SMART
SUSTAINABLE
CITIES

ANSI
American National Standards Institute

ANSI Workshop Report: *Smart and Sustainable Cities*

Thursday, November 21, 2013 | 9 a.m. – 5:30 p.m.

Ronald Reagan Building and International Trade Center
Pavilion Room, 2nd Floor
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1.0 Executive Summary

On 21 November 2013, the American National Standards Institute (ANSI) convened a workshop in Washington, DC, to consider the contribution of standardization to achieving smart and sustainable cities.

The backdrop for the smart cities movement and the workshop was the growing population of urban communities, particularly in developing countries, combined with the proliferation of information and communications technologies (ICTs), such as sensors, smart phones, intelligent transport systems, building energy management systems, etc., that can assist cities in making their operations more efficient, more sustainable, and more resilient. Countries in Europe and Asia, with support from their national governments, have undertaken strategic initiatives to explore this area. Likewise, a number of new standardization roadmapping activities have emerged at the national, regional, and international levels to assess what standards and conformance programs already exist and what additional activity may be needed.

As administrator and coordinator of the U.S. private sector–led/public sector–supported voluntary system of standardization, ANSI convened the workshop to dialogue on U.S. national standardization priorities in this area and the need for a coordinated U.S. approach internationally. ANSI serves as the U.S. national member of the International Organization for Standardization (ISO) and, via the U.S. National Committee, the International Electrotechnical Commission (IEC).

Largely an information-sharing event, the workshop included both panel presentations and breakout discussions. This included discussion of a number of initiatives of private industry, government, academia, standardization bodies, and multi-stakeholder groups, addressing both the application of ICT and the development of standards and best practices to achieve smart and sustainable cities.

The workshop identified a number of priority areas where standardization can contribute to smart and sustainable cities. These include:

- a standardized set of definitions / lexicon for smart cities, applicable across sectors
- interoperability for systems of systems, including common data formats and communication protocols to enable sharing of data between systems
- key performance indicators so that measurements are consistent and comparable
- a baseline guidance document that can be adapted to address the specific needs of sectors
- best practices
- resiliency for disaster preparedness and recovery

An outcome of the workshop was that ANSI will develop a proposal to form a collaborative to further define standardization needs, particularly through outreach and engagement of public sector stakeholders. The Institute has a track record of serving as a neutral facilitator to address national and global priorities in areas as diverse as electric vehicles, energy efficiency, and homeland security. Standards panels and collaboratives do not write standards; rather, they bring together affected stakeholders from the private and public sectors to discuss standardization needs.

2.0 Workshop Background and Overview

With half the world's population living in cities and urban areas – a number that is projected to increase to 70 percent or more by the middle of the 21st century – and with climate change and natural disasters posing new challenges, there is a growing market for smart, sustainable, and resilient urban infrastructure planning and development. Increasingly, stakeholders recognize the need for a more holistic approach to the economic, environmental, and social challenges that cities face. Information and communications technology companies are partnering with cities to leverage innovations in urban informatics – a process of gathering and analyzing infrastructure data – to drive improvements in areas such as smart grid, green building, energy and water use, waste management, and transportation.

While standards and related conformance programs are well developed in many of these specific areas, a number of international activities have recently been initiated to look at standardization needs in the area of smart and sustainable cities. In March 2012, the International Organization for Standardization (ISO) established Technical Committee (TC) 268, *Sustainable development in communities*. In February 2013, the International Telecommunication Union (ITU) established a *Focus group on smart sustainable cities (FG SSC)*. In June 2013, the International Electrotechnical Commission (IEC)'s Standardization Management Board (SMB) formed a *Systems evaluation group (SEG) on smart cities*. In September 2013, ISO's Technical Management Board (TMB) established a *Task force on smart cities* to develop a strategic approach within ISO and to coordinate with the IEC/SEG. In November 2013, ISO/IEC Joint Technical Committee 1 (JTC 1), *Information technology*, accepted a proposal from China to form a *Study group on smart cities*. ANSI serves as the U.S. member of ISO and, via the U.S. National Committee, of IEC. ANSI also administers the international secretariat for ISO/IEC JTC 1.

ANSI works with private- and public-sector stakeholders across the full gamut of industries in our role as administrator and coordinator of the U.S. private sector voluntary standardization system. The Institute is engaged in a number of areas related to smart and sustainable cities:

- **Green buildings** – ANSI accredits a number of standards developers working in the area of green buildings.
- **Energy efficiency** – The **ANSI Energy Efficiency Standards Coordination Collaborative** (EESCC) is developing a roadmap of standards and conformance programs for energy efficiency in the built environment.
- **Electric vehicles** – The **ANSI Electric Vehicles Standards Panel** (EVSP) has produced a *Standardization Roadmap for Electric Vehicles*.
- **Greenhouse gas reduction** – ANSI offers an **accreditation program** for organizations providing third-party validation/verification services for the reduction and removal of greenhouse gases.

To explore how standards and conformance solutions can contribute to achieving smart, sustainable, and resilient cities, ANSI convened an initial meeting of its *Joint Member Forum* in April 2013. A summary of that meeting can be found **here**.

The November 21, 2013, *ANSI Workshop on Smart and Sustainable Cities* was intended to build on the April discussions. The workshop focused on three general areas:

- innovation as the driver of smart cities
- U.S. coordination in relation to several new international standards activities and other initiatives to establish smart and sustainable cities
- identifying priority areas for standardization and who should be involved

The workshop included three panel discussions, breakout groups, and an open discussion among all the participants. The workshop agenda appears at Appendix 1. Hyperlinks to the presentations are embedded in the text. A summary of key points from the breakout groups and open discussion is also set forth in this report.

The workshop drew 75 participants from 55 distinct organizations, including representatives from industry, trade associations, professional societies, standards developing organizations (SDOs), government agencies, academia, think tanks, and multi-stakeholder smart and sustainable cities initiatives, providing a range of perspectives. The workshop participants are listed at Appendix 2. Some attendees were present for only portions of the discussions.

