Impact of a higher energy efficiency target on the renewable energy target

A briefing on the 2030 EU targets

CE Delft

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Abstract

The 2030 energy and climate framework agreed on by the European Council in 2014 includes two key energy-related targets for 2030: an EU target of at least 27% renewable energy (RES) consumed in the EU, and an indicative energy efficiency (EE) target of at least 27%, relative to projections of future energy consumption. As different levels of the EE target are currently being assessed, it is important to realise that the decision on the EE target may strongly impact the effects of a given RES target in 2030.

Since the RES target is defined as a share of energy consumption, reducing energy demand reduces the RES production capacity needed to meet the target in 2030. This effect is very substantial: if the minimum target of a 27% RES share in 2030 is combined with an EE target of 40% in 2030, the EU RES target will result in almost no additional RES capacity to be installed after 2020.

It is therefore strongly recommended to first define the energy efficiency target and then set the RES target at an appropriate level. Alternatively, the definitions of the targets could be modified, to more accurately reflect the aims of the policies. This is crucial in the light of the longer-term climate goals and the EU's Energy Union ambitions and priorities, which include the aim to retain Europe's leading role in global investment in renewable energy.

1 Introduction and background

Following the adoption of the October 2014 Council position on the 2030 energy and climate framework and also considering the position of the European Parliament, the European Commission is currently considering policy options for a range of 2030 energy and climate policy issues. The first proposals for post-2020 policies and regulations were published in July, with others expected to follow later this year.

The 2030 energy and climate framework agreed on by the European Council in 2014 included a number of quantitative targets, including:

- a binding target of at least **40% domestic reduction in GHG emissions** by 2030, compared with 1990[1];
- a EU target of **at least 27% renewable energy** consumed in the EU in 2030[2];
- an indicative **EU-level energy efficiency target of at least 27%** in 2030, compared with projections of future energy consumption[3].

The overriding aim of these targets is to help the EU achieve a more competitive, secure and sustainable energy system and to meet its long-term 2050 greenhouse gas reductions target.

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1 A proposal for a regulation on binding annual GHG emission reductions by Member States was recently published by the European Commission.

2 The position of the European Parliament calls for 30% renewable energy by 2030, while various stakeholders (renewable energy industry, NGOs) have called for a 45% target by 2030.

3 Note that this value is significantly lower than the 40% target of the position by the European Parliament.

Clearly, these three targets are strongly interrelated. Increasing the share of renewable energy sources (RES) will help meet the GHG emission target, as will reducing the EU's energy consumption. At the same time, reducing energy consumption affects the RES production needed to meet the 27% RES target: the lower the energy consumption, the lower the RES production required to achieve this target.

This briefing focuses on this last issue. Since different levels of the energy efficiency (EE) target are being assessed at the moment, it is important to realise that the decision on the EE target may strongly impact the effects of a given RES target in 2030. If an ambitious EE target is agreed on, the RES target of 27% effectively reduces current growth rates of RES capacities in the EU. These impacts could be crucial in the light of the longer-term decarbonisation goals and the EU's Energy Union ambitions and priorities, which include the aim to retain Europe's leading role in global investment in renewable energy and be world leader in developing the next generation of renewable energy technologies (COM(2015) 80).

In this briefing, this issue will be further assessed by exploring the following:

- How are the RES and energy efficiency targets defined at EU level?
- What does a higher energy efficiency target mean for the RES growth ambitions in the EU towards 2030?
- How can the current RES ambition for 2030 be maintained if the energy efficiency target is increased above the minimum level of 27% as agreed by the Council?

To demonstrate these effects, this briefing includes a number of quantitative examples. It should be noted that these are merely illustrative examples and not based on detailed modelling.

2 The definition of the targets

To assess the relationship between the RES and EE targets it is important to understand how each is defined.

