



NARSTO News

**A North American Consortium for Atmospheric Research
in Support of Air-Quality Management**

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1998 Executive Assembly Meeting: NARSTO to Expand Research to Include Fine-Particle Studies

NARSTO's Executive Assembly held its second Annual Meeting on March 2 and 3, at the White House Conference Center in Washington DC. A primary deliberation at this meeting addressed the question of fine-particle research, and whether NARSTO should expand its activities to include selected elements of such research under its purview. Because NARSTO was originally conceived to address ozone research only, any decision to move into the fine-particle arena will require a formal amendment to the NARSTO Charter.

At its previous Annual Meeting the Executive Assembly tasked the Executive Steering Committee (ESC) to review this issue, and to prepare a white paper for use as a decision tool in these deliberations. This paper was prepared subsequent to a number of meetings and workshops during 1997 and was presented to the Executive Assembly at its March 1998 meeting. Following extensive discussion, the Executive Assembly voted unanimously to modify the Charter to include selected areas of fine-particle research related to "relevant regulatory standards and to goals and exposure issues." Although this effort will not include health-effect studies, a strong and interactive link with the health-sciences community is seen to be essential to its success.

The ESC will provide primary implementation guidance for the resulting research program. To this end the Executive Assembly formally charged the ESC with the following action items for 1998:

1) Redraft the NARSTO Charter to incorporate fine-particle research in a manner that reflects the spirit and intent of the 1998 Annual Meeting. Circulate the draft to the Executive Assembly, and submit the final form for ratification at the Executive Assembly's 1999 Annual Meeting.



2) Plan and conduct a NARSTO workshop for the summer of 1998 to draft a science plan for NARSTO's fine-particle research activities.

3) Design, acquire financial resources for, and implement a viable and functioning NARSTO liaison structure for scientific interchange on the fine-particle issue with the health-sciences community.

Later articles in this **NARSTO News** issue describe ESC activities to date in each of these areas.



What's in a Name? NARSTO's in for a Change!



As one might guess, NARSTO's decision to include fine-particle research was followed by some debate on what the "new" NARSTO should be called. Also as one might guess, some curious names and some interesting acronyms were suggested in the process. At its March meeting the Executive Assembly decided ultimately to drop the descriptive title "North American Research Strategy for Tropospheric Ozone." Thus "NARSTO," which is retained as our program's name, is no longer an acronym.

While simple, this undoubtedly will lead to some confusion, at least initially (pun intended!). In government circles, for example, there's often a preference for program names that indicate something about what the program does: congressional and parliamentary committees tend to respond more positively and readily to program titles having descriptive substance.

Be that as it may we are now "NARSTO," and our documentation (including this newsletter) will reflect this fact. Meanwhile we'll be thinking of creative ways to convey the message of who NARSTO is, and what it does, in economical, sub sound-bite form. Your suggestions are welcome!

NARSTO Welcomes New Members: USAF and FETC

Recently the US Air Force and the DOE Federal Energy Technology Center became sponsoring members of NARSTO. As such, these organizations will take seats on NARSTO's Executive Assembly and participate in all aspects of research-program guidance. MGen Richard Paul, Commander of the Air Force Research Laboratory, signed the NARSTO Charter for the Air Force. Dr. Ray Wells of Tyndall Air Force Base in Florida will serve as primary contact person.

Ray's group has been particularly active in assessing ozone reactivity of organic components in solvents and coatings; a technical research note written by Ray appears later in this NARSTO News issue.

The Federal Energy Technology Center is particularly interested in particulate emissions from

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energy sources, and is currently developing a major program in this area. Dr. Rita Bajura, FETC Director, officially signed the NARSTO Charter. Mr. Thomas Feeley will serve as primary contact person, and has contributed an article describing their program to this edition of the NARSTO News.

NARSTO welcomes these two new groups and looks forward to working with them on the challenges that lie ahead.

IGAC Joins NARSTO as an Affiliate Member

The International Global Atmospheric Chemistry (IGAC) program, which has been in operation for a number of years, is dedicated to the determination of regulatory processes occurring in global atmospheric chemistry, including the role of biological processes in producing and consuming trace gases.



More specifically, IGAC's overall goals are:

- to develop a fundamental understanding of the processes that determine atmospheric composition,
- to understand the interactions between atmospheric chemical composition and physical, biospheric and climatic processes, and



- to predict the impact of natural and anthropogenic forcings on the chemical composition of the atmosphere.

