

**U.S. Environmental Protection Agency**  
**Science Advisory Board**  
Integrated Nitrogen Committee  
Public Meeting – October 29-31, 2007  
Minutes

**Date and Time:** October 29-31 from 9:00 a.m. Eastern Time on the 29<sup>th</sup> to 2:00 p.m. on the 31<sup>st</sup> as announced in the Federal Register on August 14, 2007, Volume 72, Number 156, pages 45425-45426.

**Location:** 1025 F Street, NW, Washington DC.

**Purpose:** On this conference call, the Committee planned to hear brief summaries of the member's work, identify any critical areas that need attention before the face-to-face meeting, make recommendations for refining the agenda, and conduct other business of the Committee.

**Materials Available:** Materials made available for the INC's January 30-31 meeting, April 19 and June 8 teleconferences, June 20-22 meeting, September 14 and October 15 teleconferences are identified in those minutes. The additional materials made available for this call are listed on Attachment 1.

**Attendees:** All INC members were present during the meeting, but some were unable to stay for the full meeting. Dr. Paerl attended the first day only, Dr. Kohn the second day only, Dr. Dickerson the first two days only, Dr. Doering the first and third days, and Dr. Cowling was absent on the afternoon of the second day to participate in a conference call of the NO<sub>x</sub> and SO<sub>x</sub> Secondary NAAQS Review Panel of the USEPA Clean Air Science Advisory Committee. DFO Kathleen White, of the Science Advisory Board Staff Office was present all three days. SABSO's Dr. Stallworth was present on the afternoon of the 29<sup>th</sup> and Dr. Maciorowski was present on the morning of the 30<sup>th</sup>. Speakers Richard Haueber and Virginia Kibler of EPA, and Jan Willem Erisman of The Netherlands, were present. Jason Lynch, Clean Air Markets Division, was present on the 29<sup>th</sup> and the morning of the 30<sup>th</sup>. Mary Barber of RTI was present on the 29<sup>th</sup>.

**Summary:** In terms of content, the meeting went according to the agenda, but there was some re-ordering of agenda items. The following actions and decisions resulted from the meeting:

INC and the Nitrogen in European (NinE) program ([www.nine-esf.org](http://www.nine-esf.org)), a network project financed by the European Science Foundation) might share publicly available materials with each other to reduce workload and improve the quality of both reports.

Dr. Aneja will draft language on international coordination which will reflect his concern about what countries and organizations are not currently included in international efforts.

Working with Dr. Theis, Dr. Moomaw will provide data on Chesapeake Bay that would serve as another example of fluxes and economic damage. Dr. Dickerson would like to see the data which might be used in 3.4 or Chapter 4 as a case study of mass flow converted to dollars.

The INC requested that Dr. Cowling, who serves on the CASAC NO<sub>x</sub> and SO<sub>x</sub> Secondary NAAQS review Panel, present that Panel with this resolution prepared and agreed to by the INC, “The current air pollution indicator for oxides of nitrogen is NO<sub>x</sub> is an inadequate measure of reactive nitrogen in the atmospheric environment. The SAB’s Integrated Nitrogen Committee recommends that inorganic reduced nitrogen (ammonia plus ammonium) and total oxidized nitrogen (NO<sub>y</sub>), be monitored as indicators of total chemically reactive nitrogen”. Dr. Cowling did so.

The INC’s Producers Working Group and the Environmental System Working Group will provide the Committee with their chapters no later than March 1. The Impacts and Metrics Working Group and the Risk Reduction Working Group will provide their chapters before December 21.

Dr. Theis will update the outline for Section 3.4 and Chapter 4 and provide them to the DFO.

The INC plans to hold a Meeting in Washington April 9-11 which will include a day focused on risk reduction methodology to which participants will be invited.

INC’s final face-to-face meeting is expected to be held July 21-23 in Washington.

Each working group will hold a monthly conference call until its assignments are complete.

There will be full INC conference calls from 2-4 Eastern on Dec 13, January 17 February 13 and March 19. At least one lead or co-lead from each working group should be present to represent the Work Group.

**Further Information on Matters Discussed:**

After the DFO opened the meeting on Monday October 29, Dr. Galloway, the chair welcomed the members and asked them to briefly introduce themselves for the benefit of Ms. Kibler and Dr. Erisman who had not met with the Committee before.

The chair provided an overview of the Committee's activities and plans, noting that there are three elements to the meeting – taking in new information from the speakers, reviewing the written material provided, and writing. He asked if there were any questions about the agenda and there were none.

**Dr. Richard Haeuber**, Chief of the Assessment and Communications Branch, Clean Air Markets Division in EPA's Office of Air and Radiation spoke on Nitrogen Trading in Air focusing on experiences with the first market-based emission trading program (the SO<sub>2</sub> component of Title IV of the 1990 Clean Air Act Amendments) and the more recent NO<sub>x</sub> Budget Trading Program. These programs control emissions from stationary, fossil fuel burning sources.

Cap and trade is a stand alone approach, not something added on to traditional regulation or credit trading. It creates an incentive for innovation, early reductions and reduced costs. One of the most important features involves the integrity of the environmental goal – with an emissions cap, there is more certainty that a specific emissions level is achieved and maintained.

When cap and trade is implemented, a cap on emissions is set, sources covered receive emissions allowances, which together total the cap, and each source designs its own compliance strategy. The measurement goals include complete accounting for emissions with no underestimation; consistency, simplicity, and transparency; incentives for accuracy and improvement; cost effectiveness; flexibility for small sources; electronic reporting and auditing; and public access to data. EPA ensures stringent QA and verification of all emissions monitoring and reporting. There's an annual reconciliation which compares emissions with allowances. There are penalties for non-compliance. The overall compliance rate for both SO<sub>2</sub> and NO<sub>x</sub> is nearly 100%.

The acid rain program was the first to cap emissions, account for all emissions from all sources in a program, require national level electronic reporting, make emissions publicly available on a quarterly basis, establish long term allocations to provide regulatory certainty, support electronic transfers of allowances, allow trading without government approval of each trade, simplify permitting to a standard one page form, allow changes to compliance plans without government approval, and provide ongoing air quality and ecological assessment. The Program is unprecedented for high compliance rate and low administrative costs.

The NO<sub>x</sub> Budget Trading Program (NBP) was designed to reduce summer ozone levels to help the Eastern US comply with the National Ambient Air Quality Standards (NAAQS) for ozone by reducing NO<sub>x</sub> emissions from electric generators and industrial boilers. In 2006, ozone season NO<sub>x</sub> emissions from NBP sources were 60% less than 2000 levels and over 1 million tons (74%) below 1990 levels. The NBP covered 2579 units in 2006. The NBP has a five month compliance period (May 1 – September 30), with emission monitoring required in 2002 and emission reductions beginning in 2003. Dr. Doering asked whether operating costs are so high that the sources would shut off the reduction equipment outside of the required five month period.

The Clean Air Interstate Rule is predicted to further reduce non-attainment with the NAAQS for both ozone and fine particulate matter (PM<sub>2.5</sub>).

