Collected Breakout Group Actions for Discussion October 22

BG #1: NOx Emissions from Combustion

1. Point sources – electric utilities

a) Approx. half of capacity at 90% (more than half of generation); could step up to 95%.
b) We agreed that the idea that some fraction (~10%) of EGU's have no controls, and we need to get better numbers for this. Bringing these to 90% would get us substantial reductions in NOx emissions. Both EPRI and EPA will do an analysis for the INC.
c) Reinstate CAIR.
d) Should EPA consider NOx/unit energy provided (N_r/J) be a criterion for EGU's for industry cap? Just fossil sources or include all fuels?
e) Year-round NOx controls are appropriate for environmental problems beyond O_3.

2. Mobile sources – on road

a) 90% reduction for on-road; need to consider transition time for fleet change over if higher reductions are needed.
b)The cap on total NOx from vehicles is not falling (note: gNO/mile is criterion).

3. Mobile sources – off road

a) SCR on diesels (trucks and locomotives) with urea; for locomotives can achieve just under 90%, but it's expensive.
b) There is low-hanging fruit in vehicles such as construction equip.
c) There is no marginal increase in NOx emissions for switching some sources to electric, such as fork lifts, alternative power for ships in port and plug-in hybrids (EPRI has shown that NOx and ammonia would be reduced in urban areas with 20% of miles traveled)
d) 30,000 locomotives in the US not. ~70% have some control. ~13-18 g/bhp. Tier II is 5.5 g/bhp; Tier IV is 1.3 g/bhp. Lifetime of diesel 5-10 yr for overhaul. Regulations are in place already and regulating locomotives is a better economy of scale with reduction (more freight carried).
e) Aviation? (source not addressed)

4. Other NOx controls?

a) Conservation.
b) Increased fuel efficiency
c) Nr from ag. practices
   – No-till ag reduces soil emissions and fuel-based.
   – Ag fires emit NOx and NH3.

5. Additional Standards

a) Deadline for 2.0 Tg/yr reduction?
b) Secondary standard for chemically reactive N = NOy + NHx.
c) Begin monitoring immediately.
d) Develop standards (NAAQS) for NOy + NHx or for NOy and NHx individually? High temporal resolution vs. 24-hour?

BG#2: Managing Ammonia Emissions

1. Are there other important sources of NH_3?
   a. Catalytic converters?
   b. Dairy farms
   c. Combustion, e.g. forest fires
   d. Bidirectional exchange: Crops, turf

2. Is 20-30% Decrease in Agr NH_3 Practical?
   a. It may have additional costs. Technically possible but problem with implementation
   b. Tighter cycling between crop and animal (systems approach)
   c. Don't put extra regulation on manure compared to chemical fertilizer

3. How to decrease uncertainty in dry deposition?
   a. Need more measurements of dry deposition over a variety of ecosystems.
   b. Need to recognize bidirectional transport.

4. Do current models simulate short-range dispersion and deposition near ground?
   a. Not very well in short range (less than 50 miles)
   b. Regional models don't have good resolution locally.
   c. Need models with short-range resolution to evaluate and implement control strategies

5. Are observations suitable for model verification and evaluation?
No national network as we have with NOx and SOx

6. Should there be a combined NO_y and NH_x standard?
Yes, we don't want to trade one for the other.

7. Must take a systems approach
   a. Water and air
   b. NOx and NHy
   c. Other policies (air, water, ethanol, etc.)

BG #3:Urban and Aquatic Discharge of Reactive Nitrogen

1. Regulatory

a. Wastewater treatment plants
b. Stormwater
c. Extending regulatory authority
d. TMDL
e. Using 319 as a device
f. EPA should push the states to make better use of water quality standards to manage nutrients

2. Educational

a. Educational program must include other issues like carbon, energy, energy efficiency, green infrastructure, smart growth
b. To motivate the program needs to define/describe the problem(s) in relation to human concerns
    i. Examples: Native American with tear in his eye and Pfiesteria

3. Technology

a. Force a consideration of alternatives to standard secondary treatment
b. Look for symbiotic effects
c. Understand the cost of treatment technologies and their unintended consequences such as energy usage and putting N2O into the atmosphere
d. Develop nitrogen budgets with uncertainty analyses at regional levels, address the local impacts of the various nitrogen species, and provide states with the technical help to develop cascades and budgets for their watersheds and to evaluate boundary conditions for neighboring states.
e. INC should recommend the use of green infrastructure in new developments and retro fit it into existing areas.
f. Develop a decision framework to assess and determine appropriate solutions

BG #4: Agricultural Aquatic

1. Be more specific with recommendations. Start with a simple, understandable, declarative statement.

2. Use a watershed focus where possible because it unites research and regulation/remediation

3. Getting better data for N use and fluxes is critical---consider a bottom up approach (farm nutrient balances required for participation in farm programs) to supplement the current top down (federal govt agency as data collector). If bottom up, needs an aggregator by watershed, region, etc.

