REDI4HEAT

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ADENE: Agencia para a Energia

BIO: Bioenergy Europe

CRES: Centre for Renewable Energy Sources and Saving Foundation

DENA: Deutsche Energie-Argentur Gmbh

EGEC: European Geothermal Energy Council

EHP: Euroheat & Power

EHPA: European Heat Pump Association

EIHP: Energetski Institut Hrvoje Pozar

SHE: Solar Heat Europe / European Solar Thermal Industry Federation

ENC: Energy Cities

KAPE: Krajowa Agencja Poszanowania Energii Spolka Akcyjna

TRI: Trinomics BV

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ABBREVIATION AND ACRONYMS

DHC: district heating and cooling

DSO: distribution system operator

EC: European commission

EED: Energy Efficiency Directive

EPBD: European Performance of Buildings Directive

LHCP: local heating and cooling plans

NECP: National energy and climate plan

RED: Renewable Energy Directive

REDI4HEAT: RED implementation for heating and cooling

RES: renewable energy sources

RHC: renewable heating and cooling

TSO: transmission system operator

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1. INTRODUCTION: EVOLVING EUROPEAN POLICY CONTEXT FOR HEATING AND COOLING AND 2030 TARGETS

Heating and cooling account for 50% of Europe's energy demand, from which over 80% of energy consumption is witnessed in households. Furthermore, the new geopolitical and energy situation urges Europe to accelerate its decarbonisation efforts and decrease its dependency on fossil fuels, and more specifically gas. In 2023, the EU decided to strengthen its legislation to speed up the roll out of renewable energy. Decarbonising heating and cooling is essential to achieve the wider goal of making our energy sector carbon neutral. To this end, the Fit for 55 Package has introduced several measures aimed at significantly increasing the deployment of renewable sources and sustainable technologies for 2030, aiming to reach carbon neutrality by 2050, setting ambitious targets which need to be translated into actions within local and national plans. This includes almost doubling of the existing share of renewable energy in the EU energy mix with a binding target of 42,5% by 2030, with the ambition to reach 45%, as part of the Renewable Energy Directive (RED).

More recently, during COP28 in November 2023, a pledge from 130 countries[1] was signed and as a result, a fossil fuel phase-out agreement was adopted and a tripling of renewable energy capacity globally by 2030 was agreed[2], accelerating the energy transition in a just and equitable manner, so as to achieve net-zero emissions by 2050.

Within these targets and measures, heating and cooling play a critical role. However, the problem remains as most Member States have not yet developed sufficiently ambitious and effective strategies for the heating and cooling sector in line with the provisions arising from the EU legislation.

In this context, REDI4HEAT focuses on the implementation of the Renewable Energy Directive provisions for heating and cooling. The project supports Member States and local authorities by improving the understanding of existing policies and providing recommendations for future policies (strategic priorities for heating and cooling, possible scenarios for policy adoption and

[1] https://www.cop28.com/en/global-renewables-and-energy-efficiency-pledge
[2] https://www.wri.org/insights/cop28-outcomes-next-steps

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the exchange of best practices). It aims to identify and address gaps in the existing and evolving strategies of EU Member States, with a focus on five key countries – Croatia, Germany, Greece, Poland and Portugal. In this sense, REDI4HEAT helps Member States to comply with the fast-evolving EU legislation addressing the energy sector, with a specific focus on sustainable heating and cooling, engaging and collaborating with a wide range of stakeholders along the whole heating and cooling value chain both at local and EU level.

Work Package 5 of REDI4HEAT 'Impact monitoring, evaluation and adaptation' aims, among others, to monitor the evolution of EU legislation and to assess the main impacts of the revised directives resulting from the 'Fit for 55' package. In particular, the project aims to identify and evaluate the new regulatory framework for renewable heating and cooling (RHC), initially proposed by the European Commission in 2021 (July and December) and negotiated by the European Parliament and the Council. Therefore, this report will provide a comparative assessment of the previous and new directives with a special focus on the key legislative articles related to heating and cooling, including a SWOT analysis of the new framework. In particular, this report focuses on the analysis of the Renewable Energy Directive[3] (RED III), the Energy Efficiency Directive[4] (EED) and the European Performance of Buildings Directive (EPBD)[5]. At the time of writing, the European institutions have published the revised directives for RED and EED, while negotiations are ongoing for EPBD. This analysis will be followed by an identification of the gaps in the renewable heat strategies in the National energy and climate plans[6] (NECPs) of the partner countries in relation to the new framework, using a quantitative assessment concept developed within the project.

[3] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652

[4] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (Text with EEA relevance)

[5] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the energy performance of buildings (recast) COM/2021/802 final

[6] https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en#the-process

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1.1 European Green Deal

In recent years, Europe has faced several global challenges, most notably the growing urgency to address climate change and the ongoing conflict in Ukraine. In response to these critical issues, the European Union has embarked on a transformative pathway to reshape its economic landscape into a sustainable, resource-efficient and competitive model, consistent with the goal of achieving net-zero greenhouse gas emissions by 2050. This ambitious initiative is known as the European Green Deal[7].

Launched by the European Commission in December 2019, the European Green Deal is a comprehensive package of policy initiatives designed to steer the European economy towards a sustainable and climate-neutral future. At its core, the strategy commits to achieving climate neutrality by 2050 and addresses multiple sectors, including transport, agriculture, buildings, industry and energy. It sets out a clear roadmap of actions to improve resource efficiency, promote a clean and circular economy, combat climate change, reverse biodiversity loss and reduce pollution.

The European Green Deal also outlines the crucial investments needed to implement these policy reforms and ensure a just and inclusive transition. It highlights the availability of various financing instruments, including significant investments of more than 1 trillion to facilitate economic growth and climate neutrality in the European Union.

1.2 Fit for 55 package and key directives

To translate the ambitions of the Green Deal into concrete legislative measures, the Commission presented a comprehensive set of proposals on 14 July 2021, collectively known as 'Fit for 55' package[8]. These proposals aim to revise European climate, energy and transport legislation to align it with the EU's climate targets under the Green Deal and the European Climate Law. The 'Fit for 55' package takes its name from the EU's commitment to reduce net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. The package aims to provide a balanced framework

[7] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
[8] https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

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to ensure a just and socially equitable transition, while promoting innovation and competitiveness within European industry and with third country operators.

Key components of the 'Fit for 55' package include reforms to the EU Emissions Trading Scheme (ETS), the introduction of a new EU Emissions Trading Scheme for building and road fuels, the establishment of the Social Climate Fund, and revisions to the Energy Efficiency Directive and the Renewable Energy Directive. The European Commission presented the two latter respectively in September and October 2023, including legally binding climate targets for all major sectors of the economy, including energy and, more specifically, heating and cooling. The Commission's "Fit for 55" workplan for 2021 also includes the revision of the Energy Performance of Buildings Directive, aligning it with the objectives of the wider package. This revision outlines the visionary path towards a zero-emissions building stock by 2050. It will deliver most effectively when coordinated with European Union legislation and complementary national measures, driven by the higher ambitions set out in the EED and RED.

The new package of measures includes key provisions and ambitious targets and is expected to drive forward the integration of sustainable heat sources and enhance synergies with energy grids, while reducing Europe's dependency on imported gas.

1.3 REPowerEU and its impacts on the heating and cooling policy

Alongside the introduction of the 'Fit for 55' package, the European Union launched a major initiative called REPowerEU[9] in response to the profound disruptions in the global energy landscape triggered by Russia's invasion of Ukraine. Launched in May 2022, this strategic move by the European Commission is a proactive response to two pressing challenges: reducing Europe's dependence on Russian fossil fuels and accelerating the collective response to the climate crisis, speeding up the transition addressed by the 'Fit for 55' package.

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483

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At the heart of the REPowerEU plan[10] is a comprehensive approach to saving energy, generating clean energy and diversifying Europe's energy supply. Its overall goal is to accelerate the transition away from fossil fuels in various sectors, including residential, industrial and power generation. This acceleration paves the way for increased use of renewable energy sources while reducing dependence on harmful fossil fuels. Through the use of the Recovery and Resilience Facility (RRF), the plan aims to accelerate and improve the deployment of clean and renewable energy solutions ensuring that the European energy landscape becomes more resilient and sustainable in the face of ongoing global challenges.

REPowerEU has significant implications for the EU's heating and cooling policy, a sector that accounts for around half of the European Union's total energy consumption and still heavily dependent on natural gas, for the most part, still imported from Russia. Over the past decade, the increase in the share of renewables in heating and cooling has fallen short of the ambitious targets set by REPowerEU. The deployment of renewable heating technologies needs to be significantly accelerated over the next seven years should the EU targets be attained. Also, for this reason, the Commission has proposed an amendment to the Renewable Energy Directive to increase the 2030 target for the share of renewable energy in final energy consumption from 40% to 45%, however, the final text stops at 42.5%.

REPowerEU also streamlines the authorisation process for renewable energy projects, encourages the expansion of solar power and aims to double the use of heat pumps, providing a comprehensive strategy to promote renewable energy in the heating and cooling sector. However, projected developments in the industrial and district heating sectors are expected to fall short of REPowerEU's ambitions. Even though the energy crisis is mainly a heat crisis, the European Green Deal and REPowerUE fall short of providing all the measures and instruments to push the sector as forward as necessary. The European Heating and Cooling Strategy (published in 2016) shall be reviewed to fully fit the current needs as EU needs an ambitious strategy that provides concrete solutions to accelerate the deployment of renewable and clean heating technologies in buildings and industry. These necessary measures, such as funding and regulatory instruments for the deployment

[10] https://ec.europa.eu/commission/presscorner/detail/en/ip_22_3131

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of renewable sources in heating and cooling need to be aligned across EU legislation and support a clear long-term vision developed with Member States, local authorities and stakeholders.

2. Analysis of key regulations for heating and cooling their relevance to achieve 2030 targets and beyond

2.1 Methodology to assess EU policies for heating and cooling

In order to assess the EU policies in the heating and cooling sector, the following approach has been taken. First, three key directives for the sector were considered: the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive. A careful selection of key articles from these directives related to heating and cooling was made in close consultation between all members of the consortium. The in-depth analyses have been performed concerning RED and EED as EPBD was still under negotiation at the time of writing this report.

For the review of the Energy Efficiency Directive, the focus was on Article 25 (formerly Article 14), which deals with the assessment and planning of heating and cooling, and Article 26, which deals with the supply of heating and cooling. In the case of the Renewable Energy Directive, the selected articles include Article 3 on the cascading principle, Article 15 on rules and codes for administrative procedures, Article 15b on the mapping of areas necessary for national contributions to the Union's overall renewable energy target for 2030, Article 15c on renewable energy acceleration areas, Article 22a on the integration of renewable energy in industry, Article 23 on the integration of renewable energy, Article 24 on district heating and cooling, Article 29 on sustainability and greenhouse gas saving criteria for biofuels, bioliquids and biomass fuels.

After a careful selection of relevant articles, an extensive monitoring process followed. Throughout the negotiation stages, we monitored these chosen articles closely until their final

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revisions, assessing the extent to which they address the heating and cooling sector's specific concerns. The final form of the EED was officially published on 13 September 2023, while that of the RED on 18 October 2023. At the same time, negotiations on the EPBD were still on-going at this time.

By examining the text at hand, a comparison was made between the articles of the 2018 directives and the modified or newly introduced articles within the revised 2023 text. A special tool was created for this purpose. It consists of a table containing the 2018 and 2023 texts, a description of the content of the articles, an evaluation of the changes made as well as a SWOT analysis. This is followed by a traffic light judgment system: the green light indicates satisfaction with the results of the negotiations, the yellow light denotes the need for further improvements, and the red light expresses dissatisfaction with the amended text. Each article was divided into its specific paragraphs, including versions from 2018 and 2023, both of which were compared and evaluated. As such, it has been possible to identify the strengths, weaknesses, opportunities, and threats associated with the heating and cooling sector arising from the updated directives in the European Union and have a global picture of where the legislation stands concerning this sector. While each work package partner was responsible for different articles, a final cross-checking involving all Work Package members was made, ensuring high objectivity and accuracy of the results of the analysis.

The key outcomes of the analysis have been synthesised for the purpose of this report. They will be used for other activities planned within the project, such as policy briefs, dedicated webinars or articles.

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Paragraph	2018 version	2023 version	Analysis/description of changes
1	Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 32 %. The Commission shall assess that target with a view to submitting a legislative proposal by 2023 to increase it where there are further substantial costs reductions in the production of renewable energy, where needed to meet the Union's international commitments for decarbonisation, or where a significant decrease in energy consumption in the Union justifies such an increase.	Member States shall collectively ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least **42,5 %**. **Member States shall collectively endeavour to increase the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 to 45 %. Member States shall set an indicative target for innovative renewable energy technology of at least 5 % of new installed renewable energy capacity by 2030.**	The overall renewable target for 2030 was increased from 32% to a binding 42.5% and an indicative 45%, there was also an additional 5% target of innovative renewable energy technology added
2	Member States shall set national contributions to meet, collectively, the binding overall Union target set in paragraph 1 of this Article as part of their integrated national energy and climate plans in accordance with Articles 3 to 5 and 9 to 14 of Regulation (EU) 2018/1999. In preparing their draft integrated national energy and climate plans, Member States may consider the formula referred to in Annex II to that Regulation. If, on the basis of the assessment of the draft integrated national energy and climate plans submitted pursuant to Article 9 of Regulation (EU) 2018/1999, the Commission concludes that the national contributions of the Member States are insufficient for the collective achievement of the binding overall Union target, it shall follow the procedure laid down in Articles 9 and 31 of that Regulation.	Member States shall set national contributions to meet, collectively, the binding overall Union target set in paragraph 1 of this Article as part of their integrated national energy and climate plans in accordance with Articles 3 to 5 and 9 to 14 of Regulation (EU) 2018/1999. In preparing their draft integrated national energy and climate plans, Member States may consider the formula referred to in Annex II to that Regulation. If, on the basis of the assessment of the draft integrated national energy and climate plans submitted pursuant to Article 9 of Regulation (EU) 2018/1999, the Commission concludes that the national contributions of the Member States are insufficient for the collective achievement of the binding overall Union target, it shall follow the procedure laid down in Articles 9 and 31 of that Regulation.	No change

Figure 1 Example of the Article 3 RED comparative analysis

Strengths	Weaknesses	Opportunities	Threats	Assessment of changes
These ambitious targets will push Member State policies to go further to meet these higher goals. Moreover targets for innovative renewables will ensure that emerging technologies will get more support to ensure their market readiness.	The inclusion of an innovative renewables target could divert some funding towards less effective investments and reduce short term returns.	This significantly increased renewable energy target sends very clear signals to the entire economy and helps mobilize the resources which will be needed to make the energy transition successful	In the wake of the energy crisis, this could create some short term fluctuations in energy market and cause some volatility in prices	
N/A	N/A	N/A	N/A	N/A

Figure 2 Example of the Article 3 RED SWOT analysis (1st paragraph)

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2.2 Energy Efficiency Directive (EED)

2.2.1 Energy efficiency directive in heating and cooling

The Energy Efficiency Directive was adopted in October 2012, with the aim of providing a framework for actions on energy efficiency in the European Union. The first version of the EED set a binding target to achieve a 20% reduction in energy consumption by 2020 in the EU (relative to the 2007 reference scenario), as well as legal obligations and measures for the Member States to contribute to this overall target. Key measures included establishing national energy saving schemes to achieve an annual 1.5% reduction in energy sales for the period 2014-2020; renovating at least 3% of the building stock owned or occupied by central governments every year; drafting national long-term renovation strategies for the building stock, national energy efficiency action plans (updated every 3 years) and comprehensive assessments on efficient heating and cooling (updated every 5 years).

