19th International Emission Inventory Conference

"Emission Inventories – Informing Emerging Issues"

Training September 27, 2010
Conference September 28 - 30, 2010
San Antonio, Texas – Hyatt Regency

EPA United States Environmental Protection Agency

Sponsored by:
Emission Inventory and Analysis Group
Air Quality Assessment Division
Office of Air Quality Planning and Standards

Welcome to the 19th Annual Emissions Inventory Conference

The US Environmental Protection Agency (EPA) looks forward to your participation in the 19th Annual Emissions Inventory Conference in San Antonio, Texas September 27-30, 2010. This year's Conference focuses on how emission inventories inform emerging air quality and environmental issues. This theme highlights issues such as:

- How inventories can be used to assess the impact the rapid growth of oil and gas production;
- How inventories need to change to support analyses of short-lived climate pollutants;
- Quantification of emissions from new and emerging fuel technologies such as renewable fuels.

The conference will provide a useful forum for the exchange of ideas and information on the development and uses of emissions data. Participating organizations are to include state, local, tribal, regional, international agencies, and industry.

Training courses on different aspects of inventory preparation and use will be on Monday September 27, 2010. After the training day on Monday, the general Conference will open with a Plenary Session for all Conference attendees on the morning of Tuesday September 28, 2010. The plenary will include a welcome by the US EPA and local hosts, and a report from the US EPA Emissions Inventory and Analysis Group followed by a panel of speakers.

On Tuesday evening, we will have a Poster Session and Exhibitor Reception from 6:00 – 8:00 pm. Attending the reception is a great way to connect with other conference attendees and to discuss your air quality program needs with several exhibitors. We have a very interesting lineup of poster presentations and the authors will be available to explain their work and answer your questions. As we did last year, we intend to mix fun with work by offering attendees the opportunity to vote for the posters of their choice and award prizes to the winners so please stop by and participate.

We will continue hosting an emissions inventory 'software showcase'. The showcase is for both private sector software developers and public entities to demonstrate their wares to Conference attendees. Federal, state, local, and tribal agency staff as well as consultants will display their efforts with you regarding development and application of emissions inventory related software. We hope the showcase will lead to a sharing of ideas and solutions among those involved in developing and using software for emissions inventory applications. Demonstrations will be available throughout the day on Tuesday and Wednesday.

This is a great opportunity to keep abreast of developments in the world of emissions data and to share your experiences with other emission inventory professionals from federal/state/local and international regulatory agencies, tribal governments, industry and academia. We think you will also enjoy being in San Antonio and look forward to seeing you at the Conference.

Marc Houyoux
Group Leader
US Environmental Protection Agency
Emission Inventory and Analysis Group
Office of Air Quality Planning & Standards

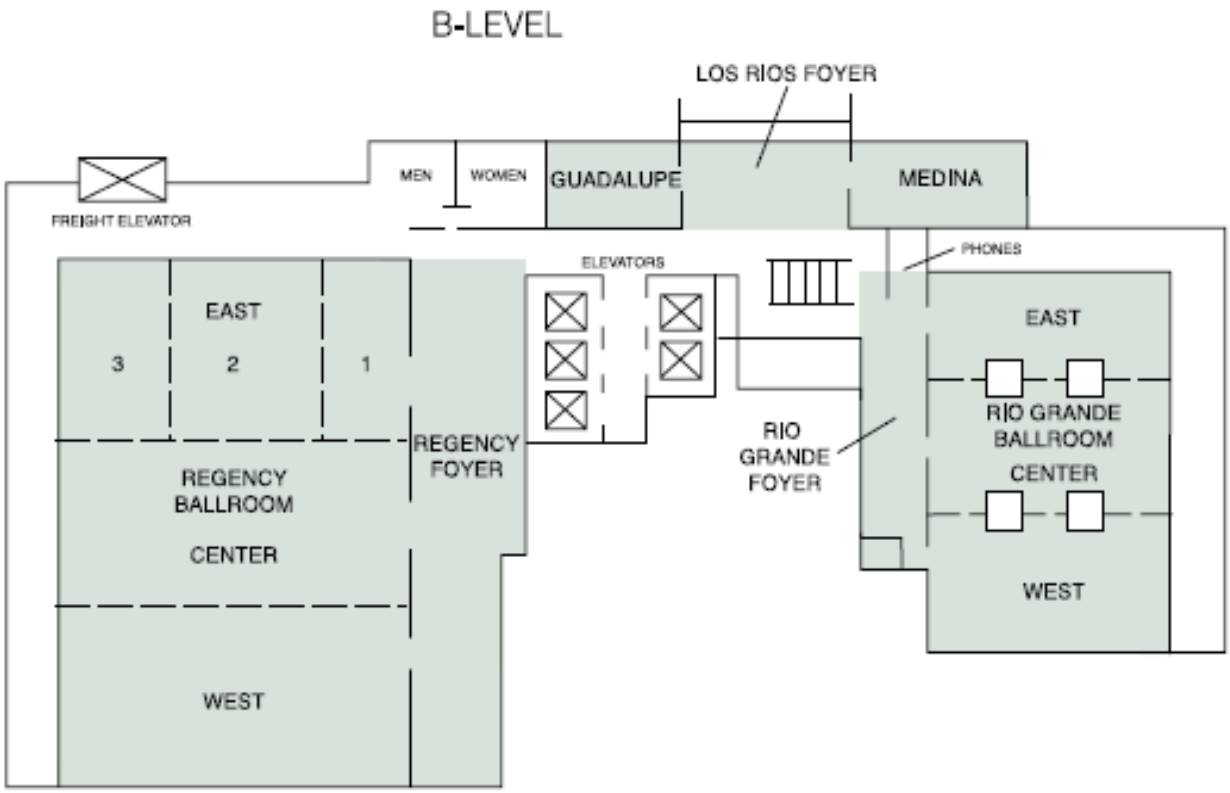
Sally Dombrowski
Technical Chair
US Environmental Protection Agency
Emission Inventory and Analysis Group
Office of Air Quality Planning & Standards

Schedule at a Glance

Date/Time	Session	Room
Mon Sep 27		
8:30 - 12:00	GHG Inventory 101	Regency East #1
8:30 - 5:00	Using MOVES for County-Level Inventory Develop	Regency East #2
8:30 - 12:00	Intro to EI for Native American Reservations	Regency East #3
1:30 - 5:00	Preparing Tribal EI Submission to EIS	Regency East #3
8:30 - 5:00	Emission Inventory System	Rio Grandee East
Tues Sep 28		
8:30 – 11:30 10:00 – 10:30	Plenary Break – *Software Showcase*	Regency East (1/2) Guadalupe
11:30 – 1:30	**Lunch (On Your Own)**	
1:30 – 2:45	- Session 1 – Air Toxics	Regency East #1
	- Session 2 – EI Preparation for Modeling	Regency East #2
	- Session 3 – Greenhouse Gases	Regency East #3
3:10 – 3:40	**Break –** *Software Showcase*	Guadalupe
3:40 – 4:55	- Session 4 – Tribal Inventories	Regency East #1
	- Session 2 – Continues	Regency East #2
	- Session 3 – Continues	Regency East #3
6:00 – 8:00	- Poster Session and Exhibitors' Reception	Rio Grandee Ballroom
Wed Sep 29		
8:30 – 10:10	- Session 5 – Global/International	Regency East #1
	- Session 6 – Mobile Sources	Regency East #2
	- Session 7 – Innovative EI Development Methods	Regency East #3
10:10 – 10:40	**Break –** *Software Showcase*	Guadalupe
10:40 – 11:55	- Session 5 - Continues	Regency East #1
	- Session 6 - Continues	Regency East #2
	- Session 8 - EI Data Analysis	Regency East #3
12:00 – 1:30	**Lunch (On Your Own)**	
1:30 – 2:45	- Session 5 – Continues	Regency East #1
	- Session 6 – Continues	Regency East #2
	- Session 8 – Continues	Regency East #3
3:10 – 3:40	**Break –** *Software Showcase*	Guadalupe
3:40 - 4:55	- Session 9 – Tools – Leveraging Technology	Regency East #1
	- Session 6 - Continues	Regency East #2
	- Session 8 – Continues	Regency East #3
5:00 – 5:30	*Software Showcase*	Guadalupe
6:00 – 8:00	**EPA HQ/RQ Meeting**	**Medina**

Schedule at a Glance (continue)

Date/Time	Session	Room
Thurs Sep 30		
8:30 – 10:10	- Session 9 – Tools – Leveraging Technology	Regency East #1
	- Session 10 – Emission Factors	Regency East #2
10:10 – 10:40	**Break**	
10:40 – 11:55	- Session 10 – Continues	Regency East #2
12:00	**Conference Concludes**	



TRAINING SCHEDULE

Monday – September 27, 2010

Course Title: **Greenhouse Gases Inventory 101**
Instructors: Andrea Denny and Leif Hockstad, US EPA
Date/Time: Monday 27, 2010, 8:30 am

Course Description:
This lecture-style course will introduce greenhouse gas inventories. Topics covered will include:

- Overview of GHG emissions sources in the US
- Purpose and scope of a GHG inventory,
- Differences between traditional criteria pollutant inventories and GHG inventories
- Choosing a baseline year
- Quantification approaches (top-down vs. bottom up)
- Available software and methodologies
- Differences between inventories and registries
- Certification and reporting protocols
- Comparability
- Level of effort

Instructors will allow ample time for Q&A with the audience.
This course is open to all conference attendees and laptops are not used.
Self-paced Alternative:
A Web-based alternative is available and allows participants to preview this course prior to attendance or provides the option of remote self-paced training, in lieu of on-site training.

A series of three, 90-minute web-based training was recorded in the fall of 2007. While aimed at state and local governments, much of the information is broadly applicable. The trainings can be viewed at http://www.epa.gov/climatechange/emissions/state_training.html

Course Title: **Using MOVES for County-Level Inventory Development**
Instructor: David Brzezinski, Gary Dolce and Harvey Michaels US EPA Office of Transportation and Air Quality
Date/Time: September 27, 2010, 8:30 am

Course Description:
MOVES2010 is EPA's current approved model for estimating air pollution emissions from on-road vehicles for regulatory purposes. This course will cover the use of MOVES at the county level, as required for SIPs and regional conformity analyses. It will include extensive hands-on training exercises including creation of a Run Specification file and use of the County Domain Manager to input local data, as well as a detailed look at MOVES data converters. This course is more detailed than past training for draft MOVES2009 and is design for people who will be using MOVES2010 to develop county-level inventories for SIPs and conformity.

PARTICIPANTS MUST BRING THEIR OWN LAPTOP COMPUTERS WITH THE LATEST VERSION OF MOVES2010 AND THE MOVES2010 DATABASE ALREADY INSTALLED AND TESTED PRIOR TO THE BEGINNING OF THE COURSE.

Course trainers will not have time to help with installations of MOVES2010 during the course. Participants should make sure that their installation of MOVES2010 is operational before they arrive at the course. MOVES2010 and associated documents are available at http://www.epa.gov/otaq/models/moves/index.htm. Users should also have Microsoft Excel or other spreadsheet software capable of opening Excel files on their

laptops. While this course will start with the basics, some prior experience with MOVES2010 or Draft MOVES2009 is helpful.

Class size will be limited to 35 students with laptop computers. Organizations should limit the number of students sent to allow space for the maximum number of individual organizations to attend.

Course Title: Introduction to Emission Inventory for Native American Reservations
Instructor: Sarah Kelly and Angelique Luedeker, Institute of Tribal Environmental Professionals
Date/Time: Monday September 27, 2010, 8:30 am

Course Description:
This training is for tribal environmental professionals who are interested in conducting an emissions inventory for their tribe's lands. We will cover basic emission inventory concepts and strategies for getting started using the TEISS emissions inventory software. **LAPTOPS REQUIRED**

Course Title: Preparing Tribal Emission Inventories for Submission to the EIS
Instructor: Sarah Kelly and Angelique Luedeker, Institute of Tribal Environmental Professionals
Date/Time: Monday September 27, 2010, 1:30 pm

Course Description
This training is for tribal environmental professionals who want to submit their completed emission inventory to the National Emission Inventory through EPA's Emission Inventory System (EIS). Participants should have their emission inventories complete or close to it. This is not an introductory course. We will cover data formatting tools and the EIS submission process.

Course Title: Emission Inventory System (EIS)
Instructor: Sally Dombrowski and Roy Huntley, US EPA
Date/Time: Monday September 27, 2010, 8:30 am

Course Description
This course is a repeat of the course offered to State/Local and Tribal agencies this past year. We will cover the required data elements needed to report your facility, point, nonpoint, onroad, nonroad and event inventories. Use of the Bridge Tool, the procedure for submitting data using the Web Client, and an overview of the EIS Gateway will be covered. Intended audience - State/Local Agencies, Tribes, Contractors

State/Local and Tribal Agencies

The first deadline has passed to submit your data to the Emission Inventory System, and you should be working on submitting any follow-up data, or corrections, by November 1, 2010. We understand that this has been a steep learning curve for both you and EPA, as we try to streamline the development of the National Emission Inventory (NEI), and would like to thank you for your cooperation and understanding.

We are very interested in hearing your comments on the process for submission, the EIS Gateway, the Bridge Tool, and any improvements that we might consider for the future. Comment forms are located at the Conference Registration Desk. We will review all comments and include them in our decision making as we move forward with improvements to the system.

Again, thank you, and we hope that we have reached our goal of providing a more transparent and accurate NEI.

Sally Dombrowski
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Plenary Session

Tuesday September 28, 2010 8:30 -11:30 am

Plenary Session Host: Al Armendariz EPA, Region 6 Administrator (***Invited***)

I. Keynote Topic: How inventories can be used to assess the impact the rapid growth of oil and gas production and associated air quality and environmental issues. Using oil & gas production activities as example, a Panel of (3) speakers will describe how their state's permitting and control technology requirements relate to the various kinds of emission inventories they need for present and future NAAQS planning needs.

Presentations will cover the following issues:

- Profile of the growth in the oil and gas sector in state/ local area and associated air quality issues.
- Approach to developing a more locally representative emissions inventory for this sector.
- Policies and mitigation measures anticipated for this industry sector and potential emission reductions.

Panel moderator: Tom Moore, Western Governors' Association

Panel speakers/presentations:

1) Wyoming DEQ AQ | Brian Bohlmann
WY is permitting and developing emission inventories for approximately 3,500 natural gas wells

2) Texas CEQ | Keith Sheedy
TX is investigating the Barnett shale formation near Dallas for possible impact on O3 attainment, and air toxic concerns, also conducting surveys of oil & gas processes.

3) New Mexico AQB | Mark Jones
NM in involved in the WRAP stage 3 characterization of oil and gas processes for their local areas.

II. EPA status reports:

GHG Mandatory Reporting Rule | Kong Chiu, OAP CCD

- Recap of due dates, for / by whom
- Current activities by industry, state/ local agencies, regional consortiums for meeting reporting dates
- Outlook for integrating the reported GHG data with state / local reported emissions in EIS

NEI 2008 | Sally Dombrowski, OAQPS EIAG

- Status of State/ local and Tribal agency data submittals to EIS
- Draft Version 1; next steps/ timetable for final version

Emissions Inventory Software Showcase

GUADALUPE ROOM

We are hosting an emissions inventory 'software showcase' for both private sector software developers and public entities to demonstrate their wares to Conference attendees. The following lists the expected participants and software demonstrations. Demonstrations will be available during breaks, lunch and at the conclusion of each conference day on Tuesday.

Tuesday, September 28, 2010

10:00 am **Greenhouse Gas Mitigaiton Strategies Database, UNC-Chapel Hill -** Web application that allows a user to explore various mitigation strategies and technologies for CO2 emissions.

