RAP®

REGULATORY ASSISTANCE PROJECT

JUNE 2021

Making renewable heating 'Fit for 55'

Samuel Thomas, Dominic Scott and Jan Rosenow[1]

Summary

In this paper, we propose four design features for a mandatory renewable heating and cooling (RES-H) target:[2]

1. Caps on the use of unsustainable bioenergy, potentially set at zero.
2. Allowing renewable electricity to count towards the target.
3. A multiplier for ambient heat (including heat pumps — ground, air, water — geothermal and solar thermal).
4. Reporting requirements to ensure the Efficiency First principle is applied.

The European Union has committed to reduce its carbon emissions by 55% net by 2030 compared with 1990 levels. The European Commission (EC) expects the 2020s to be the decade of rapid buildings sector decarbonisation. Building fabric renovation and heating system replacements are both projected to increase the share of renewable heating and cooling in all heating and cooling energy. The EC expects a major driver of change will be the replacement of coal, fossil gas and oil heating systems with heat pumps, which use electricity to transfer ambient heat to buildings. Revisions to the Renewable Energy Directive (RED) need to aim to help achieve this goal. A more ambitious and mandatory RES-H target would support this effort, but only if it does not lead to increases in the consumption of unsustainable bioenergy that warms the climate in the next decades and if it is aligned with the rest of the Fit for 55 package.

[1] The authors would like to acknowledge and express their appreciation to the following people who provided helpful insights into drafts of this paper: Femke de Jong (European Climate Foundation), Hannah Mowat (Fern), Linde Zuidema (European University Institute), Alex Mason (World Wildlife Fund), and Bram Claeys and Richard Cowart (Regulatory Assistance Project). Tim Simard and Ruth Hare provided editorial assistance.

[2] A mandatory renewable heat target would place an obligation on Member States to derive a certain portion of heating and cooling from sources defined as renewable. Member States may then introduce policy measures to help meet this target, such as through imposition of an obligation on heat businesses.

Caps on unsustainable bioenergy

Switching from fossil fuels to some types of bioenergy, such as primary[3] biomass from existing forests, would likely increase carbon emissions by 2030 (and in many cases by 2050) compared with fossil fuels, increasing the risk of irreversible climate change.[4] In addition, unsustainable bioenergy consumption accelerates biodiversity loss, while the burning of biomass causes local air pollution, with associated health impacts. Weak sustainability criteria that do not discriminate among feedstocks, coupled with funding for biomass — which may extend to unsustainable varieties — conspire to make an increase in unsustainable bioenergy use a strong possibility. Currently, bioenergy accounts for over 80% of renewable heating and cooling, and an analysis of national energy and climate plans (NECPs) concluded that bioenergy use in the sector is set to increase 11% by 2030. Stronger climate targets and a mandatory RES-H target could lead to even larger increases.

To help deal with this issue, the RES-H target could adopt either caps — potentially set at zero — or multipliers. Caps would limit the amount, or share, that some forms of bioenergy can contribute to the target. Multipliers would adjust the value of different options to Member States charged with meeting the target. Multipliers may be in the form of an uplift (a multiplier greater than 1) and a downshift (a multiplier lower than 1), applied to the credits of renewable heat options in meeting the target. Multipliers are more economically efficient when the relative values and risks associated with each of the renewable energy options are well understood. Caps are a blunter instrument and are more appropriate when the risks of an increase in the use of some energy sources is high and would undermine the achievement of the overarching policy goal.

Given the risks associated with the potential increased use of unsustainable bioenergy, we propose the inclusion of caps for certain types of bioenergy, linked to Member States' baseline consumption of these sources. This would provide some confidence that increases in renewable heat supply will not simply be met by unsustainable bioenergy sources that increase emissions compared with fossil fuels, delay investment in genuinely low-carbon technologies, and engender other negative environmental and health impacts.

Allowing renewable electricity to count towards the target

Amongst the most sustainable methods of heating buildings, electrically powered heat pumps are disadvantaged by the current RES-H accounting framework, which does not allow for the renewable portion of electricity consumption to be counted towards the target. There is no reasonable justification for what is in effect a cap of zero on renewable electricity. Removing it would allow heat pumps to deliver a higher proportion of the RES-H target, aligning it with the expectations set out in the EC's Carbon Plan Impact Assessment.

