ENERGY COOPERATION BETWEEN THE EU, THE LITTORAL STATES OF THE BLACK & CASPIAN SEAS AND THEIR NEIGHBOURING COUNTRIES

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Harmonization of Standards for Small HPP equipment and Standard used by Testing and Certification Laborities (AHEF63AM)

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Abbreviations

AB	Accreditation Body
CA	Conformity Assessment
CB-FCS	CB Full Certification Scheme
CE	European Conformity
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
DoC	Declaration of conformity
EEA	European Economic Area
EU/EC	European Union/European Commission
GOST	State Union Standards (Russian)
HPP	Hydropower Plant
IEC	International Electrotechnical Commission
IECEE	IEC System of conformity assessment schemes for electrotechnical equipment and components
ISO	International Standardisation ~~Orginasation~~Organisation
LVD	Low voltage Directive
MENR	Ministry of Energy and Natural Resources
NANDO	New Approach Notified and Designated Organisation
PC	Partner Country
PSRC	Public Services and Regulatory Commission
QMS	Quality Management Systerm
RES	Renewable Energy Sources
SHPP	Small hydropower Plants
UK	United Kingdom
UKAS	United Kingdom Accreditation Service

Executive Summary

Standards enable access to markets and build trust, ensure good practice, increase competitiveness, protect consumers, improve efficiency and reduce risk. They enable technology transfer among countries. Standards should work together with the policies and regulations of companies, countries and regions and where they are incompatible, consensus-building is essential to adopt and accept standards.

The lack of harmonisation of codes and practices in the electricity and gas sector are major obstacles to the convergence of energy markets between the EU and INOGATE Partner Countries (PCs). The old Soviet system, based on GOST standards, is being replaced by a new, voluntary system of standards which will reflect more fully the national standards of a country as used by its industry and its various stakeholders. Harmonisation with EU and International standards requires the adoption of new standards, amendment of existing technical regulations and development of new secondary legislation.

The Ministry of Energy and Natural Resources (MENR) in Armenia is keen to implement standards for hydropower in the near future. The objective of this report is to discuss ways in which to approach this, as well as looking at EU country experience in this area.

The overall objective of the assignment is to assist MENR of Armenia in the identification of European and international standards and best practice which will increase the efficiency of the Hydropower Plant (HPP) infrastructure in the country, providing more electricity and increasing their competitiveness in the sector, and the harmonization of their infrastructure to that used in Europe.

The specific objectives of the task are:

- To review relevant EU and International standards and best practice for increasing hydropower infrastructure;
- To analyse the existing regulations and rules for HPP in the country and to look for ways to harmonize the infrastructure to that used in Europe so that generation becomes export oriented and generates higher value;
- To report on international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;
- To assess the experience for mandatory application of standards in a EU member country (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);
- To list the testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards;
- To report on EU mechanisms and procedures required for the global recognition of the accredited labs;
- To ensure communication between the experts and the beneficiary to support good collaboration and achieving results in line with the priorities of the country and which will be used and adopted by the country.

Comment [C1]: mainly UK

The request for support builds on an already existing legislative framework for energy and renewable energy sources (RES), and a mature HPP sector, with the aim of increasing the efficiency of infrastructure based on European and international standards. The adoption and use of these standards would also support Armenia to export their HPP technology in Europe, with longer term results.

Assistance provided by this assignment will strengthen the capacity of the MENR in the areas of HPP standardization and it is also expected to trigger the discussion for consultation with relevant stakeholders on an agreed set of principles provided by the review of EU practices.

An overview of best EU and International standards and best practice for increasing hydropower infrastructure, which can also be used in other INOGATE Partner Countries, as they are all looking to increase the amount of power exported to the EU.

The programme will have the following impacts

- Increased knowledge of EU standards for hydropower generation, transmission and distribution, currently unknown in the country;
- An increase in the amount of power generated from hydropower in Armenia, available for the country itself and to be exported to the EU;
- The creation of an enabling environment for increased harmonization of international and European standards for energy generated from hydropower;
- Development of coherent policies, strategies and effective coordination within and across sectors;
- Armenia will have an increase in the efficiency of organisational structures, processes, resources, and management and governance issues affecting energy generated from hydropower production;
- The skills and/or ability to contribute to the realisation of harmonization of EU standards in Armenia are strengthened.

1 Rationale

Armenia is in the course of advanced discussions with the EU on implementation of European and international standards and best practice in country. In parallel there are on-going discussions on the possible upgrade of Armenia from an Observer status to the Energy Community (EnC) Treaty to a signatory member.

Comment [C2]: Is this still the current position?

In particular, the country has taken concrete steps to make renewable energy development part of its energy law and energy strategy. The 2004 Law on Energy Saving and Renewable Energy is the main legal act on renewable energy in Armenia and whose goals are to:

- Strengthen economic and energy independence and security of Armenia
- Increase the reliability of energy systems in Armenia
- Establish and develop industrial infrastructure and service organizations for promoting energy saving and renewable energy (RE)
- Reduce adverse impacts on the environment and human health as a result of technological developments.

In order to support the country's efforts in Renewable Energy, the INOGATE Technical Secretariat project has provided assistance to the Ministry of Energy and Natural Resources (MENR) in the identification of European and international standards and best practice which will increase the efficiency of the HPP infrastructure in the country, providing more electricity and increasing their competitiveness in the sector and the harmonization of their infrastructure to that used in Europe.

A Senior Energy Expert, Dr Joanta Green, and a Junior Energy Expert, Mr Sergey Abrahamyan, have undertaken the following activities:

- Reviewed relevant EU and International standards and best practice for increasing hydropower infrastructure;
- Analysed existing regulations and rules for HPP in the country and looked for ways to harmonize the infrastructure to that used in Europe so that generation becomes export oriented and generates higher value;
- Reported on international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;
- Assessed the experience for mandatory application of standards in an EU member country (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);
- Provided a list of testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards;
- Reported on EU mechanisms and procedures required for the global recognition of the accredited labs.

1.1 Observations on the assignment

The MENR and the Public Services and Regulatory Commission (PSRC) have stated that hydropower standards will be mandatory for new construction. They wish to implement the minimum technical specifications for SHPP to improve energy efficiency in ~~at~~ generation, and requested a cost benefits analysis for the introduction of mandatory standards as well as case studies to show experiences in EU member countries. It appears that Armenia will be the first country in the Caucuses to implement some European and international standards for hydropower.

The MENR has also requested information on how to support certifying laboratories that may be interested in opening an office in Yerevan to handle the certification of locally produced turbines, generators and control systems.

1.2 Scope of work

The scope of work for the delivery of this activity was expected to be the following:

- To prepare a comprehensive analysis based on published studies and previous relevant studies which will be compiled by the experts and presented to the MENR. The report will identify European and international standards and best practice which will increase the efficiency of the HPP infrastructure in the country.
- A consultation and data collection mission in which the MENR will be able to provide feedback and on the EU practices review and discuss with the experts on the adaptability of EU practices in the Armenian context. During the same visit and after the feedback provided by MENR and experts team will be able to hold meetings with the relevant stakeholders. This is to ensure communication between the experts and the beneficiary to ensure a good collaboration and achieving results in line with the priorities of the country and which will be used and adopted by the country.
- To develop international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;
- A report which is an assessment of experience in mandatory application of standards in a EU member countries (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);
- A list of testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards;
- A report on EU mechanisms and procedures required for the global recognition of the accredited labs.

2 Background on the EU and Technical Standards

Comment [C3]: Something wrong with PAGE NUMBERING - not in sequence - Nikos you need to spot this before me.

The European Union has established four **fundamental principles**:

- legislative harmonisation is limited to essential safety requirements (or other requirements in the general interest) with which products put on the market must conform and can therefore enjoy free movement throughout the European Union;
- the task of drawing up technical production specifications is entrusted to organisations competent in industrial standardisation, which take the current stage of technology into account when doing so;
- these technical specifications are not mandatory and maintain their status of voluntary standards;
- the authorities are obliged to recognise that products manufactured in conformity with harmonised standards are presumed to conform to the essential requirements established by the **Directive 98/34/EC**. If the producer does not manufacture in conformity with these standards, he has an obligation to prove that his products conform to the essential requirements.

Two **conditions** have to be met in order that this system may operate:

- the standards must guarantee the quality of the product;
- the public authorities must ensure the protection of safety (or other requirements envisaged) in their territory. This is a necessary condition to establish mutual trust between Member States.

The Commission issues **standardisation mandates** to the European standardisation organisations. Agreements between the Commission and these organisations ensure that they are carried out in accordance with the general guidelines. In the absence of European standards, national standards are verified by a procedure at European level managed by the Commission, which is assisted by a standing committee composed of officials from national administrations. Safeguard procedures are provided for in order to allow the national authorities the possibility of contesting the conformity of a product or the quality of a standard.

The scope of a Directive is defined by the wide product categories and/or types of risk it encompasses.

2.1 Outline of a "new approach" Directive

Member States have the responsibility of ensuring the **safety** on their territory of persons, domestic animals and goods. The provisions ensuring such protection must be harmonised in order to ensure the free movement of goods, without lowering existing levels of protection in the Member States.

The European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC) are the competent bodies to adopt European harmonised standards within the scope of the Directive. For specific sectors of industrial activity, other competent European bodies for the drawing up of technical specifications could be involved.

The definition of the range of products covered, as well as the nature of the hazards it is intended to avert, should ensure a consistent approach. This does not preclude the possibility of several Directives being adopted for the various types of hazard associated with the same category of product.

The products covered by a Directive may be placed on the market only if they do not endanger the safety of persons, domestic animals or goods. The Directives provide for total harmonisation as a general rule - i.e. that only products which conform can be placed on the market.

The Directive should contain a description of the safety requirements with which all products covered by the Directive must conform. It should be worded precisely enough in order to create, on transposition into national law, legally binding obligations which can be enforced.

Free movement of the product in question is ensured, without recourse to prior verification of compliance with the essential requirements.

The Member States presume conformity for products which are accompanied by one of the means of attestation described in the Directive declaring that they are in conformity either with the harmonised standards or, in the absence of harmonised standards, with national standards. Where a Member State considers that a harmonised standard does not satisfy the essential requirements, the Commission shall bring this to the attention of the Committee on Standards and Technical Regulations which gives an opinion as a matter of urgency. In the light of this opinion, the standard can be maintained, withdrawn or revised.

Should a Member State find that a product might compromise the safety of individuals, domestic animals or property, it takes all appropriate measures to withdraw or prohibit the placing on the market of the product in question. The free movement of the product can be restricted, even if it is accompanied by an attestation of conformity. If this is the case, the Member State informs the Commission of such a measure, indicating the reasons for its decision. The Commission enters into consultation with the Member States and the standing committee. If the action is felt to have been justified, the Commission informs the Member States who are obliged to prevent the product in question from being placed on the market.

The **means of attestation** which the trade may use are:

- certificates and marks of conformity issued by a third party;
- the results of tests carried out by a third party;
- the declaration of conformity issued by the manufacturer, which may be coupled with a surveillance system;
- other means of attestation which could possibly be determined in the Directive.

The national bodies authorised to issue marks or certificates of conformity are notified by the Member State to the Commission and to the other Member States. They must carry out their duties in accordance with International Standardisation Organisation (ISO) principles and practices. The Member States are responsible for controlling the operation of these bodies. The national authorities have the right to ask the manufacturer to provide them with the data relating to the safety tests

carried out when they have doubts about its conformity with safety requirements. Any manufacturer may prove, by any means he sees fit within the framework of a dispute or court proceedings, the conformity of the product.

The Sectoral Directives Standing Committee is made up of representatives appointed by the Member States who may avail themselves of the help of experts or advisers. The tasks of the committee are concerned with the implementation of the Directive. The Committee constitutes a forum for discussing any possible objections, but is not intended to carry out a systematic examination of the entire contents of the standards.

Criteria for selecting the areas in which the "general reference to standards" could be applied:

- since it is only the essential requirements which are to be harmonised, it should be possible to distinguish between essential requirements and manufacturing specifications;
- the area concerned must be covered by standardisation (or the need for regulations is felt unanimously throughout the Community);
- most of the Directives adopted concern the three areas of motor vehicles, metrology and electrical equipment. The new approach should thus initially concentrate on other areas;
- the possibility of settling, with the adoption of a single Directive, all the problems concerning regulations for a large number of products, without the need for frequent amendments or adaptations to that Directive (based mainly on practical and labour-saving considerations). Consequently, the selected areas should be characterised by a wide range of products which are sufficiently homogeneous to allow common "essential requirements" to be defined.

3 Benefits of Standards

Attached in Appendix F are Case Studies on the Economic Benefits of Standards published by ISO. To summarize the report, the benefits are as follows:

- **Key benefit 1 : Streamlining internal operations**

  One main finding is that standards can be used to streamline the internal processes of a company, for example by reducing the time needed to perform specific activities in the various business functions, decreasing waste, reducing procurement costs and increasing productivity. The case studies consistently report that the contribution of standards to the gross profit of companies ranges between 0.15 % and 5 % of the annual sales revenues.

- **Key benefit 2 : Innovating and scaling up operations**

  Some case studies provide examples where standards served as the basis for innovating business processes, allowing companies to expand their suppliers' network or to introduce and manage new product lines effectively. In other instances, standards helped mitigate the risk to companies of introducing new products onto national markets.

- **Key benefit 3 : Creating or entering new markets**

  Standards have been used as the basis for developing new products, penetrating new markets (both domestic and export), supporting the market uptake of products, and even creating markets. In exceptional cases, the impact of standards far exceeded the figure mentioned above, with companies achieving a gross profit contribution of up to 33 % of their annual revenue, which helped them position themselves as leaders in their field, at least over a certain period of time.

In addition to ISO, there is the IEC (the International Electrotechnical Commission), the world's leading organization in the preparation and publication of International Standards for all electrical, electronic and related technologies, and UNIDO (the United Nations Industrial Development Organization), which has extensive experience in setting up testing laboratories in a variety of fields.It prepares and publishes International Standards for all electrical, electronic and related technologies.. IEC International Standards cover a vast range of technologies, from electric vehicles (EVs), renewables, and power generation, transmission and distribution systems, including smart grids.—to mention just a few. Fundamental to the application of the IEC International Standards is the process of conformity assessment (CA)—the determination that equipment, systems and components conform to the standards. IEC International Standards are used for all types of conformity assessment—first-, second- and third-party—and the IEC operates three conformity assessment systems that provide third-party programmes to ensure the safety, reliability and performance of products and systems.

IECEE, the IEC System of conformity assessment schemes for electrotechnical equipment and components, is a truly international conformity assessment system. Its flagship scheme, the IECEE CB Scheme, based on the member national certification bodies' (NCBs) recognition of each other's test results, opens up access for products to the global market. Products tested and certified in one country will be accepted in all other IECEE member countries. The IECEE CB Scheme provides assurance that tested and certified products meet the strictest levels of safety, reliability and performance, as required by the IEC International Standards. It helps to reduce costs and time to market, eliminates duplicate or multiple testing, and offers a high level of confidence for manufacturers, retailers and consumers alike. Nor is acceptance of the CB Scheme confined to its member countries: through the CB Test Certificates and the associated CB Test Report, the Scheme is also accepted in countries that are not part of the IECEE community.