3:10 pm **regAction, IEA, Inc. (International Environmental Associates, Inc) -** The regAction system is made up of many inter-related applications that provide for full EHS compliance and Sustainability Data Management. Three related applications within the system support the emissions inventory process. WebMonitor supports data transfer, data quality review, data manipulation and limit notifications between the plant process data historians and the regAction system. WebEI runs periodic (Monthly, Quarterly, Semi-annual or Annual) emissions calculations from data received through webMonitor or directly uploaded into webEI by the user. WebEI also supports direct electronic emissions inventory submission to the state agencies. webCO2+(webCO2plus)manages source CO2e calculations and supporting compliance documentation and will have electronic submission of Part 98 data to the EPA once the agency provides format and content requirements to third party providers. – ***Also an Exhibitor***

Wednesday, September 29, 2010

10:10 am **RFS Consulting, Inc -** REMIS is a dynamic and powerful tool for emission inventories, compliance assurance, and support for system engineers. REMIS houses information for an unlimited number of facilities including such data as legal descriptions coordinates, driving directions, ESH and Responsible official contacts, and more. For each facility, REMIS house details on each type of equipment located there, such as unique identifiers, agency identifiers, function, manufacture make and model, design rates, permit rates, physical parameters (stack height, diameter)and assigned primary and secondary emission factors. REMIS also houses emission factors such as AP-42 factors, manufacture factors, or custom emission factors, including criteria, hazardous, and greenhouse gas pollutants. REMIS has proven valuable to engineering staff by identifying what equipment is in the field and where is located. REMIS extremely user friendly, having been designed, built, and used by environmental professionals. REMIS is also a networkable and multiuser tool. – ***Also an Exhibitor***

3:10 pm **Lakes Environmental Software** Emissions Inventory (EI) View is designed to mange large-scale (i.e., County, statewide or national-level emission inventory programs. This powerful package features a unique spatial and temporal GIS-based platform that enables users to create and maintain a comprehensive emissions inventory of a variety of sources including point, area, and mobile sources. The EI View system includes 1000's of emissions calculators and emissions factors and other productivity tools for developing emission inventories, data analysis and reporting tools including automatic reporting to Federal inventory programs such as NEI and TRI. EI View incorporates all related emissions guidance and models into one central unified interface. For additional information visit: http://www.weblakes.com/products/emissions/index.html - ***Also an Exhibitor***

Tuesday, September 28, 2010

Session 1: Air Toxics

Chairs: Lynn Barnes, SC DHEC
Darcy Wilson, ERG

1:30 "A Comprehensive Model for Multi-Pathway Risks From Air Pollution: Emission Inventory Preparation", C. Yi Wu, G. Pratt and M. Dymond, Minnesota Pollution Control Agency

The Minnesota Pollution Control Agency (MPCA) together with Lakes Environmental, Inc. developed a tool (MNRiskS for Minnesota Risk Screening) to evaluate the potential health risks from all inventoried sources of air pollution in the state. The tool is used not only as a means for adding context to the facility-specific risk assessment process, but is also broadly useful in air regulatory programs for identifying pollutants, exposure pathways, geographic areas, sources, and receptors of potential concern. In the preliminary study, issues identified regarding the emission inventory data, including stack parameters for point sources, methods for allocating county-based non-point source emissions to census tracts, and the possible occurrence of double counting for grouped pollutants. To resolve these issues, the 2005 emission inventory data were extensively reviewed, enhanced and corrected as necessary. Point sources with problematic data were identified and contacted for corrections. For nonpoint sources, new activity data were collected, and methods for allocating emissions were developed. Pollutant groups were assigned to specific species where data were available, and in other cases duplicative data were removed. The accuracy and completeness of the updated version of the 2005 emission inventory was improved greatly. The data will be incorporated into an updated version of MNRiskS.

This paper discusses the data issues addressed during the process preparing the 2005 emission inventory for MNRiskS. Detailed methods for allocating nonpoint source emissions and treating grouped pollutants are provided. This paper also summarizes the improvements in the emissions inventory and the expected effects on risk assessment results.

1:55 "Results of the 2005 NATA Model-to-Monitor Comparison", R. Oommen, Eastern Research Group

Acute and chronic exposure to specific hazardous air pollutants (HAPs) can lead to cancer and/or noncancer effects. Since the passage of the 1990 Clean Air Act Amendments (CAAA), the U.S. Environmental Protection Agency (EPA), state, local, and tribal agencies have spent considerable time and resources establishing regulations primarily through maximum achievable control technology (MACT) and mobile source standards, to reduce emissions for hazardous air pollutants (HAPs). Identification of the most important individual emission sources and source categories significantly contributing to potential health risks is challenging for many air quality managers. Large reductions in HAP emissions may not necessarily translate into significant reductions in health risk because toxicity varies by pollutant. For example, acetaldehyde mass emissions are more than double acrolein emissions on a national basis, according to EPA's 2005 National Emissions Inventory (NEI). However, according to the Integrated Risk Information System (IRIS), acrolein is 450 times more toxic in terms of respiratory noncancer risk than acetaldehyde. Thus, it is important to account for the toxicity as well as the mass of the targeted emissions when designing reduction strategies to maximize health benefits. One important tool for air quality managers is EPA's National Air Toxics Assessment (NATA), which uses HAP emissions from the NEI, meteorological data, background concentrations, and population densities to calculate census-tract level toxicity risk by HAP and source category.

This paper analyzes the model performance of the 2005 NATA through a model-to-monitor comparison, in which census-tract level concentrations calculated from the NATA model are compared to 2005 annual average concentrations of individual HAPs for several hundred-air toxics monitoring sites across the country. The results are summarized by HAP, and are important in understanding the strengths and limitations of air toxics modeling.

Panel: This panel will discuss several areas where emissions inventory and monitoring data focused on local communities to better assess air toxics and their effects on the nearby residents. The panel includes perspectives from both the national and state levels.

2:20 "The Influence of Air Toxics Emission Inventory Selection on Air Quality Model Predictions in Corpus Christi, Texas", E. McDonald-Buller, Y. Kimura, G. McCaughey, D. Sullivan and D. Allen, Center for Energy and Environmental Recourses, University of Texas at Austin; G. Yarwood, E. Ti and U. Nopmongcol, ENVIRON, CA; C. Colville, ENVIRON, TX

Ambient monitoring, emission inventory development, and air quality modeling of air toxics are critical elements of human exposure and health risk assessments. The Port of Corpus Christi, Texas is among the largest in the United States with significant petroleum refining and chemical manufacturing industries. The close proximity to residential areas has raised concerns about exposure to air toxics. Since mid-2005, The University of Texas at Austin has operated a seven-site network that measures total non-methane hydrocarbon and meteorological data as well as threshold triggered canister samples. Automated gas chromatographs are operated at two of the seven sites. Numerous inventories of air toxics emissions from industrial sources have been compared for the Corpus Christi region. Predicted concentrations of historically important air toxics in the region using the AERMOD and CALPUFF dispersion modeling systems are also under development. This study reports the findings of the emission inventory comparisons for benzene and 1, 3-butadiene, respectively, and examines the implications of point source emissions inventory variability on dispersion model predictions of benzene concentrations using CALPUFF. An underlying difference between the emission inventories is related to the chemical speciation of emissions that are otherwise reported as VOC with unspecified composition and the accounting for rule effectiveness.

"The School Air Toxics Project – Lessons Learned From Decisions Based on Using Air Toxics Emission Inventories", B. Driscoll, US EPA

On March 31, 2009, EPA released a list of priority schools for air quality monitoring as part of an initiative to understand whether outdoor toxic air pollution poses health concerns to schoolchildren. Schools were selected using a number of factors, including results from the National- Scale Air Toxics Assessment (NATA)computer modeling analysis using the 2002 National Emission Inventory (NEI), results from a recent newspaper series on air toxics at schools (modeling analysis using the 2005 Toxics Release Inventory (TRI)), and in consultation with state and local air agencies. Information from these sources was used to prioritize pollutants and possible emission sources and identify schools for further investigation.

Early in the process of selecting schools and after the selection, it became clear that facility information provided in the various inventories was often incorrect, as facilities had often over reported, miss-reported or under reported. This presentation will focus on lessons learned through the process and recommendations for improvement.

"Chicora Elementary Air Toxics Monitoring Project", L. Barnes, South Carolina Department of Health and Environmental Control

Chicora Elementary School located in North Charleston, South Carolina was one of 63 schools chosen as part of EPAâ€™s Assessing Outdoor Air Near Schools air toxics project. This unique project involved EPA collaborating with states to monitor for toxic air pollutants at schools that had a high potential to be impacted by industrial facilities€™ air emissions. The South Carolina Department of Health and Environmental Control (SCDHEC) worked with EPAâ€™s Region 4 Office to have Chicora Elementary included in the project. At least part of the reason for EPA including Chicora Elementary in the project was the significant amount of efforts that SCDHEC had committed in the North Charleston area to evaluate the impacts at the school and in the communities from the industrial facilities and nearby major interstate roads. SCDHEC had developed and were implementing a plan to assess the impacts on the schools in the North Charleston area through evaluating toxic air emission inventories for the major industrial facilities and using these inventories to model the impacts. Because South Carolina has regulations requiring Title V facilities to submit air toxics emissions, we had emissions data readily available to begin the assessment. This data was used to perform combined modeling of actual emissions. The modeling results were used in evaluating the best locations for both the EPA samplers

located at the school and additional air toxics samplers in the area. The results from the air samplers along with the modeling will be used to assess the impacts of air toxics in the communities.

Another important aspect of this project was a partnership with industry, the local school district and community leaders. This allowed sharing of information and provided facility contact directly involved with the project. It also facilitated a close working relationship with the school. We have also worked with the school to use the project to teach the children about the environment and about air monitoring. Our relationship with the school has helped to get information on the project to the studentâ€™s parents and others in the community. Both Administrator Jackson and Deputy Administrator McCarthy have visited the school this year to learn more about the project and to see the monitor.

3:10 BREAK

Session 4: Tribal Inventories and Issues

Chairs: Sarah Kelly, ITEP

3:40 "The Emission Inventory Preparation Plan", K. Ray, Air Resource Program, Confederated Tribes of the Colville Reservation

An emission inventory preparation plan (IPP) is an important tool, which provides guidance before conducting the inventory. The Air Resource program of the Confederated Tribes of the Colville Reservation utilizes the Tribal Emission Inventory Software Solution (TEISS) program IPP wizard to focus our effort in conducting our emission inventory. The IPP wizard is a menu-based program that allows Tribal air programs to fill in the desired information for categories and panels, and then print a complete implementation plan. An effective IPP will describe how data will be collected; what information exists already; how to collect additional data and describe how the information will be reported. The IPP assists air managers about what data to include and how it should be used before the inventory begins. A complete IPP defines which facilities, SCC codes, emission factors and pollutants measured will be part of the effort. This plan can be used to inform Tribal administrators, EPA and the public of the scope and use of the emission inventory. This paper discusses how we effectively utilized the wizard to prepare our inventory preparation plan for the 2008 base year.

4:05 "Emission Inventory System (EIS) within a Tribal Community", C. M. Horan, Salt River Pima Maricopa Indian Community – **Also in Poster Session**

Salt River Pima Maricopa Indian Community (SRPMIC) is a federally recognized Indian tribe, located in Maricopa County, AZ. The Community is situated within a large metropolitan region with a population of over 2 million people that includes the cities of Mesa and Tempe to the south, the cities of Phoenix and Scottsdale to the west and the cities of Fountain Hills and Scottsdale to the reservation's northern boundary. SRPMIC's Environmental Protection & Natural Resources (EPNR) implemented the Emission Inventory System (EIS) data flow. The Emission Inventory System is the new information system for storing current and historical emissions inventory data. The system is EPA's compilation of estimates of air pollutants discharged on an annual basis and their sources. The compilation includes emissions estimates submitted by State, Local and Tribal air pollution control agencies, estimates calculated by Environmental Protection Agency (EPA), and emissions obtained from other sources. EPA uses the system to track emissions over time, develop regional pollutant reduction strategies, set and analyze regulations, perform air toxics risk assessments including inhalation risks and multi-pathway exposures, model air pollutant dispersion and deposition, and measure environmental performance as required by the Government Performance and Results Act. After implementing these data flow, the Community is able to communicate environmental data information quickly to external organizations, and more importantly to the SRPMIC Tribal Community Members.

4:30 "Updates to the Tribal Emission Inventory Software Solution (TEISS)", S. Kelly, Institute for Tribal Environmental Professionals, Northern Arizona University

Recent updates and changes to the TEISS program will be described. The data entry interface, data elements required, and the reporting functions of TEISS have all been changed in the recent TEISS update. TEISS will now be compatible with the U.S. EPA's Emission Inventory System (EIS).

Session 2: EI Preparation for Modeling

Chairs: Marc Houyoux, US EPA
Zachariah Adelman, UNC

1:30 "Development of a Local Scale Emissions Inventory for the Cleveland Multiple Air Pollutant Study", B. Reid, E. K. Pollard, Y. Du and L.R. Chinkin, Sonoma Technology, Inc; D. Hammond and G. Norris, US EPA

The Cleveland Multiple Air Pollutant Study (CMAPS) is an air pollution measurement and modeling research study investigating sources of air pollution in Cleveland, Ohio, and the distribution of pollutants across the metropolitan area. The U.S. Environmental Protection Agency (EPA) began this study in July 2009 and has worked in collaboration with partner agencies such as the Cleveland Division of Air Quality, the Akron Regional Air Quality Management District, and the State of Ohio.

To support air quality modeling conducted as part of CMAPS, Sonoma Technology, Inc. (STI) developed updated emissions inventories for the Cleveland area that reflect conditions during the CMAPS measurement period, with a special focus on August 2009 and February 2010—months when EPA was conducting intensive ambient measurements. Updated emissions estimates were based on information gathered from facility surveys, travel demand modeling for the region, vessel call data for the Port of Cleveland, and other local sources of data. Pollutants addressed in the emissions inventory will include speciated mercury and other air toxics. Final 2009 and 2010 inventories were processed through the Sparse Matrix Operator Kernel Emissions Modeling System (SMOKE) to develop emissions inputs for the Community Multi-scale Air Quality model (CMAQ)

1:55 "Development of an Emission Inventory for Natural Gas Exploration and Production in the Haynesville Shale and Evaluation of Ozone Impacts", S. Kemball-Cook, A. Bar-Ilan, J. Grant, L. Parker, J. Jung, W. Santamaria and G. Yarwood, ENVIRON International Corporation

The Haynesville Shale is a rock formation that lies at depths of 10,000-13,000 feet below the surface near the Northeast Texas/Northwest Louisiana border near Shreveport. This formation is estimated to contain very large recoverable reserves of natural gas and during the two years since the drilling of the first highly productive wells, they have been the focus of intensive exploration and leasing activity. The development of natural gas resources within the Haynesville Shale is likely to be an important driver of local economic growth, but may also generate significant emissions of ozone precursors. Based on well production data from state regulatory agencies and a review of the available literature, projections of future year Haynesville Shale natural gas production were derived for 2009-2020 for three scenarios corresponding to limited, moderate, and aggressive development. These production estimates were then used to develop an emission inventory for each of the three scenarios. Results for 2020 for the moderate scenario project that more than 120 tons/day of NOx will be emitted from Haynesville Shale sources. Ozone modeling of the year 2012 using the CAMx model showed that significant 8-hour ozone impacts occurred within Northeast Texas and Northwest Louisiana because of development in the Haynesville Shale and that ozone increases from the Haynesville Shale emissions can affect regions outside Northeast Texas and Northwest Louisiana. This study evaluates only near-term ozone impacts, but the emission inventory projections indicate that Haynesville emissions may be expected to increase through 2020.

2:20 "Analysis of a New Stationary Non-GU Projection Methodology", R. Mason and L. Chappell, US EPA; A. Bollman and V. Glenn, E.H. Pechan

The Environmental Protection Agency (EPA)'s Office of Air Quality Planning and Standards (OAQPS) has begun to develop a new approach for projecting non-EGU stationary sources. For the last several years, emissions from stationary non-EGU stationary sources, specifically industrial sources, have been held at base year inventory levels when preparing emissions for future year scenarios. The reason for this was the lack of correlation between observed trends in emissions and the primarily economic-based projection (growth) factors in use at the time. In recent history observed emissions have been decreasing in most industrial sectors; however, economic-based growth factors, such as production output have often been increasing. It became apparent that improvements in efficiencies and technologies, and not just control measures, were not being accounted for and that reality was closer to no-growth than the economic-based growth factors we had been using.

