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LABORATORIO TECNOLOGICO DEL URUGUAY

National Institute of Standards and Technology
U.S. Department of Commerce

Taller Regional de
Metrología y Retos Tecnológicos en las Ciencias del Clima y la Energía Renovable

2-4 de septiembre, 2014
LATU, Montevideo, Uruguay
Salón de Actos/



Regional Workshop on
Metrology and Technology Challenges of Climate Science and Renewable Energy

September 2-4, 2014
LATU, Montevideo, Uruguay
Central Hall of LATU

SIM
SISTEMA INTERAMERICANO DE METROLOGÍA

RECS
Energía Renovable y Ciencias del Clima
Desafíos en metrología y Tecnología en las Américas

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September 2, 2014	
Day 1 : Session A – Institutional Awareness/ Día 1- Conciencia Institucional **Theme: Do we have the right policies in place? / Tema - ¿Tenemos las políticas adecuadas?**	
8:30	Registration/ Registro
9:00	**Welcoming Remarks/ Palabras de Bienvenida** Opening Address/ Discurso Inaugural **Ing. Roberto Kreimerman**, Minister of Industry, Energy, and Mining/Ministro de Industria, Energía y Minería, Uruguay ? **Arq. Francisco Beltrame** , Minister of Housing, Land Management and Environment/ Ministro de Vivienda, Ordenamiento Territorial y Medio Ambiente, Uruguay (MVOTMA) (Could not attend) LATU – **Dr. Rodolfo Silveira**, President, LATU OAS – **Embajador John Biehl Del Río,** Representante de la OEA en Uruguay (Welcome presented by **Ruben Contreras**) NIST – **Dr. Claire Saundry**, Chief/Jefa, IAAO, NIST
9:30	***Uruguayan Energy Policy and Climate Change/ Política Energética Uruguaya y el Cambio Climático,*** **Ing. Ramón Mendez** - National Director of Energy, Ministry of Industry, Energy and Mining, Uruguay
9:50	***MCTI's Experience in Dealing with Climate Change as a Public Policy/ Experiencia del MCTI en enfrentar el cambio climático como una política pública*** **Osvaldo Moraes** – Director, R&D Policies and Programs/ Director del Programa y Políticas de Investigación y Desarrollo, MCTI-INPE, Brazil
10:10	***Monitoring Air Quality in Buenos Aires/ Monitoreo de la Calidad del Aire en Buenos Aires*** **Lic. Maria Laura Mayol -** Subgerente Operativo de Calidad de Aire y Agua**,** Agencia de Protección Ambiental (APRA) del Gobierno de la Ciudad Autónoma de Buenos Aires, Argentina
10:30	***Break***
11:00	***The Use of Alternative Energy in Urban Centers/ El uso de Energías Alternas en los Centros Urbanos*** **Mauricio Arouca** - Head of the Energy Planning Program of COPPE-UFRJ, Brazil
11:20	***Climate Change Public Policies and MRV Systems in Argentina/ Políticas Públicas para el Cambio Climático y Sistemas de MRV en Argentina*** **Nazareno Castillo**, Director of Climate Change, Ministry of Environment and Sustainable Development, Argentina
11:40	***Panel Discussion on Renewable Energy and Climate Science/Panel de Discussion sobre Energía Renovable y Ciencias del Clima*** Representatives from each SURAMET Country **Adriana Rosso,** AR; **Osvaldo Moraes,** BR; **Ricardo Alcafuz,** CL; **Ever Cabrera,** PY**;** **Jorge Rucks,** UY. *Moderator/Moderador*: **Hratch Semerjian**, NIST, USA
13:00	***Lunch / Almuerzo***

