The challenges of the electricity market, a challenge for Africa

The role of standardization and quality assurance

Background

The 2013 United Nations Economic Commission for Africa (UNECA) economic report on Africa emphasizes commodity-based industrialization as a key strategy for Africa for sustainable growth and development. The declaration of the June 2013 Conference of Ministers of Industry urges member states to promote the development of the African private sector and calls on them to mainstream renewable energy into national policies and programmes. In accord with the African Energy Commission (AFREC) Convention and the founding documents of NEPAD Planning and Coordinating Agency (NPCA) to strengthen standardization at the continental level, the declaration further recognizes the Pan African Quality Infrastructure (PAQI) as the continental platform that will contribute towards the industrialization of the continent and its sustainability. (See figure 1.)

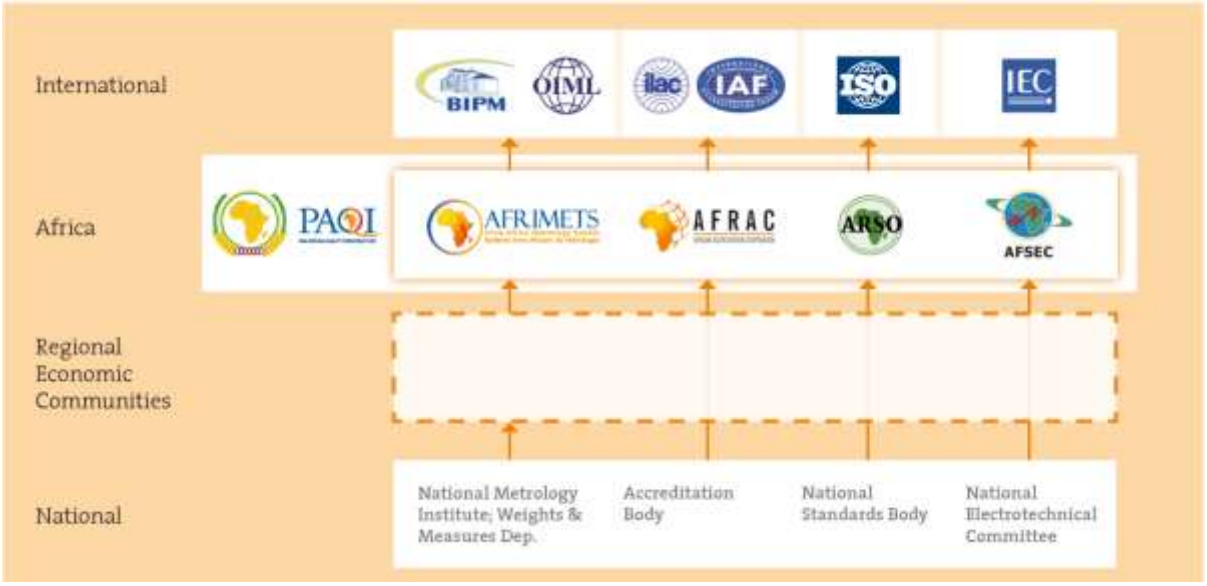

Figure 1 Pan African Quality Infrastructure

Furthermore the African Union Commission (AUC) strategic plan 2014-2017 includes many actions that have continental standardization as a prerequisite:

- Expand Intra-Africa Trade including a continental free trade area
- Global market access expanded
- Promotion of private sector development
- Acceleration of infrastructure development

In the field of electrotechnology, the African Union Commission Department for Infrastructure and Energy, via AFREC had already initiated African Electrotechnical Standardization Commission (AFSEC) in 2008, which is one of the four pillars of PAQI and has formal recognition by the International equivalent organization the International Electrotechnical Commission (IEC). The need for harmonization of the electrotechnical standards to ensure the reliable and safe operation of the evolving pan-African power grid was recognised by Union producer Distributor Electricity for Africa (UPDEA) now is Association of Power Utilities of Africa (APUA-ASEA) and this was largely the initial motivation for the formation of AFSEC, which clearly has a major role in the supporting industrialization of Africa. Without agreement on standards and application of appropriate conformity assessment systems, accelerated development of the continent is not possible.

