These are just numbers that I got through our Governor's office.

Dr. Everett: Do you have any sense in terms of your energy needs growth what it's likely to be met by in terms of new generation.

Mr. Litz: Sure – we have a fairly diverse portfolio now which is about 25 percent gas, 25 percent coal, 30 percent nuclear the rest mostly renewables and some oil. In general we have a NGCP plant being proposed in New York which the governor is supporting very heavily. I don't see anything non IGCC coming in on the coal side in New York and the natural gas and we have a big boom in renewables right now.

Dr. Everett: Let me just ask one other question – I don't know which slide it is I can't read the number but the figure that looked at summers and upstate New York, I assume the presumption was that's not a good thing is that the presumption? And I wondered if you looked at upstate winters?

Mr. Litz: I'm from upstate and still live there. Yes we did and the winters are dramatically impacted, the number of days of snow cover have decreased already quite significantly and the biggest significance is talking about the changes we've already had and talking about the changes as if it's your back yard and it is my back yard. There will always be people that see figures like this and they say yea it will be like living in North Carolina instead of upstate New York. What's hidden in the simplicity of this chart is the problems that you can reek in any system for example if some plants bloom earlier before the insects actually mature, you're disturbing that balance you don't end up with the pollination that's just one small example. Not everything in nature would be able to adapt as quickly to the change as other things in nature. Humans might be the best to adapt to the change and then you have all the other organisms.

Dr. Everett: Really the connection I was trying to see if it exist at all in your energy use where the 55 billion dollars goes you wonder what course in the pack is used in current energy consumptions whether that change in upstate New York in the winter time has the impact on that energy consumption.

Mr. Litz: I know in terms of our carbon inventory that's about 30 percent of our inventory so it could be a significant portion heating and cooling of buildings so you're right it's hard to know. These are the areas where we need more adaptation analyses if the temperatures are going up how is that going to affect the way we actually respond to this program. Do we really want to push boiler replacement? Boiler replacements might not get a verified winter and end up being two months long and didn't even run the new boilers that might be a bad investment.

Mr. Givens: With regard to this study you said what had been done to the northeast and recognize that we have done for the southeast that did the study?

Mr. Litz: It was 40 independent scientists that were self funded in their work. One of the things I'm trying to do in New York is get state funding for that kind of research. All you need to do is get a climate science pool of money and then that money would go to

researchers at your universities. It would be coordinated by someone within the state but it could be done with a relatively small staff. You could support your university scholars that way and ensure that the results are objective. My concern about that study is that it really wasn't done for decision making purposes so you have to take it with a grain of salt. That's why we need more of this research and it should be primary in government funding.

Mr. Givens: Do you know who paid for it?

Mr. Litz: The scientists themselves were not paid at all out of the grant that allowed the coordination by UCS. They had to come up with the money from their universities and in some cases their university departments supported their work on this study.

Mr. Givens: Is there in fact an interstate compact associated with RGGI or what's the interstate brain work?

Mr. Litz: There is no compact per say, we have a memorandum of understanding which is not binding. One of the provisions of the memorandum of understanding says that any state can decide to back out after 30 days. There are no enforcement provisions so New York cannot enforce it on Massachusetts. They recognize our missions permit and we recognize theirs if they do something to anger us we stop recognizing their permit, that's really our only recourse.

Mr. Givens: So in essence it's a good faith hand shake.

Mr. Litz: Yes.

Mr. Givens: Is their some potential for purchase of credits outside your region that are non-combustion credits I've had some understanding that perhaps North Carolina could generate and sell credits even though we weren't part of the program.

Mr. Litz: Yes indeed you can. Once you establish a cooperating agency relationship and that would probably be Brock's agency, then projects can originate here in North Carolina after that point.

Dr. Smith: Where does combined heating power fit in to this scenario here and how advanced was New England in going after that low hanging fruit and how much has this played into being a player?

Mr. Litz: I get a lot of grief from the CHP people because this program is focused primarily on emissions and a lot of times a CHP installation will actually increase efficiency but also increase emissions and so it's very hard to give credit for a CHP installation. The answer is we have other ways of encouraging CHP, we have a bunch of regulatory reforms underway, a decoupling proceeding that will put energy efficiency on level footing with new generation, stand-by grids you can generate your own electricity on site but then you need as a backup being able to hook to the grid and typically the

utility will charge a great deal for that stand-by credibility to have the grid power standing by and that makes the CHP less attractive.

Dr. Smith: I guess I don't understand how it would increase the emissions because my understanding is that a lot of the CHP is actually capturing waste energy and converting it to use for work whereas it is basically going up the stack as waste heat.

Mr. Litz: If it doesn't increase emissions then they're eligible under the fossil fuel but in may cases what they're doing is they're taking both their electricity requirement and their space heating requirement and they're replacing their current ways of meeting that demand with the CHP unit. Now that may actually increase their fossil emissions relative to heating and electrifying the facility on site whereas previously the electricity portion was emitted somewhere off on the grid now they're emitting that portion on site. One thing Connecticut did in their renewable portfolio standard, they have a CHP component and an energy efficiency component.

Mr. Garrou: Our next presenter is Mr. Kurt S. Creamer, Biomass Program Manager at North Carolina Solar Center and Animal and Poultry and Waste Management Center at North Carolina State University

Mr. Creamer: Good morning and thank you for allowing me to come and talk to you today about bio-fuels. I will start out with a little background on the major bio-fuels that have potential here in North Carolina and most other places as well, that would be ethanol, bio-diesel and I am also going to talk about fuels from animal waste. This is a slide (**EXHIBIT H**) about the benefits of bio-fuels that are well documented particularly in economic development that becomes obvious if you're producing these bio-fuels in state it generates jobs at the actual fuel production plants and of course that has an economic multiplier effect. It approves our energy security, in nearly all cases reduces regulated tail pipe emissions reduction and it also reduces greenhouse gas emissions. There are three ways to produce ethanol from feed stocks, the most simple is producing it directly from sugar crops and by sugar crops I'm talking about sugar cane, sugar beets and sweet sorghum. Sugar cane doesn't have much potential here in North Carolina. Sugar beets and sweet sorghum are an option but most studies have found that the cost of producing ethanol from sugar crops is higher than producing it from corn.

You may have heard a lot about Brazil recently as we wrap up our ethanol production here and their ethanol is produced from sugar cane and they are able to do this in an economical way and one of the tricks they use to do that is they burn the residue the left over stalks and cane from the sugar production process and that goes into boilers to generate the heat necessary for the ethanol production process. There is a significant amount of heat required for that process. In our country ethanol is primarily produced from corn and 97 percent of our ethanol is produced from corn and it's estimated for the year 2006 that up to 20 percent of our corn crop will go into ethanol production. This is a standard process that involves cooking the corn and breaking it down with enzymes that breaks down the starch in individual sugars. You ferment those sugars with yeast and then you distill out the ethanol. There are over 80 plants here in the US that are using this

technology and it's of course as you would expect primarily focused on the mid west. There are no plants on the eastern seaboard at the moment.