A CB Test Certificate is a global passport for electrical products. IECEE is also the exclusive provider of the PV (photovoltaic) Quality Seal and Quality Mark and, when there is a need, offers new services to meet specific demands from industries and governments worldwide who have to engage with ongoing technological innovations and emerging environmental issues. In addition to the safety aspects, the IECEE System operates and provides services related to electrical energy efficiency, called the E3 Programme. This programme ensures that products are compliant with energy consumption, performance and noise-level requirements.

The IECEE System also operates the CB-FCS (Full Certification Scheme) that is based on ISO/IECSystem 5. This scheme is the most comprehensive in that it includes factory surveillance, follow-upservices, retesting and market control in addition to type testing. This is of considerable value tomanufacturers: CB-FCS provides proof that each product from a certified factory offers consistentlevels of quality and safety over time. With the CB-FCS, a manufacturer can complete all the certification and factory surveillance steps in the country in which the factory operates. These include product sampling and testing, assessment and surveillance of assembly lines and management processes, and ongoing surveillance through regular resampling and retesting of products, both at the factory and in the market place. All members participating in the CB-FCS mutually recognize the CB-FCS Conformity Assessment Certificates (CACs) and associated Conformity Assessment Reports (CARs), including Factory Surveillance Reports, as the basis for national approval or certification in their own countries.

The CB-FCS also helps to reduce trade barriers caused by the application of different national certification criteria and speeds up certification and market access.Factory Surveillance Reports can be used as stand-alone proof that the factory location and the relevant assembly line meet the requirements of the scheme in terms of the process conformance and consistency needed to build certified products in compliance with the product standards.

IECQ, the IEC quality assessment system for electronic components, provides certification at the international level for a wide variety of electronic components. At present, eight families of componentsare covered by IECQ:

- Active components, including integrated circuits
- Electromagnetic components
- Electromechanical components
- Electro-optic components
- Hybrid integrated circuits
- Passive components
- Printed boards
- Wires and cables

In addition, it covers the processes and related materials that are used in making electronic components and assemblies. IECQ is continuously expanding to address industry's needs: hazardous substances and avionics, for example, and, more recently, electrostatic discharge (ESD). Concern for the environment and the need to eliminate hazardous waste prompted IECQ to devise a new scheme in 2005 to help electronic component suppliers prove that their products comply with the requirement that they are free of hazardous substances. Since then, the IECQ HSPM (Hazardous Substances Process Management) has grown enormously. Many countries have passed legislation restricting the use of hazardous substances in electrical and electronic products.

The European Union Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment, commonly known as Restrictions of Hazardous Substances (RoHS), and its Waste Electrical and Electronic Equipment (WEEE) Directive took effect in July 2006

and are currently being revised. Through IECQ HSPM certification, electronic component manufacturers and suppliers can demonstrate that their electrical and electronic components and assemblies meet specific hazardous-substance free local, national and international requirements. As with all IECQ certificates, these are recognized in all IECQ member countries and beyond, thus helping to reduce costs and time to market and eliminating the need for multiple testing.

EGP

4 EU and International Requirements for Laboratory Accreditation

If Armenia would like to set up its own testing and certifying laboratories, then any laboratory will have to meet the accreditation criteria. **ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories** is the main ISO standard used by testing and calibration laboratories. In most major countries, ISO/IEC 17025 is the standard for which most labs must hold accreditation in order to be deemed technically competent. In many cases, suppliers and regulatory authorities will not accept test or calibration results from a lab that is not accredited. Originally known as ISO/IEC Guide 25, ISO/IEC 17025 was initially issued by the International Organization for Standardization in 1999. There are many commonalities with the ISO 9000 standard, but ISO/IEC 17025 is more specific in requirements for competence. And it applies directly to those organizations that produce testing and calibration results. Since its initial release, a second release was made in 2005 after it was agreed that it needed to have its quality system words more closely aligned with the 2000 version of ISO 9001. Please see Appendix A for a summation of the relevant standards.

The standard was first published in 1999 and on 12 May 2005 the alignment work of the ISO/CASCO committee responsible for it was completed with the issuance of the reviewed standard. The most significant changes introduced greater emphasis on the responsibilities of senior management, and explicit requirements for continual improvement of the management system itself, and particularly, communication with the customer.

The ISO/IEC 17025 standard itself comprises five elements that are Scope, Normative References, Terms and Definitions, Management Requirements and Technical Requirements. The two main sections in ISO/IEC 17025 are Management Requirements and Technical Requirements. Management requirements are primarily related to the operation and effectiveness of the quality management system within the laboratory. Technical requirements includefactors which determine the correctness and reliability of the tests and calibrations performed in laboratory.

Laboratories use ISO/IEC 17025 to implement a quality system aimed at improving their ability to consistently produce valid results. It is also the basis for accreditation from an accreditation body. Since the standard is about competence, accreditation is simply formal recognition of a demonstration of that competence. A prerequisite for a laboratory to become accredited is to have a documented quality management system. The usual contents of the quality manual follow the outline of the ISO/IEC 17025 standard.

4.1 Predecessors

Some national systems (e.g. UKAS M10 in the UK) were the forerunners of ISO/IEC 17025:1999 but could sometimes be exceedingly prescriptive. ISO/IEC 17025 allows laboratories to carry out procedures in their own ways, but an auditor (*assessor*) may require the laboratory to justify using a particular method.

A notable predecessor was the European standard EN 45001, which was withdrawn after ISO/IEC 17025 was published and adopted as *EN ISO/IEC 17025*.

In common with other ISO quality standards, ISO/IEC 17025 requires continual improvement. Regular internal audits are expected to indicate opportunities to make the test or calibration better than it was. Additionally, the laboratory will be expected to keep abreast of scientific and technological advances in relevant areas.

In common with other accreditation standards of the ISO 17000 series (and unlike most ISO standards for management systems), third party auditing (*assessment*) of the laboratory is normally carried out by the national organization responsible for accreditation. Laboratories are therefore *accredited* under ISO/IEC 17025, rather than *certified* or *registered* (c.f. ISO 9000 series).

In short, *accreditation* differs from *certification* by adding the concept of a third party (Accreditation Body (AB)) **attesting to technical competence within a laboratory** in addition to its adherence and operation under a documented quality system, specific to a Scope of Accreditation.

A **quality management system** (QMS) is a collection of business processes focused on achieving quality policy and quality objectives — i.e. what your customer wants and needs.It is expressed as the organizational structure, policies, procedures, processes and resources needed to implement quality management. Early systems emphasized predictable outcomes of an industrial product production line, using simple statistics and random sampling.

The elements of a quality management system are:

1. Quality Policy
2. Quality Objectives
3. Quality Manual
4. Organizational structure and Responsibilities
5. Data Management
6. Processes - including purchasing
7. Resources - including natural resources and human capital
8. Product Quality leading to Customer satisfaction
9. Continuous Improvement including Corrective and preventive action
10. Maintenance
11. Sustainability - including efficient resource use and responsible environmental operations
12. Transparency and independence audit

5 Exisiting Regulations for Hydropower in Armenia: Normative-legal regulations

5.1 General

In the Republic of Armenia the sphere of small hydro power is regulated by the following legal and other acts:

- Republic of Armenia Energy Law,
- Law of Republic of Armenia on Energy Saving and Renewable Energy,
- National Program on Energy Saving and Renewable Energy,
- The Action Plan of the Government of the Republic of Armenia Aimed at the Implementation of the National Program on Energy Saving and Renewable Energy,
- Energy Security Concept of the Republic of Armenia,
- Decisions of Public Services Regulatory Commission concerning tariffs ofelectricity produced by small power plants.

In the above mentioned documents the importance of small hydro power development is highlighted for the Republic of Armenia in the absence of fossil energy resources and as a region in hard geopolitical conditions.

The sphere is regulated by the following normative documents:

- Technical regulations on “Operation of Power Plants and Networks”, implemented the Standards of the former Soviet Union and Russian Standards,
- Republic of Armenia Standard HST 281-2007 on “Conditions of connecting of small power plants (of up to 10 MW) to Electrical Power System”,

There are currently 154 small HPPs operating in Armenia, with 68 other power plants under construction.In 2013,over 757 million kWh of electrical energy wasproduced by SHPPs.

In spite of these achievements, there are several problems to be solved, one of which is the problem of legal-normative regulation.

The equipment of small HPPs is mostly imported (from China, Russia, etc.). However, in Armenia there is also a hydro turbine production factory and a considerable part of operating SHPPs are equipped with hydro units produced in that factory.

Both the imported and the produced hydro turbines, hydro generators and control systems don’t pass testing and compliance assessment procedures. There are no corresponding normative documents, standards or testing laboratories in the country, and arranging for this to be carried out outside the countryinvolves agreat financial expense.

Except that, for all the operating SHPPs there are specified license terms, after the expiry of which the issue of appropriateness or necessity of the further operation of the power plant becomes indefinite.

One of the objectives of the work carried out in this activeity was to support the development of regulatory measures and procedures for the planning, construction and operation stages of SHPPs in Armenia.

5.2 Approaches

In legal regulations the following shall be provided and used:

- similar approaches for imported and locally produced hydro units and their components,
- general requirements and technical conditions:
  - for new SHPPs under planning and construction,
  - for SHPPs under operation,
  - for SHPPs under reconstruction and/or upgrading,
  - for SHPPs decommissioned after license expiration,
- requirements regarding implementation of energy saving technologies,
- requirementsregarding provision of compliance assessment and certification, according to the statements of the Republic of Armenia Law on Technical Regulations.

5.3 Overview of the current legal framework

- The Law of the Republic of Armenia on Energy Saving and Renewable Energy has been subjected to changes and facilitates the implementation of policiestargetingregulation in the sphere of SHPPs.
- The Law of the Republic of Armenia on Technical Regulation was adopted in 2012, in the framework of negotiations for Armenia's association with the European Union, and is fully harmonized with legislation of the European Union.The new law includes provisions on compliance assessment order, procedures and issuance of certificates of compliance.
- Technical regulations on "Operation of Power Plants and Networks" are the same as the Russian technical regulations of theformer Soviet Union. In case of the new approach they don't correspond to the requirements of technical regulations, however they can be used for issues concerning hydropower plant equipment testing terms and order.
- The list of standards related to renewable energy provided by the expert ~~Joanta Green~~ has been observed and those concerning Small Power Plants have been chosenfrom the HPP standards.

The standards of the Russian organization RAO ES have been included, the application of which is mandatory for all business entities operating within the organization.

The suggested list of standards is providedin Appendix D.

Table 1: Russian standards of the organization ("RAO ES" Company)

STO 17330282.27.140.015-2008	Hydro Power Plants. Organization of operation and maintenance. Norms and requirements
STO17330282.27.140.018-2008	Hydro turbine installations. Conditions of supply. Norms and requirements
STO 17330282.27.140.001-2006	Methods of evaluation of technical conditions of the main equipment of hydropower plants
STO17330282.27.140.001-2006	Methods of evaluation of technical conditions of the main equipment of hydropower plants, 2ndpart. Annexes«А» - «Ш»
GOST 28842-90	Hydraulic turbines. Methods of full-scaleacceptance testing.

6 UK experience with Hydropower Standards

6.1 Case Study

There are no specific UK regulations on standards and certification for hydropower equioment such as control systems and generators. The Energy Expert was referred to the more general requirements for components used in electricity production.

6.1.1 Manufacturing Electrical Equipment

If manufacturing electrical equipment, one must comply with the Electrical Equipment (Safety) Regulations 1994. These implement into UK law the European Council Directive 2006/95/EEC - commonly referred to as the Low Voltage Directive (LVD).

The aim of these regulations is to ensure that electrical equipment designed for use within certain voltage limits is safe to use. This guide covers all the main points of the regulations - including which electrical equipment is affected, definition of electrical equipment, safety requirements and how to comply.

If a business manufactures electrical equipment

The Electrical Equipment (Safety) Regulations 1994 apply to businesses~~.~~ which ~~if you~~ manufacture electrical equipment designed or adapted for use between 50 and 1,000 volts (in the case of alternating current) or 75 and 1,500 volts (in the case of direct current).

The regulations cover domestic electrical equipment and equipment that is intended for use in the workplace, except electrical equipment described in Schedule 2 of these regulations.

Components

The regulations apply to electrical equipment. In general, components are not covered by the regulations. Only components which are in themselves electrical equipment need to satisfy the requirements of the regulations and, in particular, bear European Conformity (CE) marking.

The term electrical equipment is not defined in the regulations and should therefore be given the ordinary dictionary meaning. Electrical is defined as “operated by means of electricity” or “of pertaining to electricity”.

Equipment is defined as “apparatus” which is in turn defined as “the things collectively necessary for the performance of some activity or function”. An item is only subject to the requirements of the regulations if it is electrical equipment so defined.

Electrical components

Certain components of electrical equipment may in themselves be considered to be electrical equipment. In such cases, steps should be taken to ensure that they satisfy the requirements of the regulations - if they are to be supplied as separate items. This includes supply for retail sales and to other manufacturers for incorporation into other electrical equipment.

Non-electrical components

Components which are not in themselves electrical equipment do not fall within the scope of the regulations. However, the regulations do require electrical equipment to be safe and therefore the components in it should not render it unsafe.

What are the responsibilities as an electrical equipment manufacturer?

The manufacturer is the person - whether established in the European Economic Area (EEA) or not - who is primarily responsible for designing and manufacturing equipment so that it complies with the safety requirements of the Electrical Equipment (Safety) Regulations 1994.

All electrical equipment must be:

- safe - there should be minimum risk that the electrical equipment will cause death or personal injury to any person or domestic animal, or damage to property
- constructed in accordance with good engineering practice in relation to safety matters
- designed and constructed to ensure that it protects against electric shock through protective earthing, double insulation or equivalent
- designed and constructed to conform with the principal elements of the safety objectives, which are in Schedule 3 of the regulations

Electrical equipment which is constructed to meet the safety provisions of one of the following, in an accepted hierarchy of standards and requirements, will be presumed to comply with the safety requirements of the regulations:

- harmonised - agreed by the national standards bodies of all the EU member states
- international - where no harmonised standard exists, a standard published by the International Electrotechnical Commission, which includes the relevant safety objectives of the regulations, details of which have also been published by the European Commission in its official journal
- national - a published British standard or a published standard of the member state of the manufacturer, where no harmonised or international standard exists

Electrical equipment that doesn't meet any of the accepted hierarchy of standards, perhaps because it is an innovative product, must still comply with the basic requirement to be safe.

Once you are satisfied that your product meets the requirements of the regulations, you should affix CE marking to the equipment. Or, where that's not possible - to the packaging, the instruction sheet or the guarantee certificate.

You should also draw up a EC Declaration of Conformity (DoC) and compile technical documentation.

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Comment [C5]: the use of "you" is not really appropriate in a report like this. Better professional English needs to be used.

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Notified bodies

Where electrical equipment has not been manufactured to comply with one of the recognised standards, suppliers may want to have the equipment assessed for safety by a notified body.