EPA has a limited surface water monitoring program to confirm that the reductions in SO<sub>2</sub> and NO<sub>x</sub> are resulting in improvements in surface waters. EPA is currently working with several other federal agencies (US Forest Service, US Geological Survey and the National Park Service) to explore the use of the critical loads approach to ecosystem protection; used in Europe and Canada, critical loads provide a means for assessing whether atmospheric deposition of air pollution has reached a point where significant harm to ecosystems is occurring. Aneja thinks this is easier said than done. Haeuber agrees. Erisman thinks this has worked well in Europe. Doering and Boyer think there is good data for the northeastern USA.

Dr. Haeuber distinguished between an assessment tool and a regulatory tool. He thinks the critical load approach is a good assessment tool, but doesn't think a regulatory standard (e.g., under the NAAQS approach) could be developed using critical loads at this time. A projection comparing critical loads before and after CAIR shows marked improvement, but some areas still at risk.

Dr. Haeuber presented questions relating to when "To Trade or Not to Trade . . ." (See *Tools of the Trade* for more detail), including:

Can the problem be addressed with a flexible approach?

-- local or regional problem?

-- Episodic or cumulative problem?

Can emissions be measured accurately and consistently?

Do abatement costs differ among facilities?

Are there an appropriate number of sources for a viable market?

Do the necessary governmental and market institutions exist?

Dr. Haeuber draws two lessons from his experience: 1) cap and trade programs should complement, not contradict, existing environmental regulations; and 2) emissions monitoring is key to a successful cap and trade program.

Dr. Cassman asked if direct measurement was essential or whether there are other ways to monitor emissions. Dr. Haeuber said there are other monitoring methods, described in the papers he sent, that are used by the smaller sources – however, in the SO<sub>2</sub> emissions trading program, those methods accounted for only about 4% of total SO<sub>2</sub> emissions from Acid Rain Program sources in 2006.

**Ms. Ginny Kibler**, of the Office of Wastewater Management in EPA's Office of Water spoke about Nitrogen Trading in Water.

Water quality trading is very different from air trading. Water trading is not as developed as air trading. There is no national legislation or regulation for water trading.

Water Quality trading allows point sources to purchase offset credits from other dischargers. There is a voluntary exchange of pollution reduction credits. It is cost effective and can improve water quality. Trading is driven by regulation, motivated by economics, and enforced through permits. Clean Water Act Components are water quality standards, total maximum daily loads, and NPDES permits.

States set Water Quality Standards for designated uses from potable water down to navigation. Mostly they are designed to protect shellfish, fish and wildlife while protecting recreation in and on the water; no toxics in toxic amounts. Every state also has an anti-degradation policy.

Most states have not established nutrient criteria. The Mississippi River Basin includes 2/3 of the country because nitrogen is an estuarine problem, not a problem in free flowing streams. Criteria are the prime driver for trading; it is very hard to trade without them

Every five years the states check their waters to see if they are meeting their water quality standards. If the waters are out of compliance with one or more standards, they are put on the “303” list of impaired waters. For each impaired water, an analysis is done to establish the carrying capacity, what the dischargers are, and allocates a load to each and every point source. All nonpoint source and background are lumped together. There is nothing enforceable about a TMDL unless a permit takes it into account.

It is a privilege, not a right to discharge. To get that privilege you have to have a permit, much like a driver’s license. There are individual permits for facilities. There are also general permits that cover many facilities that are point sources which have common processes and discharges that require the exact same limits. CAFOs and storm water use general permits.

The permit is what makes trading legal. You need both a “without trade” limit and a “with trade” limit, different for buyers and sellers. There is a wide range of options for how trading is incorporated into permits to make trading legal.

Technology-based effluent limits establish minimum level of pollutant controls for all point source dischargers. These minimal levels (think of it as a ceiling) are set on the basis of technology and ability to pay; these were designed to provide equity among dischargers within categories and between states. You can never trade to meet one of these standards.

Water Quality-Based Effluent Limits establish a level of control that is derived from and that complies with water quality standards. Water quality based effluent limitations (WQBELs) are site-specific. IF there is a water body specific water Quality standard, then you can trade to get to the WQBEL. The WQBEL is more stringent than the technology based effluent limits. Thus, the trading area is between the WQBEL and the Technology-based effluent limit (TBEL). TBELs come from secondary treatment standards for WWTFs or Effluent Limitation Guidelines (ELGS).

The Clean Water Act does not control non-point source discharges nor contaminants that are already in the water. But, through trading, pollution from non-point sources may be reduced.

You must trade within a watershed, in the same drainage area. An economically viable trade ratio that protects water quality could further reduce the geographic scope of the trading area.

The National policy allows trades for Total Nitrogen, Total Phosphorus, Sediment, Cross-pollutant trading for oxygen demanding pollutants only, possibly other pollutants, but not for persistent, bioaccumulative toxics (PBTs) like mercury and selenium, except, perhaps, on a pilot basis.

You can trade in unimpaired waters to keep them that way, in impaired waters with TMDL, impaired waters without TMDL (because it takes 8-13 years to develop a TMDL), pretreatment, and intra-plant. Pretreatment addresses indirect discharges to WWTPs from industrial sources.

You cannot trade to meet technology-based effluent limitations, result in non-attainment of an applicable water quality standard, may not adversely affect water quality at a drinking water supply intake, cannot allow a discharger to exceed the TMDL.

There are five scenarios for trading. Many are single source to single source trades, some are multiple source trades. There are third-party exchanges involving a state for example. There are point source trades with non-point sources. And pretreatment and intra-plant trades.

Liability does NOT shift with water trading, so the buyer has to exercise some diligence to be sure that the limit is met by the seller.

For the Neuse River, 23 of 104 sources formed an association which has a common permit.

#### Trade Ratios

1. Delivery/Location ratio is the distance between buyer and seller. While you want the seller to be upstream on a single river, it makes less difference if both are discharging to the same bay.
2. Equivalency ratio establishes equivalency among forms of a pollutant
3. Uncertainty ratio addresses measurement uncertainty, installation uncertainty, and implementation uncertainty
3. Retirement ratio applies when you want to go beyond just offsetting what you have to improve water quality.

98 NPDES permits allow trading, covering 365 facilities. Not all address nitrogen, but the following do. New York, Connecticut LIS, North Carolina Charlotte Mecklenberg and Las Vegas have point source-point sources trades for Publicly Owned Treatment

Works (POTWs). New Mexico and Ohio have point-non-point source trading. Virginia's Chesapeake Bay trading program and Pennsylvania's Trading program involve future trading.

She knows of only one example of air water trading. It's very difficult and hasn't gotten very far.

**The Committee discussed nitrogen trading with both speakers.** Some of the issues raised were:

Because upstream sources are likely to be more attenuated before reaching the estuary than downstream sources, what tends to happen is that the upstream dischargers often become the buyers and the downstream users the sellers.

To address ammonia emissions, you would first need a legal and regulatory framework. One might consider whether or not ammonia trading could work by seeing whether it fits criteria in *Tools for Trading*. Trading isn't always the solution.

Could cap and trade be applied to mobile sources or the air equivalent of NPS? Some thought is being given to whether this might work for carbon trading. Nitrous oxide is the contributor to greenhouse gases of interest to the INC. There is a Chicago Climate Exchange trying to address ethanol's contribution to Greenhouse Gases including nitrous oxide.

Non-point source/point source trading is difficult because of the relative lack of monitoring data on non-point sources and also because there are constant changes in land use.

A member noted and the INC members agreed that the presentations were excellent; Dr. Haeuber and Ms. Kibler are doing a great job and should keep it up.

