Good practice guide for renewable cooling

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Executive summary

This report aims at providing an overview of best practices and recommendations for mainstreaming renewable cooling. These recommendations target a wide range of policy makers, regulatory bodies, planners and industry at different levels and are in line with existing policy instruments. Firstly, they build on the EU legislation, specifically on provisions established under the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive. A section of the report is therefore dedicated to EU policies on climate & energy for 2030, 2040 and 2050 and actions needed to implement them in a way that will favour the development of renewable cooling technologies.

In addition, a second section includes national guidelines for cooling that take into account both best legislative frameworks regarding renewable cooling technologies deployment and best practices concerning cooling applications in district networks and data centres. The member states considered in this analysis are the following project countries: Spain, France, Italy, Germany, Romania.

These recommendations will be presented to policy makers and relevant institutions in various meetings and dissemination activities during the project duration together with the recommendations regarding financing schemes and business models produced under WP4.

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1. Key aspects of the current European regulatory and policy framework

1.1 EU policies on climate & energy: new opportunities and challenges

The European Green Deal[1], approved in 2020, is a set of policy initiatives by the European Commission with the overarching aim of making the EU climate-neutral in 2050. The plan was to review each existing law on its climate merits and introduce new legislation including on the circular economy, building renovation and innovation.

To deliver the Green Deal, existing legislation is revised, and new legislative initiatives are put in place, under the "Fit for 55" package[2], launched in 2021. These legislative proposals under the 'Fit for 55" package are intended to ensure the EU achieves the -55% emission reduction target by 2030 compared with 1990 levels. In particular, the package launched the revision process of key legislation for the geothermal sector such as the Renewable Energy Directive (RED), the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD).

Moreover, in May 2022, the Commission presented its REPowerEU plan[3] as a response to the hardships and global energy market disruption caused by Russia's invasion of Ukraine. The main purpose of the plan is to save energy, produce clean energy and diversify EU energy supplies. Among others, this plan has also translated into further measures to be included in the RED, EED and EPBD revision.

All the abovementioned legislation is coherent in developing the new EU ambition towards a decarbonised and renewables-based economy.

Below will follow an analysis of the opportunities and challenges coming from key articles in RED, EED and EPBD.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN.
[2] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en.
[3] https://ec.europa.eu/commission/presscorner/detail/en/ip_22_3131.

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1.1.1 The Renewable Energy Directive

The revised REDIII builds on the 2018 revision to promote more ambitious targets and ad hoc initiatives to further develop renewables in several sectors. The revision introduces a new target of 42.5% renewables by 2030, with the possibility to top this up to 45%. More in detail, the following analysis provides an overview of the RED articles with a specific impact on the use of cooling from renewable sources.

Article 23 on mainstreaming renewable energy in heating and cooling

Heating & cooling from renewable sources - binding target

The revised article provides guidance for a gradual increase in renewable targets for heating and cooling, with a binding increase of 0.8% per year at the national level until 2026 and 1.1% from 2026 to 2030. The previous target was an indicative 1.3% increase for the whole period. The minimum annual average rate applicable to all Member States is complemented with additional indicative increases calculated specifically for each Member State. The calculation of renewable electricity used for heating and cooling towards the annual average increases must be for the first time specified and limited in the national energy and climate plans (NECPs)[4].

The binding nature of the renewable heating and cooling sub-target is an important achievement, sending a clear signal to Member States. The reference to the NECPs is also to be welcomed as a means to keep track of Member States developments in this sense. The 0.8 and 1.1 percentage points increase are, however, much lower than the 2-percentage point binding target that is required to meet the Commission's own Impact Assessment for renewable heating and cooling in 2030.

Assessment of the potential of energy from renewable sources

New Article 23 on mainstreaming renewable energy in heating and cooling states that Member States shall now assess their potential for energy from renewable sources. The assessment shall consider the available and economically feasible technologies for industrial and domestic uses to set out milestones and measures to increase the use of renewable energy sources in heating and cooling.

[4] The national energy and climate plans (NECPs) were introduced by the Regulation on the governance of the energy union and climate action (EU)2018/1999, agreed as part of the Clean energy for all Europeans package which was adopted in 2019. The national plans outline how the EU countries intend to address the 5 dimensions of the energy union: decarbonization, energy efficiency, energy security, internal energy market, research, innovation and competitiveness. See here for more information.

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A mandatory assessment of this kind is to be welcomed as it duly takes into account the different renewable energy sources and their possible implementation considering different starting conditions.

Implementing measures to promote the use of renewable energy in the heating and cooling sector

Member States shall now implement at least two measures described in paragraph 4 of article 23 (before, indicatively one or more). The list has been further specified and enlarged, in particular with reference to local mapping and planning, risk mitigation frameworks, heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies. Point (l) specifically mentions the "promotion of renewable based district heating and cooling networks, in particular by renewable energy communities, including through regulatory measures, financing arrangements and support".

The list of measures has been positively enlarged and made mandatory for at least two elements of Member States' choice. In particular, the list now includes: local mapping and planning, risk mitigation frameworks, heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies. However, given the long list of measures and the limited obligation of choosing at least two, the risk is paying little attention to some of these measures and the tendency from Member States to consider their obligations achieved by focusing only on a couple of measures. In this context, cooling related measures risk being overlooked and not given the enough space.

Article 24 on district heating and cooling

The annual increase target of the share of energy from renewable sources and waste heat and cold in district heating and cooling is increased from 1% to 2.2%. The text also introduces provisions allowing for counting renewable electricity towards the target. Member States with a RES/waste heat (WH) share in DHC between 50% - 60% are granted favourable conditions for meeting the target increase (i.e. may count any such share as fulfilling half of the average annual increase referred to above).

The annual renewable increase target has significantly increased. However, while Article 24 presents an opportunity for the DHC sector to contribute more aggressively to renewable energy targets, the non-binding nature of the target could pose some challenges.

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New Article 22a on mainstreaming renewable energy in the industry

This new article sets an indicative (non-binding) target for Member States of a yearly 1.6% increase in the share of renewable sources used in the industry sector; this increase will be calculated as an annual average for the periods 2021-2025 and 2026-2030. Waste heat and cold can be counted up to 0.4%, provided it is supplied from efficient district heating; in that case, the overall annual increase shall increase by half of the waste H&C percentage points used.

Measures to achieve this target shall promote the RES-based electrification of industrial processes, when cost-effective, and aim at reducing the use of fossil fuels for processes below 200 degrees. The contribution of renewable fuels of non-biological origin (RFNBOs) shall be at least 42% of the hydrogen used in industry by 2030 and 60% by 2035.

Moreover, Member States shall promote voluntary labelling schemes for industrial products that are claimed to be produced with renewables and RFNBOs, indicating the share of RES and RFNBOs used at each stage of the production.

The introduction of a new article signals the importance that the EU legislator gives to the decarbonisation of industrial processes. Geothermal DHC can certainly play a role in that by providing a stable and reliable share of renewable sources as required by the provision. However, the non-binding nature of the target severely undermines its impact. This means that the lack of a binding mandate lessens the directive's influence considerably and may not push Member States to action as forcefully as a mandatory requirement would. Also, renewable cooling is not explicitly mentioned in the article, unlike waste heat and cold, electrification, and RFNBOs.

