

## THE YEAR IN REVIEW

### TECHNOLOGY FOCUS

**Energy generation & storage**

**Smart Cities, Smart Grids**

**Trend-setting devices**

### INDUSTRY SPOTLIGHT

**Sensing with optical fibres**

### TECHNICAL COMMITTEES

**Standards matters in  
rail/road transport**

**How standards impact  
our world**

### IEC WORLD

**Share your work**

### IEC FAMILY

**Young Professionals**

**IEC Affiliate Country Programme**



**4** RE sources – wind, solar, marine energy, biomass – are now the fastest-growing power source on a percentage basis with hydropower representing the biggest share **8** Smart Cities and Smart Grids offer robust responses to the challenges faced by regulators, utilities, and governments **19** Starting from the first patent of a fibre optic sensor in 1967, fibre optic sensing has become a success story throughout the world **26** Road and rail transports depend on electrical and electronic systems which rely on standardization work from many IEC TC/SCs **32** Multimedia users are constantly expecting better audio and video quality on their equipment, whether they access content on large or smaller, mainly mobile devices **53** Share your work, tell us your story

## The year in review

Issue 08/2014 focuses on the 12 months since the IEC General Meeting in New Delhi, India, and highlights most of the technologies and TC work that were featured in *e-tech*. It provides an update on the IEC Young Professionals and Affiliate programmes and reviews the major international events the IEC organized and/or participated in.

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# Editorial

## Cooperation towards a Smarter World



Frans Vreeswijk  
IEC General Secretary  
and CEO

### Message from Frans Vreeswijk, IEC General Secretary & CEO

Everything from grids, to cities, to transportation and manufacturing is to become smarter.

Smart is often associated with information and communication technology. But the gathering and processing of data – so-called Big Data is only part of the picture.

Take the example of Smart Cities. These urban spaces will be more liveable, safer, healthier, cleaner and more sustainable. They will be able to better satisfy the needs of many different stakeholders, including the citizen.

In Smart Cities, improved design, planning and administration are enabled by millions of sensors collecting and transmitting data. A myriad of electronic devices rely on a steady flow of good quality electricity. They underpin services such as water and waste management, transportation, safety and security, telecommunications or financial transactions. IEC work impacts most of them.

In large scale systems, a multitude of technology solutions from many different players need to be able to seamlessly communicate and interact.

Today, the speed of innovation is fast. So fast that individual companies can no longer develop everything alone. Never before have businesses been as competitive. In electrotechnology - never before did they collaborate as much. In many ways the IEC already provides the tools that facilitate this broad cooperation. With our work devices from many different sources are able to work together safely everywhere.

Going forward the IEC will need to go beyond individual devices and small systems. Know-how and relevant expertise from many different organizations will need to be taken on board. There is not a single organization that will be able to develop all the Standards that are required for increasingly big systems. Our neutral and independent global platform can play an important role in stimulating the cooperation that has to happen. Please help us spread the word. Only if we combine our forces, can we achieve integration for a Smarter World.

I thank you all for your work and your commitment and wish you a fruitful General Meeting.

Frans Vreeswijk



*In Smart Cities, improved design, planning and administration are enabled by millions of sensors collecting and transmitting data*



*Going forward the IEC will need to go beyond individual devices and small systems*

# The promising impact of renewables

Constant need for electricity drives rapid growth of renewables

*Jewel Thomas*

**The wide-ranging environmental, economic and employment benefits of the rapidly expanding RE (renewable energy) sector are multiple and go beyond solely electricity generation. “New” RE sources, i.e. wind, solar, marine energy and biomass are now the fastest-growing power source on a percentage basis with hydropower representing the biggest share. This rapid growth is driven by a constant need for electricity and environmental concerns to also reduce the use of fossil fuels in power generation.**



*Horizontal axis tidal turbine (Siemens press photo)*

## Economic benefits and challenges

According to a BNEF (Bloomberg New Energy Finance) April 2014 report, investments for REs could range between USD 470 billion (USD 6 100 billion cumulative) and USD 880 billion (USD 9 300 billion cumulative) by 2030. Although these figures should be taken with caution, they highlight a growing market and societal interest. Tax-breaks and subsidies to bring the price of RE-generated electricity to that of other sources cause costs to decline equally rapidly, making renewables increasingly competitive. However some utilities find their conventional power plants, which are generally still needed for backup, become unprofitable. As a result, some countries are considering or cutting financial incentives for RE installations. Nevertheless, employment opportunities should continue to grow in manufacturing, equipment distribution, site preparation, installation and also benefit industry suppliers. With production gradually moving to developing countries, prospects in REs should be promising

there too especially in the MRO (maintenance, repair and operations/overhaul) sector.

The extensive standardization work done by several IEC TCs (Technical Committees) and SCs (Subcommittees) is crucial in the development of the RE sector and its associated technologies. A summary of recent developments follows.

## Marine energy

Marine energy is emerging as a huge source of RE but depends on disparate kinds of energies, which require different technologies for their full exploitation. Due to various challenges, investment in this sector has been relatively modest so far.

IEC TC 114: Marine energy – Wave, tidal and other water current converters, is preparing International Standards to help reduce the technical and financial risks associated with new technologies in this sector and enable a quicker adoption of marine energy

conversion. The TC also liaises with IEC TC 88: Wind turbines, on marine energy projects that share some technical issues with offshore wind farms on common elements, such as mooring and floating installations.

Three TS (Technical Specifications) have been published and work on a Guideline for design assessment of OTEC (Ocean Thermal Energy Conversion) is in preparation.

## Steam turbines: a hot global market

Introduced in the late 19<sup>th</sup> century, steam turbines, which use heat derived from burning fossil fuels, from nuclear reactors, biomass and other renewable sources to drive generators, have been in high demand ever since for electricity generation, marine propulsion and in industry. They are responsible for producing some 80% of the world's electricity. The technology has evolved considerably and the increased flexibility of steam turbines enables them to be used for a wide range of applications.



*Stirling dish for CSP plant*

IEC TC 5: Steam turbines, prepares International Standards that have contributed to the expansion of the sector. They concern specifications, as well as acceptance tests related to the accuracy of various types and sizes of turbines and of speed control systems.

### Thermal solar power

CSP (Concentrating solar thermal power) is attracting the interest of utility companies keen to expand their renewable portfolios, but also of original equipment manufacturers. One reason is the many common – but cleaner – traits with fossil fuels.

Different CSP technologies can be applied to collect and concentrate

sunlight, turning it in to medium to high temperature heat. It can then be used to generate electricity in a conventional way using a steam turbine or a Stirling engine, or used in other applications, such as supplying process heat. Advances in technology – including the vital thermal storage capacity that enables solar variability to be decoupled from a plant's output – are contributing to a series of major new commissioned projects in various parts of the world.

Thermal energy is relatively easy to store unlike electrical energy. New developments also include the capacity to generate electricity in the night. The main types of commercial CSP technologies in operation today are linear systems like Fresnel lensing, parabolic trough types, point concentrating systems and the more common central or tower receiver systems. Commercial storage technologies in use are steam storage in pressurized vessels and molten salt storage using insulated tanks.

Reducing energy costs and improving thermal storage systems represent the biggest challenges. The work of IEC TC 117: Solar thermal electric plants, will be central especially regarding terminology, performance testing, modelling, environmental, and safety requirements.

### Geothermal energy

Geothermal energy, heat from the Earth best known and most visible in natural form in geysers, is an abundant form of renewable energy present everywhere. Although geothermal energy application in power generation is relatively recent, its exploitation is expanding rapidly throughout the world. It is proving particularly attractive for countries without easy or affordable access to other forms of energy. Its potential is being increasingly also harnessed for many applications such as heating buildings, to produce electricity in power plants, cooling, and in CHP (combined heat and power) cogeneration.

Several countries in Africa and the South East Pacific region are making significant progress in the development of their first geothermal power plant, with plans to meet national energy needs and electricity export to other countries.

Geothermal heat pump systems are very efficient and outperform other forms of heating and cooling that rely on fossil fuels or electricity. A new promising technology is EGS (Enhanced Geothermal Systems), which employs techniques developed for enhanced oil and gas recovery (also known as fracking). However, constraints on EGS include economic, technical and environmental factors such as potential landslides.

Standardization work is essential to the proper operation and development of geothermal energy for example with IEC SC 61D: Appliances for air-conditioning for household and similar purposes, which prepares International Standards for heat pumps. With steam turbines being central to electricity generation from geothermal sources the work of IEC TC 2: Rotating machinery will also be key.



*Geothermal energy plant at The Geysers near Santa Rosa, California, USA (Photo: NREL)*

# Storage: the heartbeat of renewables

The importance of electrical energy storage



Shiobara 900 MW pumped-storage plant  
(Courtesy of Tokyo Electric Power Co.)

Jewel Thomas

**As many countries try to increase the share of REs (renewable energies) in their electricity generation portfolio, a major issue facing utilities is EES (electrical energy storage). IEC International Standards for EES technologies aim to provide a safe and stable energy supply and to integrate electricity from intermittent RE sources into the overall distribution grid. IEC created TC (Technical Committee) 120: EES (Electrical Energy Storage) Systems, in 2012 to develop International Standards on systems aspects of EES.**

## Old and new

Pumped-storage hydropower currently represents the largest and most flexible EES solution and is experiencing significant growth. Modern battery systems and chemistries have improved, increasing the capabilities of such systems. Flywheels can capture energy from RE sources in a mechanical form and can deliver uninterrupted power to the grid nearly

instantly when needed. Other effective EES systems are thermal energy storage for capturing excess energy from thermal solar plants during peak insolation periods, usually in molten salts, to release it during dark hours. Chemical storage, in the form of hydrogen or SNG (synthetic natural gas) produced from excess electricity offers more storage opportunities.

## Batteries still central to future grid storage

A new generation of advanced safe, low-cost and efficient enough batteries should play a major role in the future global EES landscape and in grid management. The global market for these batteries, which include Li-ion (lithium ion), sodium metal halide, NaS (sodium sulphur), advanced lead-acid and flow batteries, is expected to grow from USD 182,3 million in 2014 to USD 9,4 billion in 2023. However, this introduction is still limited to high-value applications like frequency regulation and demand charge mitigation.

IEC TC 21: Secondary cells and batteries, and its SCs, prepare International Standards for all types of rechargeable cells and batteries installed in EES systems.

The first ever grid-connected HBr (hydrogen-bromine) flow battery storage solution for use with renewables was connected to a test site in Israel in April 2014.

## Energy harvesting

Interest is growing significantly for energy harvesting or energy scavenging, the process associated with the collection of low-grade energy from sources such as ambient or waste

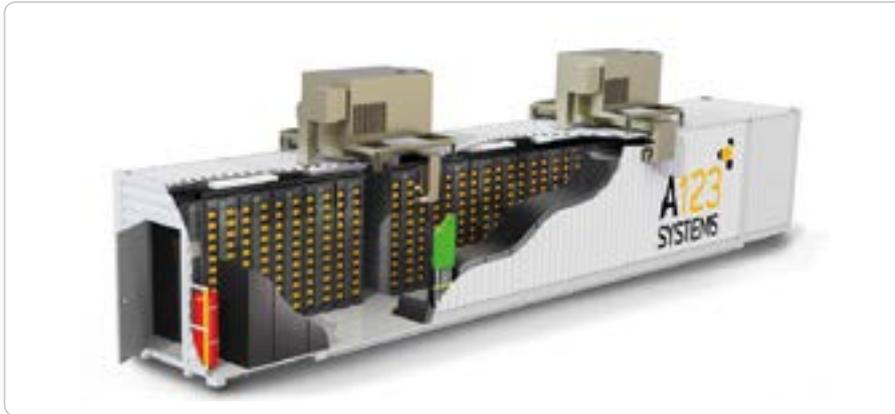
heat, human power, solar, thermal and kinetic energy, and their conversion into electrical energy. Viewed initially mainly as a convenient way of powering sensors, small wireless electronic devices and low-power systems, opportunities are now also opening up for energy harvesting use in larger applications.

Energy harvesting is widely used for powering sensors and actuators, such as those found in certain types of MEMS (micro-electromechanical systems), which are increasingly deployed in sectors such as automotive and medical. IEC International Standards for MEMS are prepared by IEC TC 47: Semiconductor devices, and are tested by IECQ (IEC Quality Assessment System for Electronic Components).

The urban public transport sector offers a great potential for energy harvesting and a more energy-efficient transportation sector. For example regenerative charge braking and energy harvesting shock absorbers are being fitted to buses to charge batteries and supercapacitors for providing extra power. In some countries, energy harvesting pavements have also been installed in certain heavy pedestrian traffic locations, such as train stations or office buildings, for powering energy-efficient lights or other systems.

## The super storage capacity of supercapacitors

Supercapacitors most commonly EDLCs (Electrochemical Double Layer Capacitors) have very favourable characteristics in terms of power density. They are also resistant to shock and vibration and have the



A123 systems nanophosphate EXT™ grid storage solution (Photo: A123 systems)

ability to be charged and discharged countless times without any degradation in performance. This is in stark contrast to chemical batteries which have a defined life span in terms of cycling.

Supercapacitors may appear as serious competition for batteries, in particular with Li-ion technology, but should more likely be considered as a complementary technology. IEC TC 40: Capacitors and resistors for electronic equipment, has published International Standards for EDLCs, and has earmarked these and hybrid EDLCs, which combine a capacitor and a battery, as being in need of appropriate standardization. In addition to uses in the transport sector, supercapacitors are found in cordless power tools, computers and consumer electronics. They are also found in wind turbine blade pitch systems, particularly offshore where their long life and reliability is a key advantage.

However, some of the disadvantages of supercapacitors include a low energy density (ranging from around 1 Wh/kg to 30 Wh/kg), particularly when compared with Li-ion batteries (about five times more energy density); and chemical batteries in terms of discharge curve. Although falling rapidly, costs for supercapacitors are still relatively high due to the increased difficulty in creating advanced materials like graphene.

Nevertheless, supercapacitors are rapidly becoming a multi-billion dollar market.

**Piezoelectrics power onwards**

Although the first practical piezoelectric devices emerged little more than three decades ago they are becoming increasingly commonplace and can now be found in a diverse array of devices and applications. With new materials and designs constantly emerging, developments in piezoelectric technology focus on achieving better operational characteristics as well as on improving environmental performance.

Given their suitability as electromechanical transducers, these materials are used in numerous

sensor applications such as those found in the ultrasonic measurement of distance in air, materials-testing equipment, accelerometers, pressure sensors, and in medical equipment. These materials are also employed in spark generators, such as those used in an electronic ignition cigarette lighter.

**Developing needed International Standards**

Within IEC, most International Standards for piezoelectric technology, with the exception of those for piezoelectric transducers, which are prepared by IEC TC 29: Electroacoustics, and IEC TC 87: Ultrasonics, are developed by IEC TC 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

**Better for the environment**

One key area of piezoelectric materials development is focused on new applications and materials to improve sensitivity, durability and operational performance. Some of the new materials being considered for piezoelectric ceramics are lead-free ones, to address toxicity problems and potential challenges associated with final disposal.



This 50 kW HBr flow battery system provides up to 100 KWh of energy (Photo: EnStorage Inc)

# Towards Smarter Cities and Smarter Grids

IEC work advances urban environments and the best use of energy



*Smart cities will be better able to meet the increasing energy needs and environmental challenges in urban environments*

Janice Blondeau

**By 2050, it is projected that the world population will reach 9.6 billion<sup>1</sup>. Moreover if current trends continue, 67% of these people are predicted to be living in cities. Hand-in-hand with these projections comes the need for sustainable, reliable solutions for the transmission, distribution and use of energy resources. Smart Cities and Smart Grids, underpinned by the work of the IEC, offer robust responses to the myriad of challenges that regulators, utilities, local, regional and national governments face today and in the future.**

## Sometimes invisible but always a vital role

Smart cities will be better able to meet the increasing energy needs and environmental challenges in urban environments. They will also

offer improved quality of life for the millions of city-dwellers worldwide. Many services in cities and buildings are directly or indirectly dependent on electricity and electronics. The most obvious is the electric infrastructure that carries electricity to and within buildings, and to other utilities such as water, gas and telecommunications.

Transportation systems, medical facilities, shopping centres, schools and factories all depend upon electricity to function, and this list is almost endless. As electricity and electronics are the key enablers of cities' development, IEC has a specific role to play in the development of International Smart City Standards.

## At the International Standards level...

The myriad of IEC TCs (Technical Committees) that enable the development of Smart Cities include:

- IEC TC 8: Systems aspects for electrical energy supply, which prepares and coordinates, in co-operation with other IEC TCs, the development of International Standards that focus on overall system aspects of electricity supply systems.
- IEC TC 57: Power systems management and associated information exchange, covers communications between equipment and systems in the electric power industry – a central element in smart buildings, Smart Cities and Smart Grid projects.

## Smart buildings in Smart Cities

IEC International Standards cover a broad range of systems, equipment and applications that are used in the construction and maintenance of smart buildings. These include lighting, automation, access control, energy systems, appliances, elevators and escalators, among others. The work of IEC TCs also plays a vital role in helping to ensure safety and interoperability.

## The big picture

The SMB (Standardization Management Board) SEG 1 (Systems Evaluation Group) on Smart Cities is identifying the many electrotechnical systems that are found in cities, with a view to integrating and optimizing them. The Smart Cities Group is preparing a reference architecture and standardization roadmap in cooperation with different organizations, fora and consortia.

In parallel, the IEC MSB (Market Strategy Board) is preparing a high-level White Paper *Orchestrating infrastructure for sustainable Smart*



IEC International Standards cover a broad range of systems, equipment and applications that are used in the construction and maintenance of smart buildings

*Cities*. It outlines how cities can move towards smartness – the what, who and how of smart city development. The development of this White Paper was led by the IEC MSB project team on Smart Cities in cooperation with CEPS (Centre for European Policy Studies). The MSB brings together the CTOs of leading international companies.

### Smart Grids key to meeting future energy needs

In the future, many national and regional grids, even if they are seemingly geographically isolated, will need to be able to communicate with each other across borders and even continents. By using consensus-built IEC International Standards, users achieve built-in interoperability on a global scale.

## IEC systems approach to Smart Cities and Smart Grids

**Jack Sheldon, IEC Standardization Strategy Manager, explains why the organization is taking a systems view...**

*One of the topics that we have identified and are focusing on is a systems approach to standardization, which is in part stimulated by accelerating technological integration and the advent of these ever more complex systems. The systems approach is designed to facilitate handling this complexity and also to provide a neutral, independent platform on which different organizations can cooperate.*

*The complexity of the world we live in today and technology convergence means that we need a new approach to tackle these subjects. The systems approach that we have in the IEC is intended to be a response to the challenges of Smart Cities.*

*To me "Smart Cities" means making optimum use of the infrastructure and resources of our cities – using the smartness to better utilize capacity than we could otherwise.*

Next time you hear the terms Smart Cities and Smart Grids, you'll know that the IEC is not far away.