Now however, a new approach has been developed that better reflects the improved efficiencies and technologies in many of the industrial source sectors. This paper will analyze the impact of these new growth factors on select priority industrial point source sectors including, but not restricted to Primary and Secondary Aluminum Production, Cement Manufacturing, Pulp and Paper, and Refineries. We will compare the cumulative impact of these priority sector projections to total anthropogenic emissions at various geographic scales for a couple of future year base case scenarios. Ultimately, EPA will be soliciting comments from industry, the public, and internally via a Notice of Data Availability (NODA). The results of these comments and subsequent improvement of these data will likely be incorporated in future year scenarios for regulatory air quality modeling in the coming year.

2:45 "New 2006 Canadian Emissions Files for Air Quality Modeling", M. Sassi, J. Chen, S. Cousineau, D. Davignon, M. Moran, J. Zhang, Q. Zheng and B. Taylor, Environment Canada

The Air Quality Modeling Applications Section of Environment Canada is developing emissions modeling files to be used for air quality policy scenario assessments. A transition from 2002 to 2006 reference emissions inventories was recently completed. It involved updates to inventories and surrogate fields as well as new developments in mobile emissions modeling and improved treatment of PM emissions.

As Canadian area emissions inventories are published on a provincial level, the accuracy of the final emissions modeling files is very dependent on the quality of the spatial surrogates used. A new set of spatial surrogate fields were developed based on improved socioeconomic data from the 2006 Canadian census. The treatment of PM emissions was also revised. Sector-specific PM size disaggregation into 12 size bins, and SCC-specific chemical speciation for the ADOM II chemistry mechanism were applied. The generation of the transportable fraction was also revised.

The treatment of mobile emissions benefited from an extensive update to the Canadian version of MOBILE6. The model integrates the latest Canadian and EPA measurements to account for recent vehicle technology and biofuels use. Additional VOC species from MOBILE6 were also used to develop speciation profiles for the ADOM-II mechanism. Emissions sensitivity to fuel composition is an asset for policy scenarios and was used to study the impact of biodiesel fuels in heavy-duty diesel vehicles. Mobile emissions also have improved spatial and temporal distributions.

These improvements in the generation of Canadian emissions modeling files allow greater flexibility in the design of air quality modeling scenarios.

3:10 BREAK

3:40 "Use of MOVES2010 in Link Level On-Road Vehicle Emissions Modeling Using CONCEPT-MV", C. E. Lindhjem, A. DenBleyker, M. Jimenez, J. Haasbeek, A. K. Pollack, ENVIRON International Corporation, CA; Z. Li, Clark County, Las Vegas, NV

Transportation and air quality modelers in nonattainment areas need to prepare on-road vehicle emissions inventories that are an accurate reflection of the area's activity. On-road vehicle emissions affect air quality both in terms of the daily emission rates as well as in terms of the spatial and temporal allocation of those emissions. This work redesigned and applied a computer program, the CONCEPT Motor Vehicle (MV) emissions model, to use EPA MOVES2010 model emission rates in detailed link level on-road vehicle emissions modeling. Presented in this work is a description of that program and emission results using link level activity data for Clark Co. (Las Vegas) Nevada with MOVES2010 emission rates.

4:05 "Development of Drivers and Post-Processing Scripts to Incorporate MOVES2010 Emission Factors with the Smoke Emissions Model", C. E. Lindhjem, A. DenBleyker, M. Jimenez and A. K. Pollack, ENVIRON International Corporation

The MOVES2010 model was release December 2009, and is now the official regulatory tool to develop on-road vehicle emissions inventories. The objective of this work was to design and implement necessary pre-processors, automated run scripts, and post-processors so that MOVES2010 emission factors could be incorporate into SMOKE for estimating on-road mobile source emissions for regional modeling efforts.

This paper describes the approach used to program automated driver scripts to create input files (called 'runspec' files) and to run the MOVES2010 model to create emission factor lookup tables. The MOVES2010 lookup tables include running ('rateperdistance'), start and parked exhaust and permeation in addition, leaks ('ratepervehicle'), parked vapor venting ('rateperprofile') emission factors. MOVES2010 need to be run multiple times to account for ambient temperature ranges for representative counties to use with individual county activity data. This paper describes unique run characteristics for each lookup table and how the driver script program works.

This paper also describes how the raw data from the MOVES2010 lookup tables are parsed, sorted, and condensed so that SMOKE can read and use them to create regional emissions inventories. MOVES2010 lookup table emission factor outputs are provided in a form not easily read by SMOKE, and this paper describes how those outputs are reformatted for use with SMOKE. The output lookup table postprocessor includes a cross-reference scheme to convert MOVES source (vehicle) and road types to the standard SCC scheme and the MOVES2010 particulate matter speciation to the standard SMOKE speciation.

4:30 "The Integration Approach of Moves and Smoke Models: Part-2; Developments of Meteorological preprocessor and SMOKE enhancements to incorporate MOVE2010 Emission Factors", B. H. Baek and C. Seppanen, Institute for the Environment; M. Houyoux, US EPA

The successful use of the MOVES2010 emission factor calculations for a regional modeling requires careful planning and a clear understanding of emission rates calculation in MOVES2010. To reduce the time and effort required of the user for this process, and to help the user obtain accurate modeling results, EPA initiated this work to integrate the MOVE2010 and SMOKE models.

The first part of the integration was to develop the meteorological data preprocessor that prepares spatially and temporally average temperatures and relative humidity to provide the meteorological conditions for both the MOVES2010 and SMOKE models. The next part was to develop the MOVES2010 driver and post-processing scripts to help users to setup and run MOVES2010 model efficiently to generate lookup tables of emission rates for all emission processes for SMOKE. The last part was to develop how to process those MOVES2010 lookup tables through SMOKE to create hourly gridded and speciated input files for a regional air quality modeling.

This paper describes how the meteorological data are prepared, so that MOVES2010 and SMOKE can read and use them for their modeling and how the MOVES2010 lookup tables are processed through SMOKE modeling system using average/real-time hourly gridded meteorology data. When user estimates on-roadway running emission processes, county-total VMT and average speed inventory are used as an input to use the

'rateperdistance' lookup table. However, SMOKE requires county-total vehicle population by vehicle type as input to use the 'ratepervehicle' and 'rateperprofile' lookup tables for off-network and parked vapor venting emissions processes, respectively.

Session 3: Greenhouse Gases

Chairs: Andrea Denny, US EPA
Leif Hockstad, US EPA

1:30 "Understanding Uncertainty in Greenhouse Gas Emission Estimates: Technical Considerations and Statistical Calculation Methods", K. Ritter, American Petroleum Institute; M. Lev-On, The LEVON Group

The global oil and natural gas industry has been active in promoting consistency and harmonization for greenhouse gas (GHG) emission inventories. Inventories of typical oil and natural gas operations are quite complex, combining measured and estimated emission data according to regulatory requirements and available information. With the emergence of GHG emissions trading systems and new reporting schemes, data quality assurance is receiving increased attention as a prerequisite for accurate GHG emissions reporting and emission reductions. The uncertainties inherent in the data used for emission inventories help inform and improve understanding for the data's use, and also enable identifying specific areas for enhanced data collection and targeted inventory improvements. The uncertainty of an inventory, or of quantified emission reductions, is determined largely by the uncertainties of the largest contributing sources. In turn, each of these uncertainties depends on the quality and availability of sufficient data to estimate emissions, or on the ability to measure these emissions and properly account for their variability. This paper will present an overview of API-sponsored work to develop technical considerations and statistical calculation methods for quantifying the uncertainty in GHG emissions, which complements the API GHG methodology compendium. In general, these efforts will augment existing industry guidance and provide technically valid approaches to assess uncertainty ranges beyond single point data accuracy determinations. The topics included are: clarification of the sources of uncertainty in entity emission inventories; information on measurement practices and their associated uncertainties; and explanation of statistical procedures that can be used to quantify uncertainties.

1:55 "Upstream Oil & Gas Sector Greenhouse Gas Reporting Protocol Development", T. Moore and L. Gribovicz, Western Governors' Association/Western Regional Air Partnership

The exploration, production, and gathering activities associated with the upstream Oil and Gas (O&G) sector are the subject of significant interest and concern regarding air quality, climate change and other environmental impacts. Emission totals of Greenhouse Gasses (GHG) from these O&G operations are significant, thus accurate measurement and reporting of the emission totals is crucial for understanding and evaluating the impacts and designing potential control options for mitigating the impacts from these air emissions. The Western Regional Air Partnership (WRAP), in conjunction with project sponsors including The Climate Registry, the New Mexico Environmental Department and the California Air Resources Board, has been working on development of a GHG accounting protocols for this upstream O&G sector so that O&G operators can report and verify GHG emissions. The protocols are tailored to reporting under both voluntary and mandatory reporting regimes. Links are provided to allow interested parties to review the background, details and supporting documentation of the project.

2:20 "Prompt Indicator of Trends in Australian Greenhouse Gas Emissions", G. Anderson and H. Saddler, Pitt&Sherry, Australia

Emissions from stationary energy and transport account for about 70% of total Australian emissions from all sectors except Forest and Grassland Conversion. Furthermore, these combustion emissions typically contribute more than 90% of annual increases in emissions. Under commitments to the UNFCCC, national greenhouse inventories are calculated annually. In Australia, the calculations are largely based on national data gathered by government agencies. Inventories are integral to tracking emissions trends and targets, yet Australian inventories are released 18 months after the end of the inventory period. Our method for achieving a 'prompt indicator' of national emission trends is based on monthly electricity, petroleum and natural gas data. The resulting monthly time series is rebased against the most recent published National Greenhouse Gas Inventory

(NGGI). The national emissions prompt indicator runs only six weeks behind time - well within the typical lag of other economic indicators.

The indicator is calculated monthly as follows:
(1) Emissions from all fuels consumed at all National Electricity Market power stations plus (2) Emissions from total national sales of petroleum products plus (3) Emissions from consumption of natural gas in eastern and southern Australia, i.e. excluding Western Australia There are known omissions and unwanted inclusions in the input data. Error is kept to a minimum by re-basing the indicator against the most recent NGGI. The only explicit source of error is in the change in the net value of omissions and inclusions from the end point of the NGGI up to the time of the indicator.

2:45 "Preliminary Results from Fugitive Emission Measurements of Selected Components at Compressor Stations", M. Harrison, URS Corporation

This presentation will review the initial results of work done by The University of Texas and URS Corporation for the United States Environmental Protection Agency. In Phase 1 of the project in 2009 and 2010, initial measurements were made for compressor related fugitive components at five compressor stations. Recent measurements included compressor related fugitive components (flanges, valves, open-ended-lines, pressure relief valves) as well as blowdown vent lines and compressor seal and rod packing emissions.

A comparison will be made of the preliminary data to the existing emission data generated in the 1990's for The Gas Research Institute and the EPA. When the project is complete, these measurements will be supplemented with additional data from other stations in other areas of the U.S. The emission factor results may replace the emission factors for these components that were previously published in the GRI/EPA study.

This study may be of special interest since the measurement techniques used were nearly identical to those that the EPA recently outlined in the April 12, 2010 proposed Subpart W of the greenhouse gas (GHG) Mandatory Reporting Rule (MRR).

3:10 BREAK

3:40 "Port Authority of New York and New Jersey Criteria Pollutant and Greenhouse Gas Emission Inventory – Calendar Years 2006-2008", S. Colodner, M. Mullen, M. Salhotra, J. Schreiber, M. Spivey, K. Thesing, J. Wilson Jr., E.H. Pechan & Associates, Inc.; R. Adamson and T. Hansen, Southern Research Institute; L. DeSantis, Port Authority of New York and New Jersey

The Port Authority of New York and New Jersey (PANYNJ) has adopted a policy to reduce its greenhouse gas (GHG) emissions by 80 percent by the year 2050. For this project, Pechan and Southern Research Institute developed 2006, 2007, and 2008 calendar year GHG and criteria pollutant emission inventories for Port Authority facilities and operations, including the emissions of its tenants (e.g. airlines and shippers) and patrons (e.g., airport passengers, PATH riders). In addition, the consulting team developed and implemented systems that allow for annual tracking and reporting of GHG emissions. The PANYNJ manages and maintains the bridges, tunnels, bus terminals, airports, Port Authority Trans-Hudson (PATH) commuter rail system and marine terminals that are critical to the metropolitan New York and New Jersey region's trade and transportation capabilities. Major facilities owned, managed, operated, or maintained by the PANYNJ include John F. Kennedy International (JFK), Newark Liberty International, and LaGuardia airports; the George Washington Bridge; the Lincoln and Holland tunnels; Port Newark and the Howland Hook Marine Terminal; the Port Authority Bus Terminal; and the 16-acre World Trade Center site in Lower Manhattan. This paper addresses the challenges associated with developing consistent GHG and criteria pollutant emission estimates for a diverse set of source types, updating these methods with time as new information and new protocols emerge, and having methods that are sensitive to the measures being adopted by the PANYNJ to reduce their emissions.

4:05 "Development of a Regional Greenhouse Gas Inventory and Forecast Including Direct and Consumption-Based/Energy-Cycle Emissions", S. M. Roe, J. Wilson, M. Mullen, B. Strode, H. Lindquist, an d J. Schreiber, E.H. Pechan & Associates; H. Hammer and J. Matic, AKRF, Inc; J. Perlman North Jersey Transportation Planning Authority

This paper provides a summary of the greenhouse gas inventory and forecast developed for North Jersey Transportation Planning Authority (NJTPA) region. To meet the needs of municipal, county, and regional GHG mitigation planners, inventory data was prepared to inform planners of the relative merits of mitigation actions taken to reduce GHG emissions both directly and indirectly. Direct GHG reductions result from reducing emissions at the source. Indirect GHG reductions result from reducing consumption of some GHG-emitting product or process. Emissions relevant to indirect reductions are captured in the form of consumption-based GHG accounting. Another important GHG accounting issue concerns energy-cycle emissions, which cover those that result from upstream activities (e.g. material extraction, processing, and transport). While the consumption-based approach including energy-cycle emissions enables the comparison of the full costs and benefits of proposed actions, other inventories developed at the state, national, and local level are developed primarily on a direct emission basis. In addition, some mitigation benefits goals may be better measured on a direct basis. To inform regional stakeholders of the full merits of all GHG mitigation options, as well as, maintain consistency with other efforts, estimates were developed based on two accounting methods, whenever possible: Direct Emissions, and Consumption-Based/Energy-cycle Emissions. The inventory covers all sources and sinks of GHG, provides emission estimates for all six Kyoto Protocol gases at the county and municipal levels, and covers a 2006 base year and forecast years of 2020, 2035 and 2050.

4:30 "Electricity Consumption Greenhouse Gas Inventory Tool for States", A. Denny, A. Diem, L. Pederson, J. Herr, A. Choate, US EPA

The U.S. EPA State and Local Branch has been developing guidance and providing technical support to states on their greenhouse gas (GHG) emission inventories since 1990. EPA has developed a suite of Microsoft Excel-based tools—the State Inventory Tool (SIT)—to facilitate development of GHG inventories in a cost effective and transparent manner. The Electricity Consumption module is the eleventh, and newest, module developed as part of the SIT suite of modules. This module is designed to fill the gap between generation-based estimation methodologies (recommended at the state level to avoid double counting and to align with readily available data) and consumption-based estimates. The importance of consumption-based estimates is highlighted in the action-planning phase, as states scrutinize emissions and screen potential mitigation actions. While electricity is used in all states, the magnitude and carbon intensity of electricity generation varies significantly by state.

The Electricity Consumption module calculates carbon dioxide equivalent (CO_2 Eq.) emissions from electricity consumption of various equipment types in four end-use sectors. Based on state electricity consumption data from the Energy Information Administration's State Energy Data System, the module enables states to estimate emissions from industrial, transportation, residential, and commercial sources consuming electricity. Data provided in the module are based on publicly available information. In this paper, we will provide an overview of the new Electricity Consumption model and provide some examples of how the outputs of this module can inform mitigation actions at the state level.

