

CORE THEME 2

RES in Heat



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1 IN A NUTSHELL

This report outlines the topics covered by Core Theme 2, RES Heat, during the course of the third phase of the Concerted Action for the Renewable Energy Sources Directive (CA-RES3, 2017-20) and summarises the main insights and lessons learned. It is intended for stakeholders interested in learning about and gaining experience in how MS are implementing and developing policies to increase the uptake of renewable heat generation (all scales, both large and small).

CA-RES is a structured and confidential dialogue between national authorities (or their nominated representatives) responsible for the implementation of the European Directive on Renewable Energy Sources (2009/28/EC) (hereafter RES Directive). In the CA-RES, participating countries exchange experiences and best practices, participate in a cross-learning process and develop common approaches. CA-RES3 is organised around five core themes in the areas of renewable (RES) electricity, RES heat, Guarantees of Origin and disclosure, biomass mobilisation and sustainability, and RES in transport. For more information on CA-RES see www.ca-res.eu.

Core Theme 2 covers on-site generation of heating or cooling as well as renewable district heating and cooling in buildings. It covers all aspects of this, from analysis of statistics on renewable energy levels, to policy considerations such as policies to address financial barriers, non-financial barriers and regulation.

In December 2018, the revised Renewable Energy Directive 2018/2001/EU (hereafter RED II) entered into force. Supporting this amendment, the scope of Core Theme 2 was expanded to include a number of new articles. The articles within the RED II Directive covered by Core Theme 2 are as follows, where they apply to renewable heating or cooling (from here on, the Articles will be referred to as they are in the RED II):

- RES Directive **Article 3** – Support schemes for RES heating and cooling
- RES Directive Article 5 > **CHANGE RED II Article 7** – Calculation of the share of energy from renewable sources
- RES Directive Article 13 > **CHANGE RED II Article 15** – Administrative procedures, regulations and codes
- RES Directive Article 14 > **CHANGE RED II Article 18** – Information and training
- RES Directive Article 16 > **CHANGE RED II Article 20** – Access to and operation of the grids
- **NEW RED II Article 21** – Renewables self-consumers
- **NEW RED II Article 22** – Renewable energy communities
- **NEW RED II Article 23** – Mainstreaming renewable energy in heating and cooling
- **NEW RED II Article 24** – District heating and cooling

With regards to **Article 3**, discussions have related mainly to the provision of support schemes for renewable heat. **Article 7** handles communications on support schemes for RES; however, this Core Theme only deals with heating and cooling elements. All scales of heat generation are covered since all renewable heat (both large and small) will either serve on-site heat demand or be exported to other sites (i.e. district heating). The term “on-site generation” is used to mean any situation where energy is both generated and consumed on a particular site. **Article 15** covers RE in heat ensuring that **“their competent authorities at national, regional and local level include provisions for the integration and deployment of renewable energy, including for renewables self-consumption and renewable energy communities, and the use of unavoidable waste heat and cold when planning, including early spatial planning, designing, building and renovating urban infrastructure, industrial, commercial or residential areas and energy infrastructure, including electricity, district heating and cooling, natural gas and alternative fuel networks.”** Core Theme 2 also deals with the issues of “Information and Training” covered in **Article 18** of the RES Directive, namely on topics such as how to raise awareness and reach all relevant actors with information on the net benefits of RES heat at local and regional levels, information provision relating to RES heat support schemes and how to implement certified or qualified training of installers of RES. **Article 20** requires MS to take steps to assess the necessity to build new infrastructure for DHC from renewable sources in order to meet their renewables targets.

Article 21 sets the provisions for consumers to become renewable self-consumers, entitling them to **“generate renewable energy, including for their own consumption, store and sell their excess production of renewable electricity, including through renewables power purchase agreements, electricity suppliers and peer-to-peer trading arrangements.”** MS are required, as per **Article 22**, to ensure a definition of and an enabling framework for Renewable Energy Communities are in place in their country. In order to mainstream renewable energy in heating and cooling, **Article 23** requires for MS to **“endeavour to increase the share of renewable energy in that sector by an indicative 1,3 percentage points as an annual average calculated for the periods 2021 to 2025 and 2026 to 2030, starting from the share of renewable energy in the heating and cooling sector in 2020, expressed in terms of national share of final energy consumption and calculated in accordance with the methodology set out in Article 7”.** **Article 24** introduces renewable district heating and cooling requirements, requiring MS to **“increase the share of energy from renewable sources and from waste heat and cold in district heating and cooling by at least one percentage point as an annual average calculated for the period 2021 to 2025 and for the period 2026 to 2030, starting from the share of energy from renewable sources and from waste heat and cold in district heating and cooling in 2020, expressed in terms of share of final energy consumption in district heating and cooling, by implementing measures that can be expected to trigger that average annual increase in years with normal climatic conditions.”**

As of April 2020, Core Theme 2 had covered the following topics listed in chronological order:

- **March 2017 Plenary Meeting (Bratislava):** Information, awareness raising, advice to consumers and other actors in the supply chain
- **November 2017 Plenary Meeting (Zagreb):** Smart finance for renewable heating and cooling in the residential sector
- **April 2018 Plenary Meeting (Warsaw):** Renewable cooling – challenges and solutions for recognising the contribution of cooling towards achieving the RES Directive targets
- **November 2018 Plenary Meeting (Vienna):** Renewable district heating and cooling
- **May 2019 Plenary Meeting (Copenhagen):** RES in buildings linked to building regulations and the EPBD and laying future foundations for the RED II
- **November 2019 Plenary Meeting (Brussels):** Calculating target contributions from energy sources, prosumers and renewable energy communities and smart financing in RE

The March 2017 PM was dedicated to Article 14, whereby MS shared experiences on information, awareness raising and advice campaigns for consumers, discussions focussed on programme design and evaluation as well as on case studies and good practices from Member States. The second PM was largely based on smart finance for renewable heat and cool, focussing on the variety of existing support schemes in the residential sector and exploring the patterns across different schemes that are currently targeting households. The third PM's focus was on renewable cooling challenges and solutions for recognising the contribution of cooling towards achieving the RES Directive targets, during which the participants were provided with an overview of the broader policy context, the status of renewable cooling within the participating Member States and a presentation by a representative of the Oeko Institut, who presented the initial results from a study looking to collect background information on current and future cooling demand in the EU. The fourth PM focussed on renewable district heating and cooling whereby the CT2 participants were provided with an overview of the broader policy context in order to get a better understanding of the links between the Energy Efficiency Directive and the Renewable Energy Directive, they then focused on the topic of district heating and cooling and how Member States can convert and optimise existing district heating and cooling systems from largely fossil fuels to largely renewable sources and finally, they looked into the recast of the Renewable Energy Directive (RED II) that mentions how waste heat and cold can count towards the Member States' renewable energy targets.