IEC Technical Committees active in Smart Grids include:

- SC (Subcommittee) 8A which develop International Standards for the grid integration of large-capacity RE (renewable energy) generation, which is set to play a central role in future energy supply and smart projects.
- TC 82 and TC 88 cover generation from photovoltaic and wind energy sources respectively, integral offerings in the overall portfolio of Smart Grid Standards.
- PC (Project Committee) 118: Smart Grid user interface, whose work covers information exchange for demand response and connecting demand side equipment and/or systems into the Smart Grid.
- TC 65: Industrial-process measurement, control and automation, and its SCs, as well as TCs involved in storage (rechargeable batteries) and fuel cell technologies (TC 21 and TC 105, respectively).

### The way ahead

For Smart Grid applications, the IEC published a Smart Grid Standardization Roadmap in 2010 and has defined a range of Standards, among them Standards for substation control (IEC 61850), energy (IEC 61970) and distribution management (IEC 61968) and meter reading (IEC 62056).

The CIM (Common Information Model) for Distribution and Energy Management (IEC 61970 family of Standards) provides a CIM necessary for exchanges of data between devices and networks, primarily in the transmission (IEC 61970) and distribution (IEC 61968) domains, and is a cornerstone of IEC Smart Grid standardization.

### A bird's eye view of Smart Grid Standards

The IEC has developed a free online system which can position a given



The IEC systems approach is intended to be a response to the challenges of Smart Cities

Standard in relation to its role within the Smart Grid, IEC Smart Grid Standards Map.

Developed in 2013 by IEC Standardization Management Board SG (Strategic Group) 3: Smart Grid, the IEC Smart Grid Standards Map provides fast and automatic identification of all the Standards that apply to a given domain of the Grid in

a matter of seconds. Using a diagram or a list view, users can drill down to a specific aspect, and then see a list of the Standards that relate to it.

SG 3: Smart Grid was transformed into SEG (Systems Evaluation Group) 2 Smart Grid, and in June 2014 SEG 2 became SyC (Systems Committee) Smart Energy.

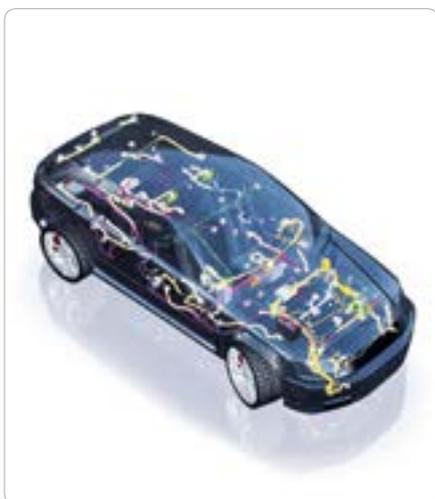
### IEC Systems Committee on Smart Energy

The first IEC Systems Committee, SyC Smart Energy, has recently been established, following approval by IEC National Committees. The scope of the SyC Smart Energy is to provide systems-level standardization, coordination and guidance across Smart Grid and Smart Energy, including interaction in the areas of heat and gas. It will widely consult to provide overall systems-level support and guidance to the TCs and other standards development groups, both inside and outside the IEC. SyC Smart Energy will liaise and cooperate closely with the SEG Smart Cities and future SEGs, as well as the future Systems Resource Group.

1 United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision, Highlights and Advance Tables. Working Paper No. ESA/P/WP.228.

# The sparks that make land transport flow

All modes of land transport depend on electrical and electronic systems



Well-designed EEA (electrical electronic architecture) plays a vital role in modern cars (Photo: Delphi Automotive PLC)

*Morand Fachot*

**Public and personal road transport, as well as railways, rely to an ever greater extent on electrical and electronic systems for better safety and energy efficiency. IEC International Standards are central to the expansion of the sector, allowing more and more people and larger volumes of goods to be transported over short and long distances in superior conditions.**

**Internal combustion engines rely increasingly on... electricity**

As electricity in cars, buses and lorries

is increasingly associated with electric vehicles, it is often overlooked that conventional motor vehicles powered by internal combustion engines rely more and more than ever on electrical and electronic systems. These once limited to essential functions, such as starter engines, and safety features like headlights, are taking over more and more roles and functions in motor vehicles.

To lure private customers away from the competition, manufacturers have gradually introduced a variety of devices often relying on electrical components to make driving easier



*This camera-based alertness assistant detects the blink of the eyelid and calculates the blink frequency and blink duration (Photo: Hella KGaA)*

and more comfortable. Initially these features, such as electric power steering and electromechanical transmission, electric windows, heated rear windscreens and air conditioning, were available on top of the range vehicles only or at extra cost; now many of these are standard equipment in most cars. More systems like light and rain sensors that automatically switch on lamps and wipers, cruise control allowing drivers to maintain a constant speed are being introduced all the time. They all contribute, along with a variety of other aids, to better driveability, increased comfort and reduced driver distraction.

Today electrical and electronic systems represent some 20-30% of the total cost for all categories of cars, and this share is expected to reach 40% or so by 2015. The figure is nearer 50% if all electrical systems are included. This growth is set to continue: a recent study by A.T. Kearney, a consulting firm, predicts that a car's embedded software and electronics will account for up to 65% of its total value by 2025.

### Safety first

Improving road safety has been another major factor in the growing electrical and electronic content of motor vehicles. Sensors play a crucial role – for example by setting off airbags and detecting critical situations so as to prevent a skid using ESC (electronic stabilisation control) or ABS (anti-lock braking system). Safety is likely to

improve further with the introduction of many other devices that mitigate the seriousness of accidents or even prevent collisions.

Systems that use information transmitted from roadside infrastructure systems and rely on electronics to control engines and brakes are also being developed.

Safety is further enhanced by better lighting emanating from LED lamps that are more luminous than conventional lamps.

### More fuel efficient and cleaner vehicles

A number of electronic systems now ensure cars and other vehicles powered by internal combustion engines are more fuel efficient and cleaner than ever whilst offering better performance.

Electronic fuel injection, has greatly improved the running of engines. It allows smoother driving, better operation throughout a wide range of temperatures and is more efficient, as less fuel is needed for the same power output. As a result exhaust emissions are cleaner, containing combustion by-products that are less toxic and relatively easy to eliminate using clean-up devices such as catalytic converters.

Other technologies help save fuel and cut emissions. They include Start/Stop in which double-layer capacitors shut down and restart engines automatically when vehicles wait at traffic lights or stop frequently, or braking recuperation that recycles the energy normally lost during braking by storing it and then using it for acceleration or re-starting.

### Personal, rapid, clean and safe

In addition to private road vehicles another mode of transport is emerging in urban areas. Small self-driving electric-powered vehicles running on dedicated guideways and designed for

on-demand use by individuals or small groups, typically 4 to 6 passengers, often referred to as PRTs (personal rapid transit systems), are being introduced around the world.

They are intended to combine the convenience and privacy of cars with the environmental benefits of mass transit. Their primary aims are to achieve optimum door to door mobility, improve safety, reduce environmental impact and lower operational costs.

They are part of the advance towards a new era of “smart mobility” in which infrastructure, methods of short distance transport, passengers and goods will be increasingly interconnected, especially in urban areas.

Examples of operational PRT systems can be found at Heathrow Airport near London and Masdar City near Abu Dhabi, UAE (United Arab Emirates).

### Towards autonomous vehicles

The wider significance of driverless PRT networks is that they are part of a long term trend in the car industry to develop autonomous vehicle control systems equipped with a combination of sensors and dedicated software for the personal mobility sector.

The US-based market research and consulting firm Navigant Research forecast in August 2013 that sales of autonomous vehicles would rise from fewer than 8 000 annually in 2020 to 95,4 million in 2035, representing 75% of all light duty vehicle sales by that time.

The first features of such autonomous vehicles “will most likely be self-parking, traffic jam assistance, and freeway cruising – well-defined situations that lend themselves to control by upgraded versions of today's on-board systems”, according to David Alexander, senior research analyst at Navigant Research.



Regional train (Bombardier)

**On the right track**

In urban areas, tramways, metropolitan “light railways”, and trolleybuses are a familiar sight. The first urban public transport systems powered by electricity

was introduced in Berlin in 1879 in the form of the first electric suburban railway (S-Bahn), followed by electric trams in 1881 and electric trolleybuses a year later. As the percentage of the world’s

population living in cities is forecast to hit 60% by 2030, according to United Nations data, the growing use of such electric urban transport systems offers an environmentally-friendly option to reduce local emission of pollutants significantly in the expanding cities of the future.

Besides urban areas, rail transport is essential to domestic and global trade, ferrying billions of people and millions of tonnes of goods of all kinds across countries and continents. It is still one of the most energy efficient, rapid and safe modes of transportation.

Whether powered by internal combustion engines or electricity, whether running on roads or tracks, all land transport systems depend on countless standardization work by dozens of IEC TCs (Technical Committees) and SCs (Subcommittees) to operate more efficiently, safely and rapidly.

# Over a century of electric medical devices

The continual evolution of healthcare technology

*Antoinette Price*

**The effects of electricity on the body were recorded as far back as ancient Greek and Roman times, when electric eels were used to treat joint pain, migraines and epilepsy. In the late 18<sup>th</sup> century,**



Low-dose CT cardiac scan carried out on a six-month-old girl (© St Louis Children’s Hospital Barnes-Jewish Hospital, US)

**experiments by Italian scientists Luigi Galvani and Alessandro Volta using a metallic probe caused muscle contractions in a dead frog’s legs and eventually led to the invention of the electric battery. German physicist Wilhelm Röntgen discovered the X-ray in the late 19<sup>th</sup> century, and since, countless EMDs (electric medical devices) have enabled significant advances in medicine.**

**Getting a clearer bigger picture**

New developments in medical imaging technology have made major contributions to medicine, allowing

doctors to get a much clearer internal picture of their patients, facilitating diagnosis, treatment and surgery. The five main groups comprise:

- X-ray imaging, using a form of electromagnetic radiation.
- CT using X-rays to produce images allowing three-dimensional views of internal organs.
- Ultrasound using high-frequency sound waves to create images, viewed on a screen, of organs, vessels and tissue.
- MRI (magnetic resonance imaging) which uses magnetic fields and radio waves to produce images of the body.
- Nuclear imaging also for imaging by sections, using a penetrating wave.

In conjunction with other TCs (Technical Committees) that work on standardization for these technologies, the SCs (Subcommittees) and WGs (Working Groups) of IEC TC 62: Electrical equipment in medical practice, has carried out the bulk of the medical equipment standardization work required to produce the IEC 60601 family of Standards.

### Seeing in 3D

Though still not fully exploited, 3D printing and printing electronics are being used for a wide range of applications. This technology can be life-changing, because it helps surgeons prepare for complex surgery. Some examples include the separation of twins joined at the head, the reconstruction of body parts after serious accidents, or in the case of rare diseases, life-saving surgery to replace body parts with a 3D-printed plastic version. Other innovative uses include customized dental parts, joint replacements and tailor-made hearing aids. IEC TC 119: Printed electronics,



MEG (Magnetoencephalograph) scanner

works on a number of International Standards, some of which are used for 3D printing.

### Good things come in small packages

The manipulation of matter at atomic and molecular levels or nanotechnology

is growing rapidly and has great potential in medical applications. One example is the development by engineers, of a custom-fitted implantable device with printed embedded sensors. The device fits on the heart like a glove and could eventually replace pacemakers. The International Standards for this particular application of nanotechnology are prepared by IEC TC 113.

### Surgical robotics

Medical robots have taken the operating theatre by storm and seem set to revolutionize healthcare, especially surgery. This technology makes MIS (minimally invasive surgery) or laparoscopic surgery possible for gall bladder and prostate removal, gastrointestinal and gynaecological surgery and urology. It also covers complex cardiothoracic, orthopaedic and general surgery and internal radiation therapy.



Surgeons operating using a da Vinci Si Surgical System (Photo: © 2011 Intuitive Surgical, Inc.)

# Ultrasonics in medical applications

All healthcare technology relies on electrotechnology

*Antoinette Price*

**Over the past century, the great progress made in healthcare for existing and new technology relies on electrotechnology. Following the discovery of X-ray imaging in the late 19<sup>th</sup> century, great advances have been made to ultrasonics diagnosis and treatment equipment. The evolution in medical imaging used to see and examine the interior of patients' bodies has made it clearer and safer. This in turn results in faster, more accurate diagnosis and subsequent treatment of illness and traumatic injuries.**



*Echocardiography used during a minimally invasive guided heart valve replacement (Photo: Philips)*

## Diagnosis

Research into the use of ultrasonics for medical diagnosis began after WWII. Ultrasonic scanning, or ultrasonography, uses high frequency sound waves to produce images on a screen, of internal organs, vessels and tissues. It is arguably the best of all ultrasonic medical applications, particularly for prenatal ultrasound scans or echographs.

Quicker, easier (and less costly) to use than CT (computerized tomography) scans and MRI (magnetic resonance imaging), ultrasonic scans are therefore frequently used to monitor and diagnose the condition of organs, such as the liver, kidneys or gallbladder. Echocardiograms, or ultrasonic scans of the heart, are also used to diagnose and follow up heart conditions.

## Silence is golden

Ultrasound technology is increasingly being used in surgery. USIs (ultrasonic surgical instruments) convert an

ultrasonic signal into a mechanical vibration using a transducer; a waveguide then amplifies and propagates the vibration. Highly useful in diverse medical procedures, USIs can cut bone and other tissue while simultaneously reducing bleeding by coagulating tissue. This generally reduces the average length of surgery and damage to tissue, resulting in fewer complications overall.

## Non-invasive therapeutic applications

Scientific advances mean that ultrasound energy can be used as non- or minimally-invasive HIFU (high-intensity focused ultrasound), or HITU (high-intensity therapeutic ultrasound). These methods can be used to remove body tissue in the treatment of cancers and other conditions, by applying ultrasound energy to heat and destroy diseased tissues.

This technology has greatly benefited other treatments, in particular ESWL

(extracorporeal shock wave lithotripsy). Ultrasound (or other) imaging systems locate and target kidney, gallbladder or liver stones, which are smashed into pieces by ultrasound pulses and evacuated naturally through urination. Introduced in the early 1980s, it quickly replaced surgery to become the most widespread treatment for stones.

Some other treatments now using HIFU/HITU include:

- Bone healing and physiotherapy for inflammation caused by rheumatism, tendinitis or joint injuries.
- Drug distribution to treat tumours, especially in the brain, where it may be difficult to achieve.
- Cosmetic applications, such as non-invasive liposuction and for a number of therapies to improve skin tone, scars and sun-based damage.

## Bright smiles

One public health application of ultrasonics is in dental care as

descalers to remove plaque before it hardens into tartar. Ultrasonic descalers have a tip that vibrates at high frequency to break down the bacterial matter to which plaque and calculus stick. This technology enables a smoother and less painful experience.

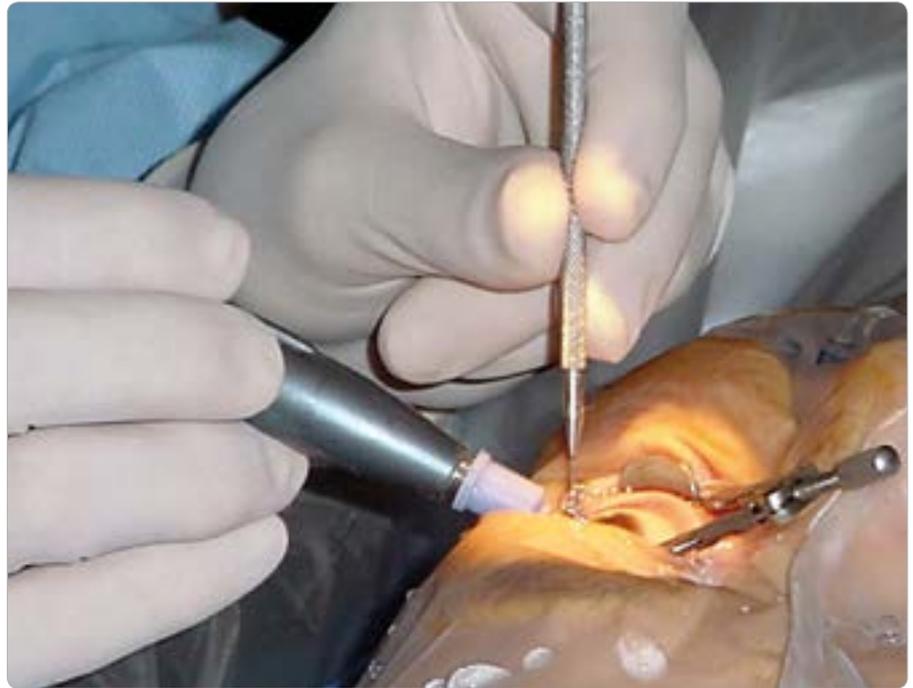
### Hygiene safety

All medical and dental equipment must be absolutely clean before use, particularly in case of contact with a patient's tissue (surgical instruments) or mucous membranes (endoscope), otherwise the introduction of pathogenic microbes can lead to infection. It is imperative to clean, disinfect and sterilize all multiple-use instruments and devices after use on a patient or surgery. Ultrasonic cleaning uses a special wash solution to reach and effectively remove organic waste from difficult-to-clean areas, such as equipment or devices with joints and crevices.

### Why International Standards for ultrasonics?

Medical diagnostic ultrasonic equipment is expanding rapidly, and surgical and therapeutic ultrasound applications are expected to continue growing significantly. This medical field ranges from diagnosis to surgical and non-invasive treatments and also comprises ultrasonic cleaners. As a recognized requirement for meeting regulations worldwide, the need to characterize the ultrasonic fields and establish a means for determining exposure levels to them is fulfilled by International Standards. Such Standards ensure that these ultrasonic equipment and systems meet all the requirements for safe use for patients and medical staff.

Created in 1985, IEC TC (Technical Committee) 87: Ultrasonics, prepares International Standards related to the characteristics,



*Phacoemulsification: operation using ultrasound instrument to emulsify the eye's internal lens*

methods of measurement, safety and specifications of fields, equipment and systems in the area of ultrasonics, covering medical equipment and industrial applications.

As of September 2014, TC 87 had published 45 International Standards, Technical Reports and Specifications, and continues to develop more, mostly for medical applications.



*Ultrasonic clean / rinse / dry system for medical facilities (Photo: Blue Wave Ultrasonics)*

# Trend-setting devices

## Staying connected

Antoinette Price

**We live in a “real time” world where soft- and hardware Internet technology enables us to access more products and services any time, any place. IEC work, including printed electronics, semiconductors and many other components, greatly helps the development and roll-out of these technologies.**

### Monitoring human activities...

Managing modern life and staying healthy is high on the agenda for many people. With a greater self-awareness, ways to monitor and measure human fitness and wellness levels at work, play and in between are becoming a part of the everyday preventative actions taken to stay fit and healthy. Hundreds of companies showcased their connected devices at the CES (Consumer electronics) show in Las Vegas, and set the stage for some of this year’s mega trends.