RECOMMENDATIONS ON RED:

- ***Implementing measures to promote the use of renewable energy in the cooling sector***

  Among the list of measures that has been positively enlarged and made mandatory for at least two elements of Member States' choice, Member States should focus on the ones that can boost renewable cooling solutions, in particular: heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies.

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- **Member States shall take the necessary actions and show commitment to achieve the renewable targets in buildings, district heating and industry despite their indicative nature.**

1.1.2 The Energy Efficiency Directive

This section provides an overview of the EED articles with a specific impact on DHC systems and heating and cooling assessment and planning.

New article 12 on data centres

New article 12 states that by 15 May 2024 Member States shall require owners and operators of data centres in their territory with a power demand of the installed information technology (IT) of at least 500kW, to make publicly available some minimum requirements with regard to their energy performance among which, inter alia, energy consumption, power utilisation, temperature set points, waste heat utilisation, water usage and use of renewable energy. In addition, Member States shall encourage owners and operators of data centres in their territory with a power demand of the installed IT equal to or greater than 1 MW to take into account the best practices referred to in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency. With all this information the Commission shall establish a European database on data centres which will be needed for reporting and monitoring purposes to propose further measures to improve energy efficiency, including establishing minimum performance standards and an assessment on the feasibility of transition towards a net-zero emission data centres sector, in close consultation with the relevant stakeholders.

New article 25 paragraph 6 on heating and cooling assessment and planning

The revised article creates a new provision regarding local heating and cooling plans (LHCP). Member States shall ensure that municipalities with more than 45,000 inhabitants conduct LHCP. The article details some key principles for the goal, process and content of the LHCP. It also obliges Member States to develop recommendations and strong technical and financial support for local authorities. This article therefore greatly strengthens the local dimension of the decarbonisation of heating and cooling, as the 2018 version only vaguely encouraged this. Moreover, it specifically mentions that these plans should “provide an estimate and mapping of the potential for increasing energy efficiency, including via low-temperature district heating

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readiness, high efficiency cogeneration, waste heat recovery, and renewable energy in heating and cooling in that particular area".

New article 26 on heating and cooling supply

Definition of efficient district heating and cooling systems

The new definition of efficient district heating and cooling systems has been improved significantly compared to the old definition. From a single definition, now a whole article is dedicated to it, which recognises the importance of the DHC sector and its potential to provide sustainable heat to buildings. It focuses on ensuring more efficient consumption of primary energy and increasing the share of renewable energy in the heating and cooling supply. It introduces specific criteria for efficient district heating and cooling systems based on the percentage of renewable energy, waste heat, and high-efficiency cogeneration used in the system over different timeframes. A new milestone is introduced into the definition for 2045, which no longer includes high-efficiency cogeneration, and states that efficient DHC systems have to use 75% RES and waste heat. This means that cogeneration running on fossil fuels can be counted towards the energy source of efficient DHC systems until the end of 2045.

Paragraph 1 also sets specific targets for the share of renewable energy, waste heat, and high-efficiency cogeneration in district heating and cooling systems, which allows Member States to utilize available sustainable energies based on their decarbonisation pathway. These targets gradually increase over time until they reach a system that uses only renewable energy, waste heat, or a combination of both by 2050.

The new article places a strong emphasis on increasing the share of renewable energy in district heating and cooling systems, which aligns with EU efforts to reduce greenhouse gas emissions. Such a flexible target, towards which both renewable and waste heat jointly count, enables Member States to develop their DHC networks based on their locally available energy source in a flexible manner. This can of course be a great incentive for the implementation of geothermal DHC networks. By setting targets increasing over time, the paragraph allows for a transition towards more sustainable district heating and cooling systems, leading to more investments in DHC infrastructures. Moreover, the focus on renewable energy and high-efficiency cogeneration may drive innovation and technological advancements in the district heating and cooling sector.

However, the timeline that permits non-renewable energy sources in DHC systems until 2045 can be questioned, as it seems in contradiction with the rapid decarbonisation effort which generally inspires the Fit for 55 package.

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Alternative definition for efficient district heating and cooling systems

This article creates also an alternative definition for efficient district heating and cooling systems, which instead of a share of RES and WH in the system refers to grams of CO2 emitted for each kWh of heat produced.

It respects that different EU Member States have different decarbonisation pathways and gives the flexibility to MSs to choose the definition of their preferences. However, even though a CO2 criterion is also favourable to geothermal DHC networks, this alternative definition was conceived to favour MSs utilizing waste heat from nuclear energy sources, bypassing the concept of renewable sources of energy.

Specific criteria for district heating and cooling systems to qualify as efficient

The new article sets specific criteria[5] for district heating and cooling systems to qualify as efficient, particularly when they are built or substantially refurbished. It also ensures that DHC systems, to comply with the definition, newly built or refurbished, should not use fossil fuels, except natural gas until 2030.

By discouraging fossil fuel use and promoting the use of renewable energy, it guarantees the development of renewable energy sources, the utilisation of waste heat in DHC and the contribution to reducing GHG emissions and environmental impacts associated with heating and cooling systems. The ban on new fossil fuel capacity, in particular natural gas from 2030, is a progress but could represent a difficulty for backup capacity in case of peak load, as there is no exemption. In this sense, geothermal energy should be considered as the most valid solution to give reliable baseload capacity.

[5] These criteria are listed in paragraph 1:
"*In order to ensure more efficient consumption of primary energy and to increase the share of renewable energy in heating and cooling supply going into the network, an efficient district heating and cooling system is a system which meets the following criteria:*
a. until 31 December 2027, a system using at least 50% renewable energy, 50% waste heat, 75% cogenerated heat or 50% of a combination of such energy and heat;
b. from 1 January 2028, a system using at least 50% renewable energy, 50% waste heat, 50% renewable energy and waste heat, 80% of high-efficiency cogenerated heat or at least a combination of such thermal energy going into the network where the share of renewable energy is at least 5% and the total share of renewable energy, waste heat or high-efficiency cogenerated heat is at least 50%;
c. from 1 January 2035, a system using at least 50% renewable energy, 50% waste heat, 50% renewable energy and waste heat or a system, where the total share of renewable energy, waste heat or high-efficiency cogenerated heat is at least 80% and in addition the total share of renewable energy or waste heat is at least 35%;
d. from 1 January 2040, a system using at least 75 % renewable energy, 75% waste heat or 75% renewable energy and waste heat, and using at least 95% renewable energy, waste heat and high-efficiency cogenerated heat and in addition the total share of renewable energy or waste heat is at least 35%;
da. from 1 January 2045, a system using at least 75 % renewable energy, 75% waste heat or 75% renewable energy and waste heat.
e. from 1 January 2050, a system using only renewable energy, only waste heat, or only a combination of renewable energy and waste heat."