From the beginning of 2019, the focus of discussions within Core Theme 2 centred largely around the new articles under RED II. They served to build CA-RES3 participants' understanding of the new articles, provide support to Member States in their transposition of the new articles into national law and facilitate the exchange of knowledge and good practice to inform the design of new policies to meet the new requirements.

Two task forces were established during the course of the project looking into the use of flexibility tools, such as demand response and storage need to be addressed in the residential building sector in order to reach a higher level of renewable penetration in the heating and cooling sector.

2 TOPIC IN THE SPOTLIGHT

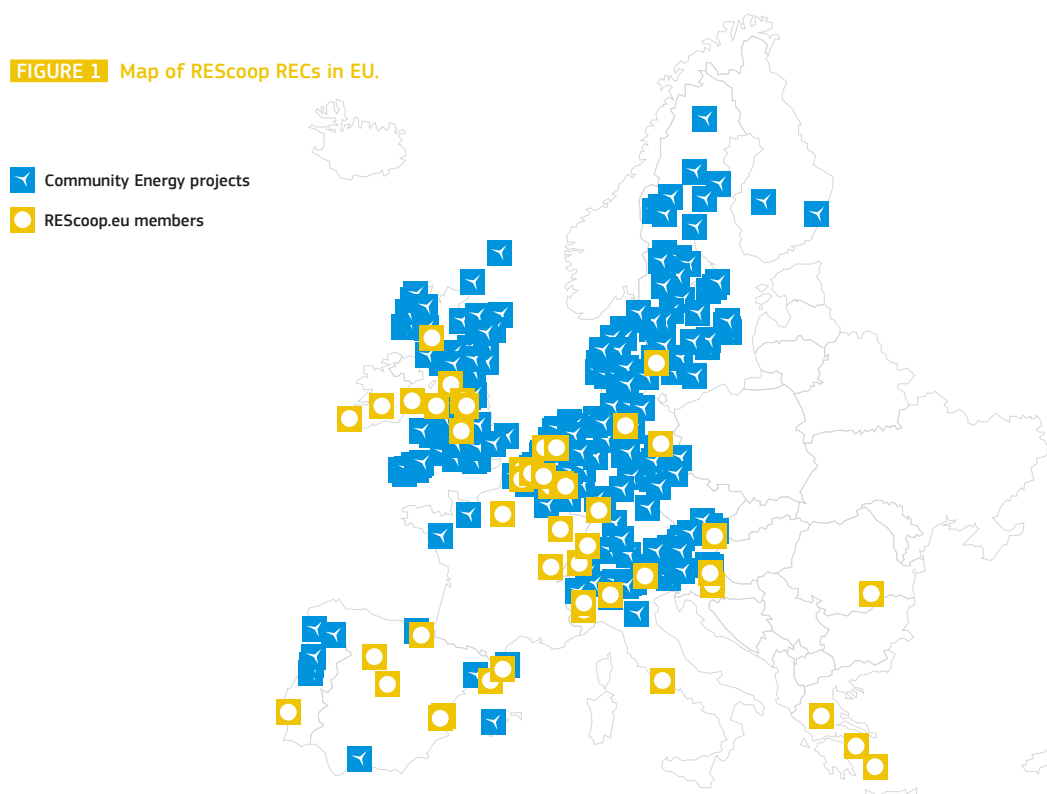
This chapter pays tribute to the work Core Theme 2 and its participants have undertaken on the topics of self-consumers and renewable energy communities (Articles 21 & 22, RED II) over the course of the CARES3 project.

Prosumers and Renewable Communities (Focus on Heat) – Article 21 and 22

Article 21 ensures consumers are entitled to become renewable self-consumers. It requires Member States to develop a legislative consumer protection framework. Article 22 introduces the concept of renewable energy communities (REC), whereby RECs are entitled to produce, consume, store and sell renewable energy. Article 22 acknowledges the important role of citizen participation in the energy transition. Citizen participation can help to increase local acceptance and trigger the development of new, innovative business models such as crowdfunding or peer-to-peer energy trading.

Core Theme 2 work provided insight and support to Member States on **self-consumers and Renewable Energy Communities** as they consider their approaches for the transposition of Articles 21 & 22 into national legislation, the deadline for which is the 30th June 2021. As of November 2019, only three Member States already had or had begun to develop the necessary legislation and/or supporting policy

FIGURE 1 Map of REScoop RECs in EU.



instruments to transpose and implement these articles. Discussions and exchange of knowledge served to build CA-RES3 participants' understanding of the new articles, provide support for the transposition of these into national law and facilitate the exchange of knowledge and good practice to inform the design of national policies and instruments to implement the new requirements. Aspects to consider when designing an enabling legislative framework were presented and discussed and examples of different instruments to support individual households and communities to develop renewable heating projects were explored to provide CA-RES3 participants with ideas and inspiration to inform the design of national policies and instruments. The work undertaken also facilitated the exchange of knowledge on other complimentary measures that can work alongside Articles 21 and 22 to empower and motivate citizens to adopt renewable heating and cooling technologies.

A lot of information, good practice and examples of frameworks for energy communities exists, not only relating to RES electricity, but also RES heating and cooling. The RESCoop.eu project shone a light on the numerous and diverse renewable energy projects that already exist across Europe. REScoop.eu is the European federation of renewable energy cooperatives and is a growing network of 1,500+ European energy cooperatives representing over a million citizens who are active in the energy transition.

RED II requires MS to develop a definition and create an enabling framework for Renewable Energy Communities. An enabling framework must **“promote and facilitate the development of RECs ensuring unjustified barriers are removed, fair transparent procedures are adopted and tools to facilitate access to finance and information are developed in each MS”**. Examples of such frameworks can be found in several Member States (Greece, Lithuania and Scotland) and were provided to CA-RES3 participants. These frameworks allow energy communities to operate across the market, a short description of each is provided below.