As such, IGAC provides a valuable complement to NARSTO, dealing with tropospheric pollution issues on larger geographic scales.

Alex Pszenny, from IGAC Headquarters at MIT, presented a brief programmatic overview at the March Executive Assembly meeting, and the Assembly voted to include IGAC as an official Affiliate Member of NARSTO. As such, IGAC will become a component of NARSTO's Liaison Team, and NARSTO will enjoy reciprocal affiliate membership in IGAC, in a manner similar to that currently existing for EUROTRAC (see Winter/Spring 1998 **NARSTO News**).

Currently IGAC is engaged in a number of tropospheric-chemistry research activities throughout the world. Results of many of these will be presented at the forthcoming IGAC Symposium, which will be held in Seattle during late August.

Additional information on the IGAC and the Symposium is available on the IGAC Web site, <http://web.edu/igac/www/>.

California Aerosol Study Affiliates with NARSTO

NARSTO's Science and Resource Planning Group recently voted to include the California Regional PM10/2.5 Air Quality Study as a NARSTO component. This study is a multi-year program of planning, air-quality and meteorological monitoring, emission-inventory development, data analysis, and modeling, with the following central goals:

1. to provide an improved understanding of emissions, PM10 and PM2.5 composition, and dynamic processes leading to particulate matter formation;
2. to establish a scientific foundation for informed decision making
3. to develop methods to identify the most efficient and cost-effective emission control plan to achieve the ambient PM10/PM2.5 standards in Central California.

The overall budget for the Study is \$27.5 million. The Study's sponsors consist of a cooperative

partnership between representatives from federal, state, and local government agencies as well as representatives from agriculture and private industry. Representatives of the partnership serve on the Policy and Technical Committees that direct and manage the Study. The California Air Resources Board's Andrew Ranzieri serves as Chair of the Technical Committee. Chuck McDade from ENSR is the Field Program Manager, and currently is working with NARSTO's Quality Systems and Data Management personnel to ensure efficient data flow to the NARSTO data archive.

The study's Technical Committee is planning a large-scale annual and episodic field study starting late in 1999 and continuing through the year 2000. A draft field plan will be available late this spring.

EUROTRAC symp 98 Held During March

Some 500 scientists attended EUROTRAC's **symp 98**

Symposium on Transport and Chemical Transformation in the Troposphere, which was held on March 23 – 27 in Garmisch, Germany. Technical presentations at the conference were subdivided into several categories, and included:



- chemical mechanisms;
- distributions and trends of photo-oxidants;
- aerosols and clouds;
- science applications to policy development in Europe, the EU, and North America;
- coastal processes, acidification, mercury, and persistent organic pollutants;
- urban, regional, and global modeling and model validation; and
- regional and urban problems.

Jake Hales represented NARSTO at the symposium, and presented an overview of NARSTO's operational experiences as a policy-relevant scientific effort in the North American context.

EUROTRAC has made substantial contributions to aerosol and oxidant science, and many of these were reported at the symposium. Bound proceedings of **symp 98** will be available in the near future.



All in One Swell Foop? Possible Additional Charter Amendments on the Horizon

As noted on page 1, the fine-particle initiative will require an amendment to NARSTO's Charter. Any amendment process within NARSTO requires substantial parliamentary processing, coordination, and lead-time, and because of this the Executive Steering Committee is considering the simultaneous presentation of one or more additional amendments for Executive Assembly consideration at its 1999 Annual Meeting.

These potential additional amendments are largely a consequence of our experience with NARSTO operations during its first years of existence, where some elements have functioned exceptionally well while others have demonstrated the need for some tune-up. In particular, it is generally felt that our organizational structure is somewhat complex and cumbersome, and that some elements on our organization chart need to be trimmed, or at least consolidated, as a result (see article on page 9, entitled "Liaison with Health-Effects Research Community"). Another issue requiring resolution – and possible Charter modification – involves how NARSTO handles, and funds, its infrastructure processes.

Currently the ESC is beginning the process of drafting potential Charter amendments, and will be working these out during the next several months. It is intended that the candidate amendments will be made available for review and comment well in advance of the 1999 Annual Meeting. Any suggestions you may have in this area are welcome!

Reactivity Research at the Air Force Research Laboratory

Assessing the impact of volatile organic compounds (VOC) is not new to the Air Force. One of the early concerns was the environmental impact of potential hydrazine releases from operations. Dr. Dan Stone, now at Hill AFB, Utah, was an early champion of VOC reactivity and funded some of the early work in this field.