The energy efficiency target for 2020 is defined in the EED as a minimum of 20% savings of primary energy by 2020, compared with 2007 projections. It is assumed that the same baseline, the 2007 projections, will also be used to define the 2030 energy efficiency target. A 27% EE target then results in a target of no more than 1,367 Mtoe primary energy consumption.

The renewable energy target for 2020 of the RED is defined in terms of the share of energy from renewable sources in gross final consumption of energy, and this definition is also expected to apply to the 27% target in 2030. The RES output required to meet this target therefore depends on how gross final energy consumption develops, i.e. on EU-wide energy efficiency efforts and a range of other developments such as economic growth.

Comparing the targets to the recent PRIMES reference scenario

It is worth noting that the 2007 reference scenario that was used to define the EE targets is fairly outdated. Since 2007 a number of scenario updates have been published reflecting actual energy use developments and policy developments, resulting in a lowering of projected 2020 and 2030 energy consumption over time. The primary energy consumption data of the most recent reference scenario, the EU Reference Scenario 2016, projects 1,436 Mtoe in 2030, a reduction of 23% compared with the 2007 baseline scenario. A target of 27% reduction of

energy consumption therefore means an additional effort of 4% compared with the current reference situation.

The 2016 reference scenario also provides a projection of the RES share in gross final energy consumption: 21.0% in 2020 and 24.3% in 2030. Comparing this with the RES target of 27%, we find that an RES production increase of only 2.7% is required compared with the reference.

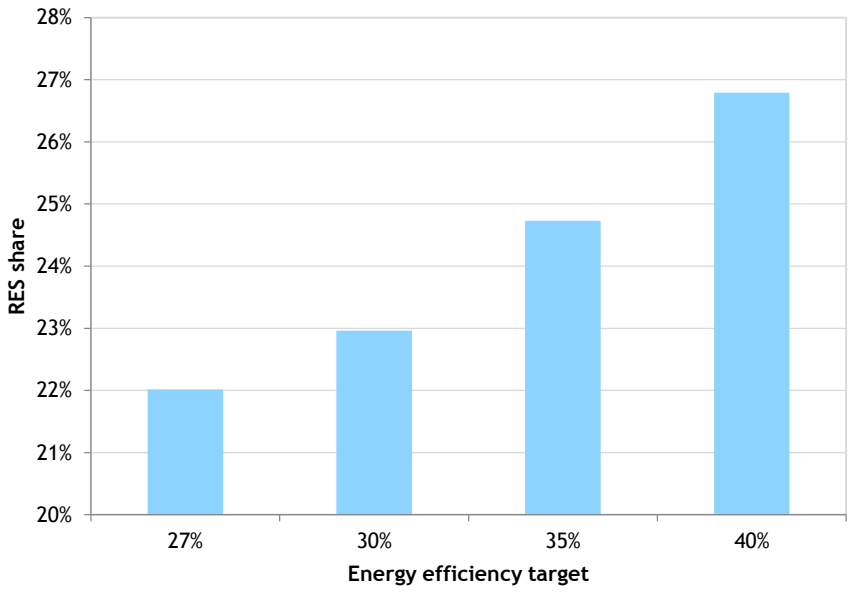
3 Quantification of the impacts

The relationship between the RES share and energy efficiency developments can be illustrated with the following example.

- Let us assume, first, that the 2020 level of RES consumption is held constant in absolute terms after 2020, at the level of the 2020 RED target. This would mean that RES production remains stable at 226.8 Mtoe after 2020.
- Let us assume, furthermore, that the energy efficiency target is increased between 2020 and 2030 from the 20% defined for 2020 (EED) to 27, 30, 35 or 40% in 2030.

In this example the reduced energy demand will automatically result in an increase of the RES share of 2030, compared to the situation in 2020, as quantified in Figure 1. In fact, the 226.8 Mtoe RES would represent a share of almost 27% of energy consumption in 2030 if an energy efficiency target of 40% is in place.