- Smart Sleep devices can help track sleeping habits and patterns.
- A UV measuring bracelet, created by the designer behind Louis Vuitton and Harry Winston jewellery brands, enables keeping the balance between a healthy dose of sun, and avoiding harmful rays.
- An innovative connected pill box ensures elderly patients and their caregivers that pills are taken on time. Once filled by the pharmacy or caregiver, sound alerts via SMS, email or voice notifications inform the patient when it’s time to take the pills and the relevant pill compartment lights up.
- A sensor cap connected to flexible printed technology could be a lifesaver, warning wearers when impacts to the head require medical attention.



Smart wristbands track activity, sleep and food consumption to help their wearers make healthier choices (Photo: Jawbone)

### ...and others too

But monitoring doesn’t focus on humans alone. A smart dog collar allows pet owners to take extra care of their four-legged friends, monitoring their activity and rest levels and sharing information with the vet when needed.

Positive progress, for any medical device, takes time because in addition to standardization of the device and data sharing protocols, potential privacy concerns need to be addressed.



Voyce has developed a smart collar for dogs (Photo: Voyce)

There will also be, especially for medical professionals, the challenge of extracting the useful, comparable information from the sea of data.

### Tremendous tiny technology

MEMS (micro-electromechanical systems) are indispensable parts of any piece of electronic equipment, from smart technology to wearable devices, cars, industrial applications and more. Approximately as thick as a human hair, these miniature systems (micro sensors and actuators) often outperform their macro-scale counterparts. Examples of how MEMS improve our life include:

- Processing motion to detect the orientation of any device, where it is heading and its absolute location in three-dimensional space
- Sharpening images in video projectors and television
- Improving storage in computers for disk drives and servers and sound in cell phones, musical devices and hearing aids
- Increasing safety in the automotive industry, as part of airbags
- Expanding medical uses, such as for releasing drug doses to patients or in blood pressure monitors
- Sensing danger by detecting gas leaks or saturation levels.

IEC work in standardization and conformity assessment is significant for the continued development of this technology.

IEC TC (Technical Committee) 47: Semiconductor devices and SC (Subcommittee) 47F: Micro-electromechanical systems, prepare many International Standards, allowing manufacturers to build more resistant, efficient and reliable sensors and MEMS.



This sensor cap by Reebok alerts its wearer when an impact reaches a level requiring medical attention (Photo: Reebok)

### Cordless chameleon

High-performance audio stereo systems never really went away, they just morphed with the times. They moved from classic stereo systems and LP record players, connected to

sizeable loud speakers in the 1970s and 80s to the more recent HD (high-definition) TV and mobile options, like car audio or portable music player systems.

The technology is packaged differently, in the form of home theatre systems and sound bars connected to TVs. Recently, digital or Wi-Fi radio and the internet have replaced the old-style stereo systems. Digital or satellite radio in some areas have replaced car cassette players as they also have for portable personal music player systems.

### Wireless boom

Early this year at the Las Vegas CES, a significant number of high-performance audio companies were represented, demonstrating new

opportunities to expand this sector, thanks to the gradual adoption of wireless connectivity. The wireless audio device sector is a fast-growing market, which reportedly could reach up to USD 13,75 billion between 2013-2018. It covers all areas, including defence and automotive. Popular items include wireless headphones, sound bar and small portable devices.

### High-quality through IEC standardization

IEC work makes high-performance audio and its availability possible with Standards that focus on equipment and the required software. IEC TC 100: Audio, video and multimedia standards and equipment, has greatly contributed to audio standardization through the IEC 60268 series on sound system equipment.

## Delivering portable healthcare

### Revolutionary wearables

Antoinette Price

**The scope of electronic wearables has broadened from the hearing aid, or heartbeat monitors, to items widely used in social, health, wellness and medical areas, such as smart glasses, smart watches, glucose monitoring and drug delivery devices. Because these**



Bluetooth-enabled glucose monitor and oximeter (Photo: iHealth)

**devices monitor crucial aspects of our health, it is imperative that they function accurately and safely.**

### The fast-growing smart trend

In 2014, the global market for wearable smart glasses, activity monitors and smart watches could total USD 3 billion. ABI Research estimates the market for wearables in the sports and health sectors will approximate 170 million devices by 2017. Their growing appeal is also being confirmed by companies like Google, Microsoft and Apple entering this exciting market.

### IEC contributions

Many parts of portable technology rely on IEC International Standards



The MIMO baby grow paired with the MIMO turtle monitors respiration, skin temperature, body position, and activity level (Photo: Rest Devices)

to operate reliably and safely. For example, IEC TC (Technical Committee) 100: Audio, video and multimedia systems and equipment, has standardized methods of measurement, as seen in IEC 62087,



Smart glasses are expected to have many applications in healthcare (Photo: Loic Le Meur)

Methods of measurement for the power consumption of audio, video and related equipment, and continues to track the needs of this emerging market.

### Powering wearable technologies

Advances in a number of areas, such as material sciences, chip evolution and battery power have helped these products go from military applications initially, to the mainstream consumer field. IEC TC 21: Secondary cells and batteries, continues to work towards batteries that meet the power needs of wearable technologies.

### New wearables for medical applications

These increasingly popular wearable technologies could significantly change healthcare, as consumer electronics morph into health monitors. Some examples include:

- A wearable, mobile-enabled ambulatory blood pressure monitor,

which connects to a user's mobile device via Bluetooth or a PC through a USB cable.

- A lightweight, wearable mobile-enabled wireless ambulatory electrocardiogram designed for 24-hour continuous monitoring.
- A new mobile-enabled wearable pulse oximeter designed for continuous monitoring up to 12 hours.

These allow users at home to share information with medical professionals and caregivers in other locations.

### Helping to break down barriers

Demographics are changing significantly, with an increasingly ageing population. The needs of people with various disabilities must be met.

TC 100 established a project on AAL (Ambient Assisted Living) for AV and multimedia systems and equipment. A survey was conducted to collect

AAL use cases to evaluate the existing accessibility barriers and develop proposals for new technologies to overcome these.

In February this year, a SEG (Systems Evaluation Group) on AAL was created.

### Connecting the technology across industries

A number of IEC technical committees are considering the convergence of digital technology from diverse industries, which demands interoperability in the consumer and the professional marketplace. IEC TC 110: Electronic display devices, is working on standards that are required for all aspects of flat panel display devices, especially concerning harmonization efforts, while TC 100 and some of its Technical Areas like TA 14, standardizes specifications for audio, video and multimedia systems and equipment.

Other major growth areas for wearables could be in gaming and entertainment and the fashion industry.

### Looking ahead

In a rapidly evolving personal mobile wearables market that demands high reliability, small sensors, micro-electromechanical devices and highly integrated semiconductor devices, the demand for new International Standards will grow and need to be addressed. Environmentally sound practices must continue to be incorporated.

IEC TC 47: Semiconductor devices and SC (Sub-Committee) 47E: Discrete semiconductor devices are best positioned to play an important and proactive role in this field. Also with a view to future convergence of these technologies, TC 47 is developing liaisons with other related IEC TCs and ISO, such as ISO/IEC JTC 1/SC 6: Telecommunications and information exchange between systems.

# Sensing with optical fibres

Fibre optic sensors make industry safer and offer advanced sensing possibilities



Baumer O500 Optical sensor used for object identification and positioning in the packaging industry (Photo: Baumer Group)

Werner Daum\* (BAM), Convenor of IEC SC 86C/WG 2

**Starting from the first patent of a fibre optic sensor in 1967, fibre optic sensing has become a success story throughout the world. Today, fibre optic point sensors and continuous distributed fibre optics sensor systems allow the measurement of nearly all physical quantities and contribute to higher safety levels in many industrial sectors. Monitoring of pipelines, power cables, lightweight and civil engineering structures, and of ground movements are heading the hit list of applications. Standardization in this field is of paramount relevance and brings to light some of the challenges now faced by IEC SC (Subcommittee) 86C/WG (Working Group) 2: Fibre optic sensors.**

## Half a century of fibre optic sensors

It is now over 50 years since the idea came up that an optical fibre could be a useful technology for sensing and measurement, leading to the first patent in this sector. From that time on, optical fibre sensing has enjoyed much success.

Today, FOS (Fibre Optic Sensor) systems are high-tech products using non-linear optical effects as well as the latest fibre optic technology equipment (e.g. optical time domain reflectometry with sub-millimetre resolution). FOS are available for mostly physical quantities (e.g. strain, temperature, pressure, electrical current) and a wide range of chemical parameters (e.g. pH value, O<sub>2</sub> concentration in blood). They are based on standardized optical fibres used for communication purposes

(single-mode and multimode fibres) or on specially designed fibres like micro-structured fibres.

## Inherently safe and reliable

FOSs are immune to electromagnetic interference and do not conduct electricity, so they can be used in places where there is high voltage or flammable materials such as gases or fuels. FOS can be designed to withstand ultra-high temperatures (1 000 °C) and corrosive atmospheres as well.

There are numerous realizations of FOS, but all fit into two categories: extrinsic and intrinsic.

An *extrinsic* FOS simply guides the light to a sensing point where the optical signal emerges into another medium within which it is modulated. The light is then collected by the same or a different fibre after it has been modulated by the quantity to be measured and returned to a remote location for processing.

In contrast, *intrinsic* FOSs keep the light within the fibre at all times so that the external quantity to be measured modulates the light as it propagates along the fibre.

Modulation principles like intensity, phase, polarization, or wavelength modulation are of common use. Also the transit time of light in the fibre can be a measure for the quantity.

Due to the possibility of influencing the light transmission properties of an optical fibre locally through an external parameter, a measurement of this parameter can be realized as a function of position along the fibre. This so-called *distributed measurement* has



Fibre optic EFPI (extrinsic Fabry-Perot interferometer) scanner (Photo: BAM)

emerged as an extremely important and unique advantage of fibre sensor technology. A distributed measurement of a quantity like temperature over distances up to several tens of kilometres is unique to fibre optics. Also, effective gauge lengths in the order of one meter can be achieved, and there are some which go to even shorter discrimination lengths. This unique capability opened up a novel range of application possibilities like power cable or pipeline monitoring.

FOS technology is experiencing impressive growth. Market analysts estimate that the global consumption value of fibre optic point sensors and continuous distributed fibre optics sensor systems will reach USD 4 billion in 2017. Driving sectors are the oil and gas industry, power generation and distribution, and civil engineering. Upcoming sectors are the aerospace industry and all sectors with lightweight constructions that need integrated structural health monitoring (e.g. strain monitoring of rotor blades of wind turbines).

**Safety and accuracy drive FOS energy applications**

The oil and gas industry is using pipelines for the transport of gases (e.g. natural gas, ammonia, and CO<sub>2</sub>) or liquids (e.g. crude oil, petrol and brine). Modern pipeline management uses distributed temperature FOS to ensure integrity, immediate leakage detection and risk mitigation. The entire downstream process and system integrity can be monitored. Temperature profiling makes it possible to detect anomalies during pipeline operation. Over long distances in remote areas, distributed fibre optic strain measurement is used to detect, for example, ground movements, landslides, or seasonal soil texture changes, which can cause a local loading of the pipeline above the designed value or a break.

Temperature monitoring in power transmission systems is an integral part of increased power flow. It is estimated that there are 30 000 transmission transformers in North America and 100 000 worldwide, all of

which could run more efficiently given proper thermal management. FOS here have the additional advantage of being built into distributed sensing systems of small physical volume to be integrated directly into the transformer. Partial discharge detection by FOS is an up and coming technology in this sector.

Power generation by offshore wind turbine farms is very common. The generated power is transmitted by underwater power cables to onshore distribution locations. The temperature of such power cables provides, at minimum, condition monitoring information. Temperature monitoring shows how cables are responding to load and allows the load to be managed according to the actual temperature of the cables.

Export and interconnector cables in shallow water may experience dramatic strains affecting their temperature under the same load. A cable may be surrounded by cool water one day and covered with meters of mud the next, or buried and then exposed, which will give a dramatically different operating environment. Damage from fishing and shipping activities may result in damaged insulation and an unusual temperature event. By monitoring the entire cable length, changes in the cable's environment and condition can be detected and acted upon.

**Dam if you don't install FOS!**

Early warning before ground or dam movements can save lives and avoid important material or property damages by preventing geotechnical hazards. The appropriate geotechnical monitoring by distributed fibre optic strain or deformation sensors in landslide-sensitive areas or in dams can detect soil movement before catastrophic failures happen. Such failures are always preceded by slow and small ground movement which



FOS are used for structural health monitoring of civil engineering structures, such as bridges or dams

can be detected prior to the complete failure of the slope or dam, and which could allow adequate measures to be taken in order to protect the area.

The use of FOS in *structural health monitoring* of civil engineering structures (e.g. bridges, tunnels, towers and buildings) allows the detection of local deterioration, damage, destruction, and partial collapse, but also highly localized strain contributions along sensors associated to the development of cracks in structures. For example, crack detection is performed within a spatial resolution in the order of 0,5 m, and cracks in the sub-millimetre range can be efficiently detected.

### Standards support introduction of innovative products

A shortage of International Standards is hindering a breakthrough of this

innovative sensor technology and obstructing the comprehensive use of FOS. Technical authorities all over the world are hesitant to approve such sensors on a routine basis for safety relevant applications due to the lack of standards.

Motivated by demands from several industrial sectors, IEC SC 86C: Fibre optic systems and active devices, re-established in 2010 its WG 2: Fibre optic sensors, which is now preparing and maintaining International Standards and specifications for FOS. These Standards cover performance and interface characteristics, as well as terminology, test methods, reliability and environmental attributes. At present SC 86C/WG 2 brings together some 50 experts from 16 countries. Representatives from all major economic areas of the world, manufacturers, users from different application fields, and research

institution guarantee high quality and impartiality of the developed standards.

### Industry to benefit from new Standards

Industry and equipment manufacturers take advantage of these Standards by using them as guides for specifying the measurement performance and reliability of their products in a uniform, recognized way. In addition, standards help applicants to select, install and operate FOS based on harmonized procedures. Furthermore, Standards create confidence in this technology and its reliability, and supports applicants to get approval of relevant authorities with respect to the use of FOS in new fields or safety-relevant fields of application. Moreover, standards help reduce expenditures by avoiding costly single-system validations.

To accommodate the complexity of technology and the wide variety of applications, a hierarchical structured series of Standards was created. IEC 61757-1, *Fibre optic sensors: Generic specifications*, builds the foundation of this series. Two other Standards under development, IEC 61757-2-1, *Fibre optic sensors: Strain measurement – Strain sensors based on fibre Bragg gratings*, and IEC 61757-3-1, *Fibre optic sensors: Temperature measurement – Distributed sensing*, which address sectional and family specifications together with product and details specifications, will complete this hierarchical structure.

Although the different applications and operating principles of various FOS represent a real challenge for proper standardization, IEC SC 86C/WG 2 is proving it can provide valid Standards to the FOS market, thus promoting its consistent development.

\*Dr Werner Daum is Head of division sensors, measurement and testing methods and Head of the Department of non-destructive testing at BAM, the German Federal Institute for Materials Research and Testing. Dr Daum received the IEC 1906 Award in 2012.

# IEC Standards drive hi-tech advances

A handful of disruptive technologies supported by IEC standardization have emerged in recent years

*Morand Fachot*

**A number of new key technologies have entered the manufacturing world after years at the R&D stage. Among these, fibre optics, printed electronics and nanotechnologies are having a major and growing impact in many sectors. Three IEC TCs (Technical Committees) develop International Standards for these technologies, which often have overlapping domains of applications.**

## Fibre optics: moving beyond telecom

The principle of transmitting light through glass by total internal reflection has been known for a long time. Glass rods (straight or bent) were used for internal illumination in medical examination as early as the 1880s.

The first development of optical fibres for another purpose, communication, started in earnest in the 1960s with research into new types of glass resulting in the invention of the first commercially viable low-loss (i.e. one that absorbs very little light) hair-thin optical fibre by Corning Incorporated in 1970. This highly transparent fibre was capable of carrying 65 000 times more information (voice, data and video) than copper wire.

The parallel development of semiconductor lasers capable of converting an electrical signal into light and transmitting that light through fibre optic cables over long distances, and of optical receivers converting light into electricity at the receiving end, made possible the transmission of information through optic fibre cables. Today

these form the backbone of the telecommunication and broadcast industries, allowing the transmission of vast volumes of content across the world right through to what is known as the “last mile” – that is, to nodes, buildings or homes.

Fibre optic systems can also be found in many other sectors such as IT and multimedia (for storage, printed boards and connections), medicine (for viewing and working inside the body with endoscopes and lasers), or for test and measurement purpose (where optic fibres are used to transmit light between devices or back to the sending device in loop tests).

Another fibre optics application that is gaining ground is the use of FOS (fibre optic sensors) to measure physical quantities and contribute to higher safety levels in many industrial sectors. Applications include the monitoring of pipelines, power transmission systems, structural monitoring of dams and civil engineering structures for early detection of local deterioration or structural damage.

IEC TC 86: Fibre optics, established in 1984, its three SCs (Subcommittees) and their WGs (Working Groups) are central to the development of the entire sector and all related industries as they prepare Standards, specifications and technical reports for fibre optic-based systems, subsystems, modules, devices and components.

As of October 2014 TC 86 had some 300 experts and had issued some 440 publications.



*Fibre optic cables conveying high-speed test data across optical PCB connectors and an electro-optical midplane (Photo SPIE)*

**Ever so small**

Nanotechnology, the manipulation of matter at the atomic scale, is seen as another key technology with the potential to change industrial sectors, economies and lives in the future in much the same way as the information technology revolution has done over the past two-three decades. It has been described as the resource for the next industrial revolution.

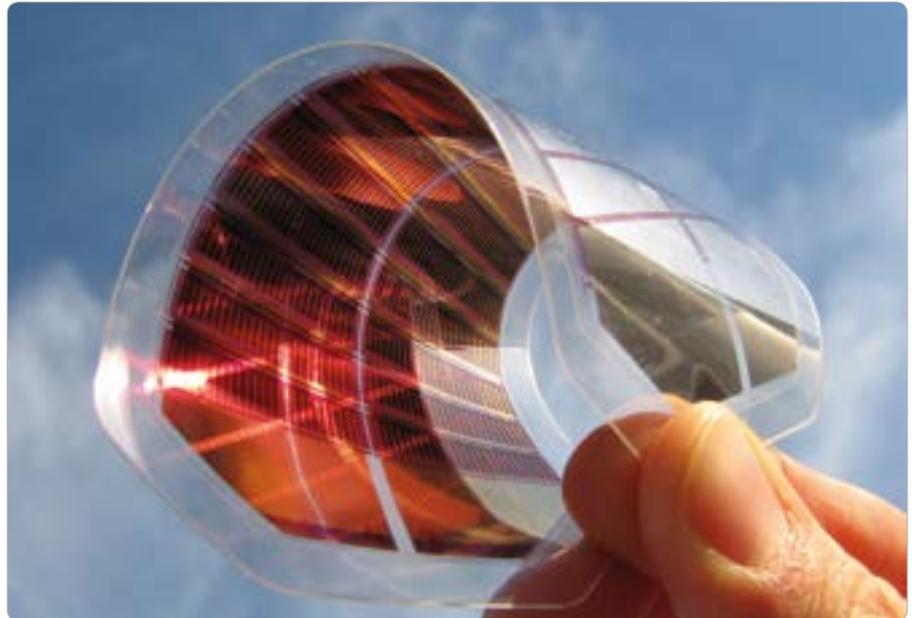
Companies and governments are investing heavily in nanotechnology and some commercial products are beginning to appear on the market. Despite this, many major applications for nanotechnology are still some 5-10 years away.

