10 October 2008

The Turmes Formula for Heat Pumps: Q&A

A brief prepared by Micropower Europe Policy Officer Will Wachtmeister following the JDS Associates Round Table event "After the Crunch Vote: What Next for Air Source Heat Pumps?" held on 25 September.

1. What is the Turmes Formula?

The "Turmes Formula" is a proposed way of calculating the renewable energy contribution made by heat pumps to a given EU member state's "2020" renewable energy targets. The relevant extract from the amendment is as follows:

"For the calculation of renewable energy produced by heat pumps, only the share taken from the environment (aerothermal, geothermal and hydrothermal energy) shall be counted following the formula:

E renew = Q used * (1 - 1 / seasonal performance factor * average power plant efficiency in a certain country)"

Or, adding brackets for accuracy and clarity:

E renew = Q used *(1-1/(SPF* average power plant efficiency in a certain country))

The Turmes Formula was formulated and introduced into the Renewable Energy Directive by the Committee on Industry, Research and Energy (the ITRE Committee) on 9 September 2008. This, the adapted Renewable Energy Directive is known as "Compromise Amendments 1-33, Draft Report, Claude Turmes." The Turmes Formula exists only in draft form but reflects a compromise hammered out by MEPs who have been listening to a whole host of different interest groups. Unless national governments change it, it will become EU law.

2. What is SPF?

A Seasonal Performance Factor (SPF) can be roughly defined as the COP of a heat pump, as averaged out over a whole year.

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However, the Turmes Formula amendment does not offer a definition. Instead, the amendment proposes the following:

"The details for the calculation of the seasonal performance factor (SPF) will be elaborated by the standing working group on renewable energy statistics under the energy statistics Regulation (EC) No XXX before 31 December 2010. This committee will also fix minimum SPF factors for geothermal, air-water and air-air heat pumps. As long as no new decision has been taken by this committee, the minimum requirements of eco-labelling laid down pursuant to Regulation (EC) No 1980/2000, where applicable, in particular the minimum coefficient of performance established in decision 2007/742/EC, and reviewed in accordance with that regulation ***will apply."***
(taken from Compromise Amendments 1-33)

In other words, the Turmes Formula proposes an open, co-operative approach to determining SPF (albeit in a relatively tight timeframe) and also that a minimum threshold of SPF be introduced. It also proposes, as an interim measure, that eco-labeling criteria be used until official SPF methodology is established.

3. What is average power plant efficiency?

Average power plant efficiency (APPE) is not defined in the Turmes Compromise and has apparently been left deliberately vague. However, the most important thing to note is that APPE is not likely to vary much between countries or indeed over time and that it is not to be confused with grid carbon intensity.

The Turmes compromise says:

"The average power plant efficiency will be calculated from verified EUROSTAT data."

It is likely that average power plant efficiency in most countries will lie somewhere in the region of 0.35 and 0.45.

[The electric efficiency of a conventional (i.e. centralised and thermal) power station is usually considered as saleable energy produced at the plant busbars compared with the heating value of the fuel consumed, and is typically 33 to 48% efficient. Average power plant efficiency can therefore be calculated relatively unproblematically for most central power plants, including nuclear. According to a recent IEA report, average power plant efficiency is 34% globally, while the EU average is 40%. EU best practice is in Spain, at 46%. (taken from Energy Efficiency Policies around the World: Review and Evaluation Executive Summary World Energy Council, IEA 2008)]

One can reasonably expect that average power plant efficiency could be simply all a country's central power plants' efficiencies added together, divided by the total number of power plants in that country. The attraction appears to be two-fold:

1. it factors in the fact that grid electricity used by heat pumps is not "clean." (Looked at another way, it imposes a "penalty" on heat pumps for using grid electricity.)
2. the data is easily obtained and does not vary greatly between countries and is not likely to change quickly over time (in contrast to grid carbon intensity)

4. What happens if the Turmes Formula is adopted?

Unless it is changed later in the ongoing legislative process, the Turmes Formula will determine how much of its 2020 renewable energy target an EU member state will have fulfilled by installing a given amount of ASHPs, GSHPs or WSHPs. It does this by converting usable heat, SPFs and APPE into a number that reflects the total number of renewable energy generated.

