Breakout group 8: Energy and the Cascading Costs of Reactive Nitrogen

Co-leads: Otto Doering, Purdue University
William Moomaw, Tufts University
DFO: Angela Nugent, EPA Science Advisory Board Staff

Invited Workshop Participants in attendance:
Catherine O'Connor, Metropolitan Water Reclamation District of Greater Chicago
Thomas Simpson, University of Maryland
Joanne Lighty, University of Utah
Mindy Selman, World Resources Institute
Bob Singleton, National Railway Equipment
John Quinn, Constellation Energy
Donald Hey, Wetlands Research, Inc.

Member of the public:
Alladio Knipping, EPRI

Charge questions:

1. How can our understanding of the reactive nitrogen cascade help us to identify opportunities for lowering the damage costs of reactive nitrogen?
2. What kind of transition are we likely to see from traditional energy systems and how will these affect reactive nitrogen forms and amounts – comparing traditional to new sources?
3. What specific concerns should we have for reactive nitrogen with new bio-based energy systems?
4. What kind of policies or institutional structures lead to effective market-based solutions for reactive nitrogen control?
5. When does the economic or dollar metric make the most sense in considering concerns of reactive nitrogen? What are its limitations and advantages? How is a dollar metric successfully juxtaposed with physical/biological or health metrics?

Discussion:

The discussion began by grouping the charge questions in three categories: a) energy; b) the context of the reactive nitrogen (Nr) cascade and the potential for effective control points; and c) the potential for measurement in dollars or other metrics.

One member of the group noted that the United States is at a crossroads, facing a decision of refining old energy methods or switching to new sources. Both paths are expensive. Another member of the group emphasized the need for a portfolio approach, which focused on delivering energy in different ways. He noted that new technologies can draw on electricity as a transportation source and emphasized the potential of using a "smart grid" and plug-in hybrid-electric vehicles. He noted that the electric grid can store greenly generated electricity and that "storage is the key" to green energy. Other

members echoed the great potential for wind and water power and emphasized the importance of reducing the costs of transmission and distribution of energy, which currently represents 54% of energy costs.

Participants voiced concern about biofuels. They questioned whether biofuels had a net positive environmental impact, once a "really complete" life cycle analysis was considered. Members noted that increased corn and soy production replaced some applications that involved low releases of reactive nitrogen (Nr). They observed that in the short-term, the country's biofuel strategy has increased Nr and that the promise of cellulosic ethanol has not been realized. Members discussed a variety of water quality and water quantity issues.

Participants noted a number of possible Nr control strategies:

- Certification programs that are technology forcing and capable of increasing stringency over time (Energy Star discussed as good model)
- Periodic evaluations of standards (such as the biofuel standard) to meet higher environmental protection targets (e.g., the low carbon fuel standard in California should be low carbon, low Nr standard)
- Nr concerns should be factored in wherever carbon controls are considered
- Conservation
- Changes in diet (e.g., vegetarianism, Mediterranean diet)
- Providing real time information about emissions of Nr
- Higher gas taxes
- Full cost accounting and costs reflecting environmental costs
- Education to increase understanding of Nr effects
- Water quality trading for Nr
- Following the Chicago Wetlands model that replaced 700,000 acres of corn and soybeans with wetlands. The approach would allow farmers sells nitrgen credits. The approach has multiple benefits, including reductions in Nr and flooding.
- Credit stacking, for carbon and Nr
- Low carbon and nitrogen fuel standards
- Reconsidering water district with pumping stations as point sources and regulate them
- Removing disincentives to new technologies by technology standards – that can increase other pollutants
- Using cap and trade programs that allow a variety of technologies. The cap must be set conservatively to meet the most stringent regional needs.