

Environmental Vision – An International Electricity Sector Conference 2015 (ENV-VISION 2015)

Crystal City, Virginia, USA
12-14 May 2015

Volume 1 of 2

ISBN: 978-1-5108-1421-9

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The information and opinions expressed in these papers/presentations are solely of the authors and should not be considered as having the endorsement or support of the Association.

Compilation Copyright © (2015) by Air & Waste Management Association.
Copyright of the individual papers are retained by the authors.

Additional copies of these and other A&WMA conference proceedings will be available through the A&WMA Online Store. To place an order, please visit the Online Store at www.awma.org or contact the A&WMA Publications Order Department at onlinestore@awma.org, +1-412-232-3444 (phone) or +1-412-232-3450 (fax).

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact Air and Waste Management Association at the address below.

Air and Waste Management Association
One Gateway Center, 3rd Floor
420 Fort Duquesne Blvd.
Pittsburgh, Pennsylvania 15222-1435
USA

Phone: +1-800-270-3444
+1-412-232-3444
Fax: +1-412-232-3450

info@awma.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

KEYNOTE PAPERS

Bridging to the Future: Meeting Today's Environmental Challenges in a Transitioning Energy Sector	1
<i>M. Howard</i>	
Greening Con Edison	4
<i>C. Ivey</i>	
Challenges for Clean Energy Financing	14
<i>R. Jones</i>	
You're Not Dead Yet": The Case for an Options-Based Climate Strategy and the Role of "Utility 1.5	28
<i>A. Cohen</i>	

PANEL SESSION 1A: FUTURE RESEARCH DIRECTIONS IN AIR QUALITY

Future Research Directions in Air Quality: A Perspective	46
<i>P. Amar</i>	
Research Needs: Air Emissions Implications of Switching to Gas and Renewables (and Other Low-pollution Generation)	58
<i>J. Apt</i>	
Perspectives on Future Directions in Air Quality Research Relevant to the Electricity Sector	71
<i>B. Hubbell</i>	
A Utility Perspective on Challenges in Air Quality Research	79
<i>J. Jansen</i>	
Looking Forward to Addressing Ever Finer (and Costlier) Issues: Research Issues in Air Quality	86
<i>A. Russell</i>	

PANEL SESSION 1B: FUTURE RESEARCH DIRECTIONS IN LAND AND WATER SCIENCES

Food/Water/Energy FY2015	99
<i>B. Cooper</i>	
Clean Water Act 316(b) Technical Implementation Challenges and Needed R&D	100
<i>D. Dixon</i>	
U.S. EPA Tools & Research to Advance the Beneficial Use of Coal Combustion Residuals.....	114
<i>K. Salyer</i>	
Conserving Species in 2015 and Beyond: Setting Priorities and Using Resources Effectively	125
<i>G. Shultz</i>	

PANEL SESSION 1C: ENERGY AND CLIMATE ANALYSIS – DIRECTION OF U.S. CLIMATE POLICY

EPA's Clean Power Plan - Development of State Plans.....	130
<i>M. Dowd</i>	
Annual Energy Outlook 2015	137
<i>S. Napolitano</i>	
Measuring the Benefits of GHG Emissions Reductions: The Social Cost of Carbon.....	161
<i>S. Rose</i>	

SESSION 2A: AIR QUALITY HEALTH

Evaluation of Evidence EPA Cites in Support of the Ozone National Ambient Air Quality Standards for Ozone Proposed Rule	172
<i>J. Goodman</i>	
Review of Major Findings from Multivariate Pollutant - Research in the Laboratory.....	180
<i>J. McDonald, M. Reed</i>	

Exposure Assignment in a Multi-City Study of Ambient Pollutants and Morbidity	195
<i>S. Sarnat, A. Winquist, J. Sarnat, J. Mulholland, A. Russell, P. Tolbert</i>	
Assessment of Air Pollutant and Lifestyle Exposures on Health	206
<i>H. Suh</i>	

SESSION 2B: WATER RESOURCE MANAGEMENT (PANEL)

Environmental and Sustainability Challenges of Water Use in the Electricity Sector	217
<i>M. Hightower</i>	
Toward a Better Understanding of Water Withdrawals and Consumption in the Thermoelectric, Agricultural and Municipal Sectors.....	229
<i>S. Roy</i>	
Electric Power Sector Engagement in Water Stewardship: Drivers, Benefits, and Challenges.....	242
<i>L. Weintraub</i>	

SESSION 2C: ENERGY & CLIMATE ANALYSIS – ANALYSES OF THE CLEAN POWER PLAN (PANEL)