September 2, 2014 Tuesday	
Day 1: Session B – Technical Workshop/ Día 1- Taller Técnico **Theme: Renewable Energy – Metrology and Technology Challenges?** **Tema: Energía Renovable- Metrología y Desafios Tecnológicos?**	
14:00	***Outlook for Biofuels Regulation in Brazil/ Perspectivas de Biocombustibles Reglamento en Brasil*** **Rosangela Moreira de Araujo** – Superintendent, ANP, Brazil
14:30	***Quality Assurance of Biofuels/*** **Aseguramiento de la calidad de los Biocombustibles** **Rosario Mostazo –** Head of Finished Products and Supplies / Jefa de Productos Terminados e Insumos, ANCAP, Uruguay
15:00	**INMETRO's actions to reduce vehicle emissions and fuel consumption/ Las acciones de INMETRO para reducir las emisiones de vehículos y consumo de combustible** **Romeu Daroda**, Head, Automotive Technology Center, INMETRO, Brazil (Presented by Humberto Brandi)
15:30	Q&A's ***Preguntas y Respuestas***
16:00	***Break***
16:30	***Mapping of Solar Resource Distributionin Uruguay - Importance of Data Quality Control/ Mapeo de la Distribución del Recurso Solar - Importancia del Control de Calidad sobre las Medidas*** **Gonzalo Abal –** Solar Energy Laboratory, UDELAR, Uruguay
17:00	***Energy Efficiency and Alternative Energies-Rio Capital of Energy/ Eficiencia Energética y Energías Alternativas-Rio de Capital de la Energía*** **Maria Paula Martins** – Coordinator of Rio Capital of Energy Program, Brazil
17:30	***Intelligent Cities & Smart Grid/ Ciudades Inteligentes y la Red Eléctrica Inteligente;*** **Mauricio Arouca**- Head of the Energy Planning Program of COPPE-UFRJ, Brazil
18:00	Q&A's ***Preguntas y Respuestas***
18:30	Summary of First Day Discussions / ***Resumen del primer día de debates*** INN, Chile – **Mariela Trujillo** LATU, Uruguay - **Claudia Santo**
19:00	***Networking Reception***

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September 3, 2014 Wednesday	
Day 2: Session A – Technical Workshop / Día 2- Taller Técnico **Theme: Climate Science – Metrology and Technology Challenges?** **Tema: Ciencias del Clima- Metrología y Desafios Tecnológicos?**	
8:30	***Registration / Registro***
9:00	***Welcoming Remarks / Palabras de Bienvenida*** INMETRO, Brazil – **Humberto Brandi** INTI, Argentina – **Hector Laiz**
9:15	***Climate Change and Renewable Energy – A US Perspective / Cambio climático y energía renovable - Una perspectiva estadounidense*** **James Whetstone** – Special Assistant for Greenhouse Gas Measurements, NIST, USA
9:45	***GHG Brazilian Network Efforts /Los esfuerzos de la red de GEI de Brasil*** **Luciana Vanni Gatti -** Coordinator of Atmospheric Chemistry Laboratory/ Coordinador del Laboratorio de Química Atmosférica, CNEN- IPEN, Brazil
10:10	***Greenhouse Gas Measuring Network of the Argentine Meteorological Office/ Medición de Gases de Efecto Invernadero de la red de la Oficina Meteorológica Argentina*** **Gerardo Carbajal Benitez -** Chief, Dept. Atmospheric Monitoring and Geophysics, National Meteorological Service, Argentina
10:30	Q&A's ***Preguntas y Respuestas***
11:00	***Break***
11:30	***Standards for UV Measurements*** *(Development of Secondary Standards for Radiometry)* ***Normas para medidas de UV (Preparación de normas secundarias para radiometría***) **Prof. Raul Cordero -** Physics Dept., University of Santiago, Chile
11:50	***Ethanol, Electronic Management and Flex Fuel Vehicles: Environmental Benefits and The Need of Improvements on Emission Measurements Test Procedures/ El etanol, la administración electrónica y los vehículos con combustible Flexible y los Beneficios ambientales y la necesidad de mejorar los procedimientos Medición de Emisiones*** **Gabriel Murgel Branco -** Director, "EnvironMentality" & Former Coordinator of CETESB-São Paulo Project, Brazil
12:10	***Air Quality Policies and Measurement Challenges in Uruguay/ Políticas de Calidad del Aire y Desafíos en las mediciónes en Uruguay*** **Magdalena Hill**- Engineer, DINAMA, Uruguay
12:30	***Lunch / Almuerzo***