---

[3] Primary products (i.e., plant mass) are formed through direct photosynthetic utilisation of solar energy. Secondary products are formed by the conversion or decomposition of organic matter. Marquard & Bahls. (2015, December). *Important terms from A to Z: Biomass*. https://www.marquard-bahls.com/en/news-info/glossary/detail/term/biomass.html#:~:text=Primary%20products%2C%20i.e.%20plant%20mass.by%20animals%20or%20other%20consumers

[4] Camia, A., Giuntoli, J., Jonsson, K., Robert, N., Cazzaniga, N., Jasinevičius, G., Avitabile, V., Grassi, G., Barredo Cano, J.I., & Mubareka, S. (2020). *The use of woody biomass for energy production in the EU*. Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC122719

A multiplier for ambient heat

Applying a multiplier to ambient heat over the period to 2030 would encourage Member States to put in place policy measures to help overcome the market failures and barriers that slow the uptake of technologies that transfer ambient heat to buildings (heat pumps, solar thermal, geothermal). These technologies have high upfront costs and low running costs. Myopic decision-making, split incentives between building owners and tenants, and barriers to finance justify policy intervention, if cost-effective. Similarly, the relative novelty of heat pump technology in the heating sector in some European markets means that supply chains and end users can be reluctant to switch from boiler-based systems, particularly when making urgent purchases. A multiplier for ambient heat would encourage innovation in technology design and installation to bring down costs in future.

Reporting requirements to ensure the Efficiency First principle is applied

RES-H targets are defined as RES-H divided by all renewable heating and cooling. This means that an increase in renewable heating or cooling will help to meet the target, regardless of whether it displaces nonrenewable heat or is purely additional. In the latter case, both the numerator and the denominator increase by the same amount, increasing the renewable fraction. This is not aligned with one of the key principles of the Clean Energy for all Europeans package, which aims to put energy efficiency first. To deal with this issue without scrapping the mandatory nature of the target, a reporting requirement could be introduced, asking Member States to explain how their policy measures avoid the expansion of unnecessary heating and cooling and the oversizing of equipment when cheaper energy efficiency options are available.

Introduction

Heating in buildings is responsible for almost one-third of total EU energy demand, and around 75% of heat is still produced by burning fossil fuels.[5] The European Union must make decarbonising heat a major priority if it hopes to meet its new more ambitious climate goals for 2030 and beyond. This will require a vast programme of energy efficiency complemented by a shift to renewable heat.

To reach the 2030 target, the European Commission foresees significant changes to the fuels used for heating. In 2015, coal, oil and fossil gas accounted for 48% of residential buildings' final energy consumption. In the commission's impact assessment scenarios for reaching the new more ambitious 2030 target, this share is halved by 2030, with coal all but disappearing from the mix, oil consumption falling by 80%-84% and fossil gas by 37%-48%. The share of renewable heating and cooling (RES-H) is expected to rise to 39%-41%, largely driven by the take up of heat pumps that use electricity to transfer ambient heat to buildings from the air, the ground or water sources.[6] In addition, energy efficiency actions are expected to drive down final energy

[5] Rosenow, J. & Lowes, R. (2020). *Heating without the hot air: Principles for smart heat electrification.* Regulatory Assistance Project. https://www.raponline.org/knowledge-center/heating-without-hot-air-principles-smart-heat-electrification/

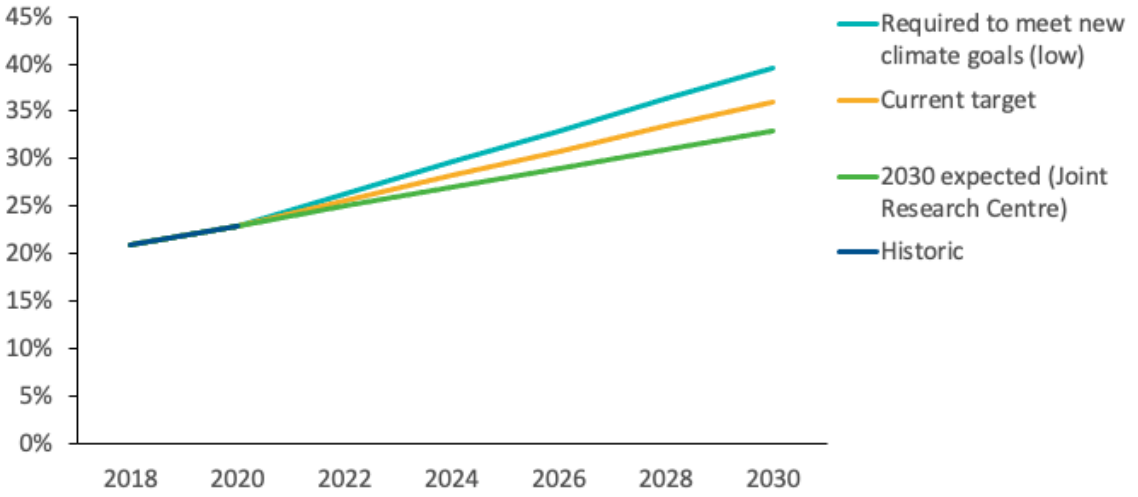
[6] European Commission. (2020, 17 September). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Stepping up Europe's 2030 climate ambition; Investing in a climate-neutral future for the benefit of our people* [Commission staff working document, impact assessment]. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020SC0176

consumption in the residential sector by 22%-25% and in the services sector by 6%-7% by 2030, relative to 2005.[7] The Climate Target Plan Impact Assessment foresees no growth in the share of bioenergy for residential space heating by 2030. It foresees a decline in bioenergy demand in residential buildings — although it is expected to remain the dominant renewable heat source in 2030 — while the amount of 'other renewables' (mostly ambient heat) increases more than 500% and electricity demand rises 25%.