Due to newly revised ozone and particulate-matter regulations, increased awareness of carcinogens in the workplace, and pollution

prevention initiatives, there has been an increasing interest in determining the air-quality impact of military operations. Paints, combustion, and cleaning are sources of emissions that impact local and global air quality.

The Materials and Manufacturing Directorate of the Air Force Research Laboratory has an Airbase and Environmental Technology division located at Tyndall AFB, FL, which is home to Air Team. Air Team's goal is to prevent pollution intelligently while maintaining performance by investigation of the detailed atmospheric chemistry of oxygenated organic chemicals.

For example, Air Team has used the relative-rate technique to measure the hydroxyl radical (OH) reaction rate constant of a chemical emitted from coatings: ethyl 3-ethoxypropionate (EEP, $\text{CH}_3\text{CH}_2\text{-O-CH}_2\text{CH}_2\text{C(O)O-CH}_2\text{CH}_3$). EEP reacts with OH with a bimolecular rate constant of $(22.9 \pm 7.4) \times 10^{-12} \text{ cm}^3\text{molecule}^{-1}\text{s}^{-1}$ at $297 \pm 3 \text{ K}$ and 1 atmosphere total pressure. In order to more clearly define EEP's atmospheric reaction mechanism, an investigation into the OH + EEP reaction products was also conducted. The OH + EEP reaction products and yields observed were: ethyl glyoxate (EG, $25 \pm 1\%$, $\text{HC(=O)C(=O)-O-CH}_2\text{CH}_3$), ethyl (2-formyl) acetate (EFA, $4.8 \pm 0.2\%$, $\text{HC(=O)-CH}_2\text{-C(=O)-O-CH}_2\text{CH}_3$), ethyl (3-formyloxy) propionate (EFP, $30 \pm 1\%$, $\text{HC(=O)-O-CH}_2\text{CH}_2\text{-C(=O)-O-CH}_2\text{CH}_3$), ethyl formate (EF, $37 \pm 1\%$, $\text{HC(=O)O-CH}_2\text{CH}_3$), acetaldehyde ($4.9 \pm 0.2\%$, HC(=O)CH_3). Neither the EEP's OH rate constant nor the OH/EEP reaction products had been previously reported.

Currently, formulation selection decisions are made using Material Safety Data Sheet (MSDS) information. However, the emission profiles of formulations can differ from those indicated by MSDS data: chemicals emitted often are not listed on MSDS and chemical emission concentrations may be different than listed. Therefore, Air Team has initiated a program investigating and assessing the air-quality impact of formulation emissions. Combining emission data with incremental reactivity has proven to be a useful tool to assess air-quality impacts. Air Team recently completed an emission assessment of nonchromated primers for the Joint Group for Acquisition and Pollution Prevention (JG-APP) – a tri-service (Army, Navy, Air Force) and industrial partner organization. The time-resolved, speciated emission profiles of two candidate replacement primers and the currently used primer were assessed using individual



chemical incremental reactivity to yield formulation reactivity. As can be seen in the table below, the two candidate primers had the same ozone-forming potential and were a significant improvement (regarding air quality) over the currently used primer.

Table 1. Comparison between Nonchromated and Chromated Primers

Primer	Maximum Incremental Reactivity (grams ozone/gram of primer)
Coating A	0.26
Coating B	0.26
MIL-P-23377F	0.75

Air Team members are: Lt. Leon Perkowski, Ray Wells, Darrell Winner, Bill Bradley, Sheryl Wyatt and Stewart Markgraf. Contact information: (850) 283-6087, ray.wells@ccmail.aleg.tyndall.af.mil, AFRL/MLQR, 139 Barnes Drive, Tyndall AFB, FL 32403-5323.

NARSTO News contribution by Ray Wells

Upper Ohio River Valley Project: Ambient PM_{2.5} Sampling and Analysis

Background

The U.S. electric-utility industry has made considerable strides in reducing emissions of SO₂, NO_x, and particulates since passage of the 1970 Clean Air Act and its subsequent amendments. For example, full implementation of Title IV of the 1990 Clean Air Act Amendments will result in an annual cap on power plant SO₂ emissions of 8.9 million tons, down from a 1990 baseline level of over 14.5 million tons. In addition, NO_x emissions during Phase I of Title IV will be reduced by 400,000 tons/year between 1996 and 1999, while Phase II will reduce emissions by another 1.2 million tons/year. Finally, the installation of controls on essentially the entire fleet of coal-fired boilers caused a dramatic decrease in primary particulate emissions. Particulate emissions in 1990 were less than 430,000 tons/year, compared with early-1970 emission levels that exceeded three million tons/year. However, despite these successes, emissions from coal-fired power plants continue to be targeted in reaction to environmental issues such as fine particulates, ozone, acidification, and air toxics.