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Proactive measures for *DHC systems operators*

The new paragraph requires operators of existing district heating and cooling systems with a total heat and cold output exceeding 5 MW, which does not meet the requirements set out in the new paragraphs 1 or 2, to prepare a plan every five years on how they will increase energy efficiency and incorporate renewable energy and waste heat.

The article emphasises proactive measures by requiring operators of existing DHC systems, from 1 January 2025 and every five years thereafter, to develop plans for improving energy efficiency and incorporating renewable energy and waste heat. This promotes long-term planning and concrete actions toward a more sustainable sector. The requirement to increase the share of renewable energy in the heating and cooling supply provides a significant opportunity for the integration of renewable sources, reducing reliance on fossil fuels and contributing to climate goals.

The new article specifically targets existing DHC systems exceeding 5 MW. Other systems that fall below these thresholds may not be subject to the same level of scrutiny or efficiency improvement requirements. The plan requirement for existing DHC systems provides opportunities for infrastructure upgrades and modernisation, potentially leading to more efficient and sustainable systems. In addition, it creates opportunities for technical advancements and innovation in the DHC sector. Existing DHC networks will be eligible for EU funding only if it is invested to meet the criteria of the efficient district heating and cooling systems definition. For this reason, creating plans for that purpose would bring opportunities for how operators could apply for EU funds.

RECCOMENDATIONS ON EED:

- **The ambition to establish minimum requirements with regard to data centres' energy performance and use of renewable energy is to be welcomed. In this context, Member States should consider that geothermal (free and active) cooling technologies represent a solution which is renewable, efficient and cost-competitive and can cool even intense sources of heat such as data centres.**
- **Member Staes should provide technical and financial support to local governments to achieve local energy plans and propose recommendations for local decarbonisation. Support to DHC and RES should be the core focus of these plans in order to avoid certain pitfalls, such as having local plans focused only on security of supply issues.**

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- **For the definition of efficient district heating and cooling systems, the one based on share of RES and WH should be preferred rather than the one referring to grams of CO2 emitted for each kWh of energy produced. Even though a CO2 criterion is also favourable to renewable based DHC networks, this alternative definition was conceived to favour Member States utilizing energy sources that are not renewable.**

1.1.3 The Energy Performance of Buildings Directive

The recast of the Energy Performance of Buildings Directive (EPBD) is part of the 2021 Commission Work Programme "Fit for 55" package and complements the other components of the package proposed in July 2021, setting the vision for achieving a zero-emission building stock by 2050. The EPBD is particularly important because buildings account for 40% of energy consumed and 36% of energy-related direct and indirect greenhouse gas emissions. In the EU, heating, cooling and domestic hot water account for 80% of the energy that households consume.The key new provisions included in the EPBD recast with influence on cooling are the following:

- goal to transform the national building stock to zero-emission by 2050[6];
- all new residential and non-residential buildings must have zero on-site emissions from fossil fuels, as of 1 January 2028 for publicly-owned buildings and as of 1 January 2030 for all other new buildings, with a possibility for specific exemptions;
- with regard to non-residential buildings, Member States will have to renovate the 16% worst-performing buildings by 2030 and the 26% worst-performing buildings by 2033;
- with regard to residential buildings, the average primary energy consumption of the entire housing stock will have to be reduced by at least 16% by 2030 and by 20 to 22% by 2035;
- new buildings are designed to optimise their solar energy generation potential and establishes timings for the deployment of solar energy installations (solar thermal and/or

[6] Art. 2(2): 'Zero-Emission Building' (ZEB) means a building with a very high energy performance, as determined in accordance with Annex I, where the very low amount of energy still required is fully covered by energy from renewable sources generated on-site or nearby, from a renewable energy community within the meaning of the amended RED or from a district heating and cooling system, in accordance with the requirements set out in Annex III;
Art. 2(3): 'Nearly Zero Energy Building' (NZEB) remains the standard for new buildings until the application of the ZEB standard in 2030, which then replaces NZEB.

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solar photovoltaics) in public and commercial buildings (new and existing) and in new residential buildings;

- Member States must include in their National Building Renovation Plans a roadmap with a view to phase out of fossil fuel boilers by 2040;
- Member States will also have to stop subsidising stand-alone fossil fuel boilers from 2025.

RECOMMENDATIONS ON EPBD:

- **The roadmap to phase out fossil fuel boilers should be implemented as soon as possible. Unfortunately, the date proposed for a phase out of fossil fuel use in heating and cooling remains indicative and comes years too late for the EU to reach its climate and energy goals.**

1.2 Towards 2040 and 2050

In June 2024, the European elections marked the beginning of a new legislative term, sparking a highly political debate that continued with the establishment of the new Commission, from the re-election of Ursula Von der Leyen as President in July to the confirmation of the proposed Commissioners and inception of the new College as of 1st December 2024.
In the previous legislative term 2019-2024, the fight against climate change was immediately identified as the key priority, with the publication of the European Green Deal in December 2019 and the subsequent legislative initiatives to achieve its objectives. With the new term, competitiveness and industrial policy are at the top of the agenda. While the transition to climate neutrality remains a priority and a legal commitment for the EU, the objective will be to ensure that decarbonisation and industrial competitiveness go hand in hand and reinforce each other.

1.2.1 Climate targets and regulatory framework beyond 2030

The European Climate Law adopted in July 2021 set an EU legally binding target to reduce greenhouse gas emissions by 55% by 2030 and achieve climate neutrality by 2050. The aim of the 'Fit for 55 package' presented by the European Commission in 2021 was to align EU legislation with these targets. The package consisted in a comprehensive set of over 20 legislative proposals that took most of the previous legislative term to be agreed upon by the co-legislators.

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At the same, the European Climate Law outlines the process to set an intermediate target for 2040. Following this process, in February 2024 the European Commission recommended a target of 90% GHG reduction target for 2040, based on the results of a public consultation, an impact assessment, and the advice of the European Scientific Advisory Board on Climate Change. This recommendation must now be followed up by an actual legislative proposal to amend the Climate Law and enshrine the 2040 target, which will have to be adopted by the co-legislators.

Setting the 2040 target will then open the debate on the post-2030 climate framework, that is how to amend and integrate EU legislation to achieve the target. The discussion has already started in Brussels, with the two key issues being simplification to reduce the regulatory burden and whether there should be a continuation or a significant revision of the current 2030 framework.

Simplification is generally recognised as a priority and the new Commission committed to working towards cutting red tape for EU companies, which was identified as a crucial challenge for the competitiveness of the European industry. Importantly, the EU executive has also been clear on the fact that simplification shall not turn into deregulation or lowering the climate ambitions and goals set in the previous years.

For some, simplifying the climate framework shall also streamline the different sub-targets established under the 2018 Clean Energy Package and the 2021 Fit for 55 package, which include a target for renewable energy, a target for renewable heating and cooling, and indicative sectoral targets for buildings, industry, and district heating and cooling.

The target for renewable heating and cooling was first introduced as an indicative target in the 2018 revision of the Renewable Energy Directive (art. 23). With the latest revision of the text that was adopted in 2023, the target became binding, a crucial milestone for the renewable heating and cooling sector.

