Global Climate Change Commission Meeting
Friday, 12 January 2007
Room 643 LOB

The Legislative Commission on Global Climate Change convened Friday, 12 January 2007 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, Representative Pricey Harrison; Representative Alice Underhill; Representative Winkie Wilkins, Senator Janet Cowell, Senator Robert Pittenger, Dr. Ryan Boyles, Mr. Tom Cecich, Mr. Walter Clark, Dr. Douglas Crawford-Brown, Dr. Dolores Eggers, Dr. Edward Erickson, Mr. Barry Eveland, Dr. George Everett, Mr. Preston Howard, Mr. Michael Nelson, Mr. Mitchell Peele, Dr. Daniel Phaneuf, Mr. Tim Profeta, Dr. Stanley Riggs, Mr. Robert Slocum, Dr. Stephen Smith, Mr. Tim Toben, Mr. Ivan Urlaub, Ms. Susan Tompkins, Ms. Vicky Will and Dr. Godfrey Uzochukwu.

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 at 10:12 am and stated that we have a very full agenda and would like to get started. The co-chair is not here and I wanted to take a minute to congratulate him on being nominated by his caucus to lead the House so I hope everybody will remember that I did that if he comes in. I think that's very exciting and a real honor to Representative Hackney. We ask George to give us his report and explain the agenda items.

Mr. Givens – Good morning and welcome to another meeting of the Legislative Commission on Global Climate Change. There are two items that I want to call to your attention, there is a document that looks like this and captioned, There is a Better Way that was distributed by Ms. Tompkins a member of the Commission, you should all have a copy of that (**Exhibit D**). There is a document that has been reported to the Commission from the Division of Air Quality captioned Air Report on the Study of Cost Benefits for Reducing Emissions of Oxidizes and Nitrogen Particulate Matter in Greenhouse Gases for Motor Vehicles. This is a follow-up to me and don't look for copies because you don't have them. It's a follow-up of information that was submitted to the Environmental Review Commission. We are going to make it available as fairly voluminous and we will make a hard copy for anybody who requested and we will post it to the web presumably this afternoon but I want to save a tree or two by not distributing it wholesale. With regards to today's agenda, today agenda is as useful as it is quite ambitious. I guarantee you we will run behind, how much behind is in your hands. I would encourage you to ask judicious questions and engage in susink discussion. We need to finish up around 3 or 3:30 and it will be a stress to do that. The agenda is more or less self explanatory but it leads to a couple of other things that I need to tell you. The first subject item is agenda item 4 which is a five part presentation on the effects of global climate change as they relate to coastal adaptation, the next item is the report of study of the renewable energy portfolio standard that was done at the request of the Environmental Review Commission by the

Utilities Commission through a contract arrangement and a state voters advisory group. We have optimistically scheduled that to occur before lunch. I hope you will help us meet that goal but that may not actually happen. Commissioner Kerr and Mr. Watson are ready to do that either way.

We also expect a further report from the CAPAG group and what we are going to do as this relates to how we are going to proceed for the rest of this present series of meetings and how we are going to create a report. The plan is as follows: we will hear from the CAPAG group an extensive discussion of the recommendations that they are intending to consider at their next meeting and its subsequent meetings with particular emphasis on what has usually been described as win-win-win or low hanging fruit or that sort of thing. That's for the purpose of putting those ideas out there - not for the purpose of taking action on them today but getting them all out. In addition to that in response to Chairman Hackney's invitation at the last meeting, we received four sets of proposed recommendations for inclusion in the interim report. Those have been duplicated and will be distributed to you. Some of them have already been sent out by e-mail. They will be distributed to you and posted to the web, the folks who prepared those, one represents three of you, and the other three were prepared by individuals. We would give those as much discussion time as time fits.

So the way forward is this: this Commission has one more meeting which is tentatively but I think you can rely fairly confident we will meet on the scheduling of that for Thursday 22 of February. The thought process goes like this – you will have hopefully by the end of the day an opportunity to give some thought and discussion to all the proposals that have currently been received or are out there. The co-chairs have asked that any other members of the Commission who wishes to submit proposals for inclusion in the written report do so by the 31st of January as sort of an ending date on that so that those proposals can be distributed and considered well in advance of the meeting on the 22nd. I caution you that what Mr. Peterson and the CAPAG group are working on at the moment are matters that the CAPAG folks have not actually taken action on, they are proposals not recommendations. Mr. Peterson and I have had a lot of discussion about this and I have talked to both co-chairs about this and what we hope is that discussion in this Commission today would inform the discussion of the next meeting of the full CAPAG which is on Wednesday 24th of January that happens to coincide with the first day of General Assembly Session. The CAPAG will take whatever action it choses and that information will come back to us on the 22nd as a third point of reference for consideration of what goes in our interim report to the Legislature. Also on the 22nd we are working on planning a reception, this is at the request and invitation of the British Counsel General of Atlanta. There will be visiting members of the British Parliament who will hopefully be able to observe at least part of the meeting on the 22nd and they plan to invite all of us to a reception in the late afternoon or early evening as an opportunity to meet and greet. I understand that these particular MPs are the ones who are particularly interested in global climate change matters. So that's the basic plan and I don't anticipate that this Commission will meet again during the session we will presumably resume our work towards a final report once the 2007 Legislative session adjourns.

In terms of getting a report together the elements of the report as I see it are (inaudible) which is easier to authorize legislation and membership for the Commission and that sort of thing. Then there is the matter of the proceedings of the Commission, that a synopsis of the minutes, that is being worked on with some outside assistance and I hope that we will have those proceedings available for distribution early in February. I don't envision really much debate about those because they are supposed to be a straight forward summary of what we have done. There may be of course corrections or there may be additions that you want us to rectify and we will certainly be open to that.

Mr. Peterson and his group will take the recommendations that are agreed by the Commission on the 22nd and do whatever needs to be done to get them in good form for inclusion in the report and that will be the report. Mr. Peterson is currently looking at the four submissions we've received to see how they work with the CAPAG things. That's not to say that the things that you all submit have to be part of what the CAPAG is doing but he's looking for similar or duplicative things so that we consolidate consideration of those matters. So that's our plan for how to produce and report what we hope is that we continue to communicate with you by e-mail in February in advance of the 22nd so you will have a pretty good idea of what we're going to be looking at. I regard the 22nd of February as the decision day. I remind you that the way legislative committees work is that the co-chairs control the agenda as has been the case for all of our meetings. They will get to say to review all packages of recommendations to determine which ones ought to be considered – no doubt with advice of counsel and many of you. So that's the plan I'll be happy to answer any questions. Thank you Mr. Chairman.

Mr. Garrou – Any questions for George? Our first speaker is S. Jeffress Williams, he is a Coastal Marine Geologist with the U.S. Geological Survey/Woods Hole Science Center, Woods Hole, MA. Thank you very much Mr. Williams for coming down here to visit with us and giving us your presentation.

Mr. Williams – Good morning – it is a pleasure to come and give my presentation. The slides will show (**Exhibit E**) some of the recent research ongoing by USGS as well as in partnership with a number of academic institutions and state institutions in North Carolina. The topic of my talk is "Coastal Vulnerability to Erosion, Storm Hazards and Potential Future Sea-Level Rise" and the real take home message that I would like to leave is that there is a great deal of high quality creditable scientific information on what's happening at the coast and what's likely to happen at the coast. And I think as planners and managers in North Carolina plan for the future I would encourage them to use the sciences available. We have a number of outstanding coastal scientists in North Carolina that have published and presented a lot of really excellent material on what's happening along the North Carolina coast and I think that in the long term that scientific information needs to be an integral part in any of the findings that goes on.

There's been an explosion of research in the climate change in the last decade. We know a whole lot more now than what we knew ten years ago. There are two quotes dealing with climate change and one is from the Union of Concerned Scientist changes consistent with global warming are already on the way across the north east. They are focused with the

north east but I think the same can be said about the mid-Atlantic region including NC. Another came out of the UK this fall the scientific evidence is now overwhelming, climate change presents very serious global risk and it demands the urgent global response. This was the Stern report and this came out of the UK government that that certainly is not known for being too radical. So I think if they take it seriously we should take it seriously as well. North Carolina and other coastal states faced upper coastal hazards that are listed here. Catastrophic storms certainly, not so much this year or last year but certainly in the historic past and recent past North Carolina has suffered tremendously from coastal storms. Coastal erosion both short term and long term erosion, global sea level rise certainly the focus of this Commission that I'll talk about. Land subsidence that's related to sea level rise and when you talk about sea level rise you talk about relative sea level rise that is the combination of the oceans coming up, the seas coming up and the land going down. That certainly pertains to NC as well. I include global and regional climate change, earthquake, tsunamis, landslides, volcanic activity, not too much of an issue for NC. I think all of you are aware that the coast line is a highly dynamic area and it's one of the most dynamic regions around the US. It's the intersection between the ocean and the land. And I've just listed some of the primary agents that drive this coastal change, some of the natural regions as well as the anthropogenic. Obviously the type of geology that you have at the coast line is very important whether or not you have hard rocky coast or low lying Barrier Islands those like you have in much of NC. The type of geomothology relative sea level hasn't changed and I'll certainly talk more about the major storms and tropical storms and extra tropical storms are very important and driving local change. And talk more on the routine coastal process from day to day of the way the wind and the tidal currents and so forth. Sediment budgets - what we mean by sediment by sediment budgets is much like your checkbook and that is the sand coming to the coast, sand leaving the coast and how the sand moves along the coast. And it's the sediment budget that's very important to (inaudible) not as close as undergoing secretion, its stable or undergoing erosion just a volume of sand that is available along the coast.

This last and certainly the last 50 years recent human activities have probably done more to alter coastal processes along much of the coast maybe not so much in NC as other parts of the coast and many of the natural conditions. Sort of the unanticipated consequences of some of the coastal (inaudible) structures navigation channels in some places and river modifications. Certainly for the Gulf of Mexico and the west coast this is important, oil and gas extraction not such a big issue for NC but certainly for other parts. I actually like the term climate variability more than climate change – climate change is such a politically charged statement that I think climate variability is just the uncertainty of what's going to happen. It's probably a more appropriate term than climate change. The map on the left is showing long term annual shore line change around the United States based on the map that USGS has done. It doesn't show up real well but the red areas are areas that are severely eroded. The yellow areas are moderate erosion. By severely erosion we are talking about in excess of a meter in excess of about three feet per year on average. Moderate erosion would be one to three feet, the green areas would be relatively stable. Some years may be eroding other years it would be relatively stable.

NC has lots of red and lots of yellows and that's no surprise that much of your shore line is under going long term erosion for a variety of purposes. So about 85 percent of the US shore line is undergoing long term erosion, so the erosion problem that you have here in NC is not unique but it's happening throughout much of the US, and the USGS has projects underway to document and quantify these changes taking place. Of course at the same time we've had an explosion of coastal population this is a figure from the newspapers a couple years ago in NC as you are well aware there's been some in excess of about a 50 percent increase in coastal population. People moving to the coast either from upward areas, people retiring from the middle part of the country and moving to the coast, it's no great surprise NC is a very nice place to live particularly in the coastal zone. But it's this clash between what's happening at the coast, the dynamic coast and people moving to the coast, the infrastructure along the coast that presents the problems.

The last decade have been a very unusual decade in the historic record and even to some degree in the geologic records and certainly the last several years have been fairly unusual. This is just a summary of 2005which in all the historic record 2005 is a record hurricane season. The hurricane season runs from June through November, in 2005 we had 27 name storms, 15 hurricanes, three of which were category five hurricanes. At the end of August Hurricane Katrina of course had a tremendous impact for all south of the south of Louisiana, these are just some of the specifics about the storm, just a huge very powerful storm. That was followed the third week in September by Hurricane Rita, 165 mile per hour wind, 15 foot storm surge about half the storm surge that Hurricane Katrina had. Katrina had on the order of 30 to 33 feet of storm surge, higher storm surge than were reported. Hurricane Wilma in October and this storm season actually brought on the cold weather until January 2006, it was a very unusual year. Two thousand and six (2006), this was just reported the last week or so, was the warmest year in recorded history. What does this protend for 2007? The only reason that we had a fairly quite hurricane season in 2006 was because of the start of El Nino which really suppresses hurricane activity but certainly the Gulf of Mexico and the Caribbean was very warm and if we didn't have El Nino we very likely could have had a repeat of what we had in 2005. So the question is would the oceans warming on the order of a degree or more if El Nino dies down as projected to do what are we going to have in 2007? So I think there is no doubt the scientific consensus that the fact climate variability, climate change is happening. The issue is how much of that is due to natural variability we certainly know that there are cycles to many things but it certainly seems like the climate warming of the atmosphere, climate warming of the oceans is just exasperating some of those natural cycles.

Talk a little bit about the effects of the sea level rise. I've listed a lot of them here from loss of coastal habitat and natural resources increased erosion, loss of recreational resources and certainly this is important for NC. Salt water intrusion - if you have fresh water wells in the coastal zone and you raised sea level you have more incursion of sea level which can bring about salt water intrusion. Elevated storm surge elevations for frequent coastal inundation all of this leads to increased risk to urban infrastructure and ultimately a greater risk to human safety. We note from the geologic records that sea level has been buried considerably this is a graph showing the present sea level right here. The modern sea level and how sea level has changed from back to 160,000 years ago. So here we are at the

present time 160,000 years ago. One hundred sixty thousand years ago sea level was down here, probably about 400 feet below where it is at the present time and it came out about 120,000 years ago and was actually five meters or about 30 feet higher than where it is at the present time. The thought was that all the ice in green would have melted at this time and put that water into the ocean and sea level was actually higher than where it is at the present time. As the climate cools, sea level drops as the climate warms up a bit it came up, so you have these fluctuations in sea level positions. This is just a graph showing the location of sea level. During the last glaciation about 20,000 years ago sea level was back down to about 400 feet below the present time as the climate warms. This is steam up here, this is a very smooth curve certainly it wasn't very straight and continuous like this but this was in general. Twenty thousand years ago -400 feet so the shoreline at that time would have been out at the edge of the continential shelf, hundreds of kilometers off shore and as the climate warms and the glaciers melt and it put more water in the oceans it came up. And it came up to around the present position probably on the order of about 5,000 years ago and since that time it's been slowly rising but certainly not rising as quickly as it did up to that point.

The take home message here is that all of this is, of course, due to natural variability in the climate system. It's the system of glaciers building, glaciers melting the climate warming, so all of this we know they are natural cycles we control, the question is what's going to happen in the future? How much of the natural cycles are going to persist in the future and how much are they going to be exasperated by greenhouse gases and climate warmth. To prove the fact that sea level is continuing to rise is shown by tide gauges. We have two tide gauges closest to NC, one is up here in Hampton Beach at the mouth of Cheseapeake Bay and one is down here at Wilmington, NC. The squiggly graphs are the sea level positions from about 1940 to the present time. For both of these and you can see lots of variability so there are lots of factors that control sea level rise. If you do a statistical regression through these data you can see this sort of yellow line here that comes up from 1930s to the present time. And this suggest that over this period of time sea levels up here at the Hampton Beach have been coming up in about 0.17 inches per year about 17 inches per century, fairly rapid. If you look at the gauge data from Wilmington it suggest that it's coming up about eight inches per century. The difference here is that this is not an ideally placed gauge it's up in the river and there are other influences on it. The other thing is that this area is probably subsided and the land is going down even more rapidly than the area down here in NC. But regardless, the message here is that there are two levels (inaudible) to the NC coast that rises probably in the order of about 18 inches per century and the question is what's going to happen to our beaches?

Ok what contributes to a global sea level rise the one we call an eustatic line. A little over a third is just thermal expansion as you warm the atmosphere the atmosphere then warms the ocean. When you warm water which warms the ocean the upper mixing area expands it so probably in excess of a third of sea level rise that we're seeing is through the thermal expansion. Another third has to do with the wastage of glaciers. You've probably read the papers that places like Alaska, Glacier National Park were very rapidly loosing their glaciers because they are melting such that probably all the glaciers will be gone in Glacier National Park within the next 50 years, so some may say that a third of the sea level rise is

due to glaciers. About a quarter is due to the melting of Greenland and this is where it really gets complex as to try to figure out the budget of ice on Greenland and particularly in Antartic. In Greenland recent evidence through the last year, year and a half suggest that Greenland is melting much more rapidly than what has been normally forecasted. A lot of the melting is taking place along the preiferial Greenland. They're actually building ice and snow in the interior so there is an adding of ice and snow in the interior to the very rapid melting on the exterior and the melting on the exterior is adding water to the ocean that contributes to sea level rise. When this figure was put together there was a real questions mark and in some degree it still is. This is a lot of very troubling information that has come out in the last six months suggesting that ice shells around Antarctica for desengerating and breaking up much more rapidly than what we anticipated. And of course the ice shells that are melted when they break up don't actually contribute to sea level rise because that's (inaudible). That's like an ice cube in a glass, if you have an ice cube in a glass and it melts, it doesn't raise the level at all. What's happening in Antarctica is that deserves attention and that as these ice shells break up they potentially can stay water or on shore glaciers because one per glacier start to move and they start to break up and they are moved to the ocean then they can certainly contribute to the sea level rise.

What's the potential for man made ice to sea level rise? I just listed them here – Antarctica by far has the most ice that contributes to the sea level rise. It has something in excess of 90 percent of all of the glacier ice that can contribute to sea level rise. If you melt all of that you would raise sea level over 70 gators 200 feet. Greenland contributes about eight percent if you melt all of Greenland you would raise sea level on the order of 20 feet and that graph that I showed of sea level in the past would (inaudible) at the present time that's thought to be the result of the melting of Greenland. Mountain glaciers and other sources like in Alaska as well as other places are relatively small probably only about one percent of the glacier life and that would raise the sea level on order of a foot or two. Those are the potential sources. We've heard a lot about the buildup of CO_2 it is one of the principle gases – this is a well known part of carbon dioxide in the past thousand years. Here is 1,000 years here is the present time and as you can see that from 1,000 years ago up to the 1800s up to the start of the industrial revolution. Carbon dioxide in the atmosphere and we know this from an analyses used for price cores in Antarctica. Carbon dioxide is fairly steady as we burn more and more fossil fuels. Carbon dioxide went up and you can see it has a steep increase. The plot here is global temperature – global average temperature in the last 1,000 years and you can see lots of squiggle and ups and downs here in the little ice age in the medieval warm period. Then when you get up here at the start of the 20^{th} century you can see the temperatures going up so there is almost a one for one correspondence between the buildup of CO_2 in the atmosphere due to the burning of fossil fuels and an increase in temperature.