The first revision of the EED was presented as part of the 'Clean energy for all Europeans package' and adopted in 2018. Notably, the text established a new energy efficiency target of 32.5% reduction in the EU energy consumption by 2030 (relative to the 2007 reference scenario), as well as an extension of the national energy saving obligation, which was set at 0.8% annual reduction in energy consumption over the period 2021-2030 (except for Malta and Cyprus).

A broader recast of the Directive was proposed by the Commission in July 2021 as part of the 'Fit for 55 package', to align its provisions with the legally binding targets to reduce GHG emission by 55% by 2030 and achieve climate neutrality by 2050 set in the EU Climate Law. The revised Directive was adopted in September 2023 and entered into force on 10 October.[11]

The highlight of the new text is the higher overall target for 2030, which is set at 11.7% compared to the 2020 EU Reference Scenario. In absolute terms, this corresponds to no more than 763 Mtoe for the EU final energy consumption, a much more ambitious target compared to 2018,

[11] https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2021)698045#:~:text=On%2014%20July%202021%2C%20the,under%20the%20European%20Climate%20Law.

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when the 32.5% reduction referred to the 2007 Scenario and would have amounted to a final energy consumption of no more than 956 Mtoe.

Furthermore, the revised Directive also strengthens the provisions on heating and cooling. In particular, Article 25 links the national comprehensive heating and cooling assessments with the submission of the integrated National Energy and Climate Plans and introduces the requirement for municipalities above 45 000 inhabitants to carry out local heating and cooling plans. Also, Article 26 sets the criteria for efficient district heating networks, which will have to raise the share of renewable energy and waste heat in their energy supply over time, reaching 100% renewable and/or waste heat by 2050.

2.2.2 Assessment of key articles for heating and cooling

2.2.2.1 Article 25 (Former Article 14) Heating and cooling assessment and planning

Comparison with the 2018 version (Article 14)

Article 25 of the EED on Heating and cooling assessment and planning replaced partially the former article 14 on the Promotion of efficiency in heating and cooling of the previous EED version.

The new version (paragraph 1) reiterates the obligation for Member States to conduct a comprehensive heating and cooling assessment and provide the European Commission with this assessment. While it was not mentioned before, this assessment should now be integrated in the update of the integrated national energy and climate plans that Member States should update by June 2024. To draft such a comprehensive heating and cooling assessment, a stakeholder engagement methodology is advised. Member states still have to carry a quite similar cost benefit analysis. The new EED version adds the obligation to designate a competent authority responsible for the analysis.

The EED still mandates Member states to take measures to exploit the potential identified in the comprehensive heating and cooling assessment and therefore develop district heating and cooling and promote renewable and waste heating and cooling in the use of cogeneration. The recast

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version puts more emphasis on waste heat in the district heating sector. Also, to strengthen the assessment implementation, Member States are now required to report identified measures in the NECP.

The major novelty of this article is finally the new provision (paragraph 6) regarding local heating and cooling plans (LHCP). Member States have the obligation to ensure that municipalities of over 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 a 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 encourages this.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES
• Paragraph 1 makes the link with the RED to ensure better alignment of the directives. It also comes with an ambitious timing, asking for Member States to provide their comprehensive heating and cooling assessment in the final version of the ongoing revision of the NECP (June 2024). • This requirement reinforces the heating and cooling part in the NECP which is often quite weak. • The compulsory characteristic for both the national level assessment and the local heating and cooling plans (for municipalities above 45,000 inhabitants) is a strength to ensure its implementation. • Paragraph 2 on stakeholders' engagement will participate in improving the quality of the assessment and in raising awareness on the results of the study and ensure a good level of involvement of all the stakeholders. • Having a competent authority designated for the assessment may allow a more structural and transparent process.	• No details on how many and what kind of stakeholders need to be involved in the process and on the methodology to adopt for consultation. • No precision of what kind of authority can be designated as in charge of the assessment. • The obligation in the paragraph 6 concerning local heating and cooling plans does not rest directly on the municipalities, for the sake of subsidiarity, so it is up to each Member State to transpose this article at national level and therefore to design the structure that suits it best for creating LHCPs. • Nothing is specified in the article for municipalities with fewer than 45,000 inhabitants, who should be encouraged to draw up these plans voluntarily at first, and then obliged to do so later once the support mechanism at national level is better established, to cover a larger proportion of the European population.

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• The paragraph on local heating and cooling plans contains a strong wording on the obligation for Member States to provide technical and financial support to local governments to achieve this, and to propose recommendations for local decarbonisation. • The paragraph on local heating and cooling plans is relatively precise on the content of the plans, which may avoid certain pitfalls, such as having local plans focused only on security of supply issues.	
OPPORTUNITIES	**THREATS**
• The timing is ideal as the Member States are in the process of updating their NECPs. • Several European countries have already introduced this type of obligation or incentive for local authorities and can therefore serve as a model to inspire other Member States. The European Commission can propose to the Member States that they work together to draw up the recommendations that they must write, and to implement this new system.	• Member States may have a limited time to draft their analysis and submit it along with the revised NECP in June 2024 and could therefore limit stakeholders' involvement. • The powers of local authorities vary greatly from one country to another, and most currently lack the appropriate skills to carry out LHCPs. There is therefore a risk that if the support mechanism is not optimal, these local plans will be reworked on the margins, and that they will never be implemented. • The Article makes obligatory the set-up of LHCPs but no measures are foreseen concerning the actual implementation of the plans.

Table 1 Article 25 EED SWOT analysis

2.2.2.2. Article 26 (part of former Article 14) Heating and cooling supply

Comparison with the 2018 version (part of former Article 14)

Article 26 deals with the heating and cooling supply. First, it emphasises the importance of aligning comprehensive assessment of high-efficiency cogeneration and efficient district heating and cooling (DHC) with NECPs and encouraging waste heat recovery in electricity generation and energy-intensive facilities through cost-benefit analyses. A key feature is the new and improved definition of efficient DHC systems. It is based on new criteria, including the percentages of renewable energy,

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waste heat, and high-efficiency cogeneration used over various timeframes. Specific targets for renewable energy, waste heat, and high-efficiency cogeneration in DHC systems are also set, allowing Member States flexibility in aligning with their decarbonisation goals. An alternative definition based on CO2 emissions per kWh of heat produced is also provided.

The revised article specifies that DHC systems, whether newly built or refurbished, should not use fossil fuels, except natural gas until 2030 (paragraph 4). It also introduces a requirement for DHC system operators with a total heat and cold output exceeding 5 MW to develop plans for improving energy efficiency and incorporating renewable energy and waste heat (paragraph 5). Furthermore, it includes a requirement for Member States to ensure that data centres with a total rated energy input exceeding 1 MW utilise waste heat or other waste heat recovery applications.

The revised article has also broadened the scope of the different types of installations for which a cost-benefit analysis of energy efficiency improvement is required. It now includes thermal electricity generation, industrial installations, service facilities and data centres, with lower thresholds for average annual total energy input (paragraph 7).

The revised article introduces the possibility of exempting individual installations from implementing options when their benefits outweigh their costs due to imperative reasons of law, ownership, or finance. Member States are required to submit reasoned notifications to the Commission if they decide to exempt such installations from the requirements. Finally, the article introduces requirements for collecting information related to cost-benefit analyses and publishing specific data while respecting sensitivity (paragraph 12).

The article sets out a clear signal recognising DHC as a key tool to decarbonise European heating and cooling as well as the importance of waste heat, whose potential remains highly untapped in the European Union, and which could cover up to a third of the EU's heat demand.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES

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• The new definition encourages greater use of renewable energy and waste heat in DHC, offering flexibility for Member States to align with local energy sources and stimulate investment in sustainable infrastructure. • The ban on fossil fuels promotes renewables, waste heat utilization, and GHG emission reduction in DHC. • Requiring operators to develop plans for energy efficiency, renewable energy, and waste heat recovery fosters long-term sustainability and reduces reliance on fossil fuels in the heating and cooling sector. • The provision for data centres to utilize waste heat enhances energy efficiency, reduces waste, and expands the capacity of DHC systems. • Paragraph 7 widens the scope and lowers thresholds for assessing energy efficiency and waste heat utilization, particularly in data centres, promoting the integration of waste heat into district heating systems. • The article underscores the importance of data centres as potential heat sources and their integration with carbon capture and storage (CCS) solutions for nearby geological storage sites. The flexibility granted to Member States in establishing thresholds based on factors like waste heat availability enhances adaptability to local conditions. • Comprehensive assessments and cost-benefit analyses facilitate the adoption of energy-efficient practices and technologies while providing data for informed decision-making in DHC installations. • The article offers flexibility for Member States to tailor solutions to unique district heating and cooling circumstances, ensuring transparency and communication through Commission notification. • Paragraph 12 promotes transparency and data accessibility, improving data-driven evaluation in the heating and cooling sector.	• The increased mandatory share of renewable energy and waste heat in the definition lacks a gradual transition and may lead to disparities between Member States, necessitating a discussion on the appropriate methodology. Additionally, establishing CO2eq values for waste and excess heat is required. • The fossil fuel capacity ban may pose challenges for backup capacity during peak load situations, necessitating the search for alternatives. • The specification for DHC systems above 5 MW excludes other systems below this threshold from the efficiency improvement requirements. Systems below the 1 MW threshold might not face the same scrutiny or efficiency improvement requirements. • Focusing on specific installations with energy input thresholds in paragraph 7 could leave out smaller installations and create administrative and resource challenges for Member States and stakeholders. • Expanded exemptions may reduce the number of installations undergoing cost-benefit analyses, potentially missing energy efficiency opportunities. Specific operating hours or proximity to geological storage sites could lead to exempting installations with significant waste heat recovery potential. • The lack of specific details on the content or requirements for authorization criteria in the paragraph may result in variations and administrative challenges within the Union. • The article lacks specific criteria for determining imperative reasons of law, ownership, or finance, potentially leading to ambiguity and varying interpretations among Member States, raising concerns about potential abuse undermining energy efficiency efforts. • Paragraph 12 presents challenges in handling confidential or commercially sensitive information without compromising transparency.
OPPORTUNITIES	**THREATS**

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• The new definition might encourage waste heat providers to sell their heat and improve their energy efficiency, as EU funding will be exclusively accessible for efficient DHC systems and their associated energy sources. • The plan requirement for DHC systems will create opportunities for infrastructure upgrades and technological innovation in the sector, making them 'efficient' and eligible for EU funding. • The provision on waste heat fosters collaboration between DHC sector and data centres. • The cost-effective analyses provide opportunities that could lead to significant energy savings and market development in the waste heat sector. • Recognition of data centres as heat sources can encourage investment in waste heat recovery technologies and partnerships between data centres and district heating operators. • Exemption criteria related to geological storage sites can incentivize the implementation of carbon capture and storage (CCS) solutions, contributing to overall energy efficiency improvements. • Publication of data encourages Member States to learn from best practice. It enables policymakers to assess the effectiveness of existing policies and identify areas for improvement, leading to more targeted and effective DHC regulation.	• The rate of decarbonisation of efficient DHC systems differs between the available definitions, leading to different DHC developments in different Member States. • Member States and stakeholders may be reluctant to transition to more renewable based DHC systems and away from fossil fuels due to higher upfront costs. • Technical and economic limitations in waste heat utilisation may hinder the uptake of waste heat recovery technologies. Also, States may lack the necessary infrastructures for integrated DHC systems. • The flexibility for Member States to establish their own thresholds and verification procedures for exemptions could lead to Member States not establishing procedures with a higher potential. • The data should be carefully managed to address privacy concerns and protect confidential information.

Table 2 Article 26 EED SWOT analysis

2.2.3 General assessment of the Energy efficiency directive and its latest evolution

These two main articles (25 and 26) of the Energy Efficiency Directive concerning heat and cooling have been extensively modified in this new version. In particular, there are 4 new important provisions:

- Alignment of the comprehensive heating and cooling assessment with the NECPs.

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- The requirement for local heating and cooling planning for towns and cities with more than 45,000 inhabitants.
- A redefinition of the efficiency criteria for district heating networks, with new criteria phased in by 2045 and including a ban of fossil fuels in such networks.
- Stronger consideration for waste heat and recommendation for data centres to connect.

These legislative developments are therefore a strong asset for achieving the objectives of introducing RES in the heating and cooling sector by 2030 and reducing greenhouse gas emissions. The SWOTs carried out on these two articles highlight the following strengths in particular:

- Better synergies between the articles of this directive and with the renewable energy directive.
- The obligatory nature of certain provisions and a relative precision of deadlines (especially for the definition of heat networks).

Also, Local planning as well as the definition of heat networks as efficient will potentially unlock public and private investment. Furthermore, some Member States have already made progress on these subjects and can share their good practices with others, especially with the publication of data referred to in Article 26.

However, both articles have weaknesses that need to be monitored, in particular:

- The lack of specifications regarding exceptions, criteria and sometimes timelines. And this in a context where Member States still have a large margin of maneuver to interpret the text during its transposition in the two years following publication.
- An increased risk of disparity between Member States both on the share of renewables in heat networks, in particular on the issues of considering waste heat, and on the way of making local heating and cooling plans.
- The capacity and skills of Member States to achieve the outlined targets.
- The indicative character of certain key targets which might not serve as a strong driver to the Member States to be achieved.

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- The timetables are too tight and the Member States risk not having time to carry out their study for this revision in 2024 and will therefore have to delay them.

To sum up, these two articles can make a major contribution to Member States putting in place the necessary legislative and support frameworks to achieve the 2030 targets and set their path towards carbon neutrality by 2050. However, we must remain cautious in view of the room for manoeuvre that Member States have in interpreting the text when transposing it into national law and pay close attention to the technical and financial support mechanisms that will help the various players to put these measures in place.

2.3 Renewable Energy Directive (RED)

2.3.1 Renewable Energy Directive in heating and cooling

The first political discussions on renewable energy sources started at the end of the 1990s. In particular, in 1997 the White Paper "Energy for the Future: Renewable Sources of Energy" established a first indicative target of 12% renewables in the EU energy mix by 2010.

After that, in the beginning of 2000s the first national indicative targets appeared in the directive on electricity from renewables and the one on biofuels. It was only in 2008 that the EU developed the first Renewable Energy Directive which set the so-called 20/20/20 targets: 20% renewables, 20% efficiency and 20% GHG reduction by 2020 at EU level and national binding targets. The RED was revised in 2018 during the work on the Clean Energy Package. REDII set new indicative targets of 32% renewable, 32,5% for energy efficiency and 40% GHG savings.

When in 2019 the European Commission published the Green Deal, the European strategy to get to carbon neutrality by 2050 decoupling economic and environmental growth, it was clear that these targets were not enough to reach the goal. For this reason, in July 2021, the Commission published the Fit for 55 Package, launching the revision of several key files including the Renewable Energy Directive.

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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%. It also develops a new definition of innovative renewables in Article 2.

Article 15a presents a new target of 49% renewable energy in the building sector by 2030. This energy should be produced on-site or nearby or taken from the grid. Member States should also establish appropriate measures in their national regulations, building codes and support schemes to further promote the renewables in buildings.

The new Article 22a sets an indicative increase of renewables in the industrial sector of at least 1,6 percentage points as an annual average calculated for the periods 2021 to 2025 and 2026 to 2030. Waste heat and cold supplied from efficient networks might also account for this average annual increases up to a limit of 0,4 percentage points.

In Article 23, the first paragraph is replacing indicative target with a new mandatory increase of renewable in the heating and cooling sector. Member States shall increase this share annually by at least 0,8 percentage points for the period 2021 to 2025 and by at least 1,1 percentage points as an annual average calculated for the period 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 gross final consumption of energy and calculated in accordance with the methodology set out in Article 7. Member States may also count waste heat and cold towards the average annual increases referred to in the first subparagraph, up to a limit of 0,4 percentage points.