Arguably, deleting the sub-target for renewable heating and cooling from the post-2030 climate framework would have a detrimental effect on the decarbonisation of heating and cooling and, additionally, it would have a questionable effect on simplification.

On one hand, the heating and cooling sector accounts for half of EU's energy consumption and the lion share of energy needs in buildings (for space heating and cooling and water heating) and industry (process heat and cold). Yet, the sector receives limited political visibility due to its complex and decentralised nature, and far less dedicated policy measures at national level. Local authorities play a central role in heating and cooling decarbonisation, but often lack the technical, financial, and regulatory capacity to address the challenge. Hence, a

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dedicated sectoral target is critical to ensure that Member States dedicate adequate political efforts (and capital) and financial resources to the decarbonisation of heating and cooling.

On the other hand, deleting the sectoral target for renewable heating and cooling will not contribute to simplification. First, a stable framework with consistent targets provides clear signals and long-term objectives to consumers and companies, which is essential to decarbonise in a cost-effective manner. Second, the various targets are complementary, hence policy measures can be designed to address multiple targets simultaneously, breaking silos and contributing to more cost-effective and cross-sectoral decarbonisation strategies that integrate energy system aspects.

RECOMMENDATION:

- **The EU climate framework for 2040 shall remain consistent with the one established to meet the 2030 targets, notably maintaining and strengthening the sub-targets related to RES-H&C.**

1.2.2 Grid stability: more than grid expansion

As the uptake of renewable energy sources grow and the shift to climate neutrality progresses, it becomes vital to adopt a holistic approach that considers the energy system as a whole. For example, electrification is clearly one of the drivers to integrate more renewables into the energy mix, which poses the issue of ensuring that the grid can accommodate the increased power consumption. In fact, the modernisation and expansion of the electricity grid is becoming a key concern for EU and national policymakers and will require significant investments over the next decades.

In November 2023, the European Commission published the EU Action Plan for Grids[7], where it is estimated that €584 billion in investments will be needed by 2030. However, the Action Plan overlooks the role of renewable heating and cooling solutions, such as geothermal and solar thermal, which help alleviating the burden on the grid and commonly integrate energy storage, contributing to the stability, resilience and flexibility of the system.

The energy demand for cooling has and will have a significant impact on electricity consumption and peak loads, especially as heatwaves become more frequent due to climate

[7] https://ec.europa.eu/commission/presscorner/detail/en/ip_23_6044.

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change. This is already the case in Southern Europe, with several instances of power outages during summer across various countries[8][9][10], as well as in other parts of the world[11].

RECOMMENDATION:

- **Acknowledge and promote renewable heating and cooling solutions to alleviate the burden on the grid, add to its stability, resilience and flexibility, and ensuring a cost-effective modernisation of the power network.**

2.2.3 New priorities for 2024-2029

The new European Commission took office on 1st December 2024. In July, President Von der Leyen presented her Political Guidelines[12] for the new mandate, and further details were shared by the proposed Commissioners during their respective hearings. Energy affordability for businesses and consumers is at the top of the political agenda given its impact on two key priorities, namely the competitiveness of the European industry and the affordability of housing.

President Von der Leyen included a Clean Industrial Deal among the priorities for the first 100 days of the new Commission. The aim of this initiative will be to strengthen the competitiveness of the European industry and ensure quality jobs in Europe. Clean tech manufacturing is expected to be among the sectors tackled by the initiative, considering its growing importance and the EU's dependency from other countries on many of these technologies. However, the priority should be to retain and reinforce the sectors that already have an established and competitive manufacturing base in Europe, such as geothermal and solar thermal.

The new Commissioner for Energy and Housing Dan Jørgensen announced that he will work on an Affordable Housing Plan to tackle the housing crisis that is impacting most European countries. Energy costs are a major component and key driver for soaring housing costs; hence they shall be addressed as a priority in this initiative. Heating and cooling needs account for up to 80% of energy needs on average in European households, with space heating representing the lion share, followed by domestic hot water. While the share of cooling is still

[8] Massive Blackout Hits Spain - EF News
[9] Al sud ancora caldo torrido | TG LA7
[10] Balkans hit by blackouts as heatwave persists
[11] Heat Season Power Outages | Climate Central
12 https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf

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relatively low on average, it is growing fast and is already a significant issue as heatwaves become more frequent due to climate change, particularly in Southern European countries. Lastly, several Member States, Members of the European Parliament, and stakeholders have been asking for a revamp of the 2016 Heating and Cooling Strategy. This revision should have a hands-on approach aimed at accelerating the uptake of renewable heating and cooling technologies, reflecting the progresses achieved by these technologies in the last 8 years as well as the urgency of decarbonising heating and cooling to meet the EU's 2030 and 2040 targets. Crucially, this revision should also

RECOMMENDATIONS:

- **The Clean Industrial deal shall address the needs of the geothermal and solar thermal industries, which have an established manufacturing base in Europe and contribute to EU competitiveness in a strategic sector like clean technologies.**
- **The announced Affordable Housing Plan shall address energy costs as a critical component of housing costs and specifically cooling costs, which are rapidly rising as heatwaves become more frequent due to climate change.**

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2. National legislation and best practices

2.1 National guidelines for cooling

National guidelines for cooling can vary significantly among countries and within the same country. Moreover, pieces of legislation which are relevant for cooling can take different shapes, as shown in the table below.

Key elements and common practices of legislation affecting renewable cooling
1. Local and Regional Regulations Various countries have specific incentives and regulations supporting the implementation of renewable cooling technologies. Local municipalities often have guidelines or programs that promote sustainable cooling solutions. **2. State Building Codes** Building codes (regulated at different levels) can include specific requirements for energy efficiency and the integration of renewable technologies in new construction and renovations, including cooling systems. **3. Local Climate Protection Plans** Many municipalities develop climate protection plans that outline goals for reducing greenhouse gas emissions and promoting renewable energy, including cooling technologies. These plans often include incentives for adopting renewable cooling solutions. **4. Incentive Programs** Local governments may offer grants, subsidies, or low-interest loans for implementing renewable cooling technologies, such as solar thermal systems or geothermal heat pumps. **5. Planning and Zoning Regulations** Local zoning laws can influence the installation of renewable cooling systems, especially for larger projects like district cooling systems. These regulations may dictate the location, size, and type of systems that can be installed. **6. Energy Efficiency Initiatives** Many municipalities have their own energy efficiency programs that promote the use of renewable cooling technologies. These initiatives may include public awareness campaigns or technical assistance for businesses and homeowners.

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7. Cooperation with Energy Providers

Local regulations often encourage collaboration with energy providers to develop district cooling systems or other collective renewable cooling solutions, ensuring that they meet local energy needs efficiently.

8. Permitting Processes

The installation of renewable cooling technologies typically requires permits. Local authorities may have specific guidelines and processes for evaluating applications for such technologies.

9. Monitoring and Reporting Requirements

Some local regulations may include monitoring and reporting requirements for the performance of installed renewable cooling systems to ensure compliance with energy efficiency goals.