On July 17, 1997, the U.S. Environmental Protection Agency (EPA) revised the National Ambient Air Quality Standards (NAAQS) to address ambient air concentrations of particulate matter with an aerodynamic diameter of 2.5 micrometers or less (PM_{2.5}). The new PM_{2.5} standard establishes a 24-hour average concentration limit of 65 µg/m³ and an annual mean concentration limit of 15 µg/m³ to protect human health from both chronic and acute effects associated with the respiration of fine particulate matter. The EPA also proposed regional haze regulations on July 31, 1997 focused on the impact of PM_{2.5} on visibility impairment in Class I ("pristine") areas of the United States.

Ambient fine particulate matter originates from a wide variety of emission sources, both man-made and natural. The combustion of coal to generate electricity produces both primary PM_{2.5} (e.g., fly ash, carbon soot) and gaseous precursors (e.g., SO₂ and NO_x) to the formation of secondary fine particles (e.g., ammonium sulfates and nitrates). However, there remain numerous uncertainties regarding the linkage between coal-fired boiler emissions and the concentration and composition of ambient fine particulate matter. Moreover, a recently released report by the National Research Council has recommended to EPA that there is a high-priority need to develop a better understanding of relationship between actual personal exposure to fine particulate matter and the ambient concentrations of PM_{2.5} measured at stationary outdoor monitors. This is necessary to assess the validity and meaning of past epidemiological studies and to build a base for future epidemiological studies and control strategies. The NRC also recommends that research targets greater chemical speciation of both emission sources and ambient PM_{2.5} to improve the understanding of the biologically important (i.e., those with suspected human-health impacts) components and characteristics of particulate matter.

The FY98 Congressional Appropriations called for the U.S. Department of Energy's Office of Fossil Energy (DOE/FE) to initiate a research program to address these technical and scientific issues from the standpoint of the impact of the new standard on coal-based power systems. This document presents the current status of the PM_{2.5} research program that is being developed by DOE/FE staff at Headquarters and at the Federal Energy Technology Center (FETC). As this is an evolving

(Continued on Page 6)



PM_{2.5} Sampling and Analysis, . . . *Continued*

program, this document is considered a draft and will be updated as the structure and content of the program continues to be defined.

DOE/FE's PM_{2.5} Research Program

The overall goal of the DOE/FE fine particulate program is to ensure that the best science and technology are available for any regulatory decision making related to the health and environmental impacts of ambient fine-particulate matter and regional haze. This goal will be achieved through a well-focused, highly-leveraged research program that includes ambient air-quality monitoring, atmospheric chemistry and pollutant formation and transport studies, emission characterization, and cost-effective control technology development. Where opportunities for synergism exist, the program may also address other ambient air-quality issues, such as ozone and mercury, and the impact of fine particulate matter on climate change.

Of particular significance, the DOE/FE program will provide key input to the following questions posed at a recent EPA *Particulate Matter Research Needs Workshop*¹:

- What are the characteristics of ambient particulate matter in different regions of the United States?
- How can the spatial and temporal variations in ambient concentrations be better characterized?
- What is the relationship between particulate matter concentrations at ambient monitoring sites and personal exposure to particulate matter of ambient origin?
- How can a standardized, widespread, research-grade ambient particulate matter monitoring network best be achieved to provide improved air quality data for exposure and epidemiologic studies?
- Can the non-anthropogenic background and other non-controllable background concentrations be estimated for use in risk assessments?

The DOE/FE PM_{2.5} program comprises three specific objectives:

- Evaluate the concentration and chemical composition of ambient fine particulate matter, and possibly other pollutants of concern (e.g, ozone, mercury), in order to provide improved resolution of deposition patterns, source-receptor relationships, emission trends, diurnal, seasonal, and annual variability in composition, management-strategy effectiveness, human-health effects, and regional haze and climate-change issues.
- Characterize primary and secondary fine-particle precursor emissions formed from coal-based power systems in order to assess their impact on ambient air quality and their role in human-health impacts. Also, assess the atmospheric formation and transport mechanisms and interactions between fine particle and ozone precursors.
- Develop technologies to cost-effectively control both primary particulate matter and secondary fine-particle precursors should further reductions in coal-based power plant emissions be necessary to address PM_{2.5} health or visibility issues.