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September 3, 2014 Wednesday	
Day 2: Session B – Technical Workshop/ Día 2- Taller Técnico **Theme: Climate Science – Metrology and Technology Challenges?** **Tema: Ciencias del Clima- Metrología y Desafios Tecnológicos?**	
14:00	***Climate Change Modelling Activities in Chile/ Actividades para Modelos de Cambio Climático en Chile*** **Ricardo Alcafuz -** Chief, Section of Research and Applied Meteorology, DMC, Chile
14:20	***Global Changes and Regional Concerns / Cambios globales y las Preocupaciones Regionales*** **Holm Tiessen -** Director, Inter-American Institute for Global Change Research (Headquartered in LATU)
14:40	***Meteorology Challenges and Measurement Support Requirements / Desafíos en la Meteorología y el Apoyo para la Medición*** **Gabriel Pisciottano -** Director, INUMET, Uruguay (withdrawn) (could not attend)
14:40	Q&A's ***Preguntas y Respuestas***
15:00	**Panel Discussion – GHG/Air Quality Measurements/ Panel de Discusión: Gases de Efecto Invernadero y Mediciones de la Calidad del Aire** Are they Measurable, Reportable, Verifiable (MRV)? / ¿Son medibles, reportables y verificables (MRV)? **Maria Laura Mayol**, AR; **Maria de Fatima**, BR; **Mariella Trujillo**, CL; **Manuel Otazú**, PY; **Jorge Zarauz** – UY. *Moderator/Moderador*: **James Whetstone**, NIST, USA
16:00	***Break***
Session C - Closing Session/ Session de Clausura **Theme: Planning for the Future – Training and Collaboration Needs?** **Tema: Planificación para el futuro - Necesidades de formación y de colaboración?**	
16:30	**Panel Discussion: Development of an Action Plan for the SURAMET Region/ Panel de Discusión: Desarrollo de un Plan de Acción para de los países en SURAMET** **Hector Laiz**, AR; **Humberto Brandi**, BR; **Mariela Trujillo**, CL; **Maria Celeste**, PY; **Claudia Santo**, UY. *Moderator/Moderador*: **Hratch Semerjian**, NIST, USA
17:30	**Summary and Action Items for the Future / Resumen y Acciones para el Futuro** **H. Laiz**, INTI, AR **H. Semerjian**, NIST, USA
18:00	**Closing Remarks/ Palabras de Cierre** Claudia Santo, LATU

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September 4, 2014 Thursday	
Day 3: Session A – SURAMET Specialists Meeting **Theme: Urban Dome Project for South America?** **Tema: Proyecto Urban "Dome" para Sur América**	
9:00	***Presentation on INFLUX Project / Presentación sobre el Proyecto "INFLUX"*** **James Whetstone** - Special Assistant for Greenhouse Gas Measurements, NIST, USA
9:30	***Greenhouse Gases - High Precision Measurements and Efforts to Construct the Brazilian GHG Network/ Medidas de Alta Precision y los Esfuerzos para construir una Red de GEI*** **Luciana Vanni Gatti -** Coordinator of Atmospheric Chemistry Laboratory/ Coordinadora del Laboratorio de Química Atmosférica, CNEN- IPEN, Brazil
10:00	***Megacities Carbon Project / Projecto de Carbono en las Megaciudades*** **Riley Duren -** Chief Systems Engineer, Jet Propulsion Lab, NASA, USA (Presented by James Whetstone, NIST)
10:30	***CO_2 and CH_4 Measurements in São Paulo and their Relationship to Vehicular Emissions / Mediciones de CO2 y CH4 en São Paulo y su relación con las emisiones vehiculares*** **Maria de Fatima Andrade** – University of São Paulo, Brazil
11:00	Break
11:30	**Summary of Initial meeting of the Megacities Carbon Project, Sao Paolo / Resumen de la Reunion Inicial del Projecto de Carbono en Megaciudades en San Paulo** **Maria de Fatima Andrade –** Profesor/Profesora, University of São Paulo, Brazil
11:50	**Discussion of Potential Urban Dome Project Cities/Metropolitan Areas in South America / *Discusión del Potencial Urbano del "Dome Project" en Ciudades y Areas Metropolitanas en América del Sur*** *Moderator/Moderador:* **James Whetstone**
12:30	***Adjourn /Cierre***

