

Legislative Mapping to VIPA International on energy efficiency of buildings in EU, China and US

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1. Introduction

As any other recently formed association, VIPA International has to understand the landscape of markets and legislation of countries where it intends to operate. Nowadays, the European Union, China and US represent the most important markets worldwide. Fully understanding the legislative landscape for energy efficiency of buildings and insulation products is fundamental for choosing where to focus the efforts of the new association.

This mapping has two main objectives:

- Identify the most relevant legislations for Vacuum Insulation Panels (VIPs) in Europe, China and US;
- Highlight future legislative developments in these geographic areas.

2. European Union

Introduction

The EU has approved two general frameworks defining energy efficiency targets for 2020 and 2030: Europe2020 and the 2030 Framework for climate and energy. Specific measures for the energy efficiency of buildings are defined in the Energy Efficiency Directive (EED)¹ and the Energy Performance of Building Directive (EPBD)². Both directives will be reviewed in the next two years.

In terms of competences, the European Union sets up general frameworks, binding and non-binding targets, leaving to the Members States the task of submitting roadmaps to comply with the targets. Specific competences of the main stakeholders are assessed in a separate stakeholder mapping.

Europe2020 and 2030 Framework for Climate and Energy

The European Union established two different sets of energy efficiency targets for 2020 and 2030. The overall energy efficiency objective at EU level for 2020 has been developed by the 2010 Commission Communication “Europe2020: a Strategy for a Smart, Sustainable and Inclusive Growth”³. The strategy sets up a binding target of a 20% cut in Europe's annual primary energy consumption by 2020. Under this framework, a Roadmap to a Resource Efficient Europe⁴ was developed, including targets for the building sector:

- The renovation and construction of buildings will be made to high resource efficiency levels, with improved sustainable materials, higher waste recycling and improved design;

¹ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>.

² Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the Energy Performance of Buildings <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32002L0091>.

³ Communication from the Commission “Europe 2020: A Strategy for a Smart, Sustainable and Inclusive Growth” of 3 March 2010, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF>

⁴ Communication from the Commission “Roadmap to a Resource Efficient Europe” of 20 September 2011, http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf

- The Life-cycle approach will be widely applied;
- All new buildings will be nearly zero-energy and highly material efficient, and policies for renovating the existing building stock will be in place so that it is cost-efficiently refurbished at a rate of 2% per year;
- 70% of non-hazardous construction and demolition waste will be recycled.

The 2030 Framework for Climate and Energy, approved by the European Council on 23 October 2014 to cover the period 2020-2030, has then adopted an EU-wide energy efficiency non-binding target of 27% by 2030.

The Communication on the Energy Security Strategy⁵ was published in May 2014, after the Ukraine crisis, to promote resilience to external energy shocks and disruption to energy supplies in the short term and reduced energy dependence in the long term. It includes recommendations on energy efficiency of buildings: the building sector is identified as a priority, and according to the document the energy demand of buildings could be cut by up to three quarters if the renovation of buildings is speeded up. The strategy will be discussed in the Parliament in the first part of 2015. The communication includes several actions which should aim to speed up the renovation of buildings, including:

- Ambitious implementation of the EED and the EPBD;
- Reinforced regulatory and public financial support to accelerate the renovation rate of buildings;
- Identify remaining barriers to energy efficiency take up;

Value for VIPA: These two frameworks set up the general direction of the European Union in terms of energy and climate policy, including energy efficiency targets. Even if targets are general, and in some cases not binding at national level, other legislative acts at EU level are derived from these frameworks and could then be reflected in national implementing acts. These targets could possibly contribute to the definition of global targets in view of the 2015 Paris UN Conference on Climate Change.

Energy Efficiency Directive

The Energy Efficiency Directive⁶ (EED) entered into force on 4 December 2012. It is a direct consequence of the decisions taken with the 2020 Strategy and has the objective of achieving the 20% cut in Europe's annual primary energy consumption by 2020⁷. A review of the EED is scheduled to take place in 2016.

Key measures of the directive for buildings are:

- EU countries should prepare a roadmap to make the entire buildings sector more energy efficient by 2050, mobilising investment in the renovation of the national stock of residential and commercial buildings (Art. 4).

⁵ Communication from the Commission "European Energy Security Strategy" of 28 May 2014

http://ec.europa.eu/energy/doc/20140528_energy_security_communication.pdf

⁶ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>.