Challenges

The framework for agreement on technical standards in developed countries was established during the first half of the 20th century. The progressive establishment of the electricity supply networks and Information and communications technology (ICT) systems in these countries was done against a background of maturing electrotechnical standards. In contrast in Africa, the infrastructure to cooperate on technical standards has been either missing or ineffective. With the exception of only a few countries, there has been little or no infrastructure established for standards to be reviewed and updated to align with international standardization; but standardization is an essential component of development. Agreement on standards to establish infrastructure, in particular the electrical and ICT networks is vital to realize the goals of the African Union's Programme for Infrastructure Development in Africa (PIDA). AFSEC has been established to provide stakeholders in the electricity supply, ICT and related industries in Africa the means to agree on the electrotechnical standards required build the infrastructure needed to develop Africa. Harmonization of standards is also necessary to conform to the World Trade Organization treaties and to promote both international and intra-Africa trade in electrotechnical products.

Many African countries do not yet have the technical infrastructure to adequately mitigate the import of non-conforming and poor quality products. As African states move towards providing their populations with increased access to electricity, the need for application of appropriate conformity assessment systems becomes increasingly important and indeed essential for the safety of new users of electricity and to create consumer confidence.

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In striving for universal access, the need for bulk supply of electrical equipment and materials is self-evident. This is both a challenge and an opportunity to increase local manufacture and create sustainable jobs. Agreement on the standards is a necessity if this opportunity is be realised.

In the process of increasing the amount of electrical energy consumed, the role of energy efficiency becomes increasingly important. Hence the need to ensure that electrical standards used for the new infrastructure and appliances contain the relevant energy efficiency requirements. The means to verify compliance, through the application of appropriate conformity assessment systems is equally important.

At the level of the continental grid, and the operation of the African power pools, and hence the trading of electricity and the creation of an Africa electricity market, agreement on standards among the individual power utilities and the regulators is essential.

The increasing needs of industry for electricity power of adequate quality and reliability creates the need for power quality measurements and hence instrumentation that is correctly calibrated. Hence the need for standards for measurement methods to be adopted and measuring instruments that can be shown to be conforming to appropriate accuracy standards.

The role of AFSEC

Standards for pan–Africa grid integration and smart grid development

AFSEC has focussed its intimal work on technical committees that mirror the work of IEC, that develop standards related to integration of the power system and the evolution of smart grids:

TC 8, System Aspects of electricity supply
TC 13, Electricity metering and load control
TC 57, Power system data Management
TC 64, Electrical installations and protection against electric shock
TC 77, Electromagnetic compatibility

The list of the first standards that were subsequently approved through the Council of AFSEC for common adoption in annex A.

Rural electrification

One of the 18 recommendations of the UNECA Conference on access to energy in rural areas is that "*Technical standards for energy service delivery and energy systems appropriate for rural areas be developed to ensure quality and efficiency"*
The same conference stressed the need for energy access to be mainstreamed in the post 2015 agenda, and that access to electricity in particular was a perquisite for achieving most of the millennium development goals.

The goal of universal access to modern energy sources by all by 2030 has been set, but the reality is that in that time frame, access to electricity via the African power grid will only be feasible for some 20% (150M) of the African population yet to have access, while mini-grid systems will cater for some 30% (275M). Hence some 50% will rely on small, stand-alone systems. Such systems in particular will need to be the subject of appropriate standards and quality assurance for them to be durable.

In 2011, AFSEC held a workshop with the aim of sharing experiences from Africa counties on application of technologies renewable energy and other technologies to give access to electricity in rural areas, and with the intention of establishing a project team to develop guidelines for rural electrification. Funding has subsequently been sources to continue this work in 2014, with the formation of a sixth technical committee mirroring the work of IEC TC 82, which has already prepared a series of specifications that can be adopted or adapted by AFSEC and referenced by the project team in preparing the guidelines.