Costs and Benefits of EPA's Proposed Clean Power Plan - Technical Flaws in EPA's Net Benefits Estimates	257
<i>S. Bloomberg</i>	
Potential Energy Market Impacts of EPA's Clean Power Plan	269
<i>J. Larsen</i>	

SESSION 2D: ENVIRONMENTAL ISSUES RELATED TO RENEWABLE ENERGY

Environmental Issues Related to Renewable Energy	281
<i>A. Coleman, J. Goodrich-Mahoney</i>	
Environmental Review and Assessment of Renewable Energy Projects.....	292
<i>P. Jacobson</i>	
Evaluating Noise Impacts from Renewable Energy Projects in Maryland.....	302
<i>P. Mountain, J. Sherwell</i>	
Predicting Solar Insolation for Renewable Energy Technologies Using Supervised Machine Learning Techniques.....	311
<i>F. Yeboah, R. Pyle, C. Hyeng</i>	

SESSION 2E: COAL COMBUSTION PRODUCTS MANAGEMENT

Creating Sustainable Roadway Infrastructure Using Coal Combustion Products	327
<i>C. Benson</i>	
Process vs. Prescription: An Update on CCP in North Carolina.....	346
<i>J. Daniels, M. Khire, C. Hardin</i>	
Framework for Evaluating Relative Impacts of Surface Impoundment Closure, Options	369
<i>A. Lewis</i>	
Use of Potential Failure Modes Analysis to Address Ash Pond Stability and EPA Coal Ash Regulations.....	378
<i>B. Walton, G. Gregory, J. Trast</i>	

SESSION 3A: AIR QUALITY HEALTH

Pulmonary Inflammatory Effects of Source-Oriented Particulate Matter From California's San Joaquin Valley	399
<i>A. Wexler</i>	
Triggering of Myocardial Infarction by Increased Ambient Fine Particle Concentration: Examination of Source Specific PM_{2.5} and PM_{2.5} Source Direction	412
<i>D. Rich</i>	

Building a Better Bridge Between Environmental Health Science and Public Health Risk Assessment.....	425
<i>A. Smith</i>	

SESSION 3B: THREATENED AND ENDANGERED SPECIES (PANEL)

Habitat Conservation Plan Overview	439
<i>R. Hall</i>	
Endangered Species Act: Challenges and Opportunities in the Endangered Species Listing Program.....	445
<i>D. Krofta</i>	
Threatened and Endangered Species Panel.....	450
<i>D. Krofta, T. Male, R. Hall</i>	

SESSION 3C: ENERGY & CLIMATE ANALYSIS – ANALYSES OF COSTS OF THE CLEAN POWER PLAN (PANEL)

A Proximate Mirror: Greenhouse Gas Rules and Strategic Behavior Under the U.S. Clean Air Act.....	452
<i>D. Burtraw, K. Palmer, S. Pan, A. Paul</i>	
The Clean Power Plan: Its Legacy and Implications for Future Policies.....	461
<i>M. Ross</i>	

SESSION 3D: ENVIRONMENTAL ISSUES RELATED TO RENEWABLE ENERGY: BIRDS AND BATS

Population-level Impacts of Wind Energy on Wildlife Populations: Assessing Risk to Golden Eagles and Indiana Bats.....	471
<i>N. Friedenberg</i>	
Integrating Avian-Friendly Electrical Infrastructure with Renewable Energy	481
<i>R. Harness</i>	
Smart Curtailment: Optimizing Wind Power Generation and Bat Conservation.....	512
<i>C. Sutter, J. Goodrich-Mahoney, L. Hooton, C. Newman</i>	

SESSION 3E: COAL COMBUSTION PRODUCTS MANAGEMENT

Groundwater Monitoring Under the Coal Combustion Residuals Rule.....	533
<i>B. Hensel</i>	
Water Management to Meet the CCR Rule	546
<i>D. Fink</i>	
EPA Guidance on Use of the Leaching Environmental Assessment Framework (LEAF).....	555
<i>S. Thorneloe</i>	

SESSION 4A: AIR TOXICS HEALTH & RISK ASSESSMENT

Evaluation of Gene Expression Changes in Human Primary Lung Epithelial Cells Following 24-HR Exposures to Inorganic Arsenic and Its Methylated Metabolites and to Arsenic Trioxide.....	569
<i>R. Gentry</i>	
Comprehensive Analysis of Inorganic Arsenic Concentrations in Finfish and Shellfish for Use in Risk Assessment.....	581
<i>A. Lewis</i>	
Cumulative Risk Assessment of Urban Air Toxics: A Pilot Study in San Antonio, Texas	598
<i>D. Proctor</i>	
Mercury: The Need for a Reappraisal of Its Releases and Fate	610
<i>D. Streets, H. Horowitz, E. Surderland</i>	