⁷ Energy consumption levels for the entire EU of no more than 1 474 Mtoe of primary energy and/or no more than 1 078 Mtoe of final energy in 2020.

- The public sector should renovate 3% of the total floor area of heated and/or cooled buildings "owned and occupied" by the central government (Art. 5). Only buildings with a total useful floor area over 500 m² and, as of 9 July 2015, over 250 m² should be considered. Central governments shall purchase only products, services and buildings with high energy-efficiency performance (Art. 6).

The EED sets out national energy efficiency targets⁸ and requires each Member State to submit National Energy Efficiency Action Plans (NEEAPs) every three years. Each strategy gives an overview of the national building stock, identifies policies to stimulate cost-effective deep renovations and estimates the expected energy savings.

Despite ambitious targets and declarations of goodwill, the implementation at national level of the EED has been problematic⁹.

An analysis¹⁰ of the Buildings Performance Institute Europe shows that only four strategies out of a sample of ten complied with the directive. The pass mark was set at 70%: only the strategies of Czech Republic, Romania, Spain and UK were considered acceptable, even if with room for improvements. Surprisingly, the strategies of traditionally ambitious and "green" countries as Austria, Denmark and the Netherlands were considered as not compliant. Findings of the study are summarized in the table below:

⁸ Under Article 24, paragraph 11, of the Energy Efficiency Directive, targets and reports are published on the Commission's website: http://ec.europa.eu/energy/efficiency/eed/reporting_en.htm

⁹ Only Cyprus, Denmark, Italy, Malta, and Sweden fully respected the EED transposition deadline of July 2014, and in the same month the Commission started the infringement procedure against all other Member States. Six EU members (Greece, Hungary, Luxembourg, Poland, Portugal and Slovenia) have missed the April publication deadline of the national renovation strategy of buildings, and will probably face infringement procedures.

¹⁰ BPIE, Renovation Strategies of Selected EU Countries, http://bpie.eu/uploads/lib/document/attachment/86/Renovation_Strategies_EU_BPIE_2014.pdf

Compliance With EED Article 4 Requirements

Country	Overview of building stock	Identification of cost-effective approaches to renovation	Policies to stimulate cost-effective renovation	Forward-looking perspective to guide investment decisions	Estimate of expected energy savings and wider benefits	Overall level of compliance with article 4 (PERCENTAGE)
Austria	3	2	1	0	1	28
Brussels Capital Region	5	5	3	2	2	68
Czech Republic	3	3	4	4	4	72
Denmark	2	1	4	0	1	32
France	4	4	4	2	2	64
Germany	4	2	3	3	3	60
Netherlands	3	0	3	1	3	40
Romania	3	3	4	4	4	72
Spain	4	4	3	4	3	72
UK	5	4	3	3	3	72
AVERAGE	3.6	2.8	3.2	2.3	2.6	58

The building renovation strategy of each Member State is available on the Commission's website¹¹. BPIE also conducted a study¹² on the 3% target for public buildings renovation, showing that 6 months after the expiration of the December 2013 deadline Bulgaria, Czech Republic, Croatia, Greece, Hungary, Luxemburg, Romania and Slovenia had not yet submitted any information.

Overall, BPIE states that the implementation level of EED still lacks "the required level of ambition, sense of urgency and strategic importance". Generally speaking the Eastern European Countries are lacking behind in transposition and implementation, but the lack of ambition and implementation is a problem at European level and also traditional environment-friendly States as Germany, Denmark and the Netherlands have received critiques from environmental NGOs and think tanks.

Value for VIPA: The EED targets the entire energy efficiency strategy and performance of Member States. The building sector is one of the main targets of the EED: positively for VIPA, it promotes ambitious building renovation targets for the public sector. NEEAPs also give a good overview of the energy efficiency strategies of Member States. Despite difficulties and delays in the implementation of the directive in several countries, including traditional "green" countries, Germany, Scandinavian countries, France and the Netherlands seem the more suitable candidates for a nation-based approach and in-depth analysis of national strategies, since they are more likely to use VIPs. Further analysis on the renovation strategy of key countries could be conducted separately to have clear indications on key countries for VIPA. VIPA could

¹¹ http://ec.europa.eu/energy/efficiency/eed/article4_building_strategies_en.htm

¹² BPIE, Setting the 3% target for public buildings renovation, http://bpie.eu/uploads/lib/document/attachment/76/Factsheet_BPIE-Article_5_EED.pdf

participate in the stakeholder consultation that will take place in view of the EED review scheduled in 2016.