FIGURE 2 Details of Greek and Lithuanian REC Frameworks.

Lithuania (draft law)

A cooperative society, association, public office, apartment building or other building own “associations or gardeners” associations are recognized the Renewable Energy Community, provided that they meet the criteria ...

Greece

An Energy Community (E.C.) is the cooperative solely aiming at promoting social and solidarity-based economy and innovation in the energy sector, addressing energy poverty and promoting energy sustainability generation, storage, self-consumption, distribution and supply of energy as well as improving end-use energy efficiency at local and regional level. It is non-profit except in the case of paragraph 4 under Article 2.

Source: RESCoop, 2019

Member States can refer to these examples when developing their own definitions and legislation. It was widely agreed and discussed that **a holistic policy framework and package of instruments is needed** to support the uptake of RECs. The most comprehensive national policy framework was found in Scotland and this case study was presented and discussed. The Scottish case is an example of how RECs can be supported at the national level; from ensuring the right targets are in place, to provision of a one-stop-shop offering information, guidance, dedicated technical support and grants to community groups for the development of local community scale renewable energy projects.

A general theme and conclusion of the discussions on this topic was the importance of **empowering municipalities and communities**. As per the Scottish case study (presented below), Scottish Government recognises the importance of providing local support and is working with Scottish local authorities (LAs) to put in place a statutory requirement for them to develop local Low Carbon Heat and Energy Efficiency Strategies. These strategies will support LAs to decarbonise the built environment.

Scottish Case Study: Support for community renewables in Scotland

In 2019, Scotland declared a Global Climate Emergency and legislated to be a net-zero economy and society by 2045. The national target sets the framework for Scotland's energy policy, which aims for 50% of energy supply to be renewable by 2030 and sets interim Greenhouse Gas (GHG) emissions reduction targets of 75% by 2030 and 90% by 2040. Scotland's Energy Strategy has six energy priorities: consumer engagement, energy efficiency, system security and flexibility, innovative local energy systems, renewable and low carbon solutions and oil and gas industry strengths. Scotland prioritises local energy systems and is moving away from central fossil fuel plants and towards renewables energy market penetration and growing decentralisation of the energy system. Scotland aims for 100% of electricity consumption to be met from renewables by the end of 2020.

Scotland's strong community engagement in local renewable energy generation is supported by the Community and Renewable Energy Scheme (CARES). CARES aims to accelerate progress towards Scottish Government's targets of 1 GW of community and locally owned renewable generation by 2020; 2 GW by 2030, and by 2020 for half of all newly consented renewable energy developments to have an element of shared ownership.

Financed by the Scottish Government CARES is managed and administered by Local Energy Scotland (a consortium of sustainable energy NGOs). Acting as a one stop shop, the programme offers information, advice, funding and bespoke support to communities, associations and rural SMEs to develop renewable and low carbon projects. As at June 2019, 731 MW of community and locally owned energy capacity was operational in Scotland and, currently in 2020, Scotland has approximately 882MW worth of new community renewables projects in the pipeline.

3 CHALLENGE MEETS SOLUTION

3.1 Highlights from the Discussions

Communication Campaigns – Article 18

Providing information on renewable heating and cooling technologies to consumers as well as to other relevant actors is required under Article 18 of the RED II and has been a central focus of Core Theme 2. Member States are required to make information available to help people raise awareness of the costs and benefits of renewable heating and cooling technologies and understand the technologies and their suitability for different circumstances. Since the introduction of the RES Directive, Member States have been more and more active in ensuring that these types of information and awareness raising provisions are in place.

Personalised information and tailored advice are important for consumers, given the technical complexity of some technologies and their varying suitability depending on the building, however not many Member States are making provisions for such advice. The main reason for this lack of advice provision is cost, because tailored and personalised support is more resource intensive and expensive to deliver.

Successful campaigns across Member States rely on the source of information and advice being seen as independent and trusted. Furthermore, peer-learning approaches and referencing the wider and multiple benefits of energy saving beyond financial savings, such as improved well-being, health and comfort, have also shown good results.

There are challenges with the evaluation of the impact of information and awareness raising measures under Article 18. This is because these measures are rarely implemented alone and most often are delivered in combination with financial incentives and installation of measures among other things, which makes it harder to evaluate their effectiveness. These challenges make designing an effective evaluation programme for these information campaigns very important. A robust evaluation of such ‘soft measures’ can give policymakers and implementers an understanding of what is working and what isn’t and guide their decisions on future investment in information campaigns.

Smart Finance for Heating and Cooling

Financing in the residential sector

In the residential sector one of the main consumer barriers to increasing the uptake of renewable heating and cooling within buildings across Member States has been access to finance. To overcome this barrier Member States have put in place appropriate policy frameworks and financial support schemes. As set out in Article 3 of the RES Directive (now superseded by RED II), Member States may apply support schemes for renewable heating and cooling in order to meet their targets.

RES heating and cooling financial support schemes by type across Europe

The key element of success of financial support schemes is long-term stability. Barriers to success include a lack of consumer awareness and trust and the cheaper price of fossil fuels making it difficult for renewables to compete. There are also split incentives between building owners and tenants that must be overcome, for instance through schemes that allow both to profit from energy and cost savings resulting from building renovation and changes to RES heating systems.

Promotional campaigns alongside the financial support scheme, as well as providing tailored advice by trained professionals, are a way to increase the uptake of renewable heat technologies by overcoming the challenge of low consumer awareness and trust. Schemes need to be easy to access and part of an overarching and stringent regulatory framework.

To measure the impacts of financial support schemes, using indices such as level of increase of RES in buildings, improved energy efficiency, energy savings and CO₂ emission reductions are more effective in measuring real impact, but harder to monitor. However, good quality monitoring and evaluation of schemes, which measures the actual outcomes, is essential to effectively demonstrating the added value of such schemes.

Business models for financing RE H&C

In 2019, the topic of smart financing was discussed further, where Member States discussions concluded that smart finance – or a blending public & private finance to ensure the provision of a “holistic” package of measures that tackle both non-financial and financial barriers – is needed to further increase the uptake of renewable heating and cooling technologies across the EU. One of the main conclusions from these discussions was that there was a clear need for an integrated approach between energy efficiency and renewable energy measures, as well as interventions on the local and national level.