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Acronyms

AR- Argentina
ANCAP- National Administration of Fuels, Alcohol and Portland/ Administración Nacional de Combustibles, Alcohol y Portland/, Uruguay
ANP- National Petroleum Agency/ Agencia Nacional de Petrólio, Brazil
APRA- Environmental Protection Agency/ Agencia de Protección Ambiental, Argentina
BR- Brazil
CL- Chile
CETESB - Technological Company of Environmental Sanitation /Companhia de Tecnologia de Saneamento Ambiental/Compañía de Tecnología de Saneamiento Ambiental, Brazil
COPPE- Alberto Luiz Coimbra Institute and Graduate School of Research and Engineering at UFRJ/Instituto Alberto Luiz y Escuela Graduada de Investigación en UFRJ
GHG – Green House Gases / Gases de Efecto Invernadero
GEI - Gases de Efecto Invernadero
IAAO- International and Academic Affairs Office/ Oficina de Asuntos Internationales y Académicos
INN- National Standards Institute / Instituto Nacional de Normalización
IPEN- Electrical and Nuclear Physics Institute/ Instituto de Pesquisas Energéticas e Nucleares/ Instituto de Investigación Energética y Nuclear, Brazil
DMC - Chilean Directorate of Meteorology/ Dirección Meteorológica de Chile
DINAMA- National Directorate of the Environment/ Dirección Nacional del Medio Ambiente, Uruguay
INPE- Instituto National de Pesquisas Espaciais / National Institute for Space Research, Brazil
INTI- National Institute of Industrial Technology / Instituto Nacional de Tecnología Industrial, Argentina
INUMET- Uruguayan Institute of Meteorology / Instituto Uruguayo de Meteorología
LATU- Technological Laboratory of Uruguay / Laboratorio Tecnológico del Uruguay
MCTI- Ministry of Science, Technology and Innovation / Ministerio de Ciencia, Technología e Innovación, Brazil
MVOTMA- Ambiente / Ministry of Housing, Land Management and Environment/ Ministerio de Vivienda, Ordenamiento Territorial y Medio, Uruguay
NASA- National Aeronautics and Space Administration / Administración National de Aeronáutica y del Espacio, USA
NIST- National Institute of Standards and Technology, US / Instituto Nacional de Estándares y Tecnología, USA
NOAA- National Oceanic and Atmospheric Administration/ Administración National de los Océanos y la Atmósfera
OAS- Organization of American States / Organización de Estados Americanos
PY- Paraguay
SMN- National Meteorological Service/ Servicio Meteorológico Nacional, Argentina
UDELAR- University of the Republic/ Universidad de la República
UFRJ – Federal University of Rio de Janeiro / Universidade Federal do Rio de Janeiro / Universidad Federal de Rio de Janeiro, Brazil
UY- Uruguay

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NIST National Institute of Standards and Technology U.S. Department of Commerce

Summary Report
Regional Workshop on
Metrology and Technology Challenges of
Renewable Energy and Climate Science (RECS)

September 2-4, 2014
LATU, Montevideo, Uruguay

a) Workshop Objectives:

Objectives of the OAS-NIST Workshops organized for each sub-region of SIM (Inter-American Metrology System) are to:

1) Assess technology, measurements, and standards needs and existing capabilities of regions and States of the Americas, and increase awareness of Government agencies interested in technology infrastructure;

2) Promote regional and international partnerships to share approaches and best practices for expanded utilization of renewable energy, measurement of GHGs and air pollutants, and efficient energy use and distribution systems;

3) Identify measurements and standards training needs to accelerate deployment of renewable energy technologies while minimizing their impact on our climate. These will be based on priorities developed by SIM members and could be provided through regional workshops and/or via collaborative research between the NMIs.

At the end of each workshop, an action plan is developed to further training and regional collaboration activities.

b) General Observations:

1. The Workshop organization was excellent, with high quality speakers that included policy makers and technical experts. LATU staff provided excellent logistical support, and their gracious hospitality was much appreciated.