Directive on the Energy Performance of Buildings

The Directive on the Energy Performance of Buildings¹³ (EPBD) was approved in 2002 and then modified in 2010. The EPBD should be reviewed in 2015. Key measures of the directive are:

- Member States shall apply a methodology for calculating the energy performance of buildings (Art. 3);
- Member States shall set up minimum energy performance requirements to achieve cost-optimal levels (Art. 4). The Commission Cost-Optimality Delegated Regulation¹⁴ establishes a comparative framework methodology to determine a cost-optimal level of minimum energy performance of buildings and building elements. A guidance document¹⁵ on how to implement the methodology at national level was published by the EU Commission in April 2012, leaving a wide degree of flexibility to the Member States.
- By 2021 new buildings in the EU will have to be nearly zero energy buildings (NZEB (Art. 9). "Nearly zero energy building means a building that has a very high energy performance". In October 2014 the Commission published a report¹⁶ on NZEB national plans, reporting that the information reported by Member States are often vague or insufficient.
- Member States shall develop plans to renovate and transform existing buildings into very low energy buildings, and inform the Commission on their national plans.

The EPBD sets up general frameworks and targets, leaving to Member States the task of taking specific decisions on how to achieve these targets. In the case of EPBD, competent national authorities are generally the ministries for energy, environment and economic development, often with the contribution of national research centers and other relevant stakeholders. Similarly to the EED, also the implementation level of the EPBD encountered several problems¹⁷. Details on implementing acts of EU Member States have been developed by Concerted Action – EPBD, an expert group of stakeholders created by the Commission to discuss the implementation of the directive, and are available on their website¹⁸.

Value for VIPA: Standards on energy performance of buildings are developed following an EPBD mandate, and the directive tries to set up a comparable methodology for calculating the energy performance of buildings. Indeed, the EPBD asks Member States to develop plans to renovate existing buildings. VIPA should participate in the stakeholder consultation that will take place in view of the EPBD review scheduled

¹³ Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the Energy Performance of Buildings <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32002L0091>.

¹⁴ Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012, <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32012R0244>

¹⁵ Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012, [http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52012XC0419\(02\)](http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52012XC0419(02))

¹⁶ Ecofys, Overview of Member States information on NZEBs - Background paper – final report, 8 October 2014, http://ec.europa.eu/energy/efficiency/buildings/doc/2014_nzeb_background_paper.pdf

¹⁷ In April and July the European Commission referred Poland, Austria, Belgium and Finland to the Court of Justice for failing to fully transpose the EPBD, proposing daily fines for the four countries. Other measures could be taken against Slovenia, the Netherlands, Luxembourg, Italy and Czech Republic for incomplete transposition.

¹⁸ <http://www.epbd-ca.org/Medias/Pdf/CA-EPBD-KIDs-Consolidated.pdf>

in 2015, supporting the need for ambitious building renovation strategies.

Resource Efficiency Opportunities in the Building Sector

On July 2014 the European Commission published a Communication on Resource Efficiency Opportunities in the Building Sector¹⁹. The Communication designs the future steps of the Commission in this sector, with special focus on construction materials; it recognizes that, even if there are several instruments able to impact on buildings and construction products²⁰, the EU lacks an overall life-cycle approach. Indeed, some Member States are currently developing policies on life-cycle approach, with the risk of having different indicators for every Member State and unnecessarily complicating European landscape on this issue.

The Communication does not include concrete measures or decisions; its objective is to prepare the debate for future legislative proposals in this sector. Concretely, it invites stakeholders to contribute to the debate, with special focus on:

- Discussing objectives and indicators for assessing the sustainability of buildings (2014-2015);
- Discussing the practical implementation of a framework containing core indicators (2014-2015);
- Contributing to the development of this framework (2015-2016).

On December 2014, the European Commission announced in its 2015 Work Programme the withdrawal of the Circular Economy Package to replace it with a new proposal which will be published later in 2015. Even if the Communication on Resource Efficiency Opportunities in the Building Sector is not directly modified by this decision, the withdrawal is likely to have a strong impact on the debate on recyclability and life-cycle approach.

Value for VIPA: This communication is not a legislative act and will not necessarily lead to the adoption of legislative acts; nevertheless, it sets the direction of future policies on buildings. The debate that this communication should trigger could be thus valuable for VIPA, particularly on recyclability, resource efficiency and construction materials. Nevertheless, it remains to be seen in the coming months how the new Commission will replace the Circular Economy package to fully understand the consequences for VIPA. VIPA should monitor closely the evolution of the issue.