Taskforces: Power to heat as a flexibility tool at the prosumer and centralised level

Self-production and consumption of renewable energy in residential buildings, the role of renewable heat and cool as a demand response flexibility tool

Utilising electricity generated on-site to power electrical devices is an established concept, however the potential for using on-site electricity for heating and cooling is less well-understood. The use of renewable electricity, in conjunction with thermal storage, to store energy can act as a flexibility tool, providing a way to integrate more variable renewable energy into the grid. Different technical options are already available in some Member States, but the awareness of their potential is low, and policymakers need a better understanding of their effectiveness before they can consider putting in place support schemes to encourage the joint use of renewable electricity and heat at individual household level.

Self-consumption combined with power to heat and storage: Options for flexibility and system integration of renewables (CT1 and CT2 Joint Session)

Using power-to-heat as a flexibility tool is of mixed importance to Member States (MS), depending on their share of variable RES in electricity and on their local distribution. In some Member States there is a conflict of interest between decarbonisation through the use of efficient but less flexible heat pumps, and the flexibility options through the use of electrical boilers and other technologies to decarbonise the heat sector like e. g. renewable gas.

The barriers to using PtH, include the stable electricity prices resulting from the high regulatory price components which make using PtH as a flexibility tool financially unviable. Furthermore, barriers to this approach exist in Member States that have not fully rolled out smart meters.

Using power to heat as a flexibility tool is not suitable everywhere and depends heavily on the circumstances of the area and although it may not be relevant to many MS now it might become more important in the future.

Renewable Cooling

Defining and quantifying renewable cooling remains a challenge and, to date, only a few Member States have a definition in place and in each case it is different. Whilst it is covered in the Renewable Energy Sources Directive 2009/28 EC, cooling/coldness is not defined as a primary fuel and renewable cooling does not have an official definition. Although cooling is part of the national renewable targets and action plans, in the same way as renewable heating, it is not accounted for in practice in national renewable targets or in the EU renewable energy targets for 2020. For instance, Annex VII of renewable energy in Commission Decision 2013/114/EU covers heat only for heat pumps and excludes cooling capacity and cooling load hours of reversible heat pumps from the calculation of renewable energy.

Core Theme 2 discussions and knowledge exchange during the 3rd Plenary Meeting in Warsaw in April 2018 concluded that useful elements of a future definition would be to specify that the energy produced is from a renewable source, specifying minimum efficiency requirements, stipulating that the coolness is meeting useful demand, and avoiding double counting. CA-RES3 participants concluded that a possible future definition and calculation method should be kept simple and leave leeway for technology developments and the climatic differences experienced across Europe.

Renewable District Heating and Cooling

Renewable energy in district heating and cooling (DHC) networks can play a vital role in supplying heating and cooling efficiently to residential and commercial buildings, especially in urban areas. Although most Member States have at least some district heating infrastructure in place, the heating needs met through district heating networks varies greatly; between less than 1% and 70%. The share of renewable energy sources used to supply the DHC networks also varies greatly.

Proportion of MS heating needs met through district heating networks and proportion met by renewable energy sources

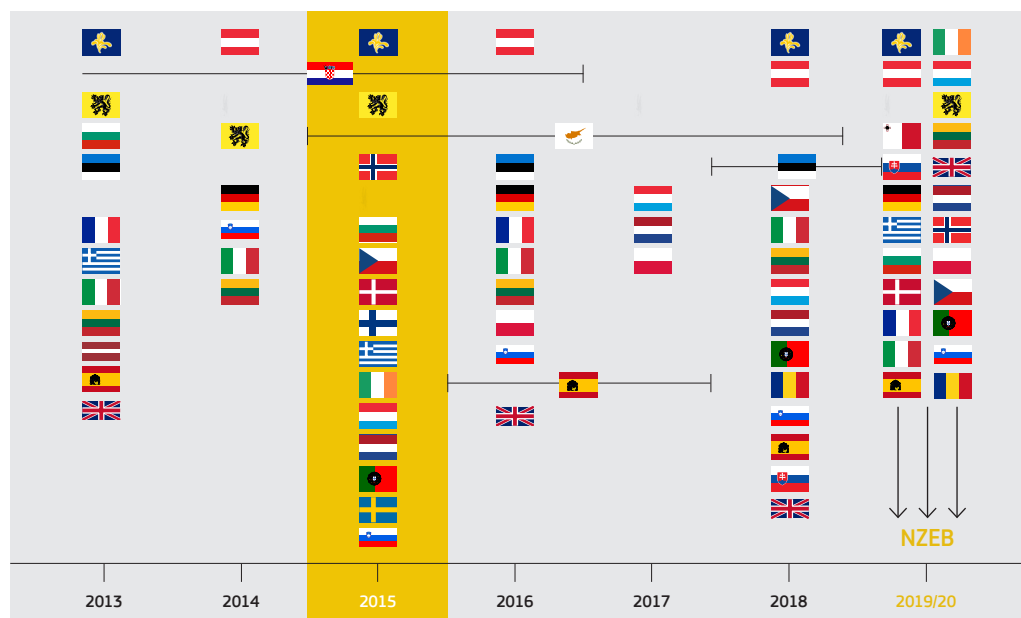
Member States have two main challenges: 1) to expand their existing DHC networks and 2) to increase the share of RES within them. The barriers that impact Member State ability to plan for DHC infrastructure tend to be the conditions of the energy market and the lack of economic incentives.

The good practice examples from Member States presented show that local authorities play an important role in the DHC sector. Many MS entrust municipalities with the role of developing DHC networks as they know the local conditions best. However, national level support is often needed to guide strategy and offer financial support. As DHC networks are large infrastructure projects, policymakers need to secure long-term investment and ambition are secured to meet future targets and decarbonise the heating sector.

RES in Buildings – Regulations & Other Measures – Article 15

Core Theme 2 work on RES in building regulations aimed to understand and facilitate discussions between CA-RES3 participants on the remaining barriers for the inclusion of RES in building codes, In addition Core Theme 2 sought to highlight the linkages to other Directives and raise awareness of mechanisms that can be utilised by Member States to transpose Article 15. Both the RED II (Article 15 – previously Article 13) and the EPBD (Definition of Nearly Zero Energy Building (NZEB) and Article 2a) include legislation to **ensure NZEBs and buildings undergoing major renovations**

FIGURE 3 Timeline of MS Adoption of Building Codes.