Figure 1 RES share in the EU28 if the level of RES production remains constant between 2020 and 2030



Alternatively, the effect of a 27% RES target for 2030 can be calculated for different levels of energy efficiency efforts after 2020. These results are shown in the following two bar charts.

Firstly, Figure 2 shows how much additional RES production is needed in 2030 - expressed in relative terms (%),compared with the 2020 target of 226.8 Mtoe. With an energy efficiency target of 27% in 2030, RES production has to increase by almost 23% to reach the 27% target. However, In line with the previous graph, hardly any additional capacity is needed if the energy efficiency target is increased to 40% and the RES target is set at the minimum level of 27% that was agreed on by the Council. What this means in terms of expected 2030 RES production levels is shown in Figure 5.

Figure 2 **Additional RES production needed in 2030 to achieve a share of 27%, compared with a 20% level of RES production in 2020**

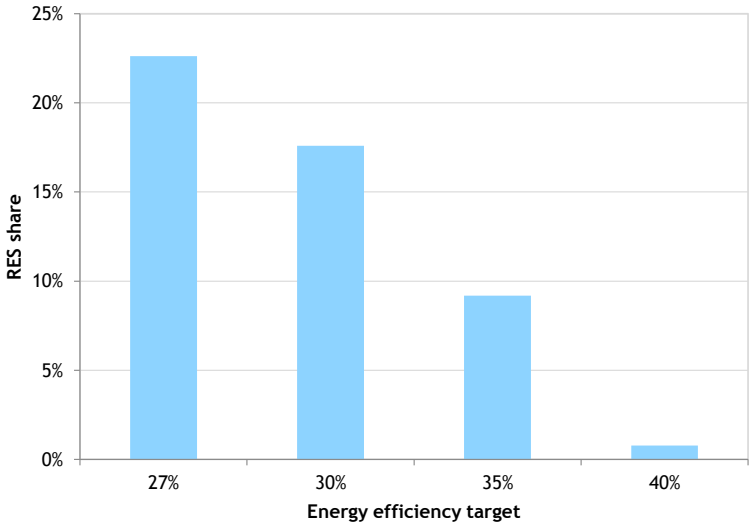
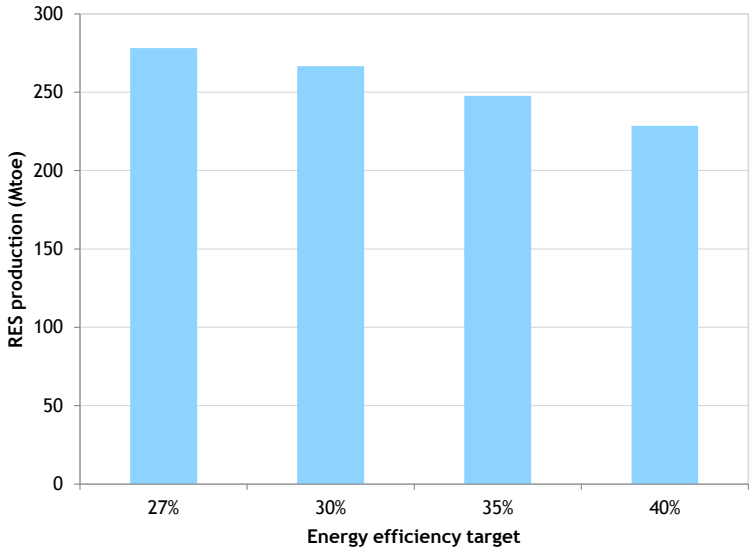
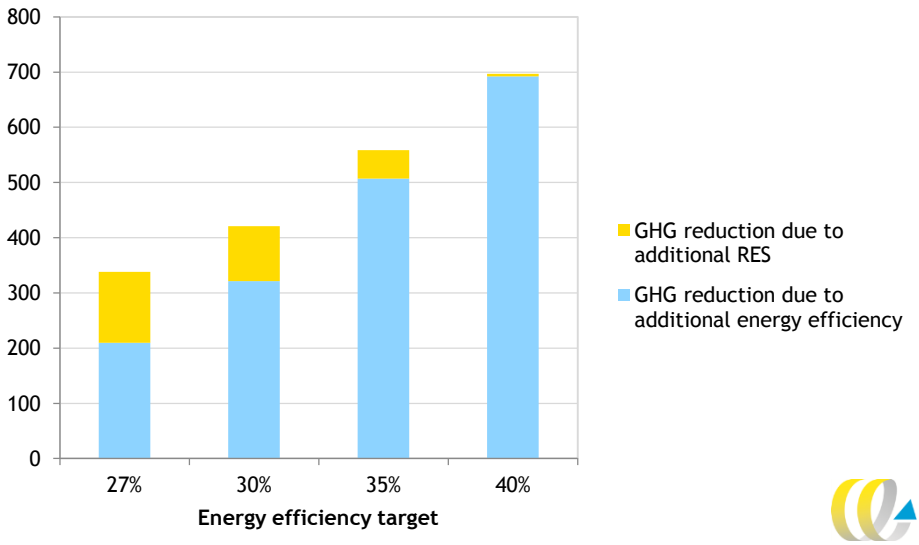