You've probably heard a lot lately about producing ethanol from cellulose and cellulose like its cousin starch is just made from individual sugar molecules. It's just there in a long chain but the issue for cellulose is they are connected differently. Chemically they're connected differently and they are also protected by two other substances, hemi-cellulose and linoncellulosic. All that together makes it more substantially difficult to break down cellulose as compared to starch. Once you accomplish that you just ferment the sugars and the back end of the production plant looks a lot like the back end of a corn to ethanol plant. One opportunity is a stepping stone toward cellulosic ethanol is you build a corn ethanol plant and then you put on the required pre-processing on the front end of that plant down the road when it becomes more economical.

US ethanol production is just sky rocketing due to a number of factors. A lot of it has to do with banning of MTB, we are in for another record year in 2006 we have over four billion gallons now in ethanol production. We use in this country about 146 billion gallons of gasoline a year. Here in North Carolina it's over four and a half billion gallons per year. We do use some ethanol here in the state, the Motor Fleet Management does use over 200,000 gallons of ethanol in the form of E85 which 85 percent ethanol, 15 percent gasoline and also another 700,000 thousand gallons of E10. You can find E10 at commercial gas stations including Crown and a chain out in western North Carolina called Hot Spot. There are also ten service stations, maybe up to 12 now that sell E85 directly and these are scattered around the state including one here in the Triangle. All told we use about five million gallons of ethanol in the state.

We have had and have had for a number of years some proposed ethanol plants for NC. You hear a lot of press releases you also have a lot of ground breakings but ground breakings are somewhat separate from the actual shovel going into the ground. The three that I'm most aware of is the Agri-Ethanol Products in Aurora, NC they talk about 54 million gallons per year plant wrapping up to 108 million gallons per year in Phase II. DFI Group has been around for a number of years looking at a site in Jamesville in Martin County and there is also a group out of Chapel Hill looking at a site in Hoke County.

This is a slide that I put together for a group that I'm involved with and that's the group that was eluded to earlier, it's a bio-fuels strategy group created out of the Energy Independence Act. This act created a group to prepare a bio-fuels strategy for North Carolina and the group is led by the Rural Center, the NC Biotechnology Center, NC State University and NC A&T University and each of those entities has a different need that goes on to this strategy group and then a number of others are invited acting as an advisory role. I put this slide together because I was curious about what is the potential looking at various scenarios of displacing gasoline in NC. So the big chunk there for our current gasoline usage would be that whole pie basically, but now I look at ways to that you might displace gasoline usage and first of course you would look at corn. What I did there I took our entire corn crop and proposed that it be used for ethanol production and

that amounts to about three and a half percent of our gasoline usage. That is the maximum you could displace from using our entire corn crop for ethanol.

Another crop we're working with at the University is Hulless Barley it can be grown in the winter so it doesn't interfere with corn production. It can work into a corn rotation and if you replace all the wheat in NC with Hulless Barley you get another 0.8 percent. Going down the list if you use all of our agricultural residues - corn, silver and sweet straw that's another 1½ percent, then you get into the big ones because the resources that we have in abundance are woody biomass resources. My best estimate based on research done at NC State suggest that by using that forest residue to produce ethanol you could displace almost ten percent of gasoline consumption in this state.

Then I looked at another scenario just more out of curiosity than immediate reality and that is using pulp wood for ethanol production. What some people may not realize is that the front end of a pulp and paper mill also looks very much like the front end of a cellulosic ethanol plant that is going to utilize woody biomass as a feedstock. If for whatever reason the pulp and paper industry should collapse here in NC then the amount of pulp wood available for ethanol production would allow us to displace about seven percent or so of gasoline consumption. I looked at a couple of scenarios we have these lands of federal program called Conservation Reserve Program, the thought there was to utilize these lands for growing a perennial crop that would have minimal environmental impact such as switchgrass and then use that switchgrass to produce ethanol. And finally look at the opportunity we have on a spray field, these are the spray fields associated with hog lagoons in the state and there is another potential opportunity to grow energy crops such as switchgrass on the spray fields and have some impact on gasoline consumption.

I am going to jump over to bio-diesel and as many of you know now that bio-diesel is produced by a chemical reaction between the methanol and some source of oil and fat. As an example, you can take 100 pounds of Canola oil, ten pounds of methanol that produces roughly 100 pounds of bio-diesel and you're left with the by-product glycerin. The potential feedstocks we have here in NC for bio-diesel production include waste vegetable oil and soy oil. We can grow Canola in the state, there are other oil seeds available, peanuts, cotton seed, and also we have several large rendering operations in the state and the animal fats from those rendering operations makes very good bio-diesel. It's often used in a blend, commercially it's used in a blend of 20 percent bio-diesel and 80 percent petroleum diesel and has a number of properties that make it nice to handle. Actually as chemical processes go it's pretty straight forward, you are mixing the source of oil or fat with methanol. There is a catalyst involved that's very simple catalyst sodium hydroxide or potassium hydroxide. After the reaction the bio-diesel and the glycerin separate into two layers, you drain off the glycerin layer and you're left with the raw bio-diesel that you then further process a little bit through a washing operation to get out some of the other contaminants.

Bio-diesel production is also ramping very rapidly in the US and a lot of this is centered around our soybean producing regions. There is a long way to go as you can see from this graph you don't have a higher percentage offset from bio-diesel as you do ethanol.

We produced about 75 million gallons for 2005 but our consumption of diesel is 40 billion gallons so we have a long way to go with bio-diesel. In our state the true leader in bio-diesel consumption was our own Department of Transportation - they still use bio-diesel - have had a very minimal or no problems with it. Use roughly one million gallons per year of B100 or pure bio-diesel a lot of it is to state agencies and municipal entities so they are non-taxed entities, and then we have a number of private stations that now offer bio-diesel. Like the ethanol situation we have had a number of proposed bio-diesel plants, the first one there Piedmont Bio-fuels the one million gallons per year facility had their grand opening and they are very close to commercial production. The Grain Growers Coop is proposing a 30 million gallon per year in Mt. Olive. They have concluded their investment drive and are in very good shape from a finance perspective which should allow things to move forward much more quickly. We have a plant in the western part of the state, a new plant in Lenior County and another plant in Autryville that is coming on line.

For the same bio-strategy group I did the exact same sort of scenario looking at how much petroleum diesel we could displace in the state. The first option would be soybeans is the most obvious so this assumes that we took the entire soybean acreage in the state and produced bio-diesel from that soil and you get to about 4.7 displacement with that. Again we're looking at a crop at NC State called Canola it's a relative of grape seed and it produces a lot of oil per acre, two or three times more than soy but can be grown in conjunction with soy in place of wheat in a corn-soy-canola rotation. So if you replace all the wheat in NC with Canola you could offset another 4.3 percent of our diesel use then you start looking at some of these other sources, peanut, cotton, corn oil, lard from pig fat, poultry fat, used vegetable oil and of course tallow we don't have much of a beef industry here so that's a very small impact.

