Energy efficiency standards and labelling in Latin America – the issue of alignment and harmonisation

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Energy Strategies for Sustainable Development

Abstract

Following early programmes in Brazil (since 1984) and Mexico (since 1992), energy efficiency standards and labelling schemes have been implemented in most countries of Latin America. Despite of several efforts over the past decades to create harmonised standards and labelling schemes, Latin America presents a heterogeneous picture, with major differences between Mexico and Central America on the one side and South America on the other. Yet, also within the South American sub-region many smaller, yet important, differences between the schemes of individual countries exist. These differences, which indicate a lack of coordination among the efforts of each country, are not conducive to regional, or even sub-regional harmonisation. The purpose of this paper is to shed light on this reality, by addressing the following issues: First, an overview on energy efficiency standards and labelling programmes will be given, focussing on Brazil, Mexico and other countries in the Southern Cone and Andean sub-regions. For each national programme, measurement standards, labelling standards and regulations, and MEPS will be addressed. Second, the degree of alignment of the various national schemes with international and other reference standards; regional labelling schemes, like European Union regulations, the US standards and labelling programme and other national programmes in the Region, and the status of MEPS will be addressed. Third, the findings will be discussed with regard to several aspects, including the technical quality of the standards and regulations, the process and methodology of establishing them and the level of ambition, and conclusions will be presented. The paper builds on two decades of involvement of the author in EE S&L programmes in Latin America, as well as recent research.

1 Introduction

Although energy efficiency policies and programmes have been conceived in Latin America since the 1980ties and gained some momentum in the 1990ties, it is only since the turn of the millennium that they are perceived as alternatives, or at least complements, to the traditionally supply-side oriented energy policies in the Region. This shift is related to the changes of economic and environmental policies, which Latin American nations have undergone over the past decades, and which have been widely influenced by the changing paradigms of international financial institutions (IFIs) like the World Bank, the International Monetary Fund (IMF) and the Inter-American Development Bank (IDB). During the decade of the 1980ties, energy sector policies were characterised by expansion of energy supply and infrastructure, under the egis of IFIs and state-owned, vertically integrated public utilities. It were the same IFIs who, following the prescriptions of the "Washington Consensus" induced Latin American governments to deregulate their energy markets and to unbundle and privatise their energy companies. Since the first decade of the new millennium renewable energy and energy efficiency are on the rise, albeit with notable differences in the ambition and the effectiveness of the policies and programmes implemented in individual countries. Interesting enough, the two largest countries of Latin America, Mexico and Brazil, who have refrained from or have only cautiously implemented neoliberal reforms, were the pioneers in the development and implementation of energy efficiency programmes in Latin America. Brazil's PROCEL[1] programme started already in 1984, while Mexico established its National Commission for Energy Saving (CONAE[2]) and related programmes in 1989. Currently, almost all Latin

[1] *Programa Nacional de Conservação de Energia* (PROCEL).
[2] *Comisión Nacional para el Ahorro de Energía*, since 2009: *Comisión Nacional para el Uso Eficiente de la Energía* (CONUEE).

American countries are engaged in some kind of energy efficiency activity, which widely vary in maturity, ambition and effectiveness [1], [2].

From the very beginning, energy efficiency standards & labelling have assumed a prominent place in the Region's energy efficiency programmes. Pioneers have again been Brazil and Mexico, whose energy efficiency programmes started with a major focus on energy efficiency standards & labelling. Since the turn of the millennium, other countries have followed, notably Argentina, Chile, Uruguay and several countries of the Andean and Central American regions. Currently, almost all countries of Latin America have implemented, or at least initiated, an energy efficiency standards and labelling programme.

Due to the lack of effective economic integration in Latin America, energy efficiency standards & labelling programmes are national and not necessarily harmonised with each other, although most of the programmes are at least partly aligned with standards & labelling schemes in other parts of the world. The purpose of this paper is to explore the characteristics of each of the major standards & labelling programmes in the Region and to compare these characteristics among each other and with those international schemes that have served as reference for national policy makers, notably the standards & labelling schemes of the European Union and of the United States and Canada.

2 Subject matter and scope

Energy efficiency standards & labelling schemes are currently implemented in more than 80 countries world-wide.[3] As will be shown below, most countries of Latin America have also implemented or are at least in the process of implementing such schemes. Both energy labelling and minimum energy performance standards are recognised as very cost-effective instruments to reduce the energy consumption in the residential, commercial, industrial and transport sector, focusing on energy consuming and energy related products like household appliances, lamps and luminaires, consumer electronics, building elements, electric motors and other industrial equipment, cars, etc.

In order to be viable and effective, energy efficiency standards & labelling programmes need to include the following main elements: (i) measurement standards (test procedures), in order to establish the performance of the product in an objective and reproducible manner; (ii) an energy label which provides veracious and reliable information to consumers, and (iii) minimum energy performance standards (MEPS), i.e. binding energy efficiency thresholds for the placing of products on the market. Yet, to make a programme work, these basic elements need to be sustained by a system of procedures and physical infrastructure, including certification and accreditation procedures, test laboratories, monitoring and verification of the programme and market surveillance. In order to make energy labelling and minimum energy performance standards mandatory, legal acts need to be issued by the authority.

The focus of this paper will be on measurement standards (test procedures), "labelling standards" and regulations for mandatory energy labelling and minimum energy performances standards (MEPS). Measurement standards are usually issued by national standardisation organisations and may be fully or partially aligned with international, regional or other national standards. In several Latin American countries the national standardisation institute also issues so-called "labelling standards", which define the design and other characteristics of the energy label. Regulations for mandatory energy labelling and MEPS are subject to national legislation of each country.

Despite of several efforts over the past decades to create harmonised standards and labelling schemes in the Region, notably the elaboration of regional labelling standards by the Pan American Standards Commission COPANT[4], Latin America presents a heterogeneous picture, with major differences between Mexico and Central America on the one side and South America on the other. Yet, also within the South American sub-region many smaller,

[3] See e.g. www.clasponline.org
[4] Comisión Panamericana de Normas Técnicas / Comissão Panamericana de Normas Técnicas / Pan American Standards Commission (COPANT).

yet important, differences between the schemes of individual countries exist. These differences, which indicate a lack of coordination among the efforts of each country, are not conducive to regional, or even sub-regional, harmonisation.

The purpose of this paper is to shed light on this reality, by addressing the following issues: In Section 3, an overview on energy efficiency standards and labelling programmes will be given, focussing on "mainstream" developments in Brazil, Mexico and other countries in the "Southern Cone" ("*Cono Sur*") and Andean sub-regions. For each national programme, measurement standards, "energy labelling standards" and labelling regulations, and MEPS will be addressed. In Section 4, the degree of alignment of the various national schemes with international and other reference standards; regional labelling schemes, like European Union regulations, the US standards and labelling programme and other national programmes in the Region, and the status of MEPS will be addressed. In Section 5, the findings will be discussed with regard to several aspects, including the technical quality of the standards and regulations, the process of establishing them and the level of ambition. Finally, in Section 6, past and current international initiatives to foster alignment and harmonisation of EE S&L programmes in Latin America will be briefly addressed and conclusions will be presented, which may be taken in consideration by policy makers in Latin America and the international standards and labelling community, in order to improve national schemes and achieve higher degrees of alignment and harmonisation.

3 Energy efficiency standards and labelling programmes in Latin America

3.1 Brazil

The Brazilian energy efficiency labelling programme PBE[5] was established in 1984, by agreement among the Ministry of Industry and Commerce, the Brazilian Electric and Electronics Industry Association (ABINEE) and the Ministry of Mines and Energy. The programme is coordinated by the National Institute of Metrology, Standardisation and Industrial Quality (INMETRO)[6], with the participation of manufacturers. Initially voluntary, the labelling is currently mandatory for 27 products, of a total of 32 energy-using and energy-related products included in the programme, including several household appliances, lamps, air conditioners, fans, water heaters, televisions, renewable energy systems and equipment, computers and peripherals, stoves and ovens, electric motors, pumps, distribution transformers and car tyres, among others (Table 1).[7] Labelling regulations are currently promulgated by Decree (*Portaria*) of the President of INMETRO.[8] The Brazilian energy label is similar to the EU label, with some differences, notably with regard to the number of energy efficiency classes and some design features. Some design features of the Brazilian label were recently revised.

Since 1993, the National Energy Conservation Programme PROCEL[9] and the National Programme for the Rational Use of Petroleum Derivatives and Natural Gas CONPET[10] offer endorsement labels for products with the best energy efficiency levels within certain product categories (*Selo PROCEL* and *Selo CONPET*). Products eligible for *Selo PROCEL* typically have to comply with energy class "A" and additional requirements, like maximum annual energy consumption or other environmental criteria, according to the respective regulations published by PROCEL.