Finally, Article 24 paragraph 4 is amended to reach an indicative of 2,2 percentage point average annual increase of renewables in district heating and cooling networks.

2.3.2 Assessment of key articles for heating and cooling

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2.3.2.1 Article 3 Cascading principle

Comparison with the 2018 version

One of the biggest changes between REDII and REDIII is the introduction of the so called "cascading use principle" which requires woody biomass to be used primarily for its highest economic and environmental added value. When possible, woody biomass should be first used to produce wood-based products, then extending their service life, re-use, recycling, and then bioenergy before the final disposal. Following the revision, Member States can make an exception to the cascading use if local industry is not able to use the material, it is in response to a natural disturbance, if it is necessary for wildfire prevention or for forest management reasons and finally if it is necessary to guarantee the security of the energy supply (Article 3.3).

Another significant difference between REDII and REDIII is the introduction of restrictions on what can be subsidised. It is now prohibited to provide subsidies to saw logs, veneer logs, industrial grade roundwood, stumps and roots. Industrial grade roundwood includes pulpwood that can be used for industrial use. Member States can exclude certain categories of material based on determinations of species, dimensions, rectitude, and node density from counting towards this definition due to forest or market conditions.

Member States may not create any new subsidies or renewing any existing subsidies for electricity-only production from biomass unless the installation is located in a Just-Transition Area, in an outermost region of the EU, or if the electricity is produced with bioenergy with carbon capture and storage (BECCS) (Article 3.3).

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES
• The legislation was written in a way to give more flexibility to Member States which allows local conditions to be better considered. • The legislation also has the possibility to channel subsidies into higher added value ends increasing the benefit from the support.	• Many of the provisions are not clearly defined, which means that there could be significant differences resulting from implementation and that there could be quite a lot of differences across the EU reducing the amount of harmony in national legislation.

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	• Proper application of the cascading principle also requires very detailed information of the market, actors, processes, and commodities. It is very difficult to be able to apply this effectively without dramatically increasing the administrative burden.
OPPORTUNITIES	**THREATS**
• The provision has the potential to improve the structure of subsidy schemes allowing for more targeted and precise support for the projects which provide the biggest advantage in terms of economic and environmental added value.	• There is the possibility that this provision could create market distortions by incentivizing upstream market participants to engage in optimistic assessments of how much material they would be able to use thus artificially constricting the supply of actors further down the cascading hierarchy. • The legislation will likely disproportionately impact actors who are in Southern Europe with a lower heat demand meaning that CHP is not always a viable option due to a lack of a market for heating resources and can reduce the amount of renewable electricity that is supplied by ending the ability to support electricity only generation.

Table 3 Article 3 RED SWOT analysis

2.3.2.2 Article 15 Administrative processes regulations and codes

Comparison with the 2018 version

Article 15 on administrative processes regulations and codes introduces two important novelties. On one hand, now also public procurement is explicitly included as a form of support to renewable energy equipment and systems for which Member States should define technical specifications to be met. On the other hand, Member States are required to promote the testing of innovative renewable energy technologies to produce, share and store renewable energy through pilot projects in a real-world environment.

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Though with some weaknesses and threats, with Article 15 and its sub-articles assessed in separate subsections below the EC gives a strong signal to support a wide-scale mapping and roll out of renewables.

SWOT assessment and final evaluation of key parts of the modified/new article

STRENGHTS	WEAKNESSES
• Important recognition of the fact that public procurement is also a means to deploy renewable energy sources, and that priority must be given to harmonized standards also with regard to that.	• Mere recognition of the existing harmonized standards without a further push to increase the harmonization of this framework.
OPPORTUNITIES	**THREATS**
• The recognition in RED of the necessity to promote at national level the testing of innovative technologies could be an important step for the deployment of new renewable solutions in the heating and cooling market.	• The prescription to promote the testing of innovative renewable energy technologies risk being too general; it should have been further developed.

Table 4 Article 15 RED SWOT analysis

2.3.2.3 Article 15b Integrated multilevel mapping and planning of areas

Content of the new article

By 18 months after the entry into force, Member States shall perform a coordinated mapping for the deployment of renewable energy in their territory to identify the domestic potential and the available land surface, subsurface, sea or inland water as necessary for the installation of plants for the production of energy from renewable sources and their related infrastructure necessary for national contributions towards the 2030 renewable energy target.

Paragraph 2 of this new article also adds that Member States shall take into account, in particular:

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a) the availability of the renewable energy resources and the potential for renewable energy production of the different technologies in the land and sea areas;

b) the projected energy demand, considering the potential flexibility of the active demand response and expected efficiency gains and energy system integration;

c) the availability of relevant energy infrastructure, including grids, storage and other flexibility tools or the potential to create or upgrade such grid infrastructure and storage.

SWOT assessment and final evaluation of key parts of the new article

STRENGHT	WEAKNESSES
• It is welcome that for the first time such a mapping is mandatory and involves Member States together with the relevant national, regional and local authorities. • Availability and flexibility are key aspects when considering the deployment of renewable energy solutions for heating and cooling.	• Subsurface areas should be mentioned again also in paragraph 2 and whenever land and sea areas are mentioned.
OPPORTUNITIES	**THREATS**
• When talking of the availability of relevant energy infrastructure (point c), it would be essential to explicitly mention also heating and cooling networks.	• Having seen the Member States' delays in the implementation of the RED II, the risk is that the deadline of 18 months after the entry into force will not be respected in some cases. The Commission should be strict in its monitoring activity.

Table 5 Article 15b RED SWOT analysis

2.3.2.4 Article 15c Renewable acceleration areas

Content of the new article

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For the first time Member States are required to establish "renewables acceleration areas" for one or more types of renewable energy sources, within 27 months after the entry into force. Paragraph 1 specifies, among others, that in those plans Member States shall:

a) designate sufficiently homogeneous land, inland water, and sea areas where the deployment of a specific type or types of renewable energy is not expected to have significant environmental effects, in view of the particularities of the selected territory.

b) establish appropriate rules for the designated renewable acceleration areas, including on effective mitigation measures to be adopted for the installation of renewable energy plants, co-located energy storage facilities, as well as assets necessary for their connection to the grid, in order to avoid or, if not possible, to significantly reduce the negative environmental impacts that may arise.

The plan or plans designating renewables acceleration areas shall be made public and shall be reviewed periodically, as appropriate, in particular in the context of the update of the NECPs.

SWOT assessment and final evaluation of key parts of new article

STRENGHTS	WEAKNESSES
• This "renewables acceleration areas" system will be very useful for a fast deployment of renewable energy sources by accelerating the permitting processes where possible and at the same time reducing as much as possible the negative environmental impacts. • The reference to the NECPs and to periodic updates are to be welcomed as effective means to keep track of Member States developments.	• The reference to "sufficiently homogeneous land, inland water and sea areas" misses to mention the "subsurface" dimension, which is key to include geothermal and storage sites.
OPPORTUNITIES	**THREATS**
• In paragraph 1 point b), appropriate rules for the designated renewable acceleration areas should also include sustainable mineral extraction capacities, so that geothermal	• Having seen the Member States' delays in the implementation of the RED II, the risk is that the deadline of 27 months after the entry into force will not be respected in some cases. The

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lithium and other sustainably sourced minerals could be supported as by-products to renewable energy capacities. • Digitalisation of the 'renewable go-to areas' data would facilitate the licensing and permitting process as new capacity is added and recorded. Therefore, the EU legislator should specify that such continuous updates should always be in electronic format in order to facilitate the permitting process and in favour of easy access from the stakeholders involved.	Commission should be strict in its monitoring activity.

Table 6 Article 15c RED SWOT analysis

2.3.2.5 Article 16 Permitting

Comparison with the 2018 version

The newly adopted RED redefines and precises the rules around permitting for RES. It redefines the rules in general for RES project but also precises in a series of specific articles (16a, 16b, 16c) the permitting granting rules for specific technologies e.g. repowering of renewable projects, solar energy equipment installation, deployment of heat pumps.

The main article (16) significantly reduces the delay for allocating permits from one or two years depending on the size of the installation to 30 or 45 days depending on the location. Indeed, the novelty is as well the introduction of RES acceleration areas, making direct links with Article 15. In these areas, permitting would be fast-tracked (15 days less). Also, in some cases, if the administration does not provide an answer in the prescribed deadlines, it will be considered as a tacit approval of the specific administrative step. This will not be applied if, for example, the project is subjected to an environmental impact assessment.

It also puts stronger incentives on the digitalisation aspects and states, specifying that to facilitate and speed up the permit granting process, local authorities should be assisted by the national government, with necessary resources, skills and qualified staff, also according to the planned capacity foreseen in the NECPs.

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Finally, to accelerate the speeding up process, it is outlined that whenever no major threat to the environment is identified, renewable energy projects would also be considered of "overriding public interest", to limit legal objections to their implementation.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES
• Obligation for competent authority to respect very short delay for the allocation of permits. The binding aspect is a good point to effectiveness of the measure. • The article underlines the importance of supporting local authorities in this work. • The "overriding public interest" provision will enable some projects to not get challenged when going to court. • There are fewer exemptions than in the previous version.	• Not enough clarity on the characteristics of acceleration areas, especially their size, & spatial mapping that should come with it. • There is no consideration of changing the local and regional rules at the same time of national ones, while most permitting is done at the subnational level.
OPPORTUNITIES	**THREATS**
• This could massively accelerate the development of RES in and outside the acceleration zones. • Some countries are moving fast (France, Germany).	• Competent authorities for permit granting may lack the staff to respect the shortened timeline. • Governments may adopt different implementation strategies resulting in very different national frameworks.

Table 7 Article 16 RED SWOT analysis

2.3.2.6 Article 23 Mainstreaming renewable energy in H&C

Comparison with the 2018 version

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The revised Article 23 outlines in paragraph 1 a gradual increase in renewable targets for heating and cooling, with a binding increase of 0.8% per year at 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 waste heat and cold towards the average annual increases, as well as the renewable electricity used for heating and cooling, must be further specified and limited in the NECPs.

New paragraph 1b now requires that Member States shall carry out an assessment of their potential of energy from renewable sources and of the use of waste heat and cold in the heating and cooling sector to be included in the NECPs. In paragraph 2, a new addition specifies that Member States shall now provide information to the owners or tenants of buildings and SMEs on how to improve the use of renewable energy in the heating and cooling systems.

Finally, the revised paragraph 4 states that Member States shall now implement at least two measures described in this paragraph. Before this revision, the measures listed were only four (now they are twelve) and there was no obligation to implement them, as MS were only invited to implement the average annual increase referred to in paragraph 1 "by means, inter alia, of one or more of the following options". The major specifications and enlargements of this list refer 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.

This article enlarges and reinforces previous provisions of RES in heating and cooling and further recognises the use of cold and waste heat, representing a lot of opportunities for the decarbonisation of EU's heating and cooling. However, further improvements could make the article more fit to reach EU's energy targets.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES

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• 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 to keep track of Member States developments in this sense. • A mandatory assessment of the potential of energy from renewable sources and of the use of waste heat and cold in the heating and cooling sector is to be welcomed as it duly considers the different renewable energy sources and their possible implementation considering different starting conditions. • Information to owners and tenants is key to implement renewable heating and cooling in buildings. • The list of measures in paragraph 4 has been positively enlarged and made mandatory for at least two elements of Member States' choice. In particular, the promotion of renewable based district heating and cooling and of local mapping and planning are key new measures.	• The 0.8 and 1.1 percentage points increase are, however, much lower than the 2 percentage points binding target that is required to meet the Commission's own Impact Assessment for renewable heating and cooling in 2030. • Distribution Service Operators (DSOs) should also be given a mandate to prepare renewable heating & cooling plans. • Many local authorities are either directly responsible for their DSOs legal requirements or devolve these legal requirements to a recognized entity. Gas DSOs and electricity DSOs, at present, do not have a clear mandate to plan and deliver renewables and renewable district heating and cooling networks of community schemes. • The measure on information to owners and tenants is a bit too generic. • In terms of sources and technology, only biogas and thermal storage are mentioned in the list of measures of paragraph 4. Instead, the promotion of all relevant sources and technologies should be added to this list.
OPPORTUNITIES	**THREATS**
• The target of paragraph 1 should be raised in subsequent revisions of the directive. • In subsequent revisions of the directive, within the assessment of their potential of energy from renewable sources, Member States should carry out also a guidance on permitting modelled on a "traffic light system". This should include the production and publication of areas where just a notification is requested, or drilling is required, or where it is prohibited. • This would ensure a more levelised starting point for all renewable options in view of the assessment carried out by local authorities to choose the best solution for their community. • A reference to One-stop shops (OSS) would be useful to make the paragraph on information to owners and tenants less vague and general.	• Threats can derive from the implementation and monitoring of the new targets. In this sense, NECPs should become more relevant and detailed documents reflecting both RED targets and national measures put in place to reach them. The Commission should be strict in its monitoring activity. • Given the long list of measures described in paragraph 4 and the limited obligation of choosing at least two, the risk is to have 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 them. In this context, some measures with favourable effects for HC networks based on renewable sources, such as risk mitigation schemes and local mapping and planning, may not be the first choice for being considered

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• As regards paragraph 4, more measures should be made binding in subsequent revisions of the directive. Moreover, more effort from the Commission would be needed to further promote Heat Purchase Agreements and risk mitigation schemes. • Heat Purchase Agreements are an important tool to drive RES HC investment in rural communities, cities and small businesses. The Commission shall issue harmonised guidelines on the design and operation of heat purchase agreements to promote their uptake. • Local authorities are at the forefront of the energy transition but require project finance support to de-risk large-scale projects including those relating to infrastructure. Centralised risk mitigation frameworks would be the more cost-effective solution in this sense, as they would reduce transaction costs and empower the deployment of renewable heating and cooling across the EU.	expensive, resource-consuming and difficult to implement.

Table 8 Article 23 RED SWOT analysis

2.3.2.7 Article 22a Mainstreaming renewables in industry

Content of the new article

The revised Directive introduces a new article 22a about mainstreaming renewable energy in industry. The article sets an indicative (non-binding) target for Member States of a yearly 1.6 percentage points 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 percentage points, 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 be included in the NECPs. The article highlights that those measures 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

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of renewable liquid and gaseous fuels of non-biological origin (RFNBOs) shall be at least 42% of the hydrogen used in industry by 2030, and 60% by 2035.

SWOT assessment and final evaluation of key parts of the new article

STRENGHTS	WEAKNESSES
• The introduction of a new article signals the importance of decarbonising industrial processes. • The reference to the NECPs is also to be welcomed as a means to keep track of Member States developments in this sense.	• The non-binding nature of the target severely undermines its impact. • Renewable heat is not explicitly mentioned in the article, unlike waste heat and cold, electrification, and RFNBOs.
OPPORTUNITIES	**THREATS**
• The article offers a relevant argument to demand adequate measures to decarbonise industry (in particular industrial process heat) in the ongoing NECP update. • The target should be made mandatory and raised in subsequent RED revisions. The role of renewable heating and cooling sources should also be highlighted more clearly.	• The main threat is the non-implementation and/or delayed implementation of the adequate measures at national level.

Table 9 Article 22a RED SWOT analysis

2.3.2.8 Article 24 District heating and cooling

Comparison with the 2018 version

Article 24 of the revised directive introduces significant changes to the 2018 Directive, with a primary focus on enhancing the incorporation of renewable energy into district heating and cooling systems.

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The updated directive, specifically in paragraph 1, strengthens and clarifies the requirement for Member States to inform final customers about the energy performance and share of renewable energy in their district heating and cooling systems. This makes the consumer a more active actor in the energy system.

The article (paragraph 4) also introduces a more ambitious target for the share of renewable energy or waste heat and cold in DHC systems. Although this target is not binding, it encourages Member States to aim for an annual increase of 2.2 percentage points, a significant jump from the previous 1%. This reflects the directive's recognition of the crucial role of renewables in the decarbonisation of the heating and cooling sector. Moreover, DHC operators with a capacity above 25 MWth are encouraged rather than obliged, to connect third party suppliers of energy from renewable sources or from waste heat and cold.