Notified bodies and the Electrical Equipment (Safety) Regulations 1994

Notified bodies are appointed by EU member states to support the implementation of certain Directives, including the LVD. The Secretary of State for Business, Innovation & Skills has appointed a number of test laboratories to act as the UK's notified bodies for the LVD.

These notified bodies have been assessed to ensure their competence in determining whether or not a product complies with the requirements laid down in Schedule 3 of the Electrical Equipment (Safety) Regulations 1994. They are appointed to provide opinions or reports on safety, or both.

Reports on safety

The use of notified bodies to draw up a safety report for the manufacturer is not mandatory. However, where electrical equipment has not been constructed to conform to the specifications of any of the recognised standards, suppliers may feel that in some circumstances it is in their best interests to have a safety report drawn up.

In the event that your product is challenged on grounds of safety by an enforcement authority, this report can be used to establish whether the equipment satisfies safety requirements.

Opinions

The EC may seek an opinion from a notified body where the safety of a product, subject to an enforcement action, is in dispute - and there is a disagreement between member states that cannot be resolved within the time limits specified.

There is a list of LVD notified bodies with the EC NANDO (New Approach Notified and Designated Organisations) Information System on the Europa website.

The list can be sorted by country or by notified body name by clicking on the column headings. Please note that UK-based companies are not restricted to using UK notified bodies.

Technical documentation and the EC DoC under the LVD

As a manufacturer, you are responsible for ensuring the electrical equipment you make meets the safety requirements, and for declaring this. This includes three main elements - technical documentation, EC DoC and affixing a CE mark.

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Technical documentation

It is your responsibility to put together technical documentation for your electrical products before placing them on the market.

These technical documents enable the enforcement authorities to assess whether your equipment meets the requirements of the Electrical Equipment (Safety) Regulations 1994. This documentation must:

- describe the electrical equipment
- contain information about its design, manufacture and operation
- set out the procedures used to ensure the conformity of the electrical equipment with the safety requirements

The documentation must include:

- a general description of the electrical equipment
- conceptual design and manufacturing drawings, and schemes of components, sub-assemblies, circuits etc
- descriptions and explanations necessary for the understanding of the drawings and schemes referred to above and the operation of the electrical equipment
- a list of the standards applied in full, or in part, and descriptions of the solutions adopted to satisfy the safety requirements of the regulations/Directive where standards have not been applied
- results of design calculations made and examinations carried out etc
- test reports - either established by the manufacturer or a third party
- a copy of the EC DoC (see information under next heading below)

As a manufacturer, it is your responsibility to compile the relevant documentation whether you are established in the EEA or not. You must also ensure that the information is kept within the EEA for inspection purposes.

You must also ensure that your manufacturing process is such that the production of the electrical equipment conforms to that described in the documentation. The documentation must be kept for at least ten years after the manufacture of the equipment has ceased.

EC DoC

An EC DoC is a written declaration by you - or your authorised representative - that the equipment to which the CE marking has been affixed complies with the requirements of the regulations. This declaration must:

- identify the manufacturer or the authorised representative
- describe the electrical equipment to which it relates
- where appropriate, specify the harmonised standard(s) or other specifications with which conformity with the safety requirements is declared
- where appropriate, refer to the specifications with which conformity is declared
- identify any signatory empowered to enter into commitments within the EC on behalf of the manufacturer or his authorised representative
- include the last two digits of the year in which the CE marking was affixed

A copy of the EC DoC is not required to accompany each product. But a copy must be retained within the territory of the EEA by the manufacturer, the authorised representative, or failing that, the importer who first places the equipment on the market in the EEA. A copy of the Declaration must also be kept with the technical documentation.

Inspection of the technical documentation and EC DoC

If there are reasonable grounds for suspecting that a product is unsafe, the enforcement authorities may request that the EC DoC and/or technical documentation is made available for inspection. Failure to make the documents available within a reasonable amount of time could amount to an offence under the regulations.

CE marking requirements under the Electrical Equipment (Safety) Regulations

CE marking is a visible declaration by you or your authorised representative that the electrical equipment satisfies all the provisions of the Electrical Equipment (Safety) Regulations 1994. Equipment bearing the mark will be taken as meeting the requirements and thereby entitled to free circulation throughout the EEA, provided that the equipment does in fact satisfy those requirements.

CE marking should be affixed to the electrical equipment or, where not possible, to the packaging, the instruction sheet or the guarantee certificate. You may decide for practical reasons to affix it to both the product and its packaging. The mark must be visible, easily legible and in an indelible form.

By affixing CE marking to electrical equipment, you are making a statement that in your view the equipment meets the requirements of all relevant Directives. It does not mean that the electrical equipment cannot be challenged by an enforcement authority if they have reasonable grounds for suspecting an infringement of the regulations.

You should also note that CE marking is not a European safety mark or quality symbol intended for consumers. Its purpose is to indicate to enforcement authorities that the electrical equipment is intended for sale in the EEA and signifies a declaration by the manufacturer or his authorised representatives that the equipment satisfies the requirements and is entitled to access those markets.

Non-CE marked electrical equipment

Suppliers of non-CE marked equipment may be required to submit information, if requested to do so, by an enforcement authority. Such information may include:

- the date when the electrical equipment was first supplied in the EEA
- why the electrical equipment does not bear CE marking

Marks other than CE marking

Other marks - eg an approval mark from a certification body - may appear on, or with, the equipment. However they cannot be used to declare compliance with the regulations. Only CE marking can be used for this purpose. Any other marks that are present must not reduce the visibility or legibility of CE marking.

Using electrical equipment on your own premises

Electrical equipment that is intended for use by you in your own premises is controlled by the Electrical Equipment (Safety) Regulations 1994. Such equipment must satisfy the safety requirements of the regulations, but need not have CE marking.

However, should you subsequently decide to supply the equipment - eg by selling it or hiring it out - it will be subject to the relevant provisions of the regulations, including the CE marking requirements.

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Safety requirements for second-hand or hired electrical equipment

You should be aware of your responsibilities under the Electrical Equipment (Safety) Regulations 1994 if you supply electrical equipment that is:

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- second-hand
- modified
- refurbished
- hired/leased
- supplied in furnished premises

Second-hand electrical equipment

The safety of second-hand equipment that is supplied in the course of business - including auctions - is controlled by the regulations. However, it does not need to satisfy the CE marking requirement, and does not need the EC DoC or the technical documentation.

Equipment is classed as second-hand if it has previously been supplied to an end user in the EEA. An end user means the consumer, and includes commercial and industrial consumers.

While there is no mandatory requirement for second-hand equipment to undergo any safety testing, you must only supply equipment that is safe so as to avoid committing an offence under the regulations.

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The supply of electrical equipment that is in need of reconditioning or repair to someone who carries on a business of repairing and reconditioning electrical equipment is excluded from the regulations. The sale of articles as scrap is also excluded.

Modified and refurbished electrical equipment

Modified and refurbished equipment are included within the scope of the regulations. Where equipment is refurbished to its original specification, it will be treated as second-hand equipment. However, if the refurbishment uses different types of components, it will be considered as modified electrical equipment.

Modified equipment will need to be assessed by the person carrying out the modifications to determine whether the modification may have introduced hazards or risks which were not covered by the original design. In this case, it is likely that the equipment would be considered as new equipment rather than second-hand equipment.

This will require the person carrying out the modification to carry out all of those exercises required of an original manufacturer. For example, preparation of technical documentation, drawing up an EC DoC and placing the CE marking on the product.

Hired/leased electrical equipment

The safety of electrical equipment that is hired out is also controlled by the regulations. If you supply such equipment, you must ensure that it satisfies the safety requirements. However, there is no requirement for the manufacturer's brand name or trade mark to be printed on the electrical equipment or packaging.

Hired/leased equipment is to be considered as new equipment when it is supplied for the first time to an end user in the EEA, and as second-hand after this.

Electrical equipment in furnished accommodation

The regulations apply to any person who supplies electrical equipment in the course of business. So this includes the safety of any electrical equipment that is supplied as part of furnished accommodation. In this case it is treated as hired/leased equipment.

Estate agents, letting agents and anyone else who hires or lets furnished accommodation are strongly advised to seek their own independent legal advice.

Enforcement of the electrical equipment safety regulations

The Electrical Equipment (Safety) Regulations 1994 are primarily enforced by the local authority trading standards departments with regard to consumer products. The Health & Safety Executive enforce the regulations in respect of electrical equipment that is:

- designed for use or operation by persons at work
- designed for use otherwise than at work, in non-domestic premises made available for persons at a place where they may use the equipment

All electrical equipment to which CE marking has been affixed will be presumed to comply with all the requirements of the regulations. Where there are reasonable grounds for suspecting that electrical equipment may not meet the requirements of the regulations, an enforcement authority should take appropriate enforcement action to remove the equipment from the market.

Compliance notice

Where for reasons other than safety, an enforcement authority has reasonable grounds for suspecting that CE marking has been wrongly affixed, the authority may issue a compliance notice on you or your authorised representative. Reasonable grounds for suspecting CE marking is wrongly affixed would be, for example, if the equipment meets the safety requirements but does not comply fully with the other requirements of the regulations.

Compliance notices are intended to give you an opportunity to take action to correct the non-compliance. Enforcement action can only be taken if such a notice has been issued and not acted upon.

Penalties

It is an offence to supply electrical equipment which does not comply with the requirements of the regulations. Any person committing an offence is liable - under summary conviction - to imprisonment, a fine or both.

Safeguard procedures

Article 9 of the LVD requires EU member states to withdraw from the market, or to prohibit and restrict the supply of, electrical equipment bearing CE marking which does not comply with the safety requirements. They must immediately notify the European Commission and other member states of its action and give reasons.

In the event of an objection to a notification being raised by another member state(s), the Commission will immediately consult with the member states concerned. The Department for

Business, Innovation & Skills is responsible for notifying the Commission and other member states of enforcement action taken in the UK, and receives details of enforcement action in other markets.

Role of the European Commission

It is only where a member state raises an objection to a notification made under the safeguard procedures that the Commission will become involved. In such circumstances they will consult with the member states concerned. If agreement between the states cannot be reached within three months of the Commission being informed, it will seek the opinion of a notified body on the safety of the equipment.

The Commission will then communicate the opinion of this body to the member states involved - who will have a period of one month to make their views known. If agreement still cannot be reached, the Commission will make their own recommendations/opinions to the member states involved.

6.1.2 Explosive Atmospheres

If you are a manufacturer of equipment and protective systems intended for use in potentially explosive atmospheres, you must comply with the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 - also known as ATEX Regulations.

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Comment [C12]: the use of "you" is not really appropriate in a report like this. Better professional English needs to be used.

These implement into UK law the European Directive 94/9/EC, and aim to ensure that these equipments and system satisfy wide-ranging health and safety requirements.

This guide outlines the main points of the Regulations, including definitions of equipment and protective systems, safety and marking requirements and will help you to ensure that your products comply.

Manufacturers of equipment and protective systems

The ATEX Regulations 1996 apply to both electrical and mechanical equipment, and protective systems for use on the surface, below ground and on fixed offshore installations.

Specifically, the Regulations relate to the following equipment and systems. If you manufacture any products matching the definitions, the Regulations apply to you.

All equipment intended for use in potentially explosive atmospheres. This is defined as machines, apparatus, fixed or mobile devices, control components and related instrumentation and detection or prevention systems which - individually or together - are:

- intended for the generation, transfer, storage, measurement, control and conversion of energy or the processing of material and which are
- capable of causing an explosion through their own potential sources of ignition

Protective systems intended for use in potentially explosive atmospheres. These are defined as design units which are intended to halt incipient explosions immediately and/or to limit the effective range of explosion flames and explosion pressures. Protective systems may be integrated into equipment or separately placed on the market for use as autonomous systems.

Safety devices, controlling devices and regulating devices intended for use outside potentially explosive atmospheres but which are required for or contribute to the safe functioning of equipment and protective systems, with respect to the risks of explosion.

Components defined as any item essential to the safe functioning of equipment and protective systems but with no autonomous function.

Equipment groups

For the purposes of the Regulations equipment is divided into two groups:

- Group I - equipment intended for use in underground parts of mines, and to those parts of surface installations of such mines liable to be endangered by fire, damp and/or combustible dust
- Group II - equipment intended for use in other places liable to be endangered by explosive atmospheres

The groups are further subdivided as follows:

- Group I, Category M1 - equipment designed to be capable of remaining functional, even in the event of rare incidents relating to equipment, with an explosive atmosphere present
- Group I, Category M2 - equipment designed to be de-energised in the event of an explosive atmosphere
- Group II, Category 1 - equipment designed to be used in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are present continuously, for long periods or frequently
- Group II, Category 2 - equipment designed to be used in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur
- Group II, Category 3 - equipment designed to be used in areas in which explosive atmospheres caused by gases, vapours, mists, or air/dust mixtures are unlikely to occur or, if they do occur, are likely to do so only infrequently and for a short period only

Explosive atmospheres and explosion safety

An explosive atmosphere is a mixture with air, under atmospheric conditions, of flammable gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

A potentially explosive atmosphere is an atmosphere that could become explosive due to local and operational conditions.

Equipment and protective systems intended for use in potentially explosive atmospheres must be designed from the point of view of integrated explosion safety.

To comply with the ATEX Regulations 1996, you must take measures that will:

- prevent the formation of explosive atmospheres that may be produced or released by equipment and by protective systems themselves
- prevent the ignition of explosive atmospheres, taking into account the nature of every electrical and non-electrical source of ignition

Should an explosion nevertheless occur which could directly or indirectly endanger persons, domestic animals or property; you must halt it immediately and/or limit the range of explosion flames and explosion pressures to a sufficient level of safety.

It is your responsibility to ensure equipment and protective systems are designed and manufactured after due analysis of possible operating faults to prevent dangerous situations. Any misuse which can reasonably be anticipated must be taken into account.

Selecting safe materials for use in potentially explosive atmospheres

Under the ATEX Regulations 1996, any materials used for the construction of equipment and protective systems must not trigger an explosion, taking into account foreseeable operational stresses.

Within the limits of the operating conditions laid down by you as the manufacturer, it must not be possible for a reaction to take place between the materials used and the constituents of the potentially explosive atmosphere that could impair explosion protection.

You must choose materials that will not become less safe over time, bearing in mind predictable changes in their characteristics and their compatibility in combination with other materials. In particular, you must take due account of the materials':

- corrosion and wear resistance
- electrical conductivity
- impact strength
- ageing resistance and the effects of temperature variations

Equipment and protective systems must be designed and manufactured with due regard to technological knowledge of explosion protection, so they can be safely operated throughout their lifetime.

Components to be incorporated into or used as replacements in equipment and protective systems must be designed and constructed so that they function safely for their intended purpose of explosion protection when they are installed in accordance with your instructions as a manufacturer.

Potential hazards in potentially explosive atmospheres

As a manufacturer, under the ATEX Regulations 1996 you must take steps in the design and manufacturing process to ensure that your products are resistant to all types of hazard.

