EPEE

European Partnership for Energy
and the Environment

A VISION FOR HEATING AND COOLING PRIORITIES FOR TODAY AND TOMORROW

EXECUTIVE SUMMARY

EPEE, representing the heating, cooling and refrigeration industry in Europe, strongly supports the "energy efficiency first" principle which is essential to achieve the EU's energy and climate goals.

Heating and cooling has been identified and projected in the long-term as the EU's biggest energy-consuming sector. Therefore, EPEE members' technologies are very well placed to significantly increase energy efficiency, limit energy demand, and reduce energy consumption.

To further boost "energy efficiency first" and to demonstrate the significant role that heating, cooling and refrigeration can play, EPEE outlines its vision on concrete measures that Europe can undertake to make its energy efficiency ambitions a reality:

- √ In the short and medium term, to further strengthen and implement existing legislation to exploit the full energy savings potential in both new and existing buildings and to reduce the cost of the energy transition by making better use of synergies between these Directives.
- √ In the longer term, to implement more visionary steps which would go beyond the existing framework and involve a more holistic, system-based approach where buildings should be considered as an integral part of the energy system, balancing energy supply and demand and where thermal networks and decentralised systems complement each other, providing more flexibility for an increased use of renewable energies.

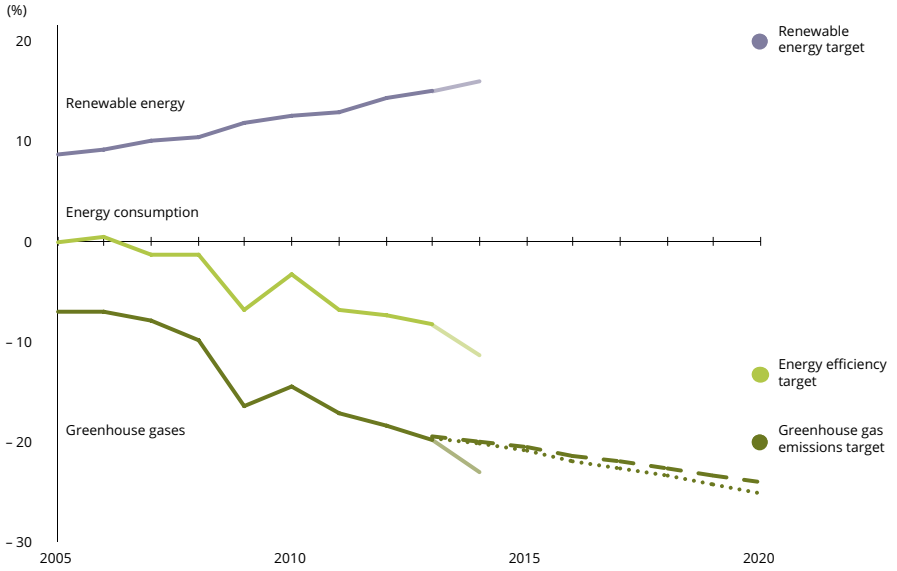
This vision follows our initial recommendations that were submitted during the consultation phase of the Heating & Cooling Strategy and responds to the EU Heating & Cooling Strategy, published in February 2016 and now under review by the Council and European Parliament.

TABLE OF CONTENTS

1 THE CONTEXT: THE ROLE OF HEATING & COOLING IN THE ENERGY EFFICIENCY DEBATE

Reducing Europe's energy consumption and dependency on imports remains its main challenge. Europe's 2020 targets set out a 20% energy savings target which has been updated to an indicative 27% target for 2030. However, new technologies and cost-effective savings potential suggest that a more ambitious 2030 target could be adopted - up to 40% as called for by the European Parliament.

EU PROGRESS TOWARDS 2020 CLIMATE AND ENERGY TARGETS



Source: Trends and projections in Europe 2015 — Tracking progress towards Europe's climate and energy targets: http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2015

Existing EU legislation on energy consumption, from legislation on products (Ecodesign & Energy Label), to buildings (EPBD), and to end-use and supply (EED), remain instrumental in terms of binding measures that can help make Europe's energy ambitions a reality.