Source: "Towards 2020 - Nearly Zero-Energy Buildings - Overview and outcomes - August 2015", Authors Hans Ehm, Heike Ehm-Kluttig, Fraunhofer Institute for Building Physics (IBP), in CA EPBD Book "2016 - Implementing the Energy Performance of Buildings Directive (EPBD) - Featuring Country Reports"

integrate energy from on-site or nearby renewable energy sources. An internal survey found that 35% of MS still need to incorporate renewable energy into their building codes. All MS are required to develop their building codes to ensure NZEB is the minimum standard by the end of 2020.

A key outcome of discussions was the agreement among CA-RES3 participants that closer collaboration is needed between CA EPBD and CA-RES3 to increase and deepen the exchange and dialogue on this issue, support the implementation of RED II requirements, whilst minimising duplication in terms of time and resources. This topic also highlighted that building codes alone are not sufficient for ensuring full adoption of Article 15 and that a combination of measures (carrots, sticks and tambourines) were needed at MS level to maximise the potential for renewable heat technologies.

Calculating Target Contributions from Energy Sources – Articles 7, 23 and 24.4

The most important aspect of this topic was the dialogue that Core Theme 2 facilitated between CA-RES3 participants, DG ENER and EUROSTAT. Discussions and exchange focussed on the gaps in and limitations of the current calculation tool with regards to the monitoring and reporting of RES shares required by the RED II. The internal survey conducted found that 23/25 responding CA-RES3 participants use the Eurostat SHARES Tool as their methodology for implementing RED II. It also found that 14/25 MS believe that this methodology needs updating in order for them to fully calculate, monitor and report on the increased shares of RES heat and cool arising from their implementation of the RED II in a harmonised manner. The need for a harmonised calculation methodology is a recurring theme within Core Theme 2, whereby the requirements of the RED II Directive are difficult to meet without a harmonised calculation methodology, this will be described later in this report. The Eurostat SHARES Tool is the most used, favoured and harmonised means for calculating the share of RES heat in Member States. During the Plenary Meeting in Brussels in November 2018, Eurostat informed MS about the planned update of the SHARES Tool, intended to enable Member States to meet the monitoring and reporting requirements and timeframes of RED II. Additional support for Member States from the Joint Research Centre (JRC) is in progress. JRC is actively working with DG ENER and EUROSTAT to develop a calculation methodology for renewable energy, waste heat and efficient heating and cooling. Preliminary results are expected in summer 2020.

Mainstreaming Renewable Energy in Heating and Cooling – Article 23

From 2020, Article 23 of the RED II requires MS to increase the share of RE in the heating and cooling sector by an average of 1.3% per year. Core Theme 2 facilitated on Article 23 focussed on exchange of knowledge and experience between CA-RES3 participants on the main implementation challenges identified – including the need for harmonized national and EU calculation methodologies and definitions for waste heat and renewable cooling as well as on how waste heat data will be monitored by Eurostat for the transposition of provisions related to RES heat in the building sector. The participating experts highlighted the need to better understand the interlinkages between EED Article 7 and RED II Article 23. The main outcomes of discussions on Article 23 was a clear call for harmonized calculation methodologies. Regarding how MS will monitor Article 23, it is believed that Eurostat's data will be key and require the European Commission to provide additional guidance for a harmonised EU-wide approach.

Waste Heat – Article 14

The recast of the Renewable Energy Directive (RED II) describes how waste heat can contribute towards Member States' renewable energy targets. RED II requires Member States to carry out an assessment of the use of waste heat and cold as part of the Comprehensive Assessments conducted under Article 14 of the Energy Efficiency Directive (2012/27/EU) to guide the development of national measures. This topic was covered by Core Theme 2 twice over the course of CA-RES3, initially to share practices amongst participants about current practices and plans for accounting for waste heat and cold in the future, then, later, to clarify certain ambiguities in the RED II related to waste heat. Waste heat and cold from industry, sewage systems, underground ventilation systems, waste incineration and other sources can be integrated into district heating networks. They allow district heating companies to optimise the production of heat plants and CHP plants. With input from the European Commission (DG ENER), participants were able to better understand the new legislative revisions and provisions to enable a more successful implementation of the RED II and related legal texts. Currently, the Joint Research Centre (JRC) are working with DG ENER and EUROSTAT to develop the methodology for RES waste heat and alongside this EUROSTAT have set up a taskforce with representatives of some Member States on the Shares Tool update post-2020. An outcome of Core Theme 2 was that some additional Member States joined the JRC taskforce. The preliminary results of this are expected in the summer of 2020 and will be complete in time for use in the 2023 National Energy and Climate Plans (NECPs). In the meantime, DG ENER has advised Member States to refer to / use their own definitions for waste heat.

3.2 Good Practices

France – Regional Information Service

The FAIRE Renovation Information Service (<https://www.faire.gouv.fr/>) provides information to people wishing to carry out renovation works in their homes. This includes information on RES technologies and available grants. It consists of two elements: an online website and face-to-face advice. The programme operates a network which is composed of more than 450 service companies called 'points renovation info services' (PRIS), all of whom offer free and impartial advice. This network is present throughout France. PRIS advisors accompany people on a case-by-case basis, by:

- Providing information on suitable RES technologies and the nature of work to be carried out;
- Advising on how to benefit from available support schemes;
- Helping to find RGE (recognised environmental guarantor) qualified professionals for the realisation of the work.

Estonia – Renewable Energy Source in District Heating

District heating is well developed in Estonia, with 70% of heat demand met through district heating. In 2017, renewable energy covered 51.6% of Estonia's heat consumption, with over 95% coming from bioenergy and 4.6% covered by heat pumps using renewable energy. In 2007 renewables covered 32.7% of Estonia's heat consumption. The Estonian district heating market is regulated, enabling the share of RES heat to grow. However, where industrial waste heat is used, it is difficult to make a case to shift to renewable heat as the technologies in question are more expensive than utilising non-renewable excess heat. Estonia plans to invest 16 million Euros by 2020 to develop new nation-wide district heating infrastructure. One of the main drivers is the cheap price for consumers, because the more consumers there are using the heat networks the more cost effective it becomes for them.