You must prevent hazards arising from:

- ignition sources - potential ignition sources such as sparks, flames, electric arcs, high surface temperatures, acoustic energy, optical radiation, electromagnetic waves and other ignition sources must not occur
- static electricity - electrostatic charges capable of resulting in dangerous discharges must be prevented by means of appropriate measures
- stray electric and leakage currents - in conductive equipment parts, which could result in, for example, the occurrence of dangerous corrosion, overheating of surfaces or sparks capable of provoking an ignition must be prevented
- overheating - caused by friction or impacts occurring, for example, between materials and parts in contact with each other while rotating or through the intrusion of foreign bodies must, as far as possible, be prevented at the design stage
- pressure compensation operations - equipment and protective systems must be so designed or fitted with integrated measuring, control and regulation devices that pressure compensations arising from them do not generate shock waves or compressions, which may cause ignition
- power failure - where equipment and protective systems can give rise to a spread of additional risks in the event of a power failure, it must be possible to maintain them in a safe state of operation independently of the rest of the installation
- connections - equipment and protective systems must be fitted with suitable cable and conduit entries. When equipment and protective systems are intended for use in combination with other equipment and protective systems, the interface must be safe

Equipment and protective systems must be so designed and constructed as to be capable of performing their intended function safely, even in changing environmental conditions and in the

presence of extraneous voltages, humidity, vibrations, contamination and other external effects, taking into account the limits of the operating conditions established by you.

Equipment parts used must be appropriate to the intended mechanical and thermal stresses, and capable of withstanding attack by existing or foreseeable aggressive substances.

Placing of warning devices as parts of equipment

Where equipment or protective systems are fitted with detection or alarm devices for monitoring the occurrence of explosive atmospheres, the necessary instructions must be provided to enable them to be provided at the appropriate places.

Requirements for safety-related devices

As far as possible, under the ATEX Regulations 1996, failure of a safety device must be detected quickly to ensure that there is only minimal likelihood that dangerous situations will occur.

For electrical circuits, the fail-safe principle is to be applied in general. Safety-related switching must be able to activate the relevant control devices without being forced to use software.

In the event of a safety device failure, equipment and/or protective systems must, wherever possible, be secured. Emergency stop controls of safety devices must, as far as possible, be fitted with restart lockouts. A new start command may take effect on normal operation only after the restart lockouts have been intentionally reset.

Control and display units

Where control and display units are used, they must be designed to achieve the highest possible level of operating safety with regard to the risk of explosion.

Requirements for devices with a measuring function for explosion protection

Devices with a measuring function must be designed and constructed so that they can cope with foreseeable operating requirements and special conditions of use. Where necessary, it must be possible to check the reading accuracy and serviceability of devices with a measuring function.

They must also have a safety feature, which ensures that the alarm threshold lies far enough outside the explosion and/or ignition limits of the atmospheres to be registered.

Risks arising from software

In the design of software-controlled equipment, protective systems and safety devices, special account must be taken of the risks arising from faults in the programme.

Supplementary requirements for safety equipment

Under the ATEX Regulations 1996, equipment must have a means of protection such that:

- in the event of failure of one means of protection, at least an independent second means provides the requisite level of protection
- the requisite level of protection is ensured in the event of two faults occurring independently of each other

Where necessary, this equipment must be equipped with additional special means of protection. It must remain functional with an explosive atmosphere present.

Where necessary, equipment must be so constructed that no dust can penetrate it. The surface temperatures of equipment parts must be kept clearly below the ignition temperature of the foreseeable air/dust mixtures in order to prevent the ignition of suspended dust.

Equipment must be so designed that the opening of equipment parts that may be sources of ignition is possible only under non-active or intrinsically safe conditions. Where it is not possible to render

equipment non-active, you must affix a warning label to the opening part of the equipment. If necessary, equipment must be fitted with appropriate additional interlocking systems.

How to show conformity with the Regulations

The ATEX Regulations 1996 define various procedures and specify the options available to manufacturers and to their authorised representatives established in the European Community (EC).

For equipment in Group I Category M1, equipment in Group II Category 1, autonomous protective systems, safety devices for such equipment or systems and for components for such equipment, systems or devices, the options are:

- EC type-examination, followed by either production quality assurance or product verification
- unit verification

For equipment in Group I Category M2, equipment in Group II Category 2, safety devices for such equipment or systems and for components of such equipment, systems or devices, the options are as follows.

For electrical equipment and internal combustion engines:

- EC type-examination, followed by either conformity to type or product quality assurance
- unit verification

For other equipment in these groups:

- internal control of production and depositing the technical documentation with a notified body
- unit verification

For equipment in Group II Category 3, safety devices for such equipment or systems and components for such equipment, systems and devices, the options are:

- internal control of production
- unit verification

EC type-examination

If necessary, manufacturers should have an EC type-examination carried out by a Notified Body. Notified Bodies are appointed by member states to support the implementation of Directives, including Directive 94/9/EC.

An application for EC type-examination must be lodged by the manufacturer (or their authorised representative in the EU) with a Notified Body of their choice.

Production quality assurance

Under production quality assurance, the manufacturer should operate an approved quality system for production, final equipment inspection and testing, and apply to a Notified Body to have this assessed. The system will be subject to ongoing surveillance by the Notified Body.

Product verification

Under product verification, the manufacturer should apply to a Notified Body to carry out the appropriate examinations and tests to check the conformity of equipment, protective system and devices with the EC type-examination certificate.

Conformity to type

Under conformity to type, the manufacturer should take all measures necessary to ensure that their manufacturing process assures compliance of the manufactured equipment or protective systems

with the type as described in the EC type-examination certificate and with the relevant requirements of the Directive.

For each piece of equipment manufactured, the manufacturer should carry out tests relating to the anti-explosive protection aspects of the product, under the responsibility of a Notified Body.

Unit verification

Under unit verification, the manufacturer should apply to a Notified Body to carry out the appropriate examinations and tests to check the conformity of each individual piece of equipment, protective system or device.

For all of these procedures, more information about UK Notified Bodies can be found at the webside of the Department for Business, Innovation and Skills (BIS).

Technical documentation and quality marking

As the manufacturer, you are responsible for drawing up technical documentation for your equipment, protective systems and safety devices.

The technical documentation provides the enforcement authorities with the means of assessing the conformity of the safety equipment with the requirements of the ATEXRegulations 1996.

The documentation should include:

- a general description of the equipment
- conceptual design and manufacturing drawings and schemes of components, sub-assemblies, and circuits
- any descriptions and explanations that will aid understanding of the drawings and schemes and explain how the equipment operates
- a list of the standards applied in full or in part, and descriptions of the solutions adopted to meet the safety aspects of Directive 94/9/EC where the standards have not been applied
- results of design calculations made and examinations carried out
- test reports

As the manufacturer, it is your responsibility to compile the relevant documentation whether you are established in the European Economic Area (EEA) or not. However, the information must be kept within the EEA for inspection purposes.

You must also ensure that your manufacturing process is such that the production of the equipment conforms to that described in the documentation.

CE marking

CE (European Conformity) marking is a visible declaration by you or your authorised representative that your equipment, protective systems and safety devices satisfy all the provisions of the Regulations.

Equipment bearing the CE mark will be taken as meeting the requirements and thereby entitled to free circulation throughout the EEA, provided that the equipment does in fact satisfy those requirements.

CE marking should be affixed to the equipment or, where not possible, to the packaging, the instruction sheet, or the guarantee certificate. The mark must be visible, easily legible and in an indelible form.

You should note that CE marking is not a European safety mark or quality symbol intended for consumers. Its purpose is to indicate to enforcement authorities that the equipment is intended for sale in the EEA.

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Additional specific markings

Additional markings must enable full identification of equipment, protective systems and safety devices to be made. They must at least contain the following:

- the specific explosion protection mark, together with the mark indicating the equipment group and category; and, relating to equipment Group II, the letter 'G' (concerning explosive atmospheres caused by gases, vapours or mists) and/or 'D' (concerning explosive atmospheres caused by dust)
- the name and address of the manufacturer
- the designation of series or type and serial number
- the year of production
- restricted or other safety-related conditions of use

Failing to comply with the Regulations

The Health and Safety Executive (HSE) is responsible for the enforcement of the ATEXRegulations 1996 in Great Britain. You can read guidance on ATEX on the HSEwebsite.

In Northern Ireland, enforcement is the responsibility of the HSE for Northern Ireland.

Safeguard procedures

EU member states are required to take all appropriate measures to withdraw from the market any safety equipment bearing the CE marking and used in accordance with their intended purpose which are liable to endanger the safety of people and, where appropriate, of property. The member state must immediately inform the European Commission of such action and give reasons.

Where, after consultation with the parties concerned, the Commission finds that the measures are justified, it informs that member state and the other member states.

Member states are required to take action against anyone who affixes the CE marking to safety equipment which do not conform to Directive 94/9/EC and so inform the Commission and other member states.

Penalties

It is an offence to supply safety equipment which does not comply with the requirements of the Regulations. Any person committing an offence is liable, under summary conviction, to imprisonment, a fine or both.

Guidance of CE Marking in the UK

The letters 'CE' appear on many products that are traded on the single market in theEuropean Economic Area (EEA).

The CE marking is required for many products and it:

- shows that the manufacturer has checked that these products meet EU safety, health or environmental requirements
- is a key indicator of a product's compliance with EU legislation
- allows the free movement of products within the European market

By placing the CE marking on a product a manufacturer is declaring, on his sole responsibility, conformity with all of the legal requirements to achieve CE marking. The manufacturer is thus ensuring validity for that product to be sold throughout theEEA. This also applies to products made in third countries which are sold in the EEAand Turkey.

Not all products must bear the CE marking. Only those product categories subject to specific Directives that provide for the CE marking are required to be CE marked.

CE marking does not mean that a product was made in the EEA, but states that the product is assessed before being placed on the market. It means the product satisfies the legislative requirements to be sold there. It means that the manufacturer has checked that the product complies with all relevant essential requirements, for example health and safety requirements.

If you are a manufacturer it is your responsibility to:

- carry out the conformity assessment
- set up the technical file
- issue the EC Declaration of Conformity (DoC)
- place CE marking on a product

If you are a distributor you must check the presence of both the CE marking and the necessary supporting documentation.

If you are importing a product that is from a third country you have to check that the manufacturer outside the EU has undertaken the necessary steps. You must check that the documentation is available.

6.1.3 Products that need CE marking

CE marking is mandatory, but only for those products which are covered by the scope of one or more of the New Approach Directives.

You can download the EC New Approach Directives guidance from the Europa website.

Even if your product is manufactured outside the EEA, you must ensure the product bears CE marking if your product comes under the scope of a Directive requiring CE Marking. Not all products sold in the EU need to bear CE marking.

CE marking applies to products, ranging from electrical equipment to toys and from civil explosives to medical devices. The full list of these product categories is below:

- active implantable medical devices
- appliances burning gaseous fuels
- cableway installations designed to carry persons
- eco-design of energy related products
- electromagnetic compatibility
- equipment and protective systems intended for use in potentially explosive atmospheres
- explosives for civil uses
- hot-water boilers
- household refrigerators and freezers
- in vitro diagnostic medical devices
- lifts
- low voltage
- machinery
- measuring instruments

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- medical devices
- noise emission in the environment
- non-automatic weighing instruments
- personal protective equipment
- pressure equipment
- pyrotechnics
- radio and telecommunications terminal equipment
- recreational craft
- safety of toys
- simple pressure vessels

The CE marking is not required for items, for example:

- chemicals
- pharmaceuticals
- cosmetics and foodstuffs

How to place a CE marking on a product

Before you place a CE marking on a product, you need to establish which EU New Approach Directives apply to your product. You must not attach a CE marking to a product outside the scope of the Directives.

The process you follow depends on the Directives that apply to your product.

1. Identify the Directive(s) and harmonised standards applicable to the product

There are more than 20 Directives setting out the product categories requiring CE marking. The essential requirements that products have to fulfil, for example safety, are created at EU level and are set out in general terms in these Directives. Harmonised European standards are issued with reference to the applied Directives and express the essential safety requirements in detailed technical terms.

2. Check the product-specific requirements

It is up to you to ensure that your product complies with the essential requirements of the relevant EU legislation. The use of harmonised standards remains voluntary. You may decide to choose other ways to fulfil these essential requirements. If you don't follow the safety requirements of a standard as it is written you will need to show that your product is as safe, by presenting the relevant documentation.

3. Identify whether an independent conformity assessment is required from a Notified Body

Each Directive covering your product specifies whether an authorised third party (Notified Body) must be involved in the conformity assessment procedure necessary for CE marking. This is not obligatory for all products, so it is important to check whether the involvement of a Notified Body is required. These bodies are authorised by national authorities and officially 'notified' to the European Commission and listed on the NANDO (New Approach Notified and Designated Organisations) database.

4. Test the product and check its conformity

If you manufacture a product it is your responsibility to test the product and check its conformity to the EU legislation (conformity assessment procedure). One part of the procedure is, as a general rule,

a risk assessment. By applying the relevant harmonised European standards, you will be able to fulfil the essential legislative requirements of the Directives.

5. Draw up and keep available the required technical documentation

If you manufacture a product you need to establish the technical documentation required by the Directive(s) for the assessment of the product's conformity to the relevant requirements, and for the risk assessment. You must be able to present the technical documentation and EC DoC to the relevant national authorities, if requested.

6. Placing the CE marking on your product and EC Declaration of Conformity

The CE marking must be placed on the product by the manufacturer, or by his authorised representative within the EEA or Turkey. It must be placed according to its legal format to the product or its data plate. It must be visible, legible and impossible to remove. If a Notified Body was involved in the production control phase, its identification number must also be displayed. It is the manufacturer's responsibility to draw up and sign an 'EC DoC' proving that the product meets the requirements. That's it, your CE-marked product is ready for the market.

Using the CE marking

Once you have satisfied the conformity assessment requirements for CE marking you must attach the CE marking to your product or its packaging. There are specific rules for using the CE marking for your product, as well as rules for the reproduction of the CE marking logo.

In general you should attach the CE marking to the product itself but it may also be placed on the packaging, in manuals and on other supporting literature. Rules covering the use of the CE markings vary depending on the specific EU Directive that applies to the product and it is advisable to study the applicable guidance. The following general rules all apply:

- CE markings must only be placed by you - as the manufacturer - or your authorised representative
- the CE marking cannot be placed on products which are not covered by the relevant European Directives
- when attaching the CE marking, you take full responsibility for your product's conformity with the requirements of the relevant Directives
- you must only use the CE marking to show the product's conformity with the relevant Directives
- you must not place any marking or sign that may misconstrue the meaning or form of the CE marking to third parties
- other markings placed on the product must not cover up the CE marking

Member states will ensure they implement the regime governing the CE marking. They will take appropriate action in the event of improper use of the marking and provide for penalties for infringements, which may include criminal sanctions for serious infringements. Those penalties will be proportionate to the seriousness of the offence and constitute an effective deterrent against improper use

The general principles of the CE marking are contained within Regulation (EC) No 765/2008 which sets the requirements for accreditation and market surveillance relating to the marketing of products..

CE marking image rules

Depending on the specifics of the Directive that covers your product, you must make sure that:

- the initials 'CE' are in the standard, recognisable form

- if you reduce or enlarge the size of your marking the letters CE must be in proportion to the standard version
- the CE marking is at least 5 millimetres - unless a larger minimum dimension is specified in the relevant Directive
- the CE marking is placed onto the product or to its data plate - if this is not possible or not warranted because of the nature of the product, it must be placed onto the packaging and accompanying documents
- the CE marking is easily visible, readable and permanent

Keep documentation for CE marking

Please refer to the specific Directives and/or regulations, and also our guidance documents.