**Dr. Jan Willem Erisman**, Unit manager Biomass Coal & Environmental Research at the Energy Research Centre of the Netherlands spoke about European approaches to nitrogen. (See his overheads.)

The European Convention on Long-range Transboundary Air Pollution (CLRTAP) successfully integrated policies using an effect based approach, reached appreciable emissions reductions, and will now be expanded to include nitrogen in different media and including agriculture. CLRTAP includes a multi-pollutant, multi-effect approach. CLRTAP will form a Task Force on Integrated Nitrogen in some ways similar to the INC but with more direct policy influence.

Europeans feel they can reduce loss of nitrogen to the environment by increasing nitrogen efficiency in agriculture. Local problems can be solved through the IPPC directive. After those easily done reductions have been made, an effects-based framework can address nitrogen in an integrated manner. Dr. Erisman sees the ingredients for an integrated approach as science, set of indicators, data and monitoring, integrated assessment, policy developments, communication, partnership/stakeholder involvement, policy implementation (protocol, guidelines, bill, etc.). Such a framework might address sewage, agriculture, industry, energy production and traffic which produce various forms of nitrogen resulting in dead zones, climate change, terrestrial/aquatic ecosystems, human health, biodiversity, and effects on materials (such as destroying cultural artifacts or the finishes on buildings). A cap and trade system could be used to implement environmental quality standards set on sustainability.

In discussion of CLRTAP, the following issues were raised:

How does CLRTAP connect to the marine environment? Dr. Erisman said what he had presented was about air. The air and water communities are very different, so this is a first step. The next are including the water community and making the connection to climate change.

Does Europe have the political will is available to address agriculture? In the past, agriculture was supported on price and productivity. Now it will be supported provided that agriculture does not pollute the environment.

What are the barriers to an integrated nitrogen program in Europe? A very simple message is needed to persuade people that there is a nitrogen problem.

INC might adopt or adapt some of the slides Dr. Erisman used in his presentation.

Do the Europeans have a process to equate the equating of different forms of nitrogen (NH<sub>3</sub>, NO<sub>3</sub>, N<sub>2</sub>O, NO<sub>x</sub>) to reactive nitrogen?

Dr. Erisman spoke of four steps in the nitrogen reduction strategy: end of pipe reductions, best available technology, intelligent, and bioengineering. Dr. Erisman's personal view is the first two steps (end of the pipe reductions and best available technology) produced small improvements. The strategy predicts greater reductions from the third and fourth steps. He believes intelligent approaches and structural changes will lead to greater reductions.

Dr. Galloway asked Dr. Haeuber and Ms. Kibler what they saw as the barriers to the US undertaking a CLRTAP approach. Haeuber thinks that some authority to regulate ammonia is needed and that a legislative

approach would be the most straightforward. He doesn't know how criteria pollutants are added to the current list; i.e., whether this occurs through a rulemaking or some other mechanism. In terms of an overall approach to nitrogen management, both CWA and CAAA need sufficient authority and linkages. Ms. Kibler says there are barriers within the CWA itself between ground and surface water. It makes it very difficult to integrate just ground and surface water. Scale is another problem. When you trade air, you have a HUGE area. When you trade in water the areas are much smaller.

Even though ammonia is not a criteria pollutant, EPA has allowed the states to regulate ammonia if they find it contributes to PM2.5. Would this allow states to implement a cap and trade program for ammonia? Dr. Haeuber said he's not certain, but it may be possible for states to include a cap and trade approach in their SIP; even so, it would be difficult to implement given the lack of monitoring for ammonia and the weaknesses of the inventory.

Later, Dr. Erisman introduced the INC to a global model that allows the user to adjust any or all of eight parameters to create different scenarios, then to see what the impact would be on nitrogen in the environment. The model can be found at the INI website (<http://initrogen.org>).

The Europeans have a NinE program (NineE for the nine major effects of nitrogen, Nitrogen in Europe, etc.) [www.nine-esf.org](http://www.nine-esf.org) NinE has a work plan and outline for a European Nitrogen Assessment report to be finished in 2009. They select scientists in Europe to write background papers on the chapters. Where there is not enough information to write a chapter, they will hold workshops to develop more. They have built a "who is who in nitrogen" on the site so it is easier to know who is working on what, build networks, and share information with global nitrogen scientists and stakeholders. It would be nice to coordinate the NinE report with INC's. For those issues that are common, NinE might simply adopt parts of the INC report rather than repeating the effort. The Committees could exchange written materials and, perhaps, review each others documents informally, engaging in "Informal International Cooperation, organized and friendly". Dr. Erisman has offered to provide an outline of the European report.

**The Committee had further discussion.** Some of the issues raised were:

INC members were asked to reflect on who is not included in international efforts. Dr. Aneja will draft language on international coordination. Dr. Boyer thinks the recommendation could go in the context of budgets at the continental and global scales which will allow to compare and contrast US and other budgets.

It may be helpful to think about what works in the US, but not in Europe and why and also what works in Europe, but not the US and why.

At international policy meetings the policy person normally is accompanied by a scientist for reference purposes. However, it is rare for the US to do this. The INC might consider recommending that policy people be accompanied by scientists when appropriate.

In considering how best NinE and INC could cooperate, it seems that the common issues are global: most effective nitrogen management, what works and doesn't and why. Of course there are also cause-effects relationships that exist everywhere.

**Dr. Otto Doering spoke on the NRC's Clean Water Act Report, released October 16.**

The report addresses what more might be done under the current law. The report is about standards and monitoring, particularly if you want to have a trading program. The twenty-page Chapter 4 prepared by Bill Luneburg of UPITT is written by a lawyer for non-lawyers and quite understandable. The NRC felt EPA had authority to do a great deal more on the Mississippi and that the Chesapeake Bay program could be used as a model. In terms of agricultural non-point sources, the report encouraged cooperation between USEPA and USDA, a more aggressive approach to its conservation program by USDA that targets funds for environmental reasons rather than following a more politically based scheme. While the report does not pick numeric standards, it does discuss the widely different standards in the different states. While the CWA report addressed differences between the CWA and CAAA, it did not address the need to link the CWA and CAA. The report is available on the National Academy of Sciences website ([http://www.nap.edu/catalog.php?record\\_id=12051#toc](http://www.nap.edu/catalog.php?record_id=12051#toc))

A separate NRC report, Water Implications of Biofuels Production in the United States ([http://books.nap.edu/openbook.php?record\\_id=12039&page=R1](http://books.nap.edu/openbook.php?record_id=12039&page=R1)), addresses nitrogen. Mostly, the report points out what must be asked as the answers are not there. Where are the acres that switched to corn and are they irrigated? If you know, you can get some idea of the impact.

**Dr. Holly Stallworth**, Designated Federal Officer for the SAB's Hypoxia Advisory Committee spoke about the Panel's recent experiences with preparing its lengthy report. About twenty people worked on the approximately 300 page report. She shared some thoughts about how to streamline the process.

1. The main problem is version control. When twenty authors write on different sections, then send the reports to the DFO to reconcile, it creates too much confusion, work, and delay. One solution is to have a lead for each section who will reconcile the section, then send to the DFO in an email that says FINAL-Section x.x
2. Taking round-robin approach to editing allows changes to build on each other.