Heating and cooling plays a primary role in this debate, not only because heating & cooling cuts across the various existing legislative measures, but most importantly because the sector has been identified and projected in the long-term as the EU's biggest energy sector. Improved efficiency in heating & cooling – specifically in buildings - will help achieve Europe's ambitions overall.

The new heating and cooling Strategy, as well as existing measures such as the Energy Performance of Buildings Directive (EPBD), the Energy Efficiency Directive (EED), the Renewable Energies Directive (RED), and the Ecodesign Directive, promote energy efficiency and provide a solid basis to decrease Europe's dependence on energy imports.

We therefore welcome the upcoming reviews of EPBD, EED and RED and fully support the commitment of the European Commission to not look at these reviews in silo. Taking a more holistic view of energy demand and supply will lead to major opportunities by driving improved efficiencies in building space and water heating, which together account for 80% of final energy use in residential buildings. Looking at the whole system will enable us to identify the most cost-effective and suitable solutions to achieve the energy transition.

II RECOMMENDATIONS FOR THE SHORT & MEDIUM TERM: MAKING THE MOST OF EXISTING LEGISLATION

Looking at existing legislation - *the Energy Performance of Buildings Directive (EPBD), the Energy Efficiency Directive (EED) and the Renewable Energies Directive (RED)* – there is great potential to make more out of them by aligning and creating better synergies. The upcoming reviews of these Directives represent a perfect opportunity to reach these objectives.

Below we describe very concrete 'case-studies' showing how, in the field of **technical systems, control technologies, service & maintenance**, as well as **in public buildings, nZEBs and renewables**, better aligned and better enforced existing legislation could make a real difference in energy efficiency in heating and cooling.

CASE-STUDY 1:
TECHNICAL SYSTEMS, CONTROL TECHNOLOGIES, SERVICE & MAINTENANCE

There are a number of ways to increase the energy efficiency of heating and cooling.

The most obvious solution is the setting of energy efficiency requirements at product level, as stipulated by the Ecodesign Directive. However, even the most energy efficient products will not lead to energy savings if the wrong type of equipment is chosen for a building, or if the heating and cooling system has not been planned to operate in the most effective way. This includes properly sizing, installing, controlling, and maintaining products.

EXAMPLE 1: A study carried out by the French consultancy Cardonnel Ingéniérie highlights the significant negative impact of a lack of proper maintenance and control of thermal equipment on energy consumption, cost and CO_2 emissions. In the example given, the energy consumption of a conventional space heater increases by 10% after 5 years and by 35% after 10 years due to a lack of maintenance and control. This has a direct impact on CO_2 emissions which increase accordingly and on the payback time, which nearly doubles due to the increased energy consumption.

➔ **Proper maintenance and control therefore seem to be the first and most obvious steps to improve the energy performance of buildings.**

EXAMPLE 2: Cardonnel Ingéniérie demonstrates that replacing thermal heating and cooling equipment can result in energy savings of **25 to 40%** combined with payback times of 5 to 10 years depending on the type of the building. Upgrading the envelope of the same buildings, however, requires payback times of 24 to 28 years, achieving energy savings from 40% to 50%.

➔ **These findings highlight the importance of ensuring that measures to improve the energy performance of buildings should not focus on the building envelope only, but should include all elements and technical systems in a building.**

HOW EXISTING LEGISLATION CAN MAKE A REAL DIFFERENCE FROM A HOLISTIC PERSPECTIVE

1. **Focus on EPBD: Article 4, Article 8, Articles 14 and 15 :**

   The below articles are complementary. Together, if and when fully implemented, they represent a huge opportunity to generate significant energy and CO_2 emission savings combined with economic benefits for users:

   - ***Article 4:*** *...Member States shall take the necessary measures to ensure that minimum energy performance requirements are set for* ***building elements that form part of the building envelope*** *and that have a significant impact on the energy performance of the building envelope ....*
   - ***Article 8:*** *...Member States shall ... set* ***system requirements in respect of the overall energy performance, the proper installation, and the appropriate dimensioning, adjustment and control*** *of the technical building systems ...*
   - ***Articles 14 and 15:*** *...Member States shall lay down the necessary measures to establish a regular inspection of the accessible parts of systems used for heating buildings... / ... of air-conditioning systems of an effective rated output of more than 12kW ....* ***The inspection shall include an assessment of the boiler / air-conditioning efficiency and the sizing compared to the heating / cooling requirements of the building*** *...*