Poster Reception

Tuesday - September 28, 2010 **6:00 - 8:00 pm**

1. "Greenhouse Gas Mitigation Strategies Database", A. Zubrow, Institute for the Environment, UNC Chapel Hill; N. Hutson, EPA; B. Lange, Eastern Research Group, Inc.; J. Staudt, Andover Technology Partners "e-DMA and the IKS eeM System", M. Ballesteros, Environmental Senior Consultor IKS eeM System Manager

2. "Prompt Indicator of Trends in Australian Greenhouse Gas Emissions", G. Anderson, Pitt&Sherry – ***Also in GHG Session***

3. "Emission Inventory System (EIS) within a Tribal Community", C. M. Horan, SRPMIC – ***Also in Tribal EI Session***

4. Reducing Emissions from Deforestation and Degradation (REDD) in the Cofan Bermejo Reserve, Ecuador", T. Eckerle, S. Webb, E. Welbourn, H. Abbey, C. Ching

5. "Developing an Improved Wildland Fire Emissions Inventory", N. Larkin, T. Strand, R. Solomon, B. Potter, M. Rorig, P. Lahm, U.S. Forest Service; S. Raffuse, D. Pryden, D. Sullivan, N. Wheeler, Sonoma Technology, Inc – ***Also in Innovative EI Session***

6. "Fire Management Tools Advance North Carolina's SMP and Emission Inventory", G.M. Curcio and J. Reardon, NC Division of Forest Resources Fire Environment Branch – ***Also in Tools Session***

7. "The National Wildfire Coordinating Group (NWCG) Smoke Committee (SmoC) Support and Development of Regional and National Emission Inventory Efforts", P. Lahm, Fire Air Specialist, USDA Forest Service; G. Curcio, Fire Environment Branch Head, NC Division of Forest Resources Fire Environment Branch; S. O'Neill, Air Quality and Atmospheric Change Team,

8. "NEI Reengineering: A Status Report on EIS and the 2008 NEI", S. Dombrowski, US EPA - A***lso in Tools Session***

9. "Evaluation of Evaporative Leaks using RSD and Inventory Implications", D. Hawkins, C. Hart, C. Fulper, J. Warila, D. Brzezinski, US EPA; S. Kishan, T. Defries, ERG (Eastern Research Group); J. Kemper, J. Sidebottom, CDPHE (Colorado Department of Public Health and Environment)

10. "Determine Sampling Methodology for Estimating Emissions Contribution of "Drayage" Heavy-Duty Vehicles in the Port of Houston using Remote Sensing Devices (RSD)", C. Fulper, C. Hart, D. Hawkins, R. Giannelli, C. Caffrey, J. Warila, R. Caldwell, E. Schauer, B. Ratkos, M. Christianson, US EPA, Office of Transportation and Air Quality; S. Kishan, T. DeFries, M. Sabisch, Eastern Research Group (ERG); H. Williamson, CACI, Inc

11. "Implications of the MOVES2010 Model on Mobile Source Air Toxic Emission Estimates", M. Claggett and V. Martinez, Federal Highway Administration

12. "Comparing On-Road Mobile Source Emission Factor Results", M. Claggett and J. Houk, Federal Highway Administration – ***Also in Mobile Session***

13. "Investigation of Cross-Border Differences in the Spatial Distribution of Onroad Mobile Emissions between the U.S. and Canada", J. Zhang, M. Moran, P. Makar, Q. Zheng, Air Quality Research Division, Science and Technology Branch, Environment Canada; M. Sassi, Air Quality Modeling Applications Section, Meteorological Service of Canada, Environment Canada

14. "A New Set of Canadian Spatial Surrogates Based on 2006 Canadian Socioeconomic Data and Other Data Sets", M. Sassi, S. Cousineau and D. Davignon, Air Quality Modelling Applications Section, Environmental Canada; M. Moran, J. Zhang and Q. Zheng., Air Quality Research Division, Environmental Canada

15. "EPA's SPECIATE Database", H. Simon, P. Bhave , D. Luecken, D. Mobley, G. Pouliot , G. Sarwar, National Exposure Research Laboratory, EPA; L. Beck, National Risk Management Research Laboratory, EPA; F. Divita, Y. Hsu E.H. Pechan and Associates; A. Reff, M. Strum, US EPA

16. "Using the Environmental Knowledge and Assessment Tool to Assist Decision Makers", R. Green, T. Boguski, L. Jamka, Center for Hazardous Substance Research; J. Fredkin, F. Massachusetts, CABEM Technologies; A. Prill, M2 Technologies

17. "The Community Modeling and Analysis System (CMAS) in 2010", A. Hanna, Z. Adelman, S. Arunachalam, U. Shankar, B.H. Baek, N. Davis, F. Binkowski, Q. He, K. Talgo, and L. Adams; Institute for the Environment – UNC, Chapel Hill, NC

18. "e-DMA and the IKS eeM System", M. Ballesteros, Environmental Senior Consultor, IKS eeM System Manager – ***Also in Data Analysis Session***

19. "Identification of Sensitive Emission Affecting Air Quality in Beijing", Z. Ying, C. Dongsheng, C. Shuiyuan, H. Qing; College of Environmental & Energy Engineering, Beijing University of Technology, Beijing, China

Exhibitors Reception

Tuesday - September 28, 2010 **6:00 - 8:00 pm**

E. H. Pechan - E. H. Pechan & Associates, Inc. provides air pollution consulting and information technology services to the U.S. Environmental Protection Agency and other public sector clients. The firm has a high level of expertise in preparing air pollution emission inventories, emission forecasts and evaluating the cost and effectiveness of air pollution control measures.

Eastern Research Group – Eastern Research Group (ERG) offers clients the full spectrum of technical services required to achieve successful air quality management. Our staff of over 330 consists of engineers and atmospheric scientists with over 25 years of experience addressing air quality needs for stationary and mobile sources. The bulk of our experience rest with public agencies in the federal, state, local, and tribal government sectors. ERG performs nationally recognized research in areas such as greenhouse gas emissions and controls, air permitting, air toxics, emissions assessments, emissions projections, air regulation development, inventory management, and ambient air quality monitoring. We assist our clients with defining and quantifying problems and determining the most technically effective and cost beneficial solutions for all stakeholders. Our conference exhibit booth will have materials available commenting the breadth of this experience, and key staff from these programs will be on hand to meet you and provide more detailed information and insight on how our capabilities can address your needs.

Lakes Environmental Software - Lakes Environmental is a world leader in the air dispersion modeling and emissions inventory field, committed to supplying robust and easy-to-use software solutions. Lakes Environmental software products can increase productivity, reduce errors and provide unique solutions to the challenges you face. **Also in Software Showcase**

MACTEC – MACTEC is the sixth largest air quality-consulting firm in the United States, with a wide variety of government and industry customers. We provide emission inventory, dispersion modeling, IT systems development, ambient monitoring, regulatory development and air program support services to EPA, states and regional planning organizations, as well as air quality consulting, permitting and compliance support to a wide variety of industrial customers.

regAction, IEA, Inc. (International Environmental Associates, Inc) - The regAction system is made up of many inter-related applications that provide for full EHS compliance and Sustainability Data Management. Three related applications within the system support the emissions inventory process. web Monitor supports data transfer, data quality review, data manipulation and limit notifications between the plant process data historians and the regAction system. webEI runs periodic (Monthly, Quarterly, Semi-annual or Annual) emissions calculations from data received through web Monitor or directly uploaded into webEI by the user. webEI also supports direct electronic emissions inventory submission to the state agencies. webCO2+(webCO2plus)manages source CO2e calculations and supporting compliance documentation and will have electronic submission of Part 98 data to the EPA once the agency provides format and content requirements to third party providers. **Also in Software Showcase**

RFS Consulting Inc – RFS Consulting, Inc. (RFS) is a multi-media environmental engineering and consulting firm, originating in Tulsa, Oklahoma and serving industry across the country since 1986. However, the firm assists a diverse client base in addressing a number of environmental concerns, our specialty have become air quality issues for predominantly the Oil and Gas Industry, followed by foundries, metal fabricators, and surface coaters. Air quality services include permitting (minor, major, and PSD), recordkeeping, reporting, emission inventories for criteria pollutants, hazardous air pollutants, and greenhouse gas emissions, compliance assistance, dispersion modeling, risk assessments, and data management systems.

To support our services and client needs, RFS has developed software called REMIS, which is a comprehensive, robust relational data management system, which serves as a tool to assist in organizing facility and equipment information, performing scientific and engineering calculations, and generating emission reports. The system utilizes physical design and operating data, manufacturer emission factors, AP-42 factors, analytical data and more to aid in completing emission inventories for facilities located across the country. **Also in Software Showcase**

RWDI AIR, Inc. - RWDI AIR Inc. (RWDI), a member of the RWDI Group of Companies, is an environmental consulting agency specialized in resolving air quality, emissions inventories, meteorological, custom software, noise & vibration and hazard & risk issues for a wide array of industrial, commercial and government clients. RWDI is a global company with offices and personnel strategically located throughout Canada, including Guelph (Ontario), Calgary (Alberta) and Vancouver (British Columbia), and all over the world, including Chile, China, India, the United Arab Emirates, United Kingdom and United States. Although their greatest resource has always been their people, RWDI's other key assets include an extensive range of computer models (including GIS and CFD), laboratory and field monitoring equipment, two boundary layer wind tunnels and a water flume. Having a full spectrum of simple to advanced tools allows RWDI to customize their services to meet the needs of their clients. Since 1972, RWDI has worked to meet their clients' modeling, measurement, mitigation and regulatory compliance needs. Over the years, RWDI has earned a trusted reputation for delivering understandable and useful results.

Trinity Consultants – For over 30 years, Trinity consultants has assisted industrial facilities with regulatory compliance and environmental management issues. T3, a division of Trinity Consultants, helps businesses operate more efficiently and cost-effectively, while improving environmental, health, and safety (EH&S) performance. The unique mix of extensive experience in EH&S consulting, software development, system support, and training, allows T3 to harness the power of technology to help streamline your EH&S information management practices.

U.S. EPA - Emission Inventory & Analysis Group (EIAG) - Staff will be available to answer your questions on the Emission Inventory System (EIS), the Emissions Modeling Framework (EMF), mobile models, the Risk Technology Rule, the Air Emissions Reporting Rule (AERR), and analysis of the National Emission Inventory data. A schedule will display when the specialist will be at the booth.

Windsor Solutions, Inc – Windsor Solutions, Inc. (Windsor) is an information technology consulting firm providing industry-specific information systems for environmental and health related government agencies. As a specialist in the environmental field, Windsor offers information and business expertise across all media and many programs areas. The company is now one of the leading technology consultants in the environmental field and is a leading participant in the evolution of the Exchange Network.

Windsor recently initiated a project with eight environmental agencies to analyze, design, build and implement a Web-based, point source emissions inventory reporting and database management system that will meet the needs of state and local governments for collecting emissions inventory data from regulated entities, managing and reviewing emissions inventory data, and submitting emissions inventory data to the EPA. The State and local Emissions Inventory System (SLEIS) is schedule for implementation in 2011. Windsor also recently collaborated with several state agencies to implement point source facility and emissions inventory data exchange to the new federal Emissions Inventory System (EIS), replacing former data flows to the legacy National emissions Inventory (NEI) system at EPA.

Wednesday, September 29, 2010

Session 5: Global/International

Chairs: Gregory Frost, NOAA
Rebecca Tooly, US EPA

PANEL 1: These presentations describe some of the progress toward sharing global emission inventories and highlight applications and the importance of sharing emissions across world regions.

8:30 "Understanding Historical Ozone Trends at Northern Mid-latitudes", D.D. Parrish, NOAA/ESRL; J. F. Lamarque, NCAR

During the 20th century baseline concentrations of ozone increased markedly at northern mid-latitudes. This increase has been documented by a variety of observational studies, and is generally attributed to increasing anthropogenic emissions of the precursors that fuel photochemical ozone production. These increased emissions accompanied the growth and development of the economies of the industrialized nations. Uncertainty remains regarding the magnitude of the increase, since pre-industrial ozone concentrations are poorly known, and in the definitive assignment of the cause of the increase, since global chemical transport models have not well reproduced the increase observed. The goal of this presentation is to review the observational evidence for the ozone trends, present recent model calculations based upon a new dataset of gridded emissions covering the historical period (1850-2000) in decadal increments, compare the modeled and observed trends, and discuss possible reasons for the model-measurement differences.

8:55 "Evaluation of Global and Regional Gridded Distribution of Emissions", C. Granier, CIRES & NOAA/ESRL; J. F. Lamarque, NCAR; T. Bond, University of Illinois; A. D'Angiola, LATMOS/IPSL; H. D. van der Gon, TNO, The Netherlands; G. J. Frost, CIRES & NOAA/ESRL; A. Guenther, NCAR; A. Heil, FZ Juelich, Germany; C. Liousse, Laboratoire d'Aerologie, France; A. Mieville, LATMOS/IPSL, France; Z. Klimont, IIASA, Austria; S. Smith, Pacific Northwest National Laboratory, USA; J. van Aardenne, Joint Research Center, Italy; G. van der Werf, VU University, The Netherlands

During the past few years, different emissions inventories have been developed, which provide emissions of gaseous and particulate atmospheric species for the past few decades at both the global and regional scales. We will discuss the main characteristics of the most recent of these inventories; this discussion will focus more particularly on the emissions inventory developed in support of the next IPCC report, which covers the 1850-2100 periods, and considers anthropogenic as well as biomass burning emissions.

The emissions provided by a large set of publicly available global and regional inventories have been intercompared over the past few months, and the results of the comparisons for carbon monoxide, nitrogen oxides, sulfur dioxide and black carbon will be discussed. The presentation will focus on the evolution of the emissions of these species since 1980. We will discuss the differences, which have been identified in anthropogenic as well as biomass inventories. The extension of this exercise to other compounds such as volatile organic compounds will be discussed.

9:20 "Climate & Air Quality Inventory Improvement & Database Management for Developing Countries", N. Davis, and J. Lents, International Sustainable Systems Research Center

Effective climate and air quality management require knowledge of the sources of air pollutants in a region, the ability to understand and project the emissions from those sources, and the ability to handle the regulatory processes associated with controlling emissions from those sources. This is an ongoing challenge for regions with ample resources; the challenge is even greater for developing counties with limited information and disparate local planning programs. Over the last decade, ISSRC has supported these countries to advance a scientific-based air quality management process that will allow for the consideration and mitigation of regional and global air pollution impacts. A cornerstone in this effort has been the creation of a tool and methodology

for developing and projecting emissions from the mobile source sector. The IVE model and data collection process has been applied now in over 15 countries.

Recently, ISSRC has expanded its focus to create an Integrated Environmental Database system (IED) to manage all air quality and energy related information. The system has the ability to create and project present and future emission, fuel and energy inventories for area and point sources for local, long-range and climate-change pollutants including analysis of source control impacts and control cost. It has been designed to integrate policy analysis for urban air, water, solid waste, and climate change pollution. The internet-based system is especially designed to work and adapt to a variety of regions and data availability. The IED is currently being applied in four cities across Latin America and Asia.

9:45 "The Trend of Sulfur Dioxide Emissions in China after 2000", Z. Lu, D.G. Streets, Argonne National Laboratory, Argonne, IL USA; Q. Zhang and S. Wang, Department of Environmental Science and Engineering, Tsinghua University, Beijing China; G.R. Carmichael, Y.F. Cheng, and C. Wei, Center for Global and Regional Environmental Research, University of Iowa, Iowa City, IA; M.Chin, T. Diehl, and Q. Tan, Laboratory for Atmospheres, NASA Goddard Space Flight Center, Greenbelt, MD

Using a technology-based methodology specifically for China, the annual sulfur dioxide (SO2) emission from China since 2000 is estimated. Due to the rapid increase of fossil-fuel consumption, SO2 emission in China increased by 53%, from 21.7 Tg in 2000 to 33.2 Tg in 2006, at an annual growth rate of 7.3%. Power plants contributed more than 50% to the total emission. Geographically, emissions from north and south China increased by 85% and 28%, respectively. The emission growth rate slowed around 2005, and emissions began to decrease after 2006 mainly due to the wide application of flue-gas desulfurization (FGD) devices in power plants. The SO2 emission data are then compared with a variety of official environmental statistics, ground-based measurements, satellite observations, and model results of sulfur related quantities over East Asia, such as SO2 and SO4 concentrations, Surface Solar Radiation (SSR), Aerosol Optical Depth (AOD), etc. The comparisons show that the trend of estimated SO2 emissions in China is consistent with the trends of SO2 concentration and acid rain pH and frequency in China, as well as with the increasing trends of AOD, background SO2 and sulfur concentration in East Asia. A longitudinal gradient in the percentage change of urban SO2 concentration in Japan is observed during 2000-2007, indicating that the transport of increasing SO2 from the Asian continent partially counteracts the local reduction of SO2 emission downwind. The arrested growth in SO2 emissions since 2006 is also reflected in the decreasing trends of sulfur related quantities over East Asia.