Some governments invest to ensure support for nanotechnology R&D in its early stages.

This is the case in the US where the President’s 2015 Budget provides over USD 1,5 billion for the NNI (National Nanotechnology Initiative), bringing the cumulative investment in this government initiative to nearly USD 21 billion since its inception in 2001. Recent investments in the NNI are aimed at “accelerating the transition from basic R&D to innovations that support national priorities, while maintaining a strong base of foundational research, to provide a pipeline for future nanotechnology-based innovations”.

Large investments in nanotechnologies can also be observed elsewhere in the world, according to a joint NNI/OECD (Organisation for Economic Co-operation and Development) symposium report.

The nanotechnology sector covers a wide range of domains, many linked to electrotechnology. Among these are initiatives that aim to help overcome current performance barriers and substantially improve the collection, conversion and storage of solar energy.



*Flexible printed electronics*

The IEC commissioned a study on “Nanotechnology in the sectors of solar energy and energy storage” from the Fraunhofer Institute for Systems and Innovation Research ISI. The study found that there is a whole range of nanomaterials which will improve generation from solar sources and storage of renewable energies.

IEC TC 113: Nanotechnology standardization for electrical and electronic products and systems, created in 2006, has, as of October 2014, some 150 experts working in its two WGs and numerous project and maintenance teams, develops International Standards for the technologies relevant to electrical and electronic products and systems in the field of nanotechnology.

The TC is developing and has already published International Standards for the use of nanomaterials such as carbon nanotubes or graphene, as well as for nano-enabled electrotechnical products.

**Printing circuits and other components**

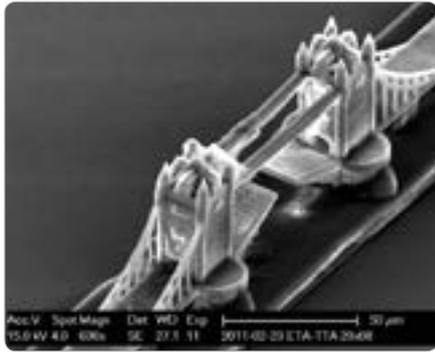
Printed technologies have also been expanding rapidly in recent

years following the rising demand for relatively low-cost and small consumer electronic goods. Producing conventional electronics using silicon-based components is costly and presents some environmental issues, making it necessary to find other technologies.

Using additive manufacturing processes, some producers have started printing electronic parts and components on rigid or flexible substrates.

Printing techniques are often similar to those used in conventional printing, such as offset, screen printing, flexography or inkjet. Each of these techniques for printed electronics production has been developed over preceding decades using a wide choice of substrates and inks and resulting in the availability of an extensive and expanding range of products. They include printed circuit boards, flexible displays, PV (photovoltaic) cells, lights, memory, sensors, RFID (radio frequency identification) and NFC (near field communication) systems, to name but a few.

The demand for new kinds of electronic goods and the variety of low-cost



3D-printed nano-object

products made possible by printing electronics and use of a range of printing techniques and materials point to the emergence of a very large market.

The research and consulting company IDTechEx expects the market to grow nearly 10-fold between 2013 and 2020 to exceed USD 55 billion.

Over 3 000 companies are currently active in the printed electronics

domain, most of them in North America, East Asia and Europe.

Since the focus has been shifting in recent years from developing printed electronics technologies to manufacturing products, a need for standardization has emerged.

TC 119: Printed electronics, was established in October 2011 to meet this need. It currently has 13 Participating and 8 Observer countries. Its five WGs develop International Standards for terminology, materials, processes, equipment, products and health/safety/environment in the field of printed electronics.

#### Commonalities

An interesting feature of these advances technologies is a frequent overlapping of many of their domains of application and even of the

technologies and processes they use. This is reflected in the web of their relationships and sometimes derives from their origin.

TC 86 and its SC 86B: Fibre optic interconnecting devices and passive components, have a liaison with TC 113. Also some techniques used in printed electronics can be applied in the production of fibre optic systems and components.

TC 119 has its origins in TC 113 AG (Advisory Group) 6: Printed electronics.

All of these innovative and advanced technologies, which depend to a great extent on IEC International Standards, will become more and more important in future manufacturing, making it possible to create new products and increase energy supply and storage from renewable sources, among many other benefits.

## Sea, sun and earth

### Standardization and certification for renewable sources

Morand Fachot

**As energy demand keeps rising countries seek to cut their reliance on fossil fuels for economic and**



Atlantis AK 1000 tidal turbine waiting to be lowered onto the seabed (Photo: Atlantis Resources Ltd)

**environmental reasons. REs (renewable energies) are set to play a role in this shift. Along traditional RE sources, such as hydropower, wind energy and PV (photovoltaic) energy conversion, marine energy and solar thermal are now playing a growing role in energy generation, whilst long-established geothermal energy is also expanding. All rely on IEC standardization work.**

#### Exploiting the oceans' power

Marine energy potential is huge, but harnessing it presents particular challenges, which explains why investment in this sector has been

relatively modest so far compared to efforts in other renewables. As oceans represent a huge source of power that can be partly converted into electrical power, the drive to develop existing or new technologies led to the creation of IEC TC (Technical Committee) 114 in 2007.

Its title: Marine energy – Wave, tidal and other water current converters, gives a clear indication of its scope. TC 114 is also open to “other conversion methods, systems and products” and as such exploring the potential of exploiting river currents.

The TC's remit is to prepare International Standards that allow technologies

to evolve beyond the early stage of development, where they have remained for some 30 years, to reach full commercial deployment.

To achieve this objective, TC 114 has adopted a structure that brings together, as of October 2014, nearly 120 experts from 14 Participating countries and 10 Observer countries into 10 PTs (Project Teams) and 3 AHG (ad hoc Groups).

The TC prepares International Standards that aim to address essential aspects of marine energy conversion, that include, among others: design requirements, performance measurement of wave, tidal and water current energy converters, resource assessment requirements, design and survivability, safety requirements, power quality, manufacturing and factory testing, evaluation and mitigation of environmental impacts.

OES (Ocean Energy Systems) forecasts that “by 2050 ocean energy will have grown to 337 GW of installed wave and tidal energy capacity”, from well under 1 GW today. This expansion will be made possible in no small part by the pioneering standardization work carried out by TC 114.

### Tapping the sun’s energy

CSP (Concentrating solar thermal power) has long been viewed favourably by the wholesale energy sector. It comprises a range of technologies that are used to collect and concentrate sunlight, turning it into medium to high temperature heat. This heat may then be used to generate electricity in a conventional way using a steam turbine or a Stirling engine, or used in other applications, for example supplying process heat.

With the exception of dish-Stirling systems in CSP power plants, the solar energy is typically absorbed by a heat transfer fluid, such as oil or molten salts, which is then passed through



Ivanpah solar electric generating station – a tower receiving system (Photo: NREL)

a heat exchanger and its associated steam circuit. To prepare International Standards for CSP, the IEC created IEC TC 117: Solar thermal electric plants, in 2011.

One of the most significant advantages CSP has over other solar energy technologies is its ability to partially decouple plant output from solar insolation using energy storage. Unlike electrical energy, thermal energy is relatively easy to store. Associated with thermal storage solutions, new CSP projects can provide electricity 24 hours a day, seven days a week. CSP is in the relatively early stages of global development and International Standards help provide a foundation upon which to develop new technologies and enhance existing practices.

Elisa Prieto, director of strategy of Abengoa Solar and an Expert with TC 117, stresses the advantages of developing a comprehensive system of International Standards for CSP, saying: “In a very global world, where tenders are international, those people who are organizing tenders – they’re usually governments – need to be sure that the requirements they are asking for are met and the only way they can do that is through Standards”.

### Heat from deep inside the earth

Geothermal energy, heat from the Earth, is an abundant form of renewable energy that has been used in different civilizations and regions since ancient times to heat buildings and water. Its exploitation in small and large scale applications that include power generation is expanding rapidly throughout the world, proving particularly attractive for countries without easy or affordable access to other forms of energy.

A number of IEC TCs prepare International Standards for components or systems central to its development. Indirect use of geothermal energy for heating and cooling of buildings is widespread. It doesn’t necessarily require hot sources but often relies on constant temperatures found close to the surface, where heat from the ground is absorbed by fluids circulating in underground pipes and extracted using heat pumps during the cold season. The process can be reversed in the summer to transfer heat back into the ground, using it as a heat sink, to help with cooling.

International Standards for heat pumps are prepared by IEC SC (Subcommittee) 61D: Appliances for air-conditioning for household and similar purposes. The



Bjarnarflag geothermal power plant, Iceland (Photo: Landsvirkjun)

application of geothermal energy in power generation is relatively recent. It is now expanding rapidly throughout the world.

To produce electricity from geothermal resources, wells are drilled into geothermal reservoirs to bring steam or hot water to the surface, where the heat is converted into electricity at a geothermal power plant using steam turbines. Steam turbines, which use heat to drive generators, were first

introduced in the 1890s. Most of the electricity produced in the world today is generated by them. The development of power generation from of CSP and geothermal sources would not have been possible without steam turbines.

Steam turbine technology is mature and International Standards prepared by IEC TC 5: Steam turbines, have contributed to the expansion of the sector. These Standards concern specifications, as well as acceptance

tests related to the accuracy of various types and sizes of turbines and of speed control systems.

### IEC standardization work and certification system central to RE expansion

Expanding electricity generation from ocean, solar or geothermal sources to meet current and future energy needs, depends to a great extent on standardization work from a number of long-established and newly-created IEC TCs and SCs.

The IEC recently introduced IECRE (IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications). As commonalities can be found in the technologies used for generating energy from the sun, the wind or the oceans, IECRE currently covers solar PV energy, wind and marine energy with the possibility of including other technologies such as CSP, fuel cells and geothermal energy in the future. IECRE was created because renewable energies require an approach that covers the entire lifecycle of equipment in RE sectors.

# Energy storage helps power world ahead

Balancing power generation and demand requires the right storage solutions

Morand Fachot

**To balance increasing levels of intermittent RE generation from wind and solar systems, EES (Electrical Energy Storage) solutions are needed that use and store energy efficiently and help improve grid stability and flexibility. The IEC MSB (Market Strategy Board) has published two White Papers, the first on EES, the second analysing the role of large-capacity EES systems that integrate large-capacity RE sources.**

### Multiple systems

EES solutions are the key to addressing the energy challenge, that's why the IEC decided in 2012 to create TC 120: EES (Electrical Energy Storage) Systems, to accelerate the integration of RE and to enable a more reliable and efficient supply of electrical energy. This TC oversees the development of International Standards that address all different types of EES technologies taking a systems-based approach rather than focusing on individual energy storage devices.

EES systems are usually classified according to the form of energy they use, i.e. mechanical, electrochemical/



Reversible pump turbine in the Goldisthal pumped-storage station (Photo: Hydroprojekt Ingenieur GmbH)



Beacon Power 20 MW flywheel frequency regulation plant (Photo: US DOE)

chemical, electrical and thermal. A number of IEC TCs are involved in standardization work for several of these.

**Mechanical energy storage**

EES is not recent; some storage solutions have been around for well over a century.

Pumped-storage hydropower, first introduced in the 1890s, stores energy generated at low-demand periods, when its price is lower, by pumping water into a reservoir that is located on higher ground. It can then be released at peak time to produce electricity. This technology currently represents the largest and most flexible EES solution, accounting for more than 99% of installed storage capacity for electrical energy. IEC TC 4: Hydraulic turbines, created in 1913, prepares International Standards for hydraulic rotating machinery and associated equipment associated with hydro-power development, including pumped storage, for which reversible pump turbines have been in use since the 1930s.

Compressed air energy systems predate electricity and were initially installed in the late 19th century to deliver [compressed air] power to factories and homes. CAES (compressed air energy storage) was

first used for utility-scale electricity storage in the late 1970s. Its use is similar to that of pumped storage. Air is compressed and stored in an underground reservoir during periods of excess power. It is then released, heated and expanded in an expansion turbine driving a generator to produce electricity at peak time. IEC TCs involved in standardization work for components and systems used in CAES, include, among others: TC 2: Rotating machinery, for motor and generators, TC 5: Steam turbines, and TC 61: Safety of household and similar electrical appliances, for pumps and motor-compressors.

Flywheels are another type of mechanical EES system. They were used in mechanical systems long before electricity was introduced. Flywheels store electrical energy in the form of kinetic energy in a low-friction spinning mass that is driven by a motor. When electricity is needed, the spinning mass drives a generator to produce electricity. TC 2 prepares International Standards for motor and generators.

**Chemistry to the rescue**

Electrochemical storage, which uses secondary (rechargeable) batteries, is a well-established and mature technology. Various types of chemistry

are used in batteries. Lead acid is the most widely used and has been commercially deployed since the 1890s. Nickel-based NiCad (nickel cadmium) and NiMH (nickel metal hydride), as well as Li-ion (lithium ion) and NaS (sodium sulphur) batteries are the main other types used for storage from RE sources. New chemistries and production methods have greatly improved the efficiency of secondary batteries. IEC TC 21: Secondary cells and batteries, prepares International Standards for all secondary cells and batteries, including flow batteries, another fairly recent electrochemical storage system, which can be recharged almost instantaneously by replacing the electrolyte liquid.

Beside electrochemical solutions, chemical storage, in the form of hydrogen or SNG (synthetic natural gas) produced from excess electricity, is another form of storage. Both hydrogen and SNG can subsequently be used to produce electricity at peak time or for other applications such as transport.

**IEC standardization will be central to future EES needs**

EES systems will become essential technologies in achieving RE integration and Smart Grid expansion as well as achieving a more efficient and reliable electricity supply. IEC International Standards will be central to realizing these goals.



8 MW Li-ion battery grid storage system in New York State (Photo: AES Corporation)

# Standards matters in road/rail transport

Safer road and rail transport with IEC Standards

*Morand Fachot*

**Road and rail transports are enjoying a major expansion throughout the world, they are central to the global economy. They depend on electrical and electronic systems which rely on standardization work from many IEC TCs (Technical Committees) and SCs (Subcommittees).**

## Multitude of regulations for road vehicles around the world

Road vehicle standardization relies on a number of international, regional and national regulations and directives.

The main requirement is that cars should comply with the UNECE (UN Economic Commission for Europe) rules as defined by its WP (Working party) 29: World Forum for Harmonization of Vehicle Regulations. Most countries — with the notable exception of the US and Canada, which have their own directives — recognize the UNECE Regulations and apply them in their own national requirements. They must also comply, when relevant, with national and regional rules and regulations. Many of those apply to equipment that depends on electrical and electronic systems.

In March 2011, IEC and ISO signed an agreement concerning the standardization of electrotechnology for road vehicles and cooperation between ISO/TC 22 “Road vehicles” and IEC Technical Committees

## International Standards and certification central to road vehicles

All road vehicles, even those powered by internal combustion engines, rely increasingly on electrical and electronic



Driverless pod in service at Heathrow Airport (Photo: Ultra Global)

systems. More than three dozen IEC TCs and SCs cover the standardization of equipment used in and related to road vehicles as well as of other associated issues. They include:

- TC 20: Electric cables
- TC 21: Secondary cells and batteries, which prepares International Standards for all secondary cells and batteries. This covers the performance, dimensions, safety installation principles and labelling of batteries used in personal and public electric vehicles.
- TC 121: Switchgear and controlgear and their assemblies for low voltage, and its SCs

Other TCs and SCs concerned include:

- SC 22G: Adjustable speed electric drive systems incorporating semiconductor power converters
- SC 23E: Circuit breakers and similar equipment for household use
- SC 23G: Appliance couplers
- SC 23H: Plugs, Socket-outlets and Couplers for industrial and similar applications, and for Electric Vehicles

- SC 32B: Low voltage fuses
- SC 32C: miniature fuses,
- TC 34: Lamps and related equipment
- SC 37A: Low-voltage surge protecting devices (surge protection of electronic devices will be a very important consideration for plug-in EVs) and
- SC 47A: Integrated circuits.

Naturally IEC TC 69: Electric road vehicles and electric industrial trucks, plays a crucial role in the development of future automotive products and its importance and workload are set to grow in coming years.

IECEE, the IEC System for Conformity Testing to Standards for Safety of Electrical Equipment, has a scheme covering certain International Standards developed for the EV industry. These Standards cover plugs, socket-outlets, vehicle connectors and vehicle inlets for conductive charging of EVs, conductive charging systems for EVs and secondary lithium-ion cells.



*This car overhead control centre integrates complex electronics for multiple functions into a limited space (Photo: Hella KGaA)*

Manufacturers producing electrotechnology components and systems for the automotive industry also rely on IECQ (IEC Quality Assessment System For Electronic Components), the worldwide approval and certification system covering the supply of electronic components and associated materials and assemblies, and in particular on its IECQ AQP (Automotive Qualification Programme).

IECQ AQP gives the automotive industry a standardized way of testing the components to ensure their reliability and the assurance that the electronic parts used in their products are of the required quality and reliability, and are not counterfeit. This way, automotive manufacturers know how the performance of components compare.

**On the right track**

Rail transport is a well-established and pivotal mode of transportation both for passengers and freight and is a key component of the global economy. It has enabled many remote areas to be developed and, far from sliding into obsolescence, it is enjoying major expansion throughout the world.

The IEC took the decision to start work on standardization for metropolitan

and railway transport networks in April 1924 with the decision to create the Advisory Committee on Electric traction equipment, which subsequently became IEC TC 9: Electrical equipment and systems for railways.

Standardization work by TC 9 now extends well beyond “tramway and railway motors”. It also includes “rolling stock, fixed installations, management systems (including communication, signalling and processing systems) for railway operation, their interfaces and their ecological environment”.

In June 2014, the IEC and the UIC (International Union of Railways) signed a global cooperation agreement to develop standards that will increase the safety, efficiency and cost-effectiveness of rail systems and benefit the whole railway sector.

As of October 2014, TC 9 had issued 102 publications covering all the above-mentioned areas, and was working on dozens more.