3.0 Opening Remarks

3.1 Welcoming Remarks – Joe Bhatia, President and CEO, American National Standards Institute (ANSI)

A Growing Market
Mr. Bhatia welcomed the workshop participants, providing the background leading up to ANSI's holding the event. He noted that the development of smart cities is critical for every segment of the U.S. economy. Navigant Research predicts that the smart city technology market will grow from $6.1 billion annually last year to $20.2 billion in 2020. From smart phones to smart meters, and from building energy management systems to intelligent traffic systems, one begins to get a picture of the possibilities that smart technologies have to offer.

Joe Bhatia

Regional Partners Are Advancing Smart Cities
Mr. Bhatia stated that many nations around the world are already implementing smart cities technology to make their urban environments cleaner, greener, and more efficient. In several bilateral meetings on the periphery of the IEC General Meeting in New Delhi last month, countries in the European Union described how they are working on a smart cities roadmap for Europe. Additionally, China, Japan, Korea, and other countries shared their plans. Mr. Bhatia commented that it's time for the U.S. standardization community to look at what we are doing to help foster this market and address our society's needs.

Cities Are Complex Systems of Systems
At the same time, Mr. Bhatia acknowledged that this is no easy task. Cities are complex, interconnected systems of people, transit, buildings, schools, healthcare, energy, water, wastewater, and much more. Inadequate municipal budgets, aging infrastructure, and a lack of vision, planning, and coordination can pose significant challenges.

In a smart city, Mr. Bhatia continued, this complexity is addressed head-on through comprehensive planning and a holistic approach. Systems are interconnected, sensors and other devices gather and analyze data, and careful attention is paid to how resources are deployed. In short, steps are taken to make the city operate more efficiently, more intelligently, and more sustainably, while improving the quality of life for its citizens.

The Benefits Are Obvious

Mr. Bhatia observed that smart cities hold enormous promise both nationally and internationally:

- the promise to help meet global energy challenges
- the promise to reduce costs of government and social services
- the promise to spur job creation and economic growth
- the promise to help meet important environmental goals
- the promise to upgrade and improve the existing infrastructure

Requires a Coordinated U.S. Approach

In summary, Mr. Bhatia stated that it's clear that we have a lot of work to do to realize the full potential for smart cites. A comprehensive approach is needed, one that involves close coordination between the public and private sectors and participation by stakeholders nationally and internationally.

3.2 Opening Keynote Address – Clarence Anthony, Executive Director, National League of Cities (NLC)

Clarence Anthony

Opportunities to Improve the Quality of Life

Mr. Anthony stated that opportunities to improve the quality of life and to make communities better is what led him into public service. He said that NLC members may not have expertise in specific technologies such as smart grid, but what they do have is the desire to work with experts in those fields who can provide the guidance needed to help make cities better.

A Public -Private Partnership Is Needed

Mr. Anthony observed that what is needed is cooperation between public leaders, the non-profit community, and the private sector – the public sector can't do it alone. He challenged the workshop participants to expand the partnership represented here today into other networks and communities all over the country. He noted that the NLC's **Sustainable Cities Institute** works to educate cities to help them build better communities for future generations.

Resiliency and Sustainability Are Key Priorities

Drawing on his experience from having grown up in Florida, and with hurricanes and natural disasters happening around the world, Mr. Anthony commented that resilience/crisis management is a priority for cities. Our leaders need to be able to create and then re-create resilient communities. We are providing a support system for future generations and we need to take a comprehensive look at sustainability and cities, he emphasized.

It is not just about energy efficiency or retro-fitting our buildings, he continued. City leaders are dealing with a lot of issues: education, homeless veterans, public safety, and crime. Mr. Anthony mentioned that NLC just convened its congress of some 4,000 city officials in Seattle, a city which is looking at management systems for its downtown. He called for diversity in our outreach efforts so that everyone has a voice in the conversation. "I hope you will put a face on the ideas and solutions that you come up with," he added.

4.0 Panel Discussions

4.1 Panel 1: Innovation as the Driver of Smart Cities

In the first panel, representatives from industry, government, and academia discussed science and technology innovations and other incentives that are enabling the creation of smart and sustainable cities and communities, the architectures for smart cities,

Panel 1

and the application of model-based systems engineering as an approach to the smart cities challenge. Panelists included:

Moderator
- James T. Pauley, Senior Vice President, External Affairs and Government Relations, Schneider Electric, and Chairman of the Board, ANSI

Panelists
- Ron Baker, Distinguished Engineer, Chief Architect for Smarter Cities & Operations, Software Architect, IBM Software Group, Industry Products
- Leah Guzowski, Energy Policy Scientist, Argonne National Laboratory, and Chicago Lakeside Development LakeSim Co-investigator
- Manyphay Viengkham, Senior Systems Analyst, GE Energy – Digital Energy
- Alex Stuebler, Vice President, Strategy, Siemens Industry, Inc.
- Dr. Francis Slakey, Upjohn Lecturer on Physics and Public Policy, Georgetown University, and Executive Director, Georgetown University Energy Prize

Jim Pauley

Innovation across Services
Mr. Baker explained the IBM view that leaders must innovate across services to meet and exceed citizen expectations. This encompasses three different areas: planning and management (the design and implementation of a city plan and the efficient running of daily operations), infrastructure (the efficient delivery of fundamental city services), and human (the provision of effective social services that meet the needs of citizens).

Trends Spurring Smarter Cities
Mr. Baker listed a number of technological trends that are contributing to the market for smart cities. These include the growth of:
- mobile applications (tablets, smart phones, and their applications)
- open data
- geospatial data (location services)
- platform application programming interfaces (APIs)
- security threats
- software as a service

He emphasized that the open data movement is big and growing and is critical to improvements in transparency, efficiency, and economic development. The standards community needs to work in this context, he added, noting that agreement on a small number of critical standards items has been effective.