2.1.1 Spanish legislation

In Spain, there are very few relevant legislative texts and practices related to renewable cooling technologies, is still evolving adopting some European directives. Although there is no comprehensive national regulation focused exclusively on heating and cooling, Spain has several laws that indirectly support the development of renewable cooling technologies.

Key pieces of Spanish legislation

1. **Royal Decree 56/2016**[13]: about energy audits, it encourages the use of high-efficiency cogeneration systems and the development of district heating and cooling infrastructure in specific areas.
2. **Spain's Long-Term Strategy for the Energy Rehabilitation of Buildings (ERESEE)**[14]: it includes energy efficiency requirements for buildings, which could facilitate the integration of renewable cooling technologies.
3. **RITE (Regulation of Thermal Installations in Buildings)**[15]: it is the regulation that states on the installation of thermal equipment (heat and cold) in buildings.

[13] Transposition of Directive 2012/27/EU of the European Parliament): https://www.boe.es/buscar/doc.php?id=BOE-A-2016-1460.

[14] https://www.transportes.gob.es/el-ministerio/planes-estrategicos/estrategia-a-largo-plazo-para-la-rehabilitacion-energetica-en-el-sector-de-la-edificacion-en-espana.

[15] The current Regulation of Thermal Installations in Buildings (RITE) was approved on July 20, 2007 by Royal Decree 1027/2007. Since its approval, it has undergone two major updates. The first, through Royal Decree 238/2013, incorporated adjustments to align with Directive 2010/31/EU on the energy performance of buildings. The second update, introduced by Royal Decree 178/2021, further amended the regulation to transpose Directive (EU) 2018/844, which revises Directive 2010/31/EU and Directive 2012/27/EU, both focused on improving energy efficiency in buildings. https://www.miteco.gob.es/es/energia/eficiencia/rite.html

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The RITE establishes the conditions that must be met by installations designed to meet the demand for thermal comfort and hygiene through heating, air conditioning and domestic hot water systems and equipment, in order to achieve a rational use of energy. The RITE establishes several energy efficiency requirements, such as, for example:

- Energy performance in heat and cold generation equipment, as well as those for the movement and transport of fluids.
- Insulation conditions in equipment and thermal fluid piping.
- Regulation and control conditions to maintain the design conditions foreseen in the air-conditioned premises.
- Use of available renewable energies, especially solar energy and biomass.
- Incorporation of energy recovery subsystems and use of residual energy.
- Mandatory consumption accounting systems in the case of collective installations.
- Gradual disappearance of more polluting solid fuels.
- Gradual disappearance of less efficient generating equipment.

Local initiatives

Some Spanish municipalities have developed Sustainable Energy and Climate Action Plans (SECAPs), often supported by the Covenant of Mayors initiative. These plans sometimes include measures to promote renewable energy sources in local cooling systems, though detailed heating and cooling assessments are not common across municipalities. However, local governments are increasingly looking at passive cooling techniques and energy efficiency renovations as part of their broader strategies to reduce energy consumption in response to climate change.

Innovative practices

Spain is also working on several innovative projects. There are some examples is the promotion of **5G low-temperature district heating and cooling systems**, combining energy efficiency with renewable technologies like geothermal energy. Such pilot projects highlight potential pathways for future legislative frameworks that promote cooling technologies.

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Best practice example:
the district heating and cooling system in Mieres, Spain

Mieres is a municipality of around 46.000 inhabitants located in the autonomous community of Asturias, in northwest Spain.

It has been traditionally a city closely linked to the activity of coal mining. In the last years, the closure of coal mines represented an important challenge for the whole community.

The Hunosa Group, a Spanish company based in Asturias, has been able to face the challenge of transforming an eminently mining company into a company that is committed to sustainable energy generation, where local renewable energies play a fundamental role.

Therefore, the Pozo Barredo geothermal project, born from the ashes of the Barredo shaft closure in 1995, has been conceived to solve the very high economic and environmental costs derived from the maintenance of water pumping activities in non-active wells.

From coal mines to geothermal plant: innovative solutions to old problems

The Asturian coal mines act as a large underground store of water generated by the intense extractive activity developed for more than a century in the interior of the Central Carboniferous Basin of Asturias. During its exploitation, a multitude of infrastructure and start-up work was carried out which, in turn, generated a network of fissures and cavities that increased infiltration and, therefore, the need to pump the flow to the outside[16].

When the exploitation ceases and the pumping stops, a natural flood occurs, so that the water happens to occupy the generated spaces, the fissures and the pores. This process of controlled flooding takes place until a minimum level of safety is reached. To maintain that level, a constant pumping of water is necessary to avoid possible affections.

After several studies carried out together with the University of Oviedo, Hunosa concluded that the geothermal exploitation of the mine waters had usable potential. This is an innovative solution and an example of circular economy that transforms a problem in a sustainable resource and in a source of wealth for the entire community, by bringing new employment opportunities[17].

[16] Source: https://www.districtenergyaward.org/barredo-collery-district-heating-mieres-asturias-spain/.
[17] The International Energy Agency awarded HUNOSA for the DHC of the Pozo Barredo in Mieres in 2019. See https://www.hunosa.es/2019/10/10/la-agencia-internacional-de-la-energia-premia-a-hunosa-por-el-district-heating-del-pozo-barredo-en-mieres/.

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Investment history

First phase

The first phase of the geothermal project using water from the Barredo Well, carried out by Hunosa, began in 2006 with some studies and the construction of the first two geothermal facilities to supply heat and cold to two buildings: the Vital Álvarez Hospital and the Research Building of the University of Oviedo on the Barredo Campus. Both entered service in 2014.

In 2016, a third facility that supplies geothermal energy was added to the headquarters of the Fundación Asturiana de la Energía (FAEN) which occupies a Rehabilitated building in what was the old compressor room of the same well.

The three installations, carried out independently, have involved an investment of around €1.5 million and add up to a total power of 4 MW.

Second phase

At the end of 2018 started the construction of the new geothermal heating and cooling district "Pozo Barredo", benefiting of water pumped from Barredo Colliery. In May 2019 the works were finished.

The new geothermal facilities allow feeding three different circuits: two at high temperature (Escuela Politécnica de Mieres and Bernaldo de Quirós high school building) and another at low temperature (buildings M9 and M10 Vasco Mayacina, totaling 245 dwellings)[18].

[18] The reason for these last buildings is that they use a climate system at low temperature, improving the equipment efficiency when their heat demand does not co-exist with those buildings working at high temperature.