You must keep certain documentation once you have placed the CE marking onto your product. This information can be requested at any time by the Market Surveillance Authorities to check that a CE marking has been legitimately placed on a product.

The information you must keep will vary depending on the specific Directives relevant to your product. You must keep general records of:

- how the product is manufactured
- how the product conforms to the relevant national standards
- addresses of manufacture and storage places
- design and manufacture of the product
- which New Approach Directives apply to the product and how they have been met
- European Community type-examination certificates, if applicable

You should keep the information in the form of a technical file which can be supplied if requested by an enforcement authority.

The manufacturer's Declaration of Conformity

The EC DoC is a document which may be required to accompany a product. In the document the manufacturer, or his authorised representative within the EEA should:

- indicate that the product meets all the necessary requirements of the Directives applicable to the specific product
- make sure it has the name and address of the manufacturer together with information about the product, for example brand and serial number

The DoC must be signed by an individual working for the manufacturer or his authorised representative, and indicate the employee's function.

CE marking enforcement

There are many bodies that enforce CE marking legislation to prevent misuse of the CE marking and to ensure that product safety is maintained to a high standard.

Enforcement, or market surveillance, is undertaken by nominated public authorities (Market Surveillance Authorities) in each member state, and each state has separate ways of enforcing the legislation once it has been implemented into national law.

Market Surveillance Authorities and processes will vary depending on which Directives are applicable to your product. The following bodies, amongst others, are responsible for CE marking enforcement in the UK:

- Trading Standards Services
- the Health and Safety Executive
- the Medicines and Healthcare products Regulatory Agency
- the Vehicle Certification Agency
- the National Measurement Office

If an enforcement body finds your product does not meet CE marking requirements, they will often provide you with an opportunity to ensure it is correctly CE marked. If you fail to comply with this, you will be obliged to take your product off the market. You may also be liable for a fine and imprisonment.

6.2 UK Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of solar photovoltaic (PV) and microgeneration systems

6.2.1 MCS Standards

MCS Technical Working Groups develop the MCS standards, which are predominantly based on international and European standards already in existence.

Product Standards

MCS approved products satisfy rigorous and established European and International standards. In addition to laboratory testing, the product manufacturers also must undertake factory production control audits to show that they have the management systems in place to support the quality production practices and demonstrate the products at the end of the production line are of the same quality as those that are tested.

Table 2: General Scheme Requirements

MCS Ref	Download the Documents	Version Number	Issue Date
MCS 010	Factory Production Control Requirements	1.5	25.02.2009
MCS 011	Testing Acceptance Criteria	1.5	25.02.2009

Table 3: Technology Specific Scheme Requirements

MCS Ref	Download the Documents	Version Number	Issue Date
Solar Thermal Systems			
MCS 004	Product Certification Scheme Requirements - Solar Collectors	3.1	16.12.2013
MCS 004	Product Certification Scheme Requirements - Solar Collectors	3.0	01.10.2013
Solar PV Systems			
MCS 005	Product Certification Scheme Requirements - Photovoltaic Panels	2.3	25.02.2009
Small and Micro Wind Turbines			
MCS 006	Product Certification Scheme Requirements - Small and Micro Wind Turbines	2.1	15.01.2014
	RenewableUK Small Wind Turbine Standard		15.01.2014
	Guidance Note - Potentially Novel Wind Turbines	1.0	07.02.2013
	Technical Note - RenewableUK Inverter Technical Note	2.0	07.02.2013
Heat Pump Systems			

MCS 007	Product Certification Scheme Requirements - Heat Pumps	2.4	16.12.2013
Biomass Systems			
MCS 008	Product Certification Scheme Requirements - Biomass	2.2	16.12.2013
Roof Mounting Kits			
MCS 012	Product Certification Scheme Requirements - Pitched Roof Installation Kits	1.2	16.12.2013
MCS 012	Product Certification Scheme Requirements - Pitched Roof Installation Kits	1.1	21.06.2013
	MCS 012 Important Information		21.06.2013
Combined Heat and Power Systems (CHP)			
MCS 014	Product Certification Scheme Requirements - CHP - Heat Led	1.2	18.05.2012
MCS 015	Product Certification Scheme Requirements - CHP - Electricity Led	1.1	18.05.2012
Micro-Hydro Systems			
MCS 016	Product Certification Scheme Requirements - Micro Hydro Turbines	1.0	19.01.2011
MCS 018	Product Certification Scheme Requirements - As New Hydro Product	1.0	27.10.2010
Bespoke Building Integrated Photovoltaic Products			
MCS 017	Product Certification Scheme Requirements - Bespoke Building Integrated Photovoltaic Products	1.0	01.08.2011
MCS Change Process Document			
	MCS Change Process	1.0	17.05.2013

6.3 Accreditation and conformity assessment guidance for business and government departments

The Department for Business, Innovation and Skills (BIS) is responsible for UK government policy on everything to do with standards-making. Theyl strengthen the standards infrastructure so that it meets the needs of UK industry and to make the processes more relevant and business friendly.

They sponsor, and work closely with, the British Standards Institution (BSI) as the UK National Standards Body (NSB). Through the European Commission (EC) they help develop European standardisation policy, which can remove barriers to trade.

The MOD's DStan (UK Defence Standardisation) works to develop, facilitate and communicate UK MOD standardisation policies, standards, procedures and guidance on standardisation both nationally and internationally.

The UK government expects UK based conformity assessment bodies to be compliant with European legislation and seek accreditation from UKAS (United Kingdom Accreditation Service) the body appointed by BIS to be the UK's national accreditation body.

Conformity assessment and accreditation are integral parts of the quality assurance infrastructure in the UK which also includes:

- National Measurement System that has a network of laboratories and process that provides measurement standards and calibration testing facilities. It maintains the measurement infrastructure, represents the position of the UK measurement internationally; influences the development of standards; and is responsible for stimulating good measurement practice and enabling business to make accurate and traceable measurements.
- British Standards Institution, the UK's national standards body, that works with many different industries, businesses, governments and consumers to develop British, European and international standards, as well as representing UK economic and social interests across all European and international standards organisations.

The role of BIS in accreditation

BIS has a number of roles in:

- policy
- promotion
- appointing and sponsoring the UK's national accreditation body
- owning, and sublicensing, the accreditation logo and symbols
- monitoring the UK's national accreditation body, UKAS

Policy

Domestically BIS leads, on behalf of government as a whole, on general accreditation policy ('horizontal' policy - ie across all departments), while individual government departments and

agencies are responsible for accreditation policy for their specific areas of responsibility ('vertical' policy').

BIS also pursues the UK's accreditation interests in Europe in communications with other member states and the Commission. BIS is also closely involved in the development of guidance in the application of European accreditation regulation, in particular Regulation (EC) No: 765/2008. Read the BIS Statement of Conformity and Accreditation Policy

Policy - Health and Social Care

There is a strong focus in the current UKAS business plan on advancing the use of accreditation in the health and social care sectors. BIS has been in discussion with the Department of Health about where accreditation can be used and to ensure thatUKAS' role and status in delivering accreditation is fully understood. To ensure clarity,BIS and the Department of Health agreed a statement that was submitted to theUKAS Policy Advisory Forum – Health and Social Care Sub-Group, in July.

Promotion

BIS seeks to encourage and promote the use of accredited conformity assessment, mainly by responding to enquiries from other government departments who are considering how to deliver a government objective and are thinking of using accreditation but also by directly supporting UKAS in extending accreditation into new areas.

UKAS, the UK's national accreditation body

Regulation (EC) No: 765/2008 requires each member state to appoint a sole national accreditation body. Through the Accreditation Regulations 2009 (Statutory Instrument No: 3155 of 2009) BIS appointed UKAS to be the UK's national accreditation body.

Monitoring

Both the MoU and Regulation (EC) No: 765/2008 require that BIS monitors the UK's national accreditation body, UKAS.

The MoU sets out how BIS will formally monitor UKAS. In addition BIS seeks every opportunity to receive feedback from UKAS' direct and indirect customers to supplement the formal monitoring.

Legal framework for accreditation

Regulation (EC) No: 765/2008 provides for the first time a legal framework for the provision of accreditation services across Europe, setting out provisions for the operation of accreditation in support of voluntary conformity assessment as well as conformity assessment required by legislation.

What does Regulation (EC) No: 765/2008 contain

In essence, this regulation:

- states that accreditation can be used in both the voluntary and regulated sectors
- requires member states to appoint a single national accreditation body (NAB) recognised by government to deliver accreditation as a public authority activity

- requires the NAB to be a not-for-profit organisation
- requires that NABs do not compete with each other
- requires conformity assessment bodies requesting accreditation to do so with theNAB of the member state in which it is established
- sets down requirements that NAB must fulfil
- requires member states to monitor their NAB
- requires NABs to undergo regular evaluation by their peers
- establishes a European accreditation infrastructure (the European co-operation for accreditation), of which each NAB must be a member

6.3.1 Notification

What is notification

Notification is an act whereby an EC member state informs the European Commission and the other member states that a body (the 'notified body'), which fulfils the relevant requirements, has been designated to carry out conformity assessment required by EU legislation. Notification of these bodies and their withdrawal are the responsibility of the notifying member state.

The competence of notified bodies

It is BIS policy that the competence of notified bodies to assess conformity with EU legislation should be determined by accreditation.

What is Decision No: 768/2008/EC (on a common framework for the marketing of products)

The above Decision provides a 'toolbox' of measures comprising a common set of reference provisions (ie standard text), definitions and general obligations for economic operators. It also provides a range of conformity assessment procedures from which the European Commission, Council and the European Parliament can select as appropriate - by direct reference to the Decision when drafting or revising Single Market Directives.

The Decision lays down reference provisions on the requirements for conformity assessment bodies to be notified to the Commission as competent to carry out the relevant conformity assessment procedures; as well as the notification procedures. The conformity assessment procedures, or modules, in the Decision, give the legislator a means to ensure that products are in full conformity with the essential requirements laid down in the technical harmonisation legislation.

The Decision not only encourages the accreditation of conformity assessment bodies working in the voluntary sector but also requires member states to consider accreditation as the preferred means of demonstrating a conformity assessment body's competence for the purposes of notification.

See Regulation (EC) No: 765/2008 and Decision No: 768/2008/EC.

6.3.2 Concerns/issues

Non-accredited certification

BIS is aware that some certification bodies and certification body representative associations are concerned at the increase in the number of UK organisations offering non-accredited certification.

For more information, please look at the The National Accreditation Logo and Symbols: conditions for use by UKAS and UKAS accredited organisations (PDF,1.41MB, 24 pages) on accreditation and conformity assessment, and specifically to section 3.4 on the application of the accreditation principles:

In applying these principles, the Department for Business Innovation and Skills recommends:

- conformity assessment bodies to be accredited by the national accreditation body
- UK businesses, government and local authorities requiring third party conformity assessment services to source such services, where they exist, from conformity assessment bodies accredited by a national accreditation body

BIS has further advised certification representative organisations in the UK that:

- in the UK, the only 'authoritative statement' of competence, that has public authority status - providing the last level of control in the conformity assessment chain is from the UK's national accreditation body, UKAS
- any organisation that is suggesting it is accredited in the sense of Regulation 765/2008 when they are not, is likely to be guilty of an offence under the Business Protection from Misleading Marketing Regulations 2008 (Statutory Instrument 2008/1276).
- certification bodies or representative organisations should refer these cases to trading standards or the Office of Fair Trading in the first instance

7 Recommendations

It is recommended that:

1. the MENR should investigate the feasibility of having a certifying and testing laboratory in Yerevan. The MENR should look at establishing partnerships wth a foreign laboratory such as Bureau Veritas. It is invaluable for a new laboratory to have a partner laboratory that is prepared to be of assistance and that has a moral involvement in doing so. Some established laboratories are prepared to take on this role—they can see that the partnership will bring long-term mutual benefits, with business flowing both ways—and they can also help with staff training. A foreign partnering laboratory may also assist with additional tests that require more sophisticated equipment. As the laboratory grows and acquires more equipment, it can, step by step, take over all the testing from the partner laboratory. The feasibility study will require outside funding as the MENR will not be able to undertake this on their budget. It was suggested that the EU, EBRD and the World Bank should be approached for funding.
2. Legislation will need to be undertaken to support the use of voluntary standards. Setting up an electrical testing laboratory in an environment that has no safety or consumer protection legislation only makes sense if the laboratory can initiate a legislative process in the country. The laboratory has to work with governmental agencies, legislators and regulators, explain to them what needs to be done, and have some regulations put in place. Any scheme to improve consumer safety must always be established on a solid base.
3. For hydropower turbines, control systems and generators to be exported, the private sector needs to aim for a CE Mark. The CE Mark is recognized as a tool that allows products to be accepted for sale in the EU market and other countries by confirming that the products meet the consumer safety requirements of these countries for electrical and electronic products. It ensures that the products comply with the requirements of safety standards as per the relevant EU Directives. A quality mark is also an acceptable alternative.
4. Internationally recoginized voluntraystandards should be implemented as soon as possible for hydropower generation systems in that they promote transparency in market access. For example standards dealing with regulated products will constrain the parties to follow the agreement which spells out in detail the procedures for market access. This has a major impact on the removal of predatory and non-transparent procedures which may favour national industries and deny national treatment to importers, thereby damaging the competitive edge of the exporting party. Estimates of savings obtained through standards are based on the removal of re-testing, re-shipment to destination marketplaces for certification and marking, and removal of the need for local staff in the destination importing marketplace to handle the interface with test labs, accreditation and certification bodies.
5. Develop a normative document on planning, construction, operation, reconstruction, repair and upgrading, as well as reoperation of SHPPs, using the existing normative documents concerning SHPPs. Pay particular attention to implementation of modern high-tech systemsfor hydro turbines and hydro units, as well as control and automation systems.
6. Translate the international standards into Armenian, harmonize them and adopt as national standards.
7. Follow the activities of international standardization organizations engaged in regulation of the sphere andregularly update the list of standards.

8 Appendices

Appendix A: EU and International Mechanisms for Recognising Accreditied Laboratories (standards https://www.iso.org/obp/ui/#iso:std:iso-iec:17021:ed-2:v1:en)

ISO/IEC 17021:2011

Conformity assessment -- Requirements for bodies providing audit and certification of management systems

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of conformity assessment, the ISO Committee on conformity assessment (CASCO) is responsible for the development of International Standards and Guides.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

Draft International Standards are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 17021 was prepared by the *ISO Committee on conformity assessment* (CASCO).

It was circulated for voting to the national bodies of both ISO and IEC, and was approved by both organizations.

This second edition cancels and replaces the first edition (ISO/IEC 17021:2006), which has been revised to expand the scope. The first edition is provisionally retained for a period of one year until the systematic review of this second edition.

This International Standard has also been published in an unofficial, marked version indicating changes from the previous edition.