➢ **View Ron Baker's presentation.**

Evidence-Based Planning

Ms. Guzowski described the application of computation-enabled urban design in relation to the **Chicago Lakeside Development** project on the site of a former U.S. Steel plant on Chicago's South Side. She explained that computational simulations produce important information that facilitates smart decision-making in urban infrastructure planning and design. She noted that this type of approach has application to large urban growth areas in developing countries, such as the Pearl River delta in China.

➢ **View Leah Guzowski's presentation.**

A Systems Engineering Approach Is Needed

Ms. Viengkham explained that systems thinking and a systems engineering approach are needed to address the challenge of creating smart and sustainable cities that meet the needs of citizens and stakeholders. All life cycle aspects need to be considered holistically across vertical sectors: defining objectives, developing and testing standards, deploying them, and evaluating if the system behaved as expected. If it does not, then it is necessary to make modifications. Collaboration is key.

➢ **View Manyphay Viengkham's presentation.**

Research Contributes to the Discussion

Mr. Stuebler described research undertaken by independent partners and sponsored by Siemens to understand the needs of cities. Much of the focus has been on sustainability of urban infrastructures as well as how technology can be employed to increase urban efficiency. The **Siemens Green City Index** research series has evaluated 130 cities around the world, including 27 in the U.S. and Canada. Defining the boundaries of a city and comparing data between cities is challenging.

➢ **View Alex Stuebler's presentation.**

A Prize for Energy Efficiency

Dr. Slakey remarked that the potential savings from energy efficiency makes it the number-one fuel source, according to a recent report from the International Energy Agency. While 87% of the public says they want to be more energy efficient, only about 5% are actually doing anything about it. The **Georgetown University Energy Prize** seeks to incentivize this untapped resource. The competition will award $5 million to the community that develops a long-term energy efficiency plan and demonstrates reductions in energy consumption from electric and gas utility suppliers over the course of two years. Any community with a population between 5,000 and 250,000 people is eligible to participate. The competition launches in March 2014 and the winner will be announced in Fall 2016.

It's a Question of Resources

In the ensuing discussion, one of the biggest challenges cited in achieving smart cities was the lack of financial resources needed to replace systems already in place. The comment was made that cities are not resistant to optimizing the use of technology. Rather, there is a tremendous desire to learn and to use indicators. For its part, industry wants to help guide cities on how to use what they already have more efficiently. It starts with defining what a smart city is, and what the higher level objectives are in specific cases.

Resilience and Sustainability Go Hand in Hand

The growing importance of resiliency was noted – that it goes to the safety and security of cities and, hence, is part of sustainability. For example, the movement to centralize the electric grid will help to ensure that hospitals keep operating if adversity hits in the form of a storm.

It was noted that standards such as ***NFPA 1600, Standard on Disaster/Emergency Management and Business Continuity Programs***, and the ***EMAP Emergency Management Standard*** deal with threat assessment. President Obama's ***Executive Order on Improving Critical Infrastructure Cybersecurity*** was also noted.

Engage the Public

It was also observed that there is a need to discuss best practices for public awareness and engagement in planning smart and sustainable communities. Social science research and ecological systems theory can provide insights into how people interact with systems that are put in place.

4.2 Panel 2: Formal International Standards Activities for Smart and Sustainable Cities

Panel 2

In the second panel, experts discussed recent activities within the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU), and ISO/IEC JTC 1, *Information technology*, to define standardization needs in the area of smart and sustainable cities. Panelists included:

Moderator/Panelist
- James E. Matthews, III, Vice-President, International Electrotechnical Commission (IEC), and Chairman, IEC Standardization Management Board

Additional Panelists
- Paul B. Najarian, Foreign Affairs Officer – ICTs, U.S. Department of State
- Alex Tarpinian, Senior Manager, International Standards and Policy, IBM, and INCITS Executive Board Member and Chair, Study Group on Planning
- Professor Patricia L. McCarney, Department of Political Science and Director, Global Cities Institute, John H. Daniels Faculty of Architecture, Landscape and Design, University of Toronto, and Liaison to ISO TC 268, WG2

Systems Standardization in the IEC

Mr. Matthews described a new process within the IEC for addressing standardization matters that relate to systems. A Systems Evaluation Group (SEG) – the first stage of systems development – brings together experts to identify relevant stakeholders and to define the general architecture and boundaries of the problem to be addressed. These groups have a lifespan of about two years, during which time they evaluate the need for standards but they themselves do not develop standards. An SEG may recommend the formation of a Systems Committee (SyC), which may span multiple Technical Committees (TCs) and external organizations, and which may define reference architectures and use

cases and develop IEC International Standards. A Systems Resource Group (SRG) also may be constituted to guide the development of specialized tools and software applications for the systems, and to encourage use of these tools and sharing of best practices.

Currently, there are two SEGs: the *SEG smart grid* and the **SEG smart cities**. The latter is holding its first meeting in December 2013 and will undertake, among other things, to develop a standardization roadmap including a gap analysis looking at existing standards in IEC as well as related activities in ISO. Mr. Matthews emphasized that participation in the SEG is open.

  ➢ **View Jim Matthews' presentation.**

ITU Focus Group on Smart Sustainable Cities

Presenting on behalf of the ITU and his colleague Franz Zichy of the State Department, who serves as vice chairman of the **ITU Focus group on smart sustainable cities (FG SSC)**, Mr. Najarian began by noting that sustainable cities and sustainable development were among the top five priorities identified by ITU members in every region around the world. E-waste is a major problem. There is also increased connectivity via access to mobile phones. There is an opportunity for information and communication technologies (ICTs) to help address the adverse consequences of climate change. The FG SSC falls under ITU Study Group 5 on the environment and climate change. There are four working groups, and the main tasks closely map to what the IEC/SEG is doing. Draft documents under development cover definitions, key performance indicators (KPIs), and a stakeholder's map and city engagement plan. Anyone can participate. Two meetings have been held so far with the next one coming up in December.