3. Page numbering, figure numbering, table numbering, and references are nightmares. The HAP DFOs had no success getting MSWord to number tables and graphs by chapter.
4. Line numbering is a particular problem on conference calls because there may be as many as four versions of the draft: MSWord (with and without balloons) and PDF (with and without balloons). This leads to confusion and wasted time on the conference call.
5. The HAP DFOs had someone who worked full-time on references an assist which DFO White will not have. Dr. Doering says the people who write the text MUST insert the references and keep them straight.

Dr. Galloway thinks INC can nominate leads for each section, but not get into the word processing issues. He asked about length, structure, and public comments. The current 300-page Hypoxia draft has 91 recommendations of which 11 made it to the Executive Summary where they are prioritized. He prefers a 100 page report.

Dr. Stallworth has the public comments posted and makes the Panel aware of them. It is the Panel's responsibility to consider them, but it need not respond to them.

The invited outside technical reviews, however, were treated differently. The leads responded to the reviewers comments on their respective chapters.

Dr. Paerl, who serves on both the HAP and INC, believes invited reviewer and public comments can be useful, although some are so predictable that they add nothing.

The chair asked the INC to reflect on today's presentations and their implications for nitrogen management in the US. The following issues were raised:

Some believe you don't do trading unless there is a regulation. Others believe you can have market based trading without regulations. The INC will need to address these views.

Trading can work, but it needs a rethinking of how we set standards. The CWA is inflexible as it relates to cap and trade. Maybe there are some enforceable solutions short of new legislation. It is very hard to get around rigid water quality requirements. The air standards have the flexibility to allow for market-based tools to be more easily implemented than the CWA. The 24/365 nature of water standards makes it more difficult. You have to look at it from three perspectives: water quality criteria attainment must be the goal (to eliminate eutrophication, for example), attainability in the TMDL (in some cases trading may not work very well because there are not enough sources that can be managed well enough to reach it), and for trading the sources must be in the same

watershed and there should be economic advantage to trading instead of individual source management.

If it is true that we need to be able to acceptably monitor with decent quality before implementing nitrogen trading AND you need this for permitting anyway, maybe we need to focus on monitoring. EPA is getting involved with GEOS which addresses all regulated substances. That could be a consensus point.

A hierarchy of measurement approaches allows you can contain the uncertainty of the trade. You may never know what you've done but you can build in the cost of monitoring to the trading. The California Carbon Credit Exchange encourages carbon sequestration through no till agriculture. This exchange accepts a great deal of uncertainty at the same time that Duke is recommending two meter samples in the field.

There are more studies on fugitive sources in air now. Monitoring is currently expensive, difficult, and limited. There are many variables (climate, management practices, climate, diurnal, annual) that make it difficult to monitor. At the same time there is increased pressure to regulate.

You have to have standards and you have to have monitoring. It would be very, very difficult to apply to non-point sources for those reasons.

BMPs are not well characterized. There has to be monitoring to verify that pollutants are being moved. There is already too heavy a reliance on modeling in trading programs. There are inter-annual differences, climatic differences that effect residence times. We are approaching the time when we have enough skills and monitoring to monitor representative fields.

Connecticut only uses point-to-point trading because there is no practical way to monitor non-point sources. Perhaps it is time to take the chance and verify with in-stream monitoring. We can't afford to monitor at individual BMP fields AND that you have to invest in stream monitoring to see if you are making a difference. However, we are losing ground on in-stream monitoring budgets at USGS and the states. It may be possible to require that, permittees contribute to a fund that goes to USGS instead of making permittees pay for monitoring.

Non-point source monitoring means could mean ambient monitoring of oxidized and reduced forms of nitrogen, which is not yet done. It is possible, but not easy, fast or cheap, to do emissions monitoring at the field level. Measurement of deposition will take longer. In addition to those kinds of monitoring, INC should discuss a "motley mix" of new approaches.

When it comes to field based crop agriculture, big studies are too conservative about mega-trends when new technologies coming down the pike. The MEA addressed the range of things that might happen in the next 50 years, but failed to address the possibility of a doubling in the price of food. A year after publication, the commodity price of food doubled. The on-farm efficiency of nitrogen fertilizer is key; probably it will soon be possible to assess uptake with satellite imaging. That would allow cap and trade in a BMP environment.

Buffers do little or nothing for nitrogen reduction, but precision agriculture can do a lot. Nitrogen lost to the environment can vary by a factor of 10 based on how it is applied. Is the form of nitrogen sold to the farmer also important? Historically, form makes a difference of a factor of 2, however there is a new class of fertilizers that are better at feeding the plant and releasing less to the environment. Dow and DuPont resisted the Montreal Protocol until they realized they could make more money from the substitutes. Is there a nitrogen equivalent?

A practice needs to be in place before it is worthwhile to monitor. Despite the promise of precision seeding and precision agriculture, adoption rates are very low for these very good and relatively cheap technologies. Why?

Could these rates be improved by pairing commodity payments with implementation of the new technologies? Under existing WTO rules, farmers can only be compensated for conservation activities up to the cost of the activity itself. That is, you cannot make an income payment beyond the cost of the conservation to encourage farmers to conserve and have this income counted as "green box" payments (non-trade-distorting).

What's done with non-point air sources of nitrogen under current trading? Off-road emissions are increasing. These sources are not included in current cap and trade programs. However, we cannot make an impact on Nr without addressing non-point sources. That means it has to be addressed.

Given the institutional system to influence agricultural behavior through incentives, a wise Czar of payments, could slow the movement of nitrogen off the files 15-20% in three years. As low hanging fruit, without additional regulations, it's not a bad place to start.

The CWA was supposed to make the nations waters fishable and swimable by 1983 which is 24 years ago, so the CWA may not be the way to go. The USDA's Conservation Reserve Enhancement Programs (CREPs) \$200 million grants program may not have improved water quality in the watershed one iota.

Linking the CWA and the Farm Bill might help. NPS trading creates inequity among farmers. Some states allow farmers to use the support payments to put in the BMPs that they will get credit for. The support payments could be coordinated to get better adoption of BMPs. Trading and the Farm Bill could work together to improve the environment.

Little progress can be made if ammonia is not addressed. Although EPA has a Total Nitrogen standard for water, there is no total Nitrogen standard in the air.

**Ammonia.** The chair reflected that, from what he has heard in discussion, it will be difficult to develop an integrated nitrogen management strategy until there is a regulatory structure for ammonia. Dr. Dickerson suggested that INC can call for ammonia to become an indicator right away. Indicator is EPA talk for something that you monitor and limit to reduce something else. Once it is an indicator, you can begin to monitor it and control its emissions. Dr. Cowling, who will be at a CASAC call tomorrow on the planning phase for the NO<sub>x</sub> secondary standard, noted that Rich Burrow has proposed that ammonia become an indicator.

Dr. Dickerson proposed that INC draft a resolution stating what it believes, vote on it and have Dr. Cowling communicate it to CASAC. Many points were discussed such as what would be included in the indicator, what would be measured, and affordability. The meaning of “indicator” in various media and programs was discussed as well as the consequences of recommending that ammonia become an indicator in the context of the NAAQS. Perhaps the recommendation would be construed as meaning EPA would regulate ammonia, which is good, but doesn’t move us towards an integrated strategy. This may be a necessary step, yet not sufficient, for integrated nitrogen management. The connection of ammonia to PM<sub>2.5</sub> was discussed.