Because I am with the Animal Waste, Poultry Management Center at State I want to talk a little bit about the unique opportunity we have with hogs in the state. Many of you know we have roughly ten million hogs in the state concentrated in the eastern region and they present us with a unique issue with their waste and if you look at the opportunity they're taking both hog waste and poultry litter and generating electricity from them. These are my estimates of how much power you can generate from hog waste-poultry litter-dairy cow waste and also poultry layer waste using different technologies. In the case of hog waste that would be an animal digestion or bio-gas technology and in the case of poultry litter would be a combustion or gasification. The ideal part about utilizing hog waste in this way is it gives you a double benefit because methane is a very potent greenhouse gas. By covering lagoons or using some other technology to capture the methane generated you're eliminating that source of greenhouse gases and then you also get a double benefit because if you use it for generating electricity you are also displacing some fossil fuels.

I want to talk about some of the programs we are conducting at NC State and elsewhere to look at potential feedstocks for bio-fuels. We have right now and we just got a second year of funding from the Gold Leaf Foundation a grant to look at energy crops for NC. We focused on five crops, canola for bio-diesel production, switchgrass which could be

for ethanol production, it could be for coal firing, it could be for combustion and gasification those latter to generate electricity. We are also looking at hulless barley - this would be in a starch based ethanol plant. We are looking at Coastal Bermudagrass and that's of interest because that's the grass that is now grown on lagoon spray fields because of its tremendous nutrient uptake potential. But also since it's a low value hay you can certainly imagine the scenario where it could also be utilized as an energy crop and then our big resource, our woody biomass. Why are we focusing on these particular crops – well for the case of canola it could produce two or three times as much oil per acre as soybeans but it does not have to replace soybean production. You can follow canola with soybeans if the next winter is fallow and then the following spring is corn. You can work it into an existing rotation where it essentially just replaces wheat in that rotation. It has similar agricultural inputs to wheat but we are projecting from some work we do with our Ag and Resources Economics Department at NC State that you can actually get a better return for canola than for wheat.

Again hulless barley - we are looking at that it would also be the exact same scenario so you can't replace all the wheat with both hulless barley and canola you've got to pick and chose here. But the idea is the same it would replace wheat in that same corn-hulless barley-soy rotation. It uses a lot less energy to produce than wheat and therefore makes the energy balance I'm going to talk about much better for this crop than as compared to corn.

Switchgrass it once was a native grass to NC you can produce in a minimum five tons of biomass per acre which translates into about 400 gallons of ethanol per acre. What's especially attractive about switchgrass is it is a perennial so that it can help control soil erosion and can be managed in such a way even with biomass harvest to provide a habitat for wild life.

On behalf of the State Energy Office the NC Solar Center was asked to organize the NC Biomass Council and our mission is to promote economic development and reduction in greenhouse gas emissions and promote energy security through utilization of biomass in the state. We have a very good group - a mixture of industries - state government and university representatives and we are working on a road map for NC for biomass utilization and that includes biomass for both power production and biomass for bio-fuel production, we are feeding into the other groups that I eluded to earlier the Strategic Bio-fuels Initiative, feeding our recommendations into their recommendation process.

We have already done some of our work on the road map and have come up with some recommendations. These are recommendations from individual biomass council members they don't reflect an official list of biomass council recommendations. You can see a number I selected from a group of 24 that we're going to be reviewing at our next meeting but some of these are excellent suggestions for furthering the use of biomass in our state. There are a couple of really excellent federal programs that promote the use of renewable energy and I think it will be a real boom to NC to offer state matching funds to help promote and provide some funding for some of these up front cost related to these programs. One of those programs was created in the 2002 farm bill called the

Renewable Energy and Energy Efficiency Program. It's eligible to farmers and rural small businesses. Renewable energy projects are eligible for grants up to 25 percent of the cost of the projects, they can get another 25 percent in the form of a loan, it could go for a 50 percent loan too but the maximum federal funding is 50 percent. But what they don't pay for is some of the up front cost like feasibility studies so there are not too many farmers that are willing to risk the kind of money you would need to sink into a feasibility study in order to move forward with the project.

I want to talk a little bit about the legislative end incentive scenario in NC. There was a bill passed recently to help promote the production and distribution of bio-fuels in the state it allows for 25 percent tax credit for the capital cost associated with constructing a bio-fuel production facility. Also there is another 15 percent tax credit available for the distribution of the bio-fuels. In other words this would be for instance if you needed a separate tank for dispensing E85, you would be eligible for this tax credit. Also last year there was a special budget provision that was passed that seeks to require the state to utilize 20 percent of bio-fuels or reduction in fossil fuels of 20 percent. There is a plan being put together for this program and agencies need to report on this program to the State Energy Office. There are also a couple of good grant programs in the state to further the use of bio-fuels and other alternative fuels. The Solar Center is managing a project that received two million dollars from the NCDOT coupled with matching funds from the State Energy Office and the Division of Air Quality to fund the program to actually fund projects related to the reduction of fossil fuels and the emphasis is on emission reduction so it's only eligible for certain counties in the state. The incremental cost of alternative fuel vehicles, the incremental cost of refueling and construction, infrastructure and also for idle reduction technologies and diesel particulate traps, all of these technologies are eligible for reimbursement under the program. There is the mobile source emission reduction grants program that have gone on for a number of years that have funded a bunch of great projects to increase the use of alternative fuels.

I want to talk about the climate change impact of bio-fuels. The energy balance of a bio-fuel is to define as the amount of energy inherent in the fuels divided by the amount of energy required to produce the fuel and when I say the required energy to produce that fuel I'm talking about the fossil fuel energy necessary to produce that fuel. In this sense by this definition a high number is good so for instance in Brazil they get nine units of energy inherent in the fuel itself if you burn the fuel while only putting one unit of energy in as fossil fuel. The reason they can have such a high ratio is the fact that they are utilizing the residue of the sugar cane to generate steam to help drive some of the processes involved in producing ethanol. Those energy consuming activities in producing ethanol primarily the matching process and the distillation process are big energy consumers. If you can provide some sort of alternative fuel for those processes your energy ratio looks much better and you may have read about a project in Texas where they are actually going to be using methane from animal waste to utilize in an ethanol plant for producing ethanol. There is a lot of debate on these ratios among government scientists for corn ethanol that is about 1.2-1. Cellulose ethanol looks better because production of ethanol from cellulose as a by-product leaves over a product of this lignon by-product that can be burned and used to generate steam for the actual distillation

step in the process. So cellulosic ethanol looks attractive, soy bio-diesel has a good ratio because this is not primarily a thermal process. A lot of it has to do with mechanically squeezing the oil out of the soybeans. What people often forget is in order to get gasoline to your retail gas station you also have to put fossil fuels for the extraction and distribution of that gasoline to get it to your retail station. So the ratios for gasoline and diesel are actually less than one. This has a direct correlation to the greenhouse gas reduction. The higher this ratio the better the greenhouse gas reduction is for that bio-fuel. This is what this next slide demonstrates when you're using switchgrass or popular or looking at other cellulosic fuels because of that higher energy ratio you are getting a very high reduction in the emission of greenhouse gases from the utilization of those fuels. This all relates to the fact that switchgrass is getting its energy from the sun the only fossil fuel you have to put into it is for some of the processing. So it's utilizing CO_2 from the atmosphere when that burns of course that CO_2 goes right back to the atmosphere in a cycle.