Paragraph 5 introduces an additional situation in which a DHC operator may refuse to connect or purchase heat or cold from a third-party supplier, that corresponds to the definition of efficient DHC set out in the recast of the EED. The provision aims to promote the integration of renewable energy and waste heat. The provision also outlines a structured procedure to resolve disputes, ensuring that unjustified refusals are addressed.

Paragraph 6 completely replaces the previous one by introducing new requirements for a coordination framework. This recognises the potential of waste heat and cold as it aims to facilitate the use of waste heat and cold from the industrial and tertiary sectors in DHC systems. Its primary goal is to enhance overall energy efficiency and promote a circular economy, stressing the need for collaborative dialogue among stakeholders involved in heating and cooling (e.g. DHC operators, local authorities, RES communities and enterprises).

To facilitate sector integration and enable DHC networks to play a role in providing flexibility to the electricity grid, the revised text sets out rules for assessing DHC systems' potential to provide balancing, storage, and other system services. Member States should consider these results in grid planning, investment and infrastructure development. The directive also strengthens the framework for cooperation with the electricity DSO-TSO and other energy networks.

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The article strengthens the provisions on the definition and enforcement of consumer rights and on the operation of DHC systems. Indeed, it is for Member States to make these rules publicly available (paragraph 9).

Finally, the article (paragraph 10) encourages the growth of the sector by allowing exemptions for Member States that increase their share of efficient DHCs. It adapts the three possible exemptions for Member States in line with the new provisions of the RED and the EED.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHTS	WEAKNESSES
• The provision formalises the procedure for Member States to count renewable electricity towards the target. • The provision promotes the improvement of grid stability and flexibility, as well as integrated and more efficient energy systems. • The involvement of local authorities can also lead to better energy planning and uptake of DHC systems. • Transparency and accountability are improved, leading to a more informed and engaged community.	• The requirement to provide information on how much energy was used to deliver a unit of heating needs to be clarified, as it is rather ambiguous and may lead to an administrative burden. • The target that Member States should reach is not binding. • The coordination framework lacks specific guidelines, leading to inconsistencies between Member States. • The rule on the availability of information may add administrative burden for DHC system operators and the relevant authorities.
OPPORTUNITIES	**THREATS**
• Greater consumer involvement could help to raise awareness of the benefits of DHC over individual heating solutions. Customers will be empowered to engage with the DHC sector and market competition will be encouraged. • The target could be made binding in future revisions of the Directive. • The rapid decarbonisation of electricity could be used to electrify part of the heat demand and count towards the target. As more countries reach a share of renewables in DHC	• A stricter requirement to disclose information on the operation of networks could lead to the disclosure of commercially sensitive information, GDPR issues and higher administrative costs. • The renewable electricity that MSs plan to use to meet the target may not be available (seasonal variations, needed in another sector). Countries with a share of renewables in DHC above 60% may lack the incentive to decarbonise further.

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of over 50%, they can benefit from the provisions allowing them to count this higher share towards the increase in the target. • Facilitating the participation of district heating and cooling systems in electricity markets can create new revenue streams and incentivise further investment in these systems. • It can also improve communication between operators and consumers. • By allowing derogations for Member States that increase their share of efficient district heating and cooling, the growth of the sector is encouraged.	• The involvement of multiple stakeholders in the implementation of the coordination framework may pose challenges in terms of consensus and communication. • The lack of guidelines and timelines for implementation may create uncertainty and hinder the integration of DHC services. Meanwhile, there may be political challenges in implementing demand response and thermal storage solutions.

Table 10 Article 24 RED SWOT analysis

2.3.2.9 Article 29 Sustainability criteria

Comparison with the 2018 version

REDIII will cover many more installations than REDII did because the exemption threshold for installations producing electricity, heating and cooling from biomass fuels was lowered from 20 MW to 7.5 MW (total thermal rated input). Previously all installations below 20 MW were exempted from needing to demonstrate that they could meet all the requirements of the sustainability criteria for biomass. Now all plants between 7.5 MW and 20 MW will also need to demonstrate their compliance with the regulation. (Article 29.1).

Forest biomass may not be sourced from areas located within "no-go" areas. These are areas that were originally restricted to prevent conversion to agricultural land and the mass production of biofuels, but the concept of these no-go areas has now been broadened to include forest biomass as well. Forest biomass may not come from primary old growth forests (Article 29.3a), highly biodiverse forests (Article 29.3b), highly biodiverse grasslands (Article 29.3d), heathland (Article 29.3e), wetlands (Article 29.4a), nor peatlands (Article 29.5).

Member States must also apply specific measures when sourcing their biomass. Soil quality and biodiversity must be "considered" with the aim of "preventing" negative impacts. The harvesting on vulnerable soils and of stumps and roots should be avoided, as well as the degradation of primary and old-growth forests and their conversion into plantation forests. Additionally, any clear-cuts must

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be below any maximum level in national law and there must be a certain amount of deadwood left behind in the forest. Logging systems need to ensure impacts on soil quality, including compaction, and biodiversity features and habitats are minimized. (Article 29.6a.iv).

Member States need to ensure through their NECPs, that the production of bioenergy from domestic biomass does not interfere with their targets in the Land Use, Land Use-Change, and Forestry (LULUCF) Regulation (Article 29.7a). Each country must also include in their NECP an assessment of domestic forest biomass available for energy, a projection on the amount of forest biomass used for bioenergy, and a description of national measures ensuring compatibility between the two (Article 29.7b).

All installations will eventually be required to meet an 80% greenhouse gas savings compared with a fossil alternative. This means that biomass can only have a little bit of lifecycle emissions from sourcing and processing (for example at most, only 20% of the emissions that would be released from using fossil fuels can be released in the drying of biomass by natural gas, and the transport in a truck using diesel). Under the previous version of RED, only new installations had to meet these criteria on lifecycle emissions, but after a grace period for existing installations, all installations (above the exemption threshold of 7,5 MW) will need to be able to show at least 80% savings (Article 29.10).

There are exemptions to derogate from the criteria in RED for installations which are located in the outermost regions of the EU, and those extended to also apply to bioliquids and biofuels. Previously these derogations only applied to biomass fuels used for electricity, heating or cooling production (Article 29.13a) and in addition to creating the derogation to ensure a smooth phase-in of the criteria, Member States can also derogate in order to ensure access to safe and secure energy (Article 29.13b).

As an exception to all the new changes, there was also a grandfathering exception added to allow for support to continue to certain installations which meet the sustainability criteria under REDII (Article 29.15). This support may be extended no later than the 31st of December 2030. The criteria for this support to be extended were that support was granted before the entry into force of REDIII (Article 29.15.a) and that the support was granted in a long-term form and that it ensures there is no overcompensation (Article 29.15.b).

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SWOT assessment and final evaluation of key parts of the modified article

STRENGHT	WEAKNESSES
• By lowering the exemption threshold, more installations will be covered, and sustainability will be demonstrated by more installations for a larger share of the biomass used for bioenergy. • No-go areas will increase the protection that exists to ensure the protection of primary forests. • The legislation still allows for the application of a risk-based approach which can reduce compliance costs while still ensuring sustainability. • Stronger requirements for forest protection in the sustainable forest management practices provide more clarity on which practices should be followed in order to ensure that there are no negative impacts resulting from the harvesting of biomass. • Applying the greenhouse gas savings to all installations will ensure that bioenergy provides greater environmental benefits.	• By lowering the exemption threshold from 20MW to 7,5 MW, the legislation reduces harmony with existing legislation as 20MW is the same threshold for the ETS. • Forest management and harvesting are not made to produce bioenergy, placing sourcing restrictions on bioenergy does little to change overall forestry practices, but it limits the valorization of wastes and residues from these processes. • The legislation only requires greenhouse gas savings for bioenergy and does not consider the embedded lifecycle emissions in any other forms of energy.
OPPORTUNITIES	**THREATS**
• Wetlands, peatlands, and heathlands all have the ability to sequester a lot of carbon and by placing restrictions on sourcing material from these areas it is possible that carbon stocks and sinks can be preserved or increased. • Sustainable forest management practices are written in a way that gives consideration for national differences and local circumstances which should help ensure that Member States and third countries can apply the legislation in an effective way. • Derogations exist for outermost regions which gives these communities the flexibility to adapt the directive to their local specificities.	• Lowering the exemption threshold will require operators who do not represent a large share of the biomass to demonstrate compliance which will raise administrative costs for them and reduce system efficiency. • Some countries are more heavily covered by peatlands than others and a strict interpretation could disproportionately impact certain Member States. • The retroactive application of the greenhouse gas savings values has the potential to undermine business decisions which were taken under a different legal framework and

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	undermine or eliminate the profitability of investments.

Table 11 Article 29 RED SWOT analysis

2.3.2.10 Article 30 Sustainability criteria

Comparison with the 2018 version

Overall, the changes made to article 30 were relatively modest. The article was adjusted to align with the modified articles in the revision and added a requirement to provide access to the currently collected information in an easily accessible manner.

The scope of the article was also broadened from "biofuels, bioliquids, biomass fuels and other fuels that are eligible for counting towards the numerator referred to in point (b) of Article 27(1)" to "renewable fuels and recycled carbon fuels".

Finally, the article was also adjusted to allow for the flexibility of simplified verification for operators between 7.5 MW (new exemption threshold) and 20 MW (old exemption threshold). The allowance for the simplified verification is perhaps the most significant change to the article.

SWOT assessment and final evaluation of key parts of the modified article

STRENGHT	WEAKNESSES
• By requiring clear presentation, the quality of information could be increased through verification.	• In order for there to be any benefit of simplified regulation for actors, Member State governments must first set up a new system which some are unlikely to do as they do not have any national schemes.
OPPORTUNITIES	**THREATS**

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• Requiring current data to be provided in a more accessible manner will make it easier for consumers to access the data and increase the quality of decisions made. Additionally, allowing for simplified verification can lower compliance costs for smaller operators.	• Requiring changes to how data is collected, and the scope of the article might increase administrative and compliance costs.

Table 12 Article 30 RED SWOT analysis

2.3.3 General assessment of the Renewable Energy Directive and its latest evolution

The revision of the Renewable Energy Directive has significantly increased its overall ambition, as well as the sectoral efforts for heating and cooling. Certainly, the energy crisis triggered by the Russian invasion of Ukraine played a crucial role in this sense, with the EU facing the consequences of its overreliance on Russian fossil fuels in terms of energy security and affordability for its citizens and businesses. Nonetheless, especially regarding heating and cooling, the new measures introduced are far from sufficient to meet the urgency of the climate challenge, as demonstrated by the SWOT analysis, and should therefore be considered as an encouraging starting point.

Firstly, the new text set some important targets for renewable sources, including:

- The headline target for the share of renewables in the EU energy mix in 2030 (article 3), which raised to 42.5%, more than ten percentage points higher than the previous one.
- The sectoral target for the share of renewables in heating and cooling (article 23) was made binding; while the target per se is close to a business-as-usual scenario, its mandatory nature is a crucial step to ensure compliance by Member States.
- A new indicative target for the share of renewables in buildings in 2030 (article 15a), which was set at 49%.
- A new indicative target for the share of renewables in industry (article 22a), requiring an average annual increase of 1.6 percentage points for the periods 2021-2025 and 2026-2030.
- The target for the share of renewable energy in district heating, while maintained indicative (non-binding), was raised from a 1% average annual increase to 2.2 percentage points.

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Secondly, the revision introduces several articles aimed at streamlining and accelerating permitting procedures for renewable energy projects and installations, through the identification of renewable acceleration areas and dedicated measures for specific technologies. These new articles were included through a targeted amendment presented by the Commission in May 2022 as part of the REPowerEU package, to speed up the deployment of renewable technologies and reduce dependency on Russian fossil fuels. Lastly, the Directive (articles 29 and 30) partially revised the sustainability criteria for biomass.

2.4 Other relevant regulations at EU level: the Energy Performance of Buildings Directive (EPBD) and the Emission Trading System (ETS)

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. Making Europe more resilient calls for renovation of EU buildings, making them more energy efficient and less dependent on fossil fuels. Renovation is key for reducing the energy consumption of buildings, for bringing down emissions and for reducing energy bills. At the moment of drafting this report, its recast is still ongoing, with a final agreement between the co-legislators foreseen for mid-2024. For the purpose of our analysis, we are going to mention the key novelties of this recast which could affect the heating and cooling deployment mainly with regard to the Commission's proposal of revision. We will then briefly mention the state of the art of the negotiations between the co-legislators and show the highlights of their provisional agreement.

The key articles included in the Commission proposal with influence on heating and cooling are the following:

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Article 2: Definitions

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.

Art. 2(19): 'Deep Renovation' means a renovation that transforms a building or building unit into an NZEB before 2030 and into a ZEB starting from that year onwards.

Article 3: Long-term Renovation Strategies renamed to National Building Renovation Plans (NBRP)

One of the key updates in the requirements is a national roadmap where Member States have to set targets for 2030, 2040 & 2050 on different indicators such as annual energy renovation rate, primary and final energy consumption of the national building stock and its operational GHG reductions. For 2050 the objective for the transformation of the existing building stock is raised from NZEB to ZEB.

Article 7: New Buildings

7(1): All new public buildings shall be zero-emission buildings from 2027, and all other new buildings from 2030.

NEW Article 9: Minimum energy performance standards (MEPS) for existing buildings

9(1): With the goal to transform the national building stock to zero-emission by 2050 a progressive MEPS timeline has been set for different types of buildings to be achieved in the coming decade:

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- Buildings & building units owned by public bodies to achieve at least EP class F by 2027 and class E by 2030.
- Non-residential buildings & building units to achieve at least class F by 2027 and class E by 2030.
- Residential buildings & building units to achieve at least class F by 2030 and class E by 2033.

NEW Article 9a: Solar Energy in Buildings

This new article, while not in the original EC proposal, was later included as part of the measures proposed in the REPowerEU Plan. This new provision aims to promote the deployment of energy generation in buildings, namely solar energy (solar thermal and/or solar photovoltaics). It requires that new buildings are designed to optimise their solar energy generation potential and establishes timings for the deployment of solar energy installations in public and commercial buildings (new and existing) and in new residential buildings.

NEW Article 10: Renovation Passport

A new article introduces the Renovation Passport as a document that provides a tailored roadmap for the renovation of a specific building in several steps. The passport should contain expected benefits in terms of energy savings, savings on bills and operational GHG reductions, as well as benefits related to health and comfort.

NEW Article 15: Financial barriers

15(10): From 2027, MS shall not provide any financial incentives for the installation of fossil fuel boilers.

Articles 16-18: Energy Performance Certificates

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16(1): EPCs shall include a primary energy use indicator for energy efficiency (not specified if total or non-renewable), reference values for minimum energy performance standards (Art. 9) and for NZEB & ZEB requirements.

16.2: Performance class A shall be a zero-emission building, class G corresponding to the 15% worst-performing in the national building stock.

16.6: EPCs recommendations shall include an assessment whether heating or air-conditioning systems can be adapted to operate in more efficient temperature settings.

17.1: Buildings undergoing major renovations need to have EPCs, as well as all public buildings (owned or occupied by public authority).

Annex III: Zero-Emission Building Requirements

The first part of Annex III lays down the requirements for ZEBs, both new and renovated. Maximum thresholds are laid down, expressed in total annual primary energy use, per climatic zone and per different building types. In addition, ZEBs shall not cause on-site carbon emissions from fossil fuels.

On 8 December 2023, the Council and the Parliament reached a provisional political agreement on the Commission's proposal to revise the EPBD[12]. The main points of the agreement are the following:

- 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;

[12] The provisional political agreement on the EPBD recast has not been made public at the moment of drafting this report.