Dr. Galloway found the discussion useful. He noted that this is the first time they’ve put up a statement and worked to make it comfortable for all of them. INC will do more of this tomorrow. Erisman said this is an historic moment for him. In 1991 he was at a meeting at Hilton Head where the Dutch recommended ammonia be considered.

There was no **Public Comment** because none was requested and no members of the public were present in the afternoon.

### **Risk Assessment, Risk Management and Implications for Risk Reduction**

(Please see Dr. Theis’ overheads) Dr. Theis described US environmental management in three time periods. In the pre-regulatory period (prior to 1965) the focus was on correcting problems of the past using simple controls that were often end-of-pipe and/or site-specific. In the regulatory period (1965-1990) the focus broadened to include doing things correctly from the present forward so that compliance as well as remediation was important although the nature of controls changed very little. In the Global (since 1990) period, the focus switched to doing things correctly in the present so that the environment

of the future would be protected; there was increased emphasis on waste minimization and life cycle approaches to environmental protection. The conceptual model for protection evolved over these decades from voluntary through command-and-control to systems-based approaches incorporating cooperative elements. While conservation and public health were sufficient to address the problems of the past, the need to address increasingly complex issues required inter-disciplinary and eventually meta-disciplinary expertise.

The Risk Assessment Paradigm has four major elements:

1. Identify the nature and endpoint of the risk
2. Develop quantitative methods of analysis and methods of measurement, often dose-response
3. Determine extent of impact (i.e. fate, transport and transformation to an exposed population)
4. Calculate probability of reaching the endpoint. (e.g. 05% probability of 1/100 occurrence over a human lifetime.)

Risk Management is different. It's where risk assessment gets combined with economic, legal and other considerations. A variety of endpoints can be addressed through risk management, such as environmental impacts, ecosystem functions, ecosystem services, economic endpoints, hazard concentration, and environmental standards.

Dr. Theis presented a table from "The value of the world's ecosystem services and natural capital" published in *Nature* by R. Costanza and others. The table pairs ecosystem services with the related ecosystem functions. We tend to think of the services as anthropocentric and the functions as more closely related to ecosystem health.

Dr. Theis raised these points relating to implementation:

1. Role of research in reducing risk  
Identification of hazard or problem, risk assessment, perturbation effects, source characterization, material balances, measurement, treatment technologies, BMPs, data management, modeling.
2. Management  
Setting standards and critical loadings  
Issuing regulations  
Writing permits (command and control)  
Pricing instruments (fees, taxes, offsets, market trading)  
(marginal costs=marginal benefits)  
Government programs (price supports, subsidies, construction programs)
3. Social & Policy  
Enabling legislation (goals, direction, penalties)  
Education, communication, information  
Decision-making

INC members discussed the possibility that some integrating legislation is needed. The presentation pretty much describes the current practice for water. The question is always whether the science behind the criterion is appropriate, especially because the criteria are national level, but ecosystems vary. INC might consider pointing out the need for integration of all acts. Or INC might prefer not to make the perfect the enemy of the good, especially since the 1977 CWA reauthorization was supposed to take care of nonpoint sources. A discussion about co-benefits might be helpful.

Dr. Theis would like to reorganize according to these three sections (role of research in reducing risk, management, and social & policy), then move stuff from other chapters there. Dr. Galloway asked if each of the three areas could be divided into:

What is EPA doing now?

and

What it could be doing better, either by itself or in conjunction with other agencies?

An INC member recalled that Ms. Kibler indicated states move at different rates in implementing the regulatory framework. He doesn't understand this and asked, "Is this itself a constraint?" It goes against the fundamental rationale of the report. Another member thinks a lot IS getting done. Most programs are delegated to the state level. Dr. Stacey provided Dr. Theis and Dr. Galloway with a summary on the CWA addressing how he thinks things work under the CWA. To consider CWA implementation for the 50 states would be a book in itself. Theis noticed that Long Island Sound and Tahoe are the only interstate water quality trading situations.

Another member observed that the people actually working on nitrogen issues are aware of the issues. Research funding is an issue as is coordination between ORD and the program offices. The way that money flows through the Agency may actually be an impediment to integrated approaches. At the recommendation of chartered SAB member Dr. Theis, the DFO provided INC with the two-pager descriptions of research programs that were made available to the chartered Board at its last public meeting. (These were provided to the INC on October 30.) This discussion might fit in the research section of Chapter 4.

The chair started the discussion of the consensus points using the running list developed by the DFO with input from INC members. The first of these was

**1. Current policies and practices for nitrogen are not sustainable.**  
(Theis Sept 14)

A member thought this statement was too broad and would like it linked to the cascade diagram. Drs. Boyer and Cassman were charged with re-writing, however, a different solution was found on Oct 31.

**2. There are critical research needs wrt reactive nitrogen that should be addressed (more effective application of nitrogen fertilizers, control of**

**runoff and leachate, ammonia deposition rates, application of multimedia nitrogen models to sensitive regions).** (Theis Sept 14)

No objections were raised on the September 14 conference call.

Alternate language #1

There are critical research needs wrt reactive nitrogen that should be addressed (better understanding of the environmental and management factors governing N cycling, more robust and accurate models to predict the Nr inputs and outputs to ecosystems and regions, improved technologies for achieving substantial reductions in N losses from agricultural systems without sacrificing productivity or profitability, control of runoff and leachate, ammonia deposition rates, application of multimedia nitrogen models to sensitive regions). (Ken Cassman emailed revisions)

Alternate language #2

There are critical research needs wrt reactive nitrogen that should be addressed. For example, little is known about ammonia deposition rates and the application of multimedia nitrogen models to sensitive regions. Additionally, there are certainly more effective methods of application of nitrogen fertilizers, of runoff and leachate control that should be determined with the models to test out hypotheses for limiting reactive nitrogen emissions. (Lighty email of 10/23)

Alternate language #3

There are critical research needs with respect to controlling nitrogen in the environment that include pollution prevention (e.g., more effective application of fertilizers) and application of management practices (e.g., wetlands construction, stream buffering, low impact development).

One member preferred the first formulation to the second because of its brevity. Another thought that, once you start listing things, you have to be comprehensive or you exclude things. He would prefer the third formulation omitting the information in the parentheses. A third member, on the other hand, sees this as an opportunity for the INC to raise attention to critical research that is not being done. He would rather list more neglected areas. The chair sees these as bulleted findings which can then be supported by explanatory text. The third member agreed there must be supporting text, but, for research, we either have broad text or more specifics. The second would like the consensus points left general UNTIL the supporting text is developed. A fourth member thinks there are research and educational needs; if the research exists, we may just need the outreach. Secondly the public may not understand that fertilizer include manure and biosolids. There is more of a problem with manure being applied in excess than commercial fertilizer. A fifth spoke about research needs in general AND research needs within EPA. The second sees that there are gaps in the research, some of which can be filled by EPA and others would have to be filled by others. The sixth encouraged INC to write down the gaps it knows about.

The chair hears that INC should take out the parentheses, make a general statement with supporting information below on where the gaps are, and address whether they are gaps EPA should fill or others. A table of what we don't know, what we know, what we know well, and primary responsibility of the research, could be used as a springboard for this recommendation.