Conformity assessment

Two capacity-building seminars have been held in Africa in collaboration with the IEC to familiarize Africa countries with specific conformity assessment systems:

In 2012: Abidjan; IECEx Conformity Assessment (CA) system, for equipment for use in explosive atmospheres. A further one is planned for September 2104, for the mining industry, to be hosted in D R Congo.

In 2013: Nairobi; IECEE conformity assessment system, focusing on specific electrical and electronic equipment in common use.

AFSEC will establish its Conformity Assessment Committee later in 2014, which should lead to concrete recommendations on how Africa States can begin to further collaborate on the practical application of existing CA systems such as those developed by IEC.

Benefits

In the field of electrotechnology, AFSEC is paving the way for agreement on harmonised standards, and conformity assessment at a continental level, leading to increased quality, consumer confidence, reliability of supply, increased access to electricity, clean energy, etc. Through AFSEC, agreement of the standards required to establish an integrated electricity market, through the interconnections of the Africa power pools will lead to increased securing of and reliability of supply. It further provides a platform for sharing of technical know-how at level of the African continent.

Thus AFSEC supports accelerated industrial and infrastructure development, meeting the existing and future needs of a 21st century Africa. Reduction of poor quality imports, increasing in intra-Africa trade in electrotechnical equipment and support services, such as testing and quality assurance will result.

Risks to be addressed

While the essential need for the work of AFSEC is clearly demonstrated, there are significant risks to its sustainability and effectiveness.

Since inception, despite some start up financial support from AFREC, AFSEC has relied on financial support from the payment of membership fees, and support in kind from South Africa and the organisations of the President and Vice Presidents.

It has yet to establish a permanent secretariat and headquarters. Negotiations for the establishment of AFSEC's headquarters in South Africa have been proposed, but as yet the outcome of any such negotiations is uncertain.

It is also necessary to identify and find the necessary financial support for a successor for the current Executive Secretary, who will complete a second and final 4-year term in 2016.

The technical work of AFSEC relies of the members allowing technical experts to give of their time to the technical committee work and to cover their travel and accommodation expenses when physical meetings are required. All African states are financially constrained, and such funding is not always available. This limits the amount of work and number of technical committees that can be effective.

Annex A

IEC standards approved for common adoption by AFSEC members

IEC 62052-11 - Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment

IEC 62053-11 - Electricity metering equipment (a.c.) - Particular requirements - Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)

IEC 62053-21 - Electricity metering equipment (a.c.) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)

IEC 62058-11 - Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods

IEC 62058-21 - Electricity metering equipment (AC) - Acceptance inspection - Part 21: Particular requirements for electromechanical meters for active energy (classes 0,5, 1 and 2)

IEC 62058-31 - Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)

IEC 62056-21 - Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange

IEC 62056-5-3 - Electricity metering data exchange - The DLMS/COSEM suite - Part 5-3: DLMS/COSEM application layer

IEC 62056-6-1 - Electricity metering data exchange - The DLMS/COSEM suite - Part 6-1: Object Identification System (OBIS)

IEC 62056-6-2 - Electricity metering data exchange - The DLMS/COSEM suite - Part 6-2: COSEM interface classes

IEC 62055-31 - Electricity metering - Payment systems - Part 31: Particular requirements - Static payment meters for active energy (classes 1 and 2)

IEC 62055-41 - Electricity metering - Payment systems - Part 41: Standard transfer specification (STS) - Application layer protocol for one-way token carrier systems

IEC 62055-51 -Electricity metering - Payment systems - Part 51: Standard transfer specification (STS) - Physical layer protocol for one-way numeric and magnetic card token carriers

IEC 61439-1 - Low-voltage switchgear and control gear assemblies - Part 1: General rules

IEC 61439-2 - Low-voltage switchgear and control gear assemblies - Part 2: Power switchgear and control gear assemblies

IEC 61140 - Protection against electric shock - Common aspects for installation and equipment

IEC 61970 [all parts] - Energy management system application program interface (EMS-API)

IEC 61850 [all parts] - Communication networks and systems in substations