  ➢ **View Paul Najarian's presentation.**

ISO/IEC JTC1 Study Group on Smart Cities

Representing JTC 1 and INCITS, Mr. Tarpinian reported that a proposal from China to form a *JTC1 Study group on smart cities* was accepted at the JTC1 plenary meeting a few weeks earlier, following earlier review by the JTC1 *Special working group on planning*. The study group will undertake to define smart cities and the market requirements and societal aspects that need to be addressed. It will catalog current technologies that are being deployed to enable smart cities. It will also do a survey of current standards activities, identifying groups to partner with and leveraging existing work. The group will develop a report with recommendations on how JTC 1 should address the ICT standardization needs of smart cities for consideration at the 2014 JTC 1 plenary meeting. The convenor, Yuan Yuan, from China, has been nominated to serve as the JTC 1 contact for the IEC/SEG and the ITU FG SSC. There will be a call for participation in a few weeks and one international face-to-face meeting will be held in Beijing. There are a number of related JTC 1 entities, including a *Special working group on internet of things* created last year, a new *Study group on big data* championed and led by the U.S. national body, and a new Subcommittee (SC) 40 on *IT service management and IT governance*.

  ➢ **View Alex Tarpinian's presentation.**

Global City Indicators and ISO TC 268, WG2

Professor McCarney described the evolution of the **Global Cities Indicators Facility (GCIF)** and taking its work into ISO TC 268 on *Sustainable development in communities*. Started in 2008 in collaboration with the World Bank and nine pilot cities, the GCIF undertook to address the lack of a standardized set of urban indicators and a methodology that would allow cities to compare how they were performing. Since then, GCIF's membership has grown to the point where 253 cities across 80 countries are

reporting on the standard. The indicators are focused around city services, quality of life, and related sub-themes. GCIF initially submitted its proposal to ISO in 2010. The new work item proposal was approved in September 2012, and WG 2 on *Global city indicators* held its first meeting in October 2012. The U.S. is an observer member and it is hoped that we will become a participating member soon. *ISO 37120, Sustainable development and resilience of communities – Indicators for city services and quality of life,* is set to be published in January 2014 and ISO has made a video to help promote the standard. During development of the ISO standard, it became evident that there was a desire for additional indicators, especially around sustainability and resilience. Accordingly, a new technical report, ISO TR 37121, is being prepared to address issues such as emergency preparedness, storm damage, risk assessment, resilience (economic and political), water, and smart grid. The next TC 268 plenary meeting will be held in Toronto in May 2014 in conjunction with the GCIF Global Cities Summit. All are welcome.

> **View Patricia McCarney's presentation.**

Coordination Is Key

The subsequent discussion focused on efforts underway to coordinate these various standards activities to avoid duplication and overlap, and to conserve resources given the similarities in scope. The importance of liaisons was noted. Much of the work is at an early stage, and IEC, ITU, and ISO are working better together than ever before. Mr. Bhatia noted that ANSI has formed panels and collaboratives which identify existing work and what needs to be done in cases where there is a need to put forward a coherent voice internationally. Not everyone has the resources to go to Toronto or China for a meeting, and that is where ANSI can help. The public sector must be engaged.

4.3 Panel 3: Other Initiatives and Issues Related to Smart and Sustainable Cities

In the third panel, experts discussed other national, regional, and international initiatives to establish and promote standards and best practices for smart and sustainable cities, including sustainability ratings for local communities, German and European activities, the needs of developing countries, and greenhouse gas reduction in cities. Panelists included:

Moderator John Kulick (left) and Panel 3

Moderator
- Dr. John Kulick, Siemens Corp., Corporate Technology, and Chair, ANSI Company Member Forum

Panelists
- Hilari Varnadore, Executive Director, STAR Communities
- Dr. Albert Hövel, Head of Technical Department, DIN, the German Institute for Standardization
- Anthony Pellegrini, Founding Partner and Director, Infrastructure and Urban Development Practice, Centennial Group
- Mary Sotos, Associate, Greenhouse Gas Protocol Program, World Resources Institute
- A final panelist, Dr. Lawrence E. Jones, Vice President, Utility Innovations & Infrastructure Resilience, Alstom Grid North America, was unable to attend the workshop. Dr. Jones had been scheduled to speak on behalf of the Smart Cities Council which has developed a *Smart Cities Readiness Guide.*

STAR Communities

Ms. Varnadore described **STAR Communities** – sustainability tools for assessing and rating communities (STAR) – which provides cities and counties with a means to measure progress against their sustainability objectives. Launched through a partnership of the U.S. Green Building Council, the National League of Cities, the Center for American Progress, and ICLEI – Local Governments for Sustainability, STAR was developed using an open, consensus-based process and released in October 2012. A pilot program to test it commenced in November 2012.

Last week the City of Tacoma, Washington, became the first U.S. community to be certified, and this was announced at the National League of Cities Congress of Cities in Seattle. The STAR system includes 7 goal areas with 44 objectives under these. Objectives are measured using a point system and are based on attainment of community-level outcomes and/or through completion of local actions needed to reach the outcomes. Three levels of certification are available providing recognition and other benefits such as demonstrating risk management to municipal bond agencies. The rating system is available as a free download, and additional guidance is available for purchase in the form of a technical guide and subscription packages. Some 68 communities are in the STAR network.

> ➢ **View Hilari Varnadore's presentation.**

Europe and German Initiatives

Dr. Hövel provided an overview of European and German work on smart cities. In the UK, the Department of Business has commissioned the British Standards Institution (BSI) to develop a smart cities standards strategy. BSI has published for comment a draft publicly available specification (PAS) on smart cities vocabulary. The French standards body AFNOR has signed a cooperation agreement with its Chinese counterpart, SAC, that includes smart cities. Italy held a smart city exhibition in October, and Spain has initiated work on a number of standards. The German standards body, DIN, is working with DKE, its counterpart on the electrotechnical side, to develop a standardization roadmap targeted for release in April 2014; this has the support of the German government.

In Europe there is also a CEN/CENELEC smart + sustainable cities and communities coordination group (SSCC-CG), which will provide an evaluation report on national, European, and international activities to the European Commission. There is also a high-level group of the **European Innovation Partnership on Smart Cities and Communities,** which has developed a strategic implementation plan. DIN is leading the ISO Task force on smart cities to assess ISO's contribution. DIN is also hosting the first meeting of the IEC SEG.