The question is what's likely to happen in the future? This is a graphic base from the Intergovernmental Annual and Coastal Climate Change that was published in 2001 and it just shows the global mean temperature here from 1850 to 2000 and based on the number of numeric computer models these are different scenarios. If you just have sort of a steady stage this is what the temperature is likely to do, it's likely to go up about another degree during the next century. These are the different model runs that we did up here. These are

very high scenario that is likely to happen. These are just average reports what is going to actually happen is going to be highly variable. Some areas are going to warm considerably and we already see that in the colder regions. You probably read in the papers about the break up of ice in the Antarctic the warming up there was in the order of four and five degrees. It varied in other parts in the order of one degree. Even in Massachusetts where I am it has been a really warm winter so far – it's a little deceiving to talk about climate (inaudible) that's highly variable some areas are going to be wetter other areas dryer, there are just lots of things that could be affected. It is truly encouraging to see states like NC take a leadership role, certainly there hasn't been much leadership coming out of Washington and I encourage states like NC to take the leadership role, recognizing that this is an important issue.

Let's summarize on the current projected sea level rise, we know from the tide gauge records that over the past 100 years or so sea level has risen on average of about eight inches. The result of this is contributions from further expansion of the ocean as well as melting from glaciers. Some of the computer models suggest that over the next few years sea level could rise with the estimate of about one-half meter, about two feet. What does this mean for NC? What it means is that sea level is likely to double over the next century and this is just a graph that again is from the IPCC showing the different model runs for what to expect in sea level rise. I might mention too that the IPCC has a report that came out in 2001 and it should be forthcoming later in the year. We'll talk about what USGS is doing in the area of coastal research. USGS is the research artery of the Department of Interior they have national programs and one of the research areas is the coastal change strategy. We are mainly charged with doing the studies in concert with our colleagues at the universities and state agencies that are needed to predict coastal changes and using this information to try and predict (inaudible). The idea being that this information can be used by planners, managers to reduce the risk of social hazards.

A number of years ago we undertook a quantitative assessment of coastal water vulnerability and this is a map and all of this is up on the USGS website. We came up with coastal vulnerability index a relative folder builder in coastal area the future still wide. And this is the map on a national scale with NC you can see lots of (inaudible). But this is based on some of the qualitative analyses of six different geologic and oceanography there is. This is just one example of the coastal vulnerability study that we did as a part of the study for the National Seashore, this happens to be for shoreline change. The red here indicate various high vulnerability going down to the blues so you can see that this on the outer coast, lots of red and browns and yellows in some cases very high vulnerability to the future on the line. This is the overall CPI index again this is up on the website these are the different variables that we measured but you can certainly get a sense from the bright hot colors that applies to the bar and is extremely vulnerable to a number of hazards including (inaudible). One of the other studies that are underway is developing a numerical model and understanding the evolution and what to expect with potential sea level rise. This work has not been published yet so I will stress that this is preliminary and it is based on the modeling work. We find that the NC barrier, the sea level rise, is the most important factor determining erosion or migration rates. The sediments are fine it is important but it's kind of secondary and this has implications I think to be encouraged. The second bullet suggest

that these are modeling that we've done. We've been able to replicate pretty well how the coast has behaved with the past 8500 years. The idea is that if you can get a model to replicate what we think is happening, what we know through the geologic records is happening, and you run that forward then you can have confidence in what it tells you for the future. What it tells us is that if we have a 0.9 meter rise in sea level, this is sort of the upper end of what the IPCC has forecast for the next 100 years. The model suggest that NC barriers might migrate up to three times more than what they have been based on the last 100 years. This last one suggest that if you pick the sea level rise rates that are well above the IPCC predictions and this is some of the information that was put out recently, if we have really wide spread melting or freezing, if we have a breakup in Antarctic ice sheets we could actually get sea level rise rates above this 0.9 meters. If you do that then the model suggests that the Outer Banks become vulnerable to a system wide what we call threshold (inaudible). This really supports some of the work that Professor Riggs and others have done and suggested that in the past as you get a very fine rate of sea level rise you can get that threshold to collapse. I think the modeling would suggest that this is possible in the future to get (inaudible) sea level to rise.

One other study is a cooperative study with USGS is now underway with a number of players here in NC, at East Carolina, NC Geological Survey as well as (inaudible) University of Delaware and Pennsylvania and that is going to last several years. We've undertaken the study to understand how the NC coastal system develop in the processes that are driving the coastal change at the present time. I listed some of the objectives here they are the projects that have been very successful and we've have excellent collaboration between federal and state scientists, academia and state surveys. We mentioned one other thing and that is that we are involved in writing reports for US Climate Change Science Program and this is the website that USGS has the lead with EPA and Noah. This is something I'm undertaking the way to report on the current state of knowledge, the science of sea level rise, the factors that influence coastal change, and also the various methods involved with better ways to predict future coastal change.

This is a map that is just getting started. We had the first meeting of this group in Washington and it will probably go on about a year and a half and this is something that I think is important for ideas to summarize the state of knowledge about climate change in regard to sea level rise. It will not be definite we will put uncertainties in this report as well because we don't know everything, there are a lot of uncertainties and I think we know a great deal more now than what we did ten years ago or even five years ago.

Let me just go ahead and conclude – I've listed four bullets here that I think the take home message is:

1. Sea level rise we know is a primary driver of coastal change and is rising. Future rates of coastal erosion and inundation no double will increase.
2. Climate change is warming the oceans. Sea level rise is accelerating due to thermal expansion and increased melting. The future sea level rise is likely to be on the order of 18 inches higher by the year 2100. Melting on Greenland and Antarctic could

further accelerate this rate. So I think 18 inches is probably a good number to plan for and you need to stay turned to see what's going to happen.

3. Warming ocean temperatures seem to be increasing the hurricane intensity. This is on top of the natural cycle of hurricane activity that we know about. There seems to be 25 year cycles to hurricanes with a cycle now we've probably been in it for ten years so we probably have another 15 years to go. Certainly 2005 is very active for the east coast and NC was spared from much of that certainly prior to that you had a number of major storms and climate warming is just going its natural cycle.

So all those are good links that climate warming and hurricane intensity related to hurricane frequency is still scientifically uncertain, there is still a lot of research that needs to be done on that.

The last thing I'll leave you with is:

4. Science should guide coastal management and policy adaptation to climate change.

Mr. Garrou – Thank you Mr. Williams. What I would like to suggest is to finish the presentations under this heading before we ask questions. Our next speaker is Debra Hernandez who is the President of Hernandez and Company and she is going to give us a report on the National Academy of Sciences report.

Ms. Hernandez – Thank you Mr. Chairman it is a pleasure to be here. As your chairman just noted my name is Debra Hernandez. I am a coastal engineer and policy handler, I currently work for myself. I am here on behalf of the National Academy of Science which recently produced a report on Mitigating Erosion along Sheltered Coasts and what is being handed out (**Exhibit F**) the slicker paper is a report prepared by the National Academy and you are also getting a handout of my presentation (**Exhibit G**). First I am going to describe the presentation contents of the reports and then discuss in more detail the major findings and recommendations it contains. I would say that the report itself is not only an issue of climate change it does address some of the likely impacts of rising sea level and that you are going to see erosion of your sheltered shorelines that were just mentioned by the previous speaker.

The purpose of this study was to examine the impact of shoreline management of a sheltered environment. The sponsors of the study are the Environmental Protection Agency, US Army Corps of Engineers, Cooperative Institute for Coastal and Estuarine Environmental Technology and NOAA Coastal Services Center. The purpose of the study was to examine the impacts of shoreline management on sheltered coastal environments and identify conventional and alternative strategies to minimize potential negative impacts to adjacent of nearby coastal resources. The study will provide framework for collaboration between different levels of owners to aid in making decisions regarding the most appropriate alternatives for shoreline protection. First, what engineering approaches and land management/planning measures are available to protect sheltered coastlines from erosion or inundation? Second, what information is needed to determine where and when these measures are reliable and effective both from an engineering and a habitat

perspective? Thirdly, what are the likely impacts of various shoreline protection practices? And lastly, probably more relative to this Commission, given the current trends in erosion and acceleration of relative sea-level rise, how can design criteria, and the various technologies that are available and land use plans be implemented to protect both the environment and property over the long term? It a nine member committee and supported by the Academy staff Susan Roberts, Study Director.

The report is organized into five major sections: the first is understanding erosion on sheltered coasts, identify various methods and options for addressing erosion. The third talks about mitigating erosion on sheltered shorelines and its particular focus on a trade-off that has to be made. No matter what you do to help protect shorelines from erosion there is going to be impacts to mitigating coastal resources ecosystem and those have to be sound. Fourthly, the existing decision-making process on sheltered coasts is for shoreline protection. And last the report posted for new management approach. I think what you will find as I go through this that it is a lot of common sense. I know you all have done a lot here in NC.

First what am I talking about – what is a sheltered coast – primarily your bays, harbors and estuaries. What's the problem – you all know that there are many people moving to our coastal regions and lastly landowners typically work to harden their shoreline and bays of erosion problems. If this report does anything, I think just raising awareness that is a particular aspect of it. The three major categories of the shoreline are beaches and dunes, mudflats and vegetated communities and unconsolidated bluffs.

Let me take the next few minutes to walk you through the eight major findings and recommendations that are included in this report. The findings are four categories: Information Needs; Erosion Mitigation and Permitting; Cumulative Effects; and Shoreline Management Planning. The information needs the primary finding its scope and accessibility of information on causes of erosion and overall patterns of erosion, accretion and inundation in the broader region is insufficient in most areas to support the kind of planning and management that is necessary. So the committee recommended that federal agencies (USACE, EPA, USGS and NOAA) collaborate with local entities such as counties and states to develop target studies that facilitate more effective decision making that it is looking at the whole system as opposed to what is happening at an individual site.

These studies should identify trade offs in ecosystem services that are associated with the different options to managing the shoreline. Second, the study should document the processes and hazard information is available to a particular area including mapping erosion zones and rates. And then lastly, we need to develop better models to predict how shoreline features are going to respond to various sea level rise in areas, etc.

The next series of findings is in the category of erosion mitigation and permitting. There are three major findings. The first – compared to open coasts is a much greater variety of techniques available to address erosion because these systems are subject to lower energy impact, there are a lot more alternatives to mitigating relations. There are new technologies that are being developed and they require rigorous process testing and evaluation to

determine their effectiveness and environmental impacts. And third, the current permitting system discourages the use of alternatives.

The recommendations under this same category erosion mitigation and permitting – first the major federal permitting agencies (EPA, USACE, and NOAA) should initiate a national policy dialogue. Secondly, the dialogue should be used to develop guidelines for mitigating erosion on sheltered coasts and give deference to ecologically beneficial measures and ensure consistency of decision making across regions. The regulatory preference for permitting bulkheads and similar structures should be changed to favor one that is more ecologically beneficial and then states and federal regulatory programs should establish a technical assistance.

The next set of findings and recommendations for cumulative effects are take a look at the cumulative impact of the loss of many small parcels will at some point alter the properties, composition and functioning of the ecosystem. The recommendation is that shoreline management plans should be developed to account for potential cumulative effects of shoreline hardening. And that by anticipation of the problem you can better manage it.

The last category of findings and recommendations is under the shoreline management planning category. First, many factors in addition to sediment budgets must be considered in the developing regional plans. We have to also look at the socio-economic factors as well as the environmental processes affecting the shoreline. Secondly, regional shoreline management plans could be implemented under the auspices of the federal Coastal Zone Management Act. The third finding category is that there is a good model with the US Corps of Engineers Regional Sediment Management program that can be evaluated to address the problems in NC.

The recommendations of the committee is regional shoreline management plans should be developed to address erosion on sheltered shorelines, they should be comprehensive, they should be pro-active to avoid the unintended losses. You should have a plan – a shared vision for the future of the shoreline, one solution will not work for the entire coast. Analyze the sediment budgets and other effects of existing shoreline management activities. You need to include in the plan mechanisms for turning the vision into reality and to implement the plan. And lastly, enhance performance evaluation and monitoring requirements.

The final two recommendations under the shoreline management planning heading are the information obtained from various monitoring programs and should be incorporated into subsequent planning activities. Use adaptive management strategies to consistently evaluate and refine regional plans. And lastly, each of the regional shoreline management plans should describe the physical and hydrodynamic settings you should include information on method of structure. All of this should be made available in a GIS format ideally and the plan should describe what options are most suitable for the environment and processes that are applicable for a particular area.

So in summary information on shoreline changes is insufficient for sheltered coast. Decision makers and this is landowners, contractors, and state and federal authorities are generally unaware of some of the alternative erosion mitigation strategies and their effectiveness. Individual decisions lead to cumulative impacts. All mitigation measures affect ecosystem. Local pro-active shoreline management plans could prevent unintended consequences of site-by-site permitting. And then lastly, permitting systems need to be changed so that they can promote mitigation alternatives that are more protective of the ecosystem and the natural resources in your area. So as I've said much of this is common sense. The report is not out in print yet it is available for downloading from the website. I have a publication if anyone is interested. That's my presentation.

Mr. Garrou – Thank you very much Ms. Hernendez. If you would be so kind as to hang around for a while until the last presenter is finished for questions. Our next speaker is Douglas Rader who is the Principal Scientist for Oceans and Estuaries Environmental Defense and he is going to relay some of what is referred to as NC specifics. Mr. Rader.

Mr. Rader – Thank you Mr. Chairman and members of the Commission. My job is to bring the important messages that you have heard this morning home to NC. I've been looking around the audience and it looks like a personal trip through the past. People I've worked with for almost 30 years on trying to take the things that we have here that are special and make them be around for our children and their children. Before I began I do want to acknowledge certain people that have made a big difference in my thinking about this and that have been active collaborators over the last year in thinking about NC's coast and what warming seas rising sea level means for our special place. Dr. Sam Pearsall is here he made a big difference in my thinking. You all know Dr. Riggs but in addition Pete Peterson, Pat Halpin and Jennifer Phelan made a big difference to the way we think about these things.

I am going to do three things exactly this morning. First, to give you an affirmative on why our coast is a more special place than anyone really recognizes. But then second of all I am going to give you a painted picture about what the implication are for this special place based on the science in this area. And then third give you some science based quality recommendations on where we might go from here. I don't think I have to argue to you that we have a world class predator at risk. World class fisheries, world class forest, world class (inaudible). And of course most important is world class people, culture, heritage, based on natural resources extending centuries into the past all of these extending centuries into the future. By the way the picture on the right (**Exhibit H**) is a copy I am of a black and white photograph from 1905 of the river here in the Albemarle Sound where single pulls of (inaudible) could capture over 100,000 fish in the western Albemarle Sound at that time. But in addition to being special to us this place is special to the entire northern Atlantic, large green ecosystem and that is because of where we are located in an underlying geomorphology in the way the critters over the millennium have adapted to this place. On the left you will see a picture of the world through the eyes of cool water fish and citrus spawn and things migrating to the north. And to them this is the place where they have wintering cabins or spawning cabins or fish going all the way to the bay. The bluer colors on the map the more ecological importance it is as in massive conjunction off

the north side coast. And if the estuaries had been colored it would be a bright shinning blue-purple. The picture on the right locates NC at the north of the warm spawn. As eastern North America is seen through the eyes of reef pictures and things like that where fish spawn and our estuaries could (inaudible) as far as the Gulf of Mexico.

If you look at this special place and keep it apart what you find is a truly unbelievable natural valley accruing at this meeting of the cool waters and the warm waters. I am going to focus for a moment on Albemarle and Pamlico Sounds because it is one of the world's great unsung predators. Currently delineated by the Barrier Islands to the east and since 1917 with no inlet north of Cape Hatterus forming a largely fresh water or (inaudible) barely salty, a system in the Albemarle Sound a graphic water for (inaudible) system in the middle. Total swan and nursery areas of old time for (inaudible) associated with the fresher waters for wasters and things associated with the more brackish waters. And in between a massive, massive low lying wetland system also surrounding by nursery areas for marine and estuarine lands but also on the land had to catch the migratory birds that nest upon the (inaudible).

If you look at this place Albemarle and Pamlico Sounds and their tributaries the lineages of heritage in fisheries are acute. The Stripped Bass on the left have recovered after being over-fished since the 70s and 80s. Now there's been absolutely peace settling in an in creditable valuable natural resource that a lot of people are highly dependent on, but then also the Shads and Herrings that were in fact the founding fish. Not only for George Washington and Company that over wintering before finally vesting the British but also bring calmness overland to Jamestown into northeastern NC in the middle late 1600. That was the water that made this place work for calmness or be it certain people life. In addition to these fisheries highly dependent on working rivers, the marsh themselves provide key nurseries for fish spawn far from here. This is an aerial picture on the left and the tidal reef primary nursery area, the first place that sea spawn, shrimps and crabs and many other fish unsettle as (inaudible) growth toward juvenile and adulthood. But engine productions are much of the picture in the western Atlantic.