The Brazilian Energy Efficiency Law of 2001[11] confers to the government the authority and responsibility to establish mandatory minimum energy performance standards (MEPS) for

[5] *Programa Brasileiro de Etiquetagem* (PBE)
[6] INMETRO is an autonomous body of the Ministry of Development, Industry and Foreign Trade, established in 1973.
[7] Voluntary labelling regulations also exist for residential, public, commercial and services buildings and for certain types of motor vehicles.
[8] Previously, the Decrees referred to *Regulamentos Específicos para Uso da Etiqueta Nacional de Conservaçao de Energía* - ENCE, which still exist for some products.
[9] *Programa Nacional de Conservação de Energia* (PROCEL).
[10] *Programa Nacional de Uso Racional dos Derivados do Petróleo e do Gás Natural* (CONPET).
[11] *Lei de Eficiência Energética N^{o} 10.295/2001.*

energy using products. The process of standard setting follows established procedures which include public hearings and consultations, and is led by a Committee[12] which is composed of several ministries, the regulatory agencies for electricity (ANEEL) and petroleum and gas (ANP), a representative of academia and an independent expert. MEPS are promulgated by Inter-ministerial Decree (*Portaria Interministerial*) of the Ministries of Mines and Energy, Science and Technology, and of Development, Industry and Foreign Trade.

So far, MEPS have been established for the following products[13]:

- Three-phase electric motors (2002 and 2005)
- Compact fluorescent lamps (2006 and 2010)
- Household refrigerators and freezers (2007 and 2011)
- Air conditioners (2007 and 2011)
- Gas stoves and ovens (2007 and 2011)
- Instantaneous and storage gas water heaters (2008 and 2011)
- Incandescent lamps (2010)
- Electromagnetic ballasts for high pressure sodium vapour and metal halide lamps (2010)

The Inter-ministerial Decrees refer to "Specific regulations establishing the maximum levels of consumption" and to "Programmes of Objectives" ("*Programas de Meta*"), which establish i.a. the periods of review of the thresholds defined (which is usually every four years).

3.2 Mexico

The Mexican system of energy efficiency standardisation was initiated in 1992, based on the Federal Law of Metrology and Standardization[14]. Based on the work of former CONAE[15] and of the National Advisory Committee for Official Mexican Energy Efficiency Standards[16], the first standards were implemented in 1995. Mexican energy efficiency standards are Official Mexican Standards (*Normas Oficiales Mexicanas* – NOM), which – in accordance with the Federal Law of Metrology and Standardisation – are mandatory. The Official Energy Efficiency Standards are denominated "NOM-ENER" and include – in one legal document – test procedures, minimum energy efficiency standards and labelling requirements. The Mexican energy label follows the model of the US Energy Guide, including a continuous scale which indicates the relative savings of the product with regard to the threshold defined by the NOM. Test procedures and MEPS are partly aligned with US rulemaking. NOM-ENER are promulgated by the National Consultative Committee of Standardisation for the Preservation and Rational Use of Energy Resources[17], which is presided by the General Director of CONUEE, following a transparent and participatory process, involving stakeholders.

Currently, 29 NOM-ENER are in force, including standards for household appliances, air conditioners, water heaters, lamps, lighting systems, electric motors, pumps and pumping systems, distribution transformers, commercial refrigeration appliances, mechanised tortilla machines, the building envelope of residential and non-residential buildings, thermal insulation material for buildings, glass and glazing systems for buildings, industrial thermal insulation, standby electric power of equipment and appliances, as well as CO_2 emissions and fuel efficiency of automobiles (Table 2). The NOM for compact fluorescent lamps, room air conditioners and commercial refrigeration appliances were jointly promulgated by CCNNPURRE and the National Consultative Committee of Consumer Safety, Commercial

[12] *Comitê Gestor de Indicadores e Níveis de Eficiência Energética* (CGIEE).
[13] In brackets: years of first promulgation and recast of the respective regulation.
[14] *Ley Federal de Metrología y Normalización*
[15] *Comisión Nacional de Ahorro de Energía* (CONAE), since 2008: *Comisión Nacional de Uso Eficiente de la Energía* (CONUEE)
[16] *Comité Consultivo Nacional para las Normas Oficiales Mexicanas de Eficiencia Energética*
[17] *Comité Consultivo Nacional de Normalización para la Preservación y Uso Racional de los Recursos Energéticos* (CCNNPURRE)

Information and Practices[18]. In the case of CO_2 emissions and fuel efficiency standards of automobiles, the Ministry of the Environment and Natural Resources[19] is the leading entity.

In addition to CONUEE's mandatory standards and labelling programme, the Electric Power Saving Trust Fund (FIDE)[20] offers the possibility to manufacturers to acquire an endorsement label (*Sello FIDE*) for equipment that exceeds the minimum energy efficiency level defined by the NOM. FIDE has established technical specifications for a wide range of products.

3.3 Other countries of the Region

While Brazil and Mexico have pioneered energy efficiency standards and labelling in the Region, other countries have followed since the 1990ties, yet with different degrees of ambition and rigour. Early examples are the development of test procedures and labelling standards in Colombia, Peru and Venezuela [3], as well as mandatory energy labelling in Costa Rica, following the Law on Regulation of the Rational Use of Energy of 1994[21]. These early initiatives were followed by programmes in Argentina, Chile and Uruguay. More recently, also Bolivia, Ecuador, Paraguay and more Central American countries have initiated energy labelling activities. Some of the countries mentioned are in the process of revising or updating their energy labelling standards and regulations or are in the process of introducing MEPS.

A specific feature of the energy efficiency standards and labelling programmes in several Latin American countries are standards issued by the respective national standardisation institute which define, i.a., the energy label design, the efficiency classes and the underlying metrics. These standards, which are referred to in this paper as "(energy) labelling standards" are voluntary standards. In order to make them mandatory, a separate legal act is required, such as a government resolution or administrative order (like in Argentina and Chile) or a technical regulation (like in Peru). The "labelling standards" usually refer to test procedures or measurement standards, which are separate standards, issued by the national standardisation institute.

3.3.1 Andean Region

The energy efficiency standards & labelling schemes of the countries located in the North-Western part of South America, which will be referred to as "Andean Region", present a heterogeneous picture. As will be shown, the national schemes of these countries are influenced by those of Mexico (i.e. indirectly by the US), of the European Union and to some extent Brazil and other Southern Cone countries. This is the case for labelling regulations and standards, and also for measurement standards, which may refer either to international, Mexican, US or Brazilian standards. With some generalisation, energy efficiency standards and labelling schemes in these countries are less characterised by alignment to international or regional references, but by some kind of eclecticism, i.e. that they draw on upon different precedents. This eclecticism reflects the geographical situation of these countries between Mexico and Central America on the one hand, and Brazil and other Southern Cone countries on the other, and in particular the economic influence of Latin America's major economies on these countries. While this situation has developed historically, since the turn of the millennium, recent standards and labelling programmes, like in Ecuador or the new programme in Colombia, confirm this heterogeneity.

3.3.1.1 Bolivia

The Bolivian Standardisation Institute IBNORCA[22] has elaborated energy labelling standards for incandescent and fluorescent lamps and for refrigerators. As mentioned in [2], the Ministry

[18] *Comité Consultivo Nacional de Normalización de Seguridad al Usuario, Información Comercial y Prácticas al Comercio* (CCNNSUICPC)
[19] *Secretaría de Medio Ambiente y Recursos Naturales* (SEMARNAT)
[20] *Fideicomiso para el Ahorro de Energía Eléctrica* (FIDE)
[21] *Ley 7447 de diciembre 1994 sobre la Regulación del Uso Racional de la Energía y Decreto reglamentario N° 25584 de 1996.*
[22] *Instituto Boliviano de Normalización y Calidad (*IBNORCA*)*

of Hydrocarbons and Energy[23] runs an energy labelling programme, however this information could not be verified.

3.3.1.2 Colombia

In Colombia, approximately 30 energy efficiency labelling and measurement standards have been elaborated, since 2002, for a wide range of household appliances (including refrigerators and freezers, room air conditioners, gas and electric water heaters, household washing machines, various gas appliances), lighting equipment and electric motors. The "labelling standards", which were published as Colombian National Standards (NTC)[24], define the design, content and underlying algorithms of the label for a certain product, referring to the respective measurement standard (test procedure). The Colombian energy label is of the categorical type, following so far basically the original EU label. The existing standards were elaborated in the framework of the government's CONOCE[25] programme, in cooperation between the government agency *Unidad de Planificación Minero Energética* (UPME) and the Colombian national standardisation institute ICONTEC[26], including stakeholder consultations. The CONOCE Programme was launched in 2001 and most standards were elaborated in the period 2002 – 2004. Several labelling standards were subsequently reviewed and updated. So far, the labelling standards have been voluntary.