> ➢ **View Albert Hövel's presentation.**

The Challenges Facing Developing Countries

Mr. Pellegrini provided a perspective on the characteristics of cities in developing countries and the application of smart sustainable cities concepts to these cities. He noted that there are 2.8 billion people in cities of the developing world, versus 900 million in cities of the developed world. Almost all of the global urban growth is taking place in developing country cities, with over 2 billion new residents to be added by 2050 and maybe even a doubling of the current number. However, developing country cities have inadequate infrastructure to accommodate such growth in basic areas such as transport, water, sanitation and waste water, and power. More demand for infrastructure and energy use will lead to increased CO_2 emissions and environmental degradation.

Given these challenges, Mr. Pellegrini stated that there is much energy around the smart/sustainable city concept, especially in East Asia and in better-off countries. Examples of smart and sustainable city

projects in developing country cities include greenfield developments, district/neighborhood projects, and retrofit/revitalization projects. Drivers of demand include reduced costs, improvements in service, traffic accident reduction, faster emergency response, and early warning of natural disasters. What is needed is a revitalization of urban planning, and leaders who understand how to work with the private sector to spearhead change.

In terms of standards, there is no comprehensive international system for measuring how smart a city is. Doing a ranking creates insights into metrics and the relative contribution of each indicator. The Smart City Council's new *Readiness Guide* offers an excellent framework for analysis.

➢ **View Anthony Pellegrini's presentation.**

Measuring Greenhouse Gas (GHG) Emissions in Cities
Ms. Sotos explained that historically the audience for the *Greenhouse Gas Protocol (GHG Protocol)* has been business, but in recent years there has been a lot more interest in measuring GHG emissions within a city boundary. Some national frameworks such as *BSI PAS 2070* have appeared. Many activities are associated with GHG emissions in a city, and a city needs to be able to take an inventory of emissions in order to implement solutions and track performance. But there are inconsistencies in accounting practices, city boundary definitions, and which GHG emissions are included or excluded.

This was the catalyst for the *Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC)*, developed by the World Resources Institute (WRI), the C40 Cities Climate Leadership Group (C40), and ICLEI, in partnership with the World Bank, the United Nations Environment Programme (UNEP), and UN-HABITAT. The protocol's reporting framework looks at areas such as energy use in buildings, transportation, waste, and other indirect emissions. It is currently being pilot tested in some 35 cities around the world and is scheduled for final release in Fall 2014. There will be an external review process in Spring 2014, and this group's involvement is encouraged. One of the biggest challenges in terms of standardization is the lack of capacity, be it human, technological, or financial. Easy-to-use calculation tools are needed, as is technical assistance to foster adoption.

➢ **View Mary Sotos's presentation.**

Linkages between Initiatives
The discussion that followed picked up on the question of coordination in terms of linkages between the initiatives described in panels two and three, and others. The example of the GCIF leading to an ISO standard was noted. Ms. Varnadore indicated that STAR Communities was built by local governments and has not gone down the path of formal standardization; resources are scarce.

It was noted that there is a NIS- funded research project for a roadmap on "the smart firefighter of the future," dealing with protective equipment, apparatus, related systems, built infrastructure, fire prevention, and post-investigation activities. The challenge is to identify best practices, wherever they come from. Mr. Bhatia suggested that we need to identify which organizations can help provide some of the needed solutions. We should look to identify priority areas at the national level and define some attainable goals.

5.0 Breakout Groups and Open Discussion

Participants organized themselves into four breakout groups to discuss three general and four specific questions related to standardization of smart and sustainable cities. Jim Pauley, Chairman of the ANSI Board of Directors, moderated the report-back session and discussion. Responses given to the questions are provided below.

Workshop Participants

General Questions

What are the primary advantages and disadvantages of advancing standardization in support of smart and sustainable cities?

Advantages
- Setting standardized definitions and lexicon, which is critical across sectors
- Common data formats to enable sharing of data
- Having a baseline document which could become sectorally specific if necessary, e.g., for telecom, wastewater, etc.
- Efficiencies, such as with operation and maintenance
- Resiliency with small- and large-scale events, e.g., Fukushima Daiichi
- Improving health and wellness
- Promoting best practices
- Providing useful case studies
- Assuring completeness in addressing topics
- Promoting flexibility of growth
- Moving transparently around the world
- Addressing both prescriptive and performance approaches
- Promoting straightforward technical solutions, such as prescriptive indexes

Disadvantages
- Possibility of slowing growth
- Causing conflict with the complexities of different issues (e.g., water and electric utilities)
- Coordinating the holistic viewpoint
- Applying standards that are not on the same scale as the applications they address
- Using standards outside of the context in which they were developed (e.g., standards for developed cities versus developing cities)
- Trying to apply universal standards where social and cultural issues vary dramatically
- "Accessibility" of standards – both the cost of developing and the cost of using standards
- Limited participation in standards development – it may not be economically feasible for a portion of the user community
- Politicians bureaucrats – pet projects may die if the next elected official has different priorities

What overall areas of smart and sustainable cities are the most important to address through standardization?

- Common definitions/lexicon. SMART stands for Specific, Measurable, Attainable, Relevant, and Timely. The Smart Cities Council has some definitions in their publications.
- Address systems of systems (SoS)
- Establish communications protocols between the numerous layers of systems. Think of a smart city as a human body. IT is the brain. Appendages are different aspects of systems. The brain can't make functionality work without a central nervous system and that (for us) was communications.
- Prioritize the importance of data throughout the numerous layers, using predictive analytics to clarify risk prior to failure, i.e. "Houston, we have a problem." Frequency times severity equals risk, which affects how we prioritize. Is that something we can standardize, or something the city decides on?
- We must look at data in all its uses.
- Data consistency should be the goal so that measurements are comparable.
- Communications aspect of implementing data
- Public safety is at the top of the list – the major cost component that cities deal with.
- For developing areas, water quality
- Electrical distribution standardization
- Important to look at both *new* developing cities/communities as well as retrofitting *existing* cities

What other important smart and sustainable cities initiatives have not been discussed?