**Safety top priority in automated public transport**

As automation is increasingly entering public transport networks, a top priority is to ensure provision of the highest levels of safety while not restricting the introduction of new technology. Such

networks depend heavily on computer-based management, control and communication systems.

The IEC TCs whose activities cover automated public transport systems and personal transport pods include, beside TC 9, TC 21: Secondary cells and batteries, TC 47: Semiconductor devices, and its SCs, which prepare International Standards for semiconductor devices used in sensors and MEMS (micro-electromechanical systems) installed in personal and public transport systems.

TC 9 is responsible for International Standards relating to the systems, power components and electronic hardware and software used in fully automatic transport systems operating in the wider context of urban rail and metro transport. This includes safety aspects such as passenger alarm systems and automatic system surveillance. TC 9 works in liaison with other relevant IEC TCs, for example, coordinating with TC 69 on the development of double-layer capacitors for energy storage.

The global expansion of road and rail transport over decades would be unthinkable without the groundbreaking standardization work done by all the IEC TCs and SCs involved in a broad range of sectors.



*The introduction of hybrid and other EVs has boosted the electrical/electronic content in cars (Photo: Volkswagen AG)*

# Getting the right picture

Advances in medical imaging make for better diagnosis and treatment

*Morand Fachot*

**A central aspect of modern medical treatment is the ability to see inside the body and identify lesions or illnesses in a non-invasive manner. International Standards for many of the systems and technologies used in medical imaging and for the performance and safe operation of imaging equipment and systems are prepared by several IEC TCs (Technical Committees) and their SCs (Subcommittees).**

## Significant progress since first X-rays

Ever since the application of X-rays for medical imaging was discovered in the late 19th century by German physicist Wilhelm Röntgen, the diagnostic imaging domain has made dramatic advances with the introduction of new technologies, which have allowed it to expand well beyond its initial limitations.

Medical imaging is currently divided into five main groups of systems, on the basis of their modality:

- X-ray imaging
- CT (computed tomography)
- Ultrasound
- MRI (magnetic resonance imaging)
- Nuclear imaging

## The right technology for the right diagnosis

X-rays are still widely used in medical imaging (including in CT), and for therapy, in particular for cancer treatment.

They can have adverse effects, notably an increase in cancer risk for patients who are exposed to them repeatedly. However, significant advances have



*X-ray of a hand taken by Röntgen in 1896*

been made, especially for CT scans, in terms of lowering the radiation levels to which patients are exposed.

Ultrasound imaging uses high-frequency sound waves to produce images, viewed on a screen, of internal organs, vessels and tissues. It is widely used to monitor and diagnose the condition of certain organs, such as liver, kidneys, gallbladder and even the heart. It is well known for its use in prenatal ultrasound scans, which show images of a foetus in the mother's womb. It is considered a safe form of medical imaging technology.

IEC TC 87: Ultrasonics, prepares International Standards for equipment and systems in the domain of ultrasonics, primarily in the medical domain.

CT imaging systems use X-ray images that are then processed by a computer to produce tomographic images or "slices" to obtain three dimensional views of internal organs. As CT uses X-rays, there are adverse effects to its use, in common with X-ray imaging, but, as outlined above, modern equipment produces ever clearer images from consistently falling levels of radiation.

Nuclear imaging technologies are also used for tomography.

MRI systems use magnetic fields and radio waves to produce images of the body. The magnetic field in MRI systems is produced using magnets.

Low-field MRI scanners use permanent magnets, making them the least expensive of these medical imaging technologies.

Mid- and high-field MRI scanners use superconducting magnets which need cooling at extremely low temperatures during operation. IEC TC 90: Superconductivity, prepares International Standards related to superconducting materials such as alloys, and to devices.

The benefits of MRI scans are lower risks to health and lower energy consumption than other technologies. However, superconducting magnets require complex cooling installations.

## Performance and safety top the list

The safety and performance of the equipment used in medical imaging, as in all other medical domains, is essential to the wellbeing of the patients and medical personnel operating it.

The remit of IEC TC 62: Electrical equipment in medical practice, and of its SCs, is to "prepare International Standards and other publications concerning electrical equipment, electrical systems and software used in healthcare and their effects on patients, operators, other persons and the environment".

The activities of two of its four SCs focus on imaging equipment.

The task of IEC SC 62B: Diagnostic imaging equipment, is "to prepare



Minimally invasive image guided heart valve replacement (Photo: Philips)

international publications for safety and performance for all kind of medical diagnostic imaging equipment (e.g. X-ray imaging equipment, computed tomography and magnetic resonance imaging equipment) including related associated equipment and accessories as well as quality procedures (e.g. acceptance tests and constancy tests) to be applied during the life-time of imaging equipment. Included is also the development of related terminology, concepts, terms and definitions”.

Although TC 87 prepares International Standards for equipment and systems used in medical imaging, International Standards that cover the safety aspects of these are the responsibility of SC 62B and also encompass “protective devices against diagnostic medical X-radiation”.

MRI devices pose specific problems and require particular protective measures to be taken for patients with an active implantable medical device that may contain magnetic, electrically

conductive or radio frequency-reactive components.

SC 62B, which incorporates over 200 experts, has issued 55 publications so far. The work of SC 62C: Equipment for radiotherapy, nuclear medicine and radiation dosimetry, includes the preparation of “Standards for the safety and performance of (...) nuclear medicine equipment used for imaging”. SC 62C, which has 108 experts as of October 2014, has published 39 Standards so far. Half a dozen of these cover “Characteristics and test conditions of radionuclide imaging devices”.

### Growing market at the centre of medical advances

The overall importance of medical imaging in the healthcare environment cannot be underestimated and is illustrated by the fact that, in the past, researchers have been awarded the Nobel Prize in Physiology or Medicine for their work on two modern imaging technologies. The 2003 Prize was awarded jointly to Paul C. Lauterbur and Sir Peter Mansfield “for their discoveries concerning magnetic resonance imaging”, and in 1979 it was awarded jointly to Allan M. Cormack and Godfrey N. Hounsfield “for the development of computer assisted tomography”.

As healthcare technologies improve and find new markets in different countries, the global market for medical imaging equipment continues to expand steadily with the introduction of new systems and the phasing out of older or obsolete equipment. It is expected to reach USD 32,3 billion in 2014 and to exceed USD 49 billion by 2020. IEC standardization work that covers both the design and manufacture of this equipment and ensures its safe operation will continue to contribute to the expansion of this huge and dynamic industrial sector, for the greatest benefit of patients.



A 57-tonne magnet used in an MRI scanner being installed (Siemens press photo)

# Sharper, better pictures and sounds

IEC Standardization work is instrumental in driving multimedia growth

*Morand Fachot*

**Multimedia users are constantly expecting better audio and video quality on their equipment whether they access content on large or smaller, mainly mobile devices. A number of IEC TCs (Technical Committees) prepare International Standards to ensure this is possible for the greater benefit of industry and consumers.**

## Seeing the bigger – and the smaller – pictures

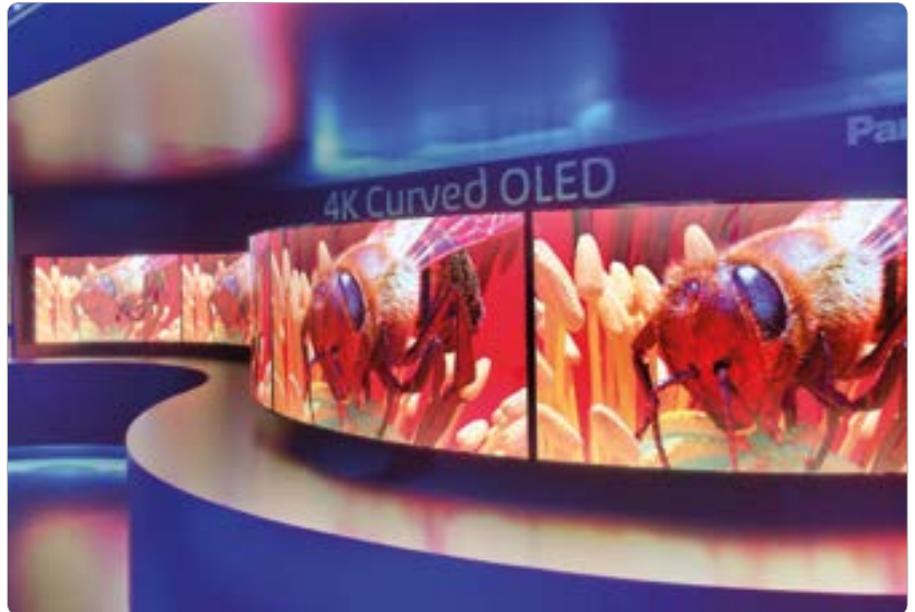
At all major international consumer electronics events, like CES (Consumer Electronics Show) in Las Vegas, IFA in Berlin or IBC in the Netherlands, manufacturers and the entertainment industry showcase high-quality multimedia equipment, which has become the norm and no longer the exception.

The digitization of sounds and pictures has made it possible to improve their quality and increase the number of services and their distribution.

Offering high-resolution video, in particular, and audio content is also a major marketing argument for manufacturers and the entertainment industry.

New display technologies are driving up the sales of equipment worldwide. The rollout of 4K or UHDTV (ultra high definition TV), which offers four times the resolution of current 1080p HD, is forecast to bring about a spectacular growth in the sale of sets.

Only 63 000 UHDTV sets were sold in 2012; 1,9 million units were shipped in 2013 and sales are expected to exceed 12,5 million units in 2014, according to a



*Curved OLED display*

December 2013 industry survey. One key factor in this dramatic growth is falling prices.

## Display is the key

Sharper video, the main driver behind higher sales of multimedia equipment, is the result of major advances in displays as flat screens rapidly displaced CRT (cathode ray tube) screens, first in IT equipment and later in the TV environment.

A variety of flat panel technologies, based first on plasma, then on LED (light-emitting diode) and, more recently, OLED (organic LED) and AMOLED (active-matrix OLED) offer better picture quality, response time, superior brightness and contrast. In addition, each generation of these technologies can operate at lower voltages and is more energy efficient than the one it replaces, resulting in longer battery life on mobile devices, which also benefit from developments in display technologies that include flexible displays.

## Key TC for multimedia equipment

IEC TC 110 prepares International Standards in the field of electronic display devices (excluding CRTs) and specific relevant components. It was initially established as SC (Subcommittee) 47C in 1998 under TC 47: Semiconductor devices, focusing on standards development in the area of flat panel display before being transformed into a full TC in June 2003. At the time it began to encompass standardization work in OLED, 3DDD



*TC 110 Standards are used in all devices, large and small*



High-definition headphones (Photo: Philips)

(3 dimensional display devices for 3DTV), EPD or non-volatile display devices, FDD (flexible display devices) and other emerging technologies. It works on terms and definitions, letter symbols, essential ratings and characteristics, measuring methods, specifications for quality assurance and related test methods and reliability.

To cover all devices, TC 110 established eight WG (Working Groups), each one dealing with a specific area including touch and interactive displays – which are now to be found in many devices and systems – and LDD (laser display devices).

TC 110 works closely with a number of IEC TCs, in particular TC 100: Audio, video and multimedia systems and equipment. As regulations in most countries now require reducing waste material and energy use through recycling, reuse of components and more energy-efficient appliances, it also works directly with TC 111: Environmental standardization for electrical and electronic products and systems.

**Sound still essential**

In spite of the widely held view that high-performance audio was losing the prominent position it had in the entertainment sphere a few decades

ago, it has been making a significant comeback in a different guise with connected and wireless devices.

Its renewal is also the result of the yearning to have high-quality audio for high-resolution video.

The 2014 Las Vegas CES offers evidence that high-performance audio is a vibrant sector, even if it didn't make the same striking headlines as UHDTV, connected appliances or 3D printing. No less than 565 out of over 3 530 CES 2014 exhibitors classified themselves as "high-performance audio companies".

New possibilities, such as live streaming of concerts or music, open up further opportunities for the sector.

One of the well-established issues in quality audio systems was – and still is – connectivity of certain cables. Reconnecting all the cables of the numerous components of stereo systems after a move used to represent a challenge. However that is receding, with the gradual adoption of wireless connectivity for high-performance audio.

**IEC standardization support for high-quality audio**

IEC standardization work for audio equipment predates the 1995 creation of TC 100, which was formed from the merger of several existing TCs and SCs. Its contribution to audio standardization includes the IEC 60268 series on Sound system equipment. This covers many audio components and applications, including amplifiers, loudspeakers, headphones and earphones, automatic gain control devices and the application of connectors for the interconnection of sound system components and for broadcast and similar uses.

Countless other IEC Standards cover various characteristics of audio equipment.

**Not just about hardware**

Standards for high-quality audio and video are not limited to equipment alone but concern also software.

To overcome the prospect of the spectrum bottleneck resulting from the large amount of bandwidth used by analogue signals, countries, broadcasters and regulators decided to move to digital transmission. This required the development of advanced compression coding/decoding standards for audio and video content that could be used in digital broadcasting and other applications. MPEG (Moving Picture Experts Group), a working group of experts, was formed by the IEC and ISO (International Organization for Standardization) in 1988 to prepare these types of Standards jointly with ITU-T (International Telecommunication Union Telecommunication Standardization Sector) Study Group 166, Multimedia, also known as VCEG (Video Coding Experts Group).

The first of the Group's five-part series, also known as MPEG-1, was published in 1993 by ISO/IEC JTC (Joint Technical Committee) 1/SC 29: Coding of audio, picture, multimedia and hypermedia information.

The latest digital compression coding/decoding standard developed by the Group, ISO/IEC 23008-2, High efficiency video coding (HEVC), or ITU-T H.265, was published in December 2013. It will allow the storage and distribution of UHDTV content.

**Considerable economic impact**

The economic impact of IEC International Standards for multimedia equipment and of IEC participation in the development of digital compression coding/decoding Standards cannot be overemphasized. A highly significant and growing share of the global broadcast media industry market, which is expected to reach nearly USD 600 billion in 2017, relies entirely on these Standards.

# How standards impact our world

Ensuring safety and simplifying life

Antoinette Price

**Modern life is more and more IT centric, whether buying a plane ticket, making reservations, paying bills, reading the news, watching a movie or downloading a song. Many daily activities are carried out over the internet, via computers, laptops and tablets. IEC works to develop International Standards which ensure compatibility among the varied technology, safety and reliability for all users.**

### Less waste and less fuss with a single external charger

Many people use multiple gadgets every day, which have a different power charger, (weighing anything from 300 to 600 grammes), that will not work with the next laptop or notebook. Thus, the concept of a single external charger that would work for a wide range of notebook computers and

laptops would save a lot of hassle, expense and more importantly, enable significant reduction of e-waste related to power supplies.

The published Technical Specification IEC TS 62700, *DC power supply for notebook computers*, does exactly this. It covers aspects such as the connector and plug, while ensuring safety, interoperability, performance and environmental considerations.

### Moving in the right direction

On a similar topic, earlier this year, the IEC welcomed the vote by the European Parliament to embed the universal charger Standard for data-enabled mobile telephones into law in the EU by 2017. The International Standard IEC 62684, *Interoperability specifications of common external power supply (EPS) for use with data-enabled mobile telephones* was the

product of a cooperative effort within a group led by the IEC, which included the USB-IF (Implementers Forum), CENELEC (European Committee for Electrotechnical Standardization) and ITU-T (International Telecommunication Union Telecommunication Standardization Sector).

It offers a good solution to the issues of e-waste and the inconvenience consumers experience, of requiring different chargers for each mobile phone, including for upgraded models.

### The standardization piece of the big data puzzle

What is big data? One definition is the massive volume of structured and unstructured data that is so large it is difficult to process using traditional database techniques. Leaders from business, academics and governments do however agree that there is potential for big data to fuel innovation, advance commerce and drive progress, by enabling more informed decisions. However, the complexity of deriving useful insights from a sea of big data poses a huge challenge.

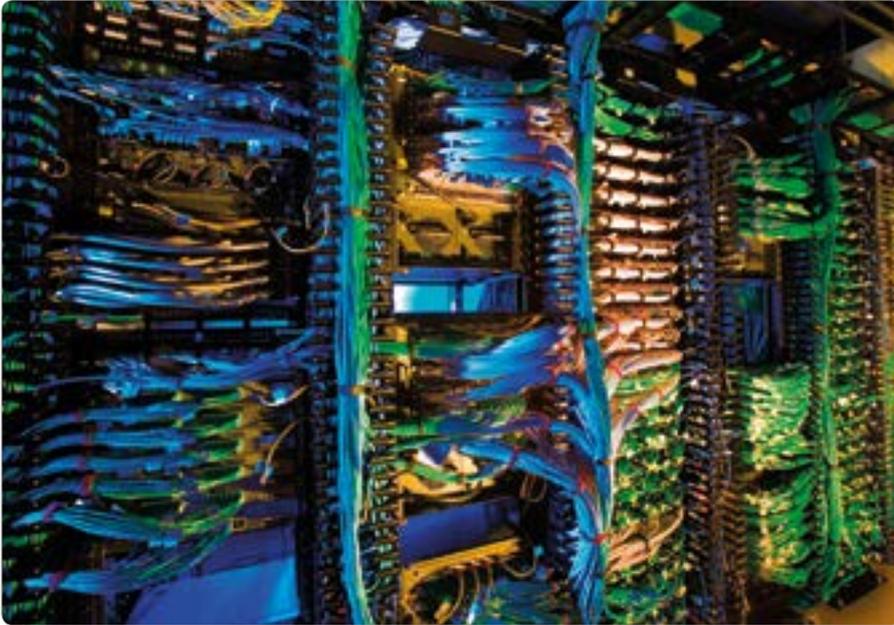
### Where does standardization fit in?

ISO/IEC JTC (Joint Technical Committee) 1: Information technology, has created ISO/IEC JTC 1 BD-SG (Study Group on Big Data), which is looking on the role of standardization in big data by:

- Surveying existing information and communication technology for key technologies and relevant standards, models, use cases and scenarios for big data from JTC 1, IEC, ISO and other standards development organizations



IEC Technical Specification TS 62700 DC power supply for notebook computers, will help reduce e-waste



Big data needs big infrastructure such as large data centres

- Identifying key terms and definitions
- Assessing the current status of big data standardization market requirements, identifying standards gaps, and proposing standardization priorities to serve as a basis for future JTC 1 work

Jim Melton, Chair of ISO/IEC JTC 1/SC 32: Data management and interchange, said: "This is a very exciting time to be involved in IT standardization. I truly believe that addressing the problems, challenges and opportunities associated with big data can create a paradigm shift."

The group is expected to make recommendations for future standards development at the 2014 ISO/IEC JTC 1 Plenary in Abu Dhabi in November.

**The future of the cloud lies in standards**

In a world flooded with information technology products from multiple vendors, it is thanks to International Standards and their interfaces that these products can interact.