The Upper Ohio River Valley Project

The new fine-particle NAAQS calls for the establishment of a nationwide network of PM_{2.5} monitors starting in late 1998. The primary objective of this monitoring effort is to identify areas of attainment and non-attainment with the new PM_{2.5} standard. However, a small but critical subset of these sites, termed "super" sites, will sample for an array of chemical species on frequent sampling intervals to address the rigorous demands involved in air-quality assessments. DOE/FE plans to work with key stakeholders, including EPA, local and state environmental agencies, NARSTO, academia, industry, and environmental groups in establishing and operating several PM_{2.5} super sites.

The DOE/FE sites will be designed to support the goal of obtaining a clearer understanding of the relationship between emissions from coal-fired power plants, and other major point and non-point sources, and ambient PM_{2.5}, regional haze, and human exposure. These sites will include both Federal Reference Method (FRM) and non-FRM samplers that will allow for the collection and

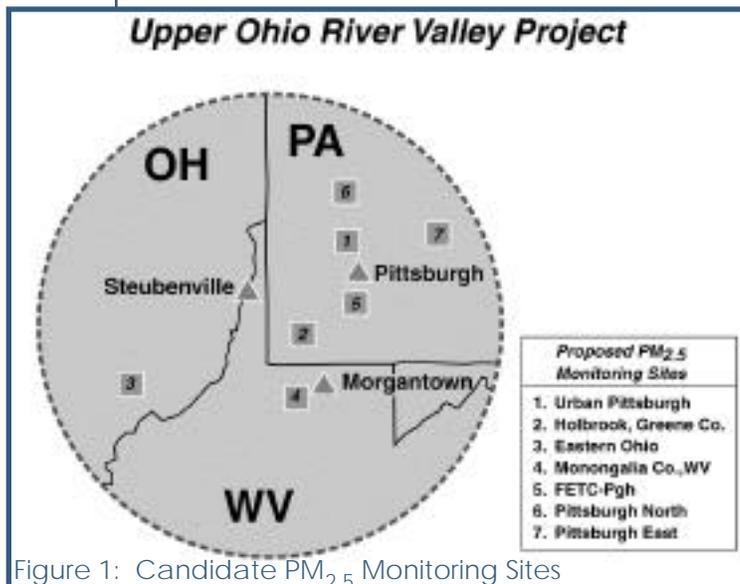
detailed chemical characterization of the samples. Continuous monitors will also be deployed for mass and for measuring the concentration of important precursor gases such as SO₂, O₃, and reactive nitrogen. In addition, the sites will collect meteorological information, including wind speed and direction, relative humidity, UV radiation, precipitation, and temperature. The data obtained from these sites will be used to perform source attribution analyses, evaluate emission inventories and air quality models, assess diurnal, seasonal, and annual variations in ambient fine-particulate composition, support epidemiological and other health-based studies, and evaluate regional haze impacts. The sites may also serve as research platforms for testing new ambient fine-particle monitoring equipment.

The Upper Ohio River Valley Project (UORVP) represents the largest component of DOE/FE's current ambient PM_{2.5} monitoring activities. This effort will involve the installation and operation of ambient fine particulate super sites in an area encompassing eastern Ohio, northwestern West Virginia, and western Pennsylvania. These sites will be equipped with a variety of equipment and instrumentation necessary for the collection and analysis of aerosol, gas-phase, and biological particulate matter and meteorological data. The purpose of the UORVP is to try to better understand the relative contribution of anthropogenic and biogenic emissions sources in the upper Ohio River Valley region on downwind ambient air quality. These sites may also be used to monitor other pollutants, such as ozone or mercury. Of particular note, EPA models have predicted that the Ohio River Valley and Western Pennsylvania are areas susceptible to potentially high mercury deposition². Contingent upon resources and research priorities, these sites could be expanded to include the collection of both dry and wet mercury samples.

While final siting of the UORVP monitoring stations is being determined, several candidate sites have been proposed (Figure 1). It is intended that at least one site be located upwind of the upper Ohio River industrial corridor in eastern Ohio to provide an air quality "baseline." In addition, an urban site will also be established in Pittsburgh,

Pennsylvania and will be coordinated with the Allegheny County (PA) Health Department's PM_{2.5} monitoring program.