This area has a trendier of the third kind of keys in corporate marine habitant in the salty waters themselves. The salt marsh and shell fish bans in submerged plant beds that are important history grounds in their own life and also key feeding grounds for oceanic fish of all types. Not to focus only on the fish, if you get in between the nurseries and you find a wonderland of natural resource values, world class rural class farmland part wood swamps sustaining both local and migratory populations of all kinds of critters, world renown in the (inaudible) system and beyond. They are also uniquely in this area a massive area of low lying non-life pairings, non-river side swamps bathed in deep organic soils each as deep as 12-14 feet. Kind of massive, massive carbon and also if under very wetland systems that (inaudible) water flows that protect the nurseries and pollution of all types including airborne pollution. Again it also provides habitat for large highly mobile (inaudible) entire migratory birds. Together an absolute treasure rarely regarded as such outside the sport club region. This is a threat to this associating the warm world driving seas are acute. The one you've heard much about rex over land play is only the tip of this iceberg. On the left you see a figure one of Dr. Riggs' recent contributions so everything in blue lower than 20

feet above current sea level and that's vulnerable the same kind as over land play change each day world wide sea level rise to current levels before. The same that happened back about 160,000 years ago. The figure on the right shows the areas that are in blue that will be flooded with lower levels. They start at 700 miles and go up to closer than 1500 square miles that with that expected sea level rises on the order of one to roughly three feet. That's much of this natural treasurer that will be directly flooded by rising sea level.

I probably should say that this shoreline the living process is natural as you've heard. If you look at thecenter of the last curve this area has been subjected to natural large scale long term variability of (inaudible) and this alters the shorelines. The way the system is zooming and the way it responds naturally to such as the last upgrading over land migration of shoreline communities. And what happens is that potential upslope migration, up basing migration is directly (inaudible). That's why people like me care so much about bulk heads and estuarine. But in addition to overland play the rest of the iceberg looks roughly like this (1) these globalized lands have been ditched and drained since George Washington since the 1790s. Everything here in blue is a ditch or a sound but that does not show the field double digits, there is a strange network in place in all of these ghastly low lying lands where natural spring channels can be put into channelized form. That's Pocosin Swamp also one of Dr. Riggs' pictures where the (inaudible) stream area and cut up into mile and a half mile blocks with major channels in blue field ditches connecting just about the entire land scene. Ways to get water off of marginal wetlands in order to use it for the surfaces but also entry points for water moving upstream and the salty waters moving upstream.

Drainage networks also lower the water tables that cause its peat to oxidize liberating large amounts of carbon currently stored in demorganic soils. A piece of the property played and I think it was vastly undervalued and a huge financial opportunity in NC to invest in stock loss for currently sequestered carbon and peat. They offer flow patterns, they allow for salt water movement up canal but also through ground and altered soil structure. They offer vegetation and (inaudible) habitat and therefore human potentials for both for recreational purposes and also for money making purposes for forestry and for agriculture. (2) The rest of the ice burden is storminess not just hurricanes but extra-tropical cyclones. You all remember Floyd and Dennis on the right the rainfall amounts I know are fresh on your mind, Hurricane Isabel on the left and the massive recession of slopes and blusts that occur associate and (inaudible). Again Dr. Riggs thank you so much for your pictures. North Carolina is storm central and this is just counting hurricanes with 46 hitting our coast in the last 150 years. If you count nor'easters and extra tropical cyclones this is per death of storminess. In fact Dr. (inaudible) at a recent symposium added with this equation the fact that most of the big storms that made the northern Atlantic arrived off our coast. We are also the generator, both the receipient and the generator of much of the massive non-tropical storm activity in this part of the world. And so are the bulldozers of the coast the models of simple overland flood simply can't at this point count for the time that has been driving effects that I personally think and that if it's due to (inaudible) swamp the effects of direct overland warmup.

This is a figure from 1974 that was about when I started working on this and Dr. Riggs has been here for ten years showing where the Roanoke River channels have been earth

geologically. You look at it and you will notice (inaudible) right now is a highly looked upon Barrier Island and the task is probably to the future is an Albemarle Sound with the Roanoke River going due east through this (inaudible) northern Barrier Island. The point is that non-linear threshold of sets of variety of scales are in our future period. There will be (inaudible) the lack of innocence in the north since 1817 and is pure artifact of things that have happened here and whether you believe the exact prescription that Dr. Riggs' has laid out and perhaps particular short term future of maps of inlets to the north or the longer term future moving more toward that has a much more dramatic impact or not there are dramatic changes in our coastal future period.

Understanding the implications of these gets complicated because it is not just flooding. It's not that flooding causes it to be lost flooding in enclosed land is different. So understanding this in terms of equalized cascades induced by plaque appearance is key to the (inaudible) success. The forest, new inland alters communities, swamps and marshes. Those shoreline pipe, alter habitat value, alter human and usage patterns and it's not just a simple linear attack that cascade attacks across the complex system. The truth in NC is that we have massively altered many of the basic glaciers and the disciples that maintain our coast. The water balances on the land, the nitrogen balances that have been preferred far more than the carbon budget and also the carbon budget. Thinking back on the future especially in the north, with a (inaudible) moderately sailing Albemarle Sound makes you wonder about nutrient sensitivity. Not just in the shoreline but in Albemarle Sound and therefore the assumptions that we have made about the pipe flows off the Roanoke protecting that system against nitrification being eroded when we take sea level into account. The real point is that all of our status quo thinking needs to be adjusted taking into account what science tells us about our changing future. We know that this last (inaudible) in use that more frequent big storms may also be accompanied by gulf (inaudible) prime times and that rainfall patterns will change probably but not with higher peaks and lower averages. That means altered water availability both for humans and (inaudible) needs will need alterations in that assembly from acids from waste that be consumed in our rivers already stretched to the breaking point and these increasing competitions for water and for (inaudible).

Changing warming world also means changing temperature patterns, it means altered forest, altered crop potential, altered natural vegetative communities and it also means altered fisheries. Most people don't realize that right now Gray triggerfish, the fish on the right has largely replaced Black Sea Bass. It's the main shell fish of the south and there are definitely changes underway. You may have heard about tropical fish in the summer and that is that it is absolutely happening and once its direct response now is that the patterns that are vigorous, it's hard to say but changes are underway. And of course there are implications and another thing you probably haven't heard about is that NC has four reefs. You probably have heard that most scientist believe that within 50 years with the world's coral reefs may largely be gone as we know them. The fact that basic biochemical capacity to make calcium carbonates (inaudible) may be gone in most of the world's oceans you may have no idea that is a direct implication for us. Because (inaudible) spinning south of Florida are roughly 20,000 square nautical miles of deep water coral reefs a world class deep water coral resource. We are just beginning to look at them the scientific community

with great vision from Steve Ross at UNC Wilmington and others are just beginning to understand what's there. They profounding findings are that many of those reefs are already in trouble that there are dead corals associated with many of them. The picture on the right shows roughly 500 ft tall coral reefs mound system those are the type that occurs. It gives the ocean's current conveyor system really breaks down the way some people believe because all their annuals, all of the greenry are adapted directly to buying those terms as both water and then unvegetative.

Finally the iceberg looks like a different (inaudible) feature the things not yet understood not necessarily fully (inaudible) into our (inaudible) ecosystems having some unpredictable effect. You may have seen these if you've gone visiting in the Pacific this is a Pacific red line, these got established in the middle and late 90s in the southeast coast and they're now spread broadly all up and down the east coast they are gracious predicators on everything else on the reef. I am not claiming that they are here because of global warming but those are interesting things to think about how the introduction of individual species we don't yet understand from massively (inaudible).

Let me complete with a huge specific recommendation:

1. We need a comprehensive and integrated climate action plan
2. We should leverage all existing environmental plans along the way. We have an unbelievable set of tools in our tool box and our General Assembly has shown great courage and great foresight in requiring coastal habitat protection plans and collaborating (inaudible) expert program just beginning to revise its (inaudible) plan. Just great planning instruments here to use, every single one of them should factors in the best (inaudible) science as prescriptions for short and long term management. Some specifics that should be included are: flow targets for all rivers including re-operation or removal of dams necessary to achieve those. Identification of drainage system divisions and particular access points are very critical in translating sea level rise (inaudible). There should be a (inaudible) on the insulation of new public and (inaudible) license infrastructure in the flood prone and surge prone areas - makes no sense to funnel money into these areas. We should remediate mistakes we've made in the past. We rarely do that we usually fix things fast or as soon as we can. We should move forward with tools in hand to balance the entire biogeochemical cycles. We should use neutrals the new (inaudible) for balance to begin meeting not just carbon emissions goals but also nitrogen goals. Remember nitrogen oxides are the major greenhouse gases above water and habitant.

We should invest in restoring oyster reefs not just for oyster reefs but also to buffer shorelines and decreasing energy. We should adopt policy in the for sale stage to upslope natural movement of shoreline in response to rising seas. And the last two things that the no brainer is we should be investing more in research and monitoring that will allow us to predict impacts. The federal government is beginning to establish jobs with USGS and lining us up with great thinkers, great universities it's time to get ahead of this (inaudible). What you probably haven't thought about is that with innovation comes change (inaudible) in NC submerged lands are public. So doing a transition blooming of existing private lands turned into public lands there is no reason that smart governments anticipating that change

can't politically (inaudible) programs that facilitates those with private losses and that help (inaudible) along the way.

In closing, this picture of the sun setting of Albemarle Sound suggest dire straight ahead and there are serous changes coming but the Osprey to me is perhaps the better model and that is it is under recovering researgents exemplified by that animal that push for implimatic coast line. People place their time and attention and resources to better achieve for that species but there is no reason that we today thinking about NC coastal future can't make commitments now and make investments now to help ease this transition along the way toward a future that humans appreciate and that the national system can (inaudible). Thank you.

Mr. Garrou – Thank you very much Dr. Rader. Our final presentation in this block of the coastal development will come from Courtney Hackney who is Chair of the Coastal Resources Commission as well as Walter Clark who is the Coastal Community and Policy Specialist for North Carolina State. Thank you.

Mr. Hackney – Thank you and I can't tell you how thrilled I was to hear that our General Assembly had the foresight to begin thinking about something that you've heard about a lot. I have two hats that I wear, one is I am a research scientist and my basic area of interest is studying how coastal wetland and coastal businesses respond to (inaudible). But I happy to sit back and (inaudible) right now and my primary goal today is to study a little about how the state of NC (inaudible) has adapted or has not adapted in terms of policies. Now I wasn't sure how much you heard before I got up to speak about the science of sea level rise from the other presentations but clearly they have given you information you need to make what I am going to tell you more clear. But I think that there are some points that are worth repeating.

The first thing I want to reiterate is that there are a number of components in sea level rise and these have direct relationships to coastal policy, as you've already heard sea level rise is more complicated than just water coming in. Also want to emphasize that the ocean is not flat and I'm going to reference Key West a couple of times for two reasons: (1) I'm from there, my family settled there much like Outer Bankers a couple of centuries ago so I got to experience sea level rise from a personal standpoint. I've also had the opportunity to see how the government is affected. This tidal gauge is a gauge (**Exhibit I**) from Key West, FL and you see how much the locations of it goes up and down, and that you've already heard from our previous speakers, but then it smoothes out fairly clearly and we had a nice living relationship in terms of sea level rise. The primary concerns that we have had historically in NC that relates to sea level rise is the coastal erosion and you've heard those people talk the fact that NC has a very high rate in the coastal zone. We have totally been dealing with from a policy standpoint far longer than anything else and one of the things that have been happening that has had a great effect on the NC coast is a change in (inaudible) and the way (inaudible) travel. So there is a down side to it – it used to be when a major storm was (inaudible) close to the coast close to the ocean. These are issues that are going to continue because of building on the coast. We also adopted years ago a strategy that could really help us and that has been to have set backs. Initially, apparently

we decided that everyone who got an urge to live on the beach should be able to pay that mortgage before the house slide into the ocean and some of you remember the mortgages for 29 years for some reason. So we basically have a policy of ten year erosion rate and setting a new house back 30 years worth of erosion and so those built in the 80s when we had a big building explosion now are getting very close to the subject. That was we had this policy of stepping back, but as you have gathered openly you can only step back so far. This has worked reasonably well and I will tell you that there is an awful lot of pressure right now to allow for change of policy and at some point in time there are going to be a lot of houses sliding into the ocean and we will be spending a lot of money on beach erosion .

We have a fairly consistent policy of allowing beach nourishment this is not without environmental costs and as those of you who (inaudible) know we can also profit (inaudible). When you stand on Wrightsville Beach and you're standing on the sand most people have the idea that what they're standing on is sand that has slipped out of the ocean and that is not true what you're really standing on is a little bit of sand and a lot of water underneath. So when you start looking for sand and re-nourishment sand especially at a certain quality certain consistency (inaudible). What is happening is a difference between the (inaudible) there aren't big pools of sand out there in general that can be used and so one would think of it as rising up nourishment (inaudible) is the fact that we do not have sand. There is a lot of sand in the NC coast and that's a long way from most of the places where we need the sand.

General Assembly wisely decided two years ago that we were not allowed to (inaudible) beaches. Permission was decided years ago but I will tell you that the last couple of years there is a fight over whether we put sea gulls on the beaches. Sea gulls protect (inaudible) they eliminate destroyed beaches. So we no longer have no policies about any parts structure along the beach there are few exceptions to the storm structures and take into consideration (inaudible) and so forth. We do allow sand bags I would like to tell you that this is an issue that isn't easy to solve. Sand bagging is the only temporary feature we've spent probably one-third on dealing with sand bag issues. They build the temporary features to save peoples' houses and everyone realize they worked ok for the storms but no one could save the house. So we've had a very difficult time managing sand bags and we continue to have difficult times. Big storms eliminate this problem because they focus on sand bags. Sand bags have a limited life span and we prohibit them after a certain amount of time. We have wisely figured out how we can eliminate certain kinds of storm damage and you understand the sea level rise that creepy sloping knowing it's swallowed up by sea level rise. We have plenty of time to (inaudible) we don't have time to move quickly when we have a storm. The storm is built on top of the sea level rise that has been going on for a long time. We have good evidence good sound evidence to show the berm protect (inaudible) and so in the special projects that produce the nourishment on Wrightsville Beach and Kure Beach the plotting designs show berms and those berms are very very successful in stopping storm damage in recent storms. We are often sacrificing those berms, they will be building them back afterwards but they do work well. Local zoning, many communities, beach communities are aware of the danger of both (inaudible). There are building policies that everything from high boots are tied on and structural aspects who will allow buildings to be replaced. It's generally local but you have to understand the

local governments are under pressure to keep their tax base up so therefore the system pulls them in two different directions, one of the things that has largely been outside of or doesn't even have any control of which has been reasonable consistent for a long time is federal insurance. The federally subsidized insurance program has allowed a lot of people to live on the beach and have flood insurance. For many many years there were very few changes to that policy but after the major hurricanes starting in 96 in which those of you who were here remember NC was like the bulls eye of the Atlantic we just got a paddling time after time. We begin to see interest in the (inaudible) changing the way in which they designated flood zones and the way in which they were going to manage the program. This process at the federal level has been pushed very hard by the storms in Florida and now Katrina and Rita are just exasperating federal moves to make some changes and the federal moves effect how we operate on the coast because it affects how people get insurance or whether they can live there remains to be seen how all this is going unfold.

This may seem like a strange side, I'm back to Key West, but I want you to see something. This is a family home of my family, this is sea level rise down at the bottom. I took down all the hurricanes those little dots are hurricane surges there are two hurricanes that this US has had exactly the same surge height. One of those hurricanes came in 59 - my family's home had water up to the top step but it didn't come in. The same exact surge in 2006 from Hurricane Wilma flooded my family's home, 2005 five inches of water. We never had storm damage or water in the house and all it takes is an inch. So sea level rise didn't cause that flooding the fact that the ozone had gone up is why that house flooded. Now I'm telling you this because we have few (inaudible) in NC where we think about the ocean but remember there is a back slide on these Barrier Islands too. The water comes up in the front we deal with wave damages and storm surges in the front, but that water level is also coming out of the back of the island as well and every year the water gets a little higher with exactly the same storm surge. So this is something that ultimately is going to be able to protect our coast.

I would glad that the other speakers suggested or discussed the fact that we have more to sea level rise than just what's going on in the ocean because NC is truly being affected. In some places greatly affected by what's going on deeper down in the ocean or deep down in the earth. I can tell you that some of these factors are important in various places including NC and they are making our sea level or which we call relative sea level change different than the amount of water coming out of the ocean. Now the (inaudible) to the ones that we've spent a good deal of time studying particularly in Louisiana and if you don't think this is important let me just tell you that the city of New Orleans was flooded largely because of shallow sediments. The levees that were built around the city of New Orleans were built with certain pipes initially when the storm hit, hitting those was a foot and a half lower than what it was built to and still looked the same it was still the same height from the outside of the levee but the whole (inaudible) had dropped because the (inaudible) would be watering they're settling, they're consolidating so the whole Louisiana area is settling and changing making up the sea level shoreline faster than most of the world. We have some of this but our problems are a little more immediate and close to the surface.

You heard Doug Rader mention that we have large areas of peat, large areas of wetland that can (inaudible) lots of organic soils. One of the things that we haven't understood very well is one of the things missing from our understanding of what happens to coasts and it is especially important to NC. Most of coastal NC's sediments and that keeps us up to sea level rise has accumulated and keep up with sea level rise that is why all the areas between Albemarle and past the sounds where we have 14 feet of peat of wetlands and again sun can make us stay up. So from our aerial view it looks like land hasn't changed, it's staying up to sea level rise. Along our coastal rivers we have sediments coming in that allow the swamps to keep up the sea level rise. In the coastal marshes storms bring sediment you pickup at sea level rise. Historically our wetlands have made what they needed in terms of adding sediment to the coastal sea level rise. There is another process that's going on here and some greater nations is not going to bring it home because this is super important for our management of the coast. Organic materials disappears from bacteria consuming and there is also opposites present that first half but no opposites and that's what most weapons are like, they process very slowly so they accumulate. So that 14 ft of peat that hasn't been put back when it flooded could not be there it would be 14 ft lower behind the Outer Banks where all that peat land is. But this (inaudible) process is driven very very fast when we have salt water intrusion and I cannot emphasize that enough. This is my sign (inaudible) all I am going to say is that the process is very complex it is something we don't know much about but when you start having salt water come into these (inaudible) the rate at which sea level rise is changing dramatically. One place in Cape Fear River is where we have been working for years – one place in ten years has dropped surface elevation six inches. So that is a six inch rise in sea level at that location in less than ten years. We watched this happen and the only thing that changed was salt water coming in, salt water intrusion.