Construction Product Regulation

To regulate the construction sector, the Construction Product Regulation²¹ (CPR) was published in March 2011 to ensure reliable information on construction products in relation to their performances. Primary objective of the Regulation is to ensure free movement of materials through CE marking and attestation of conformity. As any other construction product, VIPs have to comply with CPR requirements to obtain the CE marking and free

¹⁹ Communication from the European Commission on Resource Efficiency Opportunities in the Building Sector of 1 July 2014, <http://ec.europa.eu/environment/eussd/pdf/SustainableBuildingsCommunication.pdf>

²⁰ Energy Performance of Buildings Directive, the Energy Efficiency Directive, the Construction Products Regulation, the EU Emissions Trading System, the Industrial Emissions Directive, the Waste Framework Directive and the Landfill Directive.

²¹ Regulation No 305/2011 of 9 March 2011 laying down harmonised conditions for the marketing of construction products, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0005:0043:EN:PDF>

movement among EU Member States. To affix the CE marking, manufacturers have to use the standards developed by CEN and make the declaration of performance (DoP) of their products as defined in CPR. The Regulation provides:

- a system of harmonized technical specifications;
- a system of attestation of conformity (AoC);
- a framework of notified bodies;
- the mandatory CE marking of products as a passport to the internal market.

Member states have to establish national product contact points to give information on rules and regulations for construction products²². An online survey on the implementation of the Construction Products Regulation will be open until 23 January 2014 to the contribution of stakeholders²³. This consultation is aimed at obtaining information for an implementation report to be produced by the Commission by April 2016.

Value for VIPA: The CPR regulates the CE marking and attestation of conformity of construction products, including VIPs. As any other construction product, VIPs have to comply with CPR requirements to obtain the CE marking and free movement among EU Member States. Fully understanding CPR requirements and possible future evolutions is thus fundamental to obtain the CE marking. Standards are developed by CEN following a mandate issued by the European Commission.

Standards and Product Environmental Footprint

The European Committee for Standardization (CEN) is the main Standardization body for construction standards: the construction sector in CEN covers more than 3000 work items on product standards and test methods. National Standardization Bodies have to adopt each European Standard as a national standard and withdraw any existing national standard that conflicts with the new European Standard. CEN divides these 3000 work items into four macro-groups of standards:

- Construction products;
- Energy performance of buildings;
- Heating, Ventilation and Air Conditioning (HVAC);
- Eurocodes.

Standards for construction products are developed following the provisions of the Construction Products Regulation. A full list of harmonized standard for the construction sector is available on the Commission's

²² Full list of contact points available on European Commission website:

<http://ec.europa.eu/DocsRoom/documents/4170/attachments/1/translations/en/renditions/native>

²³ Available on

http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=7886&lang=en&tpa_id=151&title=Survey-on-implementation-of-the-Construction-Products-Regulation

website²⁴. Harmonized standards for construction products are used to make the declaration of performance (DoP) of products and to affix the CE marking.

Standards on energy performance of buildings are also relevant for VIPA. The European Commission has issued in 2010 a mandate to CEN, CENELEC and ETSI to develop relevant standards for a methodology calculating the integrated energy performance of buildings and estimating the environmental impact²⁵. A first mandate on this issue was already approved in 2004²⁶. These standards also support the implementation of the EPBD.

The Eurocodes are the Europe-wide recommended set of standards for the structural design of buildings and other civil and engineering works. It is mandatory for the Member States to accept designs to the Eurocodes and translate them into national legislation, withdrawing conflicting standards.

Thermal insulation products in buildings are also included in the list of pilot projects developed under the Product Environmental Footprint (PEF) approach²⁷. The PEF's objective is to provide a reliable and comparable tool for providing environmental information, while the pilot project have been selected to test the harmonized methodology for the calculation of the PEF developed by the Commission²⁸. The work of the thermal insulation products pilot projects started on 13 June 2014 and will last 3 years. Several relevant stakeholders (EUMEPS, EURIMA, EXIBA, Plastics Europe, PU Europe among others) are members of the Technical Secretariat. The PEF Category Rules (PEFCRs)²⁹ resulting from the PEF pilot phase will fix a consistent set of rules to calculate and communicate the PEF of products within the same category; the Commission will then decide if the results will be used only for the products subject to the PEF project or for the wider category of thermal insulation products.