EPEE Recommendations to strengthen EPBD provisions:

- ➔ **Article 4 should be linked to Article 8** to ensure that energy performance requirements optimise all factors, and not only the building envelope. In particular, these factors should encompass requirements on technical building systems including maintenance, dimensioning, adjustment and control technologies.
- ➔ **Article 8 should be linked to Articles 14 and 15** including requirements on constant monitoring, maintenance, and optimisation of the heating and cooling systems.
- ➔ **Articles 14 and 15** shall be strengthened by including the evaluation and continuous validation of the actual performance of the building, e.g. heat distribution system, to demonstrate operational performance and maintain the performance of buildings over time.

2. **Focus on EED: Article 4, Article 8, Article 14**

   - ***Article 4:*** *... Member States shall establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. The strategy shall encompass ... (b)* ***identification of cost-effective approaches to renovations*** *relevant to the building type and climatic zone...*
   - ***Article 8:***
     - *Member States shall promote the* ***availability to all final customers of high quality energy audits*** *... 3. Member States shall also develop programmes to raise* ***awareness among households about the benefits of such audits through appropriate advice services*** *...*
     - *Member States shall ensure that enterprises that are not SMEs are subject to an energy audit carried out in an independent and cost-effective manner by qualified and/or accredited experts or implemented and supervised by independent authorities under national legislation by 5 December 2015 and at least every four years from the date of the previous energy audit... [...]...Without prejudice to Union State aid law, Member States may implement incentive and support schemes for the implementation of recommendations from energy audits and similar measures.*
   - ***Article 14:*** *...Member States shall adopt policies which encourage the due taking into account at local and regional levels* ***of the potential of using efficient heating and cooling systems*** *...*

EPEE Recommendations to strengthen EED provisions:

- ➔ **Ensure coherence between Article 4 and Article 14** to better coordinate investment in the building stock with investment in heating and cooling and related infrastructures.
- ➔ **Article 8** should include a requirement on regular maintenance to allow for constant monitoring and subsequent optimisation of the technical building systems. It should also include an obligation to properly consider the cost-efficient recommendations from the energy audits and to implement such measures. This could be linked to financial incentives.

3. Focus on synergies between EPBD and EED:

To optimise the impact of EPBD and EED in view of technical systems, control technologies and service & maintenance, there should be some cross-referencing between the two Directives to mutually strengthen the relevant provisions.

In particular, EPEE recommends cross-referencing between the articles as shown below.

By doing so, Article 8 in the EED would help ensure implementation and further strengthen EPBD Articles 4, 8, 14 and 15.

EPBD		EED
Article 4 Article 8 Articles 14 and 15	⟷	Article 8

EPEE recommendations to exploit synergies between EED and EPBD:

- ➔ **Ensure that EPBD Articles 4, 8, 14 and 15 requirements are mandatory and assessed as part of the energy audit stipulated by the EED Article 8.**
- ➔ **Include an obligation to properly consider the cost-efficient recommendations from the energy audits and to implement such measures.**

CASE-STUDY 2: PUBLIC BUILDINGS, NZEBS, RENEWABLES

Public buildings play an important role in all three Directives: the EPBD, the EED and the RED. They should lead by example and encourage the rest of the market to follow suit. Again, the three Directives could mutually strengthen each other to reinforce this message and eventually extend it beyond public buildings.

- ***EPBD, Article 9:*** *... Member States shall ensure that (a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and 8b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings...*
- ***EPBD, Article 12:*** *...Member States shall ensure that an energy performance certificate is issued for buildings where a total useful floor area over 500m² is occupied by a public authority and frequently visited by the public. On 9 July 2015, this threshold of 500m² shall be lowered to 250m²....*
- ***EED, Article 5:*** *... Member States shall ensure that, as from 1 January 2014, 3% of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements...*
- ***RED, Article 13.5:*** *... Member States shall ensure that new public buildings, and existing public buildings that are subject to major renovation, at national, regional and local level fulfil and exemplary role in the context of this Directive from 1 January 2012 onwards. Member States may, inter alia, allow that obligation to be fulfilled by complying with standards for zero energy housing ...*
- ***RED, Article 13.4:*** *... By 31 December 2014, Member States shall, in their building regulations and codes or by other means with equivalent effect, where appropriate, require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation. Member States shall permit those minimum levels to be fulfilled, inter alia, through district heating and cooling produced using a significant proportion of renewable energy sources.*
- ***RED, Annex VII:*** *... Accounting of energy from heat pumps...*