2. The Workshop Steering Committee deserves our thanks for putting together an excellent program that was informative and stimulated much discussion. The program, unlike previous workshops, allowed more time for Q&A's and discussion which was critical for success. Selection of only two general topics (Renewable Energy and GHG/Air Quality Measurements) enabled more detailed coverage and discussion of these topics.

3. Participation by all countries of the SURAMET Region (Argentina, Brazil, Chile, Paraguay, and Uruguay) was critical for the success of the workshop. More than seventy five attendees participated in the workshop, representing government policy makers, the NMIs, other research organizations, and universities. Participation from metrology as well as meteorology communities enriched the discussion and encouraged future collaborations.

4. Presentations on current programs related to RECS provided clear indication that these topics are of critical importance for the region; however, the size of their economies, the natural resources and the needs of each country are quite different, and therefore their emphasis is at times on different concerns and technologies.

5. SURAMET NMIs have, in general, well established metrology capabilities. However, Climate Science related activities present new challenges for most of the NMIs, especially as they relate to chemical metrology expertise. Collaborations, joint activities and additional training will be of benefit for most of the NMIs.

6. It was clear that different SURAMET countries have special capabilities they could bring to the table (e.g., Argentina in air quality monitoring, Brazil in biofuels, Chile in atmospheric modelling, and Uruguay in hydro, wind, and solar energy). This would make it more feasible to organize activities that could address global issues such as renewable energy, GHG emissions and climate change.

7. Well established programs on monitoring of air quality in megacities such as Buenos Aires (Argentina) and São Paulo (Brazil), as well as in Uruguay, represent an excellent foundation for future efforts to develop networks for urban dome GHG monitoring.

8. Three Panel Discussions helped focus us all on common experiences, issues and needs, and helped develop an action plan for the SURAMET Region.

c) Summary of Presentations:

Presentations from Argentina, Brazil and Uruguay demonstrated that thoughtful policies on RECS are in place in these countries; but they are still struggling with implementation of these policies.

Most of SURAMET Countries are making attempts to provide GHG inventories; consistency of methodology and reliability of measurements continue to be an issue.

There was general consensus on the need to improve data quality, therefore its credibility, in order to encourage science based policy implementation and mitigation efforts.

Renewable Energy:

There are some excellent undertakings on implementation of Renewable Energy policies in the region. Rio Capital of Energy project in Brazil is supporting a large number of small projects. Buzios Intelligent City project is one of these and a very good example for an integrated approach. These and many other projects in the region are providing incentives for micro/mini-generation of electricity from solar and wind energy.

Presentations were made on some comprehensive efforts on solar mapping in Uruguay, Chile, Antarctica, and other locations to spearhead enhanced use of solar energy. Unfortunately, the capabilities to calibrate many of the instruments utilized for RECS related activities are lacking in SURAMET. For example, pyranometers used for solar mapping in Uruguay are being sent to WRC Labs in Davos, Switzerland for calibration; ozone monitoring instruments are sent to EMPA in Switzerland for calibration; ozone spectrophotometers are calibrated at NIST or PTB (Germany).

A presentation from Brazil summarized their activities on Biofuels, which continue to be the back bone of the Brazilian energy policy. These activities are being further expanded into Aviation Fuels, and into Biodiesel. Expanded use of these fuels will require certification of a large number of testing laboratories by INMETRO.

A presentation from ANCAP, the only refinery operator in Uruguay and producer of biofuels, emphasized the importance of Quality Control in their production streams, and the need for CRMs which are not readily available, especially because of customs barriers.

Air Quality Monitoring:

Presentations were made on comprehensive air quality monitoring efforts in several large cities in South America (Buenos Aires, São Paulo, Uruguay). These are excellent efforts with high technical quality; many are following U.S. EPA guidelines.

However, many of these efforts are relying on CRMs imported from other regions and NMIs, making them costly and jeopardizing the reliability of measurements.

Results were presented from a comprehensive study of emissions from automotive vehicles using ethanol, biodiesel, and flex engines in São Paulo, Brazil. The importance of matching testing protocols with actual driving conditions was emphasized. Application of novel remote sensing methods to detect modified engines were discussed.

Plans for the development of a new Automotive Technology Center at INMETRO was discussed. This facility will represent an entirely unique capability in South America, and will create additional standards and measurements needs for INMETRO. The objective of the latter is to reduce fuel consumption and vehicle emissions.