Introduction

Certification of a management system, such as a quality or environmental management system of an organization, is one means of providing assurance that the organization has implemented a system for the management of the relevant aspects of its activities, in line with its policy.

This International Standard specifies requirements for certification bodies. Observance of these requirements is intended to ensure that certification bodies operate management system certification in a competent, consistent and impartial manner, thereby facilitating the recognition of such bodies and the acceptance of their certifications on a national and international basis. This International Standard serves as a foundation for facilitating the recognition of management system certification in the interests of international trade.

Certification of a management system provides independent demonstration that the management system of the organization

- a) conforms to specified requirements,
- b) is capable of consistently achieving its stated policy and objectives, and

- c) is effectively implemented.

Conformity assessment such as certification of a management system thereby provides value to the organization, its customers and interested parties.

In this International Standard, Clause 4 describes the principles on which credible certification is based. These principles help the reader to understand the essential nature of certification and they are a necessary prelude to Clauses 5 to 10. These principles underpin all the requirements in this International Standard, but such principles are not auditable requirements in their own right. Clause 10 describes two alternative ways of supporting and demonstrating the consistent achievement of the requirements in this International Standard through the establishment of a management system by the certification body.

This International Standard is intended for use by bodies that carry out audit and certification of management systems. It gives generic requirements for such certification bodies performing audit and certification in the field of quality, environmental and other forms of management systems. Such bodies are referred to as certification bodies. This wording should not be an obstacle to the use of this International Standard by bodies with other designations that undertake activities covered by the scope of this document.

Certification activities involve the audit of an organization's management system. The form of attestation of conformity of an organization's management system to a specific management system standard or other normative requirements is normally a certification document or a certificate.

The publication of this International Standard includes the text of ISO/IEC 17021:2006, including amendments to delete relevant references to ISO 19011, with new text adding specific requirements for third-party certification auditing and the management of competence of personnel involved in certification.

Specific market needs have already been identified, resulting from a lack of specific and recognized requirements for third-party auditors of management systems, such as quality management systems, environmental management systems or food safety management systems. The lack of requirements for auditor competence and the way in which these auditors are managed and deployed has been identified by key interested parties, including industry interested parties, as being a drawback.

This International Standard provides a set of requirements for management systems auditing at a generic level, aimed at providing a reliable determination of conformity to the applicable requirements for certification, conducted by a competent audit team, with adequate resources and following a consistent process, with the results reported in a consistent manner.

This International Standard is applicable to the auditing and certification of any type of management system. It is recognized that some of the requirements, and in particular those related to auditor competence, can be supplemented with additional criteria in order to achieve the expectations of the interested parties.

In this International Standard, the word “shall” indicates a requirement and the word “should” a recommendation.

1 Scope

This International Standard contains principles and requirements for the competence, consistency and impartiality of the audit and certification of management systems of all types (e.g. quality management systems or environmental management systems) and for bodies providing these activities. Certification bodies operating to this International Standard need not offer all types of management system certification.

Certification of management systems (named in this International Standard “certification”) is a third-party conformity assessment activity (see ISO/IEC 17000:2004, 5.5). Bodies performing this activity

are therefore third-party conformity assessment bodies (named in this International Standard "certification body/bodies").

NOTE 1 Certification of a management system is sometimes also called "registration", and certification bodies are sometimes called "registrars".

NOTE 2 A certification body can be non-governmental or governmental (with or without regulatory authority).

NOTE 3 This International Standard can be used as a criteria document for accreditation or peer assessment or other audit processes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- ISO 9000:2005, *Quality management systems — Fundamentals and vocabulary*
- ISO/IEC 17000:2004, *Conformity assessment — Vocabulary and general principles*

ISO/IEC 17025:2005

General requirements for the competence of testing and calibration laboratories

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of conformity assessment, the ISO Committee on conformity assessment (CASCO) is responsible for the development of International Standards and Guides.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

Draft International Standards are circulated to the national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 17025 was prepared by the *ISO Committee on conformity assessment* (CASCO).

It was circulated for voting to the national bodies of both ISO and IEC, and was approved by both organizations.

This second edition cancels and replaces the first edition (ISO/IEC 17025:1999), which has been technically revised.

Introduction

The first edition (1999) of this International Standard was produced as the result of extensive experience in the implementation of ISO/IEC Guide 25 and EN 45001, both of which it replaced. It contained all of the requirements that testing and calibration laboratories have to meet if they wish to demonstrate that they operate a management system, are technically competent, and are able to generate technically valid results.

The first edition referred to ISO 9001:1994 and ISO 9002:1994. These standards have been superseded by ISO 9001:2000, which made an alignment of ISO/IEC 17025 necessary. In this second edition, clauses have been amended or added only when considered necessary in the light of ISO 9001:2000.

Accreditation bodies that recognize the competence of testing and calibration laboratories should use this International Standard as the basis for their accreditation. Clause 4 specifies the requirements for sound management. Clause 5 specifies the requirements for technical competence for the type of tests and/or calibrations the laboratory undertakes.

Growth in the use of management systems generally has increased the need to ensure that laboratories which form part of larger organizations or offer other services can operate to a quality management system that is seen as compliant with ISO 9001 as well as with this International Standard. Care has been taken, therefore, to incorporate all those requirements of ISO 9001 that are relevant to the scope of testing and calibration services that are covered by the laboratory's management system.

Testing and calibration laboratories that comply with this International Standard will therefore also operate in accordance with ISO 9001.

Conformity of the quality management system within which the laboratory operates to the requirements of ISO 9001 does not of itself demonstrate the competence of the laboratory to produce technically valid data and results. Nor does demonstrated conformity to this International Standard imply conformity of the quality management system within which the laboratory operates to all the requirements ofISO 9001.

The acceptance of testing and calibration results between countries should be facilitated if laboratories comply with this International Standard and if they obtain accreditation from bodies which have entered into mutual recognition agreements with equivalent bodies in other countries using this International Standard.

The use of this International Standard will facilitate cooperation between laboratories and other bodies, and assist in the exchange of information and experience, and in the harmonization of standards and procedures.

1 Scope

1.1 This International Standard specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. It covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods.

1.2 This International Standard is applicable to all organizations performing tests and/or calibrations. These include, for example, first-, second- and third-party laboratories, and laboratories where testing and/or calibration forms part of inspection and product certification.

This International Standard is applicable to all laboratories regardless of the number of personnel or the extent of the scope of testing and/or calibration activities. When a laboratory does not undertake one or more of the activities covered by this International Standard, such as sampling and the design/development of new methods, the requirements of those clauses do not apply.

1.3 The notes given provide clarification of the text, examples and guidance. They do not contain requirements and do not form an integral part of this International Standard.

1.4 This International Standard is for use by laboratories in developing their management system for quality, administrative and technical operations. Laboratory customers, regulatory authorities and accreditation bodies may also use it in confirming or recognizing the competence of laboratories. This International Standard is not intended to be used as the basis for certification of laboratories.

NOTE 1 The term 'management system' in this International Standard means the quality, administrative and technical systems that govern the operations of a laboratory.

NOTE 2 Certification of a management system is sometimes also called registration.

1.5 Compliance with regulatory and safety requirements on the operation of laboratories is not covered by this International Standard.

1.6 If testing and calibration laboratories comply with the requirements of this International Standard, they will operate a quality management system for their testing and calibration activities that also meets the principles of ISO 9001. Annex A provides nominal cross-references between this International Standard and ISO 9001. This International Standard covers technical competence requirements that are not covered by ISO 9001.

NOTE 1 It might be necessary to explain or interpret certain requirements in this International Standard to ensure that the requirements are applied in a consistent manner. Guidance for establishing applications for specific fields, especially for accreditation bodies (seeISO/IEC 17011) is given in Annex B.

NOTE 2 If a laboratory wishes accreditation for part or all of its testing and calibration activities, it should select an accreditation body that operates in accordance with ISO/IEC 17011.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- ISO/IEC 17000, *Conformity assessment — Vocabulary and general principles*
- VIM, *International vocabulary of basic and general terms in metrology*, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP and OIML

Appendix B: List of Certification and Testing Laboratories for SHPP

European

1. **BSI Group (www.bsigroup.com/en-GB/industries-and-sectors/energy-and-utilities)**

BSI is the business standards company that helps organizations all over the world make excellence a habit. For more than a century they have been challenging mediocrity and complacency to help embed excellence into the way people and products work. That means showing businesses how to improve performance, reduce risk and achieve sustainable growth. As a global leader in helping organizations improve, their clients range from high profile brands to small, local companies in 150 countries worldwide.

2. **Intertek (www.intertek.com)**

Intertek Group plc is a multinational inspection, product testing and certification company headquartered in London, United Kingdom. Intertek has expertise in power system products testing and certification providing clients with superior service levels, flexibility, and fast project turnaround times. Intertek can support testing and certification needs. They are experts on worldwide regulatory requirements and can provide third-party testing services for all markets you wish to enter.

3. **Bureau Veritas S.A. (www.bureauveritas.com)**

Bureau Veritas S.A. is a global company in testing, inspection and certification services. Bureau Veritas offer services and solutions to ensure that their clients' assets, products, infrastructure and processes meet standards and regulations in terms of quality, health and safety, environmental protection and social responsibility. The company has its headquarters in Neuilly-sur-Seine, near Paris La Défense in France. Bureau Veritas has a Hydropower Services: Testing, Inspection & Certification division.

4. **Applus+ (www.applus.com/en)**

Applus+ is one of the world's leading testing, inspection and certification companies. Theyare recognized as a global reference for quality and integrity. They provide solutions for clients in all types of sectors, to ensure that their assets and products comply with environmental, quality, health and safety standards and regulations.Applus+ is accredited by major international organizations. Theirindependent services help companies in business sectors such as Oil & Gas, Power, Automotive, Industry or Telecommunications, among others.

5. **DEKRA (www.dekra-certification.com)**

DEKRA provides certification of management systems as well as technical support, testing and certification of a wide range of products throughout the life cycle. Theirexpert services comply with both national and internationally accepted regulatory requirements. Theirexperienced personnel, who work in fully equipped state-of-the-art laboratories, can meet all safety and performance testing needs, whether they are electrical, mechanical, chemical or electromagnetic.

6. DNV GL (www.dnvgl.com)

DNV GLprovides classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. Theyalso provide certification services to customers across a wide range of industries. DNV GL is one of the world's leading certification bodies. Theyhelp businesses assure the performance of their organizations, products, people, facilities and supply chains through certification, verification, assessment, and training services.

7. Lloyd's Register (www.lr.org)

Their services providescustomerswith the confidence theyneed that theiressential materials and operating equipment:

- are designed and built to required standards, criteria and legislation;
- are built according to a structured development process; and
- have been tested at designated checkpoints to show they have achieved a specified quality level.

Their independent verification and validation services include:

- acting as the Certified Verification Agent (CVA)
- independent monitoring, evaluation and verification
- independent project verification schemes
- independent verification of turbo-machinery roto-dynamics
- verification of offshore installations.

8. SGS (www.sgs.com)

SGS provide independent services through industry leading inspection, verification, testing and certification services – anywhere in the world. Whatever theindustry, compliance with the latest regulations and standards is mandatory. As the world's leading verification company, theyoffer unsurpassed accuracy, highly experienced specialists, state-of-the-art examination methodologies and a global reach. As a result, theycan help you ensure products, services and processes follow the latest national and international standards – wherever in the world.

Theirservices enable clientsto operate in a more sustainable manner by improving quality and productivity, reducing risk, verifying compliance and increasing speed to market.

9. Institute for Testing and Certification, Inc. (www.itczlin.cz/en)

Institute for Testing and Certification, Inc. is the Czech independent company with a worldwide sphere of authority providing services on the area of testing, certification, technical inspection, metrology a standardization.

10. UL(www.ul.com/global/eng/pages)

Working closely with regulators, energy utilities and inverter manufacturers, UL is evolving the grid interconnection safety standards to keep pace with new power production applications, new product opportunities and new customers.At UL, theyare constantly developing new ways to help the world benefit from Sustainable Energy. Theirglobal teams are working to advance the safety and security of the new processes, technologies and products that are transforming the energy industry.

11. TÜV SÜD (www.tuv-sud.com/activity/testing-product-certification)

Headquartered in Munich, Germany and founded in 1866, TÜV SÜD is one of the world's leading technical service organisations.TÜV SÜD is a world leader in testing and product certification. They provide testing to international standards and Directives that are endorsed by leading quality and safety marks. For example, the US Nationally Recognised Testing Laboratory (NRTL) Mark, and the European Community's CE Marking and GS Mark. Theyalso issue TÜV SÜD product certification marks based on standards set according to internationally recognised benchmarks.

TheirInternational Compliance Management (ICM) solution supports your global market access requirements. Working with an experienced compliance expert enables clientsto meet the necessary requirements of target countries efficiently and cost effectively.

12. United Kingdom Accreditation Service (www.ukas.com)

The United Kingdom Accreditation Service is the sole national accreditation body recognised by government to assess, against internationally agreed standards, organisations that provide certification, testing, inspection and calibration services.

UKAS is licensed by BIS to use and confer the national accreditation symbols (formerly national accreditation marks) which symbolise Government recognition of the accreditation process. UKAS accreditation provides an assurance of the competence, impartiality and integrity of conformity assessment bodies. UKAS accredited certification, testing and calibration and inspection reduces the need for suppliers to be assessed by each of their customers. UKAS' involvement in international groups provides for mutual recognition which further reduces the need for multiple assessments of suppliers and as a consequence helps to reduce barriers to trade.

International

13. Asia Inspection (www.asiainspection.com)

Asian Inspection is a third party quality control services provider founded in Hong Kong. It is accredited by the China National Accreditation Service for Conformity Assessment (CNAS) and licensed by AQSIQ to perform inspections in China. Asia Inspection is a quality control services provider for importers sourcing consumer and food products from Asia. The company offers on site product inspections according to ISO 9001:2008 standards, factory audits to ISO9000, SA8000 or C-TPAT standards and laboratory testing. The company employs over 350 quality inspectors.

14. Doosan (www.doosanheavy.com/en/intro/qualitymanagement/international_test.do)

Doosan is Korea's best calibration and testing agency, supporting all of the accreditation categories and issuing calibration and testing reports that are recognized domestically and internationally.They are known as Korea's best official calibration and testing agency, operating internationally accredited laboratories.

Operation of Internationally-Recognized Calibration & Testing Laboratories

Theirresearch engineers support R&D for the development of products such as castings and forgings, power generation facilities for nuclear, hydro and thermal plants, desalination plants, environmental facilities, material handling systems and chemical process equipment, as well as various calibration and testing works. The calibration and testing service support theyprovide are accredited by the Korea Laboratory Accreditation Scheme. Today, theyare among only a handful of Korean companies that operate both calibration and testing laboratories that are recognized worldwide.

Operation of KOLAS -Accredited Testing Laboratory

Theywork as an internationally accredited testing agency, having received KOLAS accreditation from the Korean Agency for Technology and Standards of the Ministry of Commerce, Industry and Energy in September 2002.