Way soils also look attractive, sugarcane, sugar beet especially as the practice in Brazil look good, vegetable oils are very attractive. Starches not quite so good and again that has to do with the amount of coal or natural gas that has to be utilized to process the corn and the ethanol.

That is the end of my talk and I will be happy to entertain any questions that you have.

Mr. Garrou: Thank you Mr. Creamer. Questions?

Dr. Riggs: In your calculations you assume that we would convert all of our wheat production into canola and so forth, is it wise to think in terms of total conversion, don't we have a food production problem that we have to cut off or limit and is it not more realistic to think in terms of some fraction rather than the total production of those various products?

Mr. Creamer: Absolutely, I think for practical purposes you would definitely be looking at some fraction. My interest was as an engineer this is just my nature to start from the maximum and then back off from that. So I want to look at the absolute maximum potential that you would have and then move backwards from there.

Dr. Riggs: What in your opinion is the realistic figure? I realize it is different for each of those crops but are we looking at 50 percent or 25 percent?

Mr. Creamer: I think 50 percent from wheat would be very realistic now we have to have a very good year for wheat this year but that's an abnormally, wheat is off and some of the statistics on the NCDA website bears this out. It's often just used as a ground cover the revenues are so marginal from it in some cases its just plowed under. We think that canola has a real opportunity to be economically more attractive here than wheat – that's why out of all the energy crops we're looking at we're particularly interested in the canola because it seems to have the most attractive economic return in the short term which of course is what (inaudible) mission is to have impact in the short term.

Dr. Riggs: As a resource geologists I've been involved with fossil fuels most of my life and one of the questions that I've been dealing with for 40 years is the question with the ability to use organic products as a replacement and for decades it was always the question that it takes more energy to produce that than you get out the end plus the problem of feeding the world. Now we're the bread basket country of the world not just NC but the whole US system and in thinking in terms of the use of organic matter here it seems to me, and I would like your opinion on this, that we have to balance not just NC or US for food production but global food production particularly with growing populations and it is part of a bigger problem, I think my question and I would like your opinion on how we approach that?

Mr. Creamer: Well it is a question certainly beyond my capacity to answer especially in the short term. I guess my own feeling is I have a certain amount of trust that the market will shape some of that out. That as these prices for these commodities start to rise and we have seen that with corn, that you will start to see shift toward that crop and we will grow a lot more corn so I think there will be some adjustment by the market place to produce more of these crops and we have idle crop land in this country that can be utilized as well. I can't tell you how it will shake out but I think we have a lot of potential for adjustment in the crops grown without affecting food supply.

Representative Wilkins: Thank you Mr. Chair – a couple of things if I may. One is I would like to know what is included in your definition of forest residue?

Mr. Creamer: The primary components of forest residue are a harvest residue so these would be the parts of the tree that are currently left in the forest when you're harvesting timber or even pulp wood. So it tends to be upper portions of the tree - limbs, branches, etc. that cannot be economically used in the forest products industry. The second is the calling processes that occur in timber stands early on in the production of tree crops.

Representative Wilkins: Thank you Mr. Chair. Way over in the presentation under the grant programs I think you mentioned 24 counties, are they the counties that we know as non-attainment counties?

Mr. Creamer: Brock can probably answer this question better than me they are the ones that are eligible for congestion mitigation air quality grants. This is past through money from the federal government that targets certain counties that can get c-max funding, am I somewhat on target there?

Mr. Nicholson: That is correct.

Dr. Smith: How many crushing facilities are located in North Carolina now and how much of an issue is that?

Mr. Creamer: It's a big issue and as part of that grant, we obviously don't have any of the grant funding itself and the funding to site a crushing plant or even perform a

creditable feasibility study, so it's a huge issue and there are two very large crushing plants in NC. There is one in Raleigh and there is one in Fayetteville and they are both Cargill Plants, it's the kind of tonnage that is going to be a long time before we ever produce that much canola. So to get those folks interested in a canola crushing plant is going to be somewhat difficult. We have to find some sort of stepping stone to match a crushing plant with the size of canola acreage that we're likely to be able to grow in the next few years. So there is a third crushing plant, a much smaller plant, in Warsaw and we're trying to intrigue them into crushing canola and then selling the oil. This would be an expeller only not using the solvent base extraction process but expeller crushing technology to extract the oil and then sell it as a premium in restaurant applications. As you may know the canola oil has lower saturated fats than any oil. So there are some real health benefits associated with canola oil.

Dr. Smith: And I assume that a crushing facility that handles soybeans can or cannot handle ….

Mr. Creamer: Well it's an interesting question. It could with some modifications and probably some additional equipment. It certainly would be better than starting from scratch but you cannot just switch feed stocks it would not be that simple. And part of that is because with canola you have to mechanically expel the oil first. The seeds are so full of oil (40 percent oil) that you have to mechanically expel the oil first and then if you want to get the rest of the oil then you go to a solvent extraction. Whereas the large crushing plants in Raleigh and Fayetteville are both solvent extraction plants have no mechanical expelling ability.

Dr. Smith: Had there been studies that identify the potential added revenue to rural communities and to farmers, you have food and fiber obviously has been the focus but now that you bring energy crops in, I think we are all sensitive to the food impacts and I know that some of the livestock producers are sensitive to even the feed being impacted at some level. My understanding is that again significant land is discouraged from going into rotation there is a conservation easement land that can be used, particularly the thing like switchgrass because there is ecological benefits of having them. And then there is an active debate with the upcoming federal farm bill about trying to undercut some of the subsidies and the fact that in the international market there is ongoing competition about who can get federal subsidies. I am curious about whether your group or are you aware of any group that has done any of this sort of revenue generating to rural communities that is potentially here from bringing on a whole new market to bring on some of these crops for the energy sector and is there any analyses that gives any round figures for that?

Mr. Creamer: It is one of those things I am sure it is out there somewhere. I have not focused on it because our own project is much more limited in scope where we're looking at it specifically from the farmers' standpoint and from the next step in the chain, the processing standpoint or the fuel production plant. We don't really have the resources that you would need to do a full economic study. The things I see are sort of back of the envelope sort of calculations like the National Bio-diesel Board would put out or the Ethanol Vehicle Col. or the other ethanol groups would put out that say how many

employees there will be at an ethanol plant and how many extra jobs that will create in a community and those kind of studies. But I am certainly not an expert on objective detail studies on the specific rural development impacts.

Mr. Shore: Thank you for an excellent and very clear presentation. I feel smarter on this issue than I was half an hour ago. I have two requests and a question. The requests are is this something that maybe you've done to some extent or may as you do your additional analyses it could be incorporated. It would be helpful to know if doing the things that you suggested in the presentation with some reasonable scenario say 50 percent of the wheat converted to these other resources and so on, what would be the carbon reduction potential for NC, I am curious how those numbers add up to other things that NC might do? That's one request and the second one is given various potential values of carbon in the carbon marketplace using RGGIs' going price or what we might expect the going rate to be if federal caps were put in place what would be the potential revenue for the NC agricultural community from selling carbon credits? I would be interested to see that if you have any information on those and my question is as we think about the 2007 legislative session you have some draft recommendations that you shared with us could you share where you are in the process and do you think that your groups that you're involved with might have recommendations for consideration in 2007?