10:10 BREAK

10:40 "The Global Emissions Inventory Activity (GEIA)", C. Granier, LATMOS/IPSL, France and CIRES&NOAA/ESRL, USA; A. Guenter, NCAR, USA; P. Middleton, Panorama Pathways, USA; A. Mieville, LATMOS/IPSL, France

The objective of the GEIA project is to bring together people, analyses, data, and tools to quantify the anthropogenic emissions and natural exchanges of trace gases and aerosols that drive earth system changes and to facilitate use of this information by the research, assessment and policy communities. This presentation will provide an overview of the current activities of GEIA

We will present the GEIA network, which currently includes over 1000 people around the globe, and the plans to extend this network to different communities working on environmental changes issues. We will also present our plans to develop within the GEIA Center (www.geiacenter.org) a new database of scientific papers as well as national and international reports dealing with emissions issues. We will present the main conclusions of the GEIA conference, which took place in October 2009.

Given the differences often found among data sets, we will also discuss the formation of a GEIA working group composed of emission developers and modelers who will compare data sets and implications for modeling.

It has been recognized that consistent information on emissions at the global and regional scale is required, as well as an accurate quantification of emissions in the different megacities of the world. In order to develop these perspectives, GEIA will begin strengthening links with different key regions. We will discuss the plans for developing regional centers through corporation with other entities and individuals working in these regions.

11:05 "The Community Initiative for Emissions Research and Applications", G. Frost and C. Granier, Univ. Colorado/CIRES and NOAA/ESRL/CSD, Boulder, Colorado, USA;, Univ. Colorado/CIRES; NOAA/ESRL/CSD; LATMOS, CNRS and Univ. Pierre and Marie Curie, Paris, France; S. Falke, Washington Univ. St Louis and Northrop Grumman, St Louis, Missouri, USA; T. Keating, US EPA/OAR, Washington, DC, USA; J. F. Lamarque,: NCAR, Boulder, Colorado, USA; M. Melamed, AAAS Fellow, US EPA/NCER, Washington, DC, USA; P. Middleton, Panorama Pathways, Boulder, CO, USA; A. Mieville, LATMOS, CNRS and Univ. Pierre and Marie Curie, Paris, France; G. Pétron, Univ. Colorado/CIRES and NOAA/ESRL/GMD, Boulder, Colorado, USA; S. Smith, PNNL, Univ. Maryland/JGCRI, College Park, Maryland, USA

While emission inventories at a variety of spatial and temporal scales are critical inputs to the understanding and prediction of air quality and climate, inconsistencies in the methodology and structure of these inventories have hindered research progress. Systematic inventory evaluations and quantification of emission uncertainties and their impacts are crucial to establish confidence in these datasets.

We will present the Community Initiative for Emissions Research and Applications (CIERA), which is under development in the US. The goals of the work planned within this multi-agency project are to harmonize global and regional emission inventory development and to improve the exchange of emission inventory data. CIERA will facilitate the evaluation of inventories produced using a variety of methods, the investigation of the impacts of emission uncertainties and changes, and the use of these findings by the community.

We will discuss the motivation for organizing this collaborative initiative and the first steps taken. We will present plans for developing the CIERA web-based distributed data system. We will also encourage local, state, national, and international emissions communities to join the CIERA effort.

11:30 Discussion Panel

12:00 LUNCH

PANEL 2: These presentations focus on regional and global issues associated with climate and air quality interaction – with a focus on improving emission estimates for short-lived climate forcers (SLCF), particularly black carbon.

1:30 "Black Carbon as a Short-Lived Climate Forcer: A Profile of Emission Sources and Co-Emitted Pollutants", V. Rao, US EPA

A growing body of research in the past few years points to a potent source of human-induced climate warming: airborne aerosol particles, and especially the black carbon component of aerosols. The science behind black carbon and its role in climate warming is evolving but the evidence is mounting. Unlike CO2, which can hang around in the atmosphere for centuries, black carbon has a relatively short life span. It remains in the air just a few weeks before it falls to Earth. That is important, because if we can reduce black carbon emissions now, it would help blunt warming almost instantly and help offset some of the effects felt by the longer-lived greenhouse gases like CO2. As such, EPA has recently focused on Black Carbon science and policy as it relates to both climate and air quality. Congress has mandated a Report to be written by EPA that explores the science of black carbon and potential mitigation options, both domestically and globally, as it relates to climate impacts and air quality. The objective of this presentation will be to summarize the status of the Black Carbon Report to Congress with a focus on its description on the development and characterization of domestic and global black carbon emission inventories. Included in the discussion will be ongoing assessments to improve our black

carbon emission inventories, how to work more closely with our global partners, and information gaps in black carbon science that needs to be addressed in the future. .

1:55 "Poorly-Characterized Black Carbon Sources", D. McCabe, Clean Air Task Force

Certain sources of black carbon emissions, such as agricultural burning and selected small industries, may have disproportionate health and climate impacts while being relatively controllable. Technological solutions exist for these sources, but their emissions are particularly uncertain. Estimates of emissions from agricultural burning and industrial sources such as brick kilns, coke ovens, and flaring from oil and gas operations will be presented, and approaches for reducing the uncertainty of these emissions will be presented and discussed.

2:20 "Global Emission Projection from Transportation Sector and its Uncertainty Analysis", F. Yan, E. Winijkul and T. C. Bond, Department of Civil and Environmental Engineering, University of Illinois-Urbana and Champaign, Urbana, IL,USA; D. G. Streets, Decision and Information Science Division, Argonne National Laboratory, Argonne, IL

Global emission projections are needed to project large-scale impacts of pollutants. Such projections are required to determine the net response of climate to combined emissions of greenhouse gases, aerosols, and other trace species in the next 30-50 years.

Current emissions from transportation are responsible for about 16% of the integrated net forcing over 100 years from all current manmade emissions [*Fuglestvedt et al.*, 2008]. Transportation sector, including both on and off road vehicles, has been the major source of black carbon (BC), which accounts for 25% of all emissions. Diesel engines contribute about 90% of that global 25%. This work will present global and regional emission projection from transportation by applying technology based model.

We present global emission projections of primary particulate matter emissions, from transportation sector from 2010 to 2050. These projections are based on a technology driven model: the Speciated Pollutants Emission Wizard (SPEW)-Trend that responds to socioeconomic conditions in different economic and mitigation scenarios. The model contains detail about technology stock, including consumption growth rates, retirement rates, timing of emission standards, deterioration rates and transition rates from normal vehicles to vehicles with extremely high emission factors (termed ―"super emitters").

Changes of technology and policy in the future are uncertain, and their relationship with socioeconomic variables is not well known. We also present uncertainty analysis to explore the impacts of these uncertainties on emission projection. We identify the most critical factors affecting our knowledge of emission pathways; these are targets for future research on the interaction between social and economic conditions and technological response.

2:45 "Identifying Mitigation Measures to Reduce Near-Term Forcing: The Role of Short-Lived Climate Forcers", Z. Klimont, M. Amann, W. Schopp. C. Heyes, L. Hoglund-Isaksson, K Kupiainen, J. Cofala, P. Rafaj, International Institute for Applied Systems Analysis, Austria

Reductions in the atmospheric burden of CO_2 are key in any meaningful effort to mitigate climate forcing. However, short-lived climate forcing agents (SLCF), including black carbon, tropospheric ozone and methane, might play an important role in reducing the rate of the increase of forcing, especially in the near-term. In this work, we explore global mid-term emission scenarios and mitigation potentials for SLCF until 2030. The scenarios assume compliance with the current air quality and environmental targets at a regional level while identifying (and prioritizing) mitigation measures that contribute to the reduction in radioactive forcing. Impacts of both technical and selected key 'non-technical' measures on emissions of CH_4, BC, OC, CO, SO_2 are considered and results are presented for key regions.

3:10 BREAK

Session 9: Tools – Leveraging Technology

Chairs: Alison Eyth, US EPA
Ron Chapman, RWDI AIR

3:40 "A Comparison of the 2005 NATA Inventory with the Draft 2008 National Emissions Inventory", A. Eyth and M. Houyoux, US EPA

We will examine the 2005 National Air Toxics Assessment (NATA) Emissions Inventory, which was developed by updating the 2005 National Emissions Inventory (NEI) with data from a variety of sources, including industry. We will examine differences in facility configurations, available pollutants, and emissions. These preliminary assessments will suggest to inventory submitters some revisions that might be made prior to the closure of the comment period on the draft 2008 NEI.

4:05 "Development and Preliminary Results for a Residential Wood Combustion Emissions Model", Z. Adelman, G. Arora, B. H. Baek, Institute for the Environment – UNC, Chapel Hill NC; M. Houyoux, A. Eyth and M. Strum, US EPA

Air quality modeling in support of the PM2.5 NAAQS and Regional Haze Rule requires that significant sources of atmospheric PM, such as residential wood combustion (RWC), are well resolved in both space and time. This paper describes an approach for developing regression models of RWC temporal patterns based on comparisons between meteorology data and observed chemical tracers of RWC. The conceptual model driving these development activities is that RWC emissions patterns are linked to temperatures. Approaches using several different regression, conditional, and time series statistical models that related ambient temperatures, wind speeds, and planetary boundary layer heights to observed chemical tracers of RWC, such as levoglucosan, organic carbon, and PM2.5 are presented. The overall conclusions of these model development exercises were that the strongest predictors of the RWC chemical tracer are (1) the location of the chemical monitor and (2) the date that the data were collected. The development of a temperature-based regression model of RWC emissions using data from monitoring sites that are strongly representative of RWC activities is justified by statistical analyses indicating that there are confounders beyond just meteorology that are contributing to the variability in observed RWC chemical tracers, such as human behavioral patterns, and these confounders would be very difficult to parameterize in a model. By using a regression model of temperatures to RWC chemical tracers, this approach provides a simple estimate of the impacts of meteorology on RWC emissions that can be integrated into the current emissions processing stream fairly easily.

4:30 "Assessing the Anthropogenic Fugitive Dust Emission Inventory and Temporal Allocation using an Updated Speciation of Particulate Matter", G. Pouliot, H. Simon, P. Bhave, D. Mobley, T. Pierce, Atmospheric Modeling, US EPA; D. Tong, Air Resources Laboratory, National Oceanic and Atmospheric Administration, US EPA; T. Pace, US EPA

Crustal materials are mainly emitted by anthropogenic and windblown fugitive dust, but also may potentially include some fly ash and industrial process emissions, which are chemically similar to crustal emissions. Source apportionment studies have shown that anthropogenic fugitive dust emissions contribute on the order of 5-20% of PM2.5 (particles with an aerodynamic diameter less than 2.5 um) and 40-60% of PM10 (particles with an aerodynamic diameter less than 10 um) in urban areas that either have been or potentially may be unable to attain the National Ambient Air Quality Standards (NAAQS) for PM2.5 and/or PM10. On the other hand, air quality models suggest vastly higher contributions from current fugitive dust emission inventories, with contributions ranging from 50-80% for PM2.5 and 70-90% for PM10. These estimates are from a Desert Research Institute workshop report from May 2000 that is available from EPA's Technology Transfer Network Clearinghouse for Inventories & Emissions Factors. This paper uses an improved speciation of the particulate matter to include, in addition to the current PM species, eight trace metals as well as separate non-carbon organic matter to assess potential improvements to the emission estimates of anthropogenic fugitive dust (unpaved and paved road dust, dust from highway, commercial and residential construction and agricultural tilling). Proposed improvements to the inventory include revisions to the temporal profiles and revisions to the estimate of the fraction of emissions that are "transported" from the source region. Revisions to the emission estimates and methodology are modeled using updates to the Community Multiscale Air Quality (CMAQ)

model to track these eight trace metals and the non-carbon organic matter. We will show preliminary modeling results of these trace metals and compare them to observed values obtained from available observation networks.

Session 6: Mobile Sources

Chairs: Jeremy Heiken, Sierra Research
Chris Dresser, US EPA

8:30 "MOVES Sensitivity Analysis – the Impacts of Input Parameters on Emissions", D. Choi, M. Beardsley, D. Brzezinski, J. Koupal, and J. Warila, US EPA

The U.S. Environmental Protection Agency has released MOVES2010, which is designed to estimate emissions from on-road mobile sources under user-defined conditions such as time periods, geographical areas, vehicle types, pollutants and road types. The model is supported by a default database, which contains information relevant to emissions inventory estimation for the entire United States. Furthermore, MOVES2010 allows users to import data specific to their unique needs. However, using this feature requires knowledge of various input parameters and the degree to which they affect emission results. Thus, it is crucial to examine the sensitivity of emissions to a variety of individual input parameters. Because assessing the interrelationships among the large number of input parameters is beyond the scope of a single paper, the current study analyzed the sensitivity of selected emissions to changes in a single parameter in isolation from other inputs. This paper compares the impact of individual parameters on emission results
by quantifying relative sensitivity at different scales and levels of aggregation

8:55 "Comparing On-Road Mobile Source Emission Factor Results", M. Claggett, Ph.D. and J. Houk, Federal Highway Administration, Resource Center

This paper compares the results of on-road emissions models – the U.S. Environmental Protection Agency's newly released MOVES2010 with MOBILE6.2 and MOVES2010 with Emfac2007. Emfac2007 was developed by the California Air Resources Board for regulatory applications in California, while MOVES2010 was developed to supersede MOBILE6.2 for regulatory applications in the rest of the nation. Emissions computed by the models for select criteria air pollutants (i.e., carbon monoxide, nitrogen oxides, volatile organic compounds, and particulate matter) are evaluated from a variety of perspectives, including national-scale emission trends; contributions of the different emission components; emission factors versus speed; and emissions for diverse modal operations of vehicles. While the MOBILE6.2 and Emfac2007 models are based on the same basic principle, i.e., emissions from motor vehicles are based on testing with correction factors utilized to account for on-road vehicle use, MOVES2010 reflects emissions derived in large part directly from on-road vehicle testing. The reasons for some of the observed calculation differences are discussed. The implications pertaining to the evaluation of highway project alternatives are also discussed.

9:20 "Characterization of VOC Emissions from Light-Duty Vehicles in Monterrey, Mexico: Tunnel Study", A. E. Araizaga, Y. Mancilla and A. Mendoza, Department of Chemical Engineering, México

A two-week tunnel study was conducted Monterrey, Mexico during the month of June of 2009 to characterize volatile organic compound (VOC) emissions from the local vehicular fleet. The Loma Larga Tunnel (LLT), a 532 meters-long structure that is mainly used by light-duty gasoline-powered vehicles was used as experimental set-up. Ambient air samples (2-hour averages) were taken inside the LLT using 6 L SUMMA®-polished canisters. In addition, CO2 levels, temperature, pressure, and wind intensity at the same sampling points were recorded and registered on 2-minutes intervals. Samples collected in the canisters were analyzed for Total Non-Methane Hydrocarbons (TNMHC) and 53 individual VOCs using high-resolution GC-MS. During the campaign, 87,393 vehicles went across the sampling points with average velocities, on 2-hour intervals, as low as 41.9±7.18 km/hr and up to75.9±9.52 km/hr. Estimated emission factors for TNMHC and CO2 were 1.16 g/km-veh and 182 g/km-veh, respectively. The emission factors for both species tended to be higher for traffic moving upslope. However, an analysis of variance indicated that no statistical difference could be identified between traffic moving upslope or down slope, and between different traffic conditions. The average vehicle mileage estimated through the field data gave 12.3 km/L. With respect to individual VOC species, the most abundant ones were Ethane (10.6%), Isopentane (7.6%), Acetylene (7.3%), Toluene (5.9%) and *n*-Butane (5.6%). High correlations were obtained known markers of vehicular emissions. Particularly, for Ethane-

Acetylene ($R2 = 0.95$) a ratio between 1.1 and 2.4 was obtained, which indicates the presence of vehicles with a working catalytic converter.

