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## **Report on a Planning Workshop**

### **Renewable Energy and Climate Science for the Americas: Metrology and Technology Challenges**

**held at**

**CENAM, Querétaro, México**

**October 8-9, 2013**

**Organized by NIST, OAS and CENAM**

#### **1. Background**

Implementation of renewable energy and climate change related policies around the globe will require access to accurate, internationally recognized measurements and standards. These will be critical for both policy-making purposes as well as evaluating the impact of mitigation efforts. Such capabilities will be equally important for assessing the impact of energy and climate change policies on the economic development of each country. National Metrology Institutes (NMI) in each country need to be aware of the measurement and standards capabilities necessary for implementation of such policies, and must be able to ensure the quality and international acceptance of data on Air Quality and Greenhouse Gas (GHG) measurements and characterization of renewable energy sources.

In the Americas, the Inter-American System of Metrology (SIM) has undertaken a major effort to strengthen the measurement and standards infrastructure in the hemisphere. This initiative will build on that effort by establishing a new focus to develop a robust infrastructure for renewable energy and climate science in each country; this effort would directly support the activities planned within Energy and Climate Partnership of the Americas (ECPA). ECPA established seven principles as its pillars including energy efficiency, renewable energy, cleaner and more efficient use of fossil fuels, energy infrastructure, etc. This initiative clearly addresses many of the ECPA pillars, and will facilitate the implementation of technologies and promote economic development in the region.

## **2. Objective**

The objectives of the Planning Workshop at CENAM were to:

1. Identify technology and metrology areas where training and sharing of best practices would be most beneficial for countries of the Americas;
2. Start planning of workshops to improve local and regional measurement and standards infrastructure for renewable energy and climate science;
3. Explore ways to promote regional and international partnerships to share approaches and best practices for expanded utilization of renewable energy, measurement of air quality, GHGs and other pollutants, and efficient energy use and distribution systems; and
4. Develop an initial Action Plan for the Americas.

## **3. Technical Approach**

The Workshop Technical Program is presented in Appendix A. The approach of the workshop was, first, to discuss various technology areas that contribute to development of renewable energy sources and measurement and standards capabilities that would be required to implement these technologies and to monitor the human impact on our environment and the global climate change. Experts from Argentina, Brazil, Canada, Mexico and USA made presentations on current activities in their own country related to renewable energy and climate science as background for the discussions planned for the second day of the Workshop. Presentations also included discussion of measurement and standards infrastructure that have been implemented by these countries' NMIs to make these efforts a success. (website?)

During the second day of the Workshop, representatives of five subregions of the Americas presented an overview of the ongoing activities in their subregions, the policy and regulatory environment they are operating under, the driving forces they perceive that are leading to such policies, and the technologies and measurement capabilities they will need to implement these policies. The objective of this session was to assess the needs of each country and region, and identify common needs that would promote collaborative efforts. The presentation by a representative of the National Institute of Metrology of Germany (Physikalisch Technische Bundesanstalt (PTB)), who is supporting related projects in the region, was also helpful in identifying potential collaborations between the two projects.

More than seventy attendees were present during both days of the workshop. They included participants from the SIM countries, researchers from CENAM, and other interested parties from greater Mexico.

#### 4. Sub-Regional Presentations

Sub-regional Representatives were asked to address questions such as:

- a) What are the most important issues/technologies for your country or region? How do these impact economic development for your country or region? Are there other driving forces for renewable energy and climate science?
- b) What is the regulatory climate or situation in your country and in the region? How do they impact metrology needs for renewable energy and climate science? How do they impact the work for your NMI and the NMIs in your region?
- c) What are the strengths of your country and region (in terms of technology, infrastructure, natural resources, etc.) that would help meet the measurements and standards challenges in these areas?
- d) What are your short term and long term needs for capacity development to meet these challenges (in terms of technology, infrastructure, metrology, training, financial resources, etc.)? How do these impact the work of your NMI and NMIs in your region?
- e) What do you see as opportunities for regional, and perhaps hemispheric, collaboration in these areas?