Mr. Creamer: Absolutely – I can certainly speak for the Biomass Council and since I sit on the Advisory Board I can at least let you know what the schedule is there. Now with the Bio-fuels Strategy Initiative their whole target is the 2007 legislative session so they are going to deliver their set of recommendations, like I said, we're trying to provide input for that session so they will have at least a draft if not a final document ready in January. Their first draft document is going to come out in December and then they will be moving on to a final draft in mid January. They want to have impact on the legislative session and our own NC Biomass Council we are doing the exact same thing it will be a little broader in that it will include bio-fuels and bio-power what we call generating electricity from biomass. We are also targeting the legislative session so we want to have our recommendations out there since some of them could be legislatively introduced.

Mr. Shore: If you would obviously share those draft recommendation with this Commission and any comments on those data request that I made, are those reasonable?

Mr. Creamer: Yes I think they are reasonable and I think that they could be something that we could… you know I don't know the full ramifications I don't want to promise, we do have an ag resource economist on board, I don't want to make any promises because I am not sure exactly how much effort I am asking for but it certainly is something that he could be looking at.

Dr. Eggers: Thank you also for coming. I know that Germany relies primarily on rape seed or canola if you will for their bio-diesel production and Germany is one of the leading or perhaps the leading country right now in micro-algae research and I was curious when I saw your name and what you were talking about, whether you would be

talking about micro-algae. So I have a request as well and that is that we get some information on production because I know that rape seed oil and I pulling this from memory and I'm just going to get the orders of magnitude right but rape seed oil is something like 147 gallons per acre per year in terms of production. Micro-algae and this is based on data that the Germans agree with and it's coming out of MIT and NERO in Colorado, it is 5,000 to 15,000 gallons a year so you're nodding your head as if you agree. So I would love to perhaps hear more about the potential for NC and I also deeply share Stan Riggs concern about food production issues. Micro-algae offers some really innovative opportunities for example, growing it in tanks where we are also growing Tilapias to increase protein resources or growing it above crops instead of using shade netting using micro-algae between insulating layers in greenhouse for example which there is research going on in the desert southwest on that in the US. So there is a great potential opportunity here and I would love to see more information about how we can use it.

Mr. Creamer: Unfortunately a lot of the work that was done on algae production for bio-diesels specifically was done at the National Renewable Energy Lab in the 1990's and then that program was just cut dead and the level of research that is going on today I think hails in comparison to that research effort. So all of us that are interested in this topic and our interest is exactly because of what you say because we feel like we're just messing around with these land base crops if you could truly produce 5,000 gallons of oil per acre with algae but it's really going to take some effort. I don't consider it real near term solution to some of our problems but I certainly think it is one that is worth looking into because of some of that potential that folks see out there. I think it is very attractive and I will continue to look at that. We have proposed projects and everything we do is dependent on getting funding from the government or other sources and we have actually proposed some projects. There is a researcher at Clemson who has worked out a whole algae production system and we want to tie it into energy production and unfortunately that work wasn't funded but we're still very interested in trying to find projects in that area. You can't ignore that kind of potential.

Representative Harrison: Thank you Mr. Chair and thank you for your presentation. I want to follow up on the energy money available from the farm bill. I am wondering are we losing any because we don't have a state program in place or matching funding in place like we are with the farm and preservation money from the federal government and has anybody been getting any access to that money and is it a finite source of money?

Mr. Creamer: It is a finite source – the program over the last few years have been funded at the national level for about 21 million dollars. Environmental defense and some other groups are advocating a major increase in that funding and the next farm bill something along like the order of $150 million dollars and I think that is actually been well received by some of the folks in Congress. So I think there is an opportunity here to greatly increase the federal funding which would make even more urgent the idea of having some state matching money and yes I do think we have lost some projects because we didn't have any way of getting farmers over this hump of preparing feasibility studies, looking at specific projects and one thing I think the university and perhaps some other

groups could provide is some objective analyses of some of the projects that are being proposed. Our most successful model for the program was where we had a vendor and this vendor supplied solar thermal systems and he took the initiative and contacted some dairy farmers because they have hot water needs, helped them with the applications and what we did we actually had a small pot of funds from the State Energy Office to independently verify that the system was actually going to work as proposed by the vendor. I think it gave great comfort to the dairy farmer to see that there was somebody doing an objective analyses of what he was proposing and enable them to go forward. It's a very difficult thing to find folk that are interested in renewable energy projects, there is no list out there. There is no easy way to contact people that might be interested in a renewable energy project. You almost have to wait for them to come to you. Did that answer the question?

Senator Albertson: This is a most interesting subject. I am sure some of you know that the last session we passed this legislation that has asked a group of people to come back and help us develop a strategic bio-fuel plan for our state, NC State, A&T and Rural Center, Biotechnology Center, I think all of you also know that we are a corn deficit state so I don't think we can plan on getting much of the north's production from corn in North Carolina but I do sincerely believe that switchgrass, our forest products and animal waste offers a great potential for us to produce a lot of energy and keep some of those 15 billion dollars that we send outside of the state that we use to purchase energy and keep it here in North Carolina at the same time create some jobs and we'll do some things to help the rural areas of our state. So I am really looking forward to that and your presentation this morning was great and I thank you for it.

Representative Hackney: I want to thank you for a good presentation as well and to note for your next version of slides that there is a bio-diesel tax credit also.

Mr. Creamer: At the state level?

Representative Hackney: Yes.

Dr. Smith: I have a procedural question. At what point is it possible that this group, if there is general consensus, might write a letter of support or encourage our federal delegation to look at some things that may …. what Representative Harrison said I think is exactly right that 9006 or this energy renewal money that the federal government is looking at expanding a number of folks are advocating for I think it has tremendous potential for North Carolina. North Carolina if I am correct has a higher percentage of elected representatives on the House Ag Committee than just about any other state and I think it may be very timely for there to be some general level of support saying that this is something that could significantly benefit the ag community in North Carolina as well as aid the work that we're struggling with here. So it might be something to contemplate and at some point maybe we can talk about whether there is a procedure or methodology that we can use to communicate because I think it is going to take interaction government all levels and that includes state and federal and this is something with the upcoming

farm bill reauthorization that is going to be moving very quickly over the coming months it might be very timely to think about.

Mr. Garrou: Good point good suggestion.

Mr. Urlaub: Thank you for your presentation. I noticed that the State Energy Office came up a lot in one way or another involved in a lot of these projects and you've highlighted a couple of gaps in funding or resources available to get us down this path of exploring bio-fuels adequately. Is more funding for the State Energy Office so that they can expand this support an appropriate solution or something that can help us get down this path further for bio-fuels?