Appenix C: Testing and Certification Marks

VDE Testing and Certification Institute	
Mark	**Description**
	**VDE Mark for appliances as technical equipment according to the Appliance Safety Law (GSG), for Medical Device Law (MPG), components and installation materials.** The VDE Mark indicates conformity with the VDE standards or European or internationally harmonized standards resp. and confirms compliance with protective requirements of the applicable EC Directive(s). The VDE Mark is a symbol for electrical, mechanical, thermal, toxic, radiological and other hazards.
	**For appliances as technical equipment according to the GSG.** For ready-to-use equipment, the license holder may chose to affix the VDE Mark or the VDE GS Mark.
	**For products certified on the basis of harmonized certification agreements.** Testing is based on harmonized European standards listed in the ENEC Agreement. Products (at present luminaires and related components, energy saving lamps, IT equipment, transformers, switches for appliances, electrical controls, certain types of capacitors and EMI suppression components) tested to tested to the listed standards may be marked with the ENEC Mark of the VDE. The approval of any other body participating in the ENEC Agreement is not required.
	**For appliances in compliance with standards for electromagnetic compatibility.** The VDE EMC Mark expresses the conformity of a product with applicable standards for electromagnetic compatibility. The reliable function of the product in its electromagnetic environment is also included. The requirements for granting this mark comprise automatically and without restriction the compliance with applicable standards.
	**For cables, insulated cords, installation conduits and ducts, the VDE Cable Mark is applicable.** For cables and cords, the VDE Identification Thread may be used.
	**VDE-HARmonization Marking** **The VDE HARmonization Marking or VDE HARmonization Thread resp. for cables and insulated cords according to harmonized certification procedures.** Testing is based on the Harmonization Documents (HD) listed in the HAR Agreement. Products (harmonized power cables) tested and found in compliance with the requirements of the mentioned standards may be marked with the VDE HARmonization Marking. Further information is available from the Laboratory for Cables and Cords, Materials and Special Tests.
	The **VDE Component Mark** may be used for electronic components.
	**The CECC Mark for electronic components according to CECC Specifications.** For electronic components according to CECC Specifications (CECC: CENELEC Electronic Components Committee) the CECC Mark may be used.
	**VDE-Reg.-Nr. (VDE Certificate of Conformity in conjunction with factory surveillance)** This mark is used in two cases: firstly, for products in

	compliance with applicable clauses of VDE standards in the absence of a fully applicable VDE standard, and secondly, if a product, e.g. a sub-assembly, requires the fulfillment of additional conditions when incorporated into complete equipment. For cables and insulated cords, the VDE-Reg.-Nr. or the relevant mark resp. is applicable in absence of special regulations for products which were tested on the basis other standards. Special constructions and all variations of non-harmonized cables and insulated cords belong to this category of products.
Underwriters Laboratories Inc.	
Mark	**Description**
	**UL Listing Mark** This is one of the most common UL Marks. If a product carries this Mark, it means UL found that samples of this product met UL's safety requirements. These requirements are primarily based on UL's own published Standards for Safety. This type of Mark is seen commonly on appliances and computer equipment, furnaces and heaters, fuses, electrical panelboards, smoke and carbon monoxide detectors, fire extinguishers and sprinkler systems, personal flotation devices like life jackets and life preservers, bullet resistant glass, and thousands of other products.
	**C-UL Listing Mark** This mark is applied to products for the Canadian market. The products with this type of mark have been evaluated to Canadian safety requirements, which may be somewhat different from U.S. safety requirements. You will see this type of Mark on appliances and computer equipment, vending machines, household burglar alarm systems, lighting fixtures, and many other types of products.
	**C-UL US Listing Mark** UL introduced this new Listing Mark in early 1998. It indicates compliance with both Canadian and U.S. requirements. The Canada/U.S. UL Mark is optional. UL encourages those manufacturers with products certified for both countries to use this new, combined Mark, but they may continue using separate UL Marks for the United States and Canada.
	**Classification Mark** This mark appears on products which UL has also evaluated. Products carrying this mark have been evaluated for specific properties, a limited range of hazards, or suitability for use under limited or special conditions. Typically, products Classified by UL fall into the general categories of building materials and industrial equipment. Examples of types of equipment Classified by UL include immersion suits, fire doors, protective gear for fire fighters and industrial trucks.
	**C-UL Classification Mark** This Classification marking is used for products intended for the Canadian marketplace. It indicates that UL has used Canadian standards to evaluate the product for specific hazards or properties. Examples of C-UL Classified products include air filter units, firestop devices, certain types of roofing systems, and others.

	**C-UL US Classification Mark** UL introduced this new Classification Mark in early 1998. It indicates compliance with both Canadian and U.S. requirements. The Canada/U.S. UL Mark is optional. UL encourages those manufacturers with products certified for both countries to use this new, combined Mark, but they may continue using separate UL Marks for the United States and Canada.
	**Recognized Component Mark and Canadian Recognized Component Mark** These are marks consumers rarely see because they are specifically used on component parts that are part of a larger product or system. These components may have restrictions on their performance or may be incomplete in construction. The Component Recognition marking is found on a wide range of products, including some switches, power supplies, printed wiring boards, some kinds of industrial control equipment and thousands of other products. Products intended for Canada carry the Recognized Component mark "C."
	**Recognized Component Mark for Canada and the United States** This new UL Recognized Component Mark,which became effective April 1, 1998, may be used on components certified by UL to both Canadian and U.S. requirements. Although UL had not originally planned to introduce a combined Recognized Component Mark, the popularity of the Canada/U.S. Listing and Classification Marks among clients with UL certifications for both Canada and the United States has led to the new Mark.
	**International "emc-Mark"** The International "emc-Mark" appears on products meeting the electromagnetic compatibility requirements of Europe, the United States, Japan, Australia, or any combination of the four. In the United States, some types of products can't be sold without proof of compliance to U.S. electromagnetic compatibility requirements. The types of products that are subject to EMC testing include medical and dental equipment, computers, microwave ovens, televisions, radios, transmitters, and radio-controlled equipment.
	**EPH Product Mark** The UL EPH mark appear on products that have been evaluated to Environmental and Public Health Standards. The "Classified" version is used for products complying with ANSI/NSF Standards and other food equipment hygiene codes and requirements. Examples include Food Service and Meat and Poultry Plant Equipment and Drinking Water Additives. The "Listed" version is typically used for products complying with UL's own published EPH Standards for Safety.
	**Food Service Product Certification Mark** The UL Food Service Product Certification Mark is UL's Classification Mark with specific reference to the appropriate NSF International standard. In addition, at the manufacturer's option, a supplemental Mark can be applied as shown. Equipment bearing the Mark is not limited to electrical products, but also includes gas appliances and non-powered equipment. These products are commonly found in commercial food establishments, institutional food services and other locations.

	**Field Evaluated Product Mark** A Field Evaluated Product Mark is applied to a product that is thoroughly evaluated in the field instead of UL's laboratories or the manufacturer's facility. If a product has been significantly modified since its manufacture or the product doesn't bear any third-party certification mark, a building owner, a regulatory authority, or anyone else directly involved with the product can request that UL conduct tests in the field on the specific piece of equipment. Products that meet appropriate safety requirements are labeled with a tamper-resistant Field Evaluated Product Mark.
	**Facility Registration Mark** The UL Registered Firm Mark is a mark you will never see on a product. Instead, it indicates that a particular facility has passed UL's evaluation to quality assurance standards and is used in promotion and marketing by companies with quality assessment programs audited by UL. The standards UL uses are the ISO 9000 series of quality assurance standards; QS-9000, the quality standards developed by the Big Three U.S. automakers for their suppliers; and ISO 14001, the standard covering environmental management systems.
	**Marine Mark** The UL Marine mark appears on products which have been evaluated specifically for marine use. Products bearing this Mark have been evaluated to UL's published Marine Safety Standards and other applicable standards and codes. These requirements address hazards that can occur as a result of exposure to harsh marine environments such as vibration, shock (impact), ignition protection, water ingress and salt spray corrosion common on pleasure craft and boats. Examples of the type of equipment suitable for the UL Marine Mark include alternators, battery chargers/power inverters, navigation lights, and fuel tanks, filters and pumps.
	AR-UL Mark Used in conjunction with the mandatory "S" Mark of Argentina's National Office of Internal Commerce (Direccion Nacional de Comercio Interior, or DNCI), the "AR-UL" Mark indicates a product's compliance with Phase III of Argentina's Resolution 92/98. Most electrical and electronic products entering Argentina will have to display the "S" Mark adjacent to the Mark of an accredited and Recognized third-party certification organization such as UL de Argentina, S.R.L..
CSA International	
Mark	**Description**
	The CSA mark may appear alone or with indicators. If it appears alone, it means that the product is certified for the Canadian market, to the applicable Canadian standards.
	If the CSA mark appears with the indicator "US" or "NRTL" it means that the product is certified for the U.S. market, to the applicable U.S. standards.
	If this Mark appears with the indicator "C and US" or "NRTL/C" it means that the product is certified for both the U.S. and Canadian markets, to the applicable U.S. and Canadian standards.

	CGA "Script" The Canadian Gas Association (CGA) "Script" for components of gas appliances and other liquid petroleum products indicates certification to applicable Canadian standards.
	A.G.A. Blue Star The American Gas Association (A.G.A.) "Blue Star" mark for gas appliances and other liquid petroleum products indicates certification to applicable U.S. standards.
	CSA Blue Star The CSA Blue Star Mark for gas appliances and other liquid petroleum products indicates certification to applicable U.S. standards.
	CGA Blue Flame The Canadian Gas Association (CGA) "Blue Flame" mark for gas appliances and other liquid petroleum products indicates certification to applicable Canadian standards.
	CSA Blue Flame The CSA Blue Flame Mark for gas appliances and other liquid petroleum products indicates certification to applicable Canadian standards.
	A.G.A. "Script" The American Gas Association (A.G.A.) "Script" for components of gas appliances and other liquid petroleum products indicates certification to applicable U.S. standards.
NEMKO	
Mark	**Description**
	Shows that the product is Safety Certified and when relevant, that the product is also compliant with the EMC Directive. The well-known N-mark is a certification mark based on Nemko's own testing or results from testing performed by often laboratory according to multi-national or bi-lateral agreement or by otherwise Nemko accepted laboratories including all authorized manufacturers. The mark itself signifies that Nemko has tested or certified the product according to national standards official safety regulations in Norway. (which in principle are equivalent to those of the other European EU/EEA states)
	Shows that the product is tested and certified as above, but signifies clearly that the product is certified for both safety and EMC by Nemko or by a Nemko authorized laboratory. In addition this mark confirms that the product also covers the EMC Directive, tested by Nemko or Nemko authorized laboratories.
	The product is only certified for EMC by Nemko.
	Products certified by Nemko may if desired be tagged with the unique "Nemko Approved" label for use as advertising, shows, displays packages and also on the actual products.
DEMKO	
Mark	**Description**

	DEMKO's D-Mark represents electrical product safety for a great majority of consumers. The D-Mark demonstrates that, from a safety point of view, the tested product complies with: • Harmonised standards, e.g. EN/HD • International standards, e.g. IEC • National standards, e.g. DS • Other national standards e.g. American National or UL Standards • Other relevant parts of the above-mentioned standards which form part of the basis for certification e.g. National Deviations.
	DEMKO is the Competent Body for the EMC Directive and performs testing under the EMC Directive. An EMC test, in addition to an LVD test, at DEMKO gives you the right to use DEMKO's EMC Mark. The accompanying report can be used as documentation for CE Marking of your product in accordance with the EMC Directive. Safety related EMC tests under the Low Voltage and Machinery Directives should always be performed either before, or in connection with, EMC testing under the EMC Directive in order to avoid expensive double work. EMC testing at DEMKO can be monitored by the manufacturer so that any problems arising can be dealt with immediately, or DEMKO can, by agreement with the manufacturer, make any necessary changes and retest the product.
	European EMC Mark A mark for EMC has been introduced in the 15 most recognized certification bodies in Europe. • The CCA EMC Mark gives you the possibility to document that EMC requirements, which can often be difficult to handle, have been complied with. • The CCA EMC Mark is recognized by the certification bodies in the 15 countries who recognize each other's results. Full European recognition is hereby achieved. • The EMC Certificate is always documented by an accompanying EMC test report. • The EMC Mark can be used together with national safety marks as well as with the CE Mark.
FIMKO	
Mark	**Description**
	The SGS Fimko FI mark is a well-known and respected impartial certification mark indicating the safety and quality of a product. The FI mark can only be used on products that have a valid FI certificate granted by FIMKO. The FI mark can appear on the certified product, in the User's Manual and Installation Guide, in product catalogues and, for example in newspaper, TV and radio advertisements. Below the FI mark our slogan 'safe quality' can be used to strengthen and enhance the value of the mark (see figure). More information about the use of the FI mark can be found in FIMKO's FI handbook and on a diskette which can be obtained free of charge.

	An EMC certificate issued by FIMKO is a powerful way of demonstrating the EMC conformity of the product for international markets. SGS Fimko's EMC mark gives added value and can be used in marketing, for example on the packaging, in brochures and price lists. EMC certified products can be browsed on SGS Fimko's website under the FI register, product lists. The EMC certificate granted by SGS Fimko requires that testing is carried out according to European standards or in a testing laboratory assessed and approved by SGS Fimko. SGS Fimko's EMC mark can be granted to all products which are in accordance with European standards, for example household appliances, switches for household appliances, lighting fittings, measurement instruments, electromedical equipment, IT equipment, office machines, hand-held tools and consumer electronics.
SEMKO	
Mark	**Description**
	The S marking, which is voluntary today, means that SEMKO as an impartial testing laboratory certifies that the product fulfils valid safety requirements. The safety requirements include checking of e.g. • electrical safety • fire protection • mechanical hazards • radiation risks, e.g. of CD players and solaria
VARIOUS	
Mark	**Description**
	The CE-marking is the manufacturer's statement to the EU authorities that his product complies with all relevant CE-marking Directives. It is important to emphasize that the CE-marking is not a quality mark or a guarantee to consumers in EU. The manufacturer is always responsible - within or outside EU - for CE-marking. If the manufacturer is not located in EU, he can authorize a representative located in EU who thus becomes responsible for CE-marking. The representative's duties and responsibilities must be agreed in writing. Importers not authorized by the manufacturer must keep his documentation in safekeeping in EU for ten years after the last production date. Please bear in mind, that the importer may always be held responsible for the documentation.
	ENEC is an abbreviation for "European Norms Electrical Certification". These four letters are part of the registered trade mark that demonstrates that a product has been certified by one of the national certification institutes in Europe. Today, there are 18 certification institutes who are signatories to the agreement. Apart from the ENEC Mark itself, there is also a two digit number that indicates which certification body has issued the ENEC Certificate. The ENEC Agreement was originally (in 1991 under the name, the LUM Agreement) started with a view to providing manufacturers of luminaires with a joint European certification mark to replace all the different national marks. In 1999, the agreement was expanded to include: • Lighting

	• Components for lamp holders • IT • Electric office equipment • Safety isolating transformers • Isolating transformers and separating transformers • Power supply units • Switches
	The GS-Mark is the German national mark that demonstrates that a product has been tested and found to comply with the standards for the product. The GS-Mark is to Germans what the Danish D-Mark is to Danes. The GS-Mark is very well recognized by German consumers; so well recognized that certain products are nearly impossible to sell without the GS-Mark. For manufacturers and importers wishing to sell their electrical products in Germany, it is a good idea to have a GS-Mark. There are three particular areas where a GS-Mark is nearly a necessity: tools, IT equipment and electro-medical equipment. Manufacturers of tools often have a hard, if not impossible, time selling their products in Germany without a GS-Mark because such marking is supported by consumers and the trade unions. IT equipment is also affected by the requirement for GS-Marking; the mark is a requirement if you wish to sell major companies or institutions. The third area where the GS-Mark is particularly important is electro-medicine because a GS-Mark is a prerequisite for a grant to the institution in question from the German authorities.
	Keymark is a European safety mark identical to the well-known systems on which the existing European CCA system is built. Some of the most important criteria for testing products under the CCA rules are: factory inspection, random sample supervision and testing performed by testing institutes of equal standing. Market supervision is performed, i.e. products are periodically sampled from the market for examination in accordance with the procedures applied by the individual countries' national bodies. The testing institute responsible for issuing the Keymark is identified by means of a numerical code which constitutes part of the Keymark itself.
	Institute für Software, Elektronik, Bhantechnik
	The NOM Mark is the Mexican product safety mark. Our Mexico City laboratory is an accredited SECOFI laboratory - however, you can receive testing from any one of our laboratories to receive this certification.
	Warnock Mark Mark represents compliance to United States and/or Canadian product safety standards. The Warnock Hersey Mark can be found mainly on fire doors, sealed insulated glass, building materials and gas and oil fired products, like hearth products.
	The GOST R certification mark is part of the mandatory Russian Certification system.