4. Need stronger linkages among Nr, C, and water within context of climate change and remediation/regulation

5. Need stronger linkages among Nr, C, and water within context of climate change and remediation/regulation

6. Need greater clarity on uncertainty/variability about Nr loads, fluxes, and projections; How to convey uncertainties to policymakers, public. What is proper role of models?

7. How to incentivize fertilizer companies to be more efficient in use of their product; to become service profit centers as well as commodity dealers.

8. Policies on crop subsidies affect farmer decisions about what crops to grow and cropping system, which in turn has large impact on fertilizer use and fate.

9. There is a crying out loud need for a lead govt agency to coordinate and implement Nr policy, regulations, and research

10. Define intensification as applied to agriculture increased food production per unit area/time a process that is not specific to a particular type of cropping system; research must use a systems approach to study it

11. Discuss carrying capacity, biophysical limits, climate change and linkage of CC with Nr, time frame for analysis and recommendations

12. Discuss spatial focus of the report; although it must consider global megatrends, it's purpose is to inform EPA policy; options and recommendations must focus on appropriate scale (watershed, ecoregion, ?)

13. Need more prominent emphasis on role of hydrology and concept of adaptive management: how to get from current situation to desired state.

14. Don't assume linear trajectory of current economic trends, there will be feedback loops with regard to consumption patterns

BG #5: Impacts of Land Use on Accumulation and Effects of Nr in the Environment

1. Considering the nitrogen budget: The way INC describes grain & meat as an Nr output, in the context of Nr pollution – recall that they are what feeds you!

2. Quantifying "reference" landscape conditions is a major research challenge; what is the background loss from natural systems? Recognizes the fact that setting criteria or standards cannot be uniform, as a function of the heterogeneous nature of the landscape.

> For example, the ecoregion approach for setting standards is challenging -- because of the high degree of variability between watersheds over space & time, and air & water impacts. There is a huge value to considering **loads** as well as **concentrations** (for air & water) when considering standards. There is a need for an individual watershed approach. There is a need to identify loadings to air and water and to partition sources of these loads.

3. Seasonality is very important with regard to considering responses of the system, and environmental effects.

4. Can't get the right critical load value if you don't know what the endpoint is. The management goals in terms of ecosystem end points need to be defined.

5. A comprehensive Nr set of standards for air/land/water is needed. The Clean Air Act & the Clean Water Act are not well coordinated with regard to Nr pollution. We need to consider how to **integrate** air & water. We need to consider how to **implement** this on the ground. **Airsheds** & **Watersheds** are both important when considering landcape-scale budgets and plans for solutions. EPA needs to take a holistic look at the regulations guidance & technical support that they give the states in developing such plans (e.g SIP & TMDL planning processes). Certainly will require thinking about landscapes on a water region basis that crosses state and county boundaries. Might require **reorganization** in EPA, **rule changes** and **technical support improvements**.

6. EPA is now thinking about air quality standards. Measuring NO2 in the air is insufficient. Oxidized **and reduced, and organic,** forms of Nr need to be quantified and considered as Nr pollutants.

7. Getting animal production and feed production co-located would be helpful toward Nr goals. Saves transportation emissions. Enables more efficient use of the nutrients in the waste materials.

8. More science is needed about how to optimize the use of organic or waste based fertilizer materials, in crop, forest, and rangelands.

9. EPA needs to work with USDA to develop optimum recommendations for environmental protection practices. For example, how to incentivize (e.g. under the farm bill) good environmental practices; encourage producers to look at an integrated operation where you would have feedstock & livestock production close together. Recommend required nutrient management plans for all farms, not just farms with CAFOs.

10. We need to understand the effectiveness of BMPs. For example, there's USDA's conservation effects assessment project (CEAP), led by NRCS. That's the start of a framework & data collection. That could be expanded to bring in other agency research, data collection, etc.

11. In order to integrate things on a watershed or airshed basis, we need better MODELING and MONITORING. Multiscale efforts. These efforts should be coordinated, supported whole-heartedly, and supported Long-Term. This should involve partnership among agencies, and related educational programs.

12. We need a cohesive database center for N where nitrogen info can be accessed;
Metadata is very important
Data intercomparability

BG #6: Integrated Nitrogen Policies

1. What are recommendations for policies on integration and multimedia management of Nr?

a. Operationally to coordinate across Gov. Departments something like the interagency committee on climate change
b. A sound energy policy would help solve the Nr excess problem
c. Disconnect between regulatory and nonregulatory particularly with respect to agriculture and air—

2. Is there a widely perceived need for an integrated Nr policy?
--NO

3. Are the INC suggestions for initially decreasing Nr entering the environment by 25% appropriate (i.e. too little, too much, wrong apportionment)?