Full presentations of the speakers are provided on the Workshop website. A brief summary of each presentation is included here:

- **ANDIMET** (Countries of the Andean Region: Bolivia, Colombia, Ecuador, Perú, and Venezuela)

Solar heating and PV technologies, hydroelectric, geothermal energy, wind energy and biofuels are all of interest to this region. These activities represent a significant fraction of the growth domestic product (GDP) of each country of the sub-region. Several of the countries have unique energy resources, such as geothermal energy in Ecuador from a volcanic chain, or hydroelectric energy in several of the countries, or high winds in Colombia. Climate Change is of concern in the entire Andean region, because of its impact on biodiversity and agriculture. Several of the countries have established new laws/regulations such as the National Development Plan (2010-2014) *Prosperidad Para Todos* in Colombia, or *the Law of Mother Earth* (La Ley de la Madre Tierra) in Bolivia. The NMIs are not currently in position to support such

developments, and will require regional cooperation in metrology and standards to meet these challenges.

- **CAMET** (Countries of Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panamá)

CAMET Countries are rich in natural resources, but still are highly dependent on fossil fuels. For example, Panama gets 76% of its energy from hydroelectric sources. Guatemala has been using biofuels for more than 20 years. Wind energy is finding growing utilization. There are several national initiatives to expand use of renewable resources. Panama has established a National Energy Index and has passed a new law to promote use of ethanol; Costa Rica is in the process of establishing controls for GHGs, and has a National Plan to install solar collectors on 5% of homes (which is an expensive undertaking). Nicaragua has an aggressive plan to reduce oil usage from 73% to 45%. El Salvador is most impacted from climate change, and has established a El Salvador Save Energy Program and a very aggressive plan to reduce GHGs; Honduras is actively promoting reducing GHG emissions. Short term needs include improvements in quality infrastructure, e.g., to meet requirements for “La Comisión Guatemalteca de Normas” (COGUANOR) established in Guatemala, or the new Legal Metrology Act in Panama and measurement capabilities such as temperature, pressure, wind speed and dimensional metrology. In the long term, there is great potential for regional cooperation for energy efficiency, renewable energy production and improved metrology capabilities.

- c) **CARIMET** (Countries of the Caribbean: Antigua and Barbuda, Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Guyana, Haití, Jamaica, Santa Lucia, ST. Kitts and Nevis, St. Vicent and Grenadines, Suriname, and Trinidad and Tobago)

A new Comunidad del Caribe (CARICOM) Energy Policy was approved in March 2013 by member countries to improve energy security, accelerate use of renewable energy resources, and establish mitigation and emission targets. This will require strengthening and enhancement of human and institutional capacities in the energy sector. Policies and regulatory framework exists within the region; a Caribbean Energy Regulation is being discussed. Currently, NMIs do not have the capabilities to perform GHG and Particulate measurements. To go forward, collaboration among NMIs and other responsible agencies will be required, and measurement infrastructure, including equipment and human resources, will have to be improved.

The Caribbean Reference Laboratory (CaRL)) concept may be a model for effective partnerships.

**d) NORAMET** (Countries of North America: Canada, United States and Mexico)

This presentation was primarily focused on activities within Mexico. Air pollution and climate change are considered critical issues for Mexico. One study concluded that the economic loss related to environmental degradation amounted to about 6.9% of the GDP (about 60 million USD). Unfortunately, regulations are applicable only to emission sources and not to the atmosphere. A General Law on Climate Change was passed in 2012 and a National Strategy for Climate Change was established in 2013 with a 10-20-40 year Vision. Capabilities for air quality monitoring and GHG measurements exist within Mexico. Most of the environmental monitoring is done by meteorological organizations and there is little cooperation with CENAM, even though CENAM has good capabilities in this area and participates in the International Bureau of Weights and Measures (BIPM) Consultative Committee for Amount of Substance (CCQM) activities. To make these programs more effective and improve measurement quality and reliability, closer collaboration between Mexican Ministries, research and metrology organizations as well as among neighboring countries will be needed.