- Who wants the standardization? Deciding where the greatest intersection of stakeholders is. Who wants it and who is willing to pay for it?
- Environmental aspects
- Communications
- Financial aspects – how can I implement those and at what cost
- Research management
- Better data management
- Better data analysis
- Improvement of quality of life, which is the ultimate objective. Who decides what it is?
- Organization-specific initiatives, such as the **IEEE Urbanization Challenge**
- Geographic-specific initiatives, such as ongoing program in New Jersey
- Profession-based initiatives, such as NIST/NFPA smart firefighter program
- Regulatory-driven initiatives, such as DOE clean cities program
- Clarification of where current green building codes and programs fit into the bigger concept of smart cities
- Privacy, in relation to smart meters, smart phones and tracking where people are, vehicle miles traveled (VMT) tax in the case of electric vehicles

Specific Questions

Picking one or more specific areas, what are the main priorities in terms of standardization for smart and sustainable cities?

- Need to consider smart cities holistically
- Different cities have different needs, e.g., viscosity of motor oil in Canada is different than in San Juan, Puerto Rico, or Miami. You need a baseline, plus or minus.
- What is attainable?
- Standards should be scalable. Scalability equates to affordability.
- Standardizing systems for systems. If a smart city is a system of systems, those systems come from an aggregate of providers. So, interoperability is important. KPIs are inter-related.
- Standards may include other deliverables, e.g., technical reports. Let's also look at best practices.
- Also look at worst (sub-optimal) practices/failures.
- Clarifying communications protocols
- Traditional focus has been to first address buildings, but other important issues need to be considered, e.g., land use policies and planning in wildland-urban interface (WUI)
- Efficiency, such as transportation efficiency, energy efficiency, etc.
- Sustainability
- Resiliency for disaster preparedness
- Establish a universal set of definitions and lexicon
- To be forward-looking for new growth smart cities
- Addressing the existing built environment of today's civilization, i.e., the retrofit
- Use of weather information in smart infrastructure to do predictive approach and analysis

What stakeholders should be involved in this work?

- The general public and consumers, especially at-risk populations
- Government at all levels: regulators, elected officials, including at the state and local levels. Associations and societies that represent those bodies, where a collection of the whole is able to lobby for the needs of a region – the same conversations are taking place at these groups.
    - U.S. Conference of Mayors – has a group working on sustainable cities
    - International City/County Management Association (ICMA)
    - National Governors Association
- End users
- Industry
- Data scientists and cyber-physicists working with cyber-physical systems
- Academia and research
- All the traditional ANSI stakeholders

The discussion concluded around the following issues: Where do the standards originate? Do they come from the top down or the bottom up? Many of the experts come from industry. Who is the constituency driving the need? The citizen? The governmental body? The latter may not have the ability to be at the

table, but they know what they need. And this goes to the question of what role ANSI can play in terms of coordination.

Mr. Bhatia commented that it doesn't matter so much if it's top down or bottom up; the outcome is what is important. The World Trade Organization (WTO) principles allow anyone who is affected the right to participate and to have their concerns heard.

Looking over the horizon, what new technologies or other game changers need to be recognized and potentially addressed with regard to this specific area(s)?

- Technology is changing rapidly.
- We've talked about smart grid.
- Next generation user community will be different.
- Crowd everything, e.g., crowdsourcing, crowdfunding. Crowd standardization. We have new tools to develop standards.
- E-mobility
- Energy efficiency
- Better data collection and analysis.
  - Example: Otis elevators collected and stored data for 25 years. For most of that time, they didn't do anything with it. Then they opened a call center, gave the information to technicians in the field, and turned it into a huge success story.
- Communities/municipalities may not be able to hire the personnel needed to read all the data. Citizens may want their tax dollars to be used to support data gathering and analysis for certain activities, e.g., EMTs, firefighters.
- New technology is not the game changer. Affordability is the key. The ability to have a long-range plan.
- Proliferation of sensor technology. Sensors are everywhere.
- Privacy issues, proprietary data, and other ethical or cultural issues
  - Example: NSA eavesdropping. Contrast that with the ability to use data to get a lower premium on your insurance. Where are we going socially on big data collection?
- "Armageddon," e.g., if we all lose electricity
- Addressing the issue of political change/changing policy direction. We need to institutionalize a process that mandates a continuing review. For example, the building code review process takes place every three years. Take decisions a step away from politicians and put them in the hands of groups who regularly address the issues.

How can work to develop standards and conformance programs for smart and sustainable cities be better coordinated?

It was noted that over the past fifteen or so years, ANSI has operated standards panels and collaboratives as a mechanism for coordination. These groups do not write standards. Rather, they typically undertake to identify existing standards and conformance programs in a given subject area and do a gap analysis to determine what additional standards and conformance solutions are needed.

Workshop Participants

Given the breadth and potential scope of the smart cities issue, it was suggested that ANSI form a collaborative to continue this dialogue by bringing together the end-user community, SDOs, governmental agencies, and others.

It was emphasized that the price of participation in such an effort must be affordable in order to get a better cross section of the affected community.

The collaborative's deliverables — beyond a roundtable discussion — would be determined by the collaborative. To the extent new standardization work is recommended by the collaborative, that would take place within the affected sectors.

The comment was made that ANSI has a good track record serving as a facilitator and bringing stakeholders together. And workshops like the one today are very useful to foster ongoing dialogue.

Another point made was that smart and sustainable cities is a really big area. A lot of the standards are already written or being written. There needs to be a way, through this collaborative or forum, to distill down the requirements — in other words, to be able to recommend modifications to standards to satisfy the needs of cities.

It was pointed out that we need to consider specifically what is needed in terms of standardization at each level: international, regional, or national — there are differences.

The comment was also made that it is good to finally see ISO, IEC, JTC 1, and ITU touching one another on this issue.