In October 2013, the Ministry of Mines and Energy (MME) published a Draft Technical Regulation for Labelling (RETIQ)[27], which includes new labelling requirements for room and central air conditioners, household and commercial refrigerators and freezers, electromagnetic and electronic ballasts, single-phase and three-phase electric induction motors, household washing machines, electric storage water heaters, gas instantaneous and storage water heaters, gas cooking ranges and ovens. The new labelling requirements are supposed to replace the existing "labelling standards", redefining labelling classes, in some cases the underlying algorithms, and the label design. The proposed generic label design combines elements from the former categorical label with elements similar to the Mexican and US labels. Energy efficiency classes and underlying algorithms are defined analogously to the classes of former and current EU regulations, although for various products algorithms from other national regulations, like e.g. Mexico and the US, are used. The first version of RETIQ also included an annex with measurement standards for the products concerned, which are based on various national and international standards. Last, but not least, the proposed regulation includes stipulations with regard to procedures for conformity evaluation (certification) and market surveillance. A revised draft of RETIQ, dated June 2014, was published by MME, inviting comments by July 3, 2014. Taking into consideration the comments received, the final draft of RETIQ was published in November 2014 and sent to the World Trade Organisation (WTO) for international consultation. It was expected that RETIQ will be published around May 2015. The final draft does not any more include the annex with measurement standards; these are now referenced separately for each product covered by RETIQ.[28]

3.3.1.3 Ecuador

In Ecuador, Technical Regulations for Energy Labelling of household appliances and other energy-using products have been developed and implemented since 2009. Until 2013, labelling regulations were implemented for household refrigerating appliances, CFLs, room air conditioners and household washing machines. Since 2013, "emergency" regulations were adopted for the following products: storage and instantaneous gas water heaters, electric storage water heaters, electric appliances for induction cooking, clothes driers, ventilators with integrated electric motors, televisions, electric ovens, microwave ovens, clothes washer-

[23] *Ministerio de Hidrocarburos y Energía (*MHE*)*
[24] *Normas Técnicas Colombianas* (NTC)
[25] *Programa de Normalización, Acreditación, Certificación y Etiquetado de Equipos de Uso Final de Energía (*CONOCE*)*
[26] *Instituto Colombiano de Normas Técnicas y Certificación* (ICONTEC)
[27] *Reglamento Técnico de Etiquetado* (RETIQ)
[28] Personal communication Luis Fernando Lopez Pineda (MME) and Omar Alfredo Baez Daza (UPME), February 2015.

driers and dishwashers. Regulations for further products and revised regulations for gas water heaters and electric storage heaters are in the process of adoption. The labelling regulations are mainly aligned with the corresponding (previous) Colombian regulations; yet also some alignment with former EU labelling regulations and Mexican NOMs can be observed. Test procedures referred to include Ecuadorian national standards, international and US standards. Minimum energy efficiency requirements apply for household refrigerating appliances, room air conditioners, household washing machines, CFLs, standby power for televisions, storage and instantaneous gas water heaters and for ventilators with integrated electric motors. All standards and regulations are issued by the Ecuadoran standardisation institute INEN[29].

3.3.1.4 Peru

In Peru, the elaboration of test procedures was initiated in 1996. In the following years, energy efficiency test procedures were developed for refrigerators and freezers, lighting equipment (lamps and ballasts), electric motors, electric water heaters, industrial boilers and solar thermal and photovoltaic systems, followed by voluntary EE labelling standards for refrigerators and freezers, household lamps and electric motors. Since 2007, minimum efficiency performance standards for CFLs are in force. According to Government Decree of 23 October 2007[30] regulating the Law for the Promotion of Efficient Use of Energy of 2000 (Law N^{o} 27345 of 2000)[31] the Ministry of Energy and Mines (MEM) has been required to develop and implement mandatory energy efficiency labelling of energy consuming equipment and appliances.

In 2009, MEM published two documents: (i) the Guide on the Energy Efficiency Label[32] and (ii) the Guide on Minimum Energy Efficiency Standards[33]. The Guide on the Energy Label proposes the label design and the contents of the labels for industrial boilers, electric three-phase induction motors, household refrigerating appliances, electric storage water heaters, gas instantaneous water heaters, and household lamps. They are of the categorical type, similar to the EU label, and include seven energy efficiency classes A–G, with the exception of the labels of industrial boilers and electric motors, which include three energy efficiency classes A–C. The Guide on Minimum Energy Efficiency Standards proposes thresholds for the same products.

In accordance with the original mandate of 2007, MEM elaborated in 2011 Technical Regulations for Labelling for the following products: fluorescent lamps, three-phase electric motors, gas and electric instantaneous and storage water heaters, industrial package boilers and solar water heaters. Currently, guidelines and preliminary drafts for labelling and MEPS regulations for a whole range of additional products are under elaboration.[34] While some labelling regulations and test procedures published so far are aligned with international or national standards of other countries, others are genuine documents combining elements from different sources.

3.3.1.5 Venezuela

In Venezuela, labelling of refrigerators/freezers is mandatory since 1998, in addition to a voluntary labelling scheme for room air conditioners. So far, labels have been equivalent to the US Energy Guide. The labelling standards were issued by the Venezuelan Institute for Industrial Standards COVENIN[35]. In 2012, the Ministries of Electric Energy and of Commerce

[29] *Instituto Ecuatoriano de Normalización (*INEN*).*
[30] *Decreto Supremo N^{o} 053-2007-EM del 23 de octubre de 2007: Reglamento de la Ley de Promoción del Uso Eficiente de la Energía*
[31] *Ley N^{o} 27345 del 1 de septiembre de 2000: Ley de Promoción del Uso Eficiente de la Energía*
[32] *Ministerio de Energía y Minas – Dirección General de Electricidad: Guía de la Etiqueta de Eficiencia Energética, Enero de 2009.*
[33] *Ministerio de Energía y Minas – Dirección General de Electricidad: Guía de Estándares Mínimos de Eficiencia Energética, Enero de 2009.*
[34] In 2012, the Ministry of Energy and Mines commissioned the elaboration of draft technical regulations for energy labelling and MEPS for a wide range of products, including: electronic and electromagnetic ballasts, gas cooking ranges and ovens, electric ovens, LED lamps, combined clothes washer-driers, household washing machines, refrigerators and freezers, clothes driers, air conditioners and televisions.
[35] *Comisión Venezolana de Normas Industriales (COVENIN)*

issued a joint resolution, which enacted a new Technical Regulation on the Energy Efficiency Labelling of Air Conditioners[36]. The Technical Regulations covers different types of air conditioners and introduces a new label, which is similar to the previous EU label. It also stipulates minimum energy efficiency requirements. According to [2], CONVENIN has issued more labelling standards since 2000; this information could however not be verified.

3.3.2 Southern Cone countries (except Brazil)

The energy efficiency standards & labelling schemes of the countries located in the Southern part of South America, the so-called "Southern Cone" ("*Conosur*"), show many similarities with each other and are widely aligned with previous EU labelling regulations and international test procedures. This is the case for Argentina, Chile, Paraguay and Uruguay, while Brazil has developed its own scheme, which also has a much longer history than the programmes presented in this section.

3.3.2.1 Argentina

The Argentinean standards and labelling programme was initiated in 1996, as PROCAEH[37]. During its three years of operation (1996 – 1999), PROCAEH achieved a consensus with market actors, resulting in the publication of test procedures and labelling standards for refrigerators and freezers, as well as of a government resolution defining the responsibility of the government to introduce mandatory energy efficiency labelling for a wide range of products.[38] Due to changes in the public administration and the economic crisis at the beginning of the past decade, the programme remained inactive from 2000 to 2003. In 2003, the Argentinean National Energy Secretariat reinstated the programme as PROCAE[39].

At present, energy labelling is mandatory for refrigerators/freezers, household washing machines, air conditioners and fluorescent lamps. The labelling requirements are introduced by Administrative Order (*Disposición*) of the National Directorate of Internal Commerce[40] and refer to underlying "Technical Energy Efficiency Labelling Standards"[41]. Labelling standards have also been published for three-phase electrical motors, ballasts for fluorescent lamps, standby power/consumption, centrifugal pumps, electric storage water heaters and television receivers, as well as thermal characteristics of buildings. Labelling standards for electricity consuming products are developed and issued by the National Standardisation Institute IRAM, under the auspices of the National Energy Secretariat (SE)[42]. The Argentinean energy label is widely aligned to the design and the energy efficiency classes of former EU label, including the energy efficiency classes A–G.

Argentina has also established MEPS for refrigerators/freezers, room air conditioners and household washing machines. MEPS are implemented by Resolution of the National Energy Secretariat and establish energy efficiency thresholds in accordance to energy efficiency classes defined by the labelling standards. Although the thresholds have been gradually tightened, they are still rather weak, as they correspond to the previous EU energy efficiency classes A–C[43]. Incandescent lamps were banned from the Argentinian market by Law 26.473[44], which prohibits their import and the commercialisation since end of 2010.

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[36] *Reglamento Técnico para el Etiquetado de Eficiencia Energética en Acondicionadores de Aire (Resolución conjunta de los Ministerios del Poder Popular de Energía Eléctrica No 054 y de Comercio No 071 de fecha 16/11/2012).*

[37] *Programa de Calidad de Artefactos Energéticos para el Hogar (PROCAEH).*

[38] *Resolución No 319/99 ex-SICyM del 14 de mayo de 1999: "Adoptándose medidas en relación a la comercialización de aparatos eléctricos de uso doméstico que cumplan determinadas funciones".*

[39] *Programa de Calidad de Artefactos Energéticos (*PROCAE*).*

[40] *Dirección Nacional de Comercio Interior* of the Ministry of Economy and Public Finance.

[41] *Normas Técnicas de Etiquetado de Eficiencia Energética.*

[42] *Secretaría de Energía* of the Ministry of Federal Planification, Public Investment and Services.