SESSION 4B: EFFLUENT GUIDELINES

FGD Wastewater: Industry Perspectives.....	622
<i>E. Aldridge</i>	

Pilot Biological and Zero Valent Iron Wastewater Treatment Evaluation	629
<i>J. Chwirka, P. Chu, J.-C. Younan</i>	
Guidance for Power Plants in Responding to FGD Wastewater Numeric Standards	639
<i>D. Fink, T. Higgins, K. Jenkins, D. Egeland</i>	
Understanding Scrubber Wastewater Variability	649
<i>C. Acharya</i>	

SESSION 4C: ENERGY & CLIMATE ANALYSIS – CLEAN POWER PLAN REGIONAL IMPLEMENTATION PERSPECTIVES (PANEL)

A Summary of Key Results from PJM's Economic Analysis of the EPA's Clean Power Plan Proposal	658
<i>M. Abdur-Rahman, P. Sotkiewicz, M. Helm</i>	
Regional Cooperation Under the Clean Power Plan - Incentives for Trading Under Rate vs. Mass Compliance	667
<i>D. Young</i>	

VOLUME 2

SESSION 4D: LIFECYCLE AND OTHER ASSESSMENTS OF RENEWABLE TECHNOLOGIES

Addressing Air Quality Issues of Biopower in California	681
<i>M. Carreras-Sospedra, D. Dabdub, R. Williams</i>	
Lifecycle Analysis for Estimating the Human Health Impact from Electricity Generating Sources	696
<i>M. Diaz, P. LaPuma</i>	
Integrating Anthracite Coal Surface Mining and Reclamation with Pumped Storage Construction	710
<i>P. Direnzo</i>	
Environmental Impacts of Renewable Electricity Generation Technologies: A Brief Review of Greenhouse Gas Emissions, Water Use and Land Use	755
<i>G. Heath</i>	

SESSION 4E: GROUNDWATER MANAGEMENT

Priority Groundwater Activities at the U.S. Geological Survey	770
<i>P. Barlow</i>	
Hydraulic Tomography: High-Resolution Subsurface Characterization for Optimizing Environmental Control and Remediation	784
<i>C. Mok, T.-C. Yeh, W. Illman</i>	
US Nuclear Industry Perspective: Voluntary Groundwater Protection Initiative	803
<i>G. Oliver, R. Cardarelli</i>	
Groundwater Activities in the DOE Related to the Water-Energy Nexus	815
<i>J. Quinn</i>	

SESSION 5A: AIR TOXICS HEALTH & RISK ASSESSMENT

High-Resolution, Low-Dose Dose Response for Arsenic-Induced Cytotoxicity: Preliminary Results	836
<i>K. Bogen</i>	
Inhalation Cancer Risk Assessment for Hexavalent Chromium: Painesville Cohort Mortality Study	844
<i>D. Proctor</i>	

SESSION 5B: EFFLUENT GUIDELINES

Research Development and Demonstration in Preparation for the Effluent Limit Guidelines	857
<i>C. Acharya</i>	
R&D Needs to Respond to the Proposed Effluent Guidelines Standards for FGD Wastewater	866
<i>J. Preece, P. Chu</i>	

Physical/Chemical Treatment for Arsenic and Mercury in FGD Wastewater	878
<i>D. Fink, T. Higgins, K. Jenkins, L. Reid, C. Joiner, P. Chu</i>	

SESSION 5C: CLIMATE POLICY BEYOND THE CLEAN POWER PLAN

Beyond the Clean Power Plan.....	887
<i>F. Chesnaye, J. Bistline</i>	
Environmentally Beneficial Electrification.....	894
<i>K. Dennis</i>	
US Methane Emissions and Relevance for Climate Policy	906
<i>D. Jacob, A. Turner, J. Maasakkers</i>	

SESSION 5D: AIR QUALITY MODELING

SO₂ Attainment Designation Process - What Does It Mean To You?	921
<i>R. Hamel</i>	
Dealing with the SO₂ NAAQS Data Requirements Rule: Challenges and Options	935
<i>B. Paine, D. Heinold, B. Iwanchuk</i>	
Demand Response and Air Quality: Making the Case for Green DR	951
<i>K. Zhang, X. Zhang, Z. Tong</i>	

SESSION 5E: SUSTAINABILITY

Defining Sustainability Metrics: Purpose, Issue, Protocols.....	965
<i>J. Fox</i>	
Electric Utility Industry - Sustainable Supply Chain Alliance.....	973
<i>C. Peterson</i>	
Advancing Sustainability Metrics for Biodiversity Management by Electric Power Companies	980
<i>L. Wainger, J. Fox</i>	