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- 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.

Apart from the possible changes regarding the deadlines of the various targets mentioned in the articles above, the progressive effort towards having more and more zero-emission buildings and to phase out the worst-performing buildings is to be welcomed; in this sense, heating and cooling from renewable sources can be complementary in achieving these objectives. To this purpose, however, it is important that Article 15 paragraph 10, stating that MS shall not provide any financial incentives for the installation of fossil fuel boilers, is applicable immediately and not within later deadlines such as the ones proposed by the Commission (2027) or by the Council and the Parliament in their provisional agreement (2025).

Moreover, setting a date for ending fossil fuel heating in Europe's buildings provides crucial clarity for consumers and charts the path for the heating sector. It makes any investment in renewable solutions a future-proof choice. Nevertheless, 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.

Among other pieces of legislation with an influence on heating and cooling, it is important to mention the EU Emissions Trading System (ETS). The EU ETS works on the 'cap and trade' principle. A cap is a limit set on the total amount of greenhouse gases that can be emitted by the installations and aircraft operators covered by the system. The cap is reduced annually in line with the EU's climate target, ensuring that emissions decrease overtime. It is expressed in emission allowances, where one allowance gives the right to emit one tonne of CO_2eq (carbon dioxide equivalent). For each year, companies must surrender enough allowances to fully account for their emissions, otherwise heavy fines are imposed.

The revenues from the EU ETS feed mostly into national budgets. Member States use these revenues to support investments in renewable energy, energy efficiency improvements and low-carbon technologies that help reduce emissions further. The sale of allowances also supplies the EU

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ETS funds for low-carbon innovation and energy transition, the Innovation Fund and the Modernisation Fund.

Launched in 2005, the EU ETS operates in trading phases. The system is now in its fourth trading phase (2021-2030). The ETS Directive for phase 4 was first revised in 2018 in line with the EU's 2030 climate and energy framework. In view of the European Green Deal and EU's more ambitious climate targets, however, another revision of the Directive for phase 4 was launched in 2021 and approved in May 2023[13]. Among the main novelties:

- **EU ETS cap, trajectory, and rebasing**

  To achieve the target of at least 55% net reduction in greenhouse gas emissions below 1990 levels by 2030, as outlined in the European Climate Law, co-legislators committed to greater emissions reductions under the EU ETS, setting a target of 62% below 2005 levels by 2030. This is an increase compared to the 61% target originally proposed by the European Commission in the "Fit for 55" proposal, and a significant increase from the previous 43% target.
- **EU ETS scope expansion**

  The reform entails the phasing in of maritime sector emissions into the EU ETS, with the obligation to surrender allowances rising from 40% of verified emissions in 2024 to 100% in 2026. All emissions from intra-EU voyages and within EU ports will be covered by the ETS, and 50% of the emissions for journeys to or from a non-EU country. By the end of 2026, the Commission will also assess whether to introduce emissions from municipal waste incineration into the EU ETS from 2028.
- **New ETS for buildings, road transport, and additional sectors**

  In parallel, the agreement establishes a separate emissions trading system for direct emissions from buildings, road transport, and additional sectors (mainly small industry not already covered by the EU ETS). The new ETS 2 will complement the EU ETS sectoral coverage, broadening EU-level carbon pricing to cover all major sectors of the economy except agriculture and land-use. In light of the impact of the energy crisis, the new system is set to come into force in 2027. However, as a means of safeguarding vulnerable

[13] See Directive (EU) 2023/959: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32023L0959.

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households, the ETS 2 will be delayed to 2028 if energy prices are deemed exceptionally high.

- **ETS revenue use**

  Revenues from the ETS 2 will flow into a newly established Social Climate Fund. This fund is intended to address the financial burden of citizens and micro-enterprises most impacted by energy price rises, particularly for heating and transport, resulting from the new carbon price. The EU ETS's existing Innovation Fund is also set for a significant boost, with funding (coming from the auctioning of dedicated allowances) rising from 450 million to 575 million allowances in the period 2020-2030.

The new ETS targets are in line with the Green Deal objectives and will certainly play a positive role in the deployment of heating and cooling from renewable sources. In particular, the creation of an ETS 2 establishing a separate emissions trading system for direct emissions from the buildings is to be welcomed, although its actual functioning is still unclear and far in time (2027 or 2028).

3. NECP qualitative assessment of the five REDI4HEAT regions in relation to the EU targets

The EU Member States were required to provide updated NECPs by 2030, aligning their strategies with the new EU provisions arising from the Fit for 55 package. The draft of these plans was due in June 2023, while updated versions following EC's remarks are to be provided by June 2024.

On 24 October 2023, the EC published a technical assessment of the NECP progress reports towards meeting the EU's energy and climate objectives and on 18 December a wide assessment of the draft updated NECPs including recommendations for the 21 Member States that submitted that draft plan in time. While there has been an improvement in the Member States's ambitions compared to 2019, when first NECPs were published, the EC's assessments have found several major shortcomings. The estimated GHG reduction in 2023 would be 51% (4% below target) and RES share

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of around 39% (3.5% below target) while final energy consumption could reach 814 Mtoe (5.8% below target). Energy security is addressed differently by different Member States with only a few providing detailed plans for diversified access to gas or low carbon energy sources. In fact, very few Member States submitted objectives aligned with their expected national contribution. There is a significant level of heterogeneity in both the quality and the level of ambition of the NECPs. [14]

The REDI4HEAT NECP analysis was performed independently of the EC's assessment and can serve as further recommendations to the Member States.

3.1 Qualitative NECP assessment framework

The analysis of the NECPs followed a qualitative approach. The WP5 partners have developed an evaluation framework consisting of different relevant heating and cooling topics with related questions. In particular, the analysis focused on four key issues, expected to be included in the national plan.

In order to understand how and to what extent these four themes have been developed in the NECP, targeted set of questions was developed for each theme, relating to specific actions and measures that the government is or is not planning to take as part of the national plan. For example, for the first theme on district heating and cooling, the first question is 'Are there clear objectives and/or measures to roll out of DHC networks?' (see below the evaluation framework).

Depending on the level of implementation of these measures, each question was assigned a score and a coloured traffic light corresponding to the level of satisfaction and adaptation of the plan's provisions to European standards:

- 0 points, red light: unsatisfactory or non-existent measures
- 1 point, orange light: measures in place but not sufficient to achieve the objectives
- 2 points, green traffic light: satisfactory measures

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A796%3AFIN&pk_campaign=preparatory&pk_source=EURLEX&pk_medium=TW&pk_keyword=EUGreenDeal&pk_content=Communication&pk_cid=EURLEX_todaysOJ

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The total score for each topic was then calculated indicating to which point the NECPs address each aspect/topic. Each scoring level was then, again, given a traffic light symbol to facilitate the reading and understanding of the NECPs and their effectiveness at European level and to indicate visually the extent to which the NECPs comply with EU legislation.

The five topics are:

- High level focus on district heating and cooling (3 questions, max 6 points);
- Mainstreaming RHC technologies (5 questions, max 10 points)
- Affordable heating (5 questions, max 10 points);
- Removal of barriers (4 questions, max 8 points).

This has created a system for reading the level of assessment of measures related to four key objectives for the heating and cooling sector to understand where governments plan to implement sufficient measures to reach targets arising from EU legislation, and where, on the other hand, the Member States lack clear initiatives and measures. Below can be found the questions and the evaluation framework.

- **High level focus on DHC**

Measure	**Assessment**
Are there clear objectives and/or measures to roll out of DHC networks?	Yes, clear measures and objectives included (3)
Is there support for connection to district heating/cooling?	DHC mentioned with some measures/objectives (2)
Are their measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	No mention or DHC-related objectives (1)
Total	

- **Mainstreaming RHC technologies**

Measure	**Assessment**
Has the government agreed to a relevant timeline for phasing out fossil heating?	By 2030 (2) By 2040 (1) After 2040 / No agreement (0)

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Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	Before 2030 (2) After 2030 (1) No (0)
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	Before 2030 (2) After 2030 (1) No (0)
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	By 2030 (2) After 2030 (1) No (0)
Is individualized support to enable consumer choice (for example via one-stop-shops)?	Yes, support available (2) Some support available but insufficient (1) No support (0)
Total	

- **Affordable heating**

Measure	**Assessment**
Are there reduced VAT rates RHC technologies? or Have reduced VAT rates on fossil appliances ended?	Yes, both reduced VAT on RHC solutions AND end of reduced VAT rates for fossil or planned (2) Reduced VAT rate on RHC solutions OR end of reduced VAT on fossil (1) No reduced VAT on RHC and VAT on fossil ongoing (0)
Are there financial support schemes for clean heating technologies?	Accessible support for multiple RHC technologies (2) Support for wider measures that can include RHC technologies (1) No (0)
Has the government ended subsidies for fossil heating?	Yes (2) No, but it is planned (1) No and not planned (0)
Is there specific financial support for the most vulnerable households to switch for clean heating?	Specific grants, subsidies or loans available (2) Switch to RHC by homeowners is mentioned but not directly supported (1) No (0)
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	Yes (2) Timeline for upgrading buildings mentioned (1) No (0)
Total	

- **Removal of barriers and building capacity**

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Measure	Assessment
Is there a requirement for local or regional authorities to develop heat plans?	Yes (2) Heat plans mentioned (1) No (0)
Is there a supportive framework that enables local authorities to carry out heat planning?	Yes (2) Framework mentioned but insufficient (1) No (0)
Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	Yes, dedicated RHC training programmes (3) Mention of training programmes for next generations of professionals but not specifically on clean heating (2) No (1)
Has the government introduced provisions to ease the administrative procedures for installation, connection, renovation of RHC technologies?	Yes (2) Introduction of provisions to partially ease administrative procedures (only installation, connection, or renovation individually) (1) No (0)
Total	

Table 13 Questions to evaluate NECPs compared with EU 2030 targets and beyond

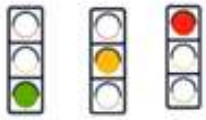
	SCORE	
High level focus on DHC	**MAX**: 6 Points GREEN: 5-6 Points YELLOW: 2-4 Points RED: 0-1 Points	
Mainstreaming RHC technologies	**MAX**: 10 Points GREEN: 8-10 Points YELLOW: 3-7 Points RED: 0-2 Points	
Affordable heating	**MAX**: 10 Points GREEN: 8-10 Points YELLOW: 3-7 Points RED: 0-2 Points	
Removal of barriers and building capacity	**MAX**: 8 Points GREEN: 7-8 Points YELLOW: 3-6 Points RED: 0-2 Points	
TOTAL	**MAX**: 34 Points	

Figure 3 Scoring system of the four categories

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3.2 Croatia

3.2.1 Qualitative analysis

- **High level focus on DHC**

MEASURE	REFERENCE	ASSESSMENT
Are there clear objectives and/or measures to roll out of DHC networks?	Several initiatives have been undertaken to further develop DHC networks, with a particular focus on increasing the list of renewable sources exploited and shifting towards new and more efficient generation systems.	
Is there support for connection to district heating/cooling?	Neither direct support nor encouragement for connection to district heating and cooling. However, declared encouragement to repair deteriorated distribution networks and other similar actions.	
Are there measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	Increasing targets for the deployment of RES technologies in heating and cooling are established until 2030.	

- **Mainstreaming RHC Technologies**

MEASURE	REFERENCE	ASSESSMENT
Has the government agreed to a relevant timeline for phasing out fossil heating?	No.	

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Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	No.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	No.	
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	No timeline established, but have defined which houses are needed to be improved following the directive 20210/31/EU.	
Is individualized support to enable consumer choice (for example via one-stop-shops)?	No individualized support for RHC, but large-group support campaigns on energy savings targeting good behaviors, reduction in consumption etc.	

- **<u>Affordable heating</u>**

MEASURE	REFERENCE	ASSESSMENT
Are there reduced VAT rates RHC technologies? or **Have reduced VAT rates on fossil appliances ended?**	No.	
Are there financial support schemes for clean heating technologies?	Financial support schemes are established for wider measures which can include RHC technologies.	

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Has the government ended subsidies for fossil heating?	No.	
Is there specific support for the most vulnerable households for clean heating?	Several measures aimed at combatting energy poverty while enabling households to switch to RHC. Amongst other measures, the strengthening of the monitoring of vulnerable households and the co-financing of the replacement of old heating and cooling systems.	
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	Grants and subsidies are available for owners to switch to RHC (also for co-owners in appartements buildings).	

- **<u>Removal of barriers</u>**

MEASURE	REFERENCE	ASSESSMENT
Is there a requirement for local or regional authorities to develop heat plans?	No.	
Is there a supportive framework that enables local authorities to carry out heat planning?	No.	

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Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	Promotion of accredited university study programmes in the field of RES, with a focus on specific fields such as geo energy, geoengineering and bioeconomy.	
Has the government introduced provisions to ease the administrative procedures (for the connection to district heating, the installation of a heat pump, etc.)?	Several provisions to ensure the systematic relief and removal of obstacles in administrative procedures that limit the greater use of energy from RES.	

Table 14 Assessment of the Croatian NECP

3.2.2 Results and recommendations

	SCORE	
High level focus on DHC	4/6 points	
Mainstreaming RHC technologies	0/10 points	
Affordable heating	5/10 points	

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Removal of barriers and building capacity	4/8 points	
TOTAL	13/34 Points	

Table 15 Croatian NECP score

Croatia's draft updated National Energy and Climate Plan (NECP) was formally published on 4 July 2023. From a general perspective, the country seems to be on the right route towards delivering the objectives of EU energy and climate policies in the heating and cooling (H&C) sector. However, the plan is characterised by several weaknesses which may undermine the country's ambitions in the long run if not adequately tackled at least in the final version.

High level focus on DHC (4/8 points): Regarding district heating and cooling (DHC), a multitude of virtuous initiatives have been undertaken in the light of boosting the deployment of new systems and the development of the existing ones. This focusing on renewable energy sources (RES), as well as high-efficiency generation (fourth generation DHC) and cogeneration. Amongst other initiatives, the commitment to tackle the losses caused by the currently dilapidated distribution network, starting from the replacement of hot water and steam pipelines with worn-out insulation of steel pipelines with new pre-insulated pipes. A particular attention was also paid to ensuring a structured and systematic involvement of local and regional authorities, most notably by introducing obligations in terms of strategic planning and monitoring. However, more no support is foreseen concerning connection to DHC.

Mainstreaming RHC technologies (0/10 points): As for mainstreaming renewable heating and cooling (RHC) technologies, Croatia's draft updated NECP seems to be lacking substantial commitment and long-term perspectives. Neither a timeline nor an end-date has been established to get rid of fossil fuels in DHC. No timeline for upgrading the performance of the least efficient buildings has been introduced either.

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Affordable heating (5/10 points): When it comes to affordable heating, a general lack of ambition is accompanied by positive specific initiatives. On one hand, the Croatian government hasn't imposed the end of subsidies for fossil heating once and for all. Not even higher taxes on fossil heating have been established as an alternative. While on the other hand, specific actions have been taken to combat energy poverty while enabling households to switch to RHC. Specifically, Croatia focused on strengthening the monitoring of vulnerable households and the co-financing of the replacement of old H&C systems. In addition, grants and subsidies have been made available for owners and co-owners to switch to renewable heating and cooling (RHC).

Removal of barriers (4/8 points): In terms of removal of barriers, Croatia opted to promote accredited university study programmes in the field of RES, focusing on specific fields such as geo-energy, geo-engineering and bioeconomy. Moreover, several provisions have been introduced to ensure a systematic relief in those administrative procedures that limit the greater use of energy from RES.

In conclusion, despite some weaknesses, especially in terms of long-term planning and fossil fuel decommissioning, Croatia's draft updated NECP seems to be moving towards the right direction. Hopefully, the existing lacks would be fulfilled by means of the final updated NECP.