Region's NMIs have good capabilities in physical measurements, but relatively little on chemical measurements that would benefit RECS activities. INTI (Argentina) is putting new emphasis on health and environment related activities, including standards for GHGs, air quality, and solar measurements. INMETRO (Brazil) expressed their willingness to work with the other SURAMET NMIs towards joint development of CRMs. INN (Chile) may have to reinvent its chemical measurements capabilities. LATU (Uruguay) is expanding its chemical metrology efforts.

GHG Measurements:

A summary of NIST Programs on Renewable Energy (Smart Grid, Solar Energy, and Building Energy Efficiency) and Climate Science (GHG and Aerosol Measurements) was presented. GHG Measurements carried out as part of recent undertakings in Indianapolis (INFLUX) and Los Angeles (LA Megacity Project) was discussed. Similar undertakings are being contemplated for South America (São Paulo) and in Asia to develop the framework for Verifying GHG Measurements in Urban Environments.

Results of a very comprehensive Brazilian study on Monitoring GHGs over the Amazon Region were presented. This work is carried out as part of a WMO/GAW Global CO_2 Monitoring Network, in collaboration with NOAA in the US. Results demonstrate the impact of climate variations and deforestation on GHGs in the atmosphere. Special precision requirements for gas standards to ensure reliability of data were discussed.

Results were also presented on another comprehensive study carried out by Argentina's GHG Measurement Network over Argentina and the Antarctic. They showed alarming levels of CO_2, as well as decreasing levels of CFCs as a result of the Montreal Protocol implementation. They also send their gas bottles to NOAA for analysis; other instruments are calibrated at EMPA in Switzerland, again highlighting the need for enhanced regional capabilities.

It was gratifying to hear about some of the high quality Atmospheric Modelling Efforts in Chile, Brazil, Argentina, and Uruguay. These efforts highly complement the air quality and atmospheric monitoring efforts, and demonstrated the benefits of closer collaboration between NMIs and universities.

Finally, a brief summary of the projects funded by the Inter-American Institute for Global Change Research was presented by the program Director. This program has focused on "bigger picture" issues, especially the impact of highest levels of urbanization encountered in Latin America, longer chain hydrocarbons emitted into the atmosphere, the impact of agricultural trends, deforestation, large scale land use changes, and human risk aversion effects on climate. This represented a very different and worthwhile perspective on climate change issues. More details of the program can be found on http://www.iai.int/ .

The last day of the workshop was devoted to a discussion of a potential "Urban Dome Project for South America". Presentations were made on GHG Measurement Program over the Amazon Region, LA Megacities Carbon Project, and the CO_2 and CH_4 Measurements in Metropolitan Area of São Paulo (MASP). A brief summary of the discussions held during the previous week in São Paulo between INMETRO, USP, IPEN, SPE, JPL, NOAA and NIST on the feasibility of initiating an Urban

Dome project in São Paulo was presented. The parties expressed their interest in such a project and further discussions will be held.

d) Action Items under Consideration:

1. Discussions (and perhaps tutorials) should be held on GHG emission inventories (perhaps at the next SIM GA in Colombia) to develop more consistent (standardized?) approaches and methodologies.

2. Increased collaboration in the area of atmospheric modelling, among SURAMET countries and with universities in the region, was encouraged.

3. Need to develop training opportunities for measurement of vehicle emissions (an area also of interest for CAMET countries).

4. Need to develop GHG instrument calibration capabilities in the region and initiate joint efforts to develop CRMs that could be shared regionally.

5. Organize training workshops on: a) PV solar panel calibrations; b) calibration of UV (solar) radiometers; c) GHG CRMs; and d) calibration of anemometers for wind measurements. (Items (a) and (c) were also of interest for CAMET countries).

6. Organize a discussion group for CRMs needed for monitoring of atmospheric GHG levels and the required accuracy levels.

7. Consider a partnership among National Metrology Institutes of the region to meet the new measurement and standards challenges represented by RECS technologies.

8. Promote enhanced collaboration between the metrology and meteorology communities in SURAMET.

12/18/2014