You're heard rainfall changes and all the possibilities that are global climate change – we had a record drought in 2001-2002 we had salt water all the way up to Castle Haynes that has never happened before so are seeing salt here in areas more salt water bring more sulfate (inaudible) to disappear. I am not going to go into all the fun stuff that's in here but this is another map showing the Outer Banks showing NC's coast but what I've got outlined in red here are all the areas that are under meter and a half in elevation and virtually all of these are pure organic soils. If you were to move to the Outer Banks and that salt water come in there you would be loosing surface probably at a rate of half a foot every ten years at least.

Now from a management standpoint, just think about all the things that go in those coastal areas. Notice down below we have a lot of that kind of habitat too – we have roads that we have to figure out how to rebuild and get through and we have subdivisions that are in parts of those areas that will need infrastructure. So from a long life standpoint this is going to be a big problem even if sea level doesn't come up it recently have salt water (inaudible) in these kinds of places. Now the year coastal (inaudible) is one where I will confess we have had a difficult time making rules that in my opinion were going to have long term capability.

You're heard the National Academy report where basically they are saying this is something that we need to deal with. There are major problems and from a policy standpoint I will tell you that the biggest problem in dealing with the inland water and inland inlets is that they are different. It's very difficult fashioning rules and regulations that are different from place to place. We've done that on the coast by looking at coastal roads and saying ok (inaudible) but in the coastal cabin each part of the shoreline is subject to different problems, different erosion problems and probably difficult solutions. You've also heard that one of the difficulties is getting local (inaudible) use to seeing something different happening. Everyone knows what a bulkhead is – everyone knows somebody that knows how to build them – it is easy to find somebody to build a bulkhead. It's actually difficult to find someone that knows how to use some of these other potential solutions. We even have a difficult time getting some of our federal and state agencies to buy into these other solutions. The ones that we've looked at, off shore flooring, basically would be (inaudible) off shore to rock to protect the marsh that they cause marsh to build. We have our different missions that have different responsibilities and the agencies that carry out those rules and responsibilities and it's often difficult to measure all of them.

One other thing that may turn out to be extremely important is the fact that the feds are soon pulling away from regulations weapons. They have been doing it for some time and some of the new Supreme Court cases may make the oversight according to the EPA more difficult for them to use, so some of those fresh weapons that we simply started getting innovative with salt waters will be a channel that probably shouldn't be there in salt water channels. We are going to have a hard time controlling some of that (inaudible) as in the past. We usually just rely on the feds – we're going to have to think about what we need in terms of regulating those weapons. We do regulate coastal weapons we cannot actively specific case and water coastal weapons (inaudible). We have required certain species and plants (inaudible) work pretty well but when we get away from that edge it doesn't work very well alone so this is something we are going to have to think about.

Infrastructure – I've got this in here because one of the things roads do when they go to large areas of weapons mechanical and (inaudible) they become dams, we may want to use those to control fresh water and keep salt water out. But we may also want to make sure there are places where the fresh water can get out. These are some of the things that we need to be thinking about as we design and build infrastructure. I also recognize that the sea level is rising and that plan is falling we are going to have to think about how do we build those roads so that they don't do what the roads in Louisiana did.

Land Use Plans – All of the newer coastal policies particularly if you have any long term background on what happened along the coast and what nature does. One way we can start strategically thinking about how we manage the coast and demanding (inaudible) we want more roads. So they have the power but I will tell you and you're going hear from Walter in just a second that very few have decided to do that. Any real weapons to sea level rise other than raising of the (inaudible) I can't think of ever reading one integrating sea level rise and what that is going to do in terms of (inaudible) in the future into their (inaudible). Furthermore we don't have any ability in terms of regulatory environment to force local governments to follow their (inaudible). The only way we have any control over them is if

they require a channel turning and we will not turn in anything just highlight the language that much of those areas where they (inaudible) are truly limited. So we have some concepts that are very clear and good it could be abandoned through the developer once they develop some area that is marshland. It's unfortunate that that's the story here of what's happened and it is still happening today.

Public Awareness – Walter this is probably a good time for you to share a little of your knowledge on the public awareness side of it.

Mr. Clark: Several years ago I did a study and we looked at all of the (inaudible) on the coast and we were looking at those plants to see if (inaudible) talk seriously about sea level rise and climate change. And surprisingly even though there is language in the (inaudible) guidelines that those weapons aren't supposed to do that we find almost no language in the plan where they had. I think we need to get more on board but the importance of this still I imagine if you look at the (inaudible) today you could find (inaudible) adequacy in having a grip on sea level rise and climate change.

Hazard Notification – Courtney wanted to give me a minute to talk about this because he knows it is a subject that is near and dear to me. There will be a brochure coming around (**Exhibit J)** in just a minute that I offered years ago along with Spencer Rogers one of my colleagues at Sea Grant called Questions and Answers on: Purchasing Coastal Real Estate in North Carolina. The idea was that it would be a good start letting people who are buying property along the coast know what they are buying and have some barriers. The problem with this is (inaudible) that it is not mandatory – it is voluntary. For quite some time now people have been concerned about the fact that there are people who are buying property on the coast who may not be aware of some of the hazards that they might encounter. Along the coast as Courtney stated there is a long standing policy to let our shore lines move. This is basically a (inaudible) situation we have set backs for from new construction basically that is to keep property out of harm's way especially from the roads and coastal storms for as long as possible. A lot of the setbacks that we put in place years ago are hurting the 30 times erosion and setbacks are now probably being caught up with. Another way that we have basically managed because we know no targeting policy on the shoreline that is very different from the ocean shoreline where we do have hardening. The only exception being is according to the government, arbitrary sand bags and said properties until other solutions can be derived due to the moving of property in these various projects can be indicated.

Sand bags are a one shot deal for property so when they get installed or removed the owner or subsequent owner has (inaudible) to do that again. For new construction a developer under the counter rules must sign something called the Ocean Hazard Notice acknowledging this associated with building in the environmental coastal area. However for some with real estate transfers after the property is built, no notice is required. And since most properties transfers on our ocean coast lines are usually resale there are re-buyers who may be unaware of the special risk associated with buying these properties. These risk include a living shoreline often called in (inaudible) terms the Walter (inaudible) rate that the erosion often protruded into sea level rise. Another risk includes the fact that

the property can't be protected from erosion except by temporary sand bags or a re-nourishment project. And third, the sand bag may have been already used and can't be used again and finally the recent headline shows all property on the ocean front is coming under control because of the higher risk associated with it.

For many years it's been an effort to establish a full notice required of erosion from property today, these efforts have not proceeded. Given the current situation with rising sea levels and the potential for more intense storms, I believe we have an obligation and I think a lot of people will agree with me to look at this issue again of hazard and education to buyers. Notice can be accomplished in several ways – the most direct and perhaps the most effective way would be notice from the company deregulations. I believe some people in the General Assembly may be familiar with that option – I think that is some legislation that has been cleared in the past. But other options could include adding warning to the current real estate closing (inaudible) required from seller to buyer. Another would be if the property is handled by a realtor you could require distribution (inaudible) similar suggest updated. That would have to be signed by prospective buyers much like the dual agency brochure that a buyer gets once he hires a realtor. That way the buyer has acknowledged the receipt from the commission, read it, begin to (inaudible) that is the normally positive discretion that the realtor is involved. It really doesn't imply the realtor might have property by (inaudible) other situation.

There is really an educational opportunity here with the full disclosure and having notification. I think it's on the path – I think it is time to revisit that and figure out how we are going to revisit it maybe require some type of legislative action or may require some action from the real estate commission in NC. I'll turn it back to Courtney.

Mr. Hackney: One of the key points that needs to be made is that despite everything that you see in the news, everything that your children have learned and their grandchildren have learned in school about sea level rise, the idea that the ocean is coming up does not seem to demonstrate into government procedures. It's a local level assessment. In fact I would argue that the thing that has the most success at making our citizens along the coast aware of sea level rise and coastal form has been the insurance industry. That's why I've got it back in here again – I will guarantee you when you get your notice if you live on the coast this year assuming you can get insurance, when you get that notice of the cost, it's going to suddenly make you think about why is my cost going up or maybe it's because we keep getting washed away. That being said I also want to mention disasters – wind disasters occur frequently there are a number of things that happened. First of all getting everyone back under view of public safety but then often there is a period of soul searching where those servants should re-think why did you ever put that road there, why did we ever let that subdivision go in. The last six months to a year when (inaudible) goes away but that moment in time there are opportunities at the local and state level to do things that we should have been doing all along and we would probably like to do.

There are a number of other issues that are involved that either the policies that we adopt simply don't affect but they do affect the coast that are important to think about. Local ones you've heard already in the dams trap sediment. Cape Fear River basins has three

dams – they trap virtually all heavy particles coming down the river. We've looked at the sediments along Cape Fear River and essentially in the swamps those sediments are simply not getting there and so our swamps are grounding out because the sediments aren't coming down. Our engineers are clearly interested in trying to think about basin sediment management because they have to get rid of sediment but they also recognize the places like Wilmington and coast itself in eastern NC have been cut off in the sand forest have used it come down Cape Fear River. We certainly don't have as much sand as we would if those dams weren't there. What's particularly sad is that everyone wants to dam the island – that's everyone that seems to have anything to do with environment included but they are still there. So dam trap sediments is a particular problem also local (inaudible) very much seem to spend some time realizing that if sea level comes up the ability simply makes the work decrease, business is especially important where you have areas that have been settled for a long period of time that has septic tanks going back 100 years or more and suddenly they don't drain as well. This is one of the key things that happen when sea level rises.

The insurance industry is like that, it is certainly driving an awful lot of thinking on how we are going to handle it and my guess is this is going to come back some day in a very important way. But at some point in time the huge population growth on the coast is going to look for somebody to insure them. It is very clear that local and state and federal insurance companies that are not sold (inaudible) they are trying to back away from the coast and what is going to ultimately happen is that they are going ask the state government to increase their exposure. The federal government is pulling away and so this is going to be something that the General Assembly is going to have on the store steps in a very near future. You are going to be hearing from your constituents on this I guarantee you because we're hearing about it.

Cumulative Impacts – You've heard earlier about cumulative impacts – one little cup doesn't do much for the thousands needed there. It isn't just the impact of 1,000 cups it is also the effect that our policy end up being directed by the number of people there and the number of things that are happening. I'll guarantee you that if we only had ten families living on Cape Hatteras we would not be discussing putting in a multi-billion dollar cost way on Ocracoke Island because it would not be cost effective. So when you get thousands of families over there then the solution ends up being very expensive and you don't have a whole lot of choice particularly when it comes to forms of safety.

Is it really a hurricane or something that happens very frequently in NC – we have largely looked at hurricane and the aftermath from safety and health standpoint. Try to get people back on track fast as we can we also have all sorts of emergency rules we work on to allow people to rebuild where it seems to make sense. Wish I could tell you that everyone of those have been good but they've all been oriented to assumed safety and human health is another one included. Unfortunately when we go back and we start reconstructing shoreline, typically the first move is to get everything back the way it was. So when we build roads on Hatteras Island where they were to begin with (inaudible). It's a bad place to have an island basically that is what happened salt water places get washed away. So we've gone back and we do things very quickly we don't have any sort of deliberate course to handle the aftermath. We should have policies that say after the storm we are going to

implement these decision making promises so that we don't repeat the same dumb things we've done before. We like to think we've used some of that but the truth is we in CRC and you in the General Assembly and local governments are driven by a notion that it has to be when we have a big bad storm.

I want to show you that this – notice the watering pattern this is not a storm, this is not a hurricane this is (inaudible) this is a house being rebuilt on the left hand of Dalton Island they are about 80 to 90 of these houses washed away and they are all being rebuilt now because the local government with money from the federal government rebuilt all of the infrastructure out there. But you shouldn't go back and do the same dumb thing again and that is what we tend to do over and over again after the storm. We would like to think that we get smarter and we do step back some degree but we need a plan for the big one so that we don't make the same mistake. Those plans by the way need to include someway in which you help the local people who want to get back. That is one of the difficulties and a major step that we have – we have too many people needing so much that the divisions are just overwhelming and we don't have time to do any sort of changing the (inaudible) in this shift that rings natural.

If you need more information please contact me at the University but I would like for you to make this a policy too.

Mr. Garrou: I'm counting on the fact that you may have forgotten some of the questions you were going to ask earlier speakers because we are running behind so if you could exercise restraints I would appreciate it.

Rep. Harrison: Thanks to all of those wonderful presentations. (Inaudible) … we have debated about why (inaudible) …. I'm wondering if you all could have a say on how do you suppose (inaudible).

Mr. Hackney: I think generally we would like to see the public understand the rich (inaudible) when they buy coastal property. I can honestly say that does not happen no matter what realty (inaudible) there are a lot of people who end up in places and claim they have no idea that ban those places (inaudible). I think the key for us is going to have a hazardous disclosure any place any time there is some sort of special permit. So any where along the coast where you have erosion as a factor that would come into play and that includes estuarine shoreline. We never discussed that because we know how difficult it is to deal with that during estuarine discussions but we have coastal erosion there too and one of the things that it does is that it eliminates the (inaudible). So right now we let people put up bulkheads. The erosion still goes on with bulkheads so I would like to see those stations where anything that requires a permit (inaudible).

Rep. Harrison: Thank you. I was just wondering if (inaudible).

Mr. Hackney: Are you thinking of (inaudible) in terms of sea level rise taking land. I don't think anybody in NC has a clue how much is incurred in a Cape Fear Basin. It is at least 200,000 that change hands with private and public (inaudible) at least probably in the

last ten years. Although the swamps along the Cape Fear River are technically public land there is a good (inaudible) but 100 years ago they were all way above the tide so we have no policy right now we don't even assert to restriction in terms of (inaudible) and so forth. I think there needs to be some thought given to the role in easements some day perhaps to compensate the individual that used to own the land. I don't know how you would do that but this is no small concern, this is big. And if the Outer Banks breaks up a little more and those tides come you are going to have exactly the same thing, large areas of the peninsula between Albemarle and Pamlico Sound.

Rep. Harrison: I want to follow up on what seems to be a personal (inaudible) and I don't really understand the process. Could you elaborate some?

Mr. Williams: I'm sorry what was the question?

Rep. Harrison: You had talked (inaudible) fresh hold (inaudible) …

Mr. Williams: Yes what we did was use this computer model and put in the possibility of a very rapid (inaudible) and that would suggest that the (inaudible) of the Outer Banks is accessible under what we call special (inaudible). It really supports some of the work that Professor Riggs and others have done documenting that in the past when we've had natural accelerations of sea level that on the Outer Banks more inlets have opened more of the Barrier Islands have (inaudible) rapidly and become submerged. In our modeling suggest that in fact that is a reality we have certainly accelerated in sea level rise.

Mr. Hackney: I'll just follow that up with an analogy that I use with my students because it is a good one. Most of the time we think of change leading to something else and it's a slow process one change to the other change. In many cases the way with the natural rule of thumb is not (inaudible) you turn that little (inaudible) down and nothing happens and all of a sudden the lights go out and that is what we see in terms of some of the biological communities along the coast particularly the swamps and wetlands. It looks flush from the air but nothing has changed but when you look at them (inaudible) what we are seeing is fundamentally they could begin to change dramatically and if you're interested in (inaudible) we looked at how much carbon flushes out of the system when you start adding salt water. It goes up as much as 700 percent. So this is no small thing, this has all sort of implications not just the surface rate but this enormous store of parking is suddenly in the atmosphere and what happens is everyone calls me and say watch the storms side down here. They just crossed that point the threshold where suddenly everything all changed and now (inaudible) on the biological side.

Mr. Everett: I wonder if we can go back to one of Dr. Williams' slides on sea level. I guess the thing that puzzles me about this whole issue is at some point on your graph on sea level there was no Albemarle Sound in fact there was no Outer Banks at all. And so we are in the situation where we are looking at it and figuring out a prospective of these very valuable resources we need to protect or maybe we don't I'm not sure. Some people would argue to keep it the way it is others would say let it change but clearly it has changed and will change. So the big difference is the public probably doesn't understand and I am not

sure I have seen the information that helps me to understand it better. How different is the change based on what we think mankind is doing versus the natural change?

Mr. Williams: That's a good point – you know if you get the difference in timing as scientists and geologists we are very comfortable with thinking and talking long term, whereas to the average citizen 30 years in a mortgage is a long time. So that is part of the difficulty. But the graph that I showed shows that 20,000 years ago sea level was 120 meters which was 400 ft lower than where it is at the present time. So you're actually right at that time the whole continental shelf was exposed, the shoreline at that time was out at the edge of the continental shelf (inaudible) that places the animals where as well as early man we were probably roaming out of the continental shelf. As the climate warms sea level came up regardless to where we are at the present time that same record shows that 120,000 years ago sea level was probably 20 ft higher than where we are at the present time and so at that time there was no Outer Banks they were under water and much of the NC coastal plain was in fact submerged. I think the reality of it is that we are probably headed toward that 120,000 year sea level scenario once again, that's the issue. But you are absolutely right if you're looking to dodge the past there has been wide variations in climate, wide variations in what the sea level has done in some cases those changes have been very slow. Many things have been very rapid, there is recent evidence of in fact very rapid climate changes in the past due apparently to natural conditions. We don't know exactly why that happens but there is evidence in decades or centuries of changes of several degrees in global temperature which drives all sorts of changes. So I think what we are looking at is human induced changes on top of a lot of that natural variability. And so it is wrong to think that climate change is all due to humans it is not we have documented science records a lots of variability from climate change. What we're looking at is humans exasperating the changes that are taking place.