Recommendations:

- Establishing a binding timeline or end-date for phasing out fossil heating.
- Increasing the targets and sub-targets for the development of renewables.
- Differentiating the energy mix including all available green sources.
- Ending subsidies to fossil heating while reducing taxes on renewable heating.
- Introducing a specific blueprint for upgrading the worst energy performing buildings.
- Strengthening the obligations for local authorities in terms of heat planning in specific.
- Easing administrative procedures in the heating and cooling sector.

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3.3 Germany

3.3.1 Qualitative analysis

- **High level focus on DHC**

MEASURE	REFERENCE	ASSESSMENT
Are there clear objectives and/or measures to roll out of DHC networks?	Multiple types of funding for the expansion and the use of renewable energies to produce DHC.	
Is there support for connection to district heating/cooling?	The Federal Aid Programme for Efficient Heating Networks (BEW) supports connections to heat networks with up to 16 connected buildings or 100 housing units. Nothing specific to district heating and conditions could be more inclusive.	
Are there measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	Germany has a Roadmap towards complete decarbonization of heat networks by 2045, in addition to financial support for the expansion and transformation of heat networks. Moreover, the country aims to produce 50% of grid-bound heating and cooling from renewables and waste heat by 2030. Moreover, the State has a provision of federal subsidies for efficient buildings and heating networks.	

- **Mainstreaming RHC Technologies**

MEASURE	REFERENCE	ASSESSMENT
Has the government agreed to a relevant timeline for phasing out fossil heating?	Fossil fuels will be phased out from heating systems, mandating climate-neutral heating for all buildings using renewable energy from 2045. The Heat Planning Act aims for 50% of wired	

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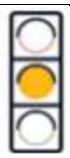
	heating and cooling from renewables and waste heat by 2030.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	Germany's Building Energy Act (GEG) means that from 2024, any new heating system installed in new or existing buildings must be powered by at least 65% renewable energy. The use of fossil fuel-fired heating systems will be completely banned from 2045.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	No specific end-date for the installation regarding existing homes except for the GEG mentioning that from 2024, any new heating system installed in new or existing buildings must be powered by at least 65% renewable energy. The use of fossil fuel-fired heating systems will be completely banned from 2045. Moreover, since 2017, the national efficiency label for old heating systems provides consumers with information on the efficiency status of their boilers over 15 years of age and is intended to motivate the replacement of inefficient boilers.	
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	No clear timeline.	
Is individualized support to enable consumer choice (for example via one-stop-shops)?	The government is actively engaged in providing comprehensive and accessible energy advice to citizens, with a particular focus on helping low-income households reduce energy consumption and costs. • 'Electricity-Chek' project specifically involves advising low-income households, particularly the formerly long-term unemployed, on how to save heat, water and electricity. • Energy advice (online or at helpdesks) from Consumer Centres on energy costs,	

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	efficiency and savings related to electricity, heating, renewable energy, energy renovation, modern heating technology and available funding. However, nothing specific on DHC.	

- **<u>Affordable heating</u>**

MEASURE	REFERENCE	ASSESSMENT
Are there reduced VAT rates RHC technologies? or **Have reduced VAT rates on fossil appliances ended?**	Nothing clear on VAT rates.	
Are there financial support schemes for clean heating technologies?	The KfW Renewable Energy Programme remains + the Federal Aid Programme for Efficient Heating Networks (BEW) of 4 billion EUR until 2027 for the expansion and transformation of the heat networks towards net-zero GHG heat supply.	
Has the government ended subsidies for fossil heating?	Introduction of a phase-out according to a G20 agreement with the prospection of improving it: "The G20 agreed in 2009 to eliminate inefficient fossil fuel subsidies in the medium term. The G7 has set itself the goal of eliminating inefficient fossil subsidies by 2025. Germany will carry out a more intensive and regular assessment of subsidies in view of their climate impact (e.g. in the context of spending reviews) and further develop reporting on climate-damaging subsidies."	

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Is there specific support for the most vulnerable households for clean heating?	• Creation of legal basis for targeted relief from higher housing and heating costs for lower income households. • Increasing the entitlement to housing benefits and expanding the range of beneficiaries of housing benefits through the introduction of a heating cost component, climate component and an increase in the general level of benefits. • Continuity of Electricity Checks to provide advice and financial support to low-income households on heating energy savings.	
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	Federal Funding for Efficient Buildings provides significant impetus to improving energy efficiency and increasing the share of renewable energies in the building sector. However, more is needed to achieve 2030 targets.	

- **<u>Removal of barriers</u>**

MEASURE	REFERENCE	ASSESSMENT
Is there a requirement for local or regional authorities to develop heat plans?	The Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) aims to ensure that heat planning is comprehensively developed by 2028 with the participation of all relevant actors at the local level.	
Is there a supportive framework that enables local authorities to carry out heat planning?	Part of the Heat Planning Act.	

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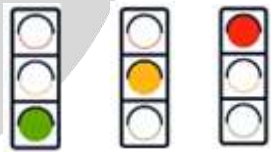
Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	Not specifically. The Federal Government has taken extensive strategic measures to remove barriers to the uptake of energy services in the public sector. These range from information provision, training opportunities and funding programmes.	
Has the government introduced provisions to ease the administrative procedures (for the connection to district heating, the installation of a heat pump, etc.)?	• Measures to increase the pace of planning and approval procedures for renewable energy as part of the reform of the Renewable Energy Act. • Accelerated planning and permit-granting procedures for network deployment. • Accelerated grid expansion through shortened permitting procedures.	

Table 16 Assessment of the German NECP

3.3.2 Results and recommendations

	SCORE	
High level focus on DHC	5/6 points	
Mainstreaming RHC technologies	6/10 points	

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Affordable heating	6/10 points	
Removal of barriers and building capacity	6/8 points	
TOTAL	23/34 Points	

Table 17 German NECP score

A thorough analysis of Germany's draft National Energy and Climate Plan (NECP), submitted in November, reveals both commendable strengths and notable weaknesses. However, the plan was published well after the 30 June 2023 deadline for Member States to submit their updated drafts to the European Commission. On the positive side, Germany demonstrates a strong commitment to decarbonising its heat networks and outlines a comprehensive roadmap in the draft NECP with a bold vision of full decarbonisation by 2045.

High level focus on DHC (5/6 points): With regard to district heating and cooling (DHC), several types of support for the expansion and use of renewable energy for DHC production are highlighted. In addition, the country aims to produce 50% of grid-bound heating and cooling from renewables and waste heat by 2030. However, the plan lacks specific measures to support district heating and cooling networks and the conditions related to DHC could be further elaborated.

Mainstreaming RHC technologies (6/10 points): The draft outlines the phasing out of fossil fuels from heating systems and mandates carbon neutral heating for all buildings using renewable energy from 2045. Any new heating system installed will have to be powered by at least 65% renewable energy, and the use of fossil fuel-fired heating systems will be completely banned from 2045. Despite these laudable aspects, the NECP has some shortcomings that deserve attention. One notable gap is the lack of a clear timetable for upgrading the most energy inefficient buildings, which could hinder the effective implementation of measures to improve energy efficiency in the built

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environment. The government is actively engaged in providing comprehensive and accessible energy advice to citizens, with a particular focus on helping low-income households reduce energy consumption and costs. However, there is no specific mention of DHCs in this context.

Affordable heating (6/10 points): the NECP emphasises support for clean heating technologies, but there is limited information on reduced VAT rates for renewable heating. Germany has put in place a robust financial support framework, including initiatives such as the KfW Renewable Energy Programme and the Federal Support Programme for Efficient Heating Networks, which are designed to provide essential financial and structural support for the expansion and transformation of existing heating networks. However, there is a lack of detail on a gradual approach to phasing out fossil fuel heating subsidies, raising concerns about the clarity and effectiveness of the proposed measures. More information is needed on integrated financial support for building renovation and RHC technologies. Germany has previewed specific clean heating support for the most vulnerable households.

Removal of barriers (6/8 points): Germany aims to ensure that heat planning is comprehensively developed by 2028, involving all relevant actors at local level. However, the NECP overlooks the importance of specific training programmes for clean heating professionals. The plan includes clear provisions to simplify administrative procedures related to district heating connections and heat pump installations. Streamlining these procedures is essential to ensure efficient implementation and reduce potential bureaucratic barriers that could hinder progress.

In summary, while the draft German NECP underlines a strong commitment to sustainable energy goals, it is imperative to address the identified gaps in order to increase the overall effectiveness of the plan. A more comprehensive approach with clear timelines, specific measures and targeted support programmes is essential to ensure the successful implementation of Germany's initiatives towards a more sustainable energy landscape.

Recommendations

- Call for a quick implementation of the intensive and regular assessment of subsidies in view of their climate impact in order to clearly end subsidies for fossil heating.

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- Provide measures such as minimum energy performance standards to upgrade the worst energy performing buildings.
- Extend efforts to improve the energy efficiency of buildings to achieve 2030 targets.
- Enable sector integration regarding electricity grids and large-scale HPs.
- Extend the support to connect to DHC networks to smaller networks and willing consumers.
- Provide a priority lane and quicker approval of state-aid for district heating and clean-heat projects.

3.4 Greece

3.4.1 Qualitative analysis

- **High level focus on DHC**

MEASURE	REFERENCE	ASSESSMENT
Are there clear objectives and/or measures to roll out of DHC networks?	The draft revision contains some mentions to district heating, but considerably less than the NECP 2019. In particular, a session about assessing the need to build new RES district heating and cooling infrastructures is not present anymore. In general, in Greece district heating has traditionally limited relevance. The NECP 2019 highlighted that there is some potential to develop district heating applications in specific areas of Greece (Northern Greece, mountainous areas, and in some North Aegean islands), using geothermal energy, residual solid biomass, and natural gas as transitional / complementary fuel.	

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Is there support for connection to district heating/cooling?	No.	
Are there measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	While the draft revision mentions support measures for the use of RES in district heating networks (mainly geothermal energy, biomass, and renewable gases), these measures are not clearly outlined in the document.	

- **<u>Mainstreaming RHC Technologies</u>**

MEASURE	REFERENCE	ASSESSMENT
Has the government agreed to a relevant timeline for phasing out fossil heating.	Yes, but only for oil boilers. There is no timeline for gas boilers.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	Yes, but only for oil boilers. There is no timeline for gas boilers.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	Yes, but only for oil boilers. There is no timeline for gas boilers.	
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	The draft revision foresees a progressive increase in the annual renovation rate, which will be included in the revised long-term renovation strategy:	

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	• The annual renovation rate of residential buildings will rise from 0.8% today to 1.4% in 2030 and 1.7% in 2050. • The annual renovation rate of tertiary sector buildings will double by 2030 reaching 0.8% in 2030. • The rate of construction of new buildings will rise from 0.18% in 2030 to 0.27% in 2050. The text also supports the exemplary role of public buildings with the ELECTRA programme. The text does not specifically address the upgrade of the worst energy performing buildings as proposed with the recast of the EPBD, though the revision of the Directive is ongoing and therefore still under negotiation. Nonetheless, the draft highlights that "60% of the country's building stock belongs to the lowest energy classes (E-G) and more than half was built before 1980".	
Is individualized support to enable consumer choice (for example via one-stop-shops)?	Awareness-raising and one-stop shops are mentioned, particularly in the context of addressing energy poverty. Among the measures on energy efficiency, there is one dedicated to information and awareness-raising.	

- **<u>Affordable heating</u>**

MEASURE	REFERENCE	ASSESSMENT
Are there reduced VAT rates RHC technologies? or **Have reduced VAT rates on fossil appliances ended?**	The standard VAT rate is 24%. • Heat pumps can benefit from the reduced rate on electricity, which is 6% • Natural gas benefits from a reduced rate of 6% until 01/01/2030.	

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	Source: Taxes in Europe Database v3 (europa.eu)	
Are there financial support schemes for clean heating technologies?	There is a specific policy measure on promoting RES systems to meet thermal and cooling needs in the building sector, yet the lack of specific information and details makes it difficult to assess.	
Has the government ended subsidies for fossil heating?	No (e.g. reduced VAT for natural gas).	
Is there specific support for the most vulnerable households for clean heating?	There are measures in place to combat energy or support vulnerable households.	
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	RHC technologies are mentioned mostly in the chapters dedicated to energy efficiency, as buildings renovations. Several financial measures are foreseen for EE measures of both public and private buildings, though sometimes clear connection with heating and cooling measures can be lacking.	

- **Removal of barriers**

MEASURE	REFERENCE	ASSESSMENT
Is there a requirement for local or regional authorities to develop heat plans?	No.	

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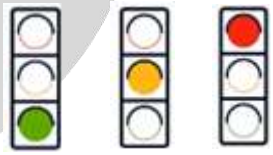
Is there a supportive framework that enables local authorities to carry out heat planning?	No.	
Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	No. *(Based on NECP)*	
Has the government introduced provisions to ease the administrative procedures (for the connection to district heating, the installation of a heat pump, etc.)?	No. *(Based on NECP)*	

Table 18 Assessment of the Greek NECP

3.4.2 Results and recommendations

	SCORE	
High level focus on DHC	2/6 points	
Mainstreaming RHC technologies	7/10 points	

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Affordable heating	4/10 points	
Removal of barriers and building capacity	0/8 points	
TOTAL	13/34 Points	

Table 19 Greek NECP score

The draft update of the Greek NECP was submitted on 6th November 2023. As a general consideration, the English version of the Greek draft NECP that was published in November 2023 presents numerous typos, mistranslations, and issues in the formatting of the document that make the assessment difficult for non-Greek stakeholders. Considering this issue should be relatively easy to solve by the Greek government, we encourage them to do so in the spirit of transparency and accessibility by all EU stakeholders.

High-level focus on DHC (2/6 points): Traditionally, district heating has played a limited role in Greece. Nonetheless, the 2019 NECP included a section dedicated to assessing the need to build new RES-based networks, which identified some potential to develop district heating applications in specific areas of Greece (Northern Greece, mountainous areas, and in some North Aegean islands), using geothermal energy, residual solid biomass, and natural gas as transitional / complementary fuel.

Mainstreaming RHC technologies (7/10 points): Greece has set a timeline to phase out oil boilers by 2025 in its National Climate Law that was adopted in 2022. However, no timeline or target has been set for phasing out gas heating systems. The draft NECP also mentions a timeline for increasing the renovation rate of the building stock, which will be included in the revised Long-Term renovation strategy incentives for RHC solutions, and specific support for vulnerable households.

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Affordable heating (4/10): The lack of details on the actions indicated in the draft NECP makes it particularly difficult to assess the support for making RHC solutions more affordable and widespread. In fact, the text does refer to a combination of different policies to enhance the use of RES systems for heating and cooling in line with projections of the Comprehensive Assessment on efficient heating and cooling but provides very limited specifics on these policies and / or the budget foreseen.

Removal of barriers (0/8): The draft contains no mentions or actions specifically dedicated to local heat plans, skills for the renewable heating and cooling sector or easing administrative burden for the deployment of RHC solutions.

Recommendations:

- Raise the ambitions and efforts in the H&C sector. The draft NECP acknowledges that the priority is the transformation of the power sector and, accordingly, the vast majority of the document is dedicated to electricity, followed by transport and renewable fuels.
- Likewise, compared to 2019, the increase in the 2030 targets for renewables in electricity (from 61% to 80%) and transport (from 19% to 29%) are much higher than the increase for H&C (from 43% to 46%).
- Provide more details on the planned actions and budget to deploy RES-based district heating networks according to the assessment carried out in the 2019 NECP and 2020 Comprehensive Assessment on H&C.
- Provide a clear timeline for the phase out of stand-alone gas boilers.
- Prioritise the upgrading of worst performing buildings by promoting energy renovations and renewable heating and cooling solutions.
- Reduce VAT rates on RHC solutions, at least to the same level as for natural gas (6%).
- Provide details on the actions foreseen to enhance the use of RES systems for heating and cooling in buildings, which are only sketched in the draft. Even better, the funding available to deploy RHC solutions should be streamlined and easily accessible for all end-users.

