

International Standards to develop and promote energy efficiency and renewable energy sources

ISO and the IEA (International Energy Agency) share the view that International Standards have an essential role to support the advancement of energy-efficiency and renewable energy,

The two organizations are actively cooperating to strengthen the portfolio of International Standards in these domains and to raise the awareness of world leaders on their importance.

The joint IEA/ISO position paper entitled “International Standards to develop and promote energy efficiency and renewable energy sources”, which has been submitted as a background document in the context of the preparation of the G8 meeting in Heiligendamm, Germany, in June 2007. The position paper highlights the key reasons why international standards matters in this domain and solicits political and business leaders to support and increase their involvement in the development and use of international standards.



INTERNATIONAL STANDARDS TO DEVELOP AND PROMOTE ENERGY EFFICIENCY AND RENEWABLE ENERGY SOURCES

*A common position paper by the
International Energy Agency (IEA) and
International Organization for Standardization (ISO)*

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Energy and International Standards

As in many other fields, International Standards have made, and will increasingly make, an important contribution to the energy sector, helping to enhance the safety and efficiency of production, distribution and use by all economic players, assuring quality and security, allowing for variety control, interoperability and interconnectivity, as well as reducing waste and environmental impact. They contribute to market development and the acceptance of energy-efficient technologies and pave the way for the development and use of alternative renewable sources.

The energy sector is facing new challenges, as highlighted by the heads of state participating at the G8 Summit held in Gleneagles in 2005, who took the collective resolution to “*promote innovation, energy efficiency, conservation, improve policy, regulatory and financing frameworks, and accelerate deployment of cleaner technologies, particular lower-emitting technologies*”.

International Standards are a powerful tool for disseminating new technologies and good practices, developing global markets and supporting the harmonization of government policies on energy efficiency and renewable sources on a global scale.

The global energy challenge and the importance of energy efficiency and renewable energy

In recent years it has become evident that the challenges facing the energy sector have become more acute. Concerns about the environment, energy security and economic prosperity, long identified as the “three Es” that inform and guide the mission of the International Energy Agency, are all three challenged by current energy trends. Over the last few years, global energy demand has outpaced the capacity of new supply to reach markets, and in the longer term the reliance on non-renewable energy sources is, by definition, unsustainable. Before that point is reached, it is now clear that humanity faces the pressing and growing problem of energy’s impact on climate. The work being done by the IEA and other organizations such as ISO is increasingly focused upon how best to address these multiple challenges and meet future energy needs in a more sustainable manner. There has been a growing appreciation of the great opportunities to be realized in exploiting untapped end-use efficiency reserves in the near term while making the transition towards lower carbon energy sources, including renewable energy sources, over the longer-term. The long-range global energy scenarios presented in the IEA’s *World Energy Outlook* (WEO) both illustrate the scale of the problems and of the

opportunities. For example, under the WEO's Reference Scenario, global energy demand continues to grow due to increasing economic activity and is projected to be 53 % higher in 2030 compared with 2004. Fossil fuels are expected to continue to dominate the energy fuel mix and as a result global CO₂ emissions to rise commensurately; the latter are projected to exceed 40 gigatonnes per annum by the end of the period. By contrast, the Alternative Policy Scenario considers what would happen if the some 1 500 carbon abatement and energy security policies that are currently only partially implemented or under active consideration were to be fully implemented. In that case, global energy-related CO₂ emissions would peak before 2030 and at a level 16 % lower than in the Reference Scenario. Some two thirds of the reductions are attributable to measures that raise end-use energy efficiency, 12 % to increased use of renewable energy, 10 % to increased use of nuclear energy and 13 % through improved efficiency and fuel-switching in the power sector. Moreover, this scenario is less costly than the Reference Scenario, mainly because of the comparatively low cost of the end-use efficiency gains. Thus the enhanced deployment of energy efficiency and renewable energy options could contribute almost 90 % of all future carbon abatement efforts in the energy sector. It is for this reason, and for the simultaneous advantages in terms of enhanced energy security and economic efficiency, that there is a pressing need to guide the global energy economy further down the pathway of the Alternative Policy Scenario rather than continue following current trends.