Dr. Smith: This is also for Dr. Williams. The variabilities that happen over long stretches of time obviously historically there was never any commendation to level with. We had the investments along the coast line that we have so we have these stipulations and my concern is that the projections particularly with some of the new signs that's coming out about Greenland, I was wondering if you could comment more about that because I know in the IPCC report many people are now concerned about the over conservative projections. The rate of the melting in Greenland and back down to developing science about the actual dynamics of glaciers and their beginnings and a lot of science has never really been understood before but it is just now getting a proper focus. In fact now that we are seeing significant earthquakes on Greenland at levels that have never been seen before because of some of these shifts, can you talk a little more about that as far as the sort of non linear way that Greenland could begin to be treating significantly to and how that type of impact is as far as the types of rates could happen?

Mr. Williams: Yes in my judgment the IPCC 2001 report is probably the best summary that we have on what to expect. That same group has been deliberating since then as was mentioned they're coming up with a report in 2007 and I think you are right. That is my assumption too, there are similar conclusions they are coming up with in the new report. I think you're probably overly conservative and don't factor in some of the recent findings

that we are finding on Greenland and Antarctica. Part of the problem is that they have been deliberating for five or six years and then had this report in preparation. The report has to go through a very extensive review process and so a lot of information that has come out on Greenland and particularly in Antarctica has just come out in the last six months or the last nine months or so and a lot of that has not really properly gotten incorporated into the new IPCC report and I think it should. And it very well could be that the report is going to be delayed because I think others have made that point, but really they ought to incorporate it to absolute latest science. But of course the challenge is whenever you write a report there is always new information coming out – you have to draw the line to say – we need to get the report out and be done with it. But I really am concerned that the new IPCC report is going to be overly conservative in some of the numbers when they come out. Primarily because of the light on (inaudible) that is being done in Greenland showing the various green of ice lost in the melting up there and the fact that so much of the ice water is (inaudible) in Antarctica has been shown to be (inaudible). Not that it is directly contributed to sea level rise but it ultimately leads to instabilities that materializes and can lead to very significant sea level rise. The one graph that I showed suggest that Antarctica contains 90 percent of ice that leads to sea level rise so it is very important that we understand the dynamics of both Greenland and Antarctica because it has huge implications of what might happen in the near future for global sea level rise.

Dr. Riggs: I have a question for Ms. Hernendez. In your presentation the feeling I got was that you dealt with the shorter term and how to mitigate shoreline erosion in the estuary dealing with not just our structures but some new technologies that essentially slowed down or stop. I would like to know from you what the National Academy of Sciences is doing in dealing with the long term where we have to deal the low lying lands where we have to deal with the evolutionary movement migration of the ecosystem of the slopes. How do we back off of some of this coastal erosion which in our estuaries is happening at 100 ft per year. In response to individual storms, we already have a tremendous amount (inaudible) of Albemarle-Pamlico systems because that says eventually has small ocean out there and the energy oils are very high and there is absolutely the same erosion rates that we have on the ocean and it is all storm driven. The ecosystems have to move before they can manage this system and (inaudible) what Dr. Radar has presented as an evolutionary development on our coastal ecosystems to protect the fisheries – how does the environment deal with it?

Ms. Hernendez: The Academy committee that took this on didn't specifically differentiate short term versus long term techniques, leaving the focus on the report on what is that function and I think that message is the communities have to decide how they want their shorelines to look and they can only do that by first documenting and analyzing what the problems are, what the rates of erosion are, and what potential options are available to mitigate the erosion and it's a matter of trade off. That's another important point – you might need in some areas to acknowledge that there is nothing that can be done but let nature take its course and ask those to relocate. In other places where the erosion has been un-significant in their solutions of some sort or more likely options that the Academy didn't advocate one solution for (inaudible). It does advocate (inaudible) proactive and if

you consider various options for decisions made just be happen stance with individual property owners making small decisions in coastal communities.

Dr. Riggs: Did your organization even address this question of long term erosion if you just present this as short term event then in NC what we have is an up hill battle because people will keep going back to your report and if you don't even acknowledge the longer term process going on here, the public is going to refer to this as a major contribution to our science as to the status of things. This is a very important document.

Ms. Hernendez: There are sections of the report that address the design life of various solutions and that is as close as this report comes.

LUNCH

Mr. Garrou: Our next presentation is coming from James Kerr, Commissioner of the Study Commission and Sam Watson, Staff Attorney and they will report on the Renewable Energy Portfolio Standards.

Mr. Kerr: Thank you Mr. Chairman and members of the Commission. I am one of the currently six members of the Utilities Commission and I appreciate on behalf of my colleague the opportunity to talk to you all about a few things that we have going on. I think the agenda speaks to me recently completed a study of a renewable portfolio standard of which we over saw the completion of at the request of ERC and which we presented to ERC several weeks ago. And at the request of counsel for this Commission we were actually (inaudible) for just a few minutes we will do that. This came up before and we have our staff attorney Sam Watson along he actually handled that. In the course of discussing coming over here today it occurred to me and I mentioned this to counsel and to the committee and Dr. Smith and I talked about this, we've got a number of issues going on at this Commission that are probably atoned with you all. So one thing I thought I would do and Mr. Givens perhaps it would not be a bad idea if we try to first of all, run through renewable portfolio standard study and try to give you some idea of the various dockets we have going on currently at the Commission. I was struck this morning by the significant and in some ways so philosophical scientific discussions that you all were having before lunch and we did similar stuff and it should impact what we do. In fact we were charged with a different job that's day to day that will actually implement policy. But the issues are beginning to creep into a number of dockets because at George's suggestion I'm going to run through these fairly quickly and we can come back. We work for the Legislature for you all and we can come back and provide you with more information and we can come back at a number of times.

So first and foremost is probably the NC green power program that we are assisting in developing and continue to have oversight responsibility of. That is a voluntary renewable energy support program that we began working on that back in 2001. Currently there are 9,000 subscribers supporting over twenty million kilowatts hours of renewable energy. My stats (**Exhibit K**) tell me that the amount of renewable energy that that would equate to the amount of coal consumed annually to produce this equivalent amount of energy would be

16 billion plus pounds. The approximate amount of carbon dioxide annually offset by the generation of renewable energy would be greater than 22 million pounds. Here is a (**Exhibit L**) sweeter docket on (inaudible) small generator interconnections and implementation of the federal (inaudible) 2005 wherein we have given more people to try to make it easier. The smaller renewable restriction generation through interconnect to the system to take advantage of some of the opportunities presented by renewable generations. Again in our (inaudible) docket the small generator only connects to the purple standard portion of the renewable policy act and we have seen with people on (inaudible) and people in the sustainable energy association and I think we made some good progress but my sympathy is with the community while not completely satisfied with all aspects of what we have done across these three dockets. We have moved along and removed (inaudible) prior barriers to the interconnection of renewable resources on to the grid even though ability to take a gain about the four votes of residential and smaller multiple applications. And integrated before planning area we are seeing the main issues that have arrived at our peak process of the same need for new base coat generating and it's going to be the extent of these alternative sources of generation demand type demands with concentration and efficiency maybe up to displace some of the proceeding for new generation. That is an annual innovative resource planning process that the Utilities are required to conduct because of an increase in level of activity through some of the renewable conservations and (inaudible) energy entities that members we have identified several fundamental issues that have been raised in this discussion about some of these issues on who have taken those issues and moved them into a generic proceeding on energy efficiency. Looking at the number of issues surrounding the man size management on energy efficiency, one thing I would say is what we are seeing is more active involvement from alternative sorts of interest in these kinds of dockets and hopefully being responsive throughout and we're certainly plowing in to some of these issues whether it be conservation, renewable energy and others in a manner that is different than we were subject to four or five years ago.

And finally there are two dockets – these are kind of both meat and potatoes type of things that we've been involved in, some of the issues you all are probably interested in that seem to be arising. First is that Duke Energy has started a request for us to deal with cost associated with their exploration of nuclear generation. That is a little bit out of the ordinary. I need to be careful not to comment any on the substance of the matter but essentially it is a bit of an unusual request under our prior practice in and under our statue. We try to do different to say only at a point and time whether or not we believe that the pursuit of nuclear generation and the efforts they got to undertake to at least retain that as an option are appropriate for improving and within the (inaudible) regardless of whether they help keep the building into a plan. Again I want to be more careful about the comment and the substance of it and I try to characterize what is going on to the extent that it is helpful to you all. It is an unusual power and I think everyone will admit that it is not the typical approach that has been taken in the past. We are pleased that a couple of our businesses bought to us we are pleased to deal with things that people (inaudible) but it is a docket you would like about climate change and environmental concerns. And then I think the other one that bears interest is the flip side of certification/application due to the carbon application to build two polarized coal units outside Shelby in the (inaudible) community. And in fact I was in Charlotte Tuesday night for a charity lane at a public hearing down

there. That didn't pick up with the press but certainly a lot of the concepts was the alternatives provided by energy efficiency renewables versus (inaudible) and I would commend all of those documents and I haven't bored you with the documents but I wanted you to know that we are seeing a lot of the issues that are relative to you. We are seeing in our day to day efforts and we are available for any thing you want us to do or provide to the Commission more detail about that or being as helpful as we can in your understanding of how we are dealing with those matters.

Let me move on to renewable portfolio standards study and I have spoken to this group before about this since some of the members of our advisory group are actually a part of this group. Let me review the process and tell you a little about what this is. We were asked by the ERC if we would oversee and pay for the conduct of study, find anything and consult and take a look at the potential cost and benefits to the state of various scenarios involved on renewable portfolio standards. We agreed to do that to lay out a plan and a procedure that we thought was fair for everyone involved and that we would end up with the best product at the end of the day. There are two important parts to that plan. One was to go out and find a (inaudible) that had the extra piece, we didn't actually have access to the actual piece to do the kind of work that we could be proud of , but also that would be useful to those such as this Commission might be interested and we think we found that with the (inaudible) Association out of Boston. The second prong of our approach is the RPS Advisory Committee. Based on other experiences we have had we understood that is not going to be very productive for us to go into driving power. Most of the consulting we do in studies that no one in the community had seen before and we understood that the study would be benefited by and the dialogue would be benefited. By then the end result would be benefited by getting the various groups and that these are willing to help with consultants. So that's what we did and we had several representatives of the various environmental interests, various forces of state government as well as the low serving entities. Dr. Erickson is one of the smart people that we've considered on the subject matter involved and they've worked with the consultants throughout and provided background information with new graphs. I don't mean to say that all of the members of the Advisory Committee support these conclusions 100 percent but what I will say is that they were involved in the process and the results are tempered by their involvement throughout. We thank them for their involvement and it is the kind of thing that you all would look at in the report as others. I think you also have confidence that this wasn't something that was done and dumped into the community but rather the community was involved in and had the opportunity to influence along the way as ideas within the committee.

So that is what we did, we have presented the study to the Environmental Review Committee. We are presenting it here – we have a relationship with the consultants where they are available. Financially we are looking on extending your contract. On giving the notice we got we could not have them down here today but we certainly could bring them back if there is some interest. The other thing, the report itself does not earn you a copy but the full report is available in our website which is www.ncsuc.net. One other part of the process, we have posted documents on our website and solicited comments from interested parties, the comments are due January 19th. The comments will complete the study that we

had in the Advisory Committee involved. With that by way of background I will see if there are questions but it would be a disservice if I tried to walk through each stage of the study. I will let Sam Watson do that.

Mr. Watson: I will try to be very brief while they are passing out copies. We put in RSP solicited bids and eventually we trapped it with campus to do the report and what we intended to do was arrive at an objective view of the issues related to potential RPS in NC. And so they looked at potential cost and benefits and the way we went about the study is that we looked at five percent RPS scenario, a ten percent RPS scenario and those would mean increasing the amount of energy produced by the renewable resources, five to ten percent over and above the four or five percent we already had. So these are all new renewable resources and again the five percent and ten percent are being ramped up over ten years evenly. The half percent of one percent of ten years we looked at each case and three different groups of resources. The first group would include those resources that are currently eligible as marine resources under NC green power program. In the first group we excluded the western end because of the rigid law and complications associated with sighting wind in the mountains. But it included things like biomass, small (inaudible) soil and wind and the wind in eastern NC. The second group of resources was all that plus western wind, development of new hybrid resources. And then finally we looked at a group of resources which included all of that and the potential for using energy efficiency to offset 25 percent of that RPS mandate. So if in the tenth year you are looking at ten percent RPS mandate the utilities could supply two and one-half percent of that 25 percent of the ten percent scenario through energy efficiency programs. The key findings that were found when they studied this were first that NC passed emission resources to meet this five percent requirement, the new renewable generation. So using the additional biomass land fill methane, animal waste, coal firing utility plants from wind resources we could have generated an additional five percent of the energy requirement in NC for new and renewable resources.

Secondly, they found to be difficult to meet a ten percent RPS requirement solely with new renewable resources located in NC. The last key finding that they had was that if you allow the utility to expend money on energy efficiency and give that equivalency towards renewable energy up to 25 percent that the state would be able to achieve the ten percent RPS and end up reducing the consumer overall electricity bills. So there is a lot of detail in study I've given you in the handout there is a lot of detail of these slides. I know we are already winding and are way behind and so I think the best thing at this point is perhaps to just see if you have specific questions. But that was the general interest of the report and the report comes in two volumes and they are both available.

Mr. Garrou: Questions?

Dr. Crawford-Brown: What are the issues of the RPS and the percentages that are being talked about? The different percentage is how you're factoring in the per capita growth of energy consumption. So for example, if you lose towards ten percent renewable that doesn't do any good for our task for reducing carbon dioxide emissions if everybody gets per capita and doubles their energy consumption. So how does that figure in, does the ten

percent always just mean whatever if the environment (inaudible) is being consumed in NC in the future, ten percent of that has to be from renewable or is it all bench marked to current end levels of energy consumption?

Mr. Watson: I'll be glad to answer that. First the purpose of the study the consultants modeled the future energy forecast as is, they took the (inaudible) resource plans that were filed by the utilities and used those energy forecast for modeling and for the ten percent requirement. Once you got into the third scenario that included energy efficiency then there was some reduction of the future low based on and equivalent to reduction per energy efficiency measures. The second part of your question I believe is the different General Assembly sides that we are seeing along these lines, those are the kind of implementation measures and the kind of additional policy measures that may want to be addressed. But for the purposes of the RPS we are ten percentages just now. You look back and what was the sale, was it ten percent was they compliant with the mandate.

Mr. Slocum: Did I understand correctly that in your definition of renewable and this is based on the existing green power study of renewable?

Mr. Watson: There were three different sorts of levels of what were eligible resources at least for persons in this study. Again what we're trying to do was to work with the consultant, work with stakeholders in NC to come up with a group of resources to make sense for NC. Clearly you can alter in your implementation to favor certain resources over others. But the reason why we began with the NC green power resources was because of the (inaudible) stakeholders the process we went through in trying to define what was acceptable resources for the purpose of the NC Green Power Program. It was considerable give and take working with the Utilities and the environmentalist and developing what was that group of resources. What eligible resources are bringing renewable. So that seems to be a good starting point since we had already gone to the stakeholder process in deriving that.

Mr. Slocum: The reason I ask is my understanding of the existing green power portfolio is that it's fairly restrictive on what can be counted from the standpoint of wood resources that can qualify as green power and the fact of the bases that it really limits the contribution that might be available from biomass from wood.

Mr. Watson: I support my answer again that those are the types of implementation and details where if the Legislature goes to adopt and RPS program. They might go into what are the available resources. I remember those discussions at the time about what wood is allowed and then there was a lot of disagreement as to it but it was a lot of concern over if you allow certain kinds of wood as well as certain kinds of practices an environmentalist would oppose to. I am not sure what all goes into it but I do recall there is a limit on the types of wood that is being burned.

Mr. Kerr: One of the things that struck me about the study and how it might be useful really if people (inaudible) we started with what we had already talked and come to a general agreement on through our (inaudible). But what we now have is a (inaudible) and I

think that many policy makers started to lose, if you know how the beaches were (inaudible) to one another, I think one of the interesting things you look to deep levels of (inaudible) until you get some sense of the relative relationship between cost of various resources between the level of which you might try to bring them on line. And then too you really go astray for those relationships. The (inaudible) is designed to be perfect in any way or definitive but I think we now have a framework and we also have a sculptures to have the modeling done so we could pump more wood into the model or we could do more western wind. We had policy makers suggest different changes, I think we are much further than we were ten months ago being able (inaudible) to the kinds of questions that you ask.

Dr. Smith: A couple of things, having been one of those who was in that battle a few years ago, I would remind folks that a number of us, I can't speak for all of the environmental community, but I think much of the distinction made between the premium pricing associated with the green (inaudible) the NC Green Power Program solution asking for people to pay extra versus an across the board requirement which is a renewable portfolio standard and the fact that many of us felt that some of the restrictions in the green power program would not necessarily transfer over to an RPS. I am not speaking for all members, but our organization certainly draws that distinction and I think we take a broader definition of the use of what resources in a mandate that is required for an RPS. And so if you use it more restrictive in this study and I think this is probably more of an economic opportunity and more economically favorable to the centers of NC to take this broader definition because I think more resources would be available. The second follow up question I had was didn't this study look at some of the economic benefits of flow from things like the pollution reduction, emissions and how those actually could be added to the economic benefit and then more importantly was there any analyses of the harming benefits associated with renewable portfolio standards which would be most applicable to our discussion. My understanding is we're looking at this in the CAPAG and this could be a very significant benefit to moving the needle on reducing carbon emission and I'm just wondering would that factor in the study of (inaudible) or would it be to bring up that in a sharper understanding of both.

Mr. Watson: The answer to the first questions – it is not a good omen to economic benefits of reduced emissions. It did go into economic benefits associated with RPS in terms of your mandating the construction of x amount of (inaudible). So there were only potential jobs created none of them offset the utility plants that wouldn't be built. Also it was suggested that there might be property tax benefits to (inaudible) but not to economic benefits to increase emissions. The second part of the questions – there is some discussion in terms of carbon equivalencies in terms of the change in the emissions from the utility portfolio versus the portfolio of resources that would go into making up a five percentage of the RPS. That would decrease emission and result in certain kinds of carbon (inaudible).