9:45 "A Tunnel Study to Characterize PM2.5 Emissions from Light-Duty Vehicles in Monterrey, Mexico", Y. Mancilla, A. E. Araizaga and A. Mendoza, Department of Chemical Engineering, México

Vehicle exhausts are a major source of air pollution in the Monterrey Metropolitan Area (MMA), Mexico. In this study, emission factors for fine particulate matter, PM2.5, from light-duty vehicles operating under real world conditions were determined using as experimental setup the Loma Larga Tunnel located within the MMA. Low-volume devices were deployed to collect 2.5-hour average PM2.5 samples. In addition, continuous CO2, temperature, pressure and wind intensity measurements were also registered at the defined sampling points inside the tunnel. From the samples collected, PM2.5 mass emission factors were estimated, as well as chemical profiles for 38 metals (Na to Pb), cations (Na+, K+, NH4 +), anions (Cl-, NO3-, SO4 2-), organic carbon (OC) and elemental carbon (EC). Overall, a fleet of 108,569 vehicles crossed the tunnel during the whole monitoring campaign, with average speeds that ranged from 43km h-1 to 76 km h-1. Average emission rates of 17.5±5.7 mg-veh-1 km-1 and 145±94 mg-L-1 for PM2.5 were obtained. The effect of road dust resuspension was considered in the computation of these emission factors. CO2 emission rates uphill (188±22 mg-veh-1 km-1 and 2,045±219 g-L-1) were greater than downhill (152±22 mg-veh-1 km-1 and 2,012±20 g-L-1). Vehicular PM2.5 emissions were dominated mainly by OC and EC, these species represented 55.2 ± 2.8% and 16.3 ± 1.6% of the total mass emitted, respectively. The ratio OC/EC was 2.85±0.79 and 1.19±0.65 for heavy traffic and moderate traffic conditions, respectively. Using the field data obtained, an average fuel consumption of 10.7 km L-1 was estimated.

10:10 BREAK

10:40 "Validation of the COPERT Road Emission Inventory Model with Real-Use Data", M. Kousoulidou, L. Ntziachristos, S. Gkeivanidis, Z. Samaras, Laboratory of Applied Thermodynamics, Dept. of Mechanical Engineering, Aristotle University of Thessaloniki, Greece; V. Franco, P. Dilara, Institute for Environment and Sustainability, Transport and Air Quality Unit, EC-Joint Research Centre, Italy

Portable Emissions Measurement Systems (PEMS) are a valuable source of real-world operation data to support the development and validation of vehicle emission factors. For the purposes of our research, a Euro 5 compliant diesel passenger car equipped with a particulate filter was fitted with a PEMS system and subsequently driven over predefined driving routes designed to include a variety of driving conditions. The exhaust flow and the concentration of exhaust pollutants at the tailpipe were recorded on a second-by-second basis. Engine speed, torque and other data readings provided by the ECU of the test vehicle were also recorded, along with GPS position and vehicle-mounted weather station data. The resulting data logs were run through a Mat lab-based model (CEMOD) that performs a correction of the signal from the PEMS analyzers to account for instrument time lag and response characteristics. These synchronized emission data are then used to develop engine emission maps. The use of these maps within a vehicle simulation tool (ADVISOR) allowed for the prediction of emissions produced over different cycles and driving conditions, including a simulation of the predefined routes. For validation purposes, results were compared to the emission factors provided by the COPERT emission model. Emissions of CO2, HC and CO correlated well with COPERT values, regardless of the distance split selected for average speed calculations. However, NOX emission levels were consistently higher than the applicable emission standard and the COPERT emission factors.

11:05 "Emission Inventories Development Using MOVES Model: A Dallas-Fort Worth, Texas Area Case Study", C. Klaus, M. Venugopal, and S. Haque, North Central TX Council of Governments

The United States Environmental Protection Agency (EPA) released a new and improved on-road emission model on December 23, 2009, to be used to develop emission inventories for Transportation Conformities and State Implementation Plans (SIP). EPA's preliminary comparison with Draft MOVES2009 and MOBILE6.2 indicates an increase in emissions for Nitrogen Oxides (NOX) and Particulate Matter (PM). To estimate emission inventories, EPA recommends employing local inputs such as age distribution; meteorology, fuel, inspection and maintenance, ramp fraction, road type distribution, source type population, vehicle type, vehicle

miles of miles of travel, etc. Some of the inputs can be readily converted from MOBILE6.2 to MOVES using converters; however, it is required to collect local fleet and travel data to develop local parameters to accurately estimate emissions for SIPs.

A comprehensive comparison of emissions and emission rates between MOVES2010 and MOBILE6.2 will be studied to understand the magnitude of increase and its effects on future Conformities and SIPs. This study will also focus on comparing emission estimates using the national default, parameters developed through converters, and local parameters without using converters. All comparisons on emissions and emission rates will be performed for Dallas County in North Central Texas.

11:30 "Greenhouse Gas Emissions Analysis of Regional Transportation Plans with EPA's MOVES Model", J. Houk, Federal Highway Administration

With growing interest in climate change issues nationally, several Metropolitan Planning Organizations (MPOs) have begun to conduct greenhouse gas (GHG) analysis of their regional long-range transportation plans. This paper provides some case studies of GHG analysis of regional transportation plans, including results of the analyses and issues encountered during the analyses. Analyses based on EPA's MOVES model are highlighted, along with a sampling of other approaches. Future policy and legislative initiatives that may lead to more widespread GHG analysis of transportation plans are discussed. Finally, the paper outlines methodologies for a comprehensive analysis methodology, encompassing operational emissions of the roadway and transit networks, construction and maintenance emissions, and fuel and vehicle lifecycle effects.

12:00 LUNCH

1:30 "Improvements to Lawn and Garden Equipment Emissions Estimates for Baltimore, Maryland", S. B. Reid, E. K. Pollard, D. C. Sullivan, Sonoma Technology, Inc.; S. L. Shaw, Electric Power Research Institute

Lawn and garden equipment are a significant source of emissions of VOC and other pollutants in suburban and urban areas. Emission estimates for this source category are typically prepared using default equipment populations and activity data contained in emissions models such as the EPA's NONROAD model or the California Air Resources Board's OFFROAD model. While such default data may represent national or state averages, these data are unlikely to reflect regional or local differences in equipment usage patterns due to variations in climate, lot sizes, and other variables. To assess potential errors in lawn and garden equipment emission estimates produced by the NONROAD model and to demonstrate methods that can be used to improve those emission estimates, this study employed bottom-up data collection techniques in the Baltimore metropolitan area to develop local equipment population, activity, and temporal data for lawn and garden equipment in the area.

Results of this study show that, depending on the pollutant considered, emission estimates for the Baltimore area based on local data collected through surveys of residential and commercial lawn and garden equipment users are 24% to 56% lower than estimates produced using NONROAD default data, largely due to a shift in equipment populations from high-usage commercial applications to relatively low-usage residential applications. In addition, study results show that the temporal allocation factors applied to residential lawn and garden equipment in the NONROAD model underestimated weekend activity levels in the Baltimore area by 30% compared to survey-derived temporal profiles.

1:55 "Determine Sampling Methodology for Estimating Emissions Contribution of 'Drayage' Heavy-Duty Vehicles in the Port of Houston using Remote Sensing Devices (RSD)", C. Fulper, C. Hart, D. Hawkins, R. Giannelli, C. Caffrey, J. Warila, R. Caldwell, E. Schauer, B. Ratkos, M. Christianson, US EPA; S. Kishan, T. DeFries, M. Sabisch, Eastern Research Group (ERG); H. Williamson, CACI, Inc – **Also in Poster Session**

The U.S. Environmental Protection Agency (EPA) along with its contractor ERG have been conducting a program for determining the emissions from "drayage" heavy-duty diesel vehicles in the port of Houston. For this project an innovative methodology for using Remote Sensing Device (RSD) technology for pre-screening

was used to recruit a mixture of exhaust emitting vehicles. Over 4,000 valid RSD measurements were gathered on almost 2,000 heavy-duty vehicles over a two-week period at the Port of Houston. Over fifty vehicles were selected using this screening methodology and instrumented with either a Portable Emission Measurement Systems (PEMS) and a Portable Activity Measurement Systems (PAMS) to gather additional activity and gaseous emissions including particulate matter (PM). This presentation will discuss the structure of the study, sampling methodology, and analyses conducted on the RSD measurements and instrumented vehicles.

2:20 "Fuel Economy and Emissions from Light-Duty Vehicles using Ethanol-Gasoline Blends and aHybrid Vehicle under Conditions of a Mexican City", L. Menchaca, M. Hernandez and A. Mendoza, Department of Chemical Engineering, México

The assessment of emissions from light-duty vehicles in Mexico is important because of their elevated contribution to the total amount of emissions from anthropogenic sources. The recent introduction of hybrid vehicles to the country and the programs that are set to start introducing gasoline oxygenated with ethanol represent an opportunity to reduce mobile source emissions. In this work, we present a study conducted to estimate fuel consumption of a hybrid light-duty vehicle and conventional light-duty vehicles using 5% and 15% v/v ethanol-gasoline blends. In addition, CO2, CO, NOx and total hydrocarbons (THC) emissions from cold-start, hot-start, controlled-circuit and real world driving tests were also conducted. Results were compared to vehicles equipped with conventional internal combustion engines using regular gasoline blends. The results showed that the hybrid vehicle tested had a fuel economy (14.5 km/L) higher than that of the internal combustion vehicles (11.1 km/L) when driven in Monterrey, Mexico. The fuel economy dropped from 1% to 5% with the conventional vehicles used a 5% ethanol blend, while the reduction ranged from 5% to 10% when a 15% blend was used. With respect to emissions, the hybrid vehicle presented lower emissions than those of an internal combustion vehicle; the reductions were in the order of 42% for CO2, 85% for CO, 72% for THC, and +90% for NOx. On the other hand, when ethanol-gasoline fuel blends were used, CO2 emissions factors changed marginally with respect to using the conventional blends, CO tended to decrease, while THC and NOx presented a more erratic behavior.

2:45 "Texas Implementation of the Motor Vehicle Emission Simulator (MOVES) Model", C. Kite, Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) has started implementing the use of the Motor Vehicle Emission Simulator (MOVES) model for on-road inventory development. In coordination with the Texas Transportation Institute, electronic utilities are being produced to combine emission rates from MOVES with vehicle miles traveled estimates from transportation sources such as travel demand models (TDMs). Unlike the previous MOBILE models, MOVES emission rates are not reported solely in units of mass per distance traveled (e.g., grams per mile), but also on a mass per vehicle basis (e.g., grams per vehicle). This presents opportunities for not only improving overall emission estimates, but also for refining the spatial and temporal allocation of those emissions for photochemical modeling applications. Existing data sets that may assist in these efforts include vehicle registration counts by zip code, along with trip origin and destination information from TDMs. The TCEQ currently uses Version 3 of the Emissions Processor System (EPS3) for preparing photochemical modeling inputs. Similar to most processors, EPS3 relies on the ten-character source category code (SCC) for tracking, reporting, chemical speciation, control strategy adjustments, and spatial allocation. The SCCs contained in the current MOVES database tables rely on twelve MOBILE-based vehicle categories, four pollutant processes, and thirteen roadway types. For photochemical emissions processing of MOVES-based inventories, the TCEQ is developing a custom SCC approach that relies on alpha characters for the thirteen source use types, nine fuel types, five road type emission rates, and fourteen pollutant processes employed by the current version of MOVES.

3:10 Break

3:40 “Implications of the MOVES2010 Model on Mobile Source Air Toxic Emission Estimates”, M. Claggett, Ph.D., Federal Highway Administration, Resource Center; V. Martinez, Federal Highway Administration, Office of Natural & Human Environment

This paper provides comparisons of mobile source emission estimates obtained with the U.S. Environmental Protection Agency’s MOVES2010 model (version 20091221) and MOBILE6.2 model (version 24-Sep-2003). The analysis focuses on the priority mobile source air toxics (MSAT), namely: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter. A nation-wide inventory of emissions by calendar year is presented, highlighting some differences between MOVES2010 and MOBILE6.2 forecasts. Since cleaner fuels and technology have become more effective in reducing overall emissions from vehicles, the significance of tailpipe emissions while vehicles are operating on highways has diminished relative to the proportion of emissions while vehicles are parked, when vehicles start, and during extended idling. The contributions of the different emission processes are shown. Also shown is the variability of emission factors as a function vehicle speed – arguably the most important traffic activity parameter. An alternative perspective is given for changes in emission factors versus the volume-to-demand ratio, a measure of traffic congestion. In addition, contrasts in emission trends of priority MSAT at the project-level computed by MOVES2010 versus MOBILE6.2 are offered.

4:05 “Characteristics of Vehicle Emission in China Based on Portable Emissions Measurement Systems”, K. He, Z. Yao and Y. Zhang, Tsinghua University, China

One hundred and twenty diesel vehicles and forty gasoline vehicles were measured in Beijing, Xi’an, and Shenzhen in China using a portable emissions measurement system (PEMS). The diesel vehicles contain one hundred trucks and twenty rural vehicles and the gasoline vehicles consist of private car. Particular matter (PM) emission factors and gaseous emission factors for pre-Euro (E0), Euro 1 (E1), Euro 2 (E2), and Euro 3 (E3) trucks were obtained under highway, urban, and rural driving conditions. In this study there is no significant decrease from E3 to E2 in the nitrogen (NOx) emission. The improvement of technology is not worked in controlling the NOx emissions in trucks. Taking Beijing as an example, it show that: the emission factors of CO, NOx and PM for heavy-duty trucks are the highest, and HC emission factors are the lowest among the light-, medium- and heavy-duty diesel trucks; the PM2.5 emission factors of diesel vehicles with the E3 technology is 60%~80% lower than those with the E1 technology; in addition, the amount of CO and HC emitted from rural vehicles and diesel trucks are also significant. Besides his study also focuses on emission characteristics of pre-Euro (E0), Euro 1 (E1), Euro 2 (E2), Euro 3 (E3) and Euro 4 (E4) cars , which were tested under different conditions.

4:30 “Uncertainty Analysis of Vehicular Emissions Inventory in China”, Y. Zhang, Q. Zhang and K. He, Tsinghua University

Multiyear inventories of vehicular emissions in China from 1994 to 2008 is developed in this paper to analysis the uncertainty of the vehicular emissions. This paper presents a bottom-up approach based on both of the models of MOBILE and the International Vehicle Emission (IVE) to calculate the vehicular emissions in China. In this paper it presents another top-down approach based on the other kind of the emission factor based on the fuel consumption and the total gasoline consumption in different provinces to calculate the vehicular emissions, which is compared to the gasoline vehicular emissions from the bottom-up approach.. This study finds that the vehicle weight distribution is a key factor that will influence the emission factor in different vehicle type. Because the difference of vehicle type between statistical data from China and the international emission factor model is hard to match perfectly, the emission factor of different type is uncertain. Secondly, the Vehicle Miles Traveled (VMT) is another factor, which is influence the vehicular emissions. Finally, the population of the vehicle in China is also an uncertain factor in estimating the vehicular emissions. This study presents using the survival function to estimate the population of the vehicle tin the model year.

Session 7: Innovative EI Development Methods

Chairs: Sally Dombrowski, US EPA

8:30 "Implementing a Collaborative Process to Improve the Consistency, Transparency, and Accessibility of the Nonpoint Source Emission Estimates in the 2008 National Emissions Inventory", J. G. Dorn and F. Divita, Jr., E.H. Pechan & Associates, Inc.; R. Huntley, U.S. EPA; M. Janssen, Lake Michigan Air Directors Consortium

In an effort to improve the development and quality of the nonpoint source emissions needed for the National Emissions Inventory (NEI), the U.S. Environmental Protection Agency (EPA) teamed up with the Eastern Regional Technical Advisory Committee (ERTAC) to implement changes to enhance consistency, transparency, and accessibility of nonpoint source emission estimates. ERTAC, which is made up of emission inventory experts from State agencies, was created to coordinate emissions inventories needed for air quality modeling and to provide a technically driven process for developing and improving 2008 emission estimates.

The collaboration focused upon working with staff of regional and state air pollution control agencies to discuss (and ultimately agree upon) consistent sets of activity data, calculation methods, and emission factors. To facilitate information exchange between stakeholders and improve transparency and consistency, the EPA, through its subcontractor E.H. Pechan & Associates, Inc., constructed a publicly accessible nonpoint emissions website to house emission calculation workbooks and detailed documentation of calculation methodologies. The website can be found at http://projects.pechan.com/EPA/Non-Point_Emission_Estimates/index.html. The workbooks and documentation provided consistency between state calculations and the accessibility of information on the website enabled feedback on how methodologies should be modified to better reflect actual emissions.