In other words, the formula will determine (all other things being equal) how much policy support individual national governments will give to heat pumps. The more generous is the formula in its attribution of renewable energy to heat pumps, the more generous a national government's support is likely to be.

Under the proposed formula, a given heat pump product's SPF, as recognised by the standing working group on renewable energy statistics referred to above, will be crucial in determining how much a national policy framework for renewables will support it. This is for two reasons:

- there will be a minimum SPF threshold;
- the SPF will determine, along with the relatively constant average power plant efficiency, how "renewable" and thereby how attractive to a policymaker, a particular heat pump is.

5. Will the Turmes Formula be adopted?

The Renewable Energy Directive is a unique piece of legislation that is being hurried through in order to avoid the political embarrassment of a delay and to allow national governments to finalise their national action plans as early as possible. This in itself makes it difficult to predict the outcome.

The main question will be if national governments are receptive to the idea of changing the formula. If they are pragmatic, one can speculate that they may want a vaguer or more

generous formula to give them more leeway in meeting their 2020 targets. The proposed amendment by the French Presidency made in August (also in response to the need of a compromise on heat pumps), may reveal a pragmatic attitude on the part of at least one member state. It said simply:

"The energy used to drive heat pumps shall be deducted from the total usable heat."

However, the heat pump industry has not been able to establish itself at EU level as a bona fide 100% renewable energy technology, in the way that for example solar thermal has. This makes it politically challenging to argue against a formula that has, after all, been designed to ensure that only renewable energy from heat pumps is counted towards 2020 targets. This means that any alternative to the formula must not only be attractive to the heat pump industry but must also lend itself to successful promotion at political level.

6. Can the Turmes Formula be changed so that it becomes more generous towards heat pumps?

Currently, the Renewable Energy Directive process involves the less formal liaising between the European Parliament and the Council of Minister as they agree a final wording. Debate and examination of this nature is scheduled in for October, November and December, with "political agreement on the final act" provisionally scheduled for 8 December. The European Plenary sitting could then be on 16 December, but that provisional timetable is subject to change. This suggests that presentations to national governments will be the most effective route for any improvements in the text at this stage.

In other words, there is currently a window in the legislative process for the formula to be changed, especially by national governments at Council of Ministers' level. The success or otherwise of a campaign to improve the formula will depend on a number of factors, including:

1. How effectively national governments are "lobbied". An effective strategy would likely centre around the pragmatic argument that a more generous formula would benefit governments by giving them a handy tool in meeting their 2020 targets while being environmentally defensible.
2. How persuasive the case is for any new formula, especially whether it is a) "scientifically sound" b) "politically acceptable" to influential stakeholders.
3. Whether any proposed changes can be made without holding up the process and without sacrificing too much political capital.
4. Consistency of messages from stakeholders – mixed messaged can be very damaging at this stage.

7. Does the Turmes Formula make sense from an environmental point of view?

The Formula makes sense to the extent that it rewards heat pumps with better SPFs used in countries with more efficient electricity grids, all other things being equal. It also does not discriminate between different types of heat pumps by putting ASHP, GSHP and WSHP on an equal footing in terms of the proposed renewable contribution calculation.

However, the Formula sidesteps the issue of grid carbon intensity, presumably because it is politically problematic. Grid carbon intensity varies significantly between countries, varies over time and depends on the politically sensitive question of how to treat nuclear as a low carbon technology. (It should be noted however, that while grid carbon intensity matters from a carbon reduction point of view, it does not, in a very strict sense, matter within the scope of the Renewable Energy Directive.)