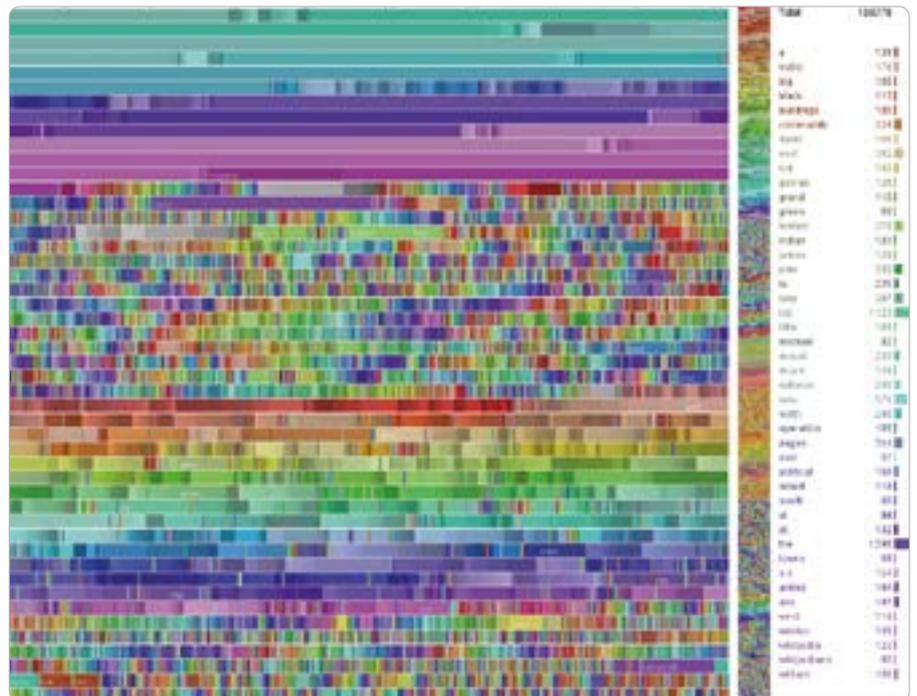
Cloud computing, in basic terms, involves the use of resources that

are not owned, controlled or maintained by a single user, rather, resources accessed over a network and shared among a community of users. As outlined in its definition in the ISO/IEC 17788 draft standard, cloud computing, is a shift in the paradigm for providing IT capabilities to users.

There are strong demands for standards, especially from governments, because cloud computing has the potential to disrupt the IT products and services marketplace.

In 2009, ISO/IEC JTC 1 recognized the emerging field of cloud computing and established the sub-committee SC 38: DAPS (Distributed Application Platforms and Services), to address three main areas – web services, service oriented architecture and cloud computing. Four years on, there is heavy focus on cloud computing and a new study group begun in 2013 is looking at future work in this area, including determining what standards are required.

ISO/IEC JTC1/SC 38 is uniquely placed to serve as a consolidator of cloud computing standards, with key players from the industry and government involved in the group. Its PAS (Publicly Available Specification) process, allowing specifications to be developed through consensus, make it the preferred vehicle for establishing new international standards in this field and a great vehicle for collaboration.



Example of Big Data: IBM-created visualization of Wikipedia edits (text and images)

# A leader in its field

IECEE is a truly international partner for the electrical and electronic industry

*Claire Marchand*

**The number of CB Certificates issued by members of the IECEE (IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components) keeps increasing each year (more than 80 000 in 2013). Add to that the successful and fruitful collaboration with international organizations, the outreach to developing countries and the introduction of new services and product categories and you have confirmation that IECEE is THE global certification system for electrical and electronic products.**

## A new Executive Secretary and COO

On 1 January 2014, Kerry McManama took over from Pierre de Ruvo as Executive Secretary and Chief Operating Officer.

McManama, a US citizen, has been involved in CA (Conformity Assessment) for many years. Before joining IECEE, McManama worked for UL (Underwriters Laboratories), an international certification body, where he served as Global General Manager of the



*Kerry McManama became IECEE Executive Secretary and COO on 1 January 2014*

Hazardous Locations (Ex) business and, most recently, as Director of Ex Programmes.

McManama's involvement with the IEC CA Systems began in 1998 when he attended the annual meeting of IECEX (IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres) in Paris, France, as an observer. Upon his return to the USA, he helped set up the US Member Body of IECEX and served as its Chairman for two terms. McManama subsequently became Chairman of IECEX ExTAG (Test and Assessment Group) for one and a half terms before being elected Chairman of IECEX for two terms.

McManama has also participated in a number of IEC Working Groups and Maintenance Teams and was the Secretary of IEC SC (Subcommittee) 31H: Apparatus for use in the presence of ignitable dust (disbanded). McManama was awarded the Thomas A. Edison Award in 2012 and received the IEC 1906 Award in 2007. Both recognize exceptional achievement and contribution to IEC work on the part of the recipient.

## Investigating certification for Smart Grids...

IECEE has been testing and certifying electric and electronic equipment for many years. It focuses on product safety and, when the Standards require it, it also provides services that help to ensure efficient performance. In response to industry demand, IECEE has started work on the Smart Grid.

The IECEE PSC (Policy and Strategy Committee) WG (Working Group) 2A on Smart Grid was created in 2011 to

explore the potential and practicality of conformity assessment applications in the fields of the smart home, smart building and smart industry (factory).

When the WG was created, it started out by leveraging the work of the IEC and others around the world on Smart Grid. That included SG (Strategic Group) 3 on Smart Grid, which first became SEG (Systems Evaluation Group) 2 and more recently was transformed into SyC (Systems Committee) Smart Energy. The WG analyzed the IEC Smart Grid Standardization Roadmap, created by SEG 2, and identified the Standards that could be included in the IECEE System.

In 2009, SG 3 held its first meeting; since then it has provided strategic guidance to all IEC Technical Committees involved in Smart Grid related standardization work. The SyC keeps abreast of the latest developments and technologies and provides recommendations regarding future requirements.

## ...and cyber security

More often than not, the aim of a cyber-attack isn't the complete shutdown of a target's network, but rather a surreptitious intrusion into the network. This may have dire consequences, causing serious damage to a system and potentially endangering the lives of those operating installations.

Understanding the cyber environment, protecting industrial control and automation systems, identifying cyber threats and possibly anticipating future development are at stake here. Minimizing exposure to cyber risks is the challenge that industry has to



An IECEE Working Group explores the potential and practicality of conformity assessment applications in the fields of the smart home, smart building and smart industry (factory)

tackle. Among the tools at its disposal are standardization and conformity assessment.

Recognizing that the topic is of vital importance to industry, IECEE asked its special WG on Industrial Automation to set up a Task Force to consider the cyber security issues and the potential services the System could offer to tackle them. Apart from cyber security the WG also has the responsibility to deal with functional safety.

At its annual meeting in June 2014, the IECEE CMC (Certification Management Committee) approved the development of a business plan and supported the recommendation to continue discussions with other organizations, such as ISA (The International Society of Automation) and WIB (Process Automation Users' Association) to evaluate potential cooperation.

**Risk management in MEE**

The IECEE MEE (Medical Electrical Equipment) Task Force meets once a year and, at the end of 2013, finalized the Guidance for the Evaluation of Risk Management in Medical Electrical Equipment, which will become an IEC Guide. This document helps

to provide a uniform approach for Certification Body Testing Laboratories and manufacturers alike on how to assess and document compliance with the relevant clauses in the IEC 60601 series of International Standards on medical electrical equipment as they relate to ISO 14971, *Medical devices – Application of risk management to medical devices*.

**International cooperation**

IECEE continues to collaborate with international organizations such as

ASEAN (Association of Southeast Asian Nations), APEC (Asia Pacific Economic Cooperation), COPANT (Pan American Standards Commission), UNIDO (United Nations Industrial Development Organization) or WTO (World Trade Organization) and regularly participates, directly or represented by one of the IEC Regional Centres, in a significant number of conferences, workshops and seminars organized by these bodies. The list is by no means exhaustive but shows that IECEE is a respected and important player on the international scene.



Today's cyber threats are global

# The ultimate safeguard in Ex areas

IECEX is a trusted partner for the Ex industry

*Claire Marchand*

**IECEX (IEC System for Certification to Standards relating to Equipment for use in Explosive Atmospheres) has continued to grow in the past year. The IECEX International Conferences – in 2012 in the UAE (United Arab Emirates), and in 2014 in Malaysia – have contributed to increase awareness and visibility in the Middle East and Asia. The IECEX Certified Persons Scheme, launched in late 2010, has really taken off since 2013, benefitting from the support of several majors in the oil and gas industry.**

## 2014 IECEX International Conference in Malaysia

The 2014 IECEX International Conference, organized by the IEC and IECEX in conjunction with the UNECE (United Nations Economic Commission for Europe), took place in Kuala Lumpur Malaysia, on 19-20 February 2014. MOSTI (Ministry of Science, Technology and Innovation) and its Department of Standards Malaysia volunteered to host and help organize the two-day event. The major sponsor of the event was PETRONAS, Malaysia's leading international petroleum corporation.

The conference brought together experts from all over the world who are involved in international standardization, equipment manufacture, inspection, repair and overhaul of Ex equipment and systems, and the assessment and certification of personnel competence. Issues specific to Asia-Pacific Ex industry needs were also covered.

Through their presentations and direct contact with participants, the experts



*The Petronas twin towers in Kuala Lumpur, where the 2014 IECEX International Conference was held in February*

were able to share their experience and detailed knowledge of all matters pertaining to the Ex field, such as plant design, principles and practical applications of area classification, installation and repair in compliance with IEC International Standards.

## ATEX Danish Forum

IECEX Executive Secretary Chris Agius participated in the ATEX Danish Forum at the end of 2013. In his presentation, he explained that at the beginning IECEX only covered the International certification of Ex equipment. Industry soon realized that these benefits could equally apply to Ex related services such as repair and overhaul as well as to the assessment of the competence of persons that work in Ex areas. He stressed the fact that the IECEX website is the only repository of the original IECEX Certificates, fully accessible to the public and allowing instant verification of claims made by a vendor. Agius also invited participants

to download the free IECEX mobile app, for iOS and Android smart phones and tablets, which provides online and offline access to all Certificates in the IECEX Certified Equipment Scheme.

The purpose of the Forum is to give participants a place to exchange experiences and knowledge and urge them to give a presentation on what they do in their company to comply with Ex related regulations in Europe. Much of what is covered involves the health and safety aspects of working in



*Chris Agius during his presentation at the ATEX Danish Forum*

explosive atmospheres: how to work in Ex areas, what should be worn and so on. It also covers the framework of the products encompassed by IEC International Standards through IEC TC (Technical Committee) 31: Equipment for explosive atmospheres, as well as European Standards.

**IECEX annual meetings**

More than 130 experts from 27 countries participated in the series of annual meetings held in The Hague, Netherlands on 25-29 August 2014. IEC General Secretary and CEO Frans Vreeswijk and IEC Vice-President and CAB (Conformity Assessment Board) Chairman Hiromichi Fujisawa were also present.

The event gave Fujisawa the opportunity to present the IEC 1906 Award to the five IECEX experts nominated in 2014:

- Heinz Berger, IECEX Treasurer
- John Allen, ExPCC (Certificate of Personnel Competence Certification Committee) Chairman
- Tim Duffy, IECEX Marks Committee Chairman
- Vitaly Grudtsyn, Head delegate of the Russian Federation
- Alexander Zalogin, IECEX Vice Chairman

**UNECE Industry Symposium**

As is the tradition now, UNECE hosted a special one day industry symposium as part of the 2014 series of annual IECEX meetings. The event offered presentations on:

- The UNECE legal framework
- The Australian experience of accepting Certificates of Conformity as proof of compliance with regulations
- Accident investigation: Biogas explosion at a waste water treatment plant

The presentations were followed by an open debate with EU (European



*Thorsten Arnhold became IECEX Chairman on 1 January 2014*

Union) Commission and industry representatives.

**New IECEX Chairman**

Taking over from Kerry McManama, who stepped down as IECEX Chairman to succeed Pierre de Ruvo as IECEE Executive Secretary, Prof Dr Thorsten Arnhold, who is Vice President of Technology at R. STAHL, began his first term as IECEX Chairman on 1 January 2014.

Prior to his appointment, Arnhold had been actively involved in IECEX for close to 10 years. He saw the System grow and expand and played a major role in its development and management. He spent more than seven years on the IECEX Management Committee and was a member of several IECEX Working Groups.

Arnhold joined R. STAHL in 1992 and six years later became Head of the company's Design and Marketing Department. He was subsequently promoted to Vice President of Product Management and Marketing and more recently to his current position.

**New countries**

IECEX has also grown in terms of membership, with three new countries joining the System and taking a seat on the International IECEX ExMC (Management Committee):

- Israel
- Spain
- United Arab Emirates

This now brings the total number of IECEX Member Countries to 33. Hot on the heels of these new members, other countries are expected to join the growing IECEX family, for example Belgium, later in 2014.

The IECEX ExMC oversees the day-to-day management operations of the IECEX System. Since each Member Country holds a seat on the ExMC, their industry and stakeholders provide direct input to the operational decision-making of the IECEX.

**Extension of the IECEX Certified Service Facilities Scheme**

The updated set of IECEX Operational Documents introduced an extension of the Ex-related services covered by the IECEX Certified Service Facilities Scheme.

In addition to the Ex Repair and Overhaul service in compliance with IEC 60079-19, *Explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation*, the Scheme now provides for the assessment and certification of organizations that offer the following services:

- Ex Selection and Installation + Initial Inspection in compliance with IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*
- Ex Inspection in compliance with IEC 60079-17, *Explosive atmospheres – Part 17: Electrical installations inspection and maintenance*
- Area Classification in compliance with the IEC 60079-10 series of International Standards on the classification of areas in explosive atmospheres

### Tracking changes in new editions of IEC 60079-1 and IEC 60079-2

The latest editions of IEC 60079-1:2014, *Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"*, published in August, and IEC 60079-2:2014, *Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"*, issued in July, are also available in a Redline version. Flameproof enclosures for housing pieces of electrical apparatus is one of the well known and most used explosion protection techniques essential for use in explosive atmospheres, such as may be encountered on oil and gas platforms, in chemical and petrochemicals plants, grain silos and in many other sectors.

Both Standards were developed by IEC TC 31. Redline versions (available in English only) provide users with a quick and easy way of comparing all the changes between Standards and their previous edition. They are particularly helpful when changes introduced in new IEC International Standards are extensive, as is the case with these two publications.

## About IECEx

IECEx provides certification of equipment, services and personnel associated with or affecting areas where there is a risk of fire and/or explosions due to flammable gases, liquids and dusts (Ex areas).

Ex areas are a part of almost every industry, from transport, food production, and textiles to petroleum and mining. IECEx covers the broad spectrum of devices, systems and services used in explosive environments, and verifies their conformity to International Standards.

The System addresses inspection (location and other), installation, maintenance and repair of equipment and systems, and assesses the competence of personnel working in this highly specialized area.

IECEx has been endorsed by the UN (United Nations) through the UNECE as THE certification system for the assessment of conformity in Ex areas.

IECEx operates the following Schemes:

- IECEx Certified Equipment Scheme
- IECEx Certified Service Facilities Scheme
- IECEx Scheme for Certification of Personnel Competence (for Explosive Atmospheres)

The System also has the IECEx Conformity Mark Licensing System which provides immediate evidence that products bearing the Conformity Mark are covered by an IECEx Certificate of Conformity.

For more information: [www.iecex.com](http://www.iecex.com)

## Quality and reliability at the forefront

IECQ provides independent verification of compliance with International Standards

*Claire Marchand*

**IECQ (IEC Quality Assessment System for Electronic Components) has been thriving in the past 12 months. The launch in 2013 of new programmes for the automotive industry and counterfeit avoidance have enriched its portfolio and broadened its scope. Together with the complete restructuring of the Schemes and a new website, they have brought new dynamics to the System. Not resting on its laurels, IECQ is actively working on new developments.**

### The LED initiative

The popularity of LED-based lighting solutions keeps growing. Their success is largely due to the fact that LEDs (light-emitting diodes) are up to 90% more efficient than incandescent bulbs and use the light emission properties of specific semiconductor materials. Initially expensive to produce, improved technologies and economies of scale have contributed to drastically reduce their prices. Their low-power consumption, long life and reduced cost of maintenance and replacement render them extremely attractive.

Demand for LED technology increases in parallel with the need to ensure that electronic components, parts and assemblies that make up LED lighting solutions are of the highest quality and reliability. IECQ set up a special WG (Working Group) to find out how the IECQ AC (Approved Component) Scheme could be used to test and assess electronic components and assemblies used in the production of LED lamps and drivers. And at its annual meeting in London, in April 2014, IECQ agreed on a procedure that allows the manufacturing supply chain for LED components to be



LED-based solutions are now found in urban and airport lighting

covered by the IECQ AC Scheme. Collaboration with IECEE (IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components) was evoked since other aspects of LED lamp testing and assessment, such as safety and performance, are dealt with by the IECEE CB Scheme.

According to IECQ Chairman Marie-Elisabeth d'Ornano, collaboration between the IEC CA Systems and Schemes is expected to develop further, as industry seeks complete solutions to its compliance needs.

#### New website

Since 2010, IECQ has gone through a major overhaul of the System. The first stages dealt, among others, with the reorganization of the Schemes, a complete review of all IECQ documentation, the alignment of the Basic Rules with the other IEC CA (Conformity Assessment) Systems and the establishment of the IECQ On-Line Certificate system as the only repository of the original Certificates.

The last stage was completed in January 2013 with the launch of the new IECQ website, a powerful tool that allows all levels of users to find the information they seek. Its enhanced speed, ease of access to information and documentation and intuitive structure make finding what you are looking for much easier than before. The homepage provides quick access to the most popular features, including the latest news items, most frequently used tools and forthcoming events.



Marie-Elisabeth d'Ornano is the IECQ Chairman

#### Changes at the helm

##### New Chairman

Marie-Elisabeth d'Ornano took over the role of IECQ Chairman on 1 January 2014. She succeeded David W. Smith who ended his 10 years (three three-year terms + one extra year) as Chairman of the IECQ Management Committee on 31 December 2013.

Marie-Elisabeth d'Ornano has been the Deputy Director for Certification at LCIE France Bureau Veritas since March 2013. She joined LCIE France in April 2005 and was responsible for the following markets: transportation, aeronautics and defence. She has a Masters in Engineering from ENSEEIHT, the University for Electrical Engineering, Electronics, Computer Science, Hydraulics and Telecommunications in Paris, France and a Masters in Management of Technology and Innovation from the University Dauphine, Paris, France.

##### New IECQ Vice Chairman

In 2013, IECQ also appointed a new Vice Chairman in the person of

Dr Young-Kwon Chang of Korea, who took up office on 1 January 2014.