Value for VIPA: VIPA members already take part in the CEN Technical Committee working on VIPs standards. Standardization was identified as a key topic for VIPA. CEN Standards will be replicated in other parts of the world so participating actively in the process is even more important to global associations such as VIPA International. The PEF process has just started, so there are probably no concrete measures taken yet. VIPA could thus monitor closely the development of PEFCRs for thermal insulation process, possibly liaising with relevant stakeholders in the Technical Secretariat or directly to the Secretariat to fully understand their development and possibly to contribute to their development.

3. China

²⁴ Available here: http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/construction-products/index_en.htm

²⁵ Mandate M480 to CEN, CENELEC and ETSI, 14 December 2010, http://ec.europa.eu/energy/efficiency/buildings/doc/2010_mandate_480_en.pdf

²⁶ Mandate M343 to CEN, CENELEC and ETSI, 30 January 2004, http://ec.europa.eu/energy/efficiency/buildings/doc/2004_mandate_343_en.pdf

²⁷ PEFCR Pilot Fiche – Thermal Insulation http://ec.europa.eu/environment/eussd/smgp/pdf/Fiche_thermal_insulation.pdf

²⁸ Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013H0179>.

²⁹ More details on the PEFCRs procedure here: http://ec.europa.eu/environment/eussd/smgp/pdf/Guidance_products.pdf

Introduction

China's building sector accounts for more than 25% of China's energy use, and Chinese buildings are on track to become responsible for one-fifth of the world's coal consumption by 2020—stretching the limits of what China can supply. Existing buildings amount to 43 billion m², most of which with poorer thermal and insulation properties than those in developed countries.

Indeed, in the last decade China experienced a construction boom, becoming one of the leading markets in the world for new constructions. China is still putting up buildings at an astonishing pace, although perhaps slightly slower now than its peak a few years ago, when it was estimated that China built 2 billion m² of building space each year. The World Bank estimated in 2010 that nearly half of all the buildings constructed in the world over the next two decades would be in China.

Some provisions to address environmental problems and boost energy efficiency were already included in the 11th Five Years Plan, covering the period 2006-2010; indeed, in November 2005 the government committed to reduce energy intensity per unit GDP by 20% by 2010. The 12th Plan, covering the period 2011-2015, is a step forward in this sense, since for the first time it includes reduction targets for both energy and climate change, aiming to reduce energy intensity by 16% and greenhouse gas emissions by 17% by 2015.

By 2020, 30% of new construction in China will be green buildings, according to the Ministry of Housing and Urban-Rural Development. Retrofitting existing buildings for energy efficiency is also an important strategy. The Chinese government has launched a program to retrofit homes in colder areas and aims to retrofit 4 million m² of nonresidential building space in ten cities. Improving the efficiency of its buildings, new and old, is a key part of China's strategy to reduce energy demand, and it is likely to attract a considerable amount of investments, estimated in 100-150 billion Yuan by 2015³⁰.

A report from NRDC and the Boston Consulting Group found that if all of China's commercial and residential buildings, new and existing, could cut energy use by 70% and 55%, respectively, by 2015, China would cut 2 billion tons of global warming pollution. It is an optimistic figure, but it does demonstrate the enormous upside of making buildings more energy efficient, not only for China, but for the planet.

12th Five Years Plan

The preoccupation for the state of the environment and the poor energy efficiency of the country clearly emerge from the 12th Five Years Plan (FYP), officially endorsed by the National People's Congress on 14 March 2011. The Plan emphasizes the need to achieve higher quality growth, respecting the environment and decreasing the consumption of energy. The concept of ecologic civilization is promoted as partial answer to the "Western" concepts of green economy and green growth.

Compared to the previous Plan, the 12th FYP includes more ambitious targets for the energy performance of new buildings and expands the coverage of the energy efficiency plan to new sectors. The FYP includes the following targets:

³⁰ Yu, Evans, Shi, Analysis of the Chinese Market for Building Energy Efficiency, March 2014, http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22761.pdf.

- 95% compliance rate of new building codes;
- Higher energy efficiency standards in big cities;
- 400 million m² retrofit target in North China, 50 million m² in South China for residential buildings;
- 10% reduction per unit area in public building energy consumption, 15% in large public buildings;
- 20% of new constructions in 2015 should be green buildings, 30% by 2030.