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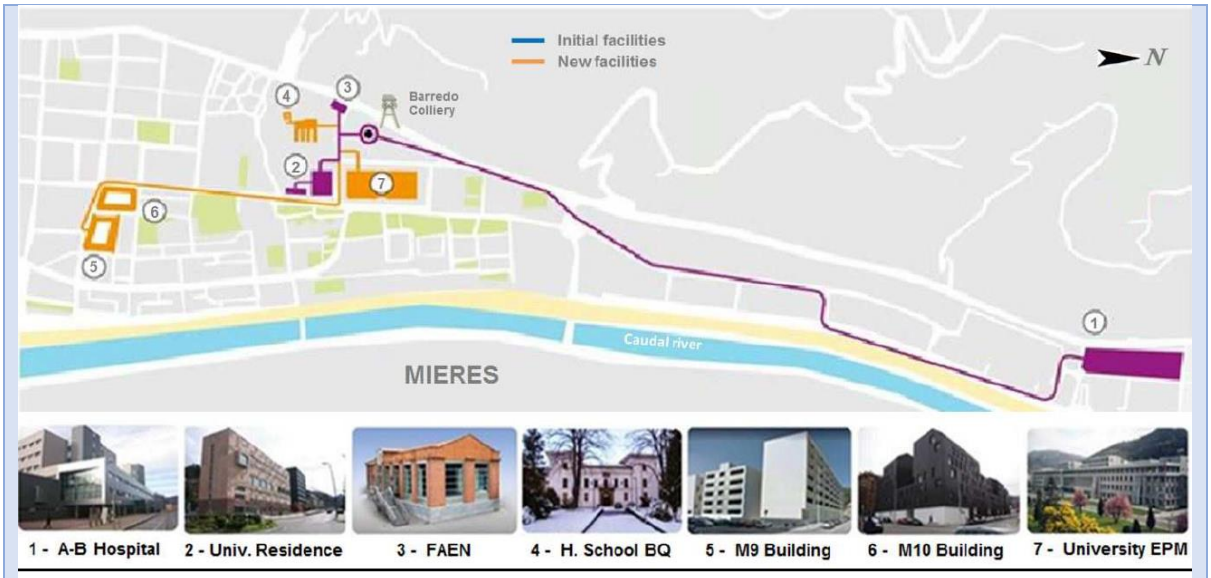

Scheme of District Heating in Barredo Colliery

Source: "Barredo Colliery" District Heating | Mieres, Asturias, Spain

The installations of this second phase have a capacity of 2 MW which, added to the 4 MW of the three previous installations, represent a total power of 6 MW for the whole network.

To guarantee the viability of the second phase of the project in 2018, Hunosa was awarded with €500.000 of grants for the participation in the call for grants co-financed by the European Union through the European Regional Development Fund (ERDF) to favour the transition to a low-carbon economy in all sectors, with the support of the Ministry of Employment, Industry and Tourism of the Principality of Asturias. The total cost of this second phase of the project was around €1.4 million.

Technical details

The mine water is extracted by means of two submersible pumps, with a total capacity of 2 MW, located in the vertical shaft of the mine. The heat pumps benefit from the temperature of the water pumped at 23º and can get heat water at higher temperatures rates up to 85°C with positive COP ratios, allowing therefore the integration of all types of buildings. These pumps have a nominal flow of 330 m3/h and a power capacity of 83 kW each.

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The new facilities are GHG-free, reach an annual CO2 emission reduction of 653 tons19 and have become the greater geothermal district heating and cooling network in Spain, as well as the first project to be developed as a heat and cool network with a centralized generation system with geothermal mine water.

The positive impacts on the historical heritage

The Pozo Barredo geothermal project has also served as an opportunity to preserve and renovate a building of great industrial heritage and historical value, without modifying the architectural typology of the original construction and maintaining also the old equipment. This old building, that was previously hosting the coal extraction machines of Barredo Colliery, is now being used as the generation room where the heat pumps are placed.

Generation plant before and after the District Heating

Source: "Barredo Colliery" District Heating | Mieres, Asturias, Spain

Finally, the Ministry, through the IDAE (Institute for Energy Diversification and Saving) publishes guides of good practices, for example, related to renewable cooling, the use of heat

[19] Before this project, all the buildings mentioned had natural gas-based heating systems. In addition, each of them had their own natural gas boiler facilities.

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pumps in the rehabilitation of buildings, etc., as well as the use of renewable energy sources or about building insulation, etc.[20].

2.1.2 French legislation

In France, since 2020, a new legislation (the RE2020 environmental regulation)[21] aims to improve the energy performance of new buildings. As well as reducing energy consumption, the RE2020 pays particular attention to the comfort of occupants, especially during the summer months. With heatwaves becoming increasingly frequent and intense, it is essential to guarantee optimum thermal comfort conditions inside buildings[22].

The degree-hour: a new indicator

This new legislation includes an indicator, the “degree-hour” that measures the cumulative time during which the occupants of a building are exposed to a temperature above a predefined comfort threshold. This indicator provides an accurate measure of the thermal discomfort experienced by occupants. It takes into account the length of time during which the temperature exceeds a defined comfort threshold. As a result, it provides a better assessment of the quality of life inside buildings during hot periods.

Summer comfort : the DH indicator (degrés-heures d’inconfort)

The calculation of the degree-hour of discomfort is based on a weather scenario similar to the 2003 heatwave, which was a major event in terms of high temperatures. This indicator is expressed in degrees per hour of discomfort (°C.h) and represents the sum of temperature exceedances of the comfort threshold, accumulated over a given period.

RE 2020 introduces two discomfort thresholds, based on the DH indicator in °C.h:

- High threshold: DH max. Beyond this, the building is not compliant (excessive discomfort).

[20] See https://www.idae.es/publicaciones/la-bomba-de-calor-en-la-rehabilitacion-energetica-de-edificios and https://www.idae.es/tecnologias/eficiencia-energetica/edificacion/aislamiento-en-edificacion/guia-practica-de-la-energia.
[21] Réglementation Environnementale des Bâtiments Neufs (RE 2020), Ministère de la Transition écologique (MTE).
[22] See https://re20-20.fr/degre-heure-re2020/#:~:text=La%20RE2020%20d%C3%A9finit%20deux%20seuils,C%20et%2028%C2%B0C.

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- Low threshold: 350 °C.h. Below this, the building is compliant. No penalty to encourage to reach this low level of discomfort is necessary.
- Between these 2 thresholds, the building is compliant with the regulatory requirement but to encourage to increase building comfort during the summer period (in particular bioclimatic design and the implementation of passive levers), a cooling charge is added to energy consumption (if the building is already air-conditioned, the air conditioning consumption is taken into account instead of this flat rate). For air-conditioned buildings, this is calculated by deactivating the air conditioning system, they must comply with the high threshold with the other levers (design, systems passive cooling).

***Confort d'été : Indicateur DH*[23]**

The RE2020 defines two temperature thresholds that must be respected to avoid any discomfort in buildings. At night, the temperature threshold is set at 26°C. During the day, an adaptive temperature threshold is set, between 26°C and 28°C. Above these thresholds, each additional degree is considered uncomfortable for the occupants[24].

To better understand the application of degree hours, let's take the example of a building where the indoor temperature exceeds comfort thresholds for two consecutive hours during the day. If this situation were to recur over a period of 15 days, the cumulative temperature exceedances would amount to 30 degrees per hour of discomfort.