Figure 3 **2030 level of RES production in the EU28 for different levels of the 2030 energy efficiency target (in Mtoe)**



What these targets mean in terms of additional GHG emission reduction in 2030 is shown in Figure 4 for a number of 2030 EE target levels[4]. These emission reductions are due to both the enhanced energy efficiency efforts and the 27% RES target that is assumed here, as compared to the Primes reference scenario.

Figure 4 **Additional GHG emission reduction in 2030 compared to the 20% EED target of 2020, for different levels of the 2030 energy efficiency target (in Mt)**



4 Adapting the 2030 RES target to the energy efficiency target

The above results lead to the conclusion that when implementing ambitious energy efficiency targets, the RES target should be increased accordingly to ensure continued RES growth in the EU beyond 2020.

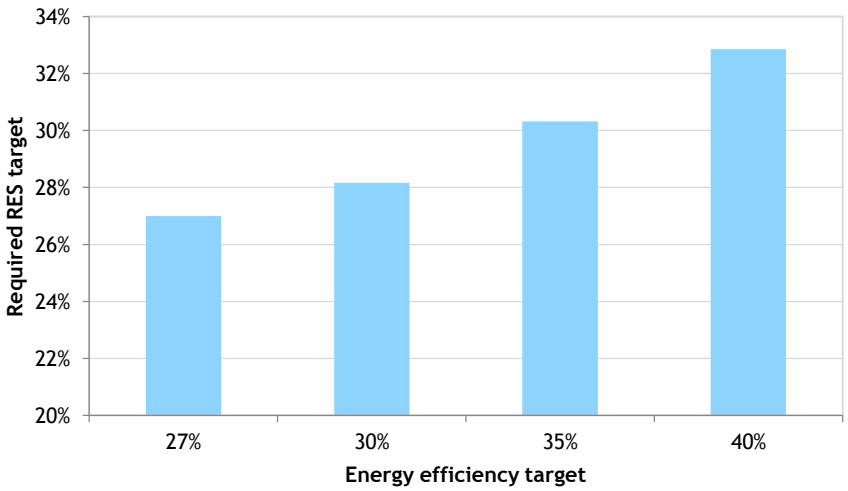
In the following, we therefore explore to what level the RES target should be increased if the level of the energy efficiency target is increased beyond 27%, to ensure the increase in RES production envisaged in the Council conclusions.