**e) SURAMET** (Countries of South America: Argentina, Brazil, Chile, Paraguay and Uruguay)

All of the SURAMET Countries are implementing policies to increase utilization of renewable energy resources, especially solar and wind energy. For example, Uruguay is targeting 100% renewable energy use, mostly hydro and increasing amounts of wind energy. Argentina has increased wind and solar energy to 8% of the total. Brazil uses renewable resources for almost 50% of its energy needs. Brazil, of course, is a major producer of bioethanol, and also increasing its biodiesel production. Most of these countries are also manufacturers of renewable energy equipment, which has a significant impact on their GDP. Each country has developed a strategy for increased use of renewable energy resources, and they all realize that this will require improved metrology infrastructure. There is also realization that some of these technologies could lead to other environmental problems; for example, open silos used for storage of biomass lead to methane emissions, which are a major GHG, and these emissions need to be controlled. Incineration of residues from bioethanol production also need better technologies

to reduce their environmental impact. Argentina has established new environmental regulations, which will require strengthening of their measurement systems. Some of these will require new reference materials for all matrices, including soil, water and air. These will be especially important for to ensure the accuracy of measurements performed by secondary laboratories.

#### **f) PTB**

PTB has recently supported two major projects in the Americas: a) Quality Infrastructure for Renewable Energy Sources and Energy Efficiency; and b) Quality Infrastructure for Climate Change and Biodiversity. Both of these clearly overlap with the proposed OAS Project and coordination between these projects would be advisable. These projects are being implemented in collaboration with SIM, Pan American Standards Commission (COPANT) and Inter American Accreditation Cooperation (IAAC).

In the first project, the focus was on the “Energy Value Chain”; priority areas identified were Solar Water Heaters, Transmission and Distribution Systems, Energy Efficiency of Household Appliances, and Transversal Awareness Building and Cooperation. These activities have been recognized by the International Renewable Energy Agency (IRENA). PTB will be initiating economic impact studies shortly on these activities.

The second project is in its initial phase; 22 proposals have been received from SIM countries; they included proposals for UV Radiation Measurements, Chemical Measurements for GHGs, and others. A planning workshop was held in August in Trinidad. PTB/Federal Ministry for Economic Cooperation and Development (BMZ) is currently evaluating the proposals.

### **5. Summary from Panel Discussion**

This session generated a lively discussion by the Panelists and many of the Workshop attendees. The discussion was focused on the following topics:

#### **a) Connect Metrology and Meteorology communities**

Need to bring in the Climate Science Research Organizations

- Collaboration between metrology and meteorology communities is the only path for success

Need to utilize a two-step process:

- Identify existing NMI capabilities that can be of immediate benefit to the climate science activities
- Identify future capabilities that are needed by the climate science community

Approach to other organizations:

- Be sensitive to their needs
- Understand their measurement challenges
- Establish mutual needs and benefits

Caribbean situation is different – this is a very new area for them  
It is a further challenge to identify the organizations to engage

## **b) Energy Efficiency Labeling**

Primarily for household appliances

This is in good shape for most of the countries, thanks to the PTB Project  
Some countries did not participate (e.g., Barbados); however, they can benefit from the experience of the other countries.

## **c) Energy Efficiency for Buildings**

Some countries already have certification processes in place; it is not clear what the basis is of this process.

European standards for green buildings are already in place.

Material properties evaluation – very few capabilities exist in the NMIs

CENAM has developed a laboratory with PTB support

More capabilities need to be developed in different countries

Need to organize a workshop on Energy Efficiency of Buildings

Topics to cover:      Materials Metrology

                                 Thermal Systems Metrology

                                 Device/Communication Systems

                                 Leadership in Energy and Environmental Design

(LEED)/ISO Standards?

                                 Life Cycle Assessment (LCA) Methodology

## **d) Smart Grid**

Represents a major technical challenge for NMIs; many have some capabilities in electrical measurements, but not a comprehensive set of expertise.

PTB Project addressed Power Quality Issues (recent workshop at the national Institute of Industrial Technology (INTI) in Argentina, Electrical Meters, Hi Voltage/Hi Current applications

Need to organize a workshop to educate the broader community, not just metrologists; it should include technicians and others working in the field.