[43] Refrigerators, refrigerator-freezers and freezers: Resolutions 396:2009, 198:2011 and 682:2013, which subsequently define minimum energy efficiency requirements equivalent to label classes C (since 2009 for refrigerators and refrigerator-freezers and since 2011 for freezers) and B (since 2013 for all appliances); Split and compact room air conditioners: Resolutions 1542:2010, 1407:2011, 814:2013 and 228:2014, which define gradually the minimum energy efficiency requirements in cooling and heating mode – currently equivalent to label class A for cooling mode and equivalent to class C for heating mode for air conditioners with a cooling capacity of ≤ 7 kW;

In the case of gas appliances, the National Regulatory Agency for Gas (ENERGAS)[45] has the legal authority to develop and to implement labelling standards and MEPS. So far, mandatory labelling standards for domestic cooking appliances (NAG-312/2010) and for instantaneous gas water heaters (NAG-313/2009, Addendum N^{o} 1/2012) were published. Labelling standards for room heaters and for storage gas water heaters were still under public discussion and were expected to be published in the second half-year of 2014.[46] For all gas appliances which are regulated by ENARGAS, minimum energy performances requirements apply.

3.3.2.2 Chile

The Energy Efficiency Standards and Labelling Programme of Chile was initiated as part of the National Energy Efficiency Program (PPEE)[47], which was created in 2005. With an annual budget of almost 30 Mio. US$ in 2009, PPEE was one of the most visible and comprehensive energy efficiency programmes of the Region. Since 2010, the Chilean Energy Efficiency Agency AChEE[48] continues the previous work of PPEE.

So far, mandatory labelling has been introduced for refrigerators/freezers, incandescent and fluorescent lamps, ballasts for fluorescent lamps, household washing machines, room air conditioners, three-phase electric induction motors and standby power for various electric and electronic devices, including microwave ovens, TV decoders, audio and video equipment, and printers. The labelling requirements are based on energy labelling standards ("*normas de eficiencia energética*") published as Official Chilean Standards[49], and are introduced on a mandatory basis by so-called "Protocols" (*Protocolos*)[50] and Resolutions issued by of the Superintendency for Electricity and Fuels (SEC)[51]. Energy labelling standards for additional products are under elaboration.

The Chilean Ministry of Energy (MoE) has worked since 2009 on the elaboration of MEPS for lamps, which became mandatory in December 2013, and which effectively phases out incandescent lamps[52]; followed by a MEPS for refrigerators, which was submitted to public consultation in August 2014. A MEPS for electric motors is currently under elaboration. MoE has received technical assistance from the Environmental Energy Technologies Division of the Lawrence Berkeley National Laboratory (LBNL) [4] and issued, in 2012, a regulation which defines the criteria and procedure to be applied in establishing MEPS.[53] The regulation requires, i.a., the elaboration of a regulatory impact assessment and consultation and coordination procedures among government entities and the public.

3.3.2.3 Paraguay

The National Standardisation Institute INTN has only recently issued standards with regard to energy labelling. In July 2013, a standard defining the general labelling design was issued, following by a labelling standard for air conditioners in March 2014. In April 2014, a draft labelling standard for refrigerators/freezers was issued. These standards, which are still voluntary, are influenced by the respective previous EU, Colombian, Argentinian and Chilean

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Household washing machines: Resolution 684:2013, defining a minimum energy efficiency requirement equivalent to label class B.

[44] *Ley 26.473. Prohíbese a partir del 31 de diciembre de 2010, la importación y comercialización de lámparas incandescentes de uso residencial general en todo el territorio de la República Argentina. Sancionado: Diciembre 17 de 2008. Promulgado de hecho: Enero 12 de 2009.*

[45] *Ente Nacional Regulador de Gas* (ENARGAS).

[46] Personal communication Salvador Gil (ENARGAS / *Universidad Nacional de San Martín*), August 2014.

[47] *Programa País de Eficiencia Energética* (PPEE).

[48] *Agencia Chilena de Eficiencia Energética* (AChEE).

[49] *Normas Chileans Oficiales* (NCh).

[50] The Protocols issued by SEC mainly refer to certification procedures, measurement standards and energy labelling standards (as far as they are published as Official Chilean Standards) to be observed on a mandatory basis.

[51] *Superintendencia de Electricidad y Combustibles* (SEC).

[52] *Resolución 60 extenta (2013): Fija estándar mínimo de eficiencia energética para lámparas no direccionales para iluminación general y su programa de implementación.* The Resolution defines a minimum efficiency equivalent to label class C and a timetable for phasing out incandescent lamps of different capacities.

[53] *Reglamento N^{o} 97 del 15/11/2011 que establece el procedimiento para la fijación de estándares mínimos de eficiencia energética y normas para su aplicación (Diario Oficial de la República de Chile del 14/05/2012).*

labelling standards and regulations. Draft labelling standards for incandescent and fluorescent lamps are under discussion.

3.3.2.4 Uruguay

In 2005, Uruguay started its National Energy Efficiency Programme, initially with the cooperation of the Global Environment Facility (GEF) and the World Bank[54]. Part of this ongoing programme[55] are the elaboration and implementation of energy efficiency labelling for electric and gas appliances and other energy-using products. So far, energy labelling standards have been issued by the National Standardisation Institute UNIT[56] for household refrigerating appliances, household washing machines, household tumble driers, gas cooking appliances, electric and gas storage water heaters, gas wall-mounted combined water heaters, air conditioners and heat pumps, incandescent and fluorescent lamps and electric three-phase induction motors. In 2009, the Ministry of Industry, Energy and Mining issued a framework regulation for mandatory energy labelling.[57] So far, energy labelling is mandatory for compact fluorescent lamps, electric storage water heaters and household refrigerating appliances.

3.3.3 Central America

Energy efficiency standards and regulations were also implemented or are under development in various Central American countries, notably in Costa Rica and Nicaragua. The standards and labelling schemes of these countries are mainly influenced by either Mexican energy efficiency standards or the corresponding COPANT standards.[58]

3.3.3.1 Costa Rica

Costa Rica was the first country in Central America to introduced energy efficiency standards and labelling, following the Law on Regulation of the Rational Use of Energy of 1994[59]. Currently, voluntary technical standards for energy efficiency have been issued by the national standardisation institute INTECO[60] for household refrigerators and freezers, commercial refrigerators, various types of air conditioners, three-phase electric induction motors, incandescent lamps and CFLs. These cover measurement standards (test procedures), energy labelling and MEPS. The labelling standards and MEPS are either partly aligned to the corresponding Mexican Official Standards (NOM) or equivalent to the corresponding COPANT standards.

For CFLs, as well as for household refrigerators and freezers, the Government has implemented, in 2000 and 2001 respectively, corresponding decrees, rendering minimum standards and labelling mandatory. Also, the national electricity company ICE[61] and INTECO have issued an energy efficiency label (*Sello EnergICE - INTECO*) which has been applied so far for compact fluorescent lamps. ICE has also issued a guide for the interpretation of the national and foreign (US and Mexican) energy efficiency labels for refrigerators. In accordance with Law 7447/1994, products which do not comply with the MEPS defined by the Government, are subject to a surcharge of 30% with regard to the selective excise duty (*impuesto selectivo de consumo*).

3.3.3.2 Nicaragua

[54] *Proyecto de Eficiencia Energética* (http://www.gefonline.org/projectListSQL.cfm)
[55] See http://www.eficienciaenergetica.gub.uy/
[56] *Instituto Uruguayo de Normas Técnicas* (UNIT).
[57] *Decreto No 429/009 – Equipos y artefactos que consumen energía. Comercialización. Cumplimiento de Normas Unit.*
[58] Work on energy efficiency standards is also ongoing in Honduras. So far, no information of such programmes in other Central American countries could be verified.
[59] See footnote 21.
[60] *Instituto de Normas Técnicas de Costa Rica (*INTECO*).*
[61] *Instituto Costarricense de Electricidad* (ICE)*.*

The National Assembly of Nicaragua has issued mandatory technical standards (NTON[62]) for energy efficiency of various energy-consuming products: household refrigerators and freezers, commercial refrigerators, various types of air conditioners, three-phase electric induction motors, incandescent lamps and CFLs, covering measurement standards (test procedures), mandatory energy labelling and MEPS. The labelling standards and MEPS are either partly aligned to the corresponding Mexican Official Standards (NOM) or equivalent to the corresponding COPANT standards. Measurement standards refer to those defined in the corresponding NOM, with some additional references to international and US measurement standards. Labels are equivalent to the corresponding Mexican energy label, with the exception of the label for lamps, which is equivalent to the label proposed by COPANT, in accordance with the former EU label.

3.3.4 COPANT

In an effort to provide harmonised energy labelling standards, the Technical Committee Energy Efficiency and Renewable Energies (CT 152) of the Pan American Standards Commission (COPANT)[63] is working since more than ten years on Pan American energy efficiency standards, which are of voluntary application.