Need end point other than just target of total % decrease of Nr—Critical load concept—watershed approach and local needs

4. Are there appropriate technical and regulatory mechanisms in place to facilitate an integrated Nr management policy? If not, what is needed create such a policy?

a. Probably not—need to keep pushing on mechanisms in place to try to make them work—secondary NOx measures—more integrated monitoring
b. How to deal with ecosystem health under the clean air act—how to do with fire, as an example, a NAAQX doesn't help—need some authority to address complex problems
c. Can now address livestock manure issues, but not synthetic fertilizer—may require statutory change. Currently no way to define a farm in the clean air act
d. Farm bill provides a mechanism farm bill is a big role, farmers need to be paid for providing ecosystem services rather than what they grow or don't grow

BF #7: Agroecosystems, Food Security, and Bioproducts

1. General Comments
   a. Keep in mind that farms have many plans already and are overwhelmed with record keeping.
   b. Recognize environmental issues related to agriculture are becoming more pressing and will need to be addressed.
   c. Providing farm-level data on fertilizer use will not be popular.

2. Current Report Recommendations
a. Soil management
b. Improve efficiencies
c. Track sources and flows of Nr
   - Fertilizer use
   - N utilization efficiency
   - Wet/dry deposition of Nr

d. Metrics of effects needed
   - Mitigation costs
   - Human health

3. Comments on Recommendations
a. How do we define an integrated approach to monitoring? Monitoring must relate to what you want to affect.
b. Foundational data needs to be geospacially and **temporally** defined for fertilizer and **organic** nutrients.
c. Specific intervention points to decrease Nr losses must be proposed to reinforce N cascade concept.
d. Need more data on Nr losses on farms
e.Need nutrient balance on all farms including crop farms (treating manure and synthetic Nr equally)
   - Currently not possible to access farm-level data to use in research programs or target extension priorities

f. Understand there will always be losses but need better cycling to minimize losses.

4. Programs to Manage Runoff
a. We need to determine what is most effective to achieve desired goals
   - Watershed or Regional Level (farm distribution)
   - Farm scale
   - Consensus: Must do both starting with farm scale now

b. Make utilities buy energy generated from farms; strive to have digesters contribute to managing Nr (e.g. capture NH3, using energy to treat Nr in manure).
c. Similar intervention strategy with air and water
d. Farm-Level Nutrient Cycling Research with Farmers Participating

- e.g. Iowa Soybean Association (Iowa Farm Network)
- Facilitated by extension
- Need data on cost effectiveness to promote to other regions and commodities

5. Research Needs
a. Can we best achieve goal from farm-level approaches or do we need regional changes?
b. Nitrogen efficiency research must also have strong focus on soil management to decrease N2O from soil
c. On-farm production-scale research on impacts of management (e.g. Need research with measurements related to flows of N on farm, not just emissions from farm.
d. Collected on-farm nutrient balance data must inform policy and extension program
- e.g. Use farm-level data (nutrient balance) or regional data (fertilizer use) to target extension program.
- Iowa On-farm Network (voluntary program does this)

6. What is the most effective way to increase efficiency of farm system
Approach must integrate airshed and watershed in programs to mitigate Nr concerns.

BG #8: Energy and the Cascading Costs of Reactive Nitrogen

We are at a crossroads:
Old energy paradigm/new energy paradigm
Large $ reserves to deal with both
Whichever route: huge impact

1. Need portfolio solution delivering energy in different ways (plug-in vehicles) – plug when appropriate
a. Infrastructure is critical – smart grip/metering initiatives
b. Electricity relates to a portfolio already in terms of generation & use
c. Petroleum use must define – single source

2. Storage is key -- Plug-in hybrids act as storage

3. Need to look at these Nr trade-offs

4. Watch for trade-offs between Carbon and Nr in any solution

5. Biofuels: Nr not the only issue
- Water & energy balances
- Land use changes – cropping changes potential to increase Nr – especially short-term grain-based
- Question what part and proportion of the portfolio is appropriate for biofuels
- Question whether liquid fuel emphasis is best way to go

6. Institutional approaches
   a. Energy Star Program
   b. 2007 energy act re: biofuels important to enforce
   c. California low carbon standards should also include low Nr

7. Changing public behavior
   a. Conservation
   b. Changing consumption patters
      - Diets
      - Transportation patterns

8. More - Changing public behavior
   a. Health concerns as a threat
   b. Providing real-time information energy, Nr, water
   c. Price fuel relatively high
   d. True life-cycle costing to set prices
   e. Need for education on Nr issue
   f. Caps & allowances for carbon
      - Include Nr & coordinate between the two
   g. Changing the consumer's choice
      - Getting Scotts to change Iowa fertilizer formula
      - Tackling the supply chain
   h. Third party assessments

9. Other Institutional approaches
   a. Credit stacking Carbon/Nr
   b.Low carbon and Nr fuel standards
   c.Pollutant trading
   d.Carbon [Nr] pricing through Cap!
   e. Cannot continue dirty systems
   f. Incentives must be for cleaner solutions [Caps/emissions]

10.Concerns – 20 -> 30% achievement of Nr low-hanging fruits
   – How can a trading system go beyond that?

11.Post treatment through wetlands vs. pre-treatment of Nr or reducing introduction of Nr (Dutch style water management system)
   a. Need accounting system & Nr credits to cover land costs
   b.Requires multi-institutional approach & multi-objective view
   c. Start offsetting treatment (credits)

12. Reconsider what is a point source
   – Example: pumped/levied farm lands