Such collaborative development proved successful in leveraging existing knowledge and in yielding more practical insights than if the EPA acted alone. By fostering a more transparent and collaborative effort, the NEI production process is expected to become more efficient and timely, leading to better informed policy decisions.

8:55 "Developing an Improved Wildland Fire Emissions Inventory", N. K. Larkin, T. Strand, R. Solomon, B. Potter, M. Rorig, and P. Lahm, U.S. Forest Service; S. Raffuse, D. Pryden, D. Sullivan, and N. Wheeler, Sonoma Technology, Inc.

Recent work has shown that largest source of uncertainty in wild land fire emissions is directly relatable to uncertainties in the basic fire occurrence information itself. While aggregate measures such as annual totals are less sensitive to these uncertainties, many applications of the National Emissions Inventory, including regional and local air quality uses, rely critically on having good fire occurrence information. Building off of work on the SMARTFIRE and BlueSky fire and emissions systems that are being used in the current U.S. NEI, efforts are now underway to combine a number of ground report sources and consumption and emissions models into a coherent wild land fire emissions inventory including both wildfire and prescribed fire-reporting systems. Lessons from this effort point to the need for unifying fire occurrence, fuels, and ancillary fire data in order to leverage the strengths of various databases with the aim of constraining uncertainties.

9:20 "Field Study of PM2.5 Emissions from a Road Widening Project", E. K. Pollard, D. S. Eisinger, P. T. Roberts, Y. Du, and S B. Reid, Sonoma Technology, Inc; B. T. Chenausky, Arizona Department of Transportation

Diesel-powered construction equipment is a significant and, historically, relatively unregulated source of air pollution. To investigate potential air quality impacts from transportation construction projects, Sonoma Technology, Inc. (STI) conducted a yearlong field study under funding from the Arizona Department of Transportation (ADOT). During this field study, STI collected data on construction equipment activities using a variety of methods, including instrumenting equipment with GPS units, collecting daily fuel logs, and reviewing ADOT field inspector diaries. This information was used to quantify emissions of particulate matter and other pollutants by equipment type and by phase of construction.

In addition, STI collected ambient air quality and meteorological measurements at the construction site via four monitoring trailers located within approximately 200 feet of the road. Monitoring data was used to characterize the near-field pollutant concentrations resulting from the construction effort and was compared to activity data and emissions estimates to investigate factors leading to increased air quality impacts from construction activities (e.g., types of equipment being used, meteorological conditions, etc)

The study results will provide ADOT with a framework for evaluating emissions from transportation construction projects and inform efforts to identify potential mitigation strategies related to construction equipment use.

9:45 "Establishing Graffiti Emissions as a Nonpoint Source Sector", A. M. Leskys, P.E., J.D.

Nationally, the annual cost of monitoring, detecting, removing, and repairing graffiti damage has been estimated as high as $15 to $18 billion. In Clark County, Nevada, it has been estimated that the costs to the public and private sectors are $30 million annually. These significant costs emphasize the importance of educating young people about the consequences of graffiti.

Yet noticeably missing from many graffiti education campaigns is detailed discussion about the impact graffiti has on air quality. In 1994, former EPA Deputy Administrator, Alvin Alm, observed that the United States was ―. . . nurturing a new generation that has much more knowledge and a different ethic about the relationship of man to the environment . . . .‖ That environmental ethic is arguably even more focused today as we learn about the serious consequences of climate change.

Within Clark County, it has been estimated that volatile organic compound (VOC) emissions from graffiti can be greater than emissions from several nonpoint sectors typically tracked by EPA. In 2008, an estimated 31 tons were emitted within Clark County, and 4,862 tons nationwide. By including graffiti-related emissions in EPA's triennial effort to establish a national emissions inventory, policymakers would be in a better position to understand graffiti's impact on air quality.

To achieve that purpose, this paper proposes a unique set of source classification codes (SCCs) for emissions proximally related to the actual act of graffiti, and methodologies for estimating those emissions. Collectively, these SCCs constitute the graffiti nonpoint sector.

10:10 BREAK

Session 8: Emission Inventory Data Analysis

Chairs: Alice Chow, US EPA
Josh Drukenbrod, US EPA

10:40 "Innovations in Greenhouse Gas Inventory Methods at the City-Scale", A. Ramaswami, University of Colorado Denver; T. J. Ewing, ICLEI-Local Governments for Sustainability

Like national and state governments, local governments seek to measure greenhouse gas emissions from within their jurisdictional boundaries, following comparable methods. Greenhouse gas (GHG) accounting at the city-scale is confounded by the relatively small spatial scale of cities and the significant exchange of materials, energy and transport that occurs across porous urban boundaries.

This paper presents an innovative hybrid life-cycle based method, field-tested in 8 US cities, that overcomes the spatial-scale and trans-boundary challenges listed above. The innovation integrates: 1) In-boundary GHG emissions associated with end-use of energy and direct process emission in cities, consistent with ICLEI LGOP; 2) Origin-destination allocation of trans-boundary transport addressing airline, freight and commuter-travel across city boundaries (Hillman et al., 2010); 3) Embodied energy of key materials essential for life in all cities, but often produced outside (e.g., food, fuel, water, shelter (construction materials)) (Ramaswami et al., 2008). The tri-module method yielded per capita GHG emissions consistent in inclusions and in magnitude (~25 mt CO2e/capita) from the city- to the national-scale for 7 major US cities, indicating the methodology maybe robust (Hillman and Ramaswami 2010).

The paper will also describe joint efforts of ICLEI-USA and UC-Denver in integrating these research findings to develop a community-wide GHG protocol for cities that is consistent with IPCC, WRI and EPA principles, that stimulates innovative policy strategies for GHG mitigation in cities, and, that links supply with consumption patterns in cities. The paper will discuss the challenges associated with city-scale inventories and the recommended methodologies for developing an inventory.

11:05 "Emissions Inventory Development for Fine-scale Air Quality Modeling", R. L. Tooly, US EPA; S. Reid, Sonoma Technology

In the U.S., many state and local agencies are now doing multi-pollutant fine-scale air quality modeling for SIP (State Implementation Plan) attainment demonstrations. The U.S. EPA formed a focus group of emission inventory developers in agencies that are building experience in developing more locally representative emission inventories to support fine-scale air quality modeling. The group was invited to share information on the types of problems they are trying to solve and approaches taken with the inventory development. This paper will discuss the findings of the focus group and emphasize the types of data analysis identified as particularly beneficial to help scope and prioritize the inventory work. Also included will be recommendations on how the group's findings can be translated to the EPA's National air Emissions Inventory (NEI). The types of NEI data analysis that can support state and local agencies who want to develop more locally representative emissions data for fine-scale air quality modeling will be described.

11:30 "A Comprehensive Emissions Inventory of Upstream Oil and Gas Activities in the Rocky Mountain States", A. Bar-Ilan, J. Grant, R. Parikh, A. Pollack, ENVIRON International Corporation; D. Henderer, Buys & Associates, Inc.; K. Sgamma, Independent Petroleum Association of Mountain States (IPAMS)

Beginning in 2007, the Independent Petroleum Association of Mountain States (IPAMS) and the Western Governor's Association's Western Regional Air Partnership (WRAP) have co-sponsored a project to develop detailed emissions inventories for oil and gas upstream exploration and production activities. These inventories cover the Rocky Mountain States in the U.S., including New Mexico, Colorado, Utah, Wyoming and Montana. These inventories, conducted on the geological basin level, are the most comprehensive oil and gas emissions inventories conducted to date in this region. The inventories include all major processes and equipment types from initial drilling, through completion, production and processing activities in the major oil and gas fields of the Intermountain West. The inventories were developed through compilation of detailed survey data collected from the major oil and gas companies operating in the region, and include criteria pollutant emissions of NOx, VOC, CO, SOx and PM considering a base year of 2006 with future year activity projections for 2012. The results of the inventory efforts for the nine basins considered in the study indicate that differences in inventories across basins are significant and justify the approach of analyzing individual basins as a basic geographic unit. Results also indicate that several factors, including permitting requirements, age of the basin and the type of production influence the equipment usage and the resulting NOx and VOC emissions. Finally, these results suggest that even in states with low permitting thresholds, the Phase III inventories indicate that significant emissions come from unpermitted sources.

12:00 LUNCH

1:30 "Characterization and Breadth of Rail Yard Specific Inventories", B. Douglass, J. Heiken and G. Rubenstein, Sierra Research

Recent interest in evaluating the impacts of rail yard facilities on local air quality includes the California ARB's 2007 rail yard health risk assessments and the Lake Michigan Air Directors Consortium's 2009 "Midwest Rail Study." In support of these two efforts, Sierra Research has completed comprehensive rail yard inventory evaluations for eight facilities. From these eight, the characteristics and breadth of emissions causing activities are quantified and contrasted including criteria pollutants as well as key toxic compounds. Inventory methods, data sources and results are presented. The key overarching characteristic impacting inventory development is the type of rail yard facility: classification, intermodal, maintenance and specialty. All four of these yard types are represented. Moreover, aside from locomotives, there are twenty types of other sources potentially present at any facility including on-road trucks/vehicles, cargo

handling equipment, stationary engines, fuel storage tanks, sand towers and wastewater treatment plants. The type of rail yard facility will indicate the types and proportions of non-locomotive operations occurring. For example, the PM emission inventory for classification rail yards will be dominated by locomotive sources (greater than 95 percent) whereas, locomotives can represent a minority of PM emissions in a intermodal facility (in the 30 percent range).

The main conclusions of this work are (1) the data requirements for properly preparing the facility inventory, depending on the type of facility, can be significant and (2) there is no "typical" facility (as variety is clearly evident) and extrapolation or generalization from one facility to another is highly discouraged.

1:55 "IKS eeM System", M. Ballesteros, Environmental Quality Directorate, Basque Country, Spain

The IKS eeM System, Integral Management System of Environmental Information, is a management instrument orientated at the new technologies which the Department of the Environment, Territorial Planning, Agriculture and Fishery of the Basque Country provides entities and the public in general of the Basque Autonomous Community to facilitate the exchange of information exclusively by electronic means through the INTERNET.

Within the 2006-2010 Strategic Plan's framework (Modernization, Management, Quality and the Automation of Systems) and boosted by the Basque Government's Department of the Environment and Regional Planning, the **Environmental Information Integral Management System, IKS eeM System which** makes up the basic central theme of the information transaction processes between entities (entities like any external agent to the organization, regardless of its legal status) and the Autonomous Basque Community's Environmental Administration.

The Electronic Management System includes all the information that the entities (any external agent) must provide the Administration for environmental control, so that it serves to cover all the information transactions of both System clients (external entities) as well as the Department itself with said entities and/or with other administrations (local, state, Ministry of the Environment) and/or from the European Community, and at the same time makes up the support for the electronic transmission of the administrative files.

In order to do this, the Basque Government's Department of the Environment and Regional Planning provides external entities the electronic Environmental Declaration/e-DMA to be used, by means of new technologies, both the annual processes of information transmission (e-DMA_NOTIFICATION) and that relating to the request for administrative authorization processing (e-DMA APPLICATION). Furthermore, the Department provides a research instrument to find solutions aimed at improving entities' environmental behavior. Information System as long as it conforms to the format stated by the European Commission (XML file).

The information contained in the IKS eeM System will provide to the entities with the necessary indicators, which define their environmental behavior on the one hand, and, on the other; the administration will have the information necessary to generate the Inventories and Statistics. Lastly, said indicators will feed the Environmental Dashboard (CMA), key in the process of making decisions, definition and execution of environmental policies.

2:20 "Air Emissions Data Management at the Goddard Space Flight Center", K. Moxley, NASA/Goddard Space Flight Center; J. E. Martin, Jr., Straughan Environmental Services

Goddard Space Flight Center in Greenbelt, Maryland, is the home of state-of-the-art laboratories, fabrication, integration and testing facilities, as well as operations capabilities for the full life cycle development of spacecraft and instrumentation.

Data Collection. GSFC has traditional emissions sources such as boilers and generators but also has unique emissions sources originating in the research laboratories and facilities. The latter facilities have little or no automated data collection. Data is transcribed from handwritten logs. The impact of data collection for GHG scope 1 combustion sources was minimal.

Management. All data is entered into a resident Access database. The ongoing maintenance of the database drains resources. Keeping up with new requirements requires time-consuming updates but allows for rapid response. Our chemical inventory of HAPs/TAPs is huge but quantity used is small. The chemicals in use are continuously changing. A central automated hazardous materials management system would make this process more accurate and much simpler. Data verification is a major issue whether for boiler/generator operations or Research &Development. Quarterly verification of all permit conditions and data quality is achieved to ensure continuous compliance.

Reporting. The database does it all, but it has the same problem of responding to changes. Challenges arise when the State changes their reporting mechanism on short notice (resident database can be quickly changed). GHG reporting drove very substantive changes.

COTS versus resident database pros and cons will be discussed. Lessons learned will be presented.

2:45 "Measurement of Residential Space Heating Fuel Use in Alaska", B. Dulla, Sierra Research

During winter months, Fairbanks, Alaska experiences arctic temperatures, severe inversions and high concentrations of $PM_{2.5}$. Analysis of speciation data collected at local monitoring sites indicates that sulfate accounts for 25 percent of the recorded mass. CMB modeling and C-14 analysis indicate that wood burning is responsible for 40+ percent of particulate matter impacting the monitors. Telephone surveys conducted in recent winters indicate that wood burning has increased in response to the increasing cost of the relatively high sulfur fuel oil (~2,200 ppm) which is the primary source of residential space heating. Since Fairbanks can exceed the ambient $PM_{2.5}$ standard at temperatures ranging between +10º F and -40º F, it is critical that space-heating emissions are accurately resolved as a function of ambient temperature and time of day. To address this need, the State of Alaska with support from Fairbanks North Star Borough is conducting a series of studies to quantify the moisture content of wood being burned and the fuel used in residential space heating. This past winter a representative sample of homes was instrumented with data loggers, which measure the number of seconds each hour that fuel oil furnaces were operated over a winter month. In addition, information on the amount of wood burned in each home, by device type was collected through a combination of methods. Thermocouples were placed directly in the flues of wood burning devices and stack temperatures were also measured over a month long period. The fuel use data has been analyzed as a function of ambient temperature, square feet of heating, space, etc. and is being used to create diurnal profiles of fuel use and emissions as a function of ambient temperature for use in photochemical modeling, source apportionment and attainment planning.

3:10 BREAK

3:40 "Portable Emissions Measurement of Retrofit Control Effectiveness on a Marine Application",
M. C. Block, Emisstar LLC

The proposed project quantified the emissions reduction performance of the high-performance ESW XtrmCat™ diesel oxidation catalyst (DOC) in combination with a Crankcase Ventilation System (CVS) on one selected test vessel from the Ingram Barge Company fleet. The specific test vessel was equipped with two recently overhauled EMD-12 cylinder engines rated at 3,000 HP per engine. This vessel, in commission since in 1964, currently operates on the Mississippi, Illinois and Ohio Rivers. This project is part of the EPA Emerging Technologies Program, and is expected to achieve significant reductions in particulate matter (PM) through the use of the DOC and CVS system installed on six (6) high horsepower Marine vessels for a total of 13 engine retrofits. Laboratory-based emissions reductions for these technologies of 0, 25, 25 and 70 percent for NOx, PM, HC and CO, respectively, have been documented by EPA.

For this project, Emisstar provided overall Project Management and completed the onsite portable in-use emissions testing (PEMS). For raw gaseous sampling, Emisstar employed the Sensors Inc.-manufactured SEMTECH-DS, and for partial dilution PM sampling, the SEMTECH Micro-Proportional Dilution System (SEMTECH-MPS) along with the SEMTECH Filter Particulate Measurement System (SEMTECH-FPM), the latter employing gravimetric filter deposition. Sampling was performed in accordance with CFR Part 1065. Testing was completed by operating the vessel in "push mode" against the river embankment over the ISO 8178-4 E3 four mode test cycle evaluating five unique emission control configurations. The preliminary

results, currently under review by project stakeholders, will be summarized in the paper/presentation upon finalization.