To this end, we assume that the Council aims to achieve a share of 27% RES in 2030, with an energy efficiency target of 27%: this combination of targets would result in 278 Mtoe RES production in 2030[5]. We can now determine the RES target that would result in this level of production for other energy efficiency targets, as shown in Figure 5. If the energy efficiency target is set at 40%, the RES target would have to be set at 33% to achieve the same 278 Mtoe RES production in 2030. For an energy efficiency target of 30%, the RES target would have to be set at 28% to achieve the same 278 Mtoe RES production in 2030.

[4] Note that in these calculations the GHG emissions of energy production from RES are considered to be zero.

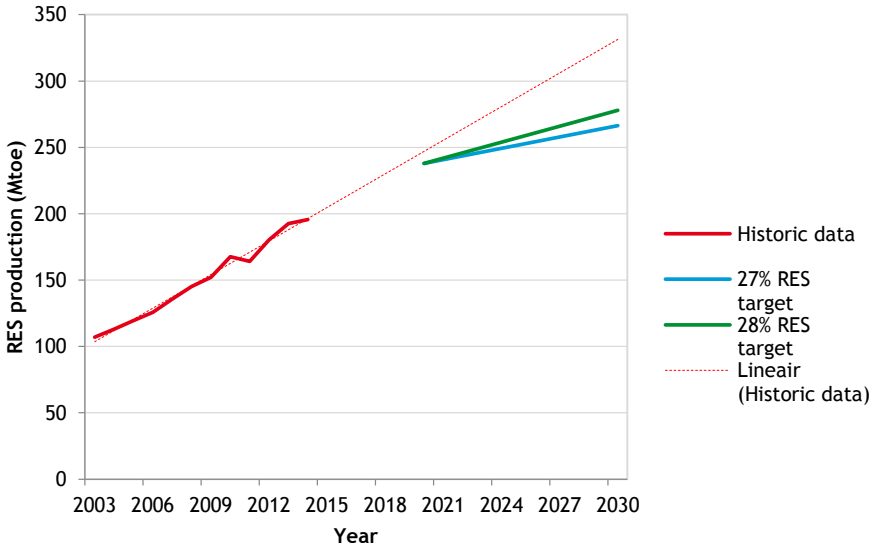
[5] Compared with the 20% target in 2020, which requires about 226.8 Mtoe RES production.

Figure 5 **RES target as a function of energy efficiency target, to achieve the ambition level expressed in the Council decision**



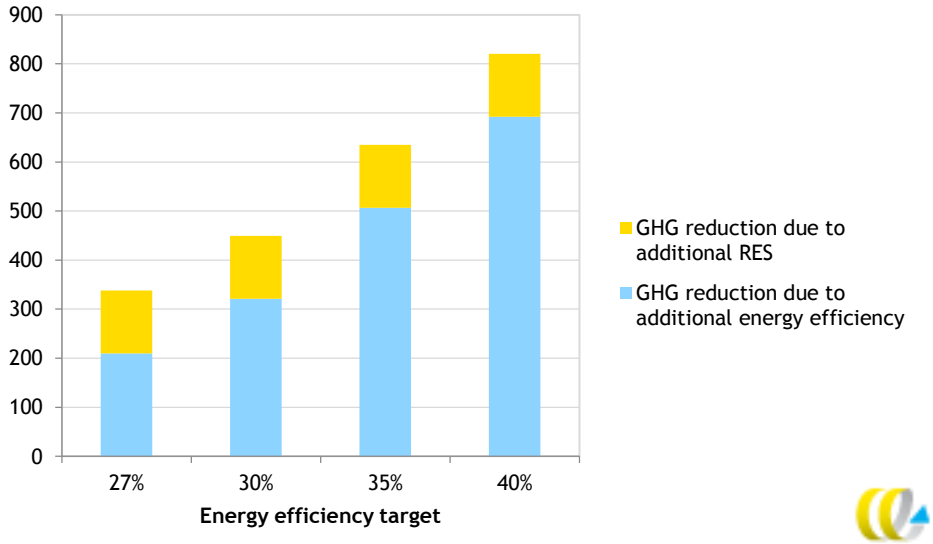
To put these data into context, Figure 6 shows the growth in RES production between 2020 and 2030 for an EE target of 30%, and RES targets of 27% and 28%, compared to the historic growth rate between 2003 and 2014.