Chang has been Vice President and Director General of the Planning and Coordination Division of the Korea Testing Laboratory since January 2008. He started with the Korea Testing Laboratory in 1999 and has worked in a number of senior and managerial positions including Manager for the Industrial Facility Safety Analysis Team, and Director of the Reliability Evaluation Team. He has a Masters in Mechanical Engineering and a PhD in Mechanical Engineering and Material Science from Kyung Hee University in Seoul, Korea.

**Tribute to Dave Smith**

The IEC CAB (Conformity Assessment Board) meeting that took place in New Delhi, India, during the IEC General Meeting paid tribute to outgoing Chairman Dave Smith. Since 2004, the year Smith began his tenure, IECQ has developed its activities tremendously to become a truly global certification system recognized by the electronic component industry. As Chairman of the Management Committee, Smith represented IECQ at many events, conferences, and trade shows. He



IECQ Secretariat Business Manager Steve Allan visited Electronstandard, the Russian Scientific Research Institute in St Petersburg

## About IECQ and its Schemes

IECQ (IEC Quality Assessment System for Electronic Components) is a worldwide approval and certification system that covers the supply, assembly, associated materials and processes of a large variety of electronic components that are used in millions of devices and systems. The IECQ Certification System provides manufacturers with independent verification that IEC International Standards and other specifications were met by suppliers who hold an IECQ certification. The avionics and increasingly other industries depend on the IECQ Electronic Component Management Plan to assess suppliers and safely manage their components' supply chain also to avoid counterfeit merchandise. IECQ also allows manufacturers to more easily comply

with increasingly strict hazardous substances regulations.

IECQ operates industry specific Certification Schemes:

- IECQ AP (Approved Process)
  - IECQ AP-CAP (Counterfeit Avoidance Programme)
- IECQ AC (Approved Component)
  - IECQ AC-TC (Technology Certification)
  - IECQ AC-AQP (Automotive Qualification Programme)
- IECQ Avionics
- IECQ HSPM (Hazardous Substances Process Management)
- IECQ ITL (Independent Testing Laboratory)

For more information: [www.iecq.org](http://www.iecq.org)

also has regular contact with IECQ members, customers and suppliers. He was instrumental in establishing the IECQ CAG (Chairman's Advisory Group) which was the predecessor of the IECQ Executive Group of which he will remain a member.

**Reaching out**

IECQ has been well represented at several major events in the past 12 months.

**Workshop and test lab visit in Russia**

In May 2014, for example, the Russian NC (National Committee) of the IEC invited the IEC and IECQ to present the System to the Russian industry during a workshop held at the Federal Agency for Technical Regulating and Metrology in Moscow. The discussions that ensued were fruitful. The idea of establishing a Russian IECQ training body was raised and the NC

committed to provide technical experts for IEC TC (Technical Committee) 107: Process Management for avionics, and for all IECQ Working Groups, included the newly-formed WGT in charge of training. IECQ Secretariat Business Manager Steve Allan was also invited to visit Electronstandard, the Russian Scientific Research Institute, and former IECQ CB, located in St Petersburg.

**Avionics Industry Dialogue**

The event, held in April 2014 in conjunction with the 2014 IECQ annual meetings, brought together experts from Boeing, Airbus, GE Aviation, Aero Engine Controls (part of the Rolls Royce Group) as well as several Certification Bodies.

IECQ also participated in the following industry events:

- Taitronics, in October 2013
- Autotronics, in April 2014

# International debut for IECRE

Testing and certification for renewable energies



IECRE comprises three sectors: Solar PV...

Claire Marchand

**The IEC, which has been at the forefront of international standardization in the wind, solar and marine energy fields for many years, has now gone a step further and launched IECRE, the IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications.**

## Inaugural meetings

The IECRE Management Committee held its inaugural meeting on 16-17 September in Boulder, Colorado, USA.

Three parallel meetings of the Marine, Solar PV, and Wind Energy Sectors were also organized in conjunction with the REMC meeting.

## Fast-paced developments

Approved by IEC CAB (Conformity Assessment Board) at its June 2013 meeting, the System provides testing, inspection and certification for renewable energy sectors such as wind energy, marine energy and solar PV (photovoltaic) energy.

The CAB approval led to the setting up of the IECRE Forum, a working group bringing together stakeholders from the renewable energy sector as well as officers and leading experts from the IEC CA side. The Forum, in charge of drafting the new System's Basic Rules, met in October and November 2013 and again in early April 2014 to discuss and finalize the draft document. IECRE Basic Rules were approved by CAB at its June 2014 meeting.

## Sectors and Schemes

Practically speaking, the IECRE System is organized in sectors and schemes.



...and marine energy

Three sectors have currently been defined:

- Solar PV Energy
- Wind Energy
- Marine Energy

Each of these sectors will be able to operate Schemes that cover:

- Products, e.g. components and systems
- Services, e.g. installations and other related offers of the sector
- Personnel, e.g. covering the competence of those working in the sector

## A lot in common

Commonalities can be found in the technologies used for generating energy from the sun, the wind or the oceans: high capital investment and harsh environmental conditions in installation deployment, the need for a systems approach to cover stages from design concept to prototype, to production of equipment and components, transportation, installation and commissioning.

## Membership

At the end of September, 16 countries had joined the System: Austria, Canada, China, Denmark, Egypt, France, Germany, Hungary, Japan, Korea, Netherlands, Portugal, Spain, Sweden, United Kingdom and United States.



...wind...

# Five years on...

## Achievements of the IEC Young Professionals programme

*Janice Blondeau*

**The Tokyo IEC Young Professionals workshop marks the fifth year that this programme has introduced up-and-coming experts to the world of the IEC. In this article, e-tech looks back on what's been achieved to date.**

### Diverse backgrounds, common interests

Since the IEC Young Professionals programme started in 2010, it has welcomed 211 participants representing 40 different countries. They have come from a range of professional backgrounds including manufacturing, distribution, testing and certification; utilities; government/public institutions, as well as industry, consumer and trade associations.

A recent survey of programme participants asked whether participation had helped them either professionally or personally. All respondents agreed that the workshop was beneficial to their development, offering:

- Networking opportunities

- Improved credibility and visibility within their company or organization
- Increased understanding of the importance of and involvement in IEC work
- Greater motivation, including encouraging colleagues to apply to the programme
- Enhanced contact with their NC (National Committees)
- Better understanding of upcoming global trends
- Helpful tips on interacting in a committee environment.

### In their own words

"The IEC YP workshop was a crash course on IEC standardization. It saved both my organization and I a lot of time and money compared to the alternative ways of learning available."

*Stina Wallström, IEC 2013 YP from Sweden*

"The IEC YP workshop is a great opportunity to meet people from the industry from all over the world, and to share international experiences and cultural aspects. It helps YPs recognize

the need for International Standards and also to understand the difficulties in making Standards. The IEC YP workshop was a great benefit for my private and professional life!"

*Michael Imseng, IEC 2013 YP from Switzerland*

"When I started I was only working on TC 114, serving as a subject matter expert on an individual project team. Since that time and in great part due to the IEC YP programme, my role in the IEC has expanded significantly...The IEC Young Professionals programme has opened an incredible number of doors for me. I've become much more engaged both in my National Committee and at the IEC level."

*Jonathan Colby, IEC 2011 Young Professional Leader from the United States\**

### Putting the knowledge to work

Almost half the survey respondents indicated that their participation in standardization or conformity assessment work had increased following their involvement in the YP programme. Some have become active members of IEC TCs (Technical Committees), national mirror committees or other working groups at the national level, and others are involved in the development of national IEC YP programmes. In addition, another 15% of survey participants replied that they were already quite involved with IEC work even before the workshop.

Since the participation of Young Professionals in both national and IEC activities is managed by National Committees, the support of the NC following the workshop is essential. Formal mentoring is an element that the YPs consider to be very important.



*Participants in the IEC Young Professionals programme...*



*...appreciate the opportunity to meet and interact with IEC leadership*

### Feedback from National Committees

A recent survey was also conducted with all of the NCs who had selected Young Professionals for the IEC programme. The large majority of NCs who responded to the survey had contacted their Young Professionals following the IEC workshops. In some countries, this resulted in the YPs supporting the NC with the development of their national equivalent programme and in the selection of future IEC Young Professionals. Numerous YPs have also

become more involved in IEC-related technical work following participation in the workshop.

### Continually improving

Throughout this year, the 2013 Young Professionals have worked on gathering success stories from all IEC YP participants and compiling them into a newsletter which also includes articles on national IEC YP programmes. The aim of this newsletter is to inspire other YPs to become more involved.

Also in response to suggestions from NCs and the Young Professionals, the upcoming workshop in Tokyo will have a success stories session to provide participants with tools to convince their employers of the benefits of participation in IEC work. Standardization activities in new areas of technology, the importance of Standards for industry and how standards are used from a business perspective will also be covered.

### One big family

The primary objective of the YP programme – to increase the participation of the younger generation of experts, managers and leaders in standardization and conformity assessment in the field of electrotechnology – is being achieved. We see that many of the participants who planned to become more involved in IEC work at the end of the workshops have done just that.

Let's help them to continue to develop in their IEC work, and remember to make these Young Professionals welcome within the IEC Family.



*The programme is now in its fifth successful year*

# Strong and infallible support

IEC Affiliate Country Programme helps bring tailor-made solutions to developing countries

*Claire Marchand*

**The past 12 months were a busy period for the Affiliate Secretariat team. From Bhutan in November 2013 to the Democratic Republic of Congo in September 2014, the IEC Affiliate Country Programme was represented at several major events in Asia and Africa. These trips were also great opportunities to organize country visits and meet with NECs (national electrotechnical committees) and their stakeholders.**

## Visit to Bhutan

After the IEC General Meeting in New Delhi, India, at the end of October 2013, IEC Affiliate Executive Secretary Françoise Rauser, accompanied by IEC-APRC (Asia-Pacific Regional Centre) Regional Director Dennis Chew, were invited by Affiliate Leader Phuntsho Wangdi to pay a visit to neighbouring country Bhutan and meet with stakeholders, regulators, utilities and government representatives.

Rauser and Chew led a workshop where they gave presentations outlining IEC activities in general, the Affiliate Country Programme and the CA (Conformity Assessment) Systems, and focusing more specifically on IEC International Standards for rural electrification. They also had a training session for Members of the newly-established NEC. Rauser and Chew had the opportunity to meet with representatives from the Bhutan Electricity Authority, the local utility, which is one of the NEC stakeholders, and with the Minister of Economic Affairs.



*From left: Tandin Wangchuk, Secretary of the Bhutan NEC, Affiliate Executive Secretary Françoise Rauser and Affiliate Leader Phuntsho Wangdi*

The last leg of the journey was a visit to the Punatsangchhu-I Hydroelectric Project, jointly managed by Bhutan and India and expected to be fully operational by 2020. Discussions with the managing team focused on the benefits of the Affiliate Country Programme and on how the dam team could get involved in the NEC.

## Africa Smart Grid Forum

IEC General Secretary and CEO Frans Vreeswijk and Rauser inaugurated and attended the first Smart Grid Forum, held in Abidjan, Côte d'Ivoire, on 14-16 May 2014. The event was the first of its kind on the African continent.

The event was organized jointly by AFSEC (African Electrotechnical Standardization Commission), CIE, the Ivoirian electricity company, and the NEC of Côte d'Ivoire with strong support of the IEC. The Forum was also backed by AFREC (African Energy Commission of the African Union), APUA (Association of Power Utilities

of Africa), KATS (Korean Agency for Technology and Standards), SGCC (State Grid Corporation of China), CENELEC (European Committee for Electrotechnical Standardization), DKE, the IEC National Committee of Germany. It took place under the auspices of the Minister of Petroleum and Energy who opened and closed the Forum. Around 300 experts from 24 countries – of which 20 were African – participated in sessions on:

- the evolution of production means in the context of Smart Grids
- the evolution of smart transportation and distribution systems
- new ITC and Smart Grids
- Smart Grid and consumers
- development of distribution networks
- Smart Grid in the city

As a concrete outcome the Forum recommended that African countries develop a comprehensive "Smart City" strategy to bring welfare to their people. This should include an action plan that aims to:



Africa Smart Grid Forum opening ceremony – From left: AFSEC President Claude Koutoua, IEC General Secretary Frans Vreeswijk

- improve urban services using Smart Grids
- develop micro grids with independent remote production sources
- optimize management of all contracts for urban services

As Vreeswijk stated: “Smart Grids are not just an option for Africa, they are a necessity.”

#### IECEX-AFSEC international seminar

AFSEC and IECEX (IEC System for Certification to Standards relating to Equipment for Use in Explosive Atmospheres) organized an international seminar in Lubumbashi, DRC (Democratic Republic of the Congo), on 7-8 September 2014. AFREC (African Energy Commission) and OCC (Office Congolais de Contrôle) collaborated to the organization of the event, in partnership with the Katanga mining authorities and Moïse Katumbi Chapwe, the governor of the Katanga Province.

The first day of the seminar was devoted to the implementation of IEC International Standards followed by a site inspection with practical exercises, report and explanation of findings the second day. It was a unique opportunity for experts, senior staff

and professionals from the mining and electrical sectors in African countries to learn about IECEX and the benefits of using the System.

#### UN SE4ALL

The UN SE4ALL (United Nations Sustainable Energy for All) initiative was launched in 2011 by UN Secretary-General Ban Ki-Moon, setting out the following objectives for 2030:

- universal access to modern energy services
- doubling the global rate of improvement in energy efficiency
- doubling the share of renewables in the global energy mix

The IEC is a partner of UN SE4ALL. Paul Johnson, Secretary of the South African NC (National Committee) and Executive Secretary of AFSEC, represented the Commission at a conference on “Rural Energy Access: A Nexus Approach to Sustainable Development and Poverty Eradication”, in Addis Ababa, Ethiopia, on 4-6 December 2013.

The main theme of the Conference, organized by UN DESA (Department of Economic and Social Affairs), in collaboration with SE4ALL, UN Energy/ UNECA (UN Economic Commission for Africa), was the essential role that

access to energy services has for enabling sustainable development and poverty eradication. Over 250 participants from 40 countries attended the Conference.

#### IEC supports rural electrification

The IEC has responded positively to a request from the United Nations Foundation to make the IEC TS 62257 technical specifications more easily available to key stakeholders in developing countries. This request was reinforced by the conclusions of a 2012 workshop on rural electrification held by AFSEC (African Electrotechnical Standardization Commission) with experts from IEC TC (Technical Committee) 82: Solar photovoltaic energy systems. As result of that workshop, AFSEC is developing a technical guide for sustainable off-grid electrification, with reference to IEC TS 62257 series.

The IEC, World Bank Group and United Nations Foundation have worked together to give access to the IEC TS 62257 series to key stakeholders at discounts ranging between 50% and 75%. Details are available from the IEC Webstore.

#### Cooperation with UNIDO

The IEC was invited, together with other DCMAS Network\* partners, to participate in the UNIDO (United Nations Industrial Development Organization) Trade Capacity Building course for Caucasus and CIS (Commonwealth of Independent States) countries, held in Warsaw, Poland on 9-16 April 2014. Four IEC Members – Belarus, Georgia, Moldova and Ukraine – and two IEC Affiliate countries – Armenia and Azerbaijan – were represented. Rauser gave a presentation on IEC standardization and conformity assessment activities, provided an overview of the IEC structure and explained how to get further involved

in the IEC. The presentation was well received with many questions arising from the delegates.

\* DCMAS Network (Network on Metrology, Accreditation and Standardization for Developing Countries) brings together 10 international organizations: BIPM (Bureau international des poids et mesures), IAF (International Accreditation Forum), IEC, ILAC (International Laboratory Accreditation Cooperation), ISO (International Organization for Standardization), ITC (International Trade Center), ITU (International Telecommunication Union), OIML (International Organization of Legal Metrology), UNECE (United Nations Economic Commission for Europe) and UNIDO.

### New Affiliate Leader nominated

IEC General Secretary Frans Vreeswijk has nominated Rosario Uría of Peru as the new Affiliate Leader. On 1 January 2015, she will take over from Phuntsho Wangdi, of Bhutan, for a two-year term. Uría is Technical Secretary of the Standardization and non-Tariff Barrier Surveillance Commission at INDECOPI (Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectual).

As Leader, Uría will be the “voice” of the Affiliate countries, will represent them and submit a report on the Programme to the SMB (Standardization Management Board) and CAB (Conformity Assessment Board) at IEC General Meetings. Her role will also be to enhance the active participation of all Affiliate countries and encourage the establishment of NECs.

### Mentoring programme for Affiliate countries

In addition to Rwanda, the first Affiliate country to benefit from the Mentoring programme in 2013 with Austria as



Solar PV panel covering battery cabinet in Gabon (Photo: Meagle Sun) IEC General Secretary Frans Vreeswijk/Françoise Rauser and Affiliate Leader Phuntsho Wangdi

mentor, four more Affiliates have established partnerships with IEC Members: Afghanistan and Malaysia, Côte d'Ivoire and France, DRC and France, Ethiopia and Germany. Uruguay and Norway have also agreed on a technical mentoring in the context of IEC TC 14: Power transformers.

The IEC Affiliate countries and their respective mentors have committed for a period of two years to reinforce their NEC through activities such as increasing the national adoptions of IEC International Standards, establishing mirror technical committees and understanding the working process for comments on technical documents.

### NECs, Affiliate Plus and adoptions

Since the General Meeting in New Delhi, four Affiliate countries have established their NEC: Botswana, Cameroon, Dominica, and Guinea. This brings the total number of NECs in the Affiliate Country Programme to 44.

Affiliate countries are encouraged to set up their own NEC and if needed,

the Affiliate Secretariat can help and assist them in their endeavour through webinars.

Two Affiliates have been granted Affiliate Plus status: Botswana and Zimbabwe. In all, 21 countries now have Affiliate Plus status.

To qualify and upgrade to Affiliate Plus, countries have to fulfill two criteria:

- Adoption of at least 50 IEC International Standards as national ones or for reference in national regulations
- Establishment of a NEC with representatives from both public and private sectors

Since the Programme began in 2001, more than 4 000 IEC International Standards have been adopted as national ones in 42 Affiliate countries.

For more information on the Affiliate Country Programme: please go to: [www.iec.ch/affiliates/](http://www.iec.ch/affiliates/)

# IEC Global Visions

Industry and government leaders share their views on IEC standardization



*Dr Ja-Kyun Koo, CEO, LSIS*

*Claire Marchand*

**For several years now, the IEC has been interviewing leaders from industry and governments on the benefits of electrotechnical standardization. In the IEC Global Visions series of interviews, these high-level executives explain how they cope with the challenges that industry and governments are facing and how the IEC helps them to do so.**

In the past 12 months, LSIS, NERSA (National Energy Regulator of South Africa) and SGCC (State Grid Corporation of China) were featured in the Global Visions series of videos.