So far, two COPANT standards have been issued:

- COPANT 1707:2006 - Energy efficiency. Domestic refrigerators, freezers and combinations. Specifications and labelling.[64]
- COPANT 1708:2006 - Energy efficiency. Household incandescent and similar lamps. Specifications and labelling.[65]

COPANT 1707:2006 defines a categorical energy label with seven energy efficiency classes A–G, which is similar to the previous EU label, and includes two alternative methods for defining the energy efficiency classes, The first method is identical to Directive 94/2/CE[66], including the same categories of products and based on an ambient test temperature of 25^{o}C, while the alternative method is based on the Brazilian categorisation of products and an ambient test temperature of 32^{o}C. The standard refers to international ISO measurement standards, including some clarifications. Household refrigerating appliances commercialised in Mexico have to comply with the requirements of NOM-015-ENER-2002. COPANT 1708:2006 is equivalent to the EU Directive 98/11/EC[67].

Draft COPANT energy efficiency standards have so far been elaborated for: Window-type air conditioners (*Proyecto* COPANT 152-002); Compact, circular and tubular fluorescent lamps (*Proyecto* COPANT 152-004); Three-phase electric induction motors (*Proyecto* COPANT 152-005); Household washing machines (*Proyecto* COPANT 152-007); Instantaneous electric water heaters (*Proyecto* COPANT 152-008) and Storage type electric water heaters for household use (*Proyecto* COPANT 152-009). In addition, COPANT has issues a pre-draft standard for split air conditioners.

4 Alignment and harmonisation

4.1 Alignment with EU and US standards and labelling schemes

Basically, two types of standards and labelling programmes exist in Latin America:

[62] *Normas Técnicas Obligatorias Nicaraguënses* (NTON).
[63] The following national standardisation institutes are members of CT 152 of COPANT: IRAM, IBNORCA, ABNT, INN, ICONTEC, INTECO, NC, COGUANOR, JBS, DGN, INDECOPI, DIGENOR, SCC and ANSI. Observers are: BNSI, AENOR, UNIT and FONDONORMA.
[64] *Norma COPANT 1707:2006 - Eficiencia energética. Refrigeradores, congeladores u combinados de uso doméstico. Especificaciones y etiquetado.*
[65] *Norma COPANT 1708:2006 - Eficiencia energética. Lámparas incandescentes de uso doméstico y similares. Especificaciones y etiquetado.*
[66] Commission Directive 94/2/EC of 21 January 1994 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric refrigerators, freezers and their combinations.
[67] Commission Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps.

First, the Mexican standards and labelling programme, whose main focus is on minimum energy performance standards. From its very beginning in 1992, the Mexican programme was designed in a similar way as the US energy efficiency standards programme. The main focus of these programmes is on MEPS, while labels are considered as a secondary instrument of consumer information. The Mexican model is also the basis for the standards and labelling programmes in Central America.

Second, the standards and labelling programmes of most South American countries, that started with the development of test procedures and labelling standards, and have moved (or are still moving) from voluntary to mandatory schemes. While some countries have moved rather quickly from voluntary to mandatory labelling, it has taken other countries longer periods (from several years to a decade) to enact the first mandatory labels. A particular striking example is Colombia, where a very complete set of testing procedures and energy efficiency labels has been developed since 2001 by the government agency UPME[68], in cooperation with the national standardisation institute ICONTEC, but labelling will only become mandatory in 2015.

Another distinctive element among Latin American standards and labelling programmes is the label design. While Mexico and Central America follow in principle the US and Canadian label designs, most South American countries have adopted category labels similar to the EU label, although with some exceptions: while Colombia and Ecuador have incorporated some elements of the North American label designs, the label design in Venezuela has been, until recently, fully aligned with the North American models. Notably, some Central American countries and Venezuela have recently introduced labels for certain products which follow the EU design. Figures 1 and 2 include examples of energy labels discussed in this paper.

Regarding measurement standards (test procedures), the picture is even more heterogeneous. Brazil and Mexico have developed own national measurement standards (NBR[69] and NOM respectively), which are based on ISO-IEC standards and US test procedures respectively, with some modifications. Also other countries of the Region have adopted national standards for the measurement of the energy performance of energy-using products, which are – to varying degrees – aligned with ISO-IEC, NBR, US, NOM or other international, regional or national standards, including some regional standards elaborated by the Pan American Standards Commission (COPANT). In the case of alignment of national measurement standards with international standards, some national standards are fully homologated with the corresponding ISO-IEC standard, while in other cases, minor or major modifications were made.

Regarding Minimum Energy Performance Standards, a distinction can be made between Mexico, where the focus was on MEPS – following US rulemaking – right from the beginning of the programme in 1995, and Brazil, who started to implement MEPS since 2001. Argentina and Chile have developed MEPS for a limited number of products (refrigerators-freezers and lamps, in the case of Argentina also air conditioners and household washing machines) since 2009. Since 2013, Ecuador and Nicaragua have promulgated technical regulations which define MEPS for a rather wide range of products. Venezuela has recently introduced a MEPS for air conditioners. It should be mentioned that the methodology to define thresholds of MEPS differs among countries. While Chile, for instances, applies a cost-benefit analysis in accordance to *Reglamento 97/2011*, the thresholds defined in Argentina appear to be fixed in negotiation with stakeholders.

4.2 Intra-regional alignment

In addition to the alignment with the EU and US standards and labelling schemes, also some tendencies to intra-regional alignment can be observed, both in the Andean and the Southern Cone sub-regions.[70]

[68] *Unidad de Planeación Minero-Energética (*UPME*).*
[69] *Normas Brasileiras (NBR),* published by *Associação Brasileira de Normas Técnicas (ABNT).*
[70] A detailed analysis of labelling regulations and standards in each country, and of intra-regional alignment is part of a forthcoming report by the author [5].

4.2.1 Colombia, Ecuador, Peru and Venezuela

4.2.1.1 Colombia

The new Technical Regulation for Labelling (RETIQ) includes in one single document ("*Anexo General*") a chapter on general requirements for labelling[71], which defines i.a. the generic label design and the contents of the label, the requirements for exhibiting the label, and the promotion of efficient products by the Government, and the specific labelling requirements for each of the products previously mentioned in Section 3.3.1[72]. The new Colombian label is a "categorical" label, which includes various energy efficiency classes (typically A–G or A–E) and is embedded into a yellow label, which resembles the Mexican and US labels. For several products (commercial refrigerators and freezers, electromagnetic and electronic ballasts, gas instantaneous and storage water heaters), the label only includes a numerical indication of product characteristics, instead of a graphical representation of energy efficiency classes.

In general, RETIQ presents a heterogeneous approach, merging elements from the previous Colombian (EU like) and Mexican label designs, and referring to different measurement standards and labelling regulations, including ISO/IEC, ANSI/ASHRAE, Mexican and national measurement standards; EU Commission Delegated Regulations, previous EU labelling directives and Mexican Official Standards (NOM). Except numerous references to Mexican NOM standards, there is no evidence of alignment with other standards or regulations in the Region.[73]

4.2.1.2 Ecuador

The Ecuadorian labelling regulations are mainly aligned with the corresponding Colombian (voluntary) labelling standards; yet also some alignment with former EU labelling regulations, Mexican NOMs and Brazilian regulations[74] can be observed. Test procedures referred to include Ecuadorian national standards, international and US standards. The general tendency to align with (previous) Colombian labelling standards, despite the fact that these are being revised, means that the current, rather new, Ecuadorian regulations and standards may have to be revised also. Minimum energy performance requirements usually refer to energy efficiency classes A or B (in the case of categorical labels) or are equivalent to the MEPS defined by the corresponding NOM standards.

4.2.1.3 Peru

Like other Latin American countries, Peru knows various "layers" of documents which define the energy labelling requirements and – in some cases – also minimum energy efficiency requirements: (i) Energy efficiency labelling "standards", which are issued by the Peruvian Standardisation Institute INDECOPI[75] as Peruvian Technical Standards (*Norma Técnica Peruana* – NTP), and (ii) technical regulations, which render the "labelling standards" mandatory. The "labelling standards" usually refer to other NTPs, which define the methods of measurement (test procedures) for the corresponding product.

While Peruvian labelling standards follow in principle the design of the previous EU label, there are some differences, e.g. different colour codes, which stem from the label design according to the previous Colombian standard NTC 5100:2002[76]. The labels for gas and electric instantaneous and storage water heaters also include safety information. Most NTPs

[71] *Ministerio de Minas y Energía: Anexo General Reglamento Técnico de Etiquetado, Octubre de 2013. Capítulo 2: Requisitos Generales del Etiquetado.*
[72] *Ibid. Capítulo 3: Requisitos Específicos de Etiquetado de Equipos.*
[73] In the final draft of RETIQ of November 2014, the Technical Regulation does not include anymore the "Annex of Measurement Standards" ("*Anexo de Ensayo del Reglamento Técnico de Etiquetado – RETIQ*"), but establishes for each product the test method and the equivalent test standard(s) to be applied. These are in general in line with the reference standards mentioned in this paragraph.
[74] For domestic ventilators and microwave ovens.
[75] *Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectual* (INDECOPI)
[76] Norma Técnica Colombiana NTC 5100:2002 Etiqueta Genérica Informativa de Desempeño Energético.

and technical regulations refer to previous Colombian labelling standards, which results in a similar problem like in Ecuador. While the labelling standards for incandescent and fluorescent lamps are aligned to the previous Directive 98/11/EC[77], others – like the standards for refrigerators, refrigerator-freezers and freezers – are influenced by Mexican NOM standards, and the standards for water heaters and industrial boilers appear to be own elaborations with reference to various national and international labelling regulations and measurement standards.