Assessment of more recent national climate and energy plans (NECPs), however, points first to an expected increase of biomass in heating[8] and second to the inadequacy of existing plans. The former is a concern because many of the negative impacts of biomass burning are associated with the scale of deployment, in terms of greenhouse gas emissions, air pollution and resource efficiency.

As for the latter, ambitions spelled out in Member States' NECPs to increase the share of renewables in the heating and cooling sector fall short on delivering the EU's climate and energy goals with an expected share of renewables of heating and cooling of 33%.[9] Indeed the Renewable Energy Directive (RED) itself does not reflect the required step up in ambition with an indicative target of 36%.[10] The current gap between the expected contribution from renewables and the indicative target (Figure 1[11]) demonstrates the need for a binding target in this sector. In addition, no measures are specifically aimed at ensuring that the amount of ambient heating increases, in line with the expectations in the Carbon Plan Impact Assessment.

Figure 1. Share of renewable energy in heating and cooling



Source: Toleikyte, A., & Carlsson, J. (2021). *Assessment of heating and cooling related chapters of the national energy and climate plans (NECPs)*

[7] European Commission, 2020.

[8] See, for example, Smith, M., Kralli, A., & Lemoine, P. (2021). *Analysis on biomass in national energy and climate plans.* Trinomics. https://www.fern.org/publications-insight/analysis-on-biomass-in-national-energy-and-climate-plans-2326/

[9] Toleikyte, A., & Carlsson, J. (2021). *Assessment of heating and cooling related chapters of the national energy and climate plans (NECPs).* Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC124024

[10] Using the estimated contribution from renewables to heating and cooling energy use in 2020 from Toleikyte and Carlsson (2021) and assuming an additional 1.3% increase per year over the period 2021-2030, not taking into account different exemptions.

[11] Toleikyte & Carlsson, 2021.

The European Commission is expected to make a proposal on the RED to correct this in the coming weeks. This offers an opportunity to ensure outcomes are aligned with both climate and sustainability goals.

Managing the risk of unsustainable bioenergy

Bioenergy is the dominant renewable heating source, accounting for 17% of all energy demand in residential buildings in 2015. In contrast to the EU Commission's expectations, an assessment of Member States' NECPs suggests that the use of bioenergy for heating and cooling is set to increase 11% by 2030.[12] Stronger climate and renewable energy targets would likely drive even higher levels of bioenergy consumption. There is thus a risk that it delivers the lion's share of more ambitious renewable heat targets — and that this is achieved through increasingly unsustainable bioenergy.[13]

We consider three elements of sustainability here: greenhouse gas and biodiversity impacts of bioenergy, and human health impacts chiefly through air quality.

Greenhouse gas impacts

Although all types of bioenergy are treated as 'carbon neutral,' there is great variation in the likely impact of use by bioenergy in the 2030 timeframe. This variability in impact is driven by changes in carbon stocks, such as forests, that are not accounted for in the existing accounting framework.[14]

Accounting for these impacts would reveal this variation. Analysis shows variation by different types of biomethane.[15] Waste wood and industrial wood residues would likely offer immediate savings, while other bioenergy such as forest residues, thinnings and salvage logging (if not used for other purposes) would likely incur negative impacts. A key concern is stem wood.[16] As such, analysis suggests that 'overall, replacing fossil fuels[17] with wood will likely result in 2-3 [times] more carbon in the atmosphere in 2050 per gigajoule of final energy. Because the likely renewable alternative would be truly low carbon solar or wind, the plausible, net effect of the biomass provisions could be to turn a ~5% decrease in energy emissions by 2050 into increases of ~5–10% or even more.'[18] This means 'more permanent damages due to more rapid melting of

[12] Smith et al., 2021.

[13] Toleikyte & Carlsson, 2021.