The NDPES (National Development Plan of the Energy Sector) sets a 2030 target for Estonia to have an 80% renewable energy share in heat consumption. In 2017, the share in residential and commercial heating was 57%. However, there is no coherent national support scheme that clearly drives achievement towards the 80% target. Most heat-related policy is set on a regional or municipal level; that said, the government has periodically introduced small support schemes for renewable heat, often in relation to the renovation of buildings or heating systems. A national support scheme encourages increased use of high-efficiency renewable energy in small residential heating systems. The scheme provides a direct payment to owners of small residential buildings to replace a liquid fuel heating system with equipment using renewable energy. The scheme covers 40% of the cost of the new system, with a maximum payment of EUR 4,000. National planning documents do not reference this plan, nor note what level of contribution it is expected to provide towards renewable targets

The district heating market and regulation in Estonia has 230 district heating systems, the majority of which is operated by private companies at the municipal level. The DH market is regulated through the District Heating Act, which requires that all municipalities that use DH prepare a local heating infrastructure development plan. The plan not only focuses on investment needs in energy production and distribution but must also assess the energy efficiency measures implemented in buildings connected to the DH. If the annual volume of a DH system is greater than 50,000 MWh, the municipality is authorised to take decisions concerning investment proposals in the sector. The DH Act allows local governments in areas that have DH systems, or that plan to establish DH systems, to give a monopoly status to the DH operator under certain conditions. While the granting of monopoly status makes investments in DH more attractive, it might result in suboptimal solutions from an energy perspective and prevent the installation of more efficient and renewable heating solutions. In recognition of this risk, the government is encouraging the creation of local heating solutions using biomass and other locally available fuels where possible, instead of the rehabilitation of inefficient district heating solutions. The Estonian Competition Authority regulates DH prices on a cost-plus basis. This means that the maximum price of heat should reflect the operating costs including production, distribution and necessary infrastructure investments, while environmental targets and quality and safety requirements are met. The cost-plus regulation also allows a justified profit for the company. In April 2017, the price of DH varied from EUR 35.33 MWh to EUR 86.96 MWh, excluding taxes. The weighted average DH price in 2017 was EUR 50.58 MWh excluding taxes. Prices are typically higher in smaller network regions with an annual sales volume below 10 GWh.

Norway – Banning Fossil Fuel Heating

Renewable electricity has long been the dominant source for heating in Norwegian buildings. However, this is not reflected in the methodology used for reporting on the renewable energy directive (2009/28/EC), where Norway reported a share of renewable energy used in heating and cooling of 34,6% in 2018. In an external consultation regarding the evaluation of the potential efficiency of heating and cooling in Norway, Oslo Economics estimated the renewable energy used for heating in Norway to be 83% in 2018. In total, renewable electricity was used for 2/3 of all heating and cooling-related energy in Norway. According to the same external consultation, only 6% of energy use in Norway was from fossil oils in 2018. This number underlines the scope of the regulation whereby Norway's heating and cooling-sector were, to a large degree, renewable before the regulation entered into effect. In 2016 the installation of fossil heating (including gas) in new buildings was banned.

To support this measure, ENOVA SF provides financial support for installing heat pumps in the transition from fossil to renewable heating. ENOVA SF is responsible for providing financial support for the reduction of greenhouse gas emissions, the development of energy and climate technology and a strengthened security of supply. Annually, ENOVA SF invests roughly 2 billion NOK (€200M) for these purposes. The regulation passed in 2018, and was active from the 1st of January 2020, although was notified in parliament in 2012. The regulation prohibits the use of fossil oil in the heating of buildings, both private and industrial, from 2020, both warm water and ventilation are included in the term heating. Biofuels are still be allowed for heating purposes under the new regulations. The rule has a few exceptions, most notably:

- Buildings not connected to the electrical grid are exempted.
- For hospitals and agricultural buildings, the regulation enters into effect in 2025.

The ban on fossil oil in heating has been estimated to save Norway 340,000 tonnes of CO₂ emissions annually.

Avedøre, Denmark – Zero Energy Community

The Avedøre Green City project (AGC) stresses the importance of citizen participation for the development of a renewable energy community, that is currently being developed. Particularly when it comes to the renovation of existing buildings. The goal/vision of the initiatives in Avedøre is to be self-sufficient whereby the citizens wish to make the power they consume sustainable and in a closed loop system by 2030.

In Avedøre, the citizens of the Copenhagen suburb sought to make their city more sustainable, however; due to a lack of knowledge, they were unsure of the steps to take. Therefore, the AGC project have set up steering group with relevant stakeholders and community members, to provide citizens with the necessary tools to set up a zero-energy district. An onsite district heating company collaborated with the AGC in order to support their zero-energy goal. Using this as the starting point, the citizen representatives and community stakeholders are able to develop a three-tiered system for their zero-energy district:

- Using energy efficient renovation techniques to reduce the energy demand of the building stock by 40%.
- Transforming their DH system with new radiators, ventilation-systems, solar energy storage and heat-pumps resulting in a 10% reduction in energy use.
- Supplying the remaining 50% of energy demand with thermal solar energy supply, PV and BIPV.

The AGC project was showcased within Core Theme 2 because of its community-lead effort to become a zero-energy community, integrating RES with the Energy Efficiency First Principle.

Netherlands – Renewable Cooling

Given the challenges with defining renewable cooling and calculating its contribution to RES targets across Member States, it's valuable to get the perspective of the Netherlands on how renewable cooling is quantified and included within the country's national building code.

In the absence of an official definition for renewable cooling, the Netherlands have developed and applied their own definition. Although they do not report renewable cooling to Eurostat, it is reported in national reports (therefore not as part of their renewable energy obligation). Out of the few national definitions of renewable cooling the Netherlands have a straight-forward definition. Renewable cooling is defined as “**all cooling from geothermal sources, including aquifer thermal energy storage and deep lake cooling**”. The principles for including renewable cooling in the Netherlands statistics specify that:

- Passive cooling is not included, similar to passive solar
- Free cooling from geothermal sources is included
- Free cooling from surface water is included

With regards to their building code, renewable cooling will count towards the required share of renewables when the EPBD is implemented in the building regulations.