Additional monitoring sites are being considered at other key downwind locations. All of the UORVP sites will be collocated with existing monitoring



stations. One possible location is the NARSTO-NE site at Holbrook, Greene County, Pennsylvania. Ambient air quality monitoring will also be carried out at the FETC research facility situated about eight miles south of Pittsburgh in South Park, Pennsylvania. The data from these urban and rural sites will be extremely relevant to any human-exposure studies planned for the western Pennsylvania area. The UORVP will be closely aligned with EPA's nationwide PM_{2.5} monitoring effort, as well as with similar research programs being supported by NARSTO, the electric-power industry, and others. Input from EPA, industry, and local and state environmental agencies has been sought in the design and implementation of the UORVP in order to ensure that it addresses the most critical research needs, including those identified in the NRC report. It is anticipated that the UORVP monitoring network will be installed and operating in early 1999.

Ambient Monitoring in the Southeast

Through an Interagency Agreement with the Tennessee Valley Authority (TVA), DOE/FE will also collaborate with TVA, EPRI, and several other

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PM_{2.5} Sampling and Analysis, . . . Continued

electric-power utilities in an evaluation of the impact of the emission of fine particulate matter on visibility at a monitoring site in the Great Smokey Mountain National Park. The agreement also calls for a study of PM_{2.5} in Atlanta, Georgia that will have as a focus the relationship between ambient fine-particle concentrations and composition and human exposure that directly responds to the NRC research recommendations. The air-quality monitoring performed in Tennessee and Georgia will help to establish a better understanding of ambient PM_{2.5} in the Southeastern United States. Further, it will serve as a point of comparison with data from the UORVP sites that offer differences in topography, climate, emission sources, and demographics.

Summary

The DOE/FE will initiate a collaborative, highly-leveraged research program in FY98 that will provide timely, high-quality technical and scientific data addressing key uncertainties, such as source-receptor relationships, fine-particle composition, and human-exposure and visibility impacts, associated with the PM_{2.5} NAAQS and emissions from coal-fired power plants. The program will also include concurrent research directed at the characterization of emissions from coal combustion and the development of cost-effective control technologies should further restrictions be placed on the emission of primary and secondary fine particulate matter. The results from this program will help ensure that sound science is brought to bear in any future regulatory decision making and that coal-based electric power generation remains a viable, environmentally sound, component of the U.S. energy mix well into the 21st Century.

References

1. McClellon, R.O., "Airborne Particulate Matter, A New Research Initiative," *Environmental Protection*, May 1998.
2. U.S. Environmental Protection Agency, "Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units - Final Report to Congress," February 24, 1998.

For further information on DOE/FE's PM_{2.5} research program, please contact:

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NARSTO News contribution by Tom Feeley

ESC Co-Chairs: Steve Cadle Assumes Private-Sector Co-Chair Position

At its 1998 Annual Meeting the Executive Assembly formally welcomed General Motors' Steve Cadle as the new Private-Sector Co-Chair of NARSTO's Executive Steering Committee. Steve assumes the gavel from Penn Power & Light's Al Ferullo, who has done an outstanding job for us during his term. The Executive Assembly also approved Environment Canada's Don McKay as Public-Sector Co-Chair Elect. Don will replace DOE's Michelle Broido when her term expires next year.

Thanks, Al; and welcome, Steve and Don!

ESC Moves Ahead on Planning for Fine-Particle Research

Following up on the action items assigned by the Executive Assembly (See lead article on page 1), the ESC is proceeding with planning for design of NARSTO's fine-particle research effort. This planning process is centered on two major workshops. The first of these is addressed primarily to fine-particle monitoring and is a response to a call from NARSTO's September 1997 workshop to create a "Blue-Ribbon Panel" to advise EPA and others on sampling technology, network layout, and measurement parameters to be used with research-grade aerosol monitoring stations. The second workshop is intended to deal with all other



Planning for Fine-Particle, . . . Continued

atmospheric aspects of fine particles, including formation, transformation, and heterogeneous chemistry, as well as emissions, removal processes, and modeling.

The first, "monitoring" workshop is designed to aid scientific planning among a variety of organizations throughout the three North American countries, several of whom are expecting to implement advanced aerosol-measurement networks in the future. A major design feature of this workshop is its promotion of a strong interactive tie between the atmospheric- and health-sciences communities, with the intent of acquiring joint and coordinated input regarding the key scientific issues that need to be addressed. Also of interest are the location, duration and kinds of atmospheric measurements that are needed to characterize ambient particulate matter and important copollutants in a way that optimizes information for multiple disciplines, including source apportionment and modeling, health and exposure studies, and risk assessment.