No one disagreed, so the chair asked Drs. Cassman and Lighty to re-write. Dr. Cassman thought a third party should re-write. Dr. Shaw suggested INC revisit the issue Tuesday when Drs. Moomaw and Kohn could contribute. It was resolved on October 31

Before the Committee recessed for the day the chair suggested that the members think about how cap & trade can be used to develop integrated nitrogen management strategy. Members should also mark their availability for a three day meeting on the June & July calendars. The DFO recessed the meeting.

After the Committee reconvened on **Tuesday October 30**, the chair reviewed the plans for the day. A few items of business remained from yesterday: collection of availability for June and July, the writing of barriers, a presentation on the 4<sup>th</sup> International Nitrogen meeting recently held in Brazil which several INC members attended, and further discussion of the need for ammonia/um monitoring to be transmitted by Cowling with the sense of the INC.

Dr. Boyer reviewed the work she had accomplished towards the development of a **nitrogen budget**. (See her overheads). Her major points were:

1. Nr inputs to the nation have been increasing, largely due to human activities associated with food production and fossil fuel combustion.
2. Despite the obvious benefits of a plentiful supply of food & energy, the adverse consequences associated with the accumulation of Nr in the environment are large, with implications for human health and the environment.
3. The greater the inputs of Nr to the landscape, the greater the potential for negative effects, including greenhouse gas production, ground level ozone, acid rain, degradation of soils and vegetation, acidification of river, lakes & streams, and coastal hypoxia & eutrophication.
4. The adverse and intertwined consequences associated with Nr inputs to air, land, and water underscore the need for EPA to explore integrated strategies that minimize Nr inputs, maximize Nr use efficiency, and protect natural resources.
5. Substantial efforts are needed in order to mitigate or reverse the effects of Nr pollution across the country. Conservation of natural resources in their native state, improved motor vehicle efficiencies, improved use of fertilizers, better landscapes, creation of wetlands, reductions in airborne emissions, and advances in wastewater treatment may all be beneficial.
6. To achieve these goals will require an integrated, interdisciplinary approach with in the USEPA. Divisions such as OAQ (CAMD?), OSW, OGW, OWW, GCRP, and the various research centers should all be working together and sharing common resources toward: understanding Nr sources, transport, and transformations; understanding factors affecting Nr, quantifying ecosystem goods & services affected by Nr cycling; educating the public about this environmental issue; and to promoting regulatory & policy strategies to mitigate the adverse effects of Nr in the environment.
7. EPA should take a leading role among other federal agencies and university scientists in coordinating approaches to the nitrogen problem, and to maintaining a national nutrient information/accounting system.

She displayed an extensive list of databases used in her analysis, described them, and addressed their limitations. Some members thought that the analysis will not capture

biofuels driven changes in the last few years; there will be a real discontinuity starting in about 2007. Fifteen million more acres of corn have been planted and it safe to assume they will receive at least as much fertilizer as the historic average. A member cautioned that one of the data bases could not be used for national estimates, but might be valuable in some smaller scale locations. Drs. Cassman and Doering were asked to advocate for a table of what the estimates are and how they relate to the USDA standard data base.

Dr. Galloway raised a double-counting issue where some of the nitrogen applied to the field appears in animal manure and human wastes. Dr. Boyer thinks this could be gotten around using the NANI method. Dr. Herz confirmed that her human waste estimates included both septic and sanitary sewers, but not combine sewage overflow (CSO). The CSOs are rarely treated, but he has trouble understanding how a trillion gallons of untreated waste going into watersheds could not make a difference. Dr. Boyer said they can address this in the discussion of uncertainty.

Dr. Boyer thought it would be valuable to include in the report a description of the sources of nitrogen how many people, how many cars, how many animals, etc. before addressing the resulting nitrogen inputs and then getting into the budget. Dr. Erisman uses the farm-gate balance which gives input, output, and balance and would work at the state level. The surplus is what goes to the environment and is what we most want to know. Dr. Boyer is concerned about what happens at the riverine scale and speculated a large enough watershed might allow input-output analyses for the states. Dr. Boyer said she doesn't have data on industrial discharges because the contents of the EPA database on discharges are so inconsistent across the country.

She believes the INC should recommend the collection of data for a national nutrient accounting system with which to develop future nitrogen budgets. A member thought the lack of data is precisely what should go into this report. Another thought some of the data is collected under confidentiality agreements. Dr. Boyer thinks the FRI and NRI have already dealt with these kinds of issues; she believes USDA could employ similar protocols for fertilizer data.

An INC member noted that, if the budget is the major organizing framework for the report and a means of identifying the control points, INC needs to quickly come to an understanding of the big things instead of the small things. A small group work could with Dr. Boyer today and start making some decisions. It doesn't have to be perfect as long as it is transparent. There was general agreement than an hour of focused discussion would do it. The chair suggested that the small group will meet at noon.

Other issues raised in discussion were:

Concern with the flow of nitrogen out and into the river. There should also be discussion of the riverine flux estimates.

Whether mortality of animals and processing wastes should be included in the analysis to give a complete discussion of agricultural input. The Dutch

don't include it. Some think mortality is very small; others think that's what the agriculturalists want us to believe. It is probably 3 -10% of animals; in the U.S. composting is the disposal method of choice. The chair thinks this should be addressed in a paragraph or two.

The nitrogen and carbon cycles intersect. As INC formulates its recommendations, we should ask ourselves, "What would be the implications of this change for the carbon cycle?" We are looking at an inventory for nitrogen. There are such things for carbon. The cycles intersect. For example, if we add more nitrogen, the plants grow bigger and capture more carbon.

If INC uses the SUM method, it can't neglect industrial discharges . Fifteen years ago GAO said the PCS data was terrible and EPA has done nothing to improve it. It would be good to use the SUM method and the NANI method and compare them. Galloway thinks the role of INC is to be holistic. Therefore, he agrees with Boyer that the fluxes should be calculated. INC can describe the limitations.

Dr. Boyer asked more input on how to report some of the balances.

The INC discussed the **Table of Assignments** as follows.

#### PWG

1. PWG needs a national nitrogen estimate for nitrogen which is not yet available. That information will allow the PWG to make its chapters internally consistent. Boyer will provide by December 15.
2. The order of the outline should be changed to begin with the budget at the very start of Chapter 3 to provide context. A table of inputs and losses for power generation, residential turf, human waste, agriculture, transportation would be valuable. The chair recommends the summary table actually go in Chapter 2 and the PWG leads agreed.
3. Certain elements are missing from the first working draft of Section 3.2 which can be revised on a schedule to be determined at this meeting. The chair asked that the PWG come together and develop a realistic schedule for their development.

#### ESWG

1. The ESWG has not been responding to the draft materials and rough calculations on nitrogen inventories. As a result the Chapter circulated October remains current.
2. The biggest missing piece is a reconciliation of the budget. The ESWG wants to look at the nitrogen cascade and put numbers on the arrows. An average of sixteen watersheds from Boyer's earlier work could serve as a starting place. The key is reconciling the numbers. Fortunately, the framework is excellent. Boyer will be calculating inputs, but not flows at the national scale. ESWG could state that INC will rely on the earlier study

because the newer, larger, updated budget will not provide the flows. It might be informative to do Northeast AND Mississippi Basin, but it may not be possible to do the latter. Another approach would be to compare and contrast two or three different watersheds within the 16 Northeast watersheds – perhaps one where agriculture is dominant, one where deposition is dominant, and one where waste is dominant. The chair suggested that the ESWG discuss these possibilities further.