Mr. Creamer: Yes I think absolutely that the State Energy Office is an excellent coordinating body for these efforts just because they have no vested interest and have a long history and very good staff. So I think it would be very beneficial and my understanding of their funding situation is that they are getting on programmatic funds the very funds that organizations like mine depend on to conduct these kind of programs.

Dr. Eggerson: That was an excellent presentation. I am curious about the slide where you look at potential power generation from animal waste and that adds up to 203 megawatts, I believe. Do you know off hand what the installed capacity is in North Carolina in terms of megawatts for electrical generators?

Mr. Creamer: Well it is sole capacity I think is about 21 gigawatts is roughly what the installed capacity is – someone in the room may know better than me. My understanding is that we are still somewhat below capacity so if you figure out the average annual rate it is something like 14 gigawatts or something like that, so the animal waste clearly isn't going to take us to a huge dent in that electricity generation. What I think is important about the animal waste is it's the whole idea of killing two birds with one stone because you're dealing with a significant environmental problem and you're getting a little generation out of it and you're also capturing the methane, so maybe it's a triple benefit.

Dr. Eggerson: It's more of a supplement than a replacement I wasn't trying to down play it but for years I've been very interested in biogas and aerobic digestive systems but I just wanted to get it in perspective.

Mr. Garrou: Thank you very much Mr. Creamer for your presentation it was very informative. Our final presentation comes from one of our members, Tim Toben and he is going to talk to us about two reports that he will describe.

Mr. Toben: Good afternoon. I have been asked by Mr. Givens and the chairs to report on two studies that came out between the last Commission meeting and today's meeting. There is a lot of material that's published daily about climate change and its impacts and sometimes it is difficult to sort through all of that. These two reports are significant, one is an international report that was produced out of Great Britain it was altered by Sir

Nicholas Stern who is Head of Government Economic Services and I think he is a former Chief Economist with the World Bank. The second report is a Rand Cooperation Report on the impact in the energy price mix if the United States went to a 25 percent renewable mix by the year 2025. So my role here today is to just give you some highlights of these two studies and I believe you will get a summary of these and what I am going to do is list some of the major points from these studies. This Stern review again Sir Nicholas Stern was widely reported in the rural media about three weeks ago, it was described as the first major contribution to the global warming debate by an economist, I think there have been many, but this one dealt with the full global impact of climate change. It also used a slightly different analytic and modeling technique, techniques which were sort of a hybrid between biological modeling techniques and economic modeling techniques similar to those that are used by insurance companies and re-insurance companies and in fact some of the probabilities that were generated from these are consistent with the probabilities defining risk for all sorts of loss calculations for the insurers.

The primary data input for the Stern review came from the Hadley Center in the UK, the Energy Forum, the US Climate Change Science Program and the Inter-government Medal Panel on Climate Change third assessment. The fourth assessment has not been released yet as I understand it so they were using the third assessment data. The model described in the report and it's available online if you would like to download a copy of the report. The full report is 700 pages, there are two good summaries, one that is an executive summary and one that is about a 25 page highlight but the model is described in detail in the appendix of this report. So if you have specific questions about that I would refer you there. The forecast that we have provided would have been more conservative of the range, damage estimates due to global warming were actually much higher when you added in the amplifying feedback, for example the perma-frost melting in the Artic region. If you added those in and the consequence release of giga tons of methane from perma-frost then the numbers were much higher. So while they may seem to be very high as we go through this, the range was actually quite a bit higher. CO_2 in this study is expressed as CO_2 equivalent to encompass the total warming effect of all of the greenhouse gases in Keota on carbon, methane, etc. By this definition the current level of greenhouse gases is 430 parts per million today versus the pre-industrial level of 280 parts per million.

The broad conclusions again are pretty dramatic but optimistic in some respect. There is still time to avoid (these are quotes from Stern) the worst impacts of climate change if we act now and act internationally. The overall conclusion was that for every $1 invested we can save at least $5 in damage cost. Governments, business and individuals need to work together to respond to the challenge. A very clear emphasis on policy at the state and national government levels worldwide essential to achieve stabilization, they have stabilization targets that we look at, the task would deem to be urgent. Delaying action will take us into dangerous territory, the benefit of strong early action far out weigh the cost of non-acting. The business as usual cost for climate change were redeemed to be high, the overview of the literature suggest that the basic elements of modern life for people around the world would be compromised, access to water, food production, human health and melting glaciers could cause water shortages of 4, 1 and 6 of the

world's populations. Crop yields would decline particularly in Africa they showed some peaks in areas like Scandinavia for several years but then a decline after that but generally crop yields would decline. More extreme weather patterns would result in severe floods and drought. Hundreds of millions of people would suffer hunger, water shortages and coastal flooding and it was concluded that all countries would be affected with the poorest countries earliest and obviously there are some countries already being affected particularly near Africa. The estimate was that the impact after 2035 would potentially be two hundred million climate refugees moving out of those drought and flood stricken areas. Without action, overall cost is equivalent to loosing five percent of global GDP. This was not including the carbon sink breakdown which could result in a cost rise of 20 percent of global GDP each year after 2035. The mitigation costs were found to be far lower. The cost of lowering GHG emissions to reduce the worst of these impacts was estimated to be limited to one percent of global GDP. The current global GDP is roughly 35 trillion dollars so the implication would be about $350 billion dollars in cost annually and I think interestingly to Senator Albertson's point, there are going to be winners and losers in this whole investment strategy. Those states and countries that get into the investment and deployment mode earliest obviously are going to be the beneficiary; these are not going to be gains that are going to be distributed sort of randomly across the globe. So I think that's where the opportunities for North Carolina to editorialize a little bit may be of interest.

Policy and investment over the next ten to 20 years will have a profound impact on the climate in the second half of the century and obviously on economies of the world thereafter. Again prompt and strong action was recommended and to put this in perspective, a five percent decline in global GDP would be equivalent to the combination of the impacts of the great depression and the world wars of the last century.

The report concludes with what they consider to be a pro-growth strategy, lack of action to reduce emissions would result in double the concentrations in GHG by 2035 versus the pre-industrial level. They have found that a cost to each ton of carbon equivalent to $85, the estimate without action is a temperature rise two degrees centigrade or roughly three and one-half degrees Fahrenheit by 2035. Most des-concerning was that there was a fifty percent change based on these models of temperature rise of five degrees centigrade under a business as usual case, which is equivalent to an average temperature from the light last ice age until today. Emergency training scheme strategies have demonstrated numerous opportunities to cut emissions for less than $25 per ton because we saw from the data in the first presentation today and then again the benefits of actions to shift the world into a low carbon path could be in the order of 2.5 trillion dollars. So 350 billion dollars invested, 2.5 billion dollars, again these are big numbers, gross numbers, but numbers that clearly give us some direction.