SESSION 6A: T&D ENVIRONMENTAL ISSUES

Program on Technology Innovation (TI): Environmental and Health Issues Related to Radiofrequency Emissions from Smart Grid Technologies - A Review	988
<i>R. Kavet</i>	
Resistance of Cardiovascular Active Implantable Medical Devices (AIMDs) When Exposed to 60 Hz Electric Fields Overview of the In Vitro (Laboratory) Test Results - A Collaborative EPRI and Hydro-Quebec Project.....	1007
<i>K. Dyrda, G. Ostiguy, D.-H. Nguyen</i>	
Smart Meters: The Issue of RF Exposure.....	1052
<i>R. Tell</i>	

SESSION 6B: PLANT DECOMMISSIONING

Environmental Issues Identification and Resolution	1067
<i>C. Carleo, G. Sampson</i>	
Alternate Endpoints for Remediating NAPL-Impacted Sites	1077
<i>K. Hierman, S. Flewelling, A. Bittner, M. Tymchak, M. Swamy</i>	
The Plant Decommissioning Process	1087
<i>B. Sieving</i>	
Confronting Legacy PCB Issues Before and During Plant Decommissioning	1096
<i>J. Woodyard</i>	

SESSION 6C: WATER TECHNOLOGY INNOVATION

Recent Advances on Dry Cooling Technologies in Power Plants.....	1111
<i>S. Acharya, J. Shi</i>	

Thermosyphon Cooler Hybrid Systems (TCHS) - Water-Smart and Energy-Smart Heat Rejection	1130
<i>T. Carter</i>	
Hybrid (Dry/Wet) Dephlegmator for Incorporation in ACCs	1145
<i>Hanno Reuter, D. Kroger</i>	

SESSION 6D: AIR QUALITY MODELING

Evaluation of Attainment Modeling Methods for Ozone and Particulate Matter.....	1179
<i>D. Cohan, B. Czader</i>	
Constraining NO_x Emissions with Space-Based Data: Step 1: Understanding the Correspondence of Ozone Monitoring Instrument (OMI) NO₂ Column Observations to U.S. AQS and CEMS Data	1201
<i>B. Duncan, L. Lamsal, Y. Yoshida</i>	
Factors Controlling PM and Ozone Over the Southeast US as Emissions Decrease: Insights from the NASA SEAC⁴RS Campaign.....	1217
<i>D. Jacob, J. Fisher, P. Kim, E. Marais, K. Travis, K. Yu, L. Zhu, R. Cohen, J. Dibb, A. Fried, T. Hanisco, G. Huey, J. Jimenez, T. Ryerson, A. Thompson, P. Wennberg, A. Wisthaler</i>	
Photochemical Modeling of Future Year Electric Generation.....	1226
<i>M. Janssen, A. Cohan</i>	

SESSION 7A: T&D ENVIRONMENTAL ISSUES

Research at the U.S. Dept. of Energy to Address Environmental Uncertainties for Technologies	1239
<i>H. Battey</i>	
Power Line Environments and Native Honey Bees.....	1250
<i>R. Kavet</i>	
Management of Invasive, Exotic Plants on Powerline Rights-of-Way: EPRI's On-Going Field-Based Research and Development Projects.....	1268
<i>C. Nowak, B. Ballard, P. Hofmeyer, J. Quant, M. Doviak</i>	
State of Epidemiologic Science: Extremely Low Frequency Magnetic Fields and Cancer	1300
<i>X. Vergara</i>	

SESSION 7B: PLANT DECOMMISSIONING

Identifying & Managing Structural PCB Impacts During Plant Decommissioning & Renovation.....	1309
<i>D. Chenoweth</i>	
Anticipating & Mitigating Environmental Risks for Retired Power Plant Decommissioning	1320
<i>J. Groesbeck</i>	
Establishing a DDD Process - Lessons Learned	1329
<i>J. Pope</i>	

SESSION 7D: AIR QUALITY MODELING

Investigating Power Plant Emissions and Their Impacts on Air Quality and Climate.....	1349
<i>G. Frost, J. Peischl, T. Ryerson, S.-W. Kim, J. Gouw, S. McKeen, D. Parrish, C. Warneke, I. Pollack, J. Holloway, M. Trainer</i>	
Dynamic Management of NO_x and SO₂ Emissions in Two Electric Power Systems and Implications for Air Quality	N/A
<i>E. McDonald-Buller, M. Webster, D. Allen, M. Craig, Y. Kimura, G. McGaughey, Z. Stines</i>	
Author Index	