Taking the degree-hour into account in building design

One of the objectives of the RE2020 is to encourage the design of buildings that are more comfortable during the summer months. The degree-hour is therefore taken into account right

[23] Guide RE 2020 - Ministère de la transition écologique.
[24] During the day this threshold is constant but is not identical to that of the previous day. It varies from one day to the next to take into account the human body's ability to adapt to high temperatures after a succession of hot days, within a limit of +2°C above the consensus threshold of 26°C.

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from the design phase to assess and optimise the level of thermal comfort. Designers can use this indicator to size cooling systems and implement appropriate architectural strategies.
Moreover, the RE2020 has high environmental ambitions in terms of reducing the energy consumption of buildings. By taking account of summer comfort using the degree-hour indicator, it encourages better control of air-conditioning systems and cooling requirements, which helps to reduce the carbon footprint t of buildings.
Therefore, the inclusion of degree hours in the RE2020 makes it possible to optimise the energy performance of buildings. By reducing the cumulative duration of thermal discomfort, the need for air conditioning and cooling is also reduced, resulting in lower energy consumption for summer comfort.

What can be improved

This regulation is certainly a good example of legislation that can serve as a drive for further deployment of renewable cooling solutions. However, such legislation could be improved by requiring either a place to install the air-conditioning system or reversible radiators, so that it becomes “ready for geothermal systems”. Moreover, the temperatures needed in such radiators should be well-defined.

2.1.3 Italian legislation

The main legislative text in Italy is the DM 26/6/15 - "Minimum Energy Performance Requirements", which sets minimum energy performance requirements for buildings, including cooling systems.

DM 26/6/15 - "Minimum Energy Performance Requirements"
Key aspects for cooling include: • Minimum Energy Efficiency Requirements for Buildings • Energy Efficiency Ratio (EER) for Cooling Systems • Limits on Energy Demand for Summer Cooling • Performance of Building Elements (Opaque and Transparent Components) • Use of High-Efficiency Cooling Technologies • Integration with Renewable Energy Sources • Obligation for Technical Report and Energy Performance Certificate (APE) • Passive Design and Natural Cooling Strategies

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- Incentives and Tax Benefits for Energy Improvements
- DLgs 48/2020, Implementation of Directive 2018/844/EU on the energy performance in buildings
- DLgs 199/2021, Implementation of Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (update of the Dlgs. 28/2011).
- From June 2022 for the new building and for the significant renovation, it is mandatory the coverage of 60% (65% for public buildings) of the planned consumption for domestic hot water production and 60% (65% for public buildings) of the sum of planned consumption for domestic hot water production, cooling and heating.

Beyond legislation, it must be pointed out that in Italy there is also a new interesting example of use of cooling from a renewable source (geothermal) in a data centre.

Renewable cooling in the new Euronext data centre in Bergamo

In 2022 Euronext, the pan-European market infrastructure, has completed the migration of its Core Data Centre and related services from Basildon, UK, to the Aruba Global Cloud Data Centre IT3 in Bergamo, Italy[25].

The migration has given Euronext better control over the sustainability of its operations, boasting the fact that the complex is 100% renewable energy powered. It sources its energy mainly via hydropower from a nearby river. However, data centres are gluttons for energy, requiring an immense amount of power not only to generate the computers, but also to cool them down. Thus, geothermal energy and dynamic free cooling are the solutions chosen to this purpose.

[25] See https://www.euronext.com/en/technology/euronext-data-centre.

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Source: 01net[26]

Euronext cooling system

The cooling system uses ground water extracted from redundant wells and sent to redundant heat exchangers. The piping system serving each data room is made with 4 lines with a quarter of the total Computer Room Air Handler (CRAH) connected to each line. Oversizing of CRAH and other components makes it possible to lose up to 2 lines and/or half of CRAH without problems on IT cooling. There are two completely independent primary cooling circuits:

- *Main primary circuit*: normally used in production mode, this uses ground water (offering further redundancy, because water is extracted from two different groups of wells) and water/water heat exchangers (each data hall can use chilled water from at least 4 different heat exchangers).
- *Emergency primary circuit*: this uses conventional air/water chillers (each data hall can use chilled water from at least 4 different chillers). Issues with impact on main primary circuit cannot affect the backup primary circuit, so full 2N redundancy is obtained.

Redundant Primary cooling circuits (which include pumps to extract water from the wells) are powered by dedicated MV/LV transformers and backed up by dedicated Diesel Generators. The switch from the main primary circuit and the backup primary circuit is fully automated using motorised valves.

The Main and Emergency primary circuits can also work in mixed and load-balanced conditions in order to run any maintenance procedure with no cooling power reduction or redundancy loss. To maximise the performance and efficiency of the air conditioning, it is

[26] https://www.01net.it/2022-data-center-euronext-borsa-italiana-aruba/.

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required that all equipment and devices located inside the racks are installed to follow the direction of the cold air flow.

2.1.4 German legislation

In Germany, several laws and regulations govern cooling technologies, particularly those that enhance energy efficiency and support the use of renewable energy. Germany's legislative framework encourages the adoption of renewable cooling technologies through a combination of national laws, EU directives and local regulations, all aimed at enhancing energy efficiency and reducing emissions.

Key pieces of German legislation
1.Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG) ***Law for the expansion of renewable energies (EEG 2023)*** Supports the integration of renewable energy sources, including technologies that can be used for cooling, such as solar thermal and geothermal systems. Offers feed-in tariffs and incentives for energy generation from renewable sources. **2. Energy Efficiency Act (Energieeffizienzgesetz, EEffG)** Promotes energy efficiency measures, including in cooling technologies. Encourages the use of waste heat and renewable energy in cooling systems. **3. Building Energy Act (Gebäudeenergiegesetz, GEG)** Sets standards for energy efficiency in buildings, including requirements for cooling systems. Encourages the use of renewable energy in new constructions and renovations. This Act was entered force in 2020 combining the previous existing Energy Saving Act (Energieeinspargesetz, EnEG), Regulation on Energy Saving (Energieeinsparverordnung, EnEV) and the Renewable Energy Heat Act (Erneuerbare-Energie-Wärmegesetz, EEWärmeG). **4. Federal Climate Protection Act (Bundes-Klimaschutzgesetz)** Establishes binding targets for reducing greenhouse gas emissions, promoting renewable technologies, including cooling systems, as a way to achieve these targets. **5. Incentives and Funding Programs** The government provides various funding programs and incentives for the adoption of renewable cooling technologies, often administered by the Federal Office for Economic Affairs and Export Control (BAFA) or the KfW Bank.

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6. Energy Performance Contracting (EPC)

A financing mechanism where an energy service company (ESCO) implements energy-saving measures and is paid from the cost savings generated, allowing organizations to improve cooling systems without upfront capital investment.

2.1.5 Romanian legislation

At present, renewable cooling systems are not widely promoted or supported through specific legislative measures in Romania. Strengthening this area through targeted policies and incentives would be beneficial for broader adoption of renewable cooling technologies. Nonetheless, there are several key programs and initiatives that indirectly encourage energy efficiency and sustainability, which may include cooling systems.