[14] Agostini, A., Giuntoli, J., & Boulamanti, A. (2014). *Carbon accounting of forest bioenergy: Conclusions and recommendations from a critical literature review.* Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC70663

[15] Searle, S., Baldino, C., & Pavlenko, N. (2018). *What is the role for renewable methane in European decarbonization?* The International Council on Clean Transportation. https://theicct.org/sites/default/files/publications/Role_Renewable_Methane_EU_20181016.pdf

[16] Joint Research Centre. (n.d.) *Biofuels & bioenergy: GHG emissions accounting in forest bioenergy pathways*. European Commission. https://ec.europa.eu/jrc/sites/jrcsh/files/specialist%20sheet%20forest%20bioenergy_en.pdf

[17] Specifically, gas. Searchinger, T. D., Beringer, T., Holtsmark, B., Kammen, D. M., Lambin, E. F., Lucht, W., Raven, P., & van Ypersele, J.-P. (2018, 12 September). Europe's renewable energy directive poised to harm global forests. *Nature Communications, 9,* Article 3741. https://www.nature.com/articles/s41467-018-06175-4

[18] Searchinger et al., 2018.

glaciers and thawing of permafrost, and more packing of heat and acidity into the world's oceans.'[19]

These accounting issues mean the external costs of biomass use are not adequately priced in through the EU's carbon accounting framework, energy taxation or state aid assessments. This distorts the cost-effectiveness of biomass in reducing greenhouse gas emissions. Not factoring in these costs of using forest biomass may result in an inherently preferential treatment of solid biomass and hinder the development of more innovative and cleaner technologies.[20] Indeed, thus far biomass burning has increased beyond expectations, while more innovative technologies have fallen behind.[21]

Biodiversity and ecosystem impacts

Bioenergy use also gives rise to sustainability concerns through its impacts on biodiversity and ecosystems, affecting flood mitigation and water, soil and air quality (the human health implications of this are considered later).[22] Impacts vary by bioenergy. For instance, biomass from clear-cutting of trees has a greater impact on birds than does removal of dead and dying trees.[23]

Risks to human health

All biomass heating emits particulate matter, irrespective of whether the source is sustainable. The associated costs to human health are significantly higher for biomass than other renewable heating sources.[24] Other negative health impacts associated with the inhalation of toxic substances are also higher with biomass than other sources.[25] Amongst renewable heating options, only ambient heat causes none of these external costs.

Additional challenges

Adding to these challenges are the physical limits to the availability of sustainable bioenergy,[26] competition for its use where other decarbonisation options are more

---

[19] Raven, P., Berry, S., Cramer, W., Creutzig, F., Duffy, P., Holtsmark, B., Kammen, D., Levin, S., Lucht, W., Moberg, C., Moomaw, W. R., Norton, M., Rahbek, C., Searchinger, T. D., Sterman, J., Walløe, L., van Ypersele, J.-P., Waring, R., Hanrahan, M., … Powlson, D. (2021, 11 February). *Letter regarding use of forests for bioenergy* [Letter to President Biden, President von der Leyen, President Michel, Prime Minister Suga, and President Moon]. https://www.saveparadiseforests.eu/en/500-scientists-tell-world-leaders-stop-treating-burning-of-biomass-as-carbon-neutral/

[20] Zuidema, L. (2020). *State aid for solid biomass: The case for improved scrutiny.* European University Institute. https://cadmus.eui.eu/bitstream/handle/1814/68737/LAW_2020_13rev1.pdf?sequence=5&isAllowed=y

[21] Zuidema, 2020.

[22] Fern. (2018). *Burning biomass: the impact on European health*. https://www.fern.org/fileadmin/uploads/fern/Documents/briefingnote%20burning%20biomass.pdf

[23] European Environment Agency. (2020). *State of nature in the EU: Results from reporting under the nature directives 2013-2018,* Figure 4.5. https://www.eea.europa.eu/publications/state-of-nature-in-the-eu-2020/

[24] Analysis shows that the burning of biomass in homes in Flanders is the type of heating with the greatest environmental damage costs. Korteland, M., van der Veen, R., & de Bruyn, S. (2019). *Environmental damage costs of domestic heating methods.* https://cedelft.eu/publications/environmental-damage-costs-of-domestic-heating-methods/

[25] Smith, M., Moerenhout, J., Thuring, M., de Regel, S., & Altmann, M. (2020). *External costs: Energy costs, taxes and the impact of government interventions on investments.* European Commission, Directorate-General for Energy. https://op.europa.eu/en/publication-detail/-/publication/91a3097c-1747-11eb-b57e-01aa75ed71a1/language-en

[26] Analysis finds, for instance, a modest potential for renewable methane in the European Union (in the 2050 timeframe): At most, renewable methane could offset 12% of projected total gas demand or 10% of residential heating. Searle et al., 2018.

constrained than for heat, and policy support for bioenergies[27] that may extend to for unsustainable biomass.

The risk is clear, therefore, that without action the EU's more ambitious climate targets will lead to a renewable heat transition that protects neither the climate nor biodiversity.

An introduction to options for reform

Options for reform link to the issues to be addressed.

For greenhouse gas impacts, the theoretically optimal solution is to address carbon stock accounting imperfections directly and to apply carbon pricing. This presents the challenge of in-depth modelling of immense sophistication and of overcoming great uncertainty.[28] Getting prices right also requires that subsidies are not paid to unsustainable bioenergy sources.