The Plan is surely a step forward compared to the past, but it has nonetheless attracted critiques from business organizations like AmCham China, who asked for additional and more ambitious policy reforms to fully achieve China's ambitions in this field.

Following the Plan, the Ministry of Housing and Urban-Rural Development (MOHURD) issued several relevant measures for the building sector to implement and give concreteness to the general targets:

- In August 2013 the MOHURD published the "National List of Pilot Smart Cities", a list of 103 cities that will develop smart and environment-friendly urban infrastructure and management plans;
- In November 2013, the Ministry released a directory of "Trial Construction Project Environmental Impact Assessment (EIA)". The aim was to inform citizens on EIA, promote transparency and reduce corruption cases related to this issue;
- The "Energy Conservation Special Plan" requires new measures and higher standards for building's insulation; to achieve the 16% reduction of energy intensity and the 65% reduction of energy consumption for space heating compared to the levels of 1980, over 1.25 billion m² of new buildings and 90 million of existing buildings need to be insulated³¹;
- The "Green Building Action Plan" calls for one billion m² and 20% of all urban buildings to be green buildings by 2015. Preferential tax and credits are foreseen to incentivize the building and purchase of green buildings. Other provisions to promote green buildings are included in the 2013 "Circular on Implementation of Green Building Action for Affordable Housing";
- The "Notice on Further Promoting Energy Saving Work for Public Buildings", issued in May 2011, aims to implement the 10% reduction per unit area in public building energy consumption and 15% in large public buildings included in the FYP.

Value for VIPA: The 12th FYP sets up the general targets and framework for actions of Chinese policy for the next five years. Local authorities and ministers have to comply with the Plan. Even if it would be difficult to influence the review of the Plan and the preparation of the 13th Plan, VIPA should closely monitor the decision that will be taken in 2015 to have a clear overview of where the Chinese market for energy efficiency products is going.

Building Codes and insulation

Chinese building codes date back to 1986, to the first "Design Standard for Energy Efficiency of Residential Buildings", which required a 30% reduction of energy consumption for space heating compared to the levels of

³¹ Yu, Evans, Shi, Analysis of the Chinese Market for Building Energy Efficiency, March 2014, http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22761.pdf.

1980, when buildings had no energy saving requirements. The Standard was firstly updated in 1995 with higher energy efficiency requirements, a reduction target of 50% and the extension of the requirements to South China.

From 2006, China changed again the standards moving the reduction target to 65% while new legislative instruments were enacted to support the deployment and the enforcement of the standards: the Code for Acceptance of Energy Efficient Building Construction and the Standard for Energy Efficiency Test of Residential Buildings are among the instruments used for this scope.

Today building energy codes set up technical requirements for different energy components. Requirements are then differentiated according to the climate region and building type (residential, commercial, public, rural). Proper insulation is covered by the building codes; different insulation requirements for walls and roofs are promoted for different climate zones and building types.

External wall insulation is the dominant type of insulation in China; in the past there were attempts to promote the use of internal insulation, but because of poor moisture control condensation was often a problem and the choice of the government turned to external insulation.

Value for VIPA: Chinese building codes are the main drivers for the development of insulation products market. It would be extremely important for VIPA to establish relations with the policy makers working on the codes to closely monitor their evolution and possibly to influence it directly.

Key Barriers

AmCham identified in its 2014 White Paper³² the following barriers to the development of green buildings:

- Insufficient economic incentives to justify energy-efficient design and solutions for certain types of buildings and projects;
- Lack of talent for integrated design and operations and management;
- Mismatch of energy efficiency incentives for builders owners and users;
- Low energy cost reduction potential in some regions due to low electricity rates;
- And lack of consumer awareness.

Additionally, the 2014/2015 Position Paper³³ of the Construction Working Group of the EU Chamber of Commerce in China highlighted that European Construction Service Providers still face legal barriers to enter Chinese construction market; despite the positive reforms promoted by the 12th FYP, no liberalization for foreign companies has been approved. Under Decree 113, “Regulations on the Administration of Foreign-Invested Construction Enterprises”, Wholly Foreign-Owned Construction Enterprises are limited to undertake the following:

³² American Chamber of Commerce in China, American Business in China White Paper 2014, <http://www.amchamchina.org/whitepaper2014>

³³ European Chamber of Commerce in China, Construction Position paper 2014/2015, <http://www.europeanchamber.com.cn/en/publications-archive/271>

- Projects financed by international institutions;
- Sino-foreign projects, where foreign investment is greater than 50%;
- Domestic projects, which are so technically demanding that Chinese CSPs are unable to undertake.