Cap and anthropogenic climate change is pro-good strategy ignoring it would undermine economic roads. One percent cost of GDP is not something that is going to dramatically disrupt our economy. Five percent decline in GDP which would be accumulative over time would indeed have a major impact. To stabilize the energy levels emissions we need to stabilize the next 20 years and fall between one percent and three percent

thereafter. There are three critical policy elements that seem to be coming up consistently that were emphasized in this report. Certainly carbon pricing was a key one, taxation, emissions trading or regulations so that people are faced with the full cost of carbon impacts. The goal is a common global carbon price across countries and sectors obviously that will take years. Technology policy to drive the development and large scale deployment of low carbon and high efficiency products, promotion of energy efficiency, removal of barriers to energy efficiency and information to education for state industry and individuals about what they can do to respond to climate. There are chapters on each of these policy initiatives and I would direct you to those but some of the highlights are as far as emissions trading goes. There was an interesting developing link between the emissions trading schemes like California and RGGI have done around the world, the conclusion with the strong markets and wealthy to drive low carbon development.

As far as technology cooperation – informal and formal trade agreements would be used to detect effectiveness of investment and innovation globally, support of R&D should double. They looked at total R&D on energy globally and concluded that those investments should double and deployment of low carbon technology should increase five fold. International cooperation of product standard would also aid in energy efficiency deployment. Two other areas of focus were actions to reduce de-forestations, loss of natural forest, forest contribute more to global emission than the entire transportation sector. Curbing de-forestation is a highly cost effective way to reduce emissions, again a carbon sink strategy.

Adaptation – the poorest countries are the most vulnerable to climate change. Climate change has to be fully integrated to development policies so that they are set aside for adapting to the changes that are ahead. International funding should support regional information on climate change impact and also for a new crop variety that are resilient to drought and flood. There are some recent policy successes in the country that are not signatory to the Keota protocols. China's eleventh five year plan contains a very ambitious goal to reduce energy intensity of their industrial outputs by 20 percent from this year to 2011. USDA investment in R&D clearly has been significant but the real focus in the US and the accommodation there was states are taking the lead through policy initiatives like RGGI and the California initiatives and deployment of renewable energy and through the use of emissions trading. In India there is increased emphasis on renewable energy and energy efficiency, so even in those countries that have not been signatory to Keota there has been progress.

The conclusion that was reported in the media from Prime Minister Tony Blair was that the Stern review showed that the scientific evidence of global warming was overwhelming and its consequences if we fail to act were literally disastrous. But the disaster also is not set to happen in some science fiction future many years ahead but in our lifetime.

The second report was from the Rand Corporation, their Environment Energy and Economic Program. Basically what they did was they set a target of 25 percent

renewable in the energy mix by the year 2025 and then they did 1500 mathematical analyses varying the cost of each of the different fossil fuels of the non-renewables and each of the renewables. And rather than sort of prescribe an outcome they let the model basically settle around this range. I'm going to read you something here that sort of summarizes where we are in the country today. In March of 2006 in his address at the Brushing Institution Senator Richard Luber, Republican of Indiana summed up the history in political dynamics of renewable energy in the US by observing that for decades the energy debate has pitted so called pro oil realists against idealist and advocates of alternative energy. The battle between the idealist and the realist has been waged largely on the grounds of cost and competitiveness and they are battled that the idealist have tepidly lost. As Luber noted the realist have prevailed by pointing out that renewable energy makes up a tiny share of energy consumed and that the dependence on oil is a choice of the market place. The reining consensus among policy makers and the public is that renewable energy is appealing but unaffordable. Is this really so? Despite this consensus or perhaps because of it, there has been relative little systematic analyses of the possible impact on total energy expenditures of expanding the issue of renewable energy reinforces like solar, wind, geothermal and biomass. A series of national and international developments has forced a reappraisal of fossil fuels and some of those developments are here under market conditions. The rising oil and natural gas prices the war in Iraq and the threat of global warming has stimulated a new look at the economics of fossil fuels and renewable energy. For example, in the last 20 years renewable technology prices have declined 57 percent and for wind energy from 40 cents per kilowatt hour to 46 cents per kilowatt hour which compares to four to five and one-half cents per kilowatt hour for a new coal generation.

In his 2006 Kennedy Union address, President Bush set a goal of replacing 75 percent of oil imports from the Middle East by 2025. Now we saw this morning from Kurt's presentation how difficult that would be to do from strictly bio-fuels but I think you see how the conditions have changed over the last two decades. The methodology for this study again was to use the energy demand and supply rejections from the US Energy Information Administration. They ran 1500 analyses, they varied future cost and rates of technology change for fossil fuels and renewable energy. Analyses illustrated the range of uncertainties around future energy cost and these were missing from some of the best guesses from previous models from EIA. They didn't presuppose any most likely scenario. Their conclusion was that renewable energy at this 25 percent level actually lowered total energy expenditures in virtually all cases in which current energy price and cost trends continue. The conclusion was renewable energy can produce 25 percent of US electric power in ten percent of motor vehicle fuels by 2025 at no additional cost to this economy so long as renewable technology can continue to improve at least 20 percent over that 20 year timeframe. The National Renewable Energy Lab predicts that it will decline by 45 percent, remember that it declined 57 percent over the last 20 years and NREL predicts 45 percent decline over the next 20 years, so the baseline here is that technology would have to improve in terms of costs improvement by 20 percent over the next 20 years. And secondly, oil prices would not exceed the EIA projections of $54 per barrel by 2025, so their projection out to that end point is that oil will be trading roughly in that $54 per barrel range. If renewable technology improves relative to fossil fuel

technology by 50 percent so if we exceed that, that 45 percent expectation will come close to that NRL prediction, the net energy savings could be about 30 billion dollars annually. And they concluded that meeting the interim goals at lower costs on the way to 2525 that is ten percent by 2015, 20 percent by 2020 is feasible since less expansion of the renewable resource is required. We currently have some renewable resources - the cheapest renewable resources are going to be the ones that are exploited first. The best win resource, the best solar site and then they will decline in terms of their choice after that.

There is also some significant national security in climate change implications, Rand found that 2525 would cut petroleum consumption by 2.5 million barrels a day by 2025 and that's about ten percent of projected US consumption in 2025. It would also eliminate one giga ton of CO_2 emissions which is about one-seventh of our projected CO_2 emissions every year at little or no additional cost. This would result in obviously a 50 percent reduction in US contributions to global warming and two-thirds reduction of our projected growth in emissions. So effectively we would achieve a 2004 emissions rate by 2025 with this deployment. There is still enormous renewable challenges as there are with fossil fuels as well, their intermittency issues with wind and with solar, there are transmission issues most of these projects are cited in rural areas, there are interconnection issues, there are supply issues and there are environmental concerns related to these large projects. Again the benefits are significant, reduction in greenhouse gases, the jobs and the economic growth in some of the rural communities, reduction in local air pollution, there was also a kind of interesting phenomenon which was downward pressure that was placed on fossil fuel prices. This more diverse energy portfolio could actually be a hedge against price (inaudible) particularly for natural gas. In Texas they have already seen some benefits from that.