Protections for biodiversity are required.[29] Similarly, given the local nature of most air quality externalities, local policy measures — for example, banning the use of solid fuels in urban areas — are likely best suited to tackling this problem. Indeed, the need for Member States to comply with the Air Quality Directive has driven policy action in this area, although the European Commission is taking infraction actions against a number of Member States.[30]

Absent such comprehensive reform, there is merit in exploring options in the RED to address these issues — notably safeguards and incentives — a key focus of this paper. These would build on an assessment of the impacts not otherwise captured in existing arrangements (the exact nature of which is beyond the scope of this paper). We outline these options below, after an introduction to the RED.

Current provisions in the RED

Article 23 of the RED[31] establishes an indicative target for increasing the share of renewable heating and cooling. This target is currently an additional 1.3% per year, calculated as an annual average for 2021-2025 and 2026-2030. The starting point is the share of renewable energy in the heating and cooling sector in 2020, expressed in terms of national share of final energy.

For Member States where waste heat and cold is not used, the target is 1.1% per year. In other words, Member States have an indicative target to increase the share of renewable heating by 11 to 13 percentage points by 2030 compared with 2020.

There are some limitations: Waste heat can only contribute up to 40% to the annual target. If the share of renewable heating and cooling is above 60% (such as in Sweden),

---

[27] Smith et al., 2021.

[28] Agostini et al., 2014.

[29] See, for instance, Fern. (2021, 24 March). *A world of strong and healthy forests: How the new EU Forest Strategy can make the European Green Deal vision a reality.* https://www.fern.org/publications-insight/response-to-the-forest-strategy-consultation-a-world-of-strong-and-healthy-forests-2315/

[30] European Commission. (2018, 17 May). *Air quality: Commission takes action to protect citizens from air pollution* [Press release]. https://ec.europa.eu/commission/presscorner/detail/en/IP_18_3450

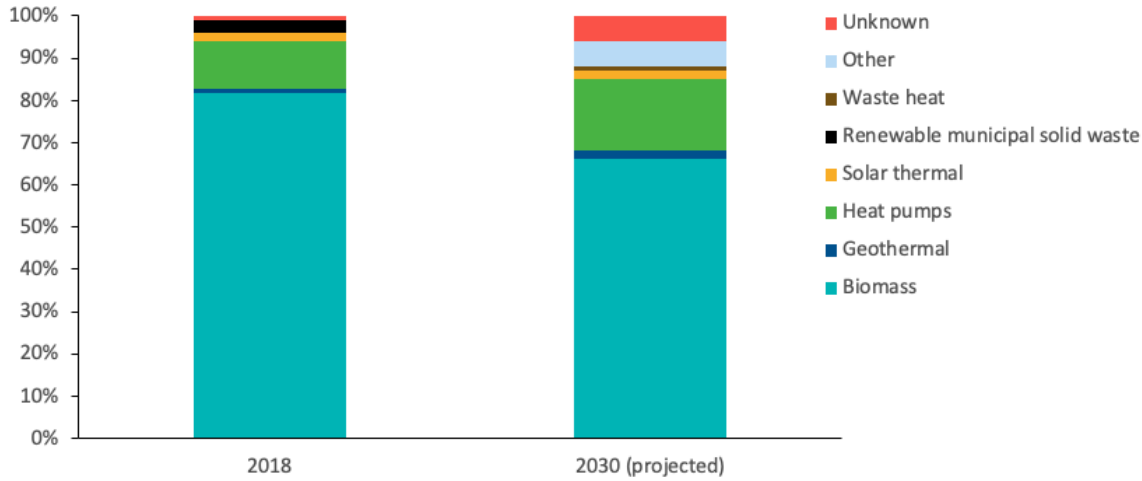
[31] European Parliament and the Council of the European Union. (2018, 21 December). *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)*. Official Journal of the European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN

any percentage point above this 60% can be counted towards the 1.3% increase. Above 50% waste heat contribution, a Member State has to achieve half of the renewable increase requirement — that is, 5.5 or 6.5 percentage points.

For district heating, the target is a 1% increase per year calculated over the period 2021-2025 and 2026-2030 (Article 24 of the RED).

There is currently no cap on any heating and cooling sources other than waste heat towards the renewable heating and cooling target. As a result, biomass contributed 81% of the total amount of renewable heating and cooling target in 2018. For 2030 it is expected to decline to 66%, still substantial (see Figure 2).[32]

Figure 2. Share of different technologies in meeting renewable heating and cooling targets



Source: Toleikyte, A., & Carlsson, J. (2021). *Assessment of heating and cooling related chapters of the national energy and climate plans (NECPs)*

For the sectoral transport target, several safeguards and incentives have been established to mitigate against unsustainable bioenergy and support alternative solutions (see Table 1).