Dr. Smith: Just to clarify – so is it my understanding then that theoretically some additional (inaudible) members could withhold probably the utility companies from the (inaudible) reduction and when it comes down to (inaudible) carbon so this would be added

to tune (inaudible). What it looks like is it's hard for this scenario to push induction benefits we've added.

Mr. Watson: They were not addressed in this report.

Mr. Kerr: I think it is calculated farther in particular at this time. The counter production is what some units of production which is (inaudible) consultants and most of fewer (inaudible) who would get a sense of that. So then when you start bobbling what Congress or anyone else might do with the carbon policy and how to price that out meaning that you and others have argued in building a coal plant and came out of it. So I think the same thing would be similarly as difficult as to whether you should go (inaudible) or not. It is difficult to try to spread an economic benefit in a situation like this. So I think in one of these new projects we will keep some level of certainty to what were comparable in having models and some of the things that are suggested, I think are battles.

Dr. Smith: (Inaudible) so there are very clear (inaudible) for that right now and then we would assume that, again we don't know for sure, it is very likely to be additional monetary ……(inaudible).

Mr. Kerr: I agree with your thesis but it is not part of (inaudible).

Senator Cowell: How do you make assumptions about the ratio between renewable energy and energy conservation and energy conservation seems like it's less expensive but yet you have it as a smaller incentive of the overall package and I am also curious about the assumption that you made on what energy efficiencies are capturable.

Mr. Watson: Certainly, when we originally begin applying them it was looking at renewable energy portfolio standards which it offset and it is more (inaudible) is requiring the low (inaudible) to generate a certain percentage of the sale through renewable resources. But through the last research and some of the interests that are from the environmental community we looked and saw that a few other states had given credit for energy (inaudible) and how much of a reduction to this money spent towards energy efficiency accomplished and given equally with energy produced by renewable energy resources. And so we improved an (inaudible) line at 25 percent of the RPS mandate since the real focus of the report was not to do energy efficiency studies but to be responsive to the request for what would be the potential policy on this, a real energy portfolio standard. As far as your second question, the second volume in this study is the energy efficiency part of it and one of the things we would try to continue to make clear is that the energy efficiency report is not a standard on energy efficiency. So it doesn't contain energy efficiency potential with what the utilities are doing to provide (inaudible) it compares the energy efficiency of current to renewable energy alternatives that would have to be secured to satisfy the RPS standards.

Dr. Eggers: Under key findings at one point it says if these additional resources can be developed at a 3.6 percent estimated rate increase at most by the 10th year and is that the 3.6 percent rate increase of what, it sounds just like this three feet mandate.

Mr. Watson: That is from this chart which shows what the rate in fact would be if developing ten percent RPS implement and ten percent RPS. And here you see the three different resource moves that are sliding and that's where you get to if you include the expanded plus the energy efficiency it would result in a 0.4 percent rate increase. If you only allowed the resources currently under NC Green Power Program you could have as high as the 3.6 percent rate impact. Then as you see it says as soon as the average lift rates (inaudible) hours 2017. The study was done assuming the ten year random period in 2007 and 2008 and 2017 one of the caveats was you may want to push that off a little bit but this corresponded with the ten year (inaudible). But what this basically says is that if you only allowed the NC Green Power, and that is where in counseling terms if it could be developed, because the preceding was in you can't get the ten percent with only instate renewable resources. And that is why there is a caveat of if they could be developed and there is also a sign here one of the things they did, they first looked at all technical potential of how much renewable energy could be condoned but then they reduced that to lower the practical potential. How much was really economic, how much do they really think will ultimately be desired.

Dr. Eggers: What would be the… is this the anticipated rating path in 2013 of (inaudible) instead of the way you look at conventional energy package.

Mr. Watson: Yes all of these are comparing the utility portfolio that they planned to install to meet their forecasted low (inaudible) versus what resources would be in place to meet the same demands that will also satisfy the five percent (inaudible) portfolio standard. So this appears to be what the overall cost of satisfying those two portfolios with the different groups of resources.

Mr. Kerr: We anticipate and we'll do our job and collectively meet the demands (inaudible) use to be in the Legislature or to (inaudible) to where that percentage of meeting that job as it comes from (inaudible) portfolio standard. And I really do want to write the script between where we would be.

Dr. Eggers: I want to thank you very much for doing that kind of thing. In soil and mountain water is one of the most economically efficient things that we can do from a user end point but it wouldn't really be confident of the renewable portfolio when using a scenario like this. And so I would just encourage everybody to look at this report as part of the possibilities but in NC understand that there is a lot more renewable energy that we can use to meet our energies that would be a suite of economically viable solutions. Does that make sense what I just said?

Mr. Watson: The solar form was addressed in the 1950s it was looked at as an energy efficiency measure and evaluated.

Mr. Urlaub: Thank you and thank you for coming – I know this was short notice. Can we talk about slide 17 and 19 real quick? In 17 can you explain to us what total incremental cost/savings over 20 years is?

Mr. Watson: Sure this goes back to that question about what would be the cost of meeting the forecast in ten years under the utilities what their plan is and in order to build and operate for generations the utilities portfolio 9,000 MW so the next value of 20 years or 15 billion dollars. So what this slide represents is if instead of building generations of base load energy repeat generations that the utilities has currently planned to meet the next ten years. What would be the cost of meeting that demand using the alternative RPS (inaudible) and so each of these are relative to that utility portfolio difference in the increase and so what it shows is that it will be an incremental cost to go with an RPS in each of the cases unless we included energy efficiency and in that case it would actually cause an increase in the total cost versus the value of (inaudible).

Mr. Kerr: Can I follow up? That is primarily because you are with an energy efficiency measure and you are reducing the demand so you are avoiding (inaudible) more extensive resources offset by (inaudible).

Mr. Watson: And if you look back at those at the raising tax line you will see that there is in the ten percent a positive link impact. So, on a portfolio (inaudible) it would actually cost more unless you had implemented the energy efficiency (inaudible) and you're using that energy and so that therefore your bill would actually be lower.

Mr. Urlaub: A quick question – so theoretically if you increase either the RPS target to have to (inaudible) the efficiency I just think a greater share of the scenario three tenths percent RPS and energy efficiency make that very important energy efficiency. We could generally send up a lower rate and then the energy efficiency is a lower cost than the renewable.

Mr. Watson: I only say that because it is offsetting the demand.

Mr. Urlaub: These are the self-setting demands. And then the cost assumptions going in for coal what we've seen is that the one proposal so far on coal powered plants the cost estimate (inaudible) 2.2 billions to three billions. It was my impression on (inaudible) necessarily capture how the changing environment of our planned capital policy and rising fuel costs is going on. Do you think that the three billion dollar price tag is it closer to two – what do you think we actually (inaudible) in our process?

Mr. Watson: The idea was (inaudible) and the number of the assumptions used in the study was actually somewhere between that two billion and three billion number. We saw the input from the stakeholders but the consultants looked at what their experience and what they knew from (inaudible) were being developed and these were only in the (inaudible) area and they come up with the assumption on cost. And so that was the singular cost control that was used in assuming in the model was higher than the two billion dollar process because of the Duke plant but not as high as the three billion dollar plan. And you're right because of the timing situation we didn't go back and (inaudible) of the study and say whatever changes you used over two or three months when we finished the study.

Mr. Kerr: And that was for the sake of putting back the kind of relationship (inaudible). People come in to us for different resource cost abilities, when we earn more and we should be more responsible in terms of cost sharing. One other thing you will hear a lot and I think this group is probably been called to 20 some odd states through the portfolio standard and that's a true statement. But I think if you peeled that statement back a little bit no statement is (inaudible) but we need to read and (inaudible) what valuable, what resources, what cost structures, and what I would commend to you is that I think we are a lot further from the seeing NC's unique prospective on how this type of policy would affect the state. Before we started this and Ivan you've been there since the beginning, we were somewhat less to extrapolate from the experiences in other places and so I would suggest that you use this as a tool not necessarily as a definitive answer and again we are available as consultants and will continue to polish up the findings.

Mr. Garrou: I have a question for Commissioner Kerr. It has nothing to do with the RPS. You mentioned a docket which you were considering have we gotten to reduce some areas on private sources concerning energy (inaudible), could you tell us a little more about that what you're doing and where you are?

Mr. Kerr: I'm glad I've got my staff attorney to help me keep it straight but I think the fundamental issue (inaudible) of the various questions and I think when you talk about through the portfolio standards you're talking about significant fundamental policy directions (inaudible) companies as to how they meet demand. (Inaudible) and continue this personal decision of what choices and investments they will make in their home in efficiency and things like solar panels and so forth. So a little bit in the middle of that is the opportunity to interconnect to the system and being the Green Power has provided a price premium for folks who want to make those investments. To help pay for those investments they sell excess generations from back home to the grid. There are some obstacles in doing that which is how small generators interconnect to the grids and so this was a series to these two dockets perhaps a third where we had gone through and worked with those small generators as well as the hundreds and operators of the grid for the low servicing entities progress through Dominion, NC. Powers of any coop to try to simplify the rules and the standards for interconnecting and (inaudible) it is one complex machine that was ever connected. Someone who is interconnected to that grid may have the potential to be benign but they also have the potential to be anything but benign. So there are issues of pliability, issues of viability, and reliability. I don't know which one I said first but there are a series of issues when you take something that you're doing disconnected from the grid to seek to bring that activity into the same grid that serves this building and the rest of our state or even other states. So I hope I have not made a too general range but the idea was for us to work with those interested parties to make it simple and less expensive or efficient for people who wanted to take some of those steps in their personal lives to participate on the grid in ways that could be advantageous to them in terms of settle (inaudible) to NC Green Power.

Mr. Garrou: So you're in the midst of that?

Mr. Kerr: Well John I'm going to be careful because some of this might be on the heel. But as a practical matter I think we have adopted a net metering standard, we have adopted a standard a small generator interconnection which is 20 residential salt commercial. The thing that is pending Mr. Chairman is in the Federal Energy Policy Act. Congress asked states to look at whether or not they had sufficiently dealt with both net metering and interconnections rules. I mean the idea was this is important for the reasons we discussed – make sure you've done what you ought to do. We believe we have, we put that out to comment and a variety of parties have responded as you might guess with these things. Some things we've done more than enough, some things we haven't done enough. So that is a continuing issue to see what else might be done and there is, I think, the practical answer would be we've covered them all and I have the numbers over there. But we've basically done residential and pretty small commercial (inaudible) up to 100 coops and there has been an approach to us probably the significant suggestion is that there is probably two to 20 MW which is still not (inaudible) but is some rapid cover on (inaudible) I'm tempted to say park raiders solar project but I mean you know some where commercially significant efforts would fall into that.

Mr. Watson: That's the question how much further do we go in applying those tools.

Mr. Kerr: One of the mis-understandings is that it doesn't mean that the utilities are obligated to anything customer generation of any size. The question is how much (inaudible) is given on a case by case basis the specific application. So what we have done is streamline our process for extremely small. Of course these are all being put out on distribution lines that people, owners and businesses and not on the (inaudible) system which is designed to carry large generations. And so you have to look at the impact to the individual distribution circuit and substations when you get a large and more complex (inaudible).

Mr. Garrou: Thank you. Mr. Givens.

Mr. Givens: Just a couple of comments Mr. Chairman. First of all if any member of the Commission wants a hard copy of the four reports sent can get that. We made an executive decision to try to conserve some resources and direct you to the website in those cases. Secondly, as noted on several pages this was added at the last minute. This is the results of over play on my part and nothing more or less I realize that we are and I apologize to the different (inaudible) and the last minute discussion and our appreciation. I would say in general, (inaudible) as long as I've been here it has been my experience to (inaudible) Commission its staff and public staff are among the most responsive and flexible agencies in state government in responding to request from over here. I only put that on record because then Brock's made (inaudible). So I ordered my (inaudible) out front the first of those is that some of you may have missed kind of appropriate (inaudible) committee and this is cause to (inaudible) the various dockets from the (inaudible) merit docket and I think those are of particular importance. I note those are the developments I've asked from you (inaudible) arriving in (inaudible) from at least we can do that for almost half of the United States (inaudible). I'm not his but since we're under oath.

Mr. Garrou: Thank you very much George.. Our next agenda item is to hear from Brock Nicholson, Deputy Director of DNER, Tom Peterson, Executive Director of the Center for Climate Strategy. Dave Ross was here earlier and maybe he'll come back in (inaudible).

Mr. Nicholson: Thank you Mr. Chairman and members of the Commission. Tom Peterson and I will present to you and all the current progress in the CAPAG process. I want to thank you for the opportunity. I must say we feel very comfortable we've had a very good effort here, very significant effort. Thank you my stakeholders who are on this Commission, thank you again for that and even if the Commission wasn't directly (inaudible) and draft material. So again thank you very much. A couple of points I want to emphasize here that what we will share is preliminary information on the first round of recommendations that will come through CAPAG. Today we're giving a kind of preview of the work that's been done and some of the results, but again let me emphasize maintaining the integrity of the CAPAG but these are three scopes in many of these cases, three decisions of the CAPAG and recommendations of what we have proposed for the 24th of January meeting. Again emphasizing the results of these mitigation options are preliminary several were in the process of being quantified (inaudible) of CAPAG. Design analyses may be modified by the CAPAG at the last and subsequent meetings so even the specifications of the recommendations may change the results of deliberations or any considerations by the CAPAG.

I think there is an overall summary that we are beginning to understand that we are trying to (inaudible) and in some cases the numbers are very encouraging. Any comments or advice from this Commission certainly will be welcomed today and I might note that the discussion this morning and the presentations I think will give us a lot of good input to our issue on adaptation in terms of the study. Today's meeting is to review the draft CAPAG mitigation options, (**Exhibit M**) the summary list of draft options and initial results. Detailed draft mitigation options templates are available at our website which is www.ncclimatechange.us if you want to go there and take a look. Beginning on the vote CAPAG voting process on final recommendations there is sort of another way in a sense and we're working pretty hard, in fact just yesterday we had a number of things that are underway and that will be forwarded at the January 24th meeting. So again your feedback would be very helpful. The next meeting we will have first round of approval by CAPAG on individual mitigation options. Additional CAPAG meetings will continue in the spring and part of the process is identifying agreement, structuring further development of options with barriers as we go on and adjust as we receive advice from the Commissioners.

Mr. Peterson: At the request of the Commissioners we have been asked to pull together some information (**Exhibit N**) for a report on the progress of the CAPAG as a way to (inaudible) we're expecting by the time we get the others in place here based on the works of the CAPAG much of which will be in place at the next meeting of CAPAG. We will have fairly substantial report available to include a summary and initial results of analysis showing (inaudible). Descriptions, policy design and other mitigation options and we will also have information that shows the (inaudible) of recommendations being finalized by CAPAG. You can expect that document to include about five or six pages for those of you who are on the CAPAG you might want to set aside a little bit of meeting time during the

next meeting. And that information the Commission wants will be on the website after the meeting on the 24th. We have three additional meetings scheduled for early May and July to finalize recommendation which is optional in terms of whether we have additional meetings. During that period of time as we the Legislative Commission identifies the recommendations of the CAPAG that are adverse or may need additional work could be (inaudible) issues but it is certainly possible that we can configure the process to work with those sorts of issues that are in support of the Commission. Certainly DENR is also available with technical assistance with permission as you contemplate the mitigation options that you might want to work on as well. So we've got a sort of process in place in the infrastructure assistance. To give you a better view of where things stand right now we have 52 draft potential litigation options that will be reviewed by the CAPAG at the next meeting. You can see a break down scattered across the five technical work groups. Just a quick reminder of how this all got started, we started with 251 that were on the list of existing actions that's been undertaken in NC and other states. The CAPAG added several more pushing that list over 300 and that includes a process of identifying the most promising options (inaudible) and that's where we are today. This has been a highly participatory process just a reminder this is a process of self determination where the CAPAG members and technical work groups are identifying the options that (inaudible) the proposals that will be for policy design. So again this is a very highly participatory project and we appreciate the time that folks have been devoting to this. Just to give you a heads up in terms of what to look for in the details of the report and the details of the background material with the CAPAG being that each and everyone of these 52 options have templates separate with (inaudible) that have been jointly developed by the groups and these are a list of all the living draft and it will become the final report. The living draft exercise and formed the recommendations and writing them up and it could have a number of different categories including a simple description of the option and the details understanding of the specific policies of the environment (inaudible) participants to study on. An indication of the sorts of implication mechanisms that are envisioned in terms of actually how this might be done and understanding our articulation of existing programs and policies that are in place the business as usual pace if you will. A specification the times that we have mass productions, where it was just carbon whether it was black carbon dioxide will be clearer and importantly we have a series of capitalizations on the potential CAPAG producing these options introducing emissions and foster (inaudible) becomes (inaudible) and so in each of these simplex we will have fairly explicit rendering of the design implementation analyses solutions to these options that will be backed up by other materials and should be in a spreadsheet on size and etc. But the thing is to make sure we are sharing our work and the technical side of this is part of process of doing so.

The other day we also found implication on the amount of support within the CAPAG for each of these options so as Brock indicated we will be going through a billing procedure. We have been able in each of these meetings to get from one stage in the process to the next. The next stage is on January 24th will be put the 52 policy groups and identify those options that do not have any objections. We expect there will be extensive discussion and there may be modifications on some of the options when we get to that stage and certainly we will enjoy complete extensive first go round on January 24th but the remainder will be discussed when we come back in early May. Just to plot the case out we might expect to

just have an extensive discussion on the renewable portfolio standards and one particular piece of what we call policy design coverage for participants when we get to the eligibility issues. And the (inaudible) resources issue comes up frequently and that is one of the many things that we expect to be an item of discussion that deals with the modification of that particular policy design variability and renewing some of the objections that we should have a chance to respond to that proposal. A key point that I would like everybody to understand is these options have not been reviewed. They don't come up just once they come up almost (inaudible) and back to the drawing board for modifications as needed. If we don't have consensus on a particular option we want to note very explicitly that the barriers are there but there's a disagreement why some obey some technical terms so they can be understood. So if there are various points of view (inaudible) as one of the options.