4. USA

Introduction

In the US, building construction is regulated by building energy efficiency codes, developed from “model” codes, adopted into law by local jurisdictions (state, county, or city governmental units). These codes govern the design and construction of new buildings as well as renovations to existing structures, and cover residential and non-residential building occupancies.

Development of the actual model code requirements and local adoption and enforcement processes occur in political and technical arenas where individual interests intersect with societal needs. Public and private interest stakeholders’ work together to maintain the model codes through regular update processes intended to bring new systems, products, and other innovations into the code through consideration of proposed modifications in a consensus process. About 40% of the US energy consumption is for residential and commercial buildings operation; codes for energy efficient buildings are an important strategy to reduce that consumption.

Energy Policy and Security Act (EPAcT)

In the US the need for reductions in building energy use became a key strategy to reduce future oil demand since the 1973 Arab oil embargo and subsequent impacts on the availability of oil. The response to concerns about US energy security was the passage of the Energy Policy and Security Act (EPAcT) in 1975. EPAcT continues to drive federal policy, and building energy efficiency requirements, 40 years after its passage. EPAcT introduced a series of measures including the creation of strategic petroleum reserves, price regulation, and efficiency standards for automobiles and appliances.

The 1975 EPAcT amendment also established the first attempt to create standards for building efficiency. Today, US law requires that states adopt American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) Standard 90.1 (or other equivalent standards) to establish minimum building efficiency standards.

Value for VIPA: The EPAcT amendment is the general federal law for standards on energy efficiency of buildings. It lacks any real enforcement mechanisms. Thus, developments at federal level should be monitored only generally by VIPA.

Building Standards

In the US, building codes are developed mainly by two organizations: the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the International Code Council (ICC).

As a result of the 1975 EAct amendment, ASHRAE paved the way for energy codes by developing Standard 90-75, Energy Conservation in New Building Designs. By 1989, ASHRAE Standard 90.1, which includes non-residential building energy efficiency, had supplanted 90-75.

ICC, formed by the merge of three model construction code groups, develops the International Energy Conservation Code (IECC), which include non-residential building occupancies as well as standards for renovations to existing buildings.

With ASHRAE and ICC continuing a somewhat cooperative approach to developing and maintaining building energy efficiency standards, even while maintaining separate sets of standards, there has been a “check-and-balance” foundation in place. Today, ASHRAE 90.1 and the non-residential provisions in the 2015 IECC provide somewhat comparable efficiency levels. Each of these standards references the other as a “deem-to-comply” standard.

Another influence on model energy codes is likely to emerge as a result of concerns about climate change and the environmental footprint of building construction. The development and promulgation of green buildings codes aimed at reducing global warming and other negative environmental impacts will have a profound impact on future energy efficiency standards.

State Adoptions and Local Enforcement

In order to regulate building energy efficiency policy in the US, the Department of Energy (DOE) has been tasked with the review of state-adopted standards. While non-residential standards utilizing ASHRAE 90.1 form the basis for DOE determinations of state compliance, state and local jurisdictions typically utilize the residential requirements in the IECC as the basis of their efficiency standards for residential buildings. The federal government has the option to incentivize the adoption and enforcement of minimum energy efficiency standards for building construction by including it as a condition for funding under other legislation. As an example, the American Reinvestment and Recovery Act (ARRA) of 2009 included such an incentive.

While federal enforcement of state energy codes is not considered feasible and outside the scope of Federal enforcement authority, oversight through DOE reviews of state codes programs does provide some level of oversight. The DOE lacks the agency authority to regulate construction but through a multi-faceted approach to education, marketing, and support of incentive programs, can impact the energy efficiency levels of the built environment.

While codes and standards for energy efficiency have focused on new construction, stakeholders have realized that existing buildings provide the single largest opportunity to reduce buildings energy consumption in the US. In order to impact the nation’s existing buildings inventory, a combination of code requirements that require efficiency upgrades during renovation projects and financial incentives to building owners to perform weatherization upgrades on an accelerated basis have been developed and implemented. Such incentives include tax and utility rebates, low-interest financing, and tax deductions including accelerated amortization schedules. Utility providers struggling with power or fuel capacity issues are often at the center of incentive programs thanks to federal and state policy. Marketing programs such as ENERGYSTAR can help educate

homeowners on the benefits of energy efficiency upgrades, and contribute to the overall reduction in buildings energy consumption.