Table 1. Safeguards and incentives for the sectoral transport target

Safeguards
Rising minimum share of advanced biofuels to 3.5% in 2030.
Maximum share of 1.7% for used cooking oil and animal fats.
Maximum shares of food and feed-based biofuels, bioliquids and biomass of between 2% and 7%, depending on the Member State.
Incentives
Multiplier ('uplift'): Electricity counts 4 times toward target for road transport and 1.5 times for rail.
Advanced biofuels count 2 times towards target.

[32] Toleikyte & Carlsson, 2021. Other analysis — such as Smith et al. (2021) — estimates it will be 70%.

In addition to those provisions, Article 15 requires Member States to specify in building codes or equivalent instruments that new buildings and those undergoing major renovations must attain minimum levels of energy from renewable energy sources. The RED currently does not specify the level of ambition required. It may be an interesting avenue, in addition to the proposed reforms below, to explore ways to encourage Member States to implement an objective hierarchy of renewable heating and cooling sources applied based on building criteria.

Options for RED reform and assessment

Safeguards

The RED contains precedents for the use of maximum and minimum shares when meeting mandatory renewable energy subtargets. Article 25 of the RED (2018) sets a minimum target of 14% of renewable energy within the final consumption of energy in the transport sector (the transport subtarget). To hit the subtarget, Member States must meet a number of requirements, including both minimum and maximum shares for certain types of fuels.

Member States must supply a rising minimum share of advanced biofuels (0.2% in 2022, 1% in 2025 and 3.5% by 2030) when meeting the transport subtarget, thus promoting the development of these fuels.[33] The impact of this provision on the actual share of advanced biofuels supplied in Member States will depend on how it interacts with the uplift for advanced biofuels provided for in Article 27 of the RED. These fuels are double counted (see Option 2 below) when calculating compliance with both the 3.5% advanced biofuels minimum and the 14% target. This effectively reduces the minimum share of advanced biofuels to 1.75% (half the minimum). The double-counting provision, however, should make it less likely that the share is limited to 1.75%.

Article 27 ensures that Member States can count a maximum share of 1.7% from used cooking oil and animal fats when meeting the transport subtarget.[34] These fuels are also double counted when calculating compliance with the 14% subtarget, effectively limiting the share to 0.85%.

Article 26 of the RED caps the maximum shares of food and feed-based biofuels, bioliquids and biomass use in the transport sector to between 2% and 7%, depending on the Member State. The maximum shares are based on Member States' food and feed-based bioenergy use in 2020. Those Member States with maximum shares lower than 7% may reduce their transport sector subtargets by the same percentage point amount. This effectively means that all Member States must meet a non-food and feed-based transport subtarget of 7% in 2030, before accounting for the impacts of the uplifts discussed in Option 2 below. In addition, Article 26(2) phases out the use of biofuels with a high risk of indirect land use change by 2030.

There are thus two basic safeguarding options, one or both of which could be applied to a renewable heat subtarget: maximum caps for unsustainable bioenergy and minimum contributions from other sources. Given that the focus of this section is on how to

[33] Advanced biofuel feedstocks are set out in European Parliament and the Council of the European Union, 2018, Annex IX, Part A.

[34] Details are set out in European Parliament and the Council of the European Union, 2018, Annex IX, Part B. Cyprus and Malta are exempt from this provision.

address sustainability concerns, we assess only the options that could be used to cap the ability of different bioenergy types to meet RES-H targets.

How might this work for heat?

The contributions of unsustainable bioenergy sources to the RES-H target could be capped, in much the same way as is already being done for waste heat, potentially reflecting both carbon and biodiversity impact. This could be achieved by:

- *Option 1*: Limiting the percentage share of a bioenergy source's contribution to the increasing share of renewable heating and cooling in all heating and cooling. For example, if a Member State's RES-H target were to increase the share of RES-H by X percentage points per year, a maximum of Y% of that increase could be delivered through the bioenergy source.
- *Option 2*: Limiting the relative share of a bioenergy source in all heating and cooling, beyond which it could not be counted towards the RES-H target. For example, if a Member State's bioenergy share were X% in 2020, any bioenergy used above X% (+/- Y%) would not count towards the target.
- *Option 3*: Limiting the absolute amount of a bioenergy source that could be counted towards the RES-H target. For example, if a Member State's bioenergy use were X in 2020, any use above X (+/-Y) would not count towards the target.

Caps could decline over time and could potentially vary among Member States, depending upon their different starting positions. Amongst the options, Option 3 — capping the amount of bioenergy eligible to meet the renewable heat target — would provide the most certain safeguard. It would also provide the clearest signal to Member States and fuel suppliers. The maximum amount could be based on an assessment of the available sustainable bioenergy resources. For unsustainable bioenergy, it would seem evident that the cap should be zero (or close to it). Options 1 and 2 provide less certainty, as the total amount of heating and cooling demand (and therefore renewables' share) will depend on economic activity, weather conditions, structural factors and the impacts of energy efficiency measures.