Possible venues for the workshop:

- a. At next year's GA in Colombia? (will the right people be at the table?)
- b. In conjunction with the Conference on Precision Electromagnetics Measurements (CPEM) in Rio in 2014? (It already has a crowded program; need to check with Gregory Kyriazis, Vice-Chair of CPEM, INMETRO)
- c. An independent workshop to bring more of the stakeholders to the table?

#### **e) Climate Change Related Measurements**

Very few NMIs have capabilities in this area of technology. Need to develop advanced measurement capabilities in GHG Measurements (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, etc); Ozone (O<sub>3</sub>); Solar Radiation.

Measurements of Particulate Matter (e.g., black carbon) – very few labs have expertise in this area

Focus on development of Reference Materials, and Measurement Technologies

If NMIs expect to interact with the Atmospheric Monitoring/Meteorology community, they need to have at least some basic capabilities.

Many pieces of legislation have been passed in several SIM countries, but the expertise to implement them does not exist;

Policy makers/politicians need to be educated on technology requirements. This part of the issue needs to be addressed by each country, but they could use outside support.

Perhaps this issue could be addressed using the OAS structure and Ministerial Meetings (such as the Meeting of Environmental Ministers).

To address the measurement issues, SIM can utilize its existing structure of Metrology WGs to improve communications, training, and skill levels.

SIM could also use existing organizations such as the Climate and Clean Air Coalition (CCAC). 7 SIM member countries have already signed the agreement; obviously they think this is an important issue. This organization could provide further policy leverage.

Don't forget about Measuring Reporting and Verification (MRV)! This is sole responsibility of the NMIs! The accuracy and reliability (and therefore the credibility) of measurements can only be improved by involvement of the NMIs.

#### **f) Biofuels**

The topic was not emphasized.

CRMs for bioethanol and biodiesel have already been developed jointly by INMETRO and NIST; similar effort are going on in EU.

Other NMIs can take advantage of these resources.

Guatemala has a 20 year history with biofuels.

Perhaps could focus on biomass.

LCA for biofuels may be an interesting topic for consideration

### **6. Future Activities and Potential Workshop Sites**

There was enthusiastic interest expressed by many countries in participating in this project and in organizing regional workshops. Guatemala has already submitted a formal letter from their Ministry of Economy to express their interest in organizing a workshop in Guatemala (topic not specified). Panama and Costa Rica also expressed interest, and perhaps they can work together to organize a regional workshop for CAMET. Common areas of interest need to be identified.

Brazil had already been working on organizing a workshop on climate change in Rio; Argentina, Chile and Uruguay expressed interest in the same topic; they plan to

work together to organize a regional workshop. This workshop is planned for early 2014.

CARIMET (Robert Medford) expressed interest in organizing a workshop on Energy Efficiency in Buildings; Jamaica and/or Grenada may host a workshop; a more formal expression of interest will be forthcoming.

ANDIMET is definitely interested in a Workshop. Bolivian Representative will discuss this with Colombia; it may be organized in conjunction with 2014 SIM GA or independently, perhaps in Bolivia. Climate Change is considered a major issue for ANDIMET Countries, especially because of its impact on biodiversity.

The discussions at the workshop identified the following topics as highest priorities (not in priority order):

- Energy Efficiency for Buildings
- Smart Grid to Improve Power Distribution Infrastructure
- Climate Change Related Measurements
- The Need for Connecting Metrology and Meteorology Communities
- The Need to Educate Policy Makers/Politicians on Climate Change Related Technology Requirements

Many SIM countries lack the measurement and standards capabilities to implement renewable energy and climate science policies. More detailed regional training needs have to be identified. Leading NMIs (CENAM, INMETRO, NIST, NRC) will offer training opportunities for technical staff from SIM NMIs.