The role of standards

So what is needed to make a transition towards more sustainable yet affordable energy solutions and what role can standards play? Most technologies, including renewable energy, need to attain economies of scale if they are to advance along a learning curve and achieve cost viability. They also require that appropriate technical specifications be established and standardized in order to accelerate their deployment. In the case of end-use energy efficiency, the barriers are somewhat more complex. Many energy efficiency technologies and practices are already highly cost-effective but are held back by additional barriers which include

- lack of awareness of the cost-effective savings potential,
- missing or partial information on energy efficiency performance and lack of common metrics,
- lack of consideration of system and process energy efficiency issues,
- split incentives e.g. the different economic incentives which exist between landlords who procure energy using equipment and tenants who pay the energy bill, and
- the fact that energy efficiency is often a minor determinant of capital-acquisition decisions and is bundled-in with more important decision factors.

As a result of these barriers, the procurement and operation of energy-using equipment is often overly focused on initial rather than life-cycle cost optimization to the detriment of its overall efficiency.

Many measures are needed to help overcome these barriers and technical, as well as management standards underpin most of them. In the case of energy-using products standards enable an otherwise invisible product attribute, namely energy efficiency, to be measurable, comparable and reportable on a common basis. This is an essential step for the most important barriers of low visibility and awareness to be successfully addressed. Where common standards for measuring, defining, comparing, reporting and verifying energy efficiency are adopted, they also provide a level playing field for all market actors. Hence, wherever practicable, the adoption of

harmonized standards is desirable. Harmonization of these energy performance standards helps

- minimize product energy performance testing and verification costs for increasingly globalized energy-using equipment markets,
- enable energy performance to be compared on a common basis across broad economic and political groupings,
- facilitate adoption of more efficient product manufacturing, and
- accelerate transfer of best practice in policy settings.

Conversely, it is important that International Standards produce energy performance measures that are relevant to the local context, e.g. that in cases where the energy performance of equipment is sensitive to the prevalent ambient operating temperature, the standards allow locally pertinent results to be derived.

Technical standards in the domain of energy efficiency need not be limited to the measurement and definition of energy performance metrics. They can include the means of testing, certifying and labelling energy performance and could also include broader system and process topics such as energy management and how to monitor, identify and verify energy savings delivered via diverse applications and programmes. The development and adoption of these broader standards is part of the infrastructure that will contribute to the development of more fungible and international energy-efficiency markets as they will hasten the day when energy efficiency can be bought and sold as an energy service commodity in the same way that electricity or gas can currently be traded.

What International Standards offer

International Standards thus provide

- a consistent and clear framework describing technologies and good practices in the fields concerned, including, i.a. terminology, classifications, test methods, performances (along with the modalities of the presentation of test results and performance levels) and good management practices, and
- state-of-the-art knowledge formalized by recognized experts in the field, based on international consensus from a balance of interests reflecting the technological, economic and public interest conditions in the vast majority of the countries of the world.

International Standards add value in this context by

- reducing uncertainty for all the economic players, thus creating a climate favourable to public-private partnership for accelerating the development and marketing of more energy-efficient products and renewable energy sources,
- supporting international trade of goods and services in these fields and the development of new markets, and
- helping to significantly improve consumer/user understanding and confidence and thus influencing consumer/user behaviour and choices.

The value of the International Standards system to public authorities

International Standards and the International Standardization system offer the following advantages for public authorities:

- International Standards can be helpful in supporting cooperation and potential harmonization of public policies in the fields concerned;
- With International Standards, governments can have immediate access to a significant portfolio of documents covering energy efficiency in a variety of

- domains (buildings, household appliances, industrial products and processes, etc.) and a variety of renewable energy sources;
- the Standardization system offers the opportunity to develop, as quickly as demanded, technical solutions addressing requirements and priorities set by public authorities, involving all the concerned parties in an open, transparent and efficient process;
 - International Standards are fully compliant with the requirements set by the Agreement on Technical Barriers to Trade of the WTO, and are used worldwide as instruments facilitating the elimination of unnecessary barriers to trade and, whenever needed, as a suitable basis for technical regulations.

Public authorities and intergovernmental organizations are increasingly aware of the usefulness and importance of international standards. An important, recent example of this recognition can be found in the Joint Statement on Energy Security and Climate Change issued at the European Union and United States of America Summit held at the White House, Washington, on 30 April 2007. The Statement includes among the key priorities the need to “...*overcome barriers to the use of renewable energy sources including through the development of international standards...*” and, inter alia, indicates the commitment of the parties to develop compatible standards for biofuels.

Examples of the use of International Standards to support energy-efficiency policy

A good demonstration of the role International Standards published by ISO could play can be seen in the energy performance of buildings. Buildings use large amounts of energy and produce large amounts of CO₂. There are many opportunities to make savings in this sector, so practical tools are needed for the design and construction of energy-efficient buildings and the retrofit of existing buildings. International Standards provide these tools.