The monitoring workshop's steering committee met at EPA on May 19 to develop a conceptual framework to focus the discussions at the workshop. This framework provides for a science-based approach that uses a series of hypotheses and science questions centered on health effects, exposure and source/receptor issues to provide the basis for a measurement program. A white paper describing some initial ideas using this approach is in preparation and will be provided to workshop attendees.

The monitoring workshop will be held July 22 and 23, 1998 at the Omni Chapel Hotel, 1 Europa Drive, Chapel Hill, North Carolina 27541, 919-968-4900. Dan Albritton, NOAA Aeronomy Laboratory and Dan Greenbaum, Health Effects Institute will serve as workshop chairs. For additional information contact:

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A date has not yet been established for the second, "mechanistic" workshop, which is slated for sometime during early fall. Hosted by the EPA in cooperation with NARSTO, a primary goal for this workshop is to acquire widespread scientific input for use in writing NARSTO's fine-particle research plan. It is anticipated that this plan will become available as Part 4 of NARSTO's Strategic Execution Plan, (Parts 1 - 3 are currently available as downloadable documents on NARSTO's Web site). Dates and location for this workshop will be posted on the Web when they become known, probably sometime in July.

Liaison with Health-Effects Research Community: NARSTO Contemplates a Paradigm Shift

As noted on page 1, the third 1998 action item assigned by the Executive Assembly to the Executive Steering Committee was to "design, acquire financial resources for, and implement a viable and functioning NARSTO liaison structure for scientific interchange on the fine-particle issue with the health-sciences community." After extended discussion of alternative approaches to this action item, the ESC has decided it most appropriate to design this activity directly into the NARSTO fine-particle scientific effort, as opposed to adding another functional box within the NARSTO Liaison-Team organization structure. This decision is already strongly apparent in NARSTO's initial fine-particle workshop design, and can be expected to become even more visible as plans progress. Throughout all of this NARSTO intends to be highly proactive in communicating with the health community and designing its program to be responsive to scientific requirements of this group.



This "hard-wired" approach is likely to lead to a general paradigm shift during future years, where each of NARSTO's functional components will include a built-in, ad hoc communication function. As noted on page 4, such a move may be reflected in a future modification of NARSTO's Charter and its organizational structure.



U.S. EPA Sponsors Well-Attended "Photochemical Reactivity" Workshop

Follow-up Meeting Planned for September 1998

DURHAM, NC. More than 200 scientists, regulators, and industry representatives from across the nation attended the Photochemical Reactivity Workshop held by the U.S. Environmental Protection Agency on May 12-14, 1998. The workshop was called to review current science and policy issues related to the use of volatile organic compound ("VOC") reactivity concepts in ozone control strategies, and to propose research needed for development of improved strategies.

It has long been known that different VOC species may have significantly different abilities to promote formation of ground-level ozone (a major component of urban smog), and that such ability — called "reactivity" — also varies greatly with atmospheric environmental conditions. At present, US VOC control policy acknowledges reactivity only through exemption of compounds designated "negligibly reactive," but all other VOC are regulated equally on a mass-reduction or on an available-technology basis. Many believe, however, that control strategies offering greater flexibility and cost-effectiveness can be designed on the basis of more detailed reactivity criteria.

A broad range of science and policy questions was addressed at the workshop, with discussions guided by moderators Jake Hales of Envair and Howard Feldman of the American Petroleum Institute. The workshop agenda included overview presentations from regulatory agency policy and research officials, followed with more specialized presentations from many of the key scientists engaged in reactivity research both here in North America and in Europe. Representatives of chemical and chemical product manufacturers expressed industry perspectives. A Workshop Report containing summaries of the presentations and open discussions is to be prepared for distribution to all workshop attendees; others interested in obtaining a copy should consult the NARSTO Home Page for a future, downloadable electronic version.

At the end of the workshop, an "ad hoc task force" convened to begin organizing a reactivity-research working group that will develop research plans, coordinate sponsors with researchers, and transmit policy-relevant products to the regulatory community. An initial meeting of the group has been tentatively scheduled for the first week in September. Any additional parties interested in participating should contact Acting Chairman Robert Wendoll of Dunn-Edwards Corporation at (800)537-4098, or by FAX at (213)771-4440.