4.2.1.4 Venezuela

The history of energy efficiency standards and labelling in Venezuela is characterised by early adoption of labelling standards – at the end of the 1990ties, more than a decade of non-activity and taking up the programme again since 2012. So far, energy labelling standards were issued for refrigerators, refrigerator-freezers and freezers and for window-type air conditioners in 1999 and 2000 respectively. Both labelling standards define labels equivalent to the US Energy Guide, featuring a reference range of annual energy consumption (kWh/year) and Energy Efficiency Ratios (EER) respectively, and refer to Venezuelan measurement standards, which appear to be equivalent to the respective US test procedures (at the time of issuing the standards).

In 2012, the Ministries of Popular Power of Electric Energy and of Commerce issued a joint resolution, which enacted a new Technical Regulation on the Energy Efficiency Labelling of Air Conditioners, which includes a minimum energy efficiency requirement[78]. The Technical Regulation includes window-type, package terminal air conditioners, split air conditioners and central ducted air conditioners. For each type of air conditioners, energy efficiency classes are defined based on the energy efficiency ratio (EER) of the product. The energy efficiency classes are given for cooling mode only and are different from those defined in Directive 2002/31/CE[79] and Commission Delegated Regulation (EU) No 626/2011[80]. The Technical Regulation defines energy labels with six energy efficiency classes A–F, refers to various ISO and IEC measurement standards and stipulates as minimum energy efficiency requirement class C.[81]

4.2.2 Southern Cone countries (except Brazil)

4.2.2.1 Argentina

Argentinean test procedures for energy performance are equivalent to the respective ISO/IEC standards, in some cases also with European EN standards.

Also, most of the energy labelling standards issued by the national standardisation institute IRAM[82] follow the previous EU labelling directive and, in the case of televisions, even the respective Commission Delegated Regulation[83]. The energy labels defined by these standards are similar to the previous EU labels, with some notable differences, e.g. in the case of household washing machines. The labelling standard for electric storage water heaters is equivalent to the draft standard COPANT 152-009[84]. Like EU labelling directives and regulations, the Argentinean labelling standards require a product fiche to be provided with the product. While Argentinean labelling regulations are largely aligned with the EU, they have influenced the labelling schemes of other Southern Cone countries, notably Paraguay and Uruguay, as will be shown below.

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[77] See footnote 67.
[78] See footnote 36.
[79] Commission Directive 2002/31/EC of 22 March 2002 implementing Council Directive 92/75/EEC with regard to energy labelling of household air-conditioners.
[80] Commission Delegated Regulation (EU) No 626/2011 of 4 May 2011 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of air conditioners.
[81] According to CEPAL (2013), CONVENIN has issued more labelling standards since 2000. This information could however not be verified.
[82] *Instituto Argentino de Normalización y Certificación (*IRAM*).*
[83] Commission Delegated Regulation (EU) No 1062/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of televisions.
[84] See Section 3.3.4.

Minimum energy performance standards have been implemented in Argentina since 2009 by Resolutions of the Energy Secretariat of the Ministry of Federal Planning, Public Investments and Services[85]. Currently minimum energy efficiency requirements correspond to energy class B (refrigerators, refrigerator-freezers and freezers; household washing machines) and class A (split and compact air conditioners in cooling mode; class C for heating mode). While there is no MEPS defined for lamps, the commercialisation of incandescent lamps is forbidden since end of 2010, by Law 26.473:2009.

4.2.2.2 Chile

Chilean test procedures for energy performance are generally aligned with the respective ISO/IEC standards.

The Chilean energy label generally follows the design and the contents of the previous EU energy label, including identical energy efficiency classes. Some minor differences refer to additional information provided and different dimensions of some labels. Like the Argentinean scheme, also Chilean regulations have influenced the elaboration of labelling standards and regulations in Paraguay and Uruguay. Chile appears the only country in the sub-region, which applies a rigorous cost-benefit analysis to establish MEPS (see Section 3.3.2).

4.2.2.3 Paraguay

The labelling standards issued so far in Paraguay are also similar to the previous EU labelling directives, yet there are apparently in the first place influenced by national regulations of Argentina (NP 51 002 14 for air conditioners), Chile (Draft standard NP 51 003 14 for refrigerators/freezers) and Colombia (NP 51 001 13, defining the generic label design). This heterogeneity leads to inconsistencies, like contradicting label dimensions and colour codes for the arrows representing the energy efficiency classes. While the energy efficiency classes for air conditioners and refrigerators/freezers are identical to those defined in the European Directive 2002/31/EC[86], the Paraguayan labels also include efficiency classes A+, A++ and A+++, which correspond to energy efficiency indices (EEI), energy efficiency ratios (EER) and coefficients of performance (COP), which are not directly comparable with those of the current Commission Delegated Regulations No 1060/2010[87] and No 626/2011[88], because of different metrics and indicators. NP 51 002 14 and draft standard NP 51 003 14 refer to the respective ISO measurement standards.

4.2.2.4 Uruguay

Also in the case of Uruguay, most labelling regulations are at least similar to the previous EU labelling directives, although they are in the first place equivalent with "labelling regulations" from Argentina (refrigerators/freezers, washing machines, air conditioners, lamps), Chile (refrigerators/freezers, air conditioners, lamps) or COPANT (draft) labelling standards (refrigerators/freezers, air conditioners, lamps, three-phase electric motors). Some labelling standards include two alternative or complementary labelling scales, like the standard for washing machines, which defines labelling scales for two temperatures (15 ^{o}C and 60 ^{o}C), the standard for air conditioners, with two label scales for cooling and heating, and the standard for gas ranges and ovens, with two scales, one for the range and another for the oven burners. The dimensions of the Uruguayan labels are not always the same like those of the EU labels, and the Uruguayan labelling standards and regulations do not require a fiche.

Test procedures referenced in the "labelling regulations" are generally recent UNIT-IEC, IEC or ISO standards, with some references to Brazilian NBR standards, e.g. for gas cooking ranges and ovens.

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[85] *Secretaría de Energía del Ministerio de Planificación Federal, Inversión Pública y Servicios.*
[86] See footnote 79.
[87] Commission Delegated Regulation (EU) No 1060/2010 of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household refrigerating appliances.
[88] See footnote 80.

4.2.3 Central America

As an example for the energy efficiency standards and labelling programmes in Central America, reference is made to the labelling and minimum energy performance standards issued in *Nicaragua* as mandatory national standards (Normas Técnicas Obligatorias Nicaraguënses – NTON). These standards are mainly aligned with the corresponding Mexican Official Standards (NOM), although some minimum performance requirements appear to be less stringent in the corresponding NTON or refer to previous editions of the NOM standard. In the case of incandescent lamps, CFLs and window-type air conditioners, the Nicaraguan standards refer to the respective COPANT standards and define categorical labels. In all other cases labels with continuous scales, according to NOM, are applied.

5 Discussion

Brazil was the first country in Latin America – and one of first countries in the world – that developed and implemented an energy efficiency standards and labelling programme. Starting from voluntary labelling, the programme evolved into a full-scale programme including mandatory labelling and – more recently – minimum energy efficiency standards for a wide range of products. Although influenced to some extent by the then incipient EU labelling scheme (in particular with regard to the label design), Brazil developed from the very beginning its own scheme, which responds to characteristic parameters like the climatic conditions of the country and specific consumer habits.[89]

While the Brazilian programme has recently shown a strong dynamic, its influences on other countries has been limited, even within the MERCOSUR sub-regional customs union and trading bloc. The main reasons may be the orientation of Argentina towards the EU labelling scheme [6], which was subsequently also adopted by the other Southern Cone countries Chile, Uruguay and – most recently – Paraguay. I.e. that Brazil, who was the pioneer of energy efficiency standards and labelling in South America, did not succeed to induce the other countries of the Region, or even of the Southern Cone sub-region, to align with its programme.

In contrast to the originality of the Brazilian energy efficiency standards and labelling programme, the Mexican scheme – from its very beginning – has been clearly aligned to another national scheme, viz. that of its northern neighbour, the United States of America. Considering that Canadian energy efficiency standards and labels are almost identical to the US system, this means that there is a high degree of alignment in the North American sub-region. The alignment of the Mexican programme with those of the US and Canada concerns the MEPS, the label design and the measurement standards with are included in the Official Mexican Energy Efficiency Standards (NOM-ENER), although in some cases the alignment is only partial and some NOM-ENER lack behind the ambition and the scope of their US references [7]. There are no indications that Mexico could change this approach in favour of other energy labelling schemes, international measurements standards or a different model to establish MEPS. The Mexican EE S&L scheme has considerable influence on other countries of the Region, in particular Central American and also some Andean countries.