For example, the energy performance of buildings can be calculated using International Standard, ISO 13790. Complementing it are several other ISO standards that can be used to calculate the thermal properties of the building envelope (walls, roof and basement) and of the individual construction materials. These provide the reference for expressing performance in trade documents and building regulations all over the world.

The ISO standards by which the thermal properties of building components (*U*-values) are calculated have been adopted as European standards, as national standards in countries like China and Japan, and are referenced in building regulations in many countries.

The ISO standards elaborated by ISO/TC 163, *Thermal performance and energy use in the built environment*, are horizontal in nature and performance based. They can therefore be applied to new, innovative, energy-efficient products and buildings, thus giving them market credibility.

Another important example concerns domestic appliances such as household refrigerators, clothes washers and room air conditioners. These products are major sources of domestic and tertiary sector electricity consumption. Yet, in part as a result of the existence of recognized energy performance test procedures, it has been possible for the world's major economies to develop energy labelling and energy performance standards that encourage the development of more efficient products, while preventing or discouraging the sale of less efficient ones, and thereby save very significant amounts of energy at low cost. By way of illustration, since the European Union introduced energy labelling and minimum energy performance

standards for domestic refrigerators, the energy consumption of these products has improved by roughly 40 % over a five-year period. This and similar policies applied to other household appliances in Europe are projected to be on course to save 46 Mt of annual CO₂ emissions and more than € 11 billion in net consumer costs for appliances (the sum of the purchase and energy savings costs), once the old appliance stock is replaced by the new and more efficient models. As the value of the energy savings comfortably exceeds the increment in appliance prices the net cost of CO₂ abatement is negative at a value of – € 241 per tonne. Without recognized and reliable appliance energy performance test procedures it would not have been possible to implement these measures. Nor are savings from these policy types confined to Europe. Just-as-impressive savings are being delivered in other OECD economies, and many non-OECD economies have now implemented similar measures. Nonetheless, standardization continues to play a key role and there remain many areas in this domain where there is a need for new or improved energy performance test methods and procedures.

The last example concerns energy management and highlights the importance of international cooperation. National energy management standards have been developed and are in use in various countries, some of which are already exploiting significant savings in energy consumption and reductions in CO₂ emissions.

Considering the developments needed in this area from a global perspective, inclusive of the needs of developing nations, the Expert Group Meeting on Industrial Energy Efficiency and Energy Management Standards organized by UNIDO on 21-22 March 2007, took the resolution listed below:

“The EGM participants reached a consensus that the timing is favorable to move forward with the international harmonization of standards for Energy Management.

Currently, four countries have standards for Energy Management (Denmark, Sweden, Ireland, and the United States) and two have standards under development (China, and Spain). In addition, two other energy management specifications are already in use (Netherlands, Germany), and in some countries, such as Brazil, companies are developing their own energy efficiency standards. Moreover, harmonization efforts within the European Union have begun under the auspices of the European Committee for Standardization (CEN).

For these reasons, the meeting participants request that the International Organization for Standardization (ISO), as the appropriate international entity for global harmonization of standards, consider initiating development of an ISO Energy Management standard at the earliest possible opportunity.”

IEA/ISO cooperation

Given the importance of International Standards to the advancement of energy-efficiency and renewable energy, the IEA and ISO have begun to cooperate to strengthen the portfolio of International Standards in these domains.

The first step in this cooperation is to conduct a gap analysis of the existing portfolio of International Standards and ongoing standards projects addressing energy

efficiency and renewable energy, and to propose the potential development of new standards when clear omissions are identified, in cooperation with organizations such as the International Electrotechnical Commission (IEC), competent for International Standards relating to electrotechnology and electronics.

The second step is to review the portfolio of existing International Standards and ongoing standards projects to see if there are any areas where they should be further promoted, strengthened or re-oriented to better serve public policy objectives in these domains. ISO and IEA will also cooperate to facilitate the dialogue between policy makers and standards developers in selecting and prioritizing subject areas to be covered by International Standards supporting energy-efficient and renewable energy technologies and best practices.

It is expected that the initial gap analysis will be completed in 2007. The two organizations will subsequently focus their attention on the broader review of areas where international standardization should be promoted, strengthened or initiated.

Commitment of political leaders

ISO and IEA welcome the increasing recognition of the role of International Standards in the fields of energy efficiency and renewable energy sources by public authorities and international organizations.