They have come a step further in the whole business of taking things back to the drawing board and working them out and coming up with alternative design proposals to get past barriers of series of bonds and letters. Everyone of these options that the group has already been working on crafting and can continue to craft to their satisfaction to get around the areas that might arise. So for instance with a particular proposal such as the renewable energy portfolio standard and energy proposal have been described, it has a set of goals which are letters of action, time periods, participants, etc. Those are certainly things that the CAPAG could modify to try to deal with any objection. Another important set of letters that you can adjust with (inaudible) is that all the areas gets a mandatory with (inaudible) standard is that the (inaudible) program etc. The bottom line is that the wider the case is in terms of exactly how any given option could be implemented and this is up to the CAPAG group and if some of these methods don't work there are other methods so we expect in many cases part of the process is solving a conflict. We would like to go ahead and get this done in addition to taking the right level of action as some would put it. It is also very important that the analysis measures be consistent with the agreement expectations of the group. Sometimes the barrier consensus are assembled and that's in disagreement of cost figures and in disagreement with a particular assumption. (Inaudible) in methodology says we end the policy (inaudible) their detail that each of the components of the analyses and if there are sticking points there certainly would be an opportunity to go back and look at alternative approaches there. Our experience has been that that's critical as opposed to satisfying this building process to get (inaudible) when we move on in terms of quality action.

With that I have a series of plotted slides that summarize the list of recommendations of CAPAG and I'll give a brief walk through. There are many members of the Commission who are on the CAPAG groups and are quite familiar with these. These are listed in the handout (**Exhibit M**) that we sent around, color coded on the front page with a listing of tables on the pages that follow that. What I would like to do is first just help you understand what's in these tables so that they are not a foreign language as you try to understand and then we can walk through and get a bird's eye view of each of them. But if you look first at the Table 1 which is color coded in orange and it is Residential Commercial and Industrial Technical Work Group, this is a work group that deals essentially with stationary energy demands and process issues. Now the table that has 11 different options (inaudible) 1-11 that are each of the 7-52 (inaudible) but there are similar

meanings for each of them in the second column and then results and analyses and just (inaudible) of the results that we have today should be considered preliminary and these results will be firmed up by the January 24th meeting. They will be adjusted as we go forward but the very first two columns are estimates of the greenhouse gas reduction potential for a particular option so (inaudible) outside management programs. The estimate of greenhouse gas production for 2010 is 6.5 and the climate's carbon dioxide level in 2020 is about 28 in mega tons. The next column which is the 2007-20 is just accumulative reductions out to year 2020 from the start of our program. Just to complete that in the next column and that present value calculation of the implementing cost or cost savings of the option and that is a dollar bill figure and that's a cumulative figure that runs from the start of the program which is 2007 out to 2020. That number does not include a modified benefit for reduction of greenhouse gas and I think no discussion about whether at some point can and should be some dollar value and what it cost emissions. You do not assume any dollar value while this is strictly the cost of cost savings associated with implementing the option. The next column which is cost effectiveness and you look at the cost associated with (inaudible). And the final column to be determined will be the result of the final (inaudible) from the CAPAG just to give you orientation of the table. I see we have some questions on this.

Mr. Erickson: Could you explain what the negative sign say for this -$5,890 in cost?

Mr. Peterson: Those are costs savings as opposed to cost. Negative costs are equal to cost savings and you will see a lot of them when you go through these documents.

Mr. Erickson: Thank you that's what I guessed but I wasn't sure.

Senator Cowell: Who is the fiscal analyst that worked on this?

Mr. Peterson: Well it is a combination of our team – some are on the 800 line right now if we need to talk to them about this. We have (inaudible) that work with us, we have (inaudible) so we have 15 to 18 folks playing that role but really the other fiscal analyst are members of the CAPAG who actually work more for the coops (inaudible) functions are we are using methodologies that are (inaudible) guideline.

Mr. Garrou: Any other questions?

Mr. Peterson: Just to give you a heads up also if you go to end of the table there are a couple of rows at the bottom. The first one is the sectors total after adjusting for overlaps. You take the eleventh item here that precedes this particular batch – though those are this column that we are showing now is what we call (inaudible) analyses. If you had this particular analysis and didn't do anything else, this is the estimate coming out of this process of what you would get out of it and how much of a cost you would save. In all likelihood these would be implemented jointly if the case of all 52 options being implemented. We have lots of potential interaction between the options and various interactions. We didn't express interest in commercial and industrial but with other groups as well so there is a lot of double carrying or interaction. We haven't gone through the

process yet of backing out the double carrying interaction, but it would be substantial. So for instance, if an energy efficiency program is put in place it would reduce the man hours in the future as a mean of the impact of the renewable programs that would allocate some percentage of coal solar power to renewable and would be less than it would be if that was done without an energy efficiency program. People go through a process of integrating all of that and we will have them some bottom line numbers that will tell you the cumulative or integrated impact with doing all of this together.

And that would be the first line, the second line is something we call adjustments or reductions from recent actions. When we started this process in February of last year we ran an emissions forecast reference case that was based on whatever you want to call them that assumed the missing plan of action would in some cases most likely be actions in the future. It was a best guess that was a part of the rules about the future was going to look like absent action from the CAPAG. But along the way things happen and it warrants this portfolio standard variability passed along the way before the conclusion of the process where something else can be done. We had to slow that out because of recent action and we show you how much has already resulted because of the consequence of that.

Then the very bottom line is what happens when you put all of that together and we show total results of the CAPAG actions along with the recent actions (inaudible) and all the amenities (inaudible). Sorry for boring you with the details but these numbers happen to be enormously confusing. Anything else I can do to help in terms of what we are going to be presenting. I should also note that the question came up from Dr. Smith regarding non carbon benefits as to where the American dollar bill figures and we haven't had any dollar benefit information which is certainly the cost of cost savings and its limitations. But in the policy template on the case by case basis there will be notation description that read the analyses on the side benefits (inaudible) the same thing. So there is carbon dioxide benefit and that is something we would be interested in, its important not to miss them but these are not co-benefits.

So then we normally do this – for most of you who will be with us on the 24th we've already gotten a taste for this as we've gone through the process is that we walk through each of the options with various amount of time and our key will get us through each of these line items and get what I call a federal express version or a thumb nail description of each of these options. Then we will then go through a round of clarifying questions from the group so that folks can one by one understand the details, understand the numbers etc. After we clear clarifying questions we will get back to the rules one by one and we will check the various proceedings and if there are no objections, we will pour over that particular option as a final recommendation. If there are objections we will have an extensive session to understand why this objection and what proposals might exist and the kinds of alternatives that might work around that. It's very common that on the plot you can work a lot of that out so that will be put in the parking lot and come back before the next meeting. So it will be the full walk through, those are detailed discussions that are painted substantially by caffeine and sugar and it will be a long day. I guess I'll seek the guidance of the chair here in terms of how much detail you want to go into here on each of these sheets of options.

Mr. Garrou: Well I don't think we have time today to outline each of these in detail on the other hand these are the things that we will also need to consider fairly shortly. So I think we need to know in broad form what you proposed.

Mr. Peterson: It's probably also (inaudible) on the relationship between these and the suggestions that will be responsive to a question I believe his name is the last commissioner we had (inaudible) suggestions on various names with low hanging fruit, win-win and various others.

Mr. Garrou: Keep in mind that this is an interim report we're looking at so (inaudible) follow me through I guess it will be fairly easy to implement the fairly obvious.

Mr. Peterson: So what I would say in response to that would be two things (1) on January 24th we will identify what we call early consensus options. Options that are reviewed and if there are no objections from this floor with a final recommendation and that in all likelihood will include things that could be done very rapidly with minimal amount of effort and perhaps other things that will take more time. But if there is no disagreement we simply underline what needs to be done. Subsequent to that there could be some sorting in terms of timing and also which of those need legislative activity which is our main object. So you will have clarification in the batch there. And of course we will meet that procedure at the following meeting so we come back and have another discussion. But they will be split out in that manner to give you guidance in terms of which ones you want.

I've seen a series of inputs since the last Legislative Commission meeting with respect as to what some of those items might be in response to the request for win-win, so a lot has improved. My general take without having gotten every last detail is that they are highly consistent in that there is tremendous overlap with the draft options that are under consideration by CAPAG. They all look very good and I think one of the things of the CAPAGs process would be in the news by the time we see each other again. That should give you some understanding of how the CAPAG feels about that particular set and whether they are without objection and we will be able to provide you with that clarification. If there are suggestions that are not from the models related to CAPAG, provided we have sufficient capacity to look at some new options, that's something certainly we will be willing to do. Take some new things that aren't there back to the group for their consideration. Some of the members have submitted their proposal and might be able to comment on them.

So the big picture on this sector is that this is where energy efficiency and conservation programs for heat power, heat, electric heat and (inaudible) are found physically. This is where we have industrial process emissions in terms like these for synthetic acids. It is a combination of these, the lion's share if you will refer to page 2 of the handout of the reductions. This entire step comes from the very first one which is the man side of managing programs. In fact if you look through the tables and you look at the whole picture, I would suggest that you look at the 2020 columns where they have fast reductions. It gives you the quickest read on the scale with potentially no reductions associated with

each of these, you will see that this is what we call a big ticket item. In fact this is one of the biggest ticket items in our entire batch.

In terms of the other programs I think most of these are relatively self explanatory but if there is anything that I can do or folks on the team or other members of the group who are working with me can do to provide clarification, I would be happy to, particularly questions about any of the items on the list.

Mr. Garrou: This would be the time to ask those questions.

Mr. Urlaub: Thank you RCI-3 Energy Efficiency Requirements for Government Buildings – could you give a couple sentences on what that might include?

Mr. Peterson: David, could you just a little background on RCI-3 if you can tell the group we're with the Legislative Commission here and we're doing the federal express walk through on these and a little bit of clarifying questions if you could give them some background on RCI-3.

David Vonhempler: Ok RCI-3 is energy efficiency requirements for government buildings and the key to RCI-3 is that new government buildings will be required to meet a certain height or the higher their code standard for energy efficiency. There will be some effort to improve the efficiency of the existing government buildings. I can go into my files and look up some more detail information for you if you guys would like.

Mr. Peterson: That will do.

Mr. Toben: I am curious as to how you and then I guess most ultimately we are going to define low hanging fruit and I look at RCI-1 which looks like it got an enormous sort of absolute potential and so I would imagine that would qualify as sort of budding and pre treating your orchard that seems like a wealth of opportunity. And then I looked down at RCI-5 which has a relatively lower absolute potential but its cost effectiveness per ton $C0_2$ equivalency is higher. So how do you propose that we prioritize beyond the sort of ease of the (inaudible) senses issue? How do we prioritize these issues are they based on what the overall (inaudible) options could be or are they served on a case by case efficiency?

Mr. Peterson: David I have a question for the chair?

Mr. Garrou: Unless yours is a question from me to you.

Mr. Toben: It seems it is going to start with you because of the recommendations coming out of the CAPAG.

Mr. Peterson: The priorities if you will are already preset in terms of poor efficient criteria. The group can be used in determining what the "ifs" priorities are. So when we established close (inaudible) and analyses the decision criteria that were used were four-fold. (1) was greenhouse gas production potential; (2) the cost of cost savings; (3) co-

benefits, co-policy, extra-analogies if you will; and (4) (inaudible) building considerations. Those four guide us to what the group has been able to use to make determinations about priorities of what should, what could be in climate action plan which is a combined portfolio of actions. Subsequent to that in terms of the implementation of what the recommendations are either legislatively or administratively. There are a series of ways in which that is typically prioritized and have to do with how much time it takes to move to adoption. I think the other key thing that comes into play comes into cases where there is a state line (inaudible) for total emissions reduction like (inaudible) time. And the question that arises then is the cumulative impact and the final set of recommendations reach the goal or not and if it surpasses the goal. The additional question is whether a margin or safety is required to be able to (inaudible) limitation barrier or potential if the emissions forecast might turn out to be greater than normal and it has to be (inaudible) and that gives guidance in terms of how important it is to implement the full range of recommendations versus some big (inaudible).

Mr. Givens: A big factor in my opinion of what I was called in line to do is (inaudible) the idea that there can be broad consensus of subjects that can actually be accomplished (inaudible) note some are not globally listed and I realize that's what the difference in planning and in terms of carbon and that's a real (inaudible). While I've got the floor I'm going to ask all of you who are submitting recommendations or plan to submit them to add a couple of columns to your review. And these are for our benefit to identify the agency or agencies that we are understandably responsible for the implementation of stated proposal. If you know, if you don't know we just have to find out if you can help us by identifying them. Secondly, we need for you to distinguish the ones that you believe are a part of this legislation have proposed and maybe somehow we accomplished the agency policy of (inaudible) action someway. And then I urge you to be conservative in this sense that a milligram might be a legislative mandate whenever you consent to adopt rules but you've got to consider the possibility that the legislature is going ahead and act. An act of substance yields (inaudible) of rule making or rather the ability to rule making process if you (inaudible) and need help to be able to consider. Beyond that consent for me to these has been done elsewhere and we are somewhat have prepared the brass language of sometimes between the 22nd of February. I and the folks sitting behind me are (inaudible) trying to make these realities in a sense of (inaudible) something policy building and (inaudible) and this is going to be tough to do. So all the help we can get with that additional information will be a big help.

Mr. Garrou: I guess I would mention one thing about that low hanging fruit and this is a personal view I have not expressed to the cochair and that is all these things that we can present to the Legislature that will enable them to take action (inaudible) for that you reach me with questions where the climate change is an issue that NC should address. In other words there ought to be (inaudible) benefits. Again that is personal.

Mr. Peterson: With respect to the criteria of bringing things forward at this time have both consensus automatically what you get out of the January 24th meeting is the first batch of things within the view of CAPAG. With respect to the last question that there may be a precious view of the adoptions that are structured to be solely for climate purposes but I

would put the number at 95 percent plus that are actually done for other uses. Typically if there was a significant carbon benefit associated with that and by adjusting these to maximize that carbon benefit that is really what the group is interested in doing.

Mr. Nicholson: Actually I was going to step up and note what Tom just said in terms of the consensus items likely to be in that group early on but since it is a group I think that is ok. The other thing in terms of (inaudible) that we still intend to do and might be part of the extended contractual effort on our part is also look at it from an economic benefit where we can (inaudible) jobs benefit some of these actions. Because they really will be grand opportunities with new industry or past existing industry in terms of (inaudible).

Dr. Riggs: You think those reach to your five years right now or is this …?

Mr. Peterson: I think we (inaudible) clarifying questions for whatever period of time the state of NC grants us.

Mr. Garrou: So the answer is not …

Dr. Riggs: When I sent the table why would I ask the question?

Mr. Peterson: If the questions with the same test would want with any of the tables.

Dr. Smith: So perhaps we can check and see what the requirements are on this first batch table.

Mr. Peterson: Table 2 recall the energy supply technical work group and this is typically the (inaudible) renewable energy for heat and power resides in terms of the options. Same table, this is on page 4 of the handout, you can see a couple of options are still under preparation we expect those results to be available by the 24th and most of these are self explanatory in terms of title. I'll be happy to respond to any questions.

Dr. Smith: This is a clarifying question to me. The environmental portfolio standard which I think it is the mirror of the more or less (inaudible) and then given what the GES study and this in your opinion how closely are they on each other. I know at one point we had asked the group to review the final product and I'm just wondering if there is a sense that ES-2 is closely in parallel to what is being submitted by the Utilities Commission.

Mr. Peterson: Let me respond to this – the general impression based on the conversation these are very close but I think others may know the details and we do have just so you know in terms of (inaudible) figures that we offer the current draft 20 percent by 2020 starting in 2008 and then only 10 percent renewable generation by 2017. I don't know if there are some comments here on eligibility criteria but I don't know to what extent they deal with the questions that came up later.

Mr. Nicholson: In summary its (inaudible) more aggressive than the (inaudible).

Dr. Smith: But it should agree following the economic benefit?

Ms. Will: I believe its also (inaudible) amounts with the residential- commercial-industrial we've read about.

Mr. Toben: Exactly, the EPS in this case is actually a two-thirds energy efficiency portion of the 20 percent and a one-third renewable portion as is currently being figured. So roughly it is about 7.5 percent renewables which is consistent with the (inaudible) study and about two-thirds or 12.5 percent energy efficiency to make up the total of 20.

Mr. Peterson: Transportation and land use there are a number of blank spaces in this spreadsheet right now on page 5. This is in progress and we will see these blanks filled up by the middle of next week. A couple of them have been filled in already. I'll be happy to respond to any of the particulars on these.

Rep. Harrison: Thank you I just want to clarify that (inaudible).

Mr. Profetea: Was Pricey's question on and I apologize for (inaudible) earlier but I don't ant to ask one by one questions. But is there any documents laying around that we can look at (inaudible) California report what level is (inaudible).

Mr. Peterson: That's on the website for the CAPAG process each of the five technical work groups and we already got the recent documents that we call (inaudible) and templates. So in California the template standard we don't know all of the details and then we will have them do the updating following version of that by the middle of next week. We will give background readings for the CAPAG meeting on the 24th and then the update of all of that will be in the form of an energy report for the Commission when we meet again in February.

Mr. Profetea: So when is it best for you to pass along to the Commission that document to take us through and (inaudible) and can the Commission see this formula prepared next week or do you want to wait until you get (inaudible) this process and report it to the Commission. How is that going to work?

Mr. Peterson: You can see the background documents – these are living graphs (inaudible) agreement modification for (inaudible) so we've got 256 pages of background material that you can look at. The next slice of that will be next Wednesday and it will be spread before the CAPAG meeting. They are right there now so there is no reason to wait in terms of background research but they will be updated as we get new analyses and the results of the discussions.