Key pieces of Romanian legislation

1. Energy Efficiency in Public Buildings Program (Administrația Fondului pentru Mediu-AFM)

This program supports energy efficiency projects in public buildings, including upgrades to cooling systems. Key aspects include:

Integration of renewable energy sources for cooling; Mechanical ventilation systems with heat recovery; Improvements in energy performance and reductions in energy consumption. Funding limits vary by applicant and region, with maximum grants up to 28,000,000 lei for municipalities.

2. Regional Operational Programmes (Programele Operaționale Regionale-POR) 2021-2027

Under Priority Axis 1 (total allocation of €4.3 billion), this program focuses on creating environmentally friendly cities, with funding for:

- Energy-efficient building upgrades, including renewable cooling systems.
- Green infrastructure and district heating system modernization.
- Sustainable urban mobility.

3. Sustainable Development Operational Programme (Programul Operațional pentru Dezvoltare Durabilă - PODD) 2021-2027

This program promotes a transition to a circular economy and includes environmental sustainability actions that indirectly support sustainable cooling. Although primarily focused on waste management, it aligns with broader environmental goals.

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4. Just Transition Operational Programme (Programul Operațional pentru Tranziție Justă - POTJ) 2021-2027

With a total budget of €1.766 billion, this program supports regions transitioning to a climate-neutral economy, with funds allocated for:

- Clean energy technologies.
- Pollution reduction and cooling initiatives.

5. National Recovery and Resilience Plan (Planul Național de Redresare și Reziliență - PNRR)

Although not specifically targeting cooling systems, this plan supports green energy and infrastructure projects, which may include renewable cooling technologies.

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3. Conclusions

In conclusion, the policy recommendations to deploy renewable cooling at both EU and national level can be summarised as follows.

Policy recommendations
EU policies on climate & energy: new opportunities and challenges towards 2030 Recommendations on RED implementation: • *Implementing measures to promote the use of renewable energy in the cooling sector* Among the list of measures that has been positively enlarged and made mandatory for at least two elements of Member States' choice, Member States should focus on the ones that can boost renewable cooling solutions, in particular: heating and cooling purchase agreements, local planning on H&C, promotion of DHC and specific renewable sources and technologies. • Member States shall take the necessary actions and show commitment to achieve the renewable targets in buildings, district heating and industry despite their indicative nature. Recommendations on EED implementation: • The ambition to establish minimum requirements with regard to data centres energy performance and use of renewable energy is to be welcomed. In this context, Member States should consider that geothermal (free and active) cooling technologies represent a solution which is renewable, efficient and cost-competitive and can cool even intense sources of heat such as data centres. • Member Staes should provide administrative, technical and financial support to local governments to achieve local energy plans and propose recommendations for local decarbonisation. Support to DHC and RES should be the core focus of these plans in order to avoid certain pitfalls, such as having local plans focused only on security of supply issues. • For the definition of efficient district heating and cooling systems, the one based on share of RES and WH should be preferred rather than the one referring to grams of

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CO2 emitted for each kWh of energy produced. Even though a CO2 criterion is also favourable to renewable based DHC networks, this alternative definition was conceived to favour Member States utilizing energy sources that are not renewable.

Recommendations on EPBD implementation:

- The roadmap to phase out fossil fuel boilers should be implemented as soon as possible. Unfortunately, the date proposed for a phase out of fossil fuel use in heating and cooling remains indicative and comes years too late for the EU to reach its climate and energy goals.
- Member States shall ensure a timely and fair transposition of the EPBD solar mandate, ensuring a level playing field among all solar technologies (solar thermal, PV, and PV-Thermal).

EU policies on climate & energy:
new opportunities and challenges towards 2040 and 2050

Recommendations:

- The EU climate framework for 2040 shall remain consistent with the one established to meet the 2030 targets, notably maintaining and strengthening the sub-targets related to RES-H&C.
- Acknowledge and promote renewable heating and cooling solutions to alleviate the burden on the grid, add to its stability, resilience and flexibility, and ensuring a cost-effective modernisation of the power network.
- The Clean Industrial deal shall address the needs of the geothermal and solar thermal industries, which have an established manufacturing base in Europe and contribute to EU competitiveness in a strategic sector like clean technologies.
- The announced Affordable Housing Plan shall address energy costs as a critical component of housing costs and specifically cooling costs, which are rapidly rising as heatwaves become more frequent due to climate change.

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National best practice examples

- Common practices of legislation affecting renewable cooling:
    - **Local and Regional Regulations** (see the Romanian Regional Operational Programmes - Programele Operaționale Regionale-POR 2021-2027 and Just Transition Operational Programme - Programul Operațional pentru Tranziție Justă - POTJ 2021-2027)
    - **State Building Codes** (see the Spanish RITE - Regulation of Thermal Installations in Buildings[27])
    - **Incentive Programs** (see the German Renewable Energy Sources Act - Erneuerbare Energien-Gesetz, EEG -, the Energy Efficiency Act - Energieeffizienzgesetz and the Federal Climate Protection Act - Bundes-Klimaschutzgesetz; the Romanian Sustainable Development Operational Programme - Programul Operațional pentru Dezvoltare Durabilă - PODD 2021-2027 and Energy Efficiency in Public Buildings Program - Administrația Fondului pentru Mediu-AFM)
    - **Planning and Zoning Regulations** (see the Spanish Royal Decree 56/2016[28])
    - **Energy Efficiency Initiatives** (see Spain's Long-Term Strategy for the Energy Rehabilitation of Buildings, ERESEE[29])
    - **Cooperation with Energy Providers** (see the German Energy Performance Contracting)

[27] The current Regulation of Thermal Installations in Buildings (RITE) was approved on July 20, 2007 by Royal Decree 1027/2007. Since its approval, it has undergone two major updates. The first, through Royal Decree 238/2013, incorporated adjustments to align with Directive 2010/31/EU on the energy performance of buildings. The second update, introduced by Royal Decree 178/2021, further amended the regulation to transpose Directive (EU) 2018/844, which revises Directive 2010/31/EU and Directive 2012/27/EU, both focused on improving energy efficiency in buildings. https://www.miteco.gob.es/es/energia/eficiencia/rite.html
[28] Transposition of Directive 2012/27/EU of the European Parliament): https://www.boe.es/buscar/doc.php?id=BOE-A-2016-1460.
[29] https://www.transportes.gob.es/el-ministerio/planes-estrategicos/estrategia-a-largo-plazo-para-la-rehabilitacion-energetica-en-el-sector-de-la-edificacion-en-espana.

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- **Monitoring and Reporting Requirements** (see the Frenche DH - degrés-heures d'inconfort - indicator[30], the Italian DM 26/6/15 - "Minimum Energy Performance and the German Building Energy Act - Gebäudeenergiegesetz, GEG)

- Best practice examples of renewable cooling systems:
  - District heating and cooling system in Mieres (Spain)[31].
  - Renewable cooling in the new Euronext data centre in Bergamo[32].

[30] See Guide RE 2020 - Ministère de la transition écologique.
[31] Source: https://www.districtenergyaward.org/barredo-collery-district-heating-mieres-asturias-spain/.
[32] See https://www.euronext.com/en/technology/euronext-data-centre.

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