Future of Codes and Standards for Energy Efficient Buildings

Concerns about national energy security and climate change have spurred the development of mandatory energy efficiency requirements in local and state standards as well as voluntary sustainable construction standards. ASHRAE 189.1, Standard for the Design of High Performance Green Buildings and the International Green Construction Code (IgCC) include sustainable buildings provisions for non-residential buildings, and ICC 700, the National Green Building Standard (NGBS) regulates residential standards for “green” homes. Additionally, other groups like the US Green Building Council (USGBC) have created voluntary ratings systems like LEED (Leadership in Energy and Environmental Design) to measure sustainable attributes of green buildings, and provide the construction markets with options to promote sustainable building practice.

The marketplace for energy efficiency (and green buildings) standards is crowded. With ASHRAE and ICC maintaining what may be considered duplicate or interchangeable documents there is a possibility that the future will include a consolidation of energy efficiency standards. While ASHRAE does not publish construction codes, Standard 90.1 could reference building code requirements in the ICC family as a baseline. ICC might consider deferring to ASHRAE for the energy provisions, and publish the IECC commercial provisions with the necessary reliance on other applicable ICC construction codes.

If ICC and ASHRAE do collaborate more closely on the responsibility for maintaining commercial energy efficiency standards, the next logical step could be for ICC to focus on residential energy efficiency provisions and further segment the green buildings standards. For example, ASHRAE could become the primary publisher of commercial energy and green buildings standards while ICC focuses on energy and green standards for the residential markets.

For VIPA, determining the market impacts of energy efficiency standards requires an in-depth look at the standards provisions, the adoption processes, and local enforcement. It is safe to say that future buildings will be moving towards net-zero energy efficiency goals through more stringent energy efficiency standards, innovative building products and systems, and the implementation of best practices like advanced air-sealing techniques and smart home technologies. The regulatory process will play an important role in this push to zero energy, and will have a very real impact on markets for building products.

Value for VIPA: The development, adoption, and enforcement of energy codes in the US is a complicated process where independent code bodies provide the technical basis for model codes, and relies on federal law that mandates state energy efficiency but lacks any real enforcement mechanisms. Thus, developments at federal level should be monitored only generally by VIPA, focusing on relations with standardization bodies and national level approach in greener States like California and New York.

5. Conclusion

New policy instruments could be soon developed in the next years: the newly elected European Commission will review its legislative instruments for energy efficiency in 2015 and 2016, while a new Five Years Plan will be discussed in China in 2015-2016. The 2030 Framework for climate and energy, the negotiations for the Transatlantic Trade and Investment Partnership (TTIP) between EU and US and the China-US deal on climate and energy could trigger developments at national and international level on energy efficiency of buildings.

Next steps for VIPA at EU level include:

- Monitoring of legislative proposals with impact on VIPs (particularly EED, EPBD, CPR);
- Participation to stakeholder consultations to influence the development of legislation and be recognised as an authoritative actor in the field of thermal insulation;
- Participation to standardization committee, possibly developing a VIPA common position and present it to external forums (i.e. IEA Task 65);
- Understand how the PEFCRs are developing and possibly participate to their development;
- Identification of key States more likely to use VIPs to develop national-based approaches.

Recent evolution of Chinese legislation on energy efficiency seems promising. The state of legislation on energy efficiency of buildings is still considerably underdeveloped compared to Europe, but the inclusion of energy efficiency targets in the 12th FYP and the incoming review of the Plan could possibly create room for manoeuvre for VIPA. Next steps for VIPA include:

- Monitoring of legislation (from the 13th FYR to building codes);
- Establishing contacts with Chinese authorities and stakeholders to contribute to the development of Chinese legislation;
- Internally, VIPA could create a group or a task force to closely monitor the evolution of Chinese legislation.

In the US the limited power of federal authorities and the existence of different sets of standards differently implemented at State level suggest that a State-based approach would probably be preferable for VIPA. Next steps for VIPA include:

- Establishing relations with the main standardization bodies (ICC, ASHRAE);
- Develop a State-based approach, with a focus on greener States as California, Vermont and New York;

Overall, the outcomes of this mapping should be debated by the committees to identify concrete courses of action for VIPA in the EU, China and US.