3. The input output budget for the five major watersheds might be better for comparison than the smaller Northeast watersheds.

4. Dr. Boyer agreed that they can do the budget

5. INC can argue the importance of a budget, recommend EPA develop it and give them some idea how. Give them some examples and quit. Don't spend so much energy on putting a budget together. The chair thinks the overall budget in Chapter 2 will provide an overview. However, INC will not make the perfect budget and it is not INC's job to do so.

6. INC could make some more general messages like, "Nitrogen is accumulating all over the environment. What are we going to do about it?" Moomaw raised a medical model – fever/global warming, kidney failure/nitrogen buildup.

7. Data from the Chesapeake Bay could provide another example of fluxes and so forth. Galloway thinks this might be best in 3.4 or Chapter 4 as a case study of mass flow converted to dollars.

#### I&MWG

There are "classical impact category" and ecosystem service or function approaches to impacts and metrics. Alternative metrics take more of a marginal damage approach. The Chesapeake Bay example Dr. Moomaw raised would best go here. Drs. Paerl and Stacey have provided some information on water quality. Dr. Theis is distilling information on global warming and will include the intersection of the carbon and nitrogen cycles. Dr. Dickerson will do air quality. Dr. Lighty has provided some text on health. Drs. Cassman and Doering have offered to provide something on landscapes. Dr. Erisman spoke of levels of effects, thresholds, critical loads, etc. These might be incorporated in a table and would be happy to help develop one as it would be helpful also from the European perspective.

#### RRWG

Theis revised the outline for Chapter 4. The chair would like further revisions and assignments made.

Dr. Theis will contrast command-and-control approaches to nitrogen control with cap and trade approaches. This might be a good place to talk about science and technological needs that feed into research applications for risk reduction.

Dr. Theis would like to sort out where EPA programs work OK. If EPA is doing something right that works, INC should say so. If improvements are needed, INC should say so. If EPA's approach is wrongheaded, that should be said. An uncritical recommendation that EPA needs a more integrated nitrogen strategy is not very helpful. The examples make it more meaningful.

Dr. Moomaw noted that one could define endpoints and use them to prioritize risk reduction. Let's say you look at health effects. Death is a very clear endpoint. Many laws speak of protecting human health and the environment, so both morbidity and mortality are useful endpoints, especially given the more qualitative nature of ecological endpoints. Morbidity and mortality even allow you to calculate costs in dollars.

The implications for regulation are significant if you take a cascade perspective. A well structured set of endpoints helps you decide when nitrogen is best treated under which act or which combination of acts. This discussion would fit in the outline under impact categories and also needs to appear under alternative metrics.

Dr. Cowling is a liaison member to INC from the **Clean Air Science Advisory Committee** and serves on a subcommittee of CASAC that was holding a teleconference at the same time as the INC was meeting, in the afternoon. The INC asked Dr. Cowling to convey this resolution which was approved by all present. The language they agreed to is:

The current air pollution indicator for oxides of nitrogen is NO<sub>x</sub> is an inadequate measure of reactive nitrogen in the atmospheric environment. The SAB's Integrated Nitrogen Committee recommends that inorganic reduced nitrogen (ammonia plus ammonium) and total oxidized nitrogen (NO<sub>y</sub>), be monitored as indicators of total chemically reactive nitrogen.

Dr. Cowling felt this language meets his needs for the CASAC subcommittee conference call. Galloway confirmed that there was no disagreement on this topic and Cowling could take it to CASAC.

In its report, INC might want to address units. Certainly INC should decide whether to use the units EPA does or the more widely used metric units. Also, INC might consider recommending that EPA use SI units. Dr. Galloway suggested INC use the metric system in the report, adding EPA units in parentheses where appropriate. Key tables should also be presented in both units. There is additional value to presenting units of elemental nitrogen (not product).

The chair and members provided a short briefing on the **Fourth International Nitrogen Conference** in Brazil attended by Drs. Boyer, Cassman, Erisman, Galloway, and Mosier. Attendees included 370 people from 47 countries. In contrast to previous conferences, there was wide attendance by stakeholders. About 10% of the attendees came from the fertilizer industry, UNEP and the Global Environment Fund attended as did countries that lacked enough nitrogen. There was the usual mix of plenary and breakout sections, short courses, a very effective video presentation. The next meeting will be in New Delhi.

There was good participation by the Chinese. If we are going to start adding nitrogen to agriculture in sub-Saharan Africa, let's try to do it without re-creating the problems of China and the West. What are some of the suggestions were for using nitrogen without making our mistakes? African fertilizer use (10 kilo per hectare) is so low that problems are a long way off. The problems aren't so much science and technology, but issues like infrastructure, lack of education, and government corruption. Gates, Rockefeller, and Packard are going to put a lot of money into this over the next decade. Africa imports 24% of all internationally traded rice, 15% of all internationally traded wheat, and 5% of all internationally traded corn. This doesn't count the humanitarian aid. Fertilizer plants there have failed and probably will continue to do so until transportation infrastructure has been developed. There was some talk of increasing legume production and using the gas flares to make fertilizer.

The UNEP/GEF funded policy workshop at the conference focused on nutrients in waters. This was a follow-up meeting following global partnership including the US started in June; it does NOT take an integrated approach. INI did a synthesis of the different assessments (MEA, etc) that addressed nitrogen none of which provide a complete overview of nitrogen. The next step in the partnership is to exchange information and knowledge.

It is good to see the major parts of the world come together (Europe, the Americas, and Asia). It is not clear yet what role Africa will play; there were representatives from some African nations. The director of the African nitrogen center was there. The millennium villages program has picked 7-8 villages which will be given fertilizer with which to increase protein intake coupled with a nitrogen fluxes program so that excess nitrogen will not result in the environmental consequences seen in the US. It will be easier for Africans to attend the New Delhi conference and it may be possible to have the 6<sup>th</sup> in Africa.

The Committee members worked in smaller groups to **further plan and organize** to meet their assignments. The leads and co-leads of the working groups then reported to the full assembled Committee.

The PWG will get the chapters to the INC by March 1. The PWG discussed what needed to be included in terms of figures and tables. The main elements are nitrogen for the base year 2002 and nitrogen trends from 1970 to 2006.

The ESWG will meet the March 1 deadline. The ESWG (minus Boyer and Dickerson) agreed to revise the current draft by mid-December. They aren't sure how long it will take to get the budget figures and get the flows. Mosier thinks it will take another month to get the other parts in.

The I&MWG and RRWG already have much material in hand. The remaining pieces are due December 1. Theis will have a first draft to circulate by December 21. Galloway asked Theis to update the outline for 3.4 and 4 and provide to him and DFO.

Dr. Cassman reported that the animal scientists felt section 3.3 that deals with human diets doesn't actually reflect the current literature. Dr. Kohn will send better data and references.

Dr. Boyer will have watershed scale budgets to people by mid-December and the national-scale one earlier.

The Committee discussed potential consensus points drafted by the members after which the DFO recessed the meeting.