8. What alternatives have Round Table participants put up for discussion?

As far as can be gathered, three relevant alternatives have been discussed following the Round Table by the event's participants. They are:

1. a formula that takes into account not APPE, but replaces it with the renewable energy intensity in the grid of a given country OR:

E renew = Q used *(1-1/(SPF* grid renewable energy intensity in a certain country))

2. a formula that takes into account the efficiency with which the heating systems that HPs are likely to replace operate OR:

E renew = Q used *(1-(average boiler efficiency for a certain country/(SPF*APPE))

3. a formula that leaves out APPE altogether OR:

E renew = Q used *(1-1/(SPF))

The first is clearly more environmentally appealing and it may well be that this is the "ideal type" formula from a purely renewable energy contribution point of view. This is because it encapsulates both the renewable heat taken from the environment (through the SPF) and the renewable energy taken from the grid. It is likely to go down well with heat pump sceptics. However, it may prove administratively difficult and the fact that grid renewable intensity varies significantly between countries may well be politically

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uncomfortable. It is also, clearly, not very generous towards heat pumps in countries with low renewable energy penetration (such as the UK).

The second formula boosts the generosity towards heat pumps by factoring in the average boiler efficiency of a country. This may be justified by appealing to the fact that it is a logical extension to having APPE in the formula. However, the main challenge for this approach is likely to be that it is not straightforward to argue (politically) for "uplift" based on existing circumstances (other technologies are not given similar allowances). In other words, the case for this approach must be made very persuasively if it is to win over sceptics.

The third formula is a simple logical extension from the argument made by Round Table participants that SPF already encapsulates primary energy usage and that adding APPE leads to double counting. However, it will need to be promoted positively in order to convince those who are uncomfortable with the fact that heat pumps use "dirty" grid electricity. Again, sceptics may have to be won over in a compelling and co-ordinated way.

All these three formulas bear further analysis and comment.

9. Why was ASHP nearly excluded from the renewable energy directive?

MEPs on the ITRE committee were concerned that many ASHPs used large amounts of conventional electricity and proposed amendments to exclude it altogether, in a bid to make sure that the Renewable Energy Directive promoted only renewable energy technologies. It appears that there was no established, compelling political narrative to counteract this attitude.

Defensive and last-ditch campaigning led to a compromise whereby ASHP is put on an equal footing with GSHP and WSHP, albeit with a fairly strict formula for calculating (all) heat pumps' renewables contribution.

10. Why and how did Micropower Europe get involved?

Micropower Europe believes that consumers should have access to a whole portfolio of microgeneration technologies and that all technologies should receive the policy support they deserve. Only then will the correct set of choices be available to consumers and governments as they aim to improve efficiency and reduce carbon emissions.

Micropower Europe also recognises that ASHP is a highly promising technology in the microgeneration family and that well-performing ASHP products are legitimate renewable technologies.

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For example, the recent Element Energy Report said:

"Micro-CHP and air source heat pumps are the two microgeneration technologies best poised to grow rapidly and deliver meaningful energy and CO_2 savings in a supportive policy environment. These technologies have economic fundamentals which make the offer to the consumer close to compelling relative to the incumbent. Other technologies (e.g. biomass, wind and solar thermal) have potential in niche locations or if directly supported. Policies which promote micro-CHP and heat pumps will therefore be most likely to achieve widespread adoption of microgeneration.
[see The growth potential for Microgeneration in England, Wales and Scotland page 16]

When invited to get involved, Micropower Europe built a strategy that involved contacting and holding discussions with influential MEPs on the ITRE committee (directly and through industry), as well as relevant interest groups in Brussels and officials from the European Commission. Micropower Europe also formulated and spread a simple, compelling message that "discriminating" between heat pumps is not the right solution to understandable concerns.

As a result of MPE's actions along with campaigning by EPEE, HPA, BEAMA as well as individual companies, a very damaging outcome involving the wholesale disqualification of ASHP as a renewable technology was avoided.

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