	ETL Listed Mark ETL Listed Mark represents compliance to United States and/or Canadian product safety standards. You will find the ETL Listed Mark on electrical-gas-, or oil- fired products. For the United States, we are recognized by Occupational Safety Hazards Association (OSHA) as an National Recognized Testing Laboratory (NRTL). Click on the NRTL link to view the scope of recognition (the list of standards, sites, and programs that OSHA has recognized us for). In Canada, we are accredited by the Standards Council of Canada (SCC) as a Testing Organization and a Certification Organization.
	ENERGY STAR is the symbol for energy efficiency. It's a label -- created by the U.S. Environmental Protection Agency and the U.S. Department of Energy -- to help consumers save money and prevent air pollution. An appliance or product with the ENERGY STAR label means that it's in the top of its class for energy efficiency. Products that meet EPA and Department of Energy efficiency criteria qualify as ENERGY STAR. Consumers save money with ENERGY STAR products because they use less energy than conventional products and cost less to operate. ENERGY STAR products also offer the same or often better performance and features as conventional products.

Appendix D: Relevant EU and International Standards for Hydropower

See Attachement D

Appendix E: Microgeneration Certification Scheme.

See Attachement E

Appendix F: Economic Benefits of Standards Case Studies

See Attachement F

Appendix G: Inception report

"INOGATE Technical Secretariat & Integrated Programme in support of the Baku Initiative and the Eastern Partnership energy objectives"

Assistance from the Ad Hoc Expert Facility

COMPONENT B: Small hydropower

INCEPTION REPORT

Harmonization of Standards for small HPP equipment and standards used by testing and certifying laboratories"

(AHEF63 AM)

DRAFT v2

Control and Revision	Prepared by	Reviewed By	Approved By
Version 1 (27/11/2013) Updated version of the ToR (13/05/2014)	Joanta H. Green	Ana Nuñez Lopez Nikos Tsakalidis	Albert Zweering

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1 BACKGROUND INFORMATION

1.1 Beneficiary country & benefiting entity

Country: Armenia

Beneficiary Organisation: Ministry of Energy and Natural Resources (MENR)

Armenia is in the course of advanced discussions with the EU on implementation of the European and international standards and best practice in country. In parallel there are on-going discussions on the possible upgrade of Armenia from an Observer status to the Energy Community (EnC) Treaty to a signatory member. INOGATE is following and provides assistance in this process through three projects:

- **INOGATE Technical Secretariat and integrated programme in support of the Baku Initiative and the Eastern Partnership energy objectives** which has the objective to contribute to the progress of the INOGATE Partner Countries in the achievement of the Baku Initiative and the Eastern Partnership objectives. The programme would support a reduction in their dependency on fossil fuels and imports, improvement of the security of their energy supply, and climate change overall mitigation.
- **Energy Saving Initiative in the Building Sector in the Eastern European and Central Asian Countries (ESIB)**
- **Supporting Participation of Eastern European and Central Asian Cities in the 'Covenant of Mayors' (INOGATE-related project)**

With respect to the legal framework, the 2004- Law on Energy Saving and Renewable Energy is the main legal act on renewable energy in Armenia and whose goals are to:

- Strengthen economic and energy independence and security of Armenia
- Increase the reliability of energy systems in Armenia
- Establish and develop industrial infrastructure and service organizations for promoting energy saving and renewable energy (RE)
- Reduce adverse impacts on the environment and human health as a result of technological developments.

PSRC also regulates RES generation as part of Armenia's commitment to promote renewable resources relates to its need to diversify its energy resource base and reduce energy imports. The country has taken concrete steps to make renewable energy development part of its energy law and energy strategy.

2 OBJECTIVES & EXPECTED RESULTS

2.1 Overall objectives

The overall objective of the assignment is to assist MENR of Armenia in the identification of European and international standards and best practice which will increase the efficiency of the HPP

infrastructure in the country, providing more electricity and increasing their competitiveness in the sector and the harmonization of their infrastructure to that used in Europe.

2.2 Specific objectives

The specific objectives of the task are

- To review relevant EU and International standards and best practice for increasing hydropower infrastructure;
- To analyse the existing regulations and rules for HPP in the country and to look for ways to harmonize the infrastructure to that used in Europe so that generation becomes export oriented and generates higher value;
- To report on international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;
- To assess the experience for mandatory application of standards in a EU member country (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);
- To list the testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards; and
- To report on EU mechanisms and procedures required for the global recognition of the accredited labs.
- To ensure communication between the experts and the beneficiary to ensure a good collaboration and achieving results in line with the priorities of the country and which will be used and adopted by the country

3 COMMENCEMENT OF SERVICES AND WORK PLAN

The consultant team comprises a Senior Energy Expert Leader (Dr. Joanta Green) and a Junior Energy Expert (Sergey Abrahamyan). The Team formally commenced services on 10 April 2014 and is expected to complete the assignment by July 2014. Mr. Seregy Abrahamyan provided a range of documents to Joanta Green before her arrival in Yerevan, and further documentation and data is being collected and assembled by the team while in the field. The team has had initial briefings with the Ministry of Energy and Natural Resources, and other beneficiaries (please see Annex 1 for the full list).

Initial discussions centered on the TOR and the current situation with technical components for hydropower generation such as the turbines, generators and control systems.

4 OBSERVATIONS ON THE ASSIGNMENT

The Ministry of Energy and Natural Resources and the PSRC have stated that hydropower standards will be mandatory for new construction. They wish to implement the minimum technical specifications for SHPP to improve energy efficiency at generation. They are requesting a cost benefits analysis for the introduction of mandatory standards as well as case studies to show

experiences in EU member countries. From meetings with INOGTE, the team was told that Armenia will be the first country in the Caucuses to implement some standards for hydropower.

The Ministry of Energy and Natural Resource has also requested information on how to get certifying laboratories to open an office in Yerevan for handling the certification of locally produced turbines, generators and control systems.

5 SCOPE OF WORK

The scope of work for the delivery of this activity will be the following:

- To prepare a comprehensive analysis based on published studies and previous relevant studies which will be compiled by the experts and presented to the MENR. The report will identify European and international standards and best practice which will increase the efficiency of the HPP infrastructure in the country.
- A consultation and data collection mission in which the MENR will be able to provide feedback and on the EU practices review and discuss with the experts on the adaptability of EU practices in the Armenian context. During the same visit and after the feedback provided by MENR and experts team will be able to hold meetings with the relevant stakeholders. This is to ensure communication between the experts and the beneficiary to ensure a good collaboration and achieving results in line with the priorities of the country and which will be used and adopted by the country.
- To develop international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;
- A report which is an assessment of experience in mandatory application of standards in a EU member countries (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);
- A list of testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards;
- A report on EU mechanisms and procedures required for the global recognition of the accredited labs.

In particular, during the second visit the expert team will have:

- A round table discussion on the reports generated such as the:
    - A report which is an assessment of experience in mandatory application of standards in a EU member countries
    - A list of testing and certifying laboratories for SHPP power equipment accredited in the EU complying with above mentioned obligatory standards;
    - A report on EU mechanisms and procedures required for the global recognition of the accredited labs
    - International standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories.

5.1 PERIOD OF EXECUTION

Proposed times

Activity	Man-days	Period of time (all in 2014)
1. Preparation for 1st mission	5	2nd half of April
2. 1st mission to Yerevan	5	26th of April, 2014 – 3rd May 2014
3. Desk work & consultation	20	May 2014
4. Preparation for 2nd mission	5	May 2014
5. 2nd mission to Yerevan	5	1st week of June, 2014
6. Desk work & consultation	5	2nd half of June, 2014
7. 3rd mission to Yerevan	5	1st week of July, 2014
8. Report delivery	11	2nd half of July, 2014
Total	**61**	**2nd half of April - Middle of July**

The date's are flexible, pending approvals and required schedule adjustments in the course of work. This list illustrates the proposed schedule of implementation.

5.2 Task timeline

Activity Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
1. Preparation for 1st mission							
2. 1st mission							
3. Desk work & consultation with beneficiary							
4. Preparation for 2nd mission							
5. 2nd mission							
6. Desk work & consultation with beneficiary							
7. 3rd Mission to Yerevan							
8. Reporting							

The timeline is tentative, pending approvals and required adjustments in progress. The timeline illustrates the planned schedule of implementation.

6 DELIVERABLES

Deliverables to the beneficiary in this task will be:

Objectives	Deliverables	Comments to the Scope of Work
To review relevant EU and International standards and best practice for increasing hydropower infrastructure;	One chapter in the report which reviews relevant EU and International standards and best practice for increasing hydropower infrastructure in Armenia.	*The MENR has asked for EU hydropower standards on a country by country basis. The team discussed that the minimum technical standards are international by the IEEC, IEC, etc. This will be uniform across all countries. Then the MENR requested that we find out which EU member countries exceed these minimum technical standards if any. Mr. Sergey has access to the technical standards for hydropower and will go through the list to highlight the standards that are most relevant to SHPP. Please find attached in Annex 2 the standards.* *MENY Is most interested in technical standards for turbines, generators and control systems but wishes to be made aware of the ISO standards related to hydropower.*
To report on international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories;	One chapter in the report which lists on international standards for power equipment of small HPPs, automated controls for this equipment and standards applied to testing and certifying laboratories and makes recommendations as to the best for Armenia.	

To list the testing and certifying laboratories for SHPP power equipment accredited in the EU complying with mentioned obligatory standards;	One annex in the report which will list the testing and certifying laboratories for SHPP power equipment accredited in the EU complying with mentioned obligatory standards	*See Annex 3 this is the first draft which is still being developed.*
To analyse the existing regulations and rules for HPP in the country and to look for ways to harmonize the infrastructure to that used in Europe so that generation becomes export oriented and generates higher value;	One chapter which analyses the existing regulations and rules for HPP in the country and looks for ways to harmonize the infrastructure to that used in Europe so that generation becomes export oriented and generates higher value	*Mr Sergey will look at the Armenian regulations to see how they can be better harmonized with the EU.*
To assess the experience for mandatory application of standards in a EU member country (with developed small hydro, manufacturers of power equipment for SHPPs and/or testing and certifying laboratories);	One chapter which will be an assessment of standards in an EU member country for SHPP.	*Dr Joanta will research case studies on this topic. An internet search has shown that BSI has some relevant case studies available.*
To report on EU mechanisms and procedures required for the global recognition of the accredited labs.	One chapter which will report on the EU Mechanisms and procedures required for recognition of accredited labs.	*Dr. Joanta is working with certifications laboratories on this issue as well as investigating the mechanism and interest for theses institutes to open a branch in Yerevan. Annex 3*
To ensure communication between the experts and the beneficiary to ensure a good collaboration and achieving results in line with the priorities of the country and which will be used and adopted by the country.	Two, possibly three, stakeholder workshops, as well as regular in-country meetings by the national expert and emails and Skype calls with both the national and international expert.	*The team is working closely with the beneficiaries.*

7 ANNEX 1

Ministry of Energy and Natural Resources

Hrachik Tsughunyan, Head of Development Department Minister of Energy and Natural Resources

Mr. Daniel Herbet Stepanyan, Head of the Renewable Energy Division

Union of Small Hydroelectric Stations

Naira Nahapetyan, President

Public Services Regulatory Commission of the Republic of Armenia

Abgar Budaghyan, Head of Development and Monitoring Department

Inogate

Mr. Levon Vardanyan, Country Expert Republic of Armenia

Armenian Renewable Resources and Energy Efficiency Fund

Tamara Babayan, Director

Appendix H: Meeting minutes

Main points of the second mission

The second mission took place from June 1 to June 7 , 2014. The Energy Expert arranged a meeting with Bureau Veritas and the Ministry of Natural Resources and Energy. The MNRE is interested in having a certifying and testing laboratory set up in Armenia that could be used by hydroelectric turbine manufacturers and companies that make and design generators and control systems for hydropower. Mr. Stepan Barakian, CountryDevelopment Manager for Bureau Veritas, presented BV and its capabilities in supplying testing and certification for hydropower systems. Created in 1828, Bureau Veritas is a **global leader in Testing, Inspection and Certification (TIC)**, delivering high quality services to help clients meet the growing challenges of quality, safety, environmental protection and social responsibility.

As a trusted partner, Bureau Veritas offers innovative solutions that go beyond simple **compliance with regulations and standards**, reducing risk, improving performance and promoting sustainable development.

Bureau Veritas core values include **integrity** and **ethics**, **impartial counsel** and validation, **customer focus** and **safety at work**.

Bureau Veritas is recognized and accredited by major national and international organizations.

Main Points of the third mission

The third mission took place from 22nd to 25th of September, 2014. In coordination with the local Energy Expert, arranged for meetings with MENR where the final draft report and annexes were shared and discussed.

The MNRE suggested that:

- A feasibility study is done to see how much investment is needed to set up a certifying and testing laboratory and what the demand would be in Armenia and the Caucuses.
- Creating a laboratory in Yerevan would be cheaper than sending equipment to another country for testing
- Inogate should be approached for funding as it would be the reasonable next step to follow up this study. The Energy Expert suggested also approaching the European Bank for Reconstruction and Development as they tend to fund these types of studies. BV stated that they had contacts there and would be willing to approach them on behalf of the Ministry of Natural Resources and Development. The World Bank was also mentioned as another possible source of funding for this effort.

In addition in the briefing with the EU Delegate Mr. Ludovic Ciechanowski, it was stated that the EU will begin a quality management programme to assist Armenia with three technologies so that they can be exported to the EU. They are hoping to add energy as one of the focal points in the future.

Comment [C15]: Any updates on this. Has it started? or still in the filing cabinet?