## **The many benefits of participation**

All interviewees expressed their firm belief in the importance of standardization. They explained how participation in IEC work offered them easy access to the pool of knowledge and experience of engineers across the whole world, how it helps accelerate technological innovation and access to markets. Taking an active part in the development of International Standards also ensures a higher level of interoperability between products, systems and installations.

Among the additional benefits that active participation in IEC standardization work brings, they cited the opportunity to learn of new technological developments and to have their voice heard in the process. Having large multinational companies and SMEs (small and medium enterprises) working together on the standards development process is also a plus. They added that their involvement was a way of strengthening their IP (intellectual property) rather than a threat, as some may fear.

All agreed that IEC International Standards are vital in tackling the challenges brought by the need to modernize existing power infrastructure and the emergence of the Smart Grids, to integrate more renewable energy sources and to develop viable energy storage solutions.

## **LSIS – Strengthen IP, increase revenue**

In his interview, Dr Ja-Kyun Koo, CEO of LSIS, a global leader in the field of power solutions, automation and green business, explains why it is very important for a company to be able to monetize R&D and IP investment and how a standardization strategy can help in this. (see article in *e-tech* November 2013)



*Themban Bukula, Regulator Member, NERSA*



*Dr Yinbiao Shu, President, SGCC and Vice-President of the IEC*

## **NERSA – Enable interoperability, secure investment**

IEC Global Visions interviewed Themban Bukula, Regulator Member at NERSA and a member of the IEC CB (Council Board), who explained why the use of IEC International Standards and participation in IEC work allow countries to ensure that investment in national electrical infrastructure is secure, reliable, safe and affordable. (see article in *e-tech* January/February 2014)

## **SGCC – Sharing know-how – Building bigger markets**

Dr Yinbiao Shu is President of State Grid Corporation of China, the largest electric utility company in the world which occupied 7th place on the global Fortune 500 list 2013. He is also one of three Vice Presidents of the IEC. In this interview, Shu explains how active participation in IEC work has enabled SGCC to first build a reliable infrastructure in China and then to contribute significantly to global power technology development. (see article in *e-tech* October 2014)

# The year in events

An overview of key events attended by IEC management

*Claire Marchand*

**Every year the IEC organizes and participates in a number of events, promoting IEC activities, engaging stakeholders and staying on top of the latest developments in electrotechnology and beyond. Below is a selection of events attended by Central and Regional Office management in the past 12 months.**

## **GSEP – energy solutions for the future**

IEC joined the heads of the world's leading electricity companies in discussions on the theme of innovation and the energy systems of new generation at the recent GSEP (Global Sustainable Electricity Partnership) annual summit in Moscow, Russia.

The IEC was represented by Past President Jacques Régis and Katharine Fraga Pearson, IEC Head of Governance and Global Strategy. Participating in the session "Global Energy Systems of the

New Generation" Régis said that the IEC provides a global platform that enables technologies, both existing and new, to be used in the best way for maximum performance reliability. The development of IEC International Standards, for example, for UHV (ultra-high voltage) and RE (renewable energy) helps to advance global energy systems of the new generation.

For GSEP members, future energy solutions need to address the priorities of ensuring security of supply while providing affordable energy that is sustainable and environmentally friendly. One such solution is the creation of flexible and adaptive energy systems consisting of several key elements: Smart Grids and energy storage well integrated with electricity generation and distribution systems, regional energy hubs and long-range ultra-high voltage lines.

IEC International Standards are fundamental for these innovations and other new technologies to be realized.

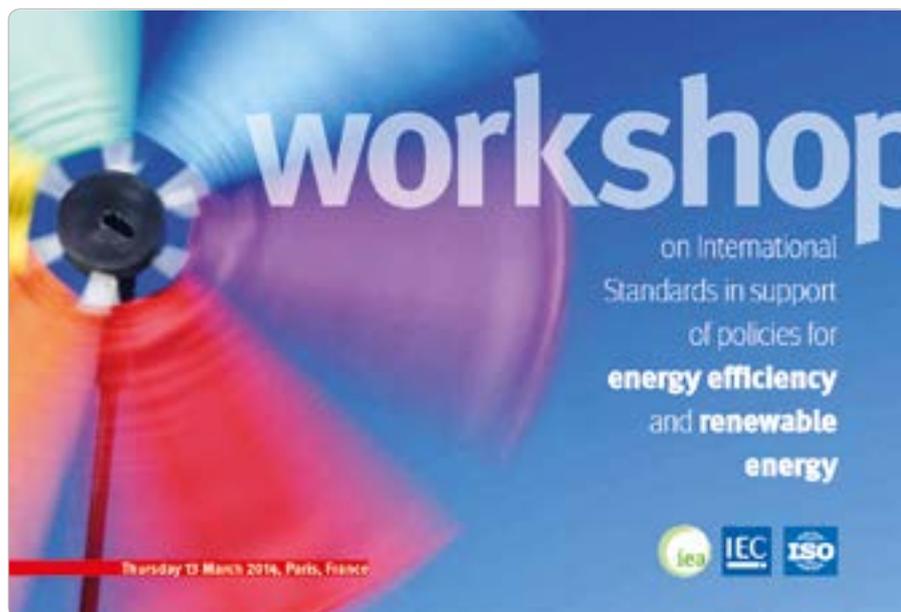
## **IEA/IEC/ISO – Meeting the energy challenge**

The IEC co-hosted a workshop, together with IEA (International Energy Agency) and ISO (International Organization for Standardization), on International Standards in support of EE (energy efficiency) and RE (renewable energy) policies. Held in Paris, France, on 13 March 2014, the workshop brought together around 100 participants – policymakers, international standardization organizations, industry and other key stakeholders – to address how they can work more closely together on these two key aspects of meeting the energy challenge.

The workshop participants stressed that only when private and public stakeholders work hand-in-hand will it be possible to put in place technology-independent decision-making processes, well-designed policies and the right technology systems. As part of these efforts, International Standards are essential to create the certainty and



*GSEP promotes sustainable energy development via electricity sector projects and training programmes for developing nations*



The IEA/IEC/ISO workshop on International Standards in support of energy efficiency and renewable energy policies brought together about 100 participants

clarity needed for market development and to allow investors to develop viable business models. In addition, a combination of effective energy policies and private sector investment in clean technologies is needed to move towards more sustainable energy systems.

#### Africa Utility Week

IEC General Secretary and CEO Frans Vreeswijk was a speaker at the 2014 African Utility Week which took place in Cape Town, South Africa, in May. The event brought together power and water professionals from over 70 countries, 30 of them in Africa.

In his speech he explained that African countries have the opportunity to do things smarter than some of the industrialized countries, which had developed their power systems in isolation. "It is of crucial importance that national grids are built and regulated in a way that allows them to connect with others, beyond borders," he said.

For Vreeswijk, the good news is that African countries are beginning to work together and that power

grids include a mix of energy, taking advantage of what is most reliable and affordable. "Several power pools are starting to cooperate. East African power pools have developed a grid code based on International Standards," he told his audience. Vreeswijk also called for more investment in off-grid small-scale electricity generation.

#### Asia-Pacific regional events

##### 37<sup>th</sup> PASC Meeting

IEC President Junji Nomura and IEC Affiliate Country Programme Leader Phuntsho Wangdi joined IEC-APRC (Asia-Pacific Regional Centre) Regional Director Dennis Chew at the 37<sup>th</sup> PASC (Pacific Area Standards Congress) meeting in Kuala Lumpur on 5-9 May 2014.

The meeting was attended by senior representatives from 19 countries in the Asia-Pacific region. One of PASC's key objectives is to facilitate collaboration between the grouping and international bodies such as IEC, ISO and ITU.

Nomura gave an update on the IEC Masterplan implementation, the Young

Professionals programme and the systems approach to standardization. The IEC Affiliate Country Programme Leader presented how the IEC is enhancing support to developing countries by introducing the IEC Mentoring Programme for Affiliates and the IEC ACAS (Affiliate Conformity Assessment Status), while the IEC-APRC Regional Director presented IEC activities in the region.

PASC encouraged its members to participate actively in the IEC Affiliate Country Programme, the IEC Young Professionals Programme and to inform the IEC-APRC Regional Director where promotional and technical support is required by member countries.

#### Asian Electronics Forum

AEF (Asian Electronics Forum), which took place in Tianjin, China, in November 2013, is an annual event where Asian electronics industry associations gather together to discuss and exchange views on important issues affecting the industry in Asia. It was the first time the IEC was invited and given an opportunity to present to the industry at the public forum section of the AEF, which was attended by more than 250 delegates. A presentation was made on the value of IEC International Standards and Conformity Assessment Systems. The IEC has been invited to the next AEF in Hong Kong in 2014.

#### EMSD Symposium

EMSD (Electrical and Mechanical Services Department), Hong Kong's regulator of electrical and electronic equipment, uses IEC International Standards and accepts IECEE CB test certificates.

In January 2014, the IEC was invited to deliver a presentation at the EMSD Symposium on Electrical & Mechanical Safety and Energy Efficiency, to create awareness and enhance confidence in IEC International Standards



Every year the IEC organizes and participates in a number of events around the world

and the IECEE CB Scheme for its stakeholders. The conference was attended by more than 300 engineers from government bodies, utilities, academia and industry.

#### **APEC and ASEAN – Dialogue at regional and national level**

The IEC regularly participates in APEC (Asia-Pacific Economic Cooperation) and ASEAN (Association of Southeast Asian Nations) fora on electrical and electronic equipment to update regulators on the latest developments in the IEC and encourage the harmonization of technical regulations based on IEC International Standards. In ASEAN, IEC International Standards are used directly or adopted as national standards in the implementation of the ASEAN Harmonized Regulatory Regime for Electrical and Electronic Equipment by 2015.

#### **Latin America regional events**

##### **Latin America Smart Grid Forum**

The Latin America Smart Grid Forum, which took place in São Paulo, Brazil

in November 2013, brought together around 400 participants. IEC-LARC Regional Manager Amaury Santos and IEC MSB (Market Strategy Board) Secretary Peter Lanctot represented the IEC.

The main objective of the event was to monitor global technological progress in the Smart Grid field, to synthesize results and to devise an action plan to create conditions for the implementation of those technologies. The plan called for the mobilization of solution providers, energy companies, regulatory and government policy agents, financial agents, consumers and society in general.

The first two days of the Forum focused on issues related to global best practices, such as regulatory and market practices and success stories, government involvement, public-private partnerships, funding sources, involving smart technology applications in critical infrastructure sectors in the entire generation, transmission, distribution and

consumption business chain. The third day was dedicated to a workshop on Public policies and incentives for the infrastructure modernization in Brazil.

The event was a great platform for Santos to apprise the audience of IEC activities in general and in the Smart Grid field in particular. In his presentation, entitled International Standards and interoperability, he gave an overview of IEC activities, its management and technical structure and, together with Lanctot, introduced the audience to the IEC Smart Grid Standards Map.

#### **Strong IEC representation at COPANT annual meetings**

In April 2014, IEC General Secretary and CEO Frans Vreeswijk, IEC Vice-President and SMB (Standardization Management Board) Chairman James E Matthews III and IECEE Executive Secretary and COO Kerry McManama joined Amaury Santos in Havana, Cuba, for a week of COPANT meetings.

In his speech at the COPANT General Assembly, Vreeswijk gave delegates an update on IEC activities and focused on how the IEC can help support sustainable economic development.

Santos participated in two workshops. The first one, on the theme *Building the Future of Standardization* in COPANT, gave him the opportunity to present the IEC Young Professionals Programme. Together with McManama, he also attended the workshop on *Strengthening the Conformity Assessment Infrastructure in the Americas*. McManama participated in a panel discussion that dealt with regional and international initiatives to enhance cooperation and ensure that conformity assessment services are available to all countries in the Americas.

# Share your work

We want your stories

*Claire Marchand*

**With 166 countries in the IEC family, more than 14 500 technical experts who work in standards development, hundreds of CBs (Certification Bodies) and TLs (Test Laboratories) in the IEC CA (Conformity Assessment) Systems, there is no shortage of stories to be told within the IEC community. In 2015, as in previous years, the e-tech editorial team will be reaching out to you to get your story.**

## Reaching a large audience

Today, *e-tech* reaches about 20 000 readers around the world. Each month the IEC publication covers a different topic that describes the work of a variety of TC/SCs and the CA Systems in that specific field. Reports on

international and regional conferences, workshops and seminars, organized by the IEC or attended by IEC representatives, are also featured.

In 2015, as in previous years, we plan to continue and increase this sharing, get your input and include articles that are of direct relevance to your area of expertise.

This is our editorial plan for the coming months of *e-tech*. We look forward to receiving your comments, news and suggestions.

## e-tech focus for 2015

### January / February

#### Multimedia & appliances

CES (Consumer Electronics Show) latest trends / wearables / appliances / smart home

### March

#### Dependability / Enclosures

EMC / protection against electric shocks / radiation instrumentation protection / dependability / safety of motor operated electric tools

### April

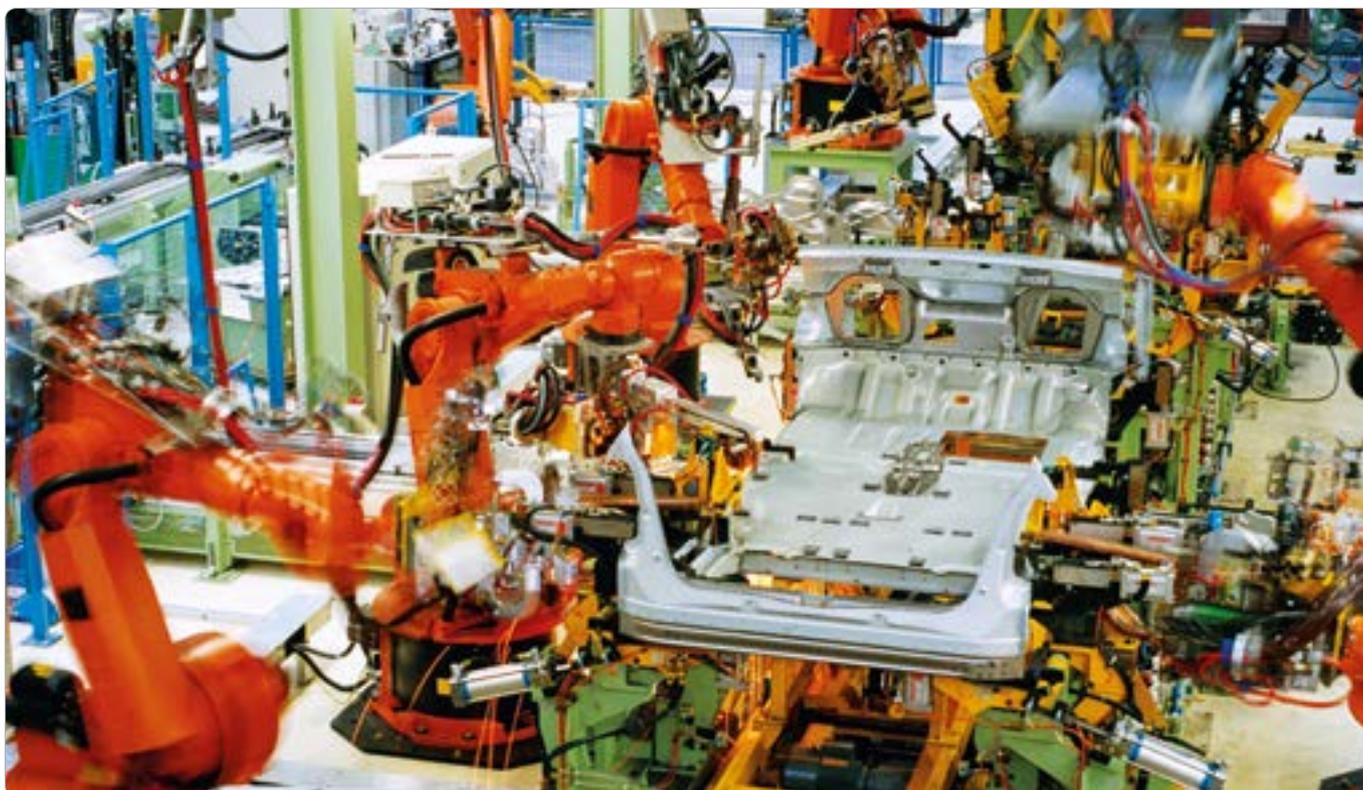
#### Transportation

Automotive industry trends / urban cable cars / ancillary equipment for industry (forklifts, etc.) / conveyor belts / extended applications for drones (search and rescue ops / agriculture / delivery services)

### May

#### Industrial automation

Smart manufacturing / robotics / cyber security / Internet of Things / Cloud / Big data / wireless sensor network



Industrial automation in May - robots welding in a car manufacturing plant



Medical equipment in July – augmented reality puts the information doctors need in front of their eyes, when they need it

**June**

**Energy**

Renewable energies (wind turbines, solar, marine, etc.) / storage / rural electrification

**July**

**Medical**

Growing electrification of medical environment / new technologies applied to medical environment

(wearables / connected devices with security implications / augmented reality, etc.) / accessibility

**August / September**

**Smart Grids, Smart Cities**

**October**

**Year in review**

From Tokyo to Minsk

**November**

**Safety and security**

Home, office, commercial and industrial environment / transportation / functional safety / airport security, access controls, biometric data / conformity assessment

**December**

**GM special + Entertainment**

Toys / robots / holiday lights and decorations / games



Safety and security in November – the use of biometrics authentication as access control is growing fast



## Equipment in public areas / GM Special

The holiday season is approaching fast. The ideal time to book tickets for a play or a musical, to take the family to see a movie, or to go to a sports arena and support your favorite hockey or basketball team. Not to forget shopping and getting ready for the many parties that are organized everywhere.

Lighting equipment in concert halls and theatres has become extremely sophisticated. New technologies, such as LEDs and lasers, have brought a new dimension to the light shows that accompany and enhance actors' and musicians' performances

Thanks to the big screens installed in huge sports arenas, the audience doesn't lose one second of the action in the field. They have the slow-motion replays to help them figure out whether the ball is in or out in a tennis game, they can see up close what emotions the players are going through. In short they can all really be part of the action.

Issue 09/2014 of *e-tech* will take a closer look at equipment in public areas. The IEC has a great number of TCs (Technical Committees) that develop International Standards for light and sound systems, for all screen types, for the signage that helps direct people in malls, arenas, theatres, stations and airports, for the sensors that detect motion and open automatic doors or get an escalator moving.

The next edition of *e-tech* will summarize much of the 2013 IEC General Meeting proceedings in Tokyo, Japan.

It will cover the President's address to Council and the IEC activity report presented by IEC General Secretary and CEO Frans Vreeswijk. Further reports will include management meetings such as SMB (Standardization Management Board), and CAB (Conformity Assessment Board) as well as an outline of the Council Open Session on the theme "Challenges of power quality". The Affiliate Forum, the Young Professionals and Industrializing Country workshops will complete the table of contents. Not to forget an extensive photo gallery of the event.





# e-tech

News & views from the IEC

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