4 MAIN FINDINGS AND ACHIEVEMENTS

Recast and New Provisions

As of the 24th of December 2018, the RED II came into force, bringing a selection of new Articles and requirements into the scope of Core Theme 2, which expanded from the beginning of 2019 to include the following four topics and articles: **renewables self-consumers** (Article 21), **renewable energy communities** (Article 22), **mainstreaming renewable energy in heating and cooling** (Article 23) and **district heating and cooling percentage targets** as an annual average calculated contribution from the share of energy from renewable sources, starting from waste heat and cold in district heating and cooling in 2020 (Article 24). From the beginning of 2019 discussions and knowledge exchange between participants were largely based on understanding the new articles, in what could be considered a “learning phase” whereby Core Theme 2 participants received information and guidance to inform their transposition and eventual implementation of the new articles.

Collaboration

Within Core Theme 2, a few important opportunities for knowledge exchange and collaboration arose during the course of CA-RES 3 including:

- **Waste Heat** – the JRC set up a taskforce with the aim of supporting Member States to develop a framework for establishing their renewable waste heat definitions. The taskforce was made up of the JRC, DG ENER and Member State representatives. As a result of the collaboration within Core Theme 2 a number of additional Member State representatives joined the JRC taskforce.
- **Building Codes** – an outcome of the discussions and exchange of knowledge facilitated by Core Theme 2 on integration of RES heat into building codes was the request for more collaboration between CA-RES3 participants and participants in the sister initiative, the Concerted Action for the Energy Performance of Buildings. The aim of this increased collaboration is to ensure RES building regulation practices are shared and harmonised between the two Directives so that requirements can be met in a synchronised manner and without duplication of time or resources between the responsible policymakers and implementing bodies. Facilitating collaboration between RED II and EPBD experts is an ongoing objective of Core Theme 2 with examples of concrete outcomes being the steps taken to ensure CA-RES3 and CA EPBD participants can attend each other's Plenary Meetings, the contributions made to joint CA in-depth workshops and efforts made to connect policymakers and implementing bodies responsible for transposing & implementing RES in building regulations both within Member States and on a wider EU-scale.
- **A Joint CA In-depth Workshop** was held in January 2020 between all three Concerted Actions: The Concerted Action for the Energy Efficiency Directive, the Concerted Action for the Energy Performance of Buildings Directive and CA-RES3 to synergistically address energy efficiency and renewable energy targets in the EU. Core Theme 2 was actively involved in the preparation of the sessions for many of the topics covered, including Zero Energy Communities, Changing consumer behaviour, Heating and cooling decentralised and district level energy & waste heat, Energy Poverty, Long Term Renovation Strategies, Innovate financing solutions, Energy Efficiency and Renewable

Energy Measures – Synergies between EED/REDII/EPBD Implementation to Achieve Targets and Multiple benefits of energy efficiency and renewable energy. The proceedings and presentations from the joint workshop are available on the CA-RES website [here](#).

- **Heat and electricity sector integration** – work on the integration of the heat and electricity sectors is a topic that was covered by Core Theme 2, in collaboration with Core Theme 1 on RES Electricity with the support of a dedicated taskforce made up of participants of both Core Themes.

Building Regulations – Article 15

The purpose of the work on Article 15 was to understand and overcome the barriers preventing Member States from including RES heat in their building codes. Article 15 requires Member States to **“require the use of minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation in their building regulations and codes or by other means with equivalent effect”**. Research conducted by Core Theme 2 showed that there are several different methods that Member States use or plan to use to implement Article 15, namely; building codes and regulations, setting a requirement for RES in building certification, prohibiting fossil fuel heating installations and taxes on fossil fuels. However, the most common approach used is via building codes and regulations – 65% of Member States have set RES requirements in their building codes and a further 11% plan to in the near future. Hence, collaboration with the CA EPBD was key to supporting Core Theme 2 participants in their transposition of Article 15. All Member States will have to adapt their building codes to ensure all new buildings will be NZEBs by the end of 2020. The work on building regulations supported Core Theme 2 participants by providing methodologies, case studies, examples of legislations and linkages to other Directives and to raise awareness of mechanisms that can be used to transpose Article 15. As mentioned above, a key outcome of the exchange between participants was that more, and ongoing, collaboration between CA-RES3 and CA EPBD participants is needed.

Waste Heat and Cooling

A survey of Core Theme 2 participants highlighted the importance and priority for ensuring clarity for Member States with regard to ambiguities in the text of Article 23. Based on the wide consensus on the need for this, Core Theme 2 provided a platform for participants to contribute to the work of DG ENER, the JRC and EUROSTAT on the definitions for waste heating and cooling.

Waste Heat: A presentation by the JRC provided Core Theme 2 participants with an in-depth update on progress towards reaching a definition for renewable waste heat and a platform for consulting CA-RES3 participants on the proposed framework to support Member States in establishing their own renewable waste heat definitions in their national contexts. The JRC explained their criteria and guidance for accounting for renewable waste heat streams, which is relatively straightforward except in the case of industrial renewable waste heat, where the establishment of a new procedure is foreseen. The overall conclusion from the discussions on waste heat was that CA-RES3 participants would welcome further guidance from the European Commission on the definition of waste heat, tailored to the context of RED II. It was noted that the definition within RED II would have to be narrower than the definition in the Comprehensive Assessment under the Energy Efficiency Directive (EED), as within EED it is not limited to DH networks. Key outcomes of Core Theme 2 exchanges on waste heat include:

- CA-RES3 participants called for a harmonized means to calculate waste heat in order to be sure they are all on the same page and “counting good”.
- Missing data and information from EUROSTAT can’t be collected without a definition of and means for calculating waste heat.
- A single definition and calculation methodology for waste heat should come from the European Commission – potentially in the form of a guidance note for Member States.

Waste Cooling: CA-RES3 participants highlighted the issue surrounding waste cooling, namely that there is a misalignment between the deadline for delivering the next NECPs (by June 2021) that will come before the planned update of the SHARES tool and associated guidelines. DG ENER acknowledged the urgency for Member States whilst noting that, as renewable cooling is a complex subject, time is needed to avoid the possibility of mistakes being made. A contract is in place for a consortium to develop a common definition and calculation methodology, in consultation with Member States and supported by JRC who will provide technical advice throughout the process as well as a peer review the final outputs. The preliminary results and outcomes of this research is planned to be ready before the RED II transposition deadline (June 2021).