International standardization is a complex endeavour that requires qualified participation of the concerned parties and their continual engagement. This ensures sustained market relevance and the close match of evolving market and societal needs.

The two organizations therefore invite the heads of state to support and increase the involvement of their national stakeholders in international standardization through their national standards bodies and appropriate expert networks such as IEA implementing agreements.



OUTCOME OF THE TASK FORCE ANALYSIS

Energy efficiency

Category	Standards found	Age	Active work found	Recommendation
Conventional power generation	**	**	**	→ Encourage existing ISO/TCs to consider aspects related to ongoing technological development with focus on efficiency of the energy conversion processes
Building	Substantial	Some older standards present	Substantial	→ Ensure focus and avoid overlaps (e.g. between ISO/TCs 59, 163, 205♦) → Encourage expeditious development of the standards with particular emphasis on ISO/TC 205 completing key tasks) → Emphasise the need for new and existing standards work to also cover retrofit and refurbishing → Consider standards giving guidance to facilitate the refurbishment of residential buildings → Investigate the need for personnel qualification standards for those working specifically on the energy efficiency of buildings → Ensure global relevance of the standards through broad participation of representatives from different nations
Industrial products and processes	Limited	Some older standards	Limited	→ Further investigation is needed (including in the area of ISO standards for heat exchangers) - contact the TCs concerned → Place emphasis on the systemic approach and encourage the

** data not available (or domain covered by IEC)

♦ ISO/TC 59: Building construction

ISO/TC 163: Thermal performance and energy use in the built environment

ISO/TC 205: Building environment design

Category	Standards found	Age	Active work found	Recommendation
				<p>focus on energy efficiency of overall systems and processes</p> <p>→ Emphasise the need for new and existing standards work to also cover retrofit and refurbishing</p> <p>→ Investigate the need for personnel qualification standards for those working in the energy efficiency of industrial plant and processes</p> <p>→ Investigate efficiency improvements in agricultural equipment</p> <p>→ Investigate efficiency improvements through industrial automation</p>
Transport	Limited	Some older standards	Limited	<p>→ Further investigation needed - contact the TCs concerned and also the international organizations in this area</p> <p>→ Investigation should cover the different transport methods - road, air and shipping</p> <p>→ Standards are needed to evaluate the energy efficiency of different transport means (people and goods)</p> <p>→ Examine supply chain management aspects</p> <p>→ Investigate transport management in general</p>
Household appliances (electrical)	**	**	**	→ Covered by IEC
Household appliances (non electrical)	**	**	**	→ Further investigation needed - contact the TCs concerned
Office equipment	Limited	Some older standards	Limited	→ Further investigate with JTC/1
Lighting	**	**	**	→ Covered by IEC

Renewable energy

Category	Standards found	Age	Active work found	
Solar heating	Limited	Some older standards	Limited	→ Investigate further to ensure that ISO work is in line with market requirements
Solar PV	**	**	**	→ Covered by IEC → However, ISO can investigate other aspects of solar PV – such as production techniques, integration of Solar PV with building construction techniques, energy contribution evaluation in building design.
Wind (ISO)	Very limited	New	Non	→ Ensure the ISO/TC activities reflect the interest in this technology and complement the work in IEC.
Biofuels	0	0	0	→ Encourage recent efforts to move forward with liquid biofuels → ISO also needs to consider solid biofuels, biomass and biogas → Specific needs of developing countries need to be taken into account
Wood	0	0	0	→ Standards are needed to facilitate the use of wood and wood waste as a fuel (e.g. standards for the quality of the fuel and the equipment/technology needed to use it) → The specific needs of developing countries need to be taken into account
Hydrogen	Limited	Newer standards present	Activity	→ Encourage the ISO/TC to continue work and provide standards to facilitate market development
Hydro Electric	**	**	**	→ Covered by IEC
Geothermal (power plant)	0	0	0	→ Further investigation - contact TCs which may be concerned
Geothermal (residential and commercial)	0	0	0	→ Further investigation - contact TCs which may be concerned

Marine Energy	0	0	0	→ Covered by IEC
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Horizontal themes

Energy Management	0	0	0	→ Encourage to move forward
Calculation methods	**	**	**	→ Need for harmonized terminology and calculation methods regarding energy efficiency, consumption and savings → Need for harmonized methods and criteria to calculate energy yield of different primary energy sources

General

Support to public policies and regulatory harmonization	**	**	**	→ Focus efforts to ensure the involvement in standards development of views from public policy officials
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Other critical issues

Carbon capture and storage for coal	0	0	0	→ Investigate current and future developments
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