EPEE Recommendations in view of public buildings, nZEBs and renewables:

- ➔ **All Directives should have a uniform calculation method** to classify technologies by the amount of energy captured from renewables. To that extent, the calculation method set out in RED, Annex VII, establishes a formula for heat pumps which could be used as a basis.
- ➔ **EED, Article 5:** Extend the minimum renovation rate to all public buildings. To determine "public buildings", the definition from EPBD Article 12 could be used.
- ➔ **Link EED Articles 4 and 5 to EPBD Article 9:** Renovation requirements resulting from EED Articles 4 and 5 could be linked to nZEB requirements from EPBD Article 9 with the long-term objective of creating building stock at nZEB level by 2050. To support this, Member States should be required to develop and implement long-term renovation strategies based on clear milestones in 2030 and 2040.

III

RECOMMENDATIONS FOR THE LONGER TERM: A HOLISTIC FRAMEWORK FOR BUILDINGS TO UNLEASH THEIR ENERGY SAVINGS POTENTIAL

As shown in the previous chapter, the existing framework provides an excellent basis to boost "energy efficiency first", allowing for a layered approach from the product level (Ecodesign) via the system level (EPBD) to the supply and user level (EED). To tap the full potential of this framework, there has to be a better use of synergies.

However, EPEE is convinced that there is scope to go much further. Buildings are a unique and essential part of the energy infrastructure, both in terms of energy transmission and energy storage, which is even more important in light of the accelerated introduction of renewable energies.

Optimal energy management requires three main components which need to be addressed to further boost the effective and efficient use of energy in Europe:

- The combination of heating, cooling, ventilation and refrigeration (HVAC&R) with building automation control systems;
- The utilisation of thermal networks through district heating & cooling;
- The integration of renewable energies, particularly when produced on-site, in decentralised systems.

COMPONENT 1: OPTIMAL ENERGY MANAGEMENT REQUIRES THE SMART COMBINATION OF HVAC&R WITH BUILDING AUTOMATION CONTROL SYSTEMS

Fitting energy efficient technologies for heating and cooling in a building without coordinating their functions (i.e. through automation control systems) is not sufficient to minimise the building's total energy input. It is essential that legislation takes into account the efficiency of the whole building system.

Future legislation related to buildings' energy efficiency should take a holistic approach, encouraging building management systems to run heating and cooling systems efficiently, whilst taking into account the habits of the occupants.

A link would therefore need to be established between the EPBD in its current form (perimeter only) and the Ecodesign legislation – including ongoing work under Lot 33 on smart appliances. The latter could be further developed by defining a framework that sets rules for maximising the energy performance of buildings, where each building would be considered as a system composed of active and passive elements and with energy inputs, useful energy outputs, and energy losses to be minimised.

In other words, an optimal energy market design would not so much require new technologies – these are already available – but rather a fine-tuning and coordination of these technologies.

COMPONENT 2:
OPTIMAL ENERGY MANAGEMENT REQUIRES THE CREATION OF THERMAL NETWORKS THROUGH DISTRICT HEATING & COOLING

Heating and cooling systems integrated into the buildings can be part of wider demand response schemes that respond to demand variability at peak times. District heating and cooling systems for larger districts/cities can be very energy efficient and run on low-carbon energy sources.

Applying a clear systems-based approach will be essential for EU regulations covering the energy consumption of equipment, the energy efficiency of buildings, as well as district heating and cooling networks – some of which would be using waste energy.

This means that buildings would need to be considered as a key element of the energy infrastructure (for energy transmission and for energy storage) with heating and cooling demand being at the core of long-term planning.