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- Include dedicated actions to support municipalities in drafting and implementing local heating and cooling plans, in line with the provisions of the Energy Efficiency Directive.

3.5 Poland

3.5.1 Qualitative analysis

- **High level focus on DHC**

MEASURE	REFERENCE	ASSESSMENT
Are there clear objectives and/or measures to roll out of DHC networks?	Measures for the construction, expansion and upgrading of district heating networks.	
Is there support for connection to district heating/cooling?	Development of district heating and co-financing of the connection of new consumers - Making use of financial support dedicated to district heating systems is intended to expand their coverage and connect new consumers.	
Are there measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	The country's goal was to increase the share of renewable energy in DHC to 47 % by 2020 and is to increase this share to 72 % by 2030. + Introduction of a new support mechanism for high-efficiency cogeneration and systemic changes in the heating sector.	

- **Mainstreaming RHC Technologies**

MEASURE	REFERENCE	ASSESSMENT

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Has the government agreed to a relevant timeline for phasing out fossil heating.	No, only general reference to the need for measures to phase out subsidies for fossil fuels.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	No.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	No.	
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	Poland is preparing a strategy for renovating the national stock of residential and non-residential buildings, both public and private ones, which will be aimed at ensuring improved energy efficiency and low-emissiveness of the building stock, by facilitating a cost-effective transformation of existing buildings into nearly zero-energy ones. The Strategy will be communicated to the EC in line with the requirements of the revised Directive 2010/31/EU as a separate document, other than an annex to the National Energy and Climate Plan. But no clear timeline.	
Is individualized support to enable consumer choice (for example via one-stop-shops)?	There is a system called "National consultancy support system for the public sector, the residential sector and enterprises in the scope of energy efficiency and RES" is executed by The National Fund for Environmental Protection and Water Management[15].	

[15] https://doradztwo-energetyczne.gov.pl/.

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- **Affordable heating**

MEASURE	REFERENCE	ASSESSMENT
Are there reduced VAT rates RHC technologies? or **Have reduced VAT rates on fossil appliances ended?**	No (For fossil boilers VAT is 23%).	
Are there financial support schemes for clean heating technologies?	RES support systems: 'green certificates' and RES auctions + a strong package from National Fund for Environmental Protection and Water Management.	
Has the government ended subsidies for fossil heating?	No, only general reference to the need for measures to phase out subsidies for fossil fuels.	
Is there specific support for the most vulnerable households for clean heating?	Policies and measures to protect vulnerable consumers of electricity and gaseous fuels, but no focus on the transition to clean heating.	
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	Poland is preparing a strategy for renovating the national stock of residential and non-residential buildings, both public and private ones, which will be aimed at ensuring improved energy efficiency and low-emissiveness of the building stock, by facilitating a cost-effective transformation of existing buildings into nearly zero-energy ones, but no financial support for RHC technologies. Two main programmes for financial support: • Thermomodernization and Renovation Fund by Bank Gospodarstwa Krajowego • Renovation with energy savings guarantee EPC (Energy Performance Contract) Plus by NFOŚiGW	

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- **Removal of barriers**

MEASURE	REFERENCE	ASSESSMENT
Is there a requirement for local or regional authorities to develop heat plans?	Yes, as part of the Energy Plan Cities, acc. To Art. 19 & 20 of Energy Law PL requiring cities and municipalities to draft plans of supply of heat, energy electricity and gaseous fuels for a period of at least 15 years with updates every 3 years.	
Is there a supportive framework that enables local authorities to carry out heat planning?	Development of energy sustainable areas at the local level - The right choice of renewable and other energy sources for energy clusters, energy cooperatives etc. may ensure local self-sufficiency and thus also energy security. It is expected that 300 energy sustainable areas will be created by 2030 locally (energy clusters, energy cooperatives etc.), however besides that no specific support for local planning is foreseen.	
Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	Not specifically, but regarding the issue of granting official authorisations to installers of renewable energy sources (only biomass-fired boilers, photovoltaic systems, solar heating systems, heat pumps, shallow geothermal systems), the minister competent for energy has issued a regulation to enable persons operating on the commercial market to confirm their qualifications/competence. The provisions of the regulation ensure standardised assembly of micro installations, small installations or renewable energy installations with an aggregate installed thermal capacity not exceeding 600 kW and the impartial and independent conduct of procedure for accrediting entities providing training and certification for installers of a given type of installations.	

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Has the government introduced provisions to ease the administrative procedures (for the connection to district heating, the installation of a heat pump, etc.)?	Objective of simplification of procedures for investing in district heating network infrastructure.	

Table 20 Assessment of the Polish NECP

3.5.2 Results and recommendations

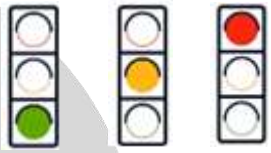
	SCORE	
High level focus on DHC	6/6 points	
Mainstreaming RHC technologies	3/10 points	
Affordable heating	4/10 points	
Removal of barriers and building capacity	5/8 points	
TOTAL	16/34 Points	

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Table 21 Polish NECP score

The analysis has been based on the 2019 NECP, as Poland at the time of the drafting of this paper did not send to the Commission the new NECP draft. Nonetheless, on the one hand, the country presented to be on the right route towards delivering some of the objectives of EU energy and climate policies in the heating and cooling (H&C) sector. On the other hand, the plan is characterised by several weaknesses which may undermine the country's ambitions in the long run if not adequately tackled in the new NECP.

High-level focus on DHC (6/6): In general, Poland strengths are in line with the central-eastern Europe tradition which gives great importance to DHC networks. Indeed, the roll out of DHC is mentioned multiple times in the NECP, especially in the context of measures for the construction, expansion and upgrading of DHC networks. Moreover, efforts to decarbonise these networks take form in the country's goal to increase the share of renewable energy in DHC to 72% by 2030 and in the introduction of a new support mechanism for high-efficiency cogeneration and systemic changes in the heating sector. It is also to be mentioned that the Polish State has foreseen dedicated support for connection to DHC.

Mainstreaming RHC technologies (3/10): The main weak points are mainly linked to the "Mainstreaming RHC Technologies" category. In particular, the government has not outlined an end-date for the installation of fossil fuel-only boilers neither in new nor in existing homes. More in general, the government has not foreseen yet a relevant timeline for phasing out fossil heating; in the NECP, only a general reference is made to the need for measures to phase out subsidies for fossil fuels. Moreover, other weaknesses are linked to the fact that RHC technologies still do not benefit from reduced VAT rates.

Affordable heating (4/10): One of identified strengths consists in the inclusion an individualized support to enable consumer choice through a system called "National consultancy support system for the public sector". As aforementioned, support also exist to connect to DHC systems. However, the government has not cancelled yet subsidies for fossil heating and clear measures to switch to clean heating targeting consumers are missing.

Removal of barriers (5/8): Plans for heating and cooling by local authorities are also considered important, with development of energy sustainable areas at the local level, however more

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support to public authorities could be included. The importance of heat plans is confirmed by an obligatory requirement from the Polish Energy Law for municipalities to deliver heat and energy plans.

Since the drafting of the 2019 NECP, some legislative progress has been made. For example, the National Air Protection Plan now forbids the use of coal in cities from 2030 and in villages from 2040, and the most polluting categories of fossil fuel boilers will be soon phased out[16]. However, the efforts made in this sense are not enough, and a plan to phase out all fossil heating (not only coal) would certainly be needed in the new NECP. More in general, EU targets for 2030 and beyond will need to be addressed properly.

Moreover, other renewables-specific plans deserve to be included in the new NECP. As an example, in May 2022 the Ministry of Climate and Environment has developed a "Multiannual Programme for the Development of the Use of Geothermal Resources in Poland"[17]. This is a roadmap for the development of geothermal energy until 2040, with an outlook to 2050. Among others, Poland's national roadmap for geothermal outlined a target to install over 200,000 geothermal HP in the country, generating 2,4 GW of heating by 2050.

Recommendations:

- Call for a clear mandatory timeline for phasing out fossil heating.
- Call for an increase of the targets of the share of renewables in 2030 in heating and cooling and ambitious objectives regarding decarbonisation.
- Build renewables-specific plans to reach 2030 targets and beyond.
- Enable sector integration regarding electricity grids and large-scale HPs.
- Implement reduced VAT rates for RHC technologies.
- Extend the streamlining of administrative procedures to heating and cooling and the district heating sector, particularly for the connection to and the development of networks.

[16] From 01.01.2024 only fossil boilers class 5 are allowed to be install as new (PN-EN 303-5:2012). Existing fossil boilers class 3 and 4 must be substituted by 2027.

[17] https://www.gov.pl/web/klimat/mapa-drogowa-rozwoju-geotermii-w-polsce.

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3.6 Portugal

3.6.1 Qualitative analysis

- **High level focus on DHC**

MEASURE	REFERENCE	ASSESSMENT
Are there clear objectives and/or measures to roll out of DHC networks?	The Portuguese NECP mentions that "On the basis of the studies and analyses carried out, it is considered that this is not a good option in the light of the climatic conditions in Portugal and therefore no developments are envisaged in the present decade."	
Is there support for connection to district heating/cooling?	None. The Portuguese NECP mentions that "On the basis of the studies and analyses carried out, it is considered that this is not a good option in the light of the climatic conditions in Portugal and therefore no developments are envisaged in the present decade."	
Are there measures and/or clear 2030 objectives to enable deployment of renewables and/or recovery of waste heat?	Portugal has raised its target for the share of renewable energy in final energy consumption for the heating sector: the target is now 43% by 2025 (36% in previous plan) and 47% in 2030 (38% in previous plan). The share of fossils fuels is expected to decrease thanks to energy efficiency and electrification measures. Portugal plans to increase the share of renewable energy through the use of renewable biomass and gases, heat pumps, high efficiency cogeneration based on renewable energy sources, solar thermal . The Portuguese NECP nevertheless states that "Portugal is one of the countries of the European Union where it may not be possible to increase the share of renewable energy sources by 1.3 %	

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	or 1.1 % per year in the heating and catering sector", but that this outlook should change in the short to medium term with the greater role of renewable gases.	

- **Mainstreaming RHC Technologies**

MEASURE	REFERENCE	ASSESSMENT
Has the government agreed to a relevant timeline for phasing out fossil heating?	As regards the use of fossil natural gas for the production of electricity, the Portuguese Climate Law provides for its prohibition from 2040, provided that security of supply is ensured.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in new homes?	No.	
Has the government outlined an end-date for the installation of fossil fuel-only boilers in existing homes?	No.	
Is there a timeline for the upgrading of the worst energy performing buildings (such as through minimum energy performance standards)?	The draft updated NECP refers to the Long Term Renovation Strategy regarding renovation objectives. This states that worst performing buildings and buildings welcoming public are the priority targets for the renovation, improving comfort and combatting energy poverty objectives. Below are the timelines mentioned in the Strategy: by 2030, to be implemented in residential buildings with worst energy performance, more specifically, permanent dwellings built prior to	

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	1990, corresponding to 65% of national building stock in2018; by 2040, in remaining residential buildings built up to 2016, corresponding to almost 100% of national building stock in 2018.	
Is individualized support to enable consumer choice (for example via one-stop-shops)?	The NECP mentions the following measures, thus addresses this issue up to a certain extent: Revise the Energy Efficiency Regulations in Housing and Services Buildings (public and private). This Regulation covers the energy upgrading of residential buildings and public and private services, ensuring better comfort and quality for their users. The revision of the Regulation through the transposition of the Energy Performance of Buildings Directive will, inter alia, have the following objectives: (I**) promote solutions capable of improving the energy performance of buildings, contributing to reducing energy demand, the need for heating and cooling and improving the energy performance of building**s; (II) enabling high-efficiency alternative systems that safeguard compliance with NZEB requirements; (III) define charging infrastructure requirements for electric mobility; (IV) adapting buildings for the integration of smart technologies, such as automation and electronic monitoring of technical building systems; (v) **carry out inspections of lighting and heating and cooling system**s; (VI) promote the registration and documentation of installation, replacement or updating of technical systems; (VII) ensure greater transparency in the methodologies for calculating the energy performance of buildings by making them fit for purpose; (VIII) ensure interoperability with other systems that assess, classify and promote water efficiency, material efficiency and decarbonisation of the building. Planned date: 2023-2025.	

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	Encouraging the use and interoperability of digital platforms for realising opportunities to improve the energy and water performance of buildings – New measure: (…) It is therefore important to encourage more extensive use of existing platforms (e.g.: CasA + portal, digital one-stop shop for the expeditious implementation of energy and water efficiency measures by residential consumers, making use of their interoperability with the Energy Certification System for Buildings (ECS) and AQUA + to speed up the process of converting the improvement opportunities identified in the respective energy certificate and water efficiency classification of buildings.	

- **Affordable heating**

MEASURE	REFERENCE	ASSESSMENT
Are there reduced VAT rates RHC technologies? or **Have reduced VAT rates on fossil appliances ended?**	The Portuguese NECP does not mention any changes on VAT related to RHC technologies. However it mentions that " Accordingly, it is set out in the above-mentioned Act that fiscal and tax policies at national level should phase out by 2030 subsidies set out in national legislation, direct or granted through tax advantages, related to fossil fuels or their use such as dedicating green tax revenues towards decarbonisation, just transition and increasing resilience and adaptive capacity to climate change and enhancing the application of the carbon rate and by applying increased taxation on the use of resources"	
Are there financial support schemes for clean heating technologies?	This is not directly mentioned in the NECP but it refers to the Environmental Fund which supports environmental policies in pursuit of the objectives of sustainable development by contributing to the fulfilment of national and international objectives and commitments,	

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	including those relating to climate change, water, waste and nature and biodiversity conservation This instrument funds non-refundable projects contributing to public environmental policies through applications that are made in the light of the notices. The beneficiaries of this fund may be: companies, NGOs, public authorities, municipalities, foundations among others. In each notice, the beneficiaries are identified. Overall, the program funds the acquisition and installation of renewable heating and cooling systems and hot water production systems (class A+ and higher). Also, applies to the acquisition of PV systems and other production units/systems for self-consumption, with and without storage.	
Has the government ended subsidies for fossil heating?	In Portugal the government has not yet ended subsidies for fossil heating but the NECP mention a measure in that direction: " Accordingly, it is set out in the above-mentioned Act that fiscal and tax policies at national level should phase out by 2030 subsidies set out in national legislation, direct or granted through tax advantages, related to fossil fuels or their use such as dedicating green tax revenues towards decarbonisation, just transition and increasing resilience and adaptive capacity to climate change and enhancing the application of the carbon rate and by applying increased taxation on the use of resources"	
Is there specific support for the most vulnerable households for clean heating?	The NECP mention the following new measure: "Promoting financing and technical assistance for the rehabilitation of buildings" that will set policies and measures to - Provide adequate financial support, in particular targeted at vulnerable households, people affected by energy poverty or living in social housing;	

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	- Provide technical assistance, including through one-stop-shops; - Design funding schemes to promote rehabilitation; - Remove non-economic barriers, including split incentives; - Monitor social impacts, in particular on the most vulnerable households. In addition, in its Environmental Fund (EF) / "Vale Eficiência", Portugal put forward a measure to "support" vulnerable families, who benefit from the social electricity tariff, with the goal to improve thermal comfort in their dwellings. It funds the acquisition and installation of renewable heating and cooling systems and hot water production systems (class A+ and higher)".	
Is there integrated financial support for building renovations (EE measures) and RHC technologies (RES, storage)?	The link between renovation and changing heating or cooling technologies to more efficient and renewable ones is not always obvious. The strategies do not seem completely integrated. However, we find both types of measures in this NECP with in particular the following measures to financially support the technologies: Promote the renovation of heating and cooling systems from renewable energy sources: Encourage the replacement of outdated heat and cold production systems with more efficient and renewable energy systems. Electrification of heating and cooling by promoting the procurement and use of heat pumps for AQS and ambient air heating and cooling in buildings. [Planned date: 2020-2030] Promote the development of a National Action Plan for heat pumps – New measure: Development of a National Action Plan to accelerate the uptake of heat pumps in Portugal	

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	in buildings and industry, with the framework of the EU Heat Pumps Action Plan.	