Figure 6 **Historic RES production compared to RES production in the period 2020 to 2030 with an energy efficiency target of 30% and two different RES production targets**



Increasing the RES target as described here will result in a significant additional GHG reduction compared with setting the target at 27%, irrespective of the EE target. This is shown in Figure 7: it is estimated that the additional RES production results in about 135 Mt CO_2 reduction in 2030 in all energy efficiency scenarios.

Figure 7 **Additional GHG emission reduction in 2030 compared with the 20% EED target for 2020 for different levels of the 2030 energy efficiency target (in Mt)**



Looking at the overall GHG savings: increasing the 2030 EE target from 27% to 40% and the RES target from 27% to 33% will result in more than 480 Mt CO_2 additional GHG savings of these policies in 2030. This represents savings of about 8% compared to the 1990 GHG emission level (the baseline for the EU's climate targets).

5 RES and EE both key to sustainable development towards future climate goals

As is recognised in many if not all EU papers and policies on energy and climate, the long-term climate and energy goals can only be met with much higher levels of RES production and significant improvements in energy efficiency compared with today.

Even with a multitude of energy efficiency improvements across the EU economy, significant renewable energy production capacities will be necessary. Investments and innovation in this field are crucial for meeting the long term climate goals – and not just in RES production capacity, but also in flexible demand and energy storage, as well as in electricity market design and regulations. These innovations are likely to take decades to develop and implement.

2030 policies should reflect this need for further growth and innovation, and not only from an environmental perspective. The renewable energy sector is a growing global industry, creating a significant number of jobs in the EU and contributing to the EU's economy and global competitiveness[6]. Furthermore, the RES cost reductions we have seen over the past few years demonstrate that financial support can decline over time and that the cost effectiveness of RES policies improves as a result of innovation, upscaling of production and other learning effects.

[6] See, for example, the recent Renewables 2016 Global Status Report of REN21.

6 Conclusions and recommendations

As the calculations in this briefing illustrate, the benefit of a given RES target for 2030 depends strongly on the energy efficiency target chosen for that year: the more ambitious and effective the energy efficiency policies are, the lower the renewable energy production required to achieve a given RES share in the EU's energy consumption. Our calculations show that if the minimum target of a 27% RES share in 2030 is combined with an energy efficiency target of 40% in 2030, almost no additional RES capacity will need to be installed between 2020 and 2030.

In view of the importance of continued growth of renewable energy capacities and innovation for both the long-term climate goals and the EU's renewable energy sector, it is strongly recommended to consider both targets in unison. Once the energy efficiency target is defined, the RES target can be set at an appropriate level - not the other way round.

Alternatively, the EU might consider changing the definitions of the targets, to more accurately reflect the aims of these policies and reduce risks, such as those described here.

Whatever the case, the RES target should accurately reflect the EU's Energy Union ambitions and priorities cited earlier: the aim to retain Europe's leading role in global investment in renewable energy and be world leader in developing the next generation of renewable energy technologies.

Annex A Key data

Table 1 **Results of the quantification of chapter 3 of this briefing**

Efficiency target	27%	30%	35%	40%
RES production (Mtoe)	278	267	248	229
GHG emissions primary energy use (Mton CO_2)	2685	2574	2390	2207
GHG reduction compared to PRIMES 2016 reference scenario (%)	6%	9%	16%	22%

Table 2 **Results of the quantification of section 4 of this briefing**

Efficiency target	27%	30%	35%	40%
RES target (%)	27%	28%	30%	33%
Additional RES production compared to scenario 1 (Mtoe)	-	11	30	50
Additional GHG emission reduction compared to scenario 1 (Mton CO_2)	-	29	76	124