Multipliers for renewable energy sources

Article 27 of the RED — which sets an obligation on fuel suppliers to meet a 2030 renewable transport target of at least a 14% share of renewable energy within the final consumption of energy in the transport sector — provides examples of application of multipliers ('uplifts' if greater than 1; 'downshifts' if less than 1) for particular fuels in calculation of their contributions towards the target.[35] Specifically, an uplift is applied to:

- The share of renewable electricity that 'shall be considered to be four times its energy content when supplied to road vehicles' and which may be considered to be 1.5 times its energy content when supplied to rail transport.[36]

[35] The outcome achieved by uplifts can be provided for by downshifts. The uplift of options other than unsustainable bioenergy (and accompanying adjustment of the overall target following this 'inflation' of credits to ensure it is not diluted) gives these renewable options an advantage over unsustainable bioenergy. For a downshift, the adjustment process entails scaling down the accounted contribution to the target of unsustainable bioenergy (no adjustment of the target is required), similarly giving these renewable options an advantage.

[36] Another uplift links to a desirable subset of biomass — biofuels and biogas for transport produced from the feedstock listed in Annex IX of the RED — and provides an advantage to it by stipulating that its share 'may be considered to be twice its energy content.'

- A list of advanced biofuels (in Annex IX of the RED) that get special treatment and contribute double their energy content to the renewable transport targets.[37]

How might this work for heat?

A similar approach could be applied to renewable heating and cooling sources in shaping their contribution to RES-H targets. This could provide for a relative advantage to renewables such as ambient heat or a relative disadvantage to the more unsustainable forms of bioenergy with unfavourable impacts (in terms of carbon abatement and other environmental and health impacts). A multiplier option is:

- *Option 4*: Build multipliers from the bottom up, drawing on an assessment by Member States of the environmental impact of replacing existing heat provision with renewable options.

Ideally an uplift should support the efficient deployment of abatement options. This is the key merit of Option 4, which assigns a multiplier to energy sources according to their relative 'abatement impact' assessed against a 'do nothing' baseline. In principle, these abatement impacts may include broader impacts such as biodiversity and air quality, as well as carbon, noting it only makes sense to capture carbon impacts in an uplift to the extent they are not fully captured by existing carbon pricing instruments. (They are not captured at all currently, and although the ETS is subject to reform, our baseline assumption is they are not fully captured.)

The implementation of multipliers faces several challenges:

- The typical consumer focus on the near-term rather than lifetime costs of different options could make it challenging for obligated parties to dissuade take-up of such unsustainable bioenergy where it is a low upfront cost option. Overcoming this challenge may require obligated party assistance with upfront costs of heat pump installation. This hinges on healthy competition (and in turn well-informed consumers) as well as an efficiently designed penalty regime: If the penalty for noncompliance is too low, obligated entities will find it cheaper to deploy unsustainable options and pay the penalty.
- Summing abatement impacts across both carbon and broader environmental outcomes in a sophisticated manner would be complex.
- To provide for a harmonised approach across the EU — with sophistication in the formula for the award of credits such that they reflect variation in expected environmental savings by Member States — would be incredibly complex.

Assessment – caps and multipliers

The complexity of multiplier options and the potentially irreversible impacts associated with deployment of unsustainable bioenergy sources — glacial melt by 2030 and loss of biodiversity — suggest that the optimal solution in the RED is the introduction of caps.

[37] Transport & Environment. (2020). *RED II and advanced biofuels: Recommendations about Annex IX of the Renewable Energy Directive and its implementation at national level*. https://www.transportenvironment.org/sites/te/files/publications/2020_05_REDII_and_advanced_biofuels_briefing.pdf

Addressing barriers to efficient renewable heating technology take-up

Investment in efficient renewable heating technologies such as heat pumps and solar thermal water heaters is affected by the same barriers and market failures affecting energy efficiency investment more broadly. High upfront costs can act as a barrier, despite long-term net benefits, owing to myopic decision-making.[38] Access to finance can also be problematic in some market segments.[39] Split incentives, between landlords and tenants, along with property and rental markets that do not factor in energy costs, mean that it is often not in the interests of building owners to invest in more expensive technologies that yield long-term gains for building tenants.[40] In addition, the relative novelty of heat pumps in many European markets means that both consumers and installers can be reluctant to switch from more traditional boiler technologies, particularly when making purchases when heating systems break down.[41]

To help overcome the barriers to the take-up of efficient end-use heating equipment, a multiplier for ambient heat could be justified in the period to 2030. This would be expected to drive Member States to put in place policy measures to support the take-up of technologies that transfer ambient heat to buildings, helping to increase their market penetration (overcoming behavioural barriers associated with their novelty) and driving down their future costs through innovation in technology and installation.