The energy efficiency standards and labelling schemes of Colombia, Ecuador, Peru and Venezuela do not show a clear alignment to any single national or regional scheme. As has been shown, labelling standards and regulations for individual products may be aligned – or at least be influenced – by EU regulations, Mexican standards, standards and regulations from other South American countries and – to a lesser extent – directly by US rulemaking. Analogously, the measurement standards applied in these countries can vary from international ISO-IEC standards to Mexican, US (ANSI-AHAM, NEMA, etc.) to genuine own national standards, which combine elements from various reference standards. A major shortcoming of the labelling regulations recently published in Ecuador and in Peru is their

[89] E.g., Brazilian test procedures for refrigerators are adapted to the relevant climate class, and the label for household washing machines primarily refers to the energy efficiency of washing cycles using water at ambient temperature (20 ^{o}C).

reference to outdated Colombian labelling standards (which are being replaced by the new Technical Regulation for Labelling (RETIQ). Also, the "home made" character of several Peruvian measurement standards and labelling regulation isolates these standards and regulations from major international schemes and trends. MEPS have been developed and implemented in Ecuador and to some extent in Venezuela.

As has been shown, the energy labelling standards of Argentina, Chile, Uruguay and Paraguay are generally aligned with the previous EU labelling directives, i.e. EU Directive 92/75/EEC[90] and the "implementing" directives for different energy-consuming products. This means, that energy efficiency classes and their underlying metrics correspond to the level of ambition in the EU of the period 1992 to 2003, before the new EU Labelling Directive 2010/30/EU[91] was enacted in 2010. While some labelling standards in Chile, Uruguay and Paraguay have taken into consideration amendments of various EU implementing directives (adding additional energy efficiency classes A+ and A++), only the Argentinean labelling standard for televisions is equivalent to the respective Commission Delegated Regulation under Directive 2010/30/EU. Argentina, Chile and Uruguay also developed labelling standards which do not exist in the EU, like for electric motors, ballasts and standby power, or which did previously not exist in the EU, like water heaters.

Alignment with EU labelling directives is strongest in Chile and also predominant in Argentina. While there is also strong alignment in Uruguay and Paraguay, labelling standards in these countries refer in the first place to Argentinean and Chilean labelling standards, i.e. that the alignment with the EU is mainly indirect. The influence from other national standards of the Latin American Region are rather limited. While Chilean labelling standards include only one reference to a Mexican standard, Uruguayan labelling standards tend to incorporate references to Brazilian standards. In the case of Paraguay, a previous Colombian standard defining the generic label design, served as example. While several MEPS have been implemented in Argentina, Chile has recently started the development and implementation of MEPS, based on a regulatory impact assessment based on cost-benefit analysis.

The labelling standards and regulations of Costa Rican and Nicaraguan, finally, show a major alignment with Mexican energy efficiency standards (NOM-ENER), although some Costa Rican and Nicaraguan labelling standards are aligned with the respective COPANT (draft) standards.

6 Conclusions

In contrast to the European Union, energy efficiency standards and labelling schemes in Latin America have been developed by national programmes, with no, or very little, supranational coordination. While this situation has grown historically, reflecting factors like the predominant economic and trade relations of individual countries with e.g. the United States and Europe and the related technological influences, it is also an indication of the lack of economic integration of Latin America, i.e. of the failure of cooperation schemes like the Mercosur, the Andean Community of Nations (CAN), the Union of South American Nations (UNASUR) or the Central American Integration System (SICA) to create common rules and standards with regard to energy using equipment. Mexico, on the other hand, is member of the North American Free Trade Agreement (NAFTA) and of the North American Energy Cooperation, which facilitates the alignment of the Mexican energy efficiency standards with those of the United States and Canada.

As a result of this lack of supranational coordination, Latin American shows the heterogeneous picture presented in this paper, with varying degrees of alignment and harmonisation among national schemes, and a notable lagging behind recent international developments, which involve more stringent energy efficiency requirements both with regard to MEPS and energy labelling.

[90] Council Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances.
[91] Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

The elaboration of Pan-American voluntary standards by COPANT is probably the only lasting effort towards harmonisation of energy efficiency standards in the Region, which however – due to its voluntary character and lengthy procedures – has so far only very limited impact. While several initiatives by international organisations to foster intra-regional cooperation on standards and labelling programmes in the past decade, did not result in any practical results[92], more recent initiatives, like the REGATTA Programme[93], appear to be more focused on the implementation of minimum energy performance standards than on the harmonisation of energy efficiency standards and labelling regulations in Latin America.

As has been demonstrated in this paper, convergence of the various national energy efficiency standards and labelling regulations is not only a pending issue in Latin America, but will require a major shift in the prevailing trend to develop and implement such programmes almost exclusively at the national level. It is hoped that this paper will contribute to raise the awareness of policy makers in Latin America and of the international standards and labelling community, in order to improve national schemes and achieve higher degrees of alignment and harmonisation.

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[92] In particular, initiatives by the United Nations Development Programme (UNDP), which aimed at sub-regional harmonisation of national standards and labelling programmes in the Andean and Southern Cone (Mercosur) sub-regions.

[93] REGATTA is the "Regional Gateway for Technology Transfer and Climate Change Action in Latin America and the Caribbean" which is implemented by the United Nations Environment Programme (UNEP) – see http://www.cambioclimatico-regatta.org. Together with UNDP, the International Copper Association (ICA), CLASP and the Natural Resource Defense Council (NRDC), the Programme has recently launched the "*Alianza Global de Productos y Equipos Eficientes en América Latina y el Caribe*" (http://www.cambioclimatico-regatta.org/index.php/es/equipos-de-refrigeracion-eficientes-en-alc).

Collaborative Labeling and Appliances Standards Program (CLASP), Project Report for Secretaría de Energía, Argentina.

[7] Lutz, W.F., Stone, C., Letschert, V., McNeil, M.A. and Sánchez Ramos, I. (2011) Normas de desempeño energético mínimo en México. Reseña de normas de eficiencia energética, potenciales de ahorro energético y selección de productos prioritarios. CLASP, LBNL, IIE (unpublished report

Table 1: Regulations for energy labelling and minimum energy performance standards in Brazil (March 2014)

Products	Energy labelling			MEPS	
	Ordinance N° / year	Character	Status	Ordinance N° / year	Year of application
Household refrigerators	20/2006	Mandatory	Under revision	326/2011	2011 – 2013
Household washing machines	185/2005	Mandatory	Under revision	–	–
Tumble dryers	–	Mandatory	To be published in 2014	–	–
Gas water heaters	413/2011 182/2012	Mandatory	Monitoring implementation	324/2011	2011 – 2013
Electric water heaters (showers, taps, tankless water heaters, tank water heaters)	–	Mandatory	To be published in 2014	–	–
Systems and equipments for solar water heater	352/2012	Mandatory	Monitoring implementation	–	–
Systems and equipment for photovoltaic energy	4/2011	Mandatory	Implemented	–	–
Centrifugal pumps	455/2010	Mandatory	Monitoring implementation	–	–
Air conditioners	7/2011 410/2013	Mandatory	Implemented Monitoring implementation	323/2011	2011 – 2014
Fans and air circulators	20/2012	Mandatory	Monitoring implementation	–	–
Ceiling fans	113/2008	Mandatory	Implemented	–	–
Televisions (cathode ray tube)	267/2008	Mandatory	Under revision	–	–
Televisions (plasma, LCD and projection)	85/2009	Mandatory	Under revision	–	–
Computers and peripherics	170/2012	Voluntary	Implemented	–	–
Gas stoves and ovens	400/2012	Mandatory	Monitoring implementation	325/2011	2011 – 2013
Commercial electric ovens	446/2012	Mandatory	Monitoring	–	–

			implementation		
Microwave ovens	499/2011	Mandatory	Monitoring implementation	–	–
Water drinking fountains	191/2003	Mandatory	Under revision	–	–
Incandescent lamps for domestic use	283/2008	Mandatory	Implemented	1007/2010	2012 – 2017
Incandescent lamps for decorative use	296/2008	Voluntary	Implemented	–	–
Compact fluorescent lamps	489/2010	Mandatory	Monitoring implementation	1008/2010	2012 – 2013
Linear fluorescent lamps	–	Voluntary	To be published in 2014	–	–
LED lamps	–	Voluntary	To be published in 2014	–	–
High pressure sodium vapour lamps	483/2010	Mandatory	Implemented	–	–
Luminaires for sodium vapour and metal halide lamps	–	Mandatory	To be published in 2014	–	–
Photoelectric relays	–	Mandatory	To be published in 2014	–	–
Luminaires for LED lamps	–	Mandatory	To be published in 2014	–	–
Electromagnetic ballasts for high pressure sodium vapour and metal halide lamps	454/2010	Mandatory	Implemented	959/2010	2011 – 2012
Three-phase squirrel cage electric induction motors	488/2010	Mandatory	Implemented	553/2005	2010
Insultating liquid filled distribution transformers	378/2010	Mandatory	Implemented	–	–
Car tyres	544/2012	Mandatory	Monitoring implementation	–	–
Wind turbines	–	Voluntary	Under development for 2013	–	–

Source: Personal communication M. Borges, *Programa Brasileiro de Etiquagem* (PBE), March 2014

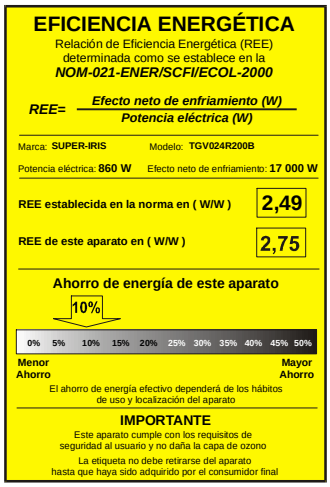
Table 2: Official Mexican Energy Efficiency Standards (March 2015)