6.0 Wrap-Up and Next Steps

Mr. Pauley noted that there is a lot of work already taking place. The key to any ANSI effort is to have the right stakeholders at the table. It also needs to be affordable.

Mr. Pauley remarked that he was excited that we had this workshop today. He thanked everyone for their participation.

Mr. Bhatia remarked that he could not imagine smart cities going forward without ANSI being involved. We need your help in putting together a structure. What are the priorities? What are the constituencies that need to be at the table? We will need to have a working session to discuss the priorities.

Mr. Bhatia noted that he sits on the Board of ISO and that ANSI is linked at all levels of engagement internationally. Malcolm Johnson, director of the telecommunication standardization bureau at ITU (ITU-T), is visiting ANSI the first week of December 2013.

Mr. Bhatia acknowledged Mr. Anthony's comment that the public sector needs to be involved to define acceptable solutions. We need to identify national solutions and take them forward internationally, Mr. Bhatia added.

Mr. Bhatia also remarked that we haven't talked much about compliance. Standards are meaningless without compliance and validation. Those are practical things that will help with adoption.

In summary, Mr. Bhatia indicated that ANSI will come back with a proposal and a program to move forward. He noted that ANSI now calls these coordination bodies "collaboratives." We will need to engage communities and have a planning meeting, he added. ANSI does not have a preferred solution — be it a roadmap, what do we like/not like at the international level, etc.

A participant who had been involved in the last two ANSI panel/collaborative efforts commented that ANSI needs to clearly define the scope, focusing on a couple of key questions: Who is the audience, who is going to read the report, and is it going to be used?

Mr. Bhatia responded that we'll do our best to define the needs. We can either go forward in an uncoordinated fashion, or we can pursue a better option.

Another participant agreed that we need a defined scope. A phased approach may make it easier to decide on engagement.

Mr. Bhatia noted that the presentations from today's meeting will be made available, along with a report of the meeting. He thanked the speakers, moderators, and participants for their contributions, and invited everyone to continue these discussions at the reception.

AGENDA

ANSI Workshop: *Smart and Sustainable Cities*

Thursday, November 21, 2013 | 9 a.m. – 5:30 p.m.

**Ronald Reagan Building and International Trade Center
Pavilion Room, 2nd Floor**
1300 Pennsylvania Avenue NW
Washington, DC 20004
202.312.1300

Time	Discussion Topic	Speaker
8:00 – 9:00 am	**Registration / Continental Breakfast**	
9:00 – 9:10 am	**Welcoming Remarks**	Joe Bhatia President and CEO American National Standards Institute
9:10 – 9:25 am	**Opening Keynote Address**	Clarence E. Anthony Executive Director National League of Cities
9:25 – 10:45 am	**Panel 1: Innovation as the Driver of Smart Cities** Representatives from industry, government and academia will discuss science and technology innovations and other incentives that are enabling the creation of smart and sustainable cities and communities, the architectures for smart cities, and the application of model based systems engineering as an approach to the smart cities challenge. *Panelist presentations followed by interactive Q&A session covering the following topics:*	**Moderator** ▪ James T. Pauley Senior Vice President, External Affairs and Government Relations Schneider Electric Chairman of the Board, ANSI **Panelists** ▪ Ron Baker Distinguished Engineer, Chief Architect for Smarter Cities & Operations Software Architect IBM Software Group, Industry Products

	- What would you say are the key characteristics of a smart and sustainable city that differentiates it from a conventional city? - What industry sectors tend to be the focus of discussion when speaking about smart and sustainable cities? - What advice would you have for a city on how it can use standards and conformance programs to become more efficient, more sustainable, and more resilient? - How should cities go about deciding what technology investments are needed in order to achieve desired outcomes in efficiency, sustainability, and resilience?	▪ Leah Guzowski Energy Policy Scientist Argonne National Laboratory Chicago Lakeside Development LakeSim Co-investigator ▪ Manyphay Viengkham Senior Systems Analyst GE Energy – Digital Energy ▪ Alex Stuebler Vice President, Strategy Siemens Industry, Inc. ▪ Dr. Francis Slakey Upjohn Lecturer on Physics and Public Policy, Georgetown University Executive Director, Georgetown University Energy Prize
10:45 – 11:00 am	**Networking Break**	
11:00 – 12:10 pm	**Panel 2: Formal International Standards Activities for Smart and Sustainable Cities** Experts will discuss recent activities within the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), the International Telecommunication Union (ITU), and ISO/IEC JTC1, *Information technology*, to define standardization needs in the area of smart and sustainable cities. *Panelist presentations followed by interactive Q&A session covering the following topics:* - What efforts are underway to coordinate these standards activities at the international level? - What efforts are underway to coordinate U.S. participation in these activities? - What more can or should be done in terms of coordination at either the international	**Moderator / Panelist** ▪ James E. Matthews, III Vice –President, International Electrotechnical Commission (IEC) and Chairman, Standardization Management Board **Additional Panelists** ▪ Paul B. Najarian Foreign Affairs Officer - ICTs U.S. Department of State ▪ Alex Tarpinian Senior Manager, International Standards and Policy IBM INCITS Executive Board Member and Chair, Study Group on Planning ▪ Professor Patricia L. McCarney