The last slide here - 2025 alternative energy reference case – their best case scenario was when they looked at all the outputs. Wind would comprise 50 percent of renewables capacity which would be 14 percent of total electricity capacity in 2025. Twenty-five percent biomass would contribute to auto fuel and would recommend it be co-fired with coal. Twenty percent solar PV and five percent hydro-electric again these are the percentages of the 25 percent renewable mix. There would be increased reliance on alternative energy which would lead to these lower prices for fossil fuels, it was predicted oil prices were four percent lower, natural gas prices were six percent lower and coal prices were 16 percent lower again as a function of demand. Electricity prices under all scenarios would be higher in 2025 the estimate was that electricity prices for the consumer would be roughly 16 percent higher in 2025. These are the conclusions of the study and again I'm basically doing a review at this point and I'll try to answer questions but would refer you to the studies which are available on line.

Mr. Garrou: Thanks Tim I have a question. Just on this last slide – if fuel prices are lower and renewables are economically neutral, why do electricity prices go up 16 percent?

Mr. Toben: I think these are fossil fuels and I know that nuclear was not taken into account but was considered in the mix so it could be that.

Dr. Eggers: At the beginning when you were talking about the Stern report you were saying that $1 invested basically will offset $5 in damage, over what time period is that?

Mr. Toben: All of these forecast were based on the down turns occurring sort of post 2035 so the five percent disruption in the economy or the five percent loss in global GDP was five percent per year and it was forecasted out basically based on that model. The one percent cost was basically a cost to avoid the five percent decline.

Dr. Eggers: I think a question some people might have is well if we spend that one percent now are we going to actually save anything in the short term?

Mr. Toben: The other metric fear that the one percent investment which was at this point 350 billion dollars per year could yield up to 2.5 trillion dollars in return. So there was that ratio. The estimate that we would have to stabilize the price per million of carbon equivalent over the next 20 years and drop by one to three percent in the out years there after in order to realize the gains beyond that.

Representative Harrison: Thank Mr. Chair and thank you Tim for the presentation. If you could clarify for me, I don't really understand the (inaudible) as well as co-firing the biomass with coal. This burning the biomass releases carbon emissions - could you just clarify what that means exactly.

Mr. Toben: Yes there was a little bit of a mention of that today. Basically the idea that the coal is a non-renewable resource so when you release the carbon into the atmosphere from coal there is nothing to uptake that carbon on the back end when you're using biomass which is a renewable resource when you're cutting timber and using that in coal plants basically through co-firing you are also replacing that resource with new forest crops that uptake that same amount of carbon. So there is a net zero carbon impact for biomass relative to coal. So you would use this facility …. have I categorized that right?

Mr. Shore: Are you familiar with some of the proposals that have been floated in North Carolina for renewable portfolio standard in terms of what percentage we could get from renewables cost effectively in our state and how those relate to the numbers that you showed in these presentations?

Mr. Toben: I've been in meetings where some of those issues have been discussed and it looks to me like the goals that are being talked about are consistent with the outcomes that are looking at no net energy cost related to a national program. So ten percent by 2015, 20 percent by 2020 and 25 percent by 2025 I think were the numbers that were reported here. It will be very interesting to see the results from the Utilities Commission's RPS study to see if their findings are consistent with these Rand Corporation findings about cost impacts of renewables as a portion of the energy portfolio in the state.

Mr. Givens: Let me say with regard to the Utilities Commission study – that study will be released on 13th of December when the ERC meets. I call the attention of all of you particularly of the non-legislator members who may be interested. The ERC will meet beginning at 9:30 in Room 544 and that report will be on the agenda and what they plan to do is issue a draft report and then take comment. They are not going to change the report based on the comment but they are going to add the comment to the end of the report as they publish the final version which will be available in January. The original projection was 1 December and that's been moved to the ERC meeting on 13 December.

Mr. Garrou: Thank you very much Tim that was a good presentation well summarized. We are now at the point in our agenda where we open the floor for discussion and any announcements here. Do you have any before we go forward George?

Mr. Givens: Reminded committee of next meeting on December 11, 2006 in this room.

Mr. Erickson: I would like to call the Commission's attention to the lead story in this morning's Wall Street Journal – Power Surge After Decades of Solar Pioneer See Spark in Sales it's a thoroughly detailed story there are not a lot of numbers in it but I am sure there are numbers behind it somewhere. It's very interesting with regard to commercially viable solar power.

Mr. Garrou: Dr. Smith would you be willing to give us an e-mail with suggestions about how we might communicate with the congressional committees you suggested earlier?

Dr. Smith: Yes I would be happy to do that we've given some thought to that and we would be happy to share that information.

Mr. Shore: We are meeting in mid December and then have a meeting scheduled for January, we have the requirement to have an interim report in January, I think and then presumably we will break for the long session. Just how do we see things unfolding over the next couple of months?

Mr. Givens: That's a matter under discussion among us up here as to what we're going to do about that. We are very conscientious about that.

Mr. Garrou: We will have the report that we are required to have we just haven't decided how we are going to get it done.

Representative Hackney: I would like for us to have a good report for the January session and to that end I want to encourage everybody and I think they have been doing this anyway, but I just want to add an encouragement to it. There is so much opportunity for, George calls it low hanging fruit, and some people call it win-wins and sometimes there are triple wins and so forth, there is a lot of opportunity for doing good things which are both efficient and smart and also contribute to the direction of this Commission. So I

want to encourage everybody to send in those ideas and suggestions, there are a lot of opportunities in forestry, lot of opportunities for the utilities, particularly with efficiencies so I hope that we will have some of that from CAPAG and we will have the biomass recommendations coming. We have a lot of recommendations to sort of field and look at I think and I am excited about the prospect for a good report for the session and we'll have some time I'm confident at the end of January to put all of these on the table and let the Commission chew on them and come up with the best ones to recommend.

Dr. Smith: I assume this is a given but maybe I didn't catch it but given that the RPS study has been delayed to a couple days past our next meeting are we requesting that there be a briefing for that or has it been a request to brief on in the January meeting on that particular ……

Mr. Givens: I've talked to staff at the Utilities Commission about that it's a timing question both as to when they are going to receive this comment that they're asking for and put that together and then what they are budgeted for in terms of access to their consultants. Their initial obligation is to report to ERC and they will do that and then I'm going to see what they can do about briefing us. I have to save some room in that budget for briefing of legislative committees once the session starts.

Meeting adjourned at 1:15 p.m.

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Mr. John Garrou
Presiding Co-Chair

Representative Joe Hackney
Co-Chair

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Thelma T. Utley, Committee Clerk

LIST OF EXHIBITS

EXHIBIT A	**Meeting Notice**
EXHIBIT B	**Meeting Agenda**
EXHIBIT C	**Visitor's Registration**
EXHIBIT D	**Letter from Ed Erickson to NC Legislative Study Commission on Global Climate Change**
EXHIBIT E	**The Energy Future: A Perspective – Dr. Edward W. Erickson**
EXHIBIT F	**Report on Climate Action Plan Advisory Group (CAPAG) Activities – Brock M. Nicholson**
EXHIBIT G	**RGGI – Regional Greenhouse Gas Initiative: States Stepping Up to Address Climate Change – Franz Litz**
EXHIBIT H	**Biofuels in North Carolina – Kurt Creamer**
EXHIBIT I	**25 Percent Renewables by 2025 is Achievable and Affordable – Tim Toben**
EXHIBIT J	**Stern Review: The Economics of Climate Change**