## Appendix A



Workshop on

### **Renewable Energy and Climate Science for the Americas: Metrology and Technology Challenges**

CENAM, Queretaro, Mexico  
October 8-9, 2013





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American States



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

## Workshop Technical Program

October 8, 2013 Tuesday Afternoon

### Plenary Session - Overview of Metrology and Technology Challenges

2:00-2:05 PM	Welcoming Remarks and Workshop Introduction	Dr. Claire Saundry* SIM (NIST)
2:05-2:20 PM	Investing in Metrology to support Climate Science and Renewable Energy in the Americas: A project executed by NIST and OAS	Mr. Ruben Contreras (OAS)
2:20-2:50 PM	Climate Change Issues and Metrology Challenges US Projects – INFLUX, LA Basin Opportunities for Global Metrology Activities	Dr. James Whetstone* NIST (USA)
2:50-3:20 PM	Urban GHG Measurement Efforts Planned in So. America Renewable Energy Activities in Brazil	Dr. Humberto Brandi INMETRO (Brazil)
3:20-3:50 PM	Air Quality Monitoring Activities in Mexico City	Dr. Francisco Guzman Mexican Petroleum Institute (IMP)
3:55-4:15 PM	Break	
4:15-4:45 PM	Renewable Energy Activities in Mexico	Dr. Antonio del-Rio- Portilla University of Mexico
4:45- 5:15 PM	Airborne Particulate Monitoring	Dr. Greg Smallwood NRC (Canada)
5:15-5:45 PM	Current NIST Research Activities on: Building Energy Efficiency, Solar Energy Electrical Measurements/Smart Grid	David Yashar* NIST (USA)
5:45-6:15 PM	SIM Participation in Quality Infrastructure for Energy Efficiency and Renewable Energy Sources in Latin-America and the Caribbean – a PTB Project and an update on current activities in Argentina	Dr. Héctor Laiz, INTI (Argentina)
6:15-7:00	General Discussion	

\*Because of US Government Shutdown, these presentations were made by Dr. Semerjian.



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October 9, 2013 Wednesday Morning

**Regional Presentations and Panel Discussion - Setting Priorities**

9:00	Welcome	Humberto Brandi, INMETRO and Hratch Semerjian, NIST/Univ. Maryland
9:15	Introductory Remarks	James Whetstone, NIST*
9:30	Brief Presentations (not to exceed 10 minutes) by representatives from: <ul style="list-style-type: none"> <li>▪ ANDIMET – Juan Carlos Casillo, IBMETRO, Bolivia</li> <li>▪ CAMET – Ileana Hidalgo, LACOMET, Costa Rica</li> <li>▪ CARIMET - Robert Medford, Grenada Bureau of Standards</li> <li>▪ NORAMET - Dr. Jorge Koelliker-Delgado, CENAM, Mexico</li> <li>▪ SURAMET – Dr.-Ing. Héctor Laiz, INTI, Argentina</li> <li>▪ PTB – Alexis Valqui – International Technical Cooperation</li> </ul>	
10:30	Panel Discussion - Needs and Priorities Objective: To identify common themes, needs and priorities! Possible Topics of Discussion: <ul style="list-style-type: none"> <li>• Greenhouse Gas (GHG) Measurements</li> <li>• Airborne Particulate Measurements</li> <li>• Biofuels Standards/Biorefineries</li> <li>• Renewable Energy (Bio, Wind, Solar, etc.)</li> <li>• Energy Efficiency for Buildings</li> <li>• Energy Distribution Infrastructure/Smart Grid</li> <li>• Natural Gas Distribution Infrastructure</li> <li>• Sustainability/Life Cycle Analysis</li> <li>• Quality Infrastructure</li> <li>• Other?</li> </ul>	
<p><b><i>Wrap-up Session – Future Activities (11:00 am – 12:30 pm)</i></b></p> <p>Open Discussion to develop an Action Plan for the Americas</p> <ul style="list-style-type: none"> <li>• Metrology Needs</li> <li>• Technology Needs</li> <li>• Training Needs</li> <li>• Regional Collaborative Activities</li> <li>• Resource Strategies</li> </ul>		
<p><b>Expected Outcome:</b>          Discuss and agree upon an initial <b>Action Plan</b> for metrology infrastructure development for <b>Renewable Energy and Climate Science in the Americas</b></p>		