Mr. Profetea: One more question – in terms of these data and I have a lot of reading material, is there any part that can be a doctrine that is more like 20 pages that has ES-6 California standard (inaudible), ES-7 that level alone (inaudible).

Mr. Peterson: We have an executive summary for the final report and also we do summaries and its much like we are going to speak out today but I would say if you want to get the flip (inaudible) version of any of these when you go the policy template the first two boxes are the ones that you can reach quickly and tell you pretty much most of what you want. One is the conceptual lay description of policy for California tailpipe standard that will hopefully say that in English. The second part is about policy design which is with timing how soon you get started may have to do with when and what level and who has to do it.

Mr. Nicholson: Let me make one quick comment on the tailpipe standards. As you may know our only choice there is the California standard and the federal law we have here. Of course standards are still subject to the human flaw suits plus California is yet to get the waiver of (inaudible).

Dr. Eggers: Speaking of fruit, organic agricultural again the study apparently might sequester twice as much carbon as no till, so (inaudible) the soil carbon management – what do we need to do to encourage increasing organic production fall under that or just specifically something else.

Mr. Peterson: I would like to introduce Steve Rowe as the leader of our estuarine waste and he can answer that question.

Mr. Rowe: In the eastern shore answers that we consider organic farming as a separate option when we went to their farmers association it was a fairly popular option of any group but just kind of in that second tier of priorities. There is a write-in that there have been studies showing a larger increase in soil carbon sequestration through organic methods but then there is also a lot of other issues as they relate to organic farming that need to be taken into consideration. So when you consider that separately so that we can look a little more specifically overall as organic farming and what the overall greenhouse gas benefits are.

Dr. Eggers: But it sounds like it gets proper rest now so we (inaudible) is that right?

Mr. Nicholson: It sounded more (inaudible) than privacy crops.

Dr. Eggers: So what does this soil private management mean?

Mr. Nicholson: This could mean in addition to things like no till agriculture and other methods that could be applied whether it's reducing fallow fields in summer or increasing winter cover crops, using bio-chard or really a host of other techniques to increase soil (inaudible).

Dr. Eggers: So it's just got so much potential that it might be worth trying (inaudible).

Mr. Rowe: Seeing that if the group wanted to include organic practices as one of the techniques …..

Mr. Nicholson: We just had a meeting yesterday with the rest of the group and one of the members brought forward another proposed policy specifically on organic farming wanting that incorporated into our initial list of priorities here and the thought of the group was that they really felt that we needed to concentrate on what we have got on the table right now and get that finished and then start to look at other things. So which I guess organic would be one.

Mr. Peterson: I think we may be asking procedural questions – is there going to be an opportunity to expand on that and assuming we can expand to do the analyses of the association and that we would want the CAPAG then to let us know which of these items that were on the second tier list of each of these categories might be of interest in putting on the four of (inaudible) so again assuming we can have the extra capacity because we as Steve said we have a full plate here.

Mr. Nicholson: I have one quick comment – in a sense its on the list we are not going to totally remove it – its just not on the first priority list but we will reserve the fact that it was suggested (inaudible).

Mr. Peterson: The list is 307 such yes that will be a party (inaudible) and the list can be updated. It's not unusual for organic farming practices to be one other than the soil (inaudible) so that can take up a big chunk of the discussion.

Mr. Toben: I would just reiterate Dr. Eggers request that it be reconsidered as part of the coastal interim plan and that if there is new data that's available that might not have been available when we were sorting through the options there but if it seems to logically to have been there, request for reconsideration on that.

Mr. Peterson: We go to Table 5.

Dr. Riggs: Are there any numbers on this table?

Mr. Nicholson: In view of the group that these are not quantifiable so the data that we have and information that we have on the templates is going to be descriptive and relatively detail in terms of referring or conformance of the implication programs.

Dr. Riggs: Still bothers me that coastal communication problems associated with this which are very different from everything in this whole set of tables here falls underneath one category called adaptation. I have several questions, first of all when you think that the coastal issues that were presented this morning represent a very major part of this full program. And I think there ought to be other ways to obtain a sense of the seven issues documented underneath that but that's one statement. The other statement is that the question do we submit our recommendations to you to go in this data that category CC5. You submitted recommendations or preliminary set of recommendations represents the beginning point for this Commission and it's really very different than what you're dealing with here. It does fall under CC-5 but I'm not sure, I'm very confused as to how this is

going to forward and how we need to feel. It seems to me that strategy elevated into a separate thing of our own. I know I'm putting fuel on comments when we type this thing up that can from Jim Stephenson who is on this TWG. But explain to me how we are supposed to go forward with all of this and what we need to do to get this up and to a major category by itself. It can't get lost, this is too important for the state of NC to let it get lost down in the bottom or some table at the far end of it.

Mr. Nicholson: I think first of all as I said before, when you've had similar comment earlier that certainly in the order it doesn't signify priority by any means and I mentioned in a previous meeting that we think adaptation is one that would be a grand candidate for early consensus and I think based on the discussions that we've had those of the last CAPAG meeting and others, I believe we are there and we will verify that on the 24th for sure. And the nature of that we're thinking about of the adaptation recommendation has sort of a teeth and bones in it. One of which is to initially identify those concerned areas or issue areas or subject areas that ought to be accomplished by the state adaptation plan. Many of which were reviewed this morning so I think that is a key part. I don't see the CAPAG itself will follow that plan. But that's a very key part of the recommendation that main part of the step where we would recommend priorities to the blue ribbon commission or task force or whatever it might be to in fact tackle the issue. A second thing of course is identifying the scientific issues and similar areas or all of the initiatives that ought to be involved in such to help them set a plan of agencies and various stakeholders. What kind of research you will be doing in the future regarding marine interest or agriculture under adaptation plan. So I think we are very much on the same wave length for this and I would hope that they would try to help the CAPAG come to a consensus on the 24th. It goes without saying that the CAPAG process has been enormously helpful to us and will be and I anticipate but we have an entirely different mandate and we can do what we want.

Dr. Riggs: So have you got a set of our recommendations?

Mr. Peterson: The recommendation that you can actually see on the website is as Brock said is recommendation the long form of (inaudible) while taking action the biggest group has gas emissions in NC station development along with the state climate change adaptation plan that was approved etc. showed a panel of (inaudible) commission etc. should have a (inaudible).

Dr. Riggs: So what we'll do in this Commission is raise this to a higher level?

Mr. Garrou: If that is the wish of the Commission which I suspect that it might be.

Mr. Profeta: Mr. Chair can I ask you the following question for Professor Riggs. Steve Crawford's own recommendation of this Commission which I think is what you're asking Tom about. If Tom had your recommendations what is the process by which this Commission takes the CAPAG output, takes its own internal recommendations that have also been submitted and comes up with what it wants the Commission to include in its internal report. What is that process? I think that's mirrored because of the

recommendations to Tom or to George or all the Commissioners or how basically to proceed.

Mr. Givens: Here are my thoughts – first of all the more time you spend on this the larger the global climate change issue (inaudible) with the large adaptation which is a subset of that (inaudible) that's a whole major area inquiry in itself (inaudible) adaptation part. With regard to the process, I spent some time taking to both co-chairs and I think what we envisioned trying to do in terms of an interim report and I don't want you to lose site of this, is those things that we think we can get done in the near term, very, very privately win-win-win, low hanging fruit, that's what we're looking at in terms of an annual report for this 2007 session. The process (inaudible). I have followed the full recommendation of the folks who represent (inaudible) to Mr. Peterson with the request that he look at them and see how it can help with CAPAG and as I said this morning, not that they have to be synopsis of (inaudible) CAPAG not that we can't have additional views but this is a report on the efficiency point of view. This Commission can consider anything that deals with (inaudible) and if the terms haven't been (inaudible) I solicit today for the last time and as we said this morning we expect to have all that in terms of (inaudible) by the 31st. Now as a practical matter it will be up to the co-chairs, this is a legislative commission, although the legislators (inaudible) and it is required of the chairs of the legislative commission to decide on issues that they are involved in and that process will occur on the 31st or so and the 22nd. (Inaudible) the best we can. I made an earlier suggestion (inaudible) to let you know that (inaudible) of reality and more specifically the closed committee that will more likely be (inaudible). (Inaudible) where we are right now, we will see or completing the long (inaudible) on the next long interim and what we can get ready for in 2008. It's my personal view and I emphasize personal view, that we gain a title change in a year or two years we (inaudible) in the year two. They will have to be (inaudible) currently scheduled like this commission with many of the issues which I think the spirit that we first of all have a (inaudible). When we start talking about insurances (inaudible) we are not going to separate between now and the 22nd of February in 2007 or 2008 probably not in 2009. So what we are trying to do is make progress, meanwhile I believe that nationally and internationally the kind we proposed currently is (inaudible) on this issue and I think we will seem more considerate after the (inaudible).

Mr. Garrou: I would just saying and I had a conversation with Chairman Hackney at lunch and it is not our intention to dwindle this down in three proposals and this sort of wrestling and give another chance to talk about the brass roots. It's likely that every thing that bottles up between now and the next meeting will be presented for action.

Mr. Profeta: If I could just follow up. I want to know what to do next. So if we (inaudible) the source of two sets of possible internal report recommendations we are going to have those that are coming out of CAPAG as the consensus matters that Tom and Brock have identified, (inaudible) we have recommendations proper phone commission to commissioners. We have two policy recommendations, will they be distributed, sometimes I wish we could get them all to work in the path and if we distribute so that I can see them before the 31st and then the agenda for February we will walk through these and say this is something the Commission wants to be important or not.

Mr. Garrou: We try to be helpful to you in terms of what the benefits and disadvantages are and particularly as they relate to the wrestling.

Mr. Givens: We will distribute those that we have received thus far as soon as we can get to next week. We will not wait until the 31st. Have all the ones distributed to the mailing list I would caution you those of you opposed to the notices that list is as good as the last time we sent it. We revise it all the time, you send it to me and I'll send it to everyone in a package. We are going to cut that process off on the 31st. We are going to do the best that we can and I'll ask Mr. Peterson in effect is requiring to have the consultants of CAPAG our assistant in terms of dealing with the recommendations. We are going to try to get them into a unified package so that we can get those out as best we can before the 22nd. The 22nd will be sole for decisions and there will not be presentations. So all the time will be available for deliberations and action, I don't what all the time means yet, because I don't have their times, starting on the 24th along with CAPAG, the Legislature is in session and everybody's job, work or a part of this shifts including I and all of my colleagues. But we are going to do what we can as we (inaudible) 2007 session. (Inaudible), if you want the Legislature to deal with something, then you have to do it in legislative terms which (inaudible) and good ideas to legislators.

Mr. Profeta: I apologize for being such a nuisance but this is very helpful.

Mr. Nicholson: I might add and I don't want to present this as if it is being processed by any means, we certainly want CAPAG to be a supporting and process to the legislature. But I think we have a duty within the CAPAG process to develop these recommendations or options as completely as we can and I would request that you do support the ideas and suggestions and specifications and what have you to CAPAG recommendations. If it develops in parallel or in addition to this body and the legislature I think that's fine but as you said we've been able to support that process and I think that's great. However in my mind I feel like we are still due a final report that has the recommendation regarding each of these subject areas. Some of which we are really fortunate that we have had some legislative activity particularly whether it's required for our report.

Mr. Givens: Whatever is bloom and you've got it in a study (inaudible) legislative procedure I'll probably anticipate on how do we advance on this one (inaudible). There is something called biller (inaudible) and it was put out in June and (inaudible). There are many deadlines for rules designated by the study commission – don't worry about that, leave that to us.

Mr. Garrou: I think unless there are other questions.

Mr. Peterson: I just wanted to provide some clarification on the method by which we might be able to incorporate feedback from the group. Certainly in every single one (inaudible) as well as the CAPAG meetings we offer an opportunity for public input. We consider input from the Commission itself to be very important (inaudible). (Inaudible) back out to everybody we are going to get on the crosswalk here just to double check and

see which of them are not already under consideration. I'm not sure that there are any that are not already under consideration but the short story is take advantage of that opportunity to satisfy working with DENRs suggestions that you have and they can be raised at some point for the rest of you to consider. Just the proposal on hog waste is my understanding from Steven that we have newer management option in place there now.

Mr. Garrou: Thank you very much. I received a call from Ms. Tompkins earlier today and she will speak.

Ms. Tompkins: Thank you sir. I have a few comments just while we are talking about (inaudible) date and near dates. I wanted to just tell the Commission and legislators that on Wednesday night in Charlotte our State Utility Commission held a plummet hearing. Almost 300 people attended on a committing of two coal fired power plants for there billion dollars and since that 50 miles from Charlotte they are going to net ten million tons per year of global warming pollutants. The Utility Commission will decide January 18th or is it the 19th whether Duke Energy can build these fossil fuel plants even though the December 18th date is that close. The capital report on December 18th a six month study that we've heard about from Mr. (inaudible) and Mr. Watson found that renewable and efficiency can provide the same power for half a billion dollars less over 20 years and its necessity is subset. These plants will not only be a major polluter in a region with the worst air quality but a huge promoter of climate change. And it just seems to me that here is a state regulated monopoly on the verge of building a major contributor to mandate coal or climate change right under our nose before we even draft our report. And it also seems that there is no reason for the Utility Commission to rush to judgment now over this unknown contributor to global warming. One of the functions of our report is not just to energize the Legislature but to energize the public. A simple way to do this would be to make the connection between pollution, air pollution which will give us a stronger leg under our table to support legislation. We can have a win-win by getting the public attention on the performance of climate change if we connect to air pollution, whether on (inaudible). It's critical that we address in our report this matter. The question is how much of our effort will be undermined if we do fail flipside, how many (inaudible) and recommendations will it take to eliminate eleven million tons of global warming pollutants. Thank you.

Mr. Garrou: Our last agenda item or reports or recommendations that we've received from several of you we are now at 3:30 we talked about this, I would propose that we receive these recommendations not get full presentations this afternoon but receive them and include them in the report. As we said before that is acceptable to those who have presented them including the document from Dr. Erickson who is giving us one today as part of your materials.

Mr. Givens: For those of you that want a hard copy, we have hard copies of the four we received and we also have Dr. Erickson's handout that you received. We have five documents total and all of these are, there is another from Dr. Eggers (**Exhibit Q**) and Michael Shore (**Exhibit R**) send it to us electronically.

Dr. Eggers: Some of your suggestions about including some columns with additional information, what I will do is resubmit mine to you electronically before the 31st per those recommendations for changes.

Mr. Givens: That would be appreciated from all of those who submitted recommendations.

Dr. Smith: That is fine a number of us submitted something so I assumed that when you pulled that back modifies appropriate to meet your request and then we resubmit so I think we like the hold our until the 31st.

Mr. Givens: I would appreciate that – that's to encourage me I tried looking at that we would have enormous difficulties that we going to have a very hard job as it is we thank you for being willing to do that.

Mr. Garrou: Are there any other questions or discussion.

Dr. Smith: We are adjourning very quickly and a number of us have been kicking around the concept of a letter or something in the report on energy and I have some one-one conversations with members of the Commission that I'm mentioned to Bob Slocum and we continue to deliberate on that. I guess the idea may be that we come back with something that could be incorporated into the interim report possibly a request so that it would necessarily limited even a report based on other things other than just the sort of legislature making recommendation on some other activities that the Commissioners would recommend to other members or other bodies of NC comparable.

Mr. Garrou: We certainly are not limited to recommendations of the Legislature. We address of course (inaudible).

Mr. Givens: Let me say on that it is our intention not to and sometimes it been alleged that I don't, I don't know whether that true or not, and as you come in here on the 22nd that you haven't seen before so my intention was that anything that you see on the 22nd I will assume (inaudible).

Mr. Garrou: On the 21st.

Mr. Givens: Well that may be. We'll leave it at that but let's say if you get it any sooner then we'll hear (inaudible) and then don't hold me to it.

Mr. Garrou: If we are running out of questions or any other discussion we will adjourn and thank you very much.

Meeting Adjourned

Respectfully submitted,

_____	_____
John Garrou, Co-Chair	Joe Hackney, Co-Chair

_____
Thelma T. Utley
Committee Clerk

APPENDIX A

Exhibit A	**Agenda**
Exhibit B	**Attendance**
Exhibit C	**Visitor Registration Sheets**
Exhibit D	**There is a better way – Ms. Susan Tompkins**
Exhibit E	**Coastal Vulnerability to Erosion, Storm Hazards and Potential Future Sea-Level Rise – S. Jeffress Williams**
Exhibit F	**Mitigating Shore Erosion on Sheltered Coasts – Debra Hernandez**
Exhibit G	**Mitigating Erosion Along Sheltered Coasts – Debra Hernandez**
Exhibit H	**Implications of Changing Climate and Rising Seas for Coastal North Carolina – Douglas N. Rader**
Exhibit I	**Sea Level Rise in North Carolina – Courtney Hackney**
Exhibit J	**Questions and Answers on Purchasing Coastal Real Estate in North Carolina – Walter Clark**
Exhibit K	**Renewable Portfolio Standard – Commissioner James Kerr, II**
Exhibit L	**Beach Replenishment and the Impact of Global Warming and Sea Level Rise**
Exhibit M	**North Carolina Climate Action Plan Advisory Group – Brock Nicholson and Tom Peterson**
Exhibit N	**North Carolina Climate Action Plan Advisory Group**
Exhibit O	**Preliminary Recommendations for Mitigating he Consequences of Climate Change Within North Carolina – Stanley Riggs, James Stephenson and Walter Clark**
Exhibit P	**Recommendation Proposal to N.C. Commission on Global Climate Change: Use of a Carbon Fund to Convert Lagoon-and-Sprayfield Systems on Hog Farms – Tom Profeta**
Exhibit Q	**Draft ideas for discussion – Dee Eggers**

Exhibit R **Win-Win Policy Measures to Combat Global Warming – Michael Shore**