- **Removal of barriers**

MEASURE	REFERENCE	ASSESSMENT
Is there a requirement for local or regional authorities to develop heat plans?	None.	
Is there a supportive framework that enables local authorities to carry out heat planning?	None.	
Are there dedicated training programmes to upskill clean heating professionals (heat pump installers, electricians, solar energy installers)?	There is not dedicated training mentioned for the heating professionals but for energy and climate transition overall. Including the following ones: Promote the training and re-skilling of the professional sector for the energy and climate transition – New measure Promote vocational training for the energy efficiency sector: - Promote new training strands for specialized technicians for the energy efficiency and renewable energy sector - Promote training for construction technicians and specialists and NZEB and ZEB buildings	
Has the government introduced provisions to ease the administrative procedures (for the connection to district heating, the installation of a heat pump, etc.)?	The draft updated NECP mentions the following new measures "Set up and operate the Mission Unit for Licensing of Renewable Energy Projects (Umer 2030)", which should ease the administrative procedures as it will be responsible for:	

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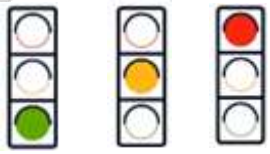
	• Procedural operationalisation resulting from the consolidation of the legal and regulatory framework applicable to electrical and environmental licensing; • Development, implementation and management of the Single Balance for Licensing and Monitoring of Renewable Energy Projects; • Proposal for a Sectoral Programme for Renewable Go-To Areas; • Actions to empower the heads and technicians of central public administration entities (DGEG, APA, ICNF, DGPC, Directorate-General for Agriculture and Rural Development), regional (Regional Coordination and Development Committees (CCDR) and local authorities (municipalities) in permitting procedures for renewable energy projects, in line with procedural operationalization.	

Table 22 Assessment of the Portuguese NECP

3.6.2 Results and recommendations

	SCORE	
High level focus on DHC	1/6 points	

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Mainstreaming RHC technologies	3/10 points	
Affordable heating	6/10 points	
Removal of barriers and building capacity	2/8 points	
TOTAL	12/34 Points	

Table 23 Portuguese NECP score

The analysis was done on the basis of the draft updated NECP that Portugal submitted to the European Commission on July 3rd, 2023.

High-level focus on DHC (1/6 points): As other southern European countries, Portugal has a low tradition of district heating networks. It is not considered a suitable option according to the analysis carried out. Spatial planning for heating and cooling, which is often important in countries developing DHC, is not mentioned, especially not at local level. But Portugal does have a strategy for increasing its share of renewable energy in the heating sector, which involves reducing consumption, electrification and the following technologies: biomass and gases, heat pumps, high-efficiency cogeneration based on renewable energy sources, solar thermal. It should be noted that district cooling is not included in the Portuguese NECP objectives.

Mainstreaming of RHC technologies (3/10 points): Regarding the mainstreaming of RHC technologies, the section demonstrates some weaknesses of the Portuguese strategies as the government did not outline an end date for the of the installation of fossil fuels only boilers in new or existing homes and the timeline set by the government regarding the phase out of fossil fuels, here natural gas, is a long way off, 2040, and subject to the condition of sufficient safety of supply.

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On the other hand, Portugal does have an ambitious renovation policy, aimed in particular at the least efficient and therefore oldest buildings, in order to reduce not only energy consumption but also the poverty and energy discomfort of its citizens. Dedicated online services to citizens are also foreseen.

Affordable heating (6/10 points): Concerning the affordable heating section, Portugal stands out with specific schemes to support vulnerable households improving the thermal comfort of their dwellings and plans to take additional measures to provide adequate support to vulnerable households. As these measures primarily concern the renovation of buildings, they also contribute to the effort of reducing energy consumption for heating and cooling, and therefore reducing the amount of fossil fuels used for this purpose.

The link between renovation and changing heating or cooling technologies with more efficient and renewable ones is not always obvious. The strategies do not seem completely integrated. However, we find both types of measures in the Portuguese NECP, in particular a plan to support cogeneration, one to develop heat pumps and one to encourage the replacement of inefficient heat or cold preparation systems with renewable and efficient systems.

Finally, the subsidy and taxation approaches are moderately satisfactory. In fact, these should no longer favor fossil fuels from 2030, but do not seem to further support renewables. However, the Environmental Fund program finances the acquisition of renewable heating and cooling systems and efficient hot water production for businesses, NGOs, public authorities including municipalities etc.

Removal of barriers and building capacity (2/8 points): Finally for the last section concerning the barriers, Portugal shows a medium score. Indeed, it fails to require local heating and cooling plans for local authorities and supporting them adequately; but has developed an upskilling programme for the energy and climate sector and is planning to improve the administrative procedures thanks to a finer Mission Unit for licensing of renewable energy projects.

Portugal should nonetheless be able to adjust its NECP in line with feedback from the European Commission, the approval of the latest legislation in progress, such as the Energy Efficiency of Buildings Directive, and developments in its own analyses and strategic thinking, in order to provide a finalized version in June 2024.

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Recommendations:

- Call for a more ambitious timeline for phasing out fossil heating.
- Call for a clear end date for the installation of fossil fuel only boilers in new and existing homes.
- Call for clear and mandatory requirements for local or regional authorities to develop heat plans and extensive technical and financial support for municipalities.
- Implement reduced VAT rates for RHC technologies.
- Build renewables-specific plans to reach 2030 targets and beyond which include further waste heat, district heating when locally relevant, and put more emphasis on cooling in their strategy.

4. Conclusions and final remarks

This report has investigated and analysed the evolving European legislative framework in the energy sector with a primary focus on heating and cooling, evaluating the ambitiousness of the new framework and comparing it with the NECPs of five Member States. While heating and cooling takes and ever-increasing part in the European legislations, also as a result of the invasion of Russia in Ukraine and the need to decrease European gas dependency, the targets and/or measures might not be ambitious enough to reach decarbonisation, as demonstrated in the report (such as indicative targets instead of binding ones, etc.). Furthermore, the analysed NECPs are on the right track to address the new legislative provisions, but will need to include stricter and more comprehensive measures should they aspire to achieve the 2030 EU targets and beyond. The European legislation evolves at a very fast pace with extremely short timelines, which might be very challenging for the Member States. Its implementation will require the creation of robust financial and technical support mechanisms in the Member States. One of the main challenges seems to be the switch from fossil to renewable energies but also the implementation of effective training strategies to generate a skilled European workforce capable of driving the transition. Below is a summary of main outcomes for key renewable sources and solutions for sustainable heating and cooling as well as that of the analysed NECPs.

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4.1 DHC

The Energy Efficiency Directive recognises the key role of district heating and cooling (DHC) in decarbonising European heating and cooling. It introduces an improved definition of efficient DHC systems based on criteria such as the share of renewable energy, waste heat and high-efficiency cogeneration over defined time periods. By 2045, efficient district heating systems should use at least 75% renewable energy and waste heat. Specific targets for renewable energy, waste heat and high-efficiency cogeneration in district heating systems provide Member States with flexibility to meet their decarbonisation targets. In addition, the Directive requires certain DHC systems to develop plans to improve energy efficiency while integrating renewable energy and waste heat. Meanwhile, the 2023 Renewable Energy Directive (RED) strongly supports the development of DHC systems, emphasising the use of renewable energy. By requiring Member States to inform end users about the energy performance of their DHC systems, the directive aims to facilitate the integration of renewables and waste heat into DHC networks. It also strengthens cooperation between DHC systems and various energy operators to ensure the efficient and reliable operation of integrated energy systems. Overall, the directives jointly emphasise transparency, ambitious targets, system services, cooperation, consumer rights and sectoral growth to promote the integration of renewable energy in DHC systems.

4.2 Waste heat

The Directives emphasise the importance of waste heat recovery and its integration into energy efficiency and renewable energy strategies, in particular with regard to efficient district heating networks, the building and industry sectors and data centres. The Renewable Energy Directive III (RED III) emphasises the need to accelerate the development of DHC systems by linking them with third-party providers of renewable energy and waste heat, hence the need for cooperation between DHC system operators and waste heat and renewables providers. Urban infrastructure and energy planning should therefore include the integration of renewable energy and unavoidable waste heat and cold. Moreover, the Energy Efficiency Directive introduces a specific percentage of waste heat recovery as one of the criteria defining an efficient DHC system. It also emphasises that local heating and cooling plans need to evaluate potential improvements in energy efficiency, waste heat recovery

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and renewable energy use. Data centres are encouraged to make use of waste heat and to analyse its cost-effectiveness. Finally, there are still weaknesses that need to be monitored, e.g. in the EED, an increased risk of disparities between Member States on the share of renewables in heat networks, in particular on issues related to the inclusion of waste heat.

4.2 Bioenergy

The changes to the Renewable Energy Directive ensure the sustainability of bioenergy, which is absolutely essential to both the sector and the feasibility for Europe to reach its ambitious climate targets. Sustainable bioenergy plays an important role in the circular bioeconomy creating value for wastes and residues from other industries which would otherwise be discarded while also supplying much needed renewable energy to a continent transitioning away from imported fossil fuels. While the overall outcome was encouraging for the bioenergy sector, there are still concerns about how REDIII will be implemented and what impact these new administrative burdens will have on compliance costs. The new strengthened sustainability criteria should be able to provide the needed public confidence in the renewability of bioenergy and allow for the creation of a stable regulatory regime which will be able to support the necessary investment in bioenergy and other renewables to accelerate the green transition.

4.3 Geothermal

Geothermal heating and cooling have the characteristics to play a crucial role in EU future energy mix: decarbonised, providing affordable heating and cooling for society, and allowing competitiveness of European industry. The EU legislator seems to have realised so in its commitment to tripling the capacity of geothermal energy by 2030[18]. In this context, the revised Renewable Energy Directive and the Energy Efficiency Directive introduce important changes to support and accelerate the uptake of geothermal energy together with the other renewable energy sources. In particular, beyond the new renewable targets concerning HC and DHC, the creation of the concept of renewable

[18] See the EU Solar Energy Strategy, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A221%3AFIN.

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go-to-areas to map the areas necessary for national contributions towards the 2030 renewable energy target are an important incentive in this sense.

However, a timely transposition and effective measures will be key; the Commission should also take advantage of the new NECP drafts in order to better monitor this implementation. Moreover, further provisions are needed at EU level to foster more effectively and in depth the deployment of renewable sources. For instance, the use of tools such as risk mitigation schemes and heat purchase agreements should made subject of more targeted measures at EU level, in order to create strong incentives for Member States to support them. Lastly, Member States should do their part and go beyond legislation by drafting renewables-specific plans to deploy in an efficient and coordinated way different renewable energy sources, following the example of the "Multiannual Programme for the Development of the Use of Geothermal Resources in Poland".

4.4 Solar thermal

The revised Renewable Energy Directive and the Energy Efficiency Directive introduce important changes to support and accelerate the uptake of renewable energy sources. Solar thermal can decarbonise heating and cooling needs in households, district heating networks and industries. Therefore, deploying solar thermal contributes to many of targets set in the revised Renewable Energy Directive, namely the share of renewables in the EU energy mix (art. 3), heating and cooling (art. 23), buildings (art. 15a), industry (art. 22a), and district heating (art. 24). Nonetheless, two crucial considerations must be highlighted: first, EU and national efforts to decarbonise heating and cooling are still largely insufficient considering that the sector represents half of the EU energy consumption. Secondly, a timely transposition and effective implementation measures are critical to the success of the new provisions introduced.

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4.5 Heat pumps

The revised directive introduces stronger measures to ensure the full utilisation of all possibilities for further development and adoption of renewable energies. This will be crucial for achieving the EU's goal of climate neutrality by 2050 and for strengthening Europe's security of

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energy supply. With regard to heat pump technology and the impact on the sector, the Revised RED, has brought some changing, especially in specific articles: art. 15a - used to suggest to MS to promote the use of renewable heating and cooling and may promote renewable based electrified heating and cooling. MS shall use all appropriate measures to promote an increased replacement rate of old heating systems and switch to renewable solutions; art 16d - which promotes to accelerate the deployment of heat pumps; art. 22a - mentioning that, when considered cost-effective, these policies and measures shall promote renewable based electrification of industrial processes. The aim of the measure is to replace fossil fuels used for industrial heating with the aim of reducing fossil fuel used for heating below 200 °C; and art.23.

Instead, the main changes in EED affecting heat pumps are present in art. 31 - expressing the default primary energy factor set to 1.9. It will be revised on December 25, 2026, and every four years thereafter; art. 8 - Gradual increase in annual energy savings target for final energy consumption from 2024 to 2030. MS shall ensure cumulative end-use energy savings of at least 1.9% of annual final energy consumption by 31 December 2030. In Annex V, art. 2 - expressing the need of exclusion of energy savings resulting from policies that encourage direct fossil fuel combustion in various sectors, with a specific focus on products, equipment, transport systems, vehicles, buildings, and works. Such energy savings will not count towards fulfilling energy savings obligations -outlined in art. 8- starting from January 1, 2024

Heat pumps are specifically mentioned as a relevant efficiency technology for the assessment of national heating and cooling potentials (Annex X), which includes residential, commercial, and industrial applications as well as district heating. Additionally, heat pumps are also specifically mentioned in the context of cost-benefit analysis for waste heat utilization (Annex XI); and also in art 25 - when it refers to the need for heating and cooling plans will increase the need for information on the municipal level including the benefits heat pumps can bring.

4.6 Local approach – how the local level is considered

The local level is much better taken into account in the new versions of the energy efficiency and renewable energy directives. Both the benefits of a local approach to the transition and the new responsibilities for local authorities (heating and cooling planning, definition of RES acceleration

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zones, new targets applying to local authorities) have been given greater prominence in the texts. However, it is important to ensure that the transposition into national legislation is accompanied by the right technical, financial and human support mechanisms for local authorities, so that all of them, whether the most advanced or the least prepared, can successfully carry out these new tasks. While some Member States are beginning to highlight the role of local authorities in the NECPs, very few are doing so concerning local heating and cooling planning or the integration of renewables in this sector.

4.7 NECPs

The analysis has confirmed that the Member States are making efforts to reach EU targets for 2030 and beyond, however, in many cases, there is a need for the foreseen targets and strategies to become stricter, as demonstrated by this report and by the recent EC assessment of 2023 NECP drafts. In many cases, the outlined specific strategies lack clear measures to reach individual targets and timelines. One of the biggest challenges seems to be the phase-out of fossil fuels, with clear and strict measures, and the roll-out of renewable energies. In most cases, the requirement to make local heat planning as well as related support measures to help local authorities in doing so are lacking. Furthermore, more efforts are to be made concerning the easing of administrative procedures and support to connect to DHC. The connection between heating and cooling and other aspects, such as electricity, is not always clear. The NECPs also vary strongly from one country to another concerning the content, the structure as well as the quality of drafting and translation. The Member States have however in most cases set a good basis towards decarbonization, which shall be further improved in the upcoming updated versions of NECP foreseen in June 2024. One of key challenges might however be the implementation in the two years following the final text approval and the space for maneouvre the Member States might apply when interpreting the texts in their respective national laws.

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