No. of Standard (includes year of publication)	**Product / system**	**Scope**
NOM-001-ENER-2014	Vertical centrifugal pumps with external motor	Energy efficiency: limits and test procedure
NOM-002-SEDE/ENER-2014	Distribution transformers	Safety requirements and energy efficiency
NOM-003-ENER-2011	Gas water heaters for domestic and commercial use	Energy efficiency: limits, test procedure and labelling
NOM-004-ENER-2014	Clean water pumps and motor pumps	Energy efficiency: limits, test procedures and labelling
NOM-005-ENER-2012	Household washing machines	Energy efficiency: limits, test procedure and labelling
NOM-006-ENER-2014	Pumping systems for deep wells	Electromechanic energy efficiency in operation: limits and test procedures
NOM-007-ENER-2004	Lighting systems in non-residential buildings	Energy efficiency
NOM-008-ENER-2001	Buildings, building envelope of non-residential buildings	Energy efficiency
NOM-009-ENER-1995	Industrial thermal insulation	Energy efficiency
NOM-010-ENER-2004	Submersible motor pumps for deep wells	Energy efficiency: limits and test procedure
NOM-011-ENER-2006	Central air conditioners	Energy efficiency: limits, test procedures and labelling
NOM-013-ENER-2013	Street lighting systems	Energy efficiency
NOM-014-ENER-2004	Single-phase electric AC squirrel cage induction motors	Energy efficiency: limits, test procedure and marking
NOM-015-ENER-2012	Household refrigerators and freezers	Energy efficiency: limits, test procedures and labelling
NOM-016-ENER-2010	Three-phase electric AC squirrel cage induction motors	Energy efficiency: limits, test procedure and marking
NOM-017-ENER/SCFI-2012	Compact fluorescent lamps with integrated ballast	Energy efficiency and safety requirements: Limits and test procedures
NOM-018-ENER-2011	Thermal insulation material for buildings	Characteristics, limits and test procedures
NOM-019-ENER-2009	Mechanised tortilla machines	Thermal and electric efficiency: limits, test

		procedure and marking
NOM-020-ENER-2011	Buildings, building envelope of residential buildings	Energy efficiency
NOM-021-ENER/SCFI-2008	Room air conditioners (window type)	Energy efficiency, safety requirements: limits, test procedures and labelling
NOM-022-ENER/SCFI-2014	Self-contained commercial refrigeration appliances	Energy efficiency and safety requirements: limits, test procedures and labelling
NOM-023-ENER-2010	Room air conditioners (split type)	Energy efficiency: limits, test procedure and labelling
NOM-024-ENER-2012	Glass and glazing systems for buildings	Thermal and optical characteristics: labelling and test procedures
NOM-025-ENER-2013	Gas household cooking appliances	Thermal efficiency: test procedures and labelling
NOM-028-ENER-2010	Lamps for general use (incandescent, halogen, fluorescent)	Energy efficiency: limits and test procedures
NOM-030-ENER-2012	Integrated LED lamps for general lighting	Energy efficiency: limits and test procedures
NOM-031-ENER-2012	LED luminaires for street lighting and lighting of public outdoor areas	Energy efficiency: specifications and test procedures
NOM-032-ENER-2013	Standby electric power of equipment and appliances	Limits of electric power: test procedures and labelling
NOM-163-SEMARNAT-ENER-SCFI-2013	CO_2 emissions and fuel efficiency of automobiles	CO_2 emissions and fuel efficiency corporate average standards

Source: http://www.conuee.gob.mx/wb/Conuee/normalizacion_

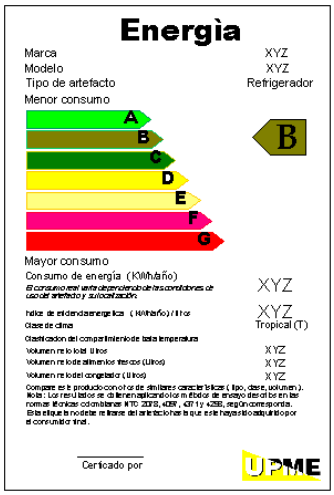
Figure 1: Energy efficiency labels in Mexico and in Andean Countries

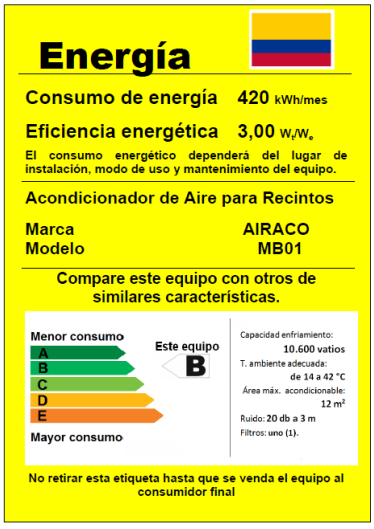


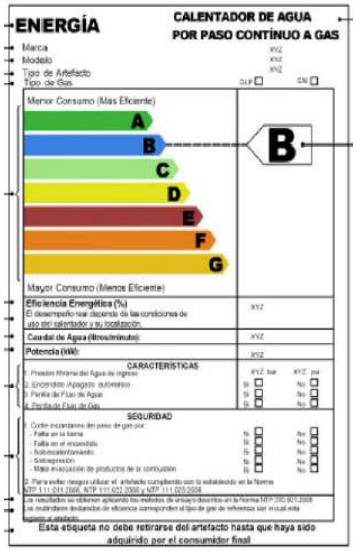
Mexico
Room Air Conditioner (NOM-021- ENER/SCFI-2008)

Venezuela
Refrigerator (COVENIN 3235:1999)

Venezuela
Air conditioner (Technical Regulation N° 071 November 2012)







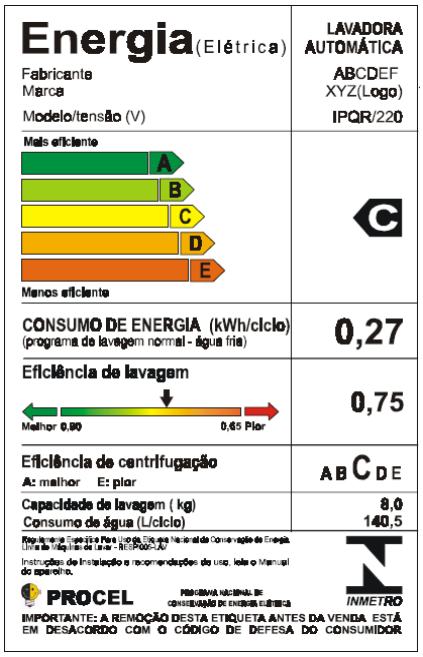
Colombia
Refrigerator (old – NTC 5020:2002)

Colombia
Room Air Conditioner (new – RETIQ, draft June 2014)

Peru
Gas Instantaneous Water Heater (Draft Technical Regulation, July 2011)

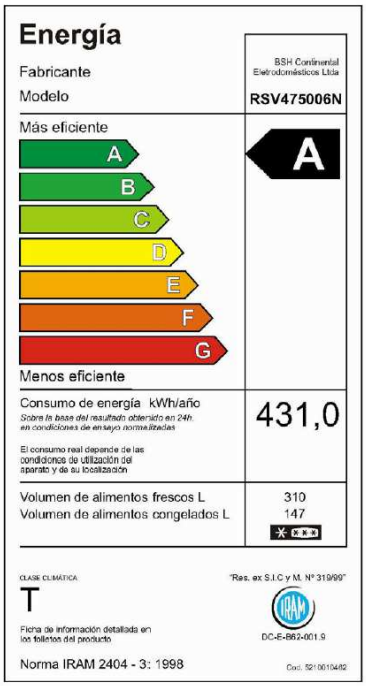
Figure 2: Energy efficiency labels in Brazil and in other Southern Cone countries

Brazil
Refrigerator (RESP/001-REF Ed. 1 December 2005)



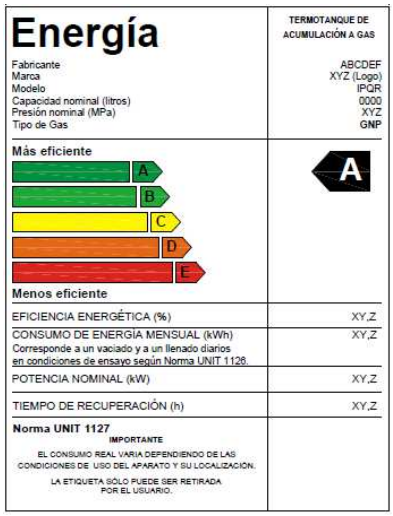
Brazil
Automatic washing machine (RESP/005-LAV Ed. 1, Rev. 1 July 2005)

Brazil
Air conditioner (Portaria N° 410 August 2013)



Argentina
Refrigerator (IRAM 2404-3:1998)

Chile
Three Phase Squirrel Cage Electric Induction Motor (NCh 2582-2.Of2007)



Uruguay
Gas Storage Water Heater (UNIT 1127:2008)