4:05 "Identification of Sensitive Emission Affecting Air Quality in Beijing", Z. Ying, C. Dongsheng, C. Shuiyuan and H. Qing, College of Environmental & Energy Engineering, Beijing University of Technology, Beijing, China

This study is an analysis about the screening of the sensitive air pollutant emission, which had great influence on the PM10 air quality in Beijing. Based on the air pollutant emission inventory of Beijing and surrounding provinces, which were developed on the geography information system, a coupled MM5-CMAQ air quality modeling system was applied to investigate the contributions of various orientation emission sources to the concentrations of PM10 in the Beijing metropolitan region over China. The scenarios results indicated that the sensitive orientation in the winter, spring and autumn was northwest, and the sensitive orientations were southwest and southeast in summer. It was also found that during the period from 10 July to 11 July in 2005 when the southwest airflow was prevailing, the contributions of PM10 concentration in Beijing from every 100,000 t PM10 emission source in Baoding, Shijiazhuang, Xingtai and Handan were 31.2μg/m3、25.4μg/m3、23.1μg/m3 and 17.3μg/m3. It could be found that with the distance increasing the sensitive degreed was reducing, but there was no linear relationship between them. In addition, stationary emission source, fugitive industrial emission source, road dust emission source, and construction site dust emission source were four types of sensitive emission in Beijing local areas, which could present high contribution of PM10 concentration in Beijing. The results could be useful for government to make specific target on keeping satisfactory air quality with reasonable emission reduction and balance the conflict between the huge benefit from good air quality and increased pressure on pollution control.

4:30 "The Use of Source Apportionment Modeling and Cost-Effectiveness Data in Control Strategy Development", G. Stella, Alpine Geophysics, LLC; R. Morris and O. Nopmongcol, ENVIRON International Corp.

A key component in the development of an effective ozone or particulate matter (PM) control strategy is the ability to define a series of emission controls that can provide benefit in areas and to pollutants, which have the largest impact on attaining an air quality standard. These strategies have mainly been defined using a cost per ton reduced metric without the benefit of completely analyzing the geographic or source category concentration contribution of these controls. The study team is implementing a previously defined approach that relates the cost-effectiveness of controls for various geographically defined source categories to reducing ozone or PM concentrations at specific locations. A database of source-specific control measure cost-effectiveness information is implemented with air quality model generated source apportionment transfer coefficients to develop metrics that can be used to further analyze the costs and contributions of various control measures. These metrics are then used to construct best practice strategies to achieve ozone and/or PM air quality standards by reducing geographically or source category targeted ozone and PM precursors. This paper provides a demonstration of that application.

4:55 "Estimating Load Factors for Nonroad Diesel Equipment using In-Use Measurements", D. Choi, C. Fulper, R. Giannelli and J. Warila, US EPA National Vehicle and Fuel Emissions Laboratory; S. Kishan, T. DeFries, Eastern Research Group

In estimating emission inventories for nonroad equipment, an important input is the "load factor," which represents the average power output of engines, expressed as a fraction of rated power. When multiplied by a brake-specific emission rate and average rated power, the result is an estimated emissions mass rate (mass/time). Cleary, the accuracy of inventories depend on how accurately load factors estimate real-world power output. Load factor inputs used in the NONROAD model range from 20% to 65% of rated power.

Until recently, load factor has been difficult to estimate. Estimates derived from engine dynamometers are as representative as the drive cycles chosen, but do not reflect the interplay between engine size and power demand during actual use.

Recently, EPA completed a study of in-use emissions and activity of heavy nonroad equipment. Equipment pieces owned by construction firms were randomly selected through a three-stage sampling design. For selected pieces, emissions and usage were measured using portable instrumentation during normal operation over one work day. Equipment measured primarily represents the equipment types commonly seen at construction sites, such as dozers, loaders, backhoes, and excavators.

It was not feasible to measure power directly using non-intrusive techniques. However, it is possible to estimate engine load, by combining measured fuel flow with peak fuel estimated from engine maps. Engine load can be estimated by relating fuel consumption to maximum fuel flow, or actual power to maximum power. This paper will present load factors estimated from in-use data and make comparisons to existing estimates.

Thursday, September 30, 2010

Session 9: Tools -Leveraging Technology

Chairs: Alison Eyth, US EPA
Ron Chapman, RWDI AIR

8:30 "Evaluation of Evaporative Leaks using RSD and Inventory Implications", D. Hawkins, C. Hart, C. Fulper, J. Warila, D. Brzezinski, US EPA; S. Kishan, T. Defries, Eastern Research Group; J. Kemper, J Sidebottom, Colorado Department of Public Health and Environment

Evaporative leaks contribute significantly to the national hydrocarbon inventory. There has not been a test program to quantify high-evaporative vehicles since pre-enhanced vehicles dominated the fleet. EPA, CRC (Coordinating Research Council) and CDPHE in various partnerships have collected data to quantify the aging enhanced evaporative fleet. RSD (Remote sensing device) technology has been used in conjunction with a 15-minute PSHED hot soak (Portable Sealed Housing for Evaporative Determination) and manual detection methods to indentify varying levels of evaporative emissions from passenger vehicles.

Over 20,000 vehicles received RSD measurements during two summer test programs in Colorado Inspection and Maintenance (IM) lanes. A sub-sample of over 250 vehicles was accompanied with PSHED measurements and manual leak inspections. Recruitment for the sub-sample used a stratified sampling methodology to assure Inclusion of less frequently seen 'high' emitting vehicles.

PSHED hot soak data has been compared to laboratory hot soak data (CRC E-77-2) of vehicles with implanted leaks of minimum OBD detection diameter (.020"). RSD sensitivity to this relatively low leak rate is still unclear; however, additional refinement to RSD analysis appears promising in its ability to distinguish smaller leaks from confounding factors (high-speed drive-bys, high exhaust hydrocarbon, and low temperatures.)

Data from field and laboratory testing have been analyzed with the goal of updating MOVES (Motor Vehicle Emission Simulator) modeling of leak prevalence and severity. We are also continuing to refine algorithms for analyzing existing RSD datasets with the ultimate goal of developing a tool for estimating evaporative emissions inventories in local areas.

8:55 "Fire Management Tools Advance North Carolina's SMP and Emission Inventory", G. M. Curcio, Fire Environment Branch Head, NC Division of Forest Resources Fire Environment Branch, Kinston, NC; J. Reardon , US Forest Service Rocky Mountain Research Station, Missoula Fire Lab, Missoula, MT, USA.

The advancement of the North Carolina (NC) Smoke Management Program is dependent on the integration of science and the effective use of fire management tools. Many natural resource management agencies in North Carolina are planning to increase controlled burning acreages at a time of changing air quality standards. More effective tactics are needed to meet the combined pressures of the new regulatory environment and the increasing complexity of NC's air sheds, which is due to the growth of urban/forest interface.

New tactics for increasing burning opportunities or the maintenance of existing prescribed burning programs are dependent on better, finer scale tools and real time data that can provide timely information that support burning decisions. In North Carolina, thick organic soils along the coastal plain are a unique factor in the decision-making process and tools such as Estimated Smoldering Potential (ESP) in Organic Soils and the National Fire Danger System can provide valuable insight on burning conditions. The Camp Lejeune case study presented here demonstrates the use of some of the available tools. ESP and NFDRS models were used to provide input into fire emission and dispersion models. The use of these models support control burning as well as provide insight to the needed development of a real time electronic emissions database.

9:20 "The Transparency Imperative in GHG Reporting", S. S. Salinas and Accenture T. Carnac, Carbon Disclosure Project

As part of Executive Order 13514, each agency's Strategic Sustainability Performance Plan shall "establish and report to the CEQ Chair and OMB Director a comprehensive inventory of absolute greenhouse gas emissions, including scope 1, scope 2, and specified scope 3 emissions as follows: (i) within 15 months of the date of this order for fiscal year 2010, and (ii) thereafter, annually at the end of January, for the preceding fiscal year."

This presentation will discuss what transparency really means in GhG reporting and provide examples from both the public and private sector. Specifically, presenters will discuss some elements of transparency in GhG reporting, including: independent verification/validation of GhG data; completeness of information, accountability in "roll-up," etc. and share lessons-learned from Accenture's client experience, Carbon Disclosure Project (CDP) reporting and Climate Leaders partners.

A New Era of Transparency in GhG Reporting A 2009 Accenture worldwide end-consumer survey entitled Shifting the Balance from Intention to Action: Low Carbon, High Opportunity, High Performance, confirms consumers' demands for transparency in greenhouse gas reporting. Accenture's Climate Change Practice works closely with CDP to provide advice on government GHG engagement strategies, including the need to deliver on this transparency imperative.

Beginning in 2010, corporations report to CDP through an improved and upgraded version of CDP's global climate change disclosure system. The new CDP platform will streamline disclosure for companies by providing enhanced tools and guidance through a single, fully accessible system, and enable the collection of a full set of global corporate climate change data, drilling down to business division and installation level as well as collecting information at a corporate level to provide more detailed, consistent, comparable and actionable data. The new reporting ability will also be easily shared with and analyzed by institutional investors, corporations and the world's national regulatory systems. With more user-friendly output of information, CDP's upgraded system will drive scale and greater use of corporate climate change information within financial and strategic decision-making. As a technical advisor to US EPA's Climate Leaders Program, WSP also promotes the highest levels of transparency in GhG reporting through on-site reviews and the development of comprehensive GhG inventory management plans.

9:45 "NEI Reengineering: A Status Report on EIS and the 2008 NEI", D. Solomon, S. Dombrowski, R. Ryan, R. Huntley and L. Driver; US EPA

In 2004, EPA began a project to reengineer the process for developing the National Emission Inventory. EPA is in the middle of implementing the new process and the new Emissions Inventory System (EIS) built to run the process. This paper will present results from the implementation thus far, lessons learned, and potential improvements for the future.

10:10 BREAK

Session 10: Emissions Factors

Chairs: Roy Huntley, US EPA
Madeleine Strum, US EPA

8:30 "Emissions Factors Program Improvement Abstract", T. Driscoll, US EPA

This presentation discusses EPA's efforts to improve the development of emissions factors; representative values that relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Ideally, all emissions data would be collected by continuous emissions monitoring with no need for emissions factors. However, measurement via instruments is sometimes not feasible or too costly. Emissions Factors were originally established to fill data gaps when developing emissions inventories. However, emissions factors are now used for a variety of air pollution activities including establishing permit limits.

EPA published an ANPRM in October 2009 seeking comments on proposed approaches to improve emissions factors development. Our goal is to develop a self-sustaining emissions factors program that produces high quality emissions factors more quickly, better indicates the precision and accuracy of emissions factors, streamlines the emissions factors development process, encourages the appropriate use of emissions factors, and ultimately improves emissions quantification.

To meet this goal, EPA is updating Web FIRE and developing a process for electronic submission of test reports. EPA is clarifying the steps needed for developing emissions factors in a procedures manual that also discusses topics such as ranking of emissions factors, use of measurements "below detection limits", and how we will handle outliers. We are revising the source classification code (SCC) system and how they are developed. We are also considering requiring the submission of all performance tests, required by parts 60, 61, and 63, to be submitted to EPA.

8:55 "Emissions Uncertainty: Focusing on NOx Emissions from Electric Generating Units", E. Wisner, A. Anderson, C. Geisenhoffer, B. Heffner, M. Shaw and B. Hunt, Dept of Statistics, NCS; D. Mobley, G. Pouliot Atmospheric Modeling and Analysis Division, National Exposure Research Laboratory

Emission factors are important for estimating and characterizing emissions from sources of air pollution. An emission factor is a representative value that attempts to relate the quantity of a pollutant released into the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of particulate emitted per mega gram of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution based on: pollutant class, type of combustion, and fuel source. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i. e., an estimated population average). The objectives of this presentation are to: (1) Verify the AP-42 NOx emission factors from combustion sources from Electric Generating Units (EGUs) with currently available continuous emission monitoring data; (2) Develop quantitative uncertainty indicators for the EPA's A through E rated emission factors on NOx emissions from combustion sources. We found that the AP-42 emission factor values were accurate for some SCCs (Source Classification Codes), which accounted for over two thirds of our data. However, in general, the AP-42 values were not accurate for over half of our SCCs. We were also able to quantify the uncertainty of the AP-42 letter grades.

9:20 "Revising the EPA's Residential Wood Combustion Access Tool to Develop a 2008 Emission Inventory", R. Huntley, EPA; F. Divita, J. Van Bruggan, EH Pechan & Associates

The EPA developed a tool that creates a county level residential wood combustion emission inventory for criteria and hazardous air pollutants. The inventory accounts for many wood burning devices, including fireplaces, inserts, woodstove, pellet stoves, outdoor hydronic heaters, and indoor furnaces, as well as wax fire logs burned in fireplaces. The inputs for the tool for specifically designed for 2005 so the inventory created in for 2005. This paper discusses the revisions of that tool so that the calculated inventory is for 2008 and the results of the first version prior to the state's data being submitted to EPA

9:45 "New Field Study Improves GHG Emissions Factors for Petroleum Industry", M. Webb, STAR Environmental

New leak quantification data gathered at oil and gas production facilities show that the average size of leaks has decreased significantly over the last 20 years.

The new study was conducted by STAR Environmental, the same company that generated the oil and gas data used in EPA's standard reference on fugitive emissions factors, EPA-453/R-95-017 – "1995 Protocol for Equipment Leak Emission Estimates"1.

When grouped into five exponential size categories, the 1995 EPA data followed a slightly skewed population distribution. Specifically, when grouped by standard cubic feet per hour (scf/hr) as “Very Small” (less than 0.010 scf/hr), “Small” (0.010 to 0.099 scf/hr), “Medium” (0.100 to 0.999 scf/hr), “Large” (1.000 to 9.999 scf/hr), and “Very Large” (equal to or greater than 10.00 scf/hr), the leak population was 1%, 28%, 35%, 29%, and 7%, respectively.

As expected, the total emissions increased exponentially, viz. 0%, 0%, 5%, 33%, and 62%, respectively.

The most recent study by STAR Environmental found that the population of “Very Large” leaks has decreased significantly. This population reduction is paralleled by a substantial reduction in total fugitive emissions into the atmosphere from the oil and gas industries.

STAR quantified leaks using a new hand-held quantifier that incorporates technology developed by Gas Technology Institute, NFP.

This paper presents findings of the new study of petroleum industry and compares current data to the 1995 EPA data.

10:10 BREAK

10:40 “Emission Estimate Methodology for Maritime Navigation”, C. Trozzi, Techne Consulting srl, Roma (Italy)

The paper reports about the methodology for estimate emissions from navigation, recently updated in the frame of maintenance of the EMEP/EEA air pollutant emission inventory guidebook1 (the Guidebook). Emissions can be estimated at different levels of complexity. In the Guidebook these are expressed in three tiers of increasing complexity (in similar way with the 2006 IPCC Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories).

The paper briefly introduces the different tiers and describes in detail the most complete methodology (tier 3) for estimate emission in cruise (open sea), maneuvering (approaching harbors) and hotelling (at the dock in port). The methodology uses both installed capacity and fuel consumption as alternative for the emissions estimates and take into account both the main and auxiliary engines. Where fuel consumptions are know the emissions can be computed with fuel related emission factors for the different navigation phases (cruise, hotelling, maneuvering).

Where fuel consumptions are not know, a specific methodology is proposed for computing emissions based on installed power. Finally, when installed power is not know specific functions are proposed to evaluate installed power from gross tonnage. The functions are derived, for different ship types, using data on about 100.000 ships from Lloyd s register database. Finally simplified methodologies are introduced for use when detailed information is not available.

11:05 “Major Environmental Advancements in Military Coatings using reduced VOC Coatings”, J. Mort, Hentzen Coatings

US military coatings have been showing major advances in environmentally - friendly formulations. HAP's Free and extensive reductions in VOC emissions have been the trend at most military painting operations. Use of Water Reducible and Exempt Solvent Technologies have shown that it is possible to have multi-functional coatings that are 'greener' and process-friendly. The prospects for reductions of 50 - 70 percent of harmful emissions has become a reality. Review of usage data and HAP / VOC impact of primary military coating systems.

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