Calculating Target Contributions from Energy Sources

Feedback from Core Theme 2 participants indicated that dialogue on the three Articles that require Member States to calculate the share of renewable energy from renewable heat and cool sources was both high in priority and urgency. The Articles requiring the calculation of target contributions from energy sources are:

- Article 7 – Ambient and geothermal energy for heating and cooling
- Article 23 – Calculating the 1.3 or 1.1 pp increase in the heating and cooling sector
- Article 24 – Calculating the share of DHC contributing to Article 23

In May 2019, CA-RES3 participants stressed the need for harmonised national and EU calculation methodologies in order to ensure the successful transposition of Articles 7, 23 and 24, including a definition and means to calculate renewable waste heat and cool. Core Theme 2 participants are in broad agreement that EUROSTAT’s data and calculation mechanisms are key in supporting the monitoring of Articles 7, 23 and 24’s targets. Therefore, discussions on calculating RES shares within Core Theme 2 aimed to help CA-RES3 participants understand the proposed methodologies and make recommendations to the European Commission and EUROSTAT on the support they require to enable accurate calculation of their RES heat and cool shares. A survey of Core Theme 2 participants showed that 23/25 MS use the EUROSTAT SHARES Tool as their methodology for implementing RED II. Information was provided to Core Theme 2 participants by the JRC and DG ENER on the barriers and solutions for supporting Member States in calculating, monitoring and reporting their share of RES heating and cooling. EUROSTAT provided MS with information and an open dialogue to discuss how the SHARES Tool is being updated to meet RED II monitoring and reporting needs and timeframes.

Based on this dialogue, Core Theme 2 participants are now aware of the methods currently available, the timescales for updating existing and / or developing new methodologies and the support they can expect to receive from the European Commission and its supporting bodies JRC, and EUROSTAT. One of the main conclusions was that Core Theme 2 participants welcomed further guidance from DG ENER on the definitions and calculation methodologies for renewable waste heat and cool.

Communities

Article 22 of the RED II introduces the concept of renewable **energy communities**. The requirements include the need for Member States to develop definitions, enabling frameworks, national supporting policy and to understand the barriers surrounding the uptake of RECs. The work undertaken in Core Theme 2 allowed participants to understand that there is already a lot of information and good practice on energy communities across Europe. Discussions with participants looked into how Member States can design their legislative frameworks to enable the mainstreaming of RECs, while maintaining the rights of final customers. Guest presenters provided participants with suggested input and strategies for the transposition of Article 22 – these included RESCoop, the Community Power Coalition and the Scottish Government. The outcomes of discussions and the preparatory survey conducted by Core Theme 2 showed that only three Member States have established or begun to develop the necessary legislation to implement Article 22. Examples of existing renewable energy communities and a good practice example of a holistic package of legislation and measures, implemented in Scotland, were provided to inspire participants as they consider how to develop their own legislation in order to transpose and implementing the RED II requirements into their national legislative and policy frameworks.

Financing and Business Models

Smart finance is a cross-cutting theme that is relevant in many of the Articles within the scope of Core Theme 2. A survey undertaken amongst Core Theme 2 participants showed that the financial barriers faced by Member States are at different levels; some are consumer-based, and others are national level barriers. The majority of respondents (80%) reported that their Member State had not yet established business models for implementing the RED II renewable heating and cooling requirements. Participants came to a common understanding that, with regards to RES heat in buildings, smart finance means **‘blending public and private finance for a “holistic” package of measures that tackle both the non-financial and financial barriers’**. Core Theme 2 facilitated knowledge sharing between participants on how they are designing and financing measures to meet the renewable heating and cooling targets and objectives set out in RED II. A range of case studies illustrating different business models were explored. One of the main outcomes of the work undertaken was that participants acknowledged that there was a clear need for an integrated approach between energy efficiency and renewable energy measures, as well as on the local and national level. Another key outcome of the discussions and exchange between participants was that successful investments in RE projects at the community or individual level rely on an enabling policy framework that provides a long-term market signal to private investors, gives local governments the ability to act and tackles the multiple (financial and non-financial) barriers to uptake.

5 ABBREVIATIONS

Participating countries are referred to according to their two-letter country codes as defined by ISO 3166-1 alpha-2 standard (AT – Austria, BE – Belgium, etc.).

Abbreviation	Full Name
AGC	Avedøre Green City
CA	Concerted Action
CA EED	Concerted Action on the Energy Efficiency Directive
CA EPBD	Concerted Action on the Energy Performance of Buildings Directive
CA-RES	Concerted Action on the Renewable Energy Sources Directive
CARES	Scotland's Community and Renewable Energy Scheme
CHP	Combined Heat and Power
CO ₂	Carbon Dioxide
DG ENER	European Commission Directorate-General for Energy
DH	District Heating
DHC	District Heating and Cooling
EED	Energy Efficiency Directive 2012/27/EU
ENOVA SF	Norwegian state enterprise that contributes to reduced GHG emissions, energy security of supply, and technology development
EPBD	Energy Performance of Buildings Directive
EU	European Union
EUR	Euro
EUROSTAT	European Statistical Office, European Commission Directorate-General
GHG	Greenhouse Gas Emissions
GW	Gigawatt
GWh	Gigawatt Hour
H&C	Heating and Cooling
JRC	Joint Research Centre
LA	Local Authorities
MS	Member State
MW	Megawatt
MWh	Megawatt Hour
NDPES	(Estonia's) National Development Plan of the Energy Sector
NECP	National Energy and Climate Plan
NGO	Non-governmental Organisation
NOK	Norwegian Krone
NZEB	Nearly-Zero Energy Building
PRIS	Points Renovation Info Services
PtH	Power-to-Heat
RE	Renewable Energy
REC	Renewable Energy Communities
RED	Renewable Energy Directive 2009/28/EC
RED II	Recast Renewable Energy Directive 2018/2001/EU
REScoop.eu	European Federation for Renewable Energy Cooperatives
RGE	Recognised Environmental Guarantor
SHARES	Short Assessment of Renewable Energy Sources

This is a public CA-RES report

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For further information please visit **www.ca-res.eu**

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