After the Committee reconvened on **Wednesday, October 31**, the Committee discussed the Consensus Points further and the Barriers to Cap & Trade briefly. Dr. Stacey passed out a couple of maps from EPA nutrient criteria guidance. They use an eco-regional approach, i.e., there are expected consistencies for nutrient criteria among water bodies located in the same eco-region. He made two points: 1) the EPA criteria in the guidance manuals are very stringent and may not be easily attained, and 2) the national nitrogen loading estimates that Dr. Boyer is developing should be disaggregated to relate to the eco-regional criteria. INC members expressed concern, both as to the validity of the EPA approach, and the difficulty of parsing nitrogen data along eco-regional boundaries. Dr. Stacey concurs that it would not be the best way to go, but the national loads should be disaggregated, probably along major watershed boundaries. INC should look at eco-regional criteria as potential targets and determine the prospects for attaining those criteria with the management activities being discussed -- in an integrated nitrogen approach of course.

There was further discussion on the nature of eco-regions and how they may not be a good fit with watershed boundaries, or state jurisdictional boundaries for that matter. Further, air criteria are uniform nationally, which would never be the case for water criteria since they need to reflect the nature of the water bodies because they vary widely in character.

The chair engaged the Committee in discussion about the **April Workshop**, including these questions:

- What is the goal?
- Get feedback on overall findings of INC
- Get specific feedback on risk management issues
- Who gets invited?
- What is the charge for the invited participants?
- What are the products?
- What is the structure (breakouts)?

The invited participants should know how much the document can/will change after their input. That the INC is willing to listen is motivating to the invited participants. Each letter should be personalized to what the individual should focus on in the report with page numbers or report sections. It should be clear that this is the individual's

opportunity to contribute to the draft. The chair will use DFO and INC members to liaise with invited participants.

In terms of workshop the possible products are: none, minutes, workshop report, working product internal to INC to be used in improving the final report. INC members could serve as rapporteurs who can identify major points and resulting actions. Each breakout session needs to be carefully organized. Each should have a lead and a rapporteur. The overall pattern is Plenary, Breakout, Plenary, Breakout, Plenary.

Because some people whose input might be valuable could feel obligated to posture before a large audience, it might be fruitful to have fact-finding calls with them and also invite someone who is able to be more candid to serve as a participant. Herz suggested INC might want to divide the workshop by sector, either the day or breakouts. Doering thinks there will be greater candor in the breakouts.

The chair believes INC will have a full draft and a workshop-specific document

Dr. Erisman cautioned the workshop provides INC with a great opportunity to simplify the message and get buy in. Shaw agreed and thought that only the material that everyone needs to know be presented in the plenary. Additional information, if needed, can be presented in the breakout sessions.

At this time we don't know which areas there will be sessions on.

Dates were set for the next two face-to-face meetings. The meeting and workshop will be April 9-11 and the final meeting will be July 21-23.

To make sure that assignments are completed, each working group will have a conference call every month until its work is done.

Dr. Galloway proposed full INC calls on Dec 14 (since changed to Dec.13), January 17 February 13 and March 19 from 2-4 Eastern Time. If a lead or co-lead cannot be on, he should talk to the other to make sure the Work Group is represented.

The meeting ended at 11:30 to provide members and small groups time for further work on their assignments.

The DFO adjourned the meeting

Respectfully Submitted:

/s/

Ms. Kathleen E. White  
Designated Federal Official

Certified as True:

/s/

Dr. James N. Galloway, Chair  
SAB Integrated Nitrogen Committee

## Attachment 1

### List of Additional Materials Made Available for this Meeting

1. Federal Register Notice
2. Agenda
3. Roster
4. Materials Provided in advance by R. Haeuber of OAR – October 24, 2007

SO<sub>2</sub> and NO<sub>x</sub> Trading Markets  
by Sam Napolitano, Melanie LaCount,  
and Daniel Chartier  
*Copyright 2007 Air & Waste Management Association*  
awma.org june 2007 p 22-26

The U.S. Acid Rain Program: Key Insights from the Design, Operation, and Assessment of a Cap-and-Trade Program  
by Sam Napolitano, Jeremy Schreifels, Gabrielle Stevens,  
Maggie Witt, Melanie LaCount, Reynaldo Forte and Kenon Smith  
The Electricity Journal, Aug./Sept. 2007, Vol. 20, Issue 7  
Published by Elsevier Inc. p47-58

Clean Air Rules. A New Roadmap for the Power Sector: How new market based regulations fit with today's programs.  
by Sam Napolitano, Melanie LaCount, James O. Lee, Beth Murray, Mary Shellabarger, and Sam Waltzer  
In Public Utilities Fortnightly, June 2007, p 52-59

To Trade or Not To Trade? Criteria for Applying Cap and Trade  
By Stephanie Benkovic\* and Joseph Kruger  
In Optimizing Nitrogen Management in Food and Energy Production  
and Environmental Protection: Proceedings of the 2nd International  
Nitrogen Conference on Science and Policy  
TheScientificWorld (2001) 1  
ISSN 1532-2246; DOI 10.1100/tsw.2001.376

Tools of the Trade: A Guide to Designing and Operating a Cap and Trade Program for Pollution Control  
Published by the United States Environmental Protection Agency Office of Air and Radiation  
EPA430-B-03-002 www.epa.gov/airmarkets June 2003. 78 pages.

Fundamentals of Successful Monitoring, Reporting, and  
Verification under a Cap-and-Trade Program  
By John Schakenbach, Robert Vollaro, and Reynaldo Forte  
*J. Air & Waste Manage. Assoc.* **56**:1576–1583, ISSN 1047-3289  
Copyright 2006 Air & Waste Management Association

5. Overheads of Presentations  
Air Trading -- Overheads of Richard Haeuber  
Water Trading -- Overheads of Virginia Kibler  
The European Perspective -- Overheads of J.W. Erisman  
The Risk Assessment/Risk Management Paradigm, Impacts, Metrics and Risk Reduction –  
Overheads of T.Theis  
Nitrogen Budgets – Overheads of Elizabeth Boyer

Potential Workshop – Overheads of James Galloway

4. **Materials distributed in paper form**

Sections 3.2 and 3.3

Draft Consensus Points

Barriers to Cap & Trade

Maps (Stacey)

Information on EPA ORD Programs

Copyrighted materials will not be posted at the SAB website, neither will materials for which an URL is given. Other substantive materials will be posted at the SAB website. All downloadable materials will be found in the FACA file.

**APPROVAL BY CHAIR**

James Galloway <jng@cms.mail.virginia.edu>

12/20/2007 03:40 PM To  
Kathleen White/DC/USEPA/US@EPA  
cc

bcc

Subject

Re: More info about the draft October 29-31 minutes

History:

This message has been replied to.

Thanks,

the minutes are fine.

Jim

>I sent you the notes November 1

>I sought clarifications of small points from Boyer, Doering, Erisman,  
>Stacey

>You provided your comments November 9

>I sent to the speakers (Erisman, Haeuber and Kibler) and got their  
>comments

>I sent to the leads and co-leads on November 12

>I incorporated the changes and sent to the full INC on November 30 as  
>notes

>

>

>I received no further comments, so I used the notes to create the  
>minutes and added things that needed to be added like the location and  
>signature blocks.

>

>

>(See attached file: Minutes of October 29-31 second draft.doc)

>Attachment converted: Macintosh HD:Minutes of

>October 2#165058.doc (WDBN/«IC») (00165058)