It is only by understanding the unique role that buildings can play in balancing energy supply and demand that we can ensure a) efficient energy use in buildings – without making concessions to comfort and healthy indoor climate requirements, and b) flexible use of energy by consumers – district heating and cooling providing readily for demand response mechanisms.

A further step, which would also enable a more optimal use of energy between different categories of users (residential/commercial/industrial), would be to coordinate building clusters. This would enable the provision of minimal energy input, without sacrificing the functionality of the system (whether dedicated to comfort, manufacturing processes, or other functions). It is clear that in such cases, a good compromise would have to be found between the complexity of managing such clusters and the energy savings that can be achieved. Strategic control infrastructures would be indispensable, and risks such as data protection would need to be duly taken into account.

COMPONENT 3:
OPTIMAL ENERGY MANAGEMENT REQUIRES THE INTEGRATION OF RENEWABLE ENERGY – PARTICULARLY WHEN IT COMES TO DECENTRALISED SYSTEMS WITH PRODUCTION ON-SITE

The approach described above makes particular sense in light of an increasing use of renewable energies – including energy produced on-site and in the buildings (e.g. through decentralised systems such as heat pumps or solar/photovoltaic). This will require coordinating and aligning all relevant EU legislation – EED, EPBD, RED, Ecodesign.

The advantage of on-site production of renewable energy is that it relieves burdens from the electricity infrastructure, while also guaranteeing delivery of energy without interruption, thus increasing supply reliability. On-site energy storage has the same benefits.

On-site production of renewables would also support the Commission's efforts outlined in the Circular Economy package, which aims at "using less resources for doing the same or more".[1]

To deliver these advantages and to work efficiently, decentralised heating and cooling systems, as well as thermal networks, need to be evaluated based on a life cycle assessment that takes into account economic, energy-related, and environmental aspects, in a technology-neutral way.

Going one step further, decentralised systems could even be included into thermal networks which would empower the consumer to help share cooling and heating capacities, be it on a local level or on the level of building clusters. Again, this would be a great opportunity to increase efficiency and flexibility while reducing investment in large central heating and cooling plants.

1 COM(2014)445 "Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on resource efficient opportunities in the building sector"

IV

CONCLUSION: EUROPE NEEDS AN ORCHESTRA, NOT JUST ONE INSTRUMENT

There is no single policy instrument that alone will help decrease Europe's dependency on energy imports.

What is needed is an "orchestra" where each instrument has its defined role and where both the single instrument and the harmony of all instruments together are decisive for the overall success.

Europe's "orchestra" of instruments is already well-equipped and now needs more practice, discipline, and good governance to be really successful.

However, it is also clear that some instruments are already more advanced than others. This is particularly true for the product level, such as Ecodesign measures. Products have already been optimised to a very high level, and it would be detrimental to the "orchestra" and overall harmony to continue focussing on this one instrument alone rather than ensuring that the others achieve the same level of expertise – in particular when it comes to the system approach.

The energy future of Europe requires visionary steps, where the energy market design provides incentives for both suppliers and users to provide flexibility for a more efficient use of energy; where buildings are no longer considered as individual buildings but as clusters of buildings and as integral parts of the energy system, helping to effectively balance energy supply and demand; and where renewable energies are no longer seen as one of many energy sources but as the most important energy source integrated into an overall supply structure where decentralised technologies and thermal networks complement each other, rather than compete.

If this is the case, all instruments will play successfully together, ensuring the overall harmony of the orchestra and making Europe's energy system truly resilient.

EPEE

European Partnership for Energy and the Environment

ABOUT EPEE

The European Partnership for Energy and the Environment (EPEE) represents the refrigeration, air-conditioning and heat pump industry in Europe. Founded in the year 2000, EPEE's membership is composed of 40 member companies, national and international associations.

EPEE member companies realize a turnover of over 30 billion Euros, employ more than 200,000 people in Europe and also create indirect employment through a vast network of small and medium-sized enterprises such as contractors who install, service and maintain equipment.

EPEE member companies have manufacturing sites and research and development facilities across the EU, which innovate for the global market.

As an expert association, EPEE is supporting safe, environmentally and economically viable technologies with the objective of promoting a better understanding of the sector in the EU and contributing to the development of effective European policies. Please see our website (www.epeeglobal.org) for further information.

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