NARSTO News contribution by Robert Wendoll

NARSTO Model-Intercomparison Workshop Held During May in Washington DC

The idea of coordinating a number of model evaluation activities involving the NARSTO-NE 1995 data set arose at the West Palm Beach NARSTO Science Symposium in November 1997, when several representatives from modeling groups in Canada and the United States (including AES, USEPA, CRC, NYDEC, EPRI and SESARM) met, discussed model evaluation programs underway or planned for the near future within their respective organizations, and decided that considerable value would be added by comparing the results of the evaluations of their modeling systems according to some agreed-on protocols. The NARSTO ESC and S&RPG encouraged the proponents of this idea to proceed, and in March 1998 the NARSTO Executive Assembly requested that a workshop be held in order to develop a plan for a rigorous model evaluation/intercomparison, with timelines, specific deliverables and cost estimates. This plan would then be presented to the NARSTO participating organizations for funding support.

Accordingly, a workshop was organized on May 27-28 at Ford Motor Company's conference facilities in Washington DC. The workshop was co-chaired by NARSTO Modeling and Chemistry Team Leader Robin Dennis of EPA and S.Venkatেশ of AES. Twenty six scientific experts and managers attended. Support for some of the attendees was provided by EPRI, U.S. EPA, and NARSTO. The objective of the workshop was to develop a



business plan for a rigorous model intercomparison and/or evaluation program, with deliverables and costs, for presenting to NARSTO for funding support.

The workshop opened with a discussion of the main current modeling projects underway and focused on the NARSTO-NE 1995 data set. These included projects by NYDEC, funded by EPRI, by Environ, funded by CRC, by MCNC, funded by SESARM, by AES and by U.S. EPA. The span of models included five chemical transport models, three gas-phase chemical mechanisms and three meteorological drivers.

Details of the available data from NARSTO-NE and some of the questions arising from this set for modelers to potentially address, as well as some other related studies that could yield useful data around the same period (e.g. SOS/Nashville) were also discussed.

After some discussion, the following two questions were selected key considerations for model evaluation:

- (1) Do different operational modeling systems give similar or different answers to management questions?
- (2) If there are differences in model predictions, particularly for the base 1995 simulations, are the management assessments nonetheless consistent?

The focus of the study will be on the Northeastern United States and Southeastern Canada. The primary period of interest will be July 1 – August 5, 1995 with an initial focus on the period July 10 – 18, 1995, excluding model spin-up. All of the groups involved in the workshop plan to exercise their various modeling systems for the initial focus period. Several combinations of meteorological drivers and air-quality models (chemical transport models) will be involved. A more limited set of meteorological driver and air-quality model combinations will be exercised for the entire period. The primary measurement data set will come from the NARSTO-NE 95 field study, but data will also be included from SOS/Nashville and Canadian sites.

It was deemed important to exercise the models both in their native states and, to the degree possible, with harmonized emission data and

additional diagnostic outputs from the meteorological and air-quality models to elucidate the reasons for differences in the predictions of different models. It was also deemed important to advance model-evaluation methods to the greatest extent allowed by the data bases and to advance model intercomparison methods through use of additional chemical (process analysis) and meteorological diagnostic outputs and use of box-model intercomparison of the chemical mechanisms.

A report on the workshop will be available by July 1998. A detailed proposal will be submitted to NARSTO for funding by July 1998.

Any other groups interested in participating in this intercomparison study should contact either of the workshop co-chairs Robin Dennis or S. Venkatesh.

NARSTO News contribution by Robin Dennis and S.Venkatesh

NARSTO Ozone Assessment Update

With exception of a few incidental components the complete draft of NARSTO's Ozone Assessment Document is now in the hands of our Technical Editor, where it is receiving a comprehensive work-over prior to its initial round of review. The first review series is scheduled to occur during July. This will be an internal NARSTO review, performed by members of NARSTO's cognizant committees as well as by lead authors on the Critical Review Papers.

Comments obtained from this first review will be used to prepare a revised draft, which will be forwarded to the Executive Steering Committee prior to submission for further review by the National Academy of Sciences.

The Assessment's Critical Review Papers, which were presented orally at NARSTO's November 1997 Science Meeting, are currently being submitted for journal review by Atmospheric Environment. Downloadable copies of the draft manuscripts are gradually becoming available on the NARSTO Web site, with the expectation that a full ensemble of some 20 papers will be available in the near future.



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