	or U.S. level? - What areas of smart and sustainable cities standardization are the most important to address? - What stakeholders need to be involved in these activities, and who is currently not at the table?	Department of Political Science and Director, Global Cities Institute John H. Daniels Faculty of Architecture, Landscape and Design University of Toronto Liaison, ISO/TC 268/WG2
12:10 – 1:00 pm	**Networking Lunch**	
1:00 – 2:20 pm	**Panel 3: Other Initiatives and Issues Related to Smart and Sustainable Cities** Panelists will discuss other national, regional and international initiatives to establish and promote standards and best practices for smart and sustainable cities, including sustainability ratings for local communities, German and European activities, the needs of developing countries, greenhouse gas reduction in cities, and the development of a readiness guide for smart cities. *Panelist presentations followed by interactive Q&A session covering the following topics:* - What linkages are there between the initiatives you've described and those of IEC, ISO, and ITU described in panel 2? - What more can or should be done in terms of coordination with the IEC, ISO and ITU activities? - What areas of smart and sustainable cities standardization are the most important to address? - What stakeholders need to be involved in these activities, and who is currently not at the table?	**Moderator** ▪ Dr. John Kulick Siemens Corp., Corporate Technology Chair, ANSI Company Member Forum **Panelists** ▪ Hilari Varnadore Executive Director STAR Communities ▪ Dr. Albert Hövel Head of Technical Department DIN, the German Institute for Standardization ▪ Anthony Pellegrini Founding Partner and Director, Infrastructure and Urban Development Practice Centennial Group ▪ Mary Sotos Associate, Greenhouse Gas Protocol Program World Resources Institute ▪ Dr. Lawrence E. Jones Vice President, Utility Innovations & Infrastructure Resilience Alstom Grid North America (on behalf of Smart Cities Council)

2:20 – 3:40 pm	**Breakout Discussions**	**All**
	Roundtable breakout discussions among participants. Recommend around 10 to a group which may require combining adjacent tables. Active participation is encouraged. Questions and suggested time allotments for discussion:	**Intro:** Jim McCabe Senior Director, Standards Facilitation American National Standards Institute
	General questions (30 minutes) - What are the primary advantages and disadvantages of advancing standardization in support of smart and sustainable cities? - What overall areas of smart and sustainable cities are the most important to address through standardization? - What other important smart and sustainable cities initiatives have not been discussed?	
	Specific questions (40 minutes) - Picking one or more specific areas, what are the main priorities in terms of standardization for smart and sustainable cities? - What stakeholders should be involved in this work? - Looking over the horizon, what new technologies or other game changers need to be recognized and potentially addressed with regard to this specific area(s)? - How can work to develop standards and conformance programs for smart and sustainable cities be better coordinated? *Note: As a follow-up action, ANSI is contemplating the establishment of a network on smart and sustainable cities to provide a mechanism for ongoing coordination and information exchange on standardization activity (for example, via monthly webconferences and other resources). Would you be interested in participating in such a network and, if so, what topics would you be most interested in learning more about?* Review key inputs (5 minutes)	

3:40 – 4:00 pm	**Networking Break**	
4:00 – 4:50 pm	**Capture Inputs from Breakout Discussions**	**Moderator** ▪ Jim Pauley
4:50 – 5:20 pm	**Open Discussion and Wrap-Up** *In this moderated open discussion, participants will share perspectives on what has been recommended during the day and discuss how ANSI can facilitate ongoing coordination of standardization initiatives for smart and sustainable cities. Active participation is encouraged.*	Jim Pauley **All**
5:20 – 5:30 pm	**Closing Remarks**	Joe Bhatia
5:30 pm	**Adjournment**	
5:30 – 6:30 pm	**Networking Reception – Pavilion Foyer**	

Organization	Attendee
A2LA	Sylvana Ricciarini
	Peter Unger
Alliance for Telecommunications Industry Solutions	Jean-Paul Emard
American Iron and Steel Institute	Helen Chen
American Society of Civil Engineers	James Rossberg
Argonne National Laboratory	Leah Guzowski
ASTM International	Brian Meincke
Booz Allen Hamilton	Joseph Cascio
The Brookings Institution	Joseph Kane
Centennial Group	Anthony Pellegrini
Chesapeake Crescent Initiative	Stephanie Carnes
Cisco Systems, Inc.	Gary Stuebing
Corning Incorporated	James Matthews
DC Office of Planning	Laine Cidlowski
DIN, the German Institute for Standardization	Albert Hövel
Emergency Management Accreditation Program	Robert Fletcher
General Electric – Energy	Manyphay Viengkham
Georgetown Climate Center	Cassandra Powers
Georgetown University Energy Prize	Francis Slakey
Greenwire	Whitney Wyckoff
IBM Corp.	Ron Baker
	Alex Tarpinian
ICF International	Angela Wong
IEEE Standards Association	Cherry Tom
InfoComm International	Allen Weidman
Ingersoll Rand	Sean McBride
Institute for Sustainable Infrastructure	Jennifer Rivers
Institute for Sustainable Power	Jack Werner
International Association of Plumbing and Mechanical Officials	Dain Hansen
International Code Council	David Karmol
International Society of Automation	Charley Robinson
Intertek	Lawrence Todd
Itron, Inc.	Ed May
Microsoft	Dave Welsh
NACE International	Ed Barrett
National Electrical Manufacturers Association	Ryan Franks
National Fire Protection Association	Greg Cade
	Casey Grant
	Meghan Housewright
National Institute of Standards and Technology	Clare Allocca
	Nancy McNabb
	Geoffrey Mulligan
	Sokwoo Rhee
	David Wollman
National League of Cities	Clarence Anthony
	Emily Pickren
	Julia Pulidindi

Organization	Attendee
	Raksha Vasudevan
Outdoor Power Equipment Institute	Gerry Coons
Project Management Institute	John Zlockie
Rockwell Automation	Emmanuel Dela Hostria
Schneider Electric	James Pauley
Siemens Industry, Inc.	Alex Stuebler
Siemens USA	John Kulick
Smart Grid Interoperability Panel	Susan Hoyler
Star Communities	Hilari Varnadore
The Urban Institute	Carlos Martin
U.S. Agency for International Development	Helen Santiago Fink
U.S. Department of Housing and Urban Development	Angelica Salazar
U.S. Department of State	Paul Najarian
U.S. Green Building Council	Meghan Bogaerts
Underwriters Laboratories Inc.	Derek Greenauer John Thompson
University of Toronto	Patricia McCarney Helen Ng
Woodrow Wilson International Center for Scholars	Allison Garland
World Resources Institute	Mary Sotos
American National Standards Institute	S. Joe Bhatia Stephanie Carroll Scott Cooper Steven Cornish Lane Hallenbeck Jim McCabe Dan Ratner Joseph Tretler