The fact that ambient heat is not responsible for air quality damages and is transferred to buildings efficiently, in line with the accounting method used in the Energy Efficiency Directive,[42] could also support the core case for a multiplier, based on overcoming market barriers.

Correcting for an anomaly in RES-H accounting

Analysis has so far focused on externalities yet to be internalised in the existing framework and market barriers to the adoption of efficient heating technologies. A further issue arises from the fact that renewable electricity used to provide heating and cooling does not count towards the RES-H target. This disadvantages technologies that use electricity, including heat pumps, which are expected to play a key role in meeting the 2030 climate goal. Other renewable energy counts towards both the overall RES target and the RES-H target, including biogases, which can compete with renewable electricity in powering heat pumps.

---

[38] Gerarden, T., Newell, R., & Stavins, R. (2015). *Assessing the energy-efficiency gap* (Working Paper 20904). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w20904/w20904.pdf

[39] Troiano, S., Vecchiato, D., Marangon, F., Tempesta, T., & Nassivera, F. (2019). Households' preferences for a new 'climate-friendly' heating system: Does contribution to reducing greenhouse gases matter? *Energies, 12*(13), p. 2632. https://www.mdpi.com/1996-1073/12/13/2632/htm

[40] Gerarden et al., 2015.

[41] Sustainable Energy Authority of Ireland. (2020). *Encouraging heat pump installations in Ireland: Strategies to maximise heat pump installation and the savings produced*. https://www.seai.ie/publications/Heat-Pump-Adoption.-Maximising-Savings..pdf

[42] The Energy Efficiency Directive Article 7 Energy Savings Obligation on Member States uses the series FEC (2020-2030) to calculate targets and compliance. This is a final energy consumption series that does not include ambient heat transferred by heat pumps.

The recommended solution to this issue would be to allow renewable electricity to be counted towards the RES-H target.[43] The target would need to be increased to take account of the existing heating and cooling provided through renewable electricity and future increases in demand for heating and particularly, cooling services.

Dealing with the perverse incentive to overheat and overcool inherent in RES-H targets

The final part of this analysis deals with a fundamental issue relating to RES-H targets. Because they are defined as RES-H divided by all renewable heating and cooling, any increase in renewable heating or cooling will help to meet the target, regardless of whether it displaces nonrenewable heat or is purely additional. In the latter case, both the numerator and the denominator increase by the same amount, increasing the renewable fraction. Where the increase in heating or cooling demand is exogenous to the target design (that is, if it is caused by increases in summer temperatures, increasing economic activity or increases in income levels), this is not an issue that should be addressed through the RES-H target itself. However, the target design itself may lead to national policy measures that, by aiming to meet the RES-H target, undermine the achievement of broader climate and energy policy goals. For example, grants supporting renewable heat deployment could lead to the heating of a previously unheated space that would have remained unheated without the subsidy. Similarly, buildings undergoing renovation might receive support for the installation of renewable heating systems in proportion to their heat load. This would undermine the incentive to undertake potentially more cost-effective energy efficiency actions before the installation of a new heating system. This is not aligned with one of the key principles of the Clean Energy for All Europeans package, which aims to put energy efficiency first, and would potentially increase the costs to society of meeting climate targets.

To deal with this issue without scrapping the mandatory nature of the target, a reporting requirement could be introduced, asking Member States to explain how their policy measures avoid the expansion of unnecessary heating and cooling and the oversizing of equipment when cheaper energy efficiency options are available. Guidance highlighting good practice in policymaking could be provided to support Member States in implementing policy measures — for example, the requirement to meet minimum efficiency standards, or that cost-effective energy efficiency measures such as roof insulation be installed, before accessing renewable heating and cooling subsidies.

More fundamental changes to the RES-H target regime could be considered to avoid this problem. For example, a requirement for Member States to make carbon emissions reductions through the replacement of fossil-based systems with renewable alternatives would anchor the target to baseline consumption. This would be analogous to Article 7 of the Energy Efficiency Directive, which places an obligation on Member States to make final energy consumption savings through either energy efficiency

[43] This can be accompanied by addressing other sources of disadvantage, such as by a rebalance of taxes and levies. Rosenow, J. (2021, 4 March). *Unlocking electrification through rebalancing levies and taxes*. Regulatory Assistance Project. https://www.raponline.org/blog/unlocking-electrification-through-rebalancing-levies-and-taxes/

obligations on energy utilities or alternative measures. In the U.S. state of Vermont, a clean heat standard is being developed that would be an example of this approach.[44]

[44] Energy Action Network. (n.d.). *Clean heat standard – network action team*. https://www.eanvt.org/events-and-initiatives/clean-heat-standard/

Energy Solutions for a Changing World

Regulatory Assistance Project (RAP)®
Belgium · China · Germany · India · United States

Rue de la Science 23
B – 1040 Brussels
Belgium

+32 2-789-3012
info@raponline.org
raponline.org