CA-RES

Calculation methodology

Table of contents

Authors:
Wolfgang Bittermann, Statistik Austria, Austria
Mojca Suvorov, Statistical Office of Slovenia, Slovenia

CA-RES CONCERTED ACTION
        RENEWABLE ENERGY
        SOURCES DIRECTIVE

In a Nutshell

The RES Directive obliges Member States not only to reach the 20-20-20 targets but also to provide evidence of their fulfilment. In several cases this evidence is impossible with established methods used for compiling energy statistics because they are not suitable to obtain sufficient information for all renewable energy sources (RES). This was the situation in 2010 – the starting point of CA-RES. In order to help Member States fulfil their RES Directive reporting obligations in a harmonised and comparable manner, the focus of Working Group 2 was the resolution of these statistical problems.

The following topics were identified, discussed and mostly solved:
- Renewable heat from solid biomass, with a special focus on private households
- Solar heat
- Renewable energy from heat pumps
- SHARES 2011 & 2012
- Liquid biofuels for transport

All the work was done in close cooperation with Eurostat to assist both the member countries and the European Commission.

The following results were achieved:
- A principal agreement on the methodologies for how to collect data on heat from solar panels and heat pumps. Both methodologies are a good compromise between data accuracy and cost effectiveness. They enable the Member States to report comparable figures to the Commission.
- As for heat from solid biomass a "Quality standard for statistics on wood fuel consumption of households taking into account the relative importance for the 20-20-20 goals" was developed and published on the CA-RES website as a public report. It was presented at the Eurostat Working Group on Energy Statistics and its use is advised by Eurostat.
- The actual version of SHARES – a tool for calculating the applicable shares of RES – that was developed by Eurostat was improved in several aspects through discussion between Eurostat and the Member States.

The activities of the working group are a good example of how close collaboration between Member States that are already experienced in adequate data collection, Member States that are newcomers in these topics and EU institutions can result in broadly accepted common methodologies taking into account both the data and resources needed.

Quality standard for statistics on wood fuel consumption of households (taking into account the relative importance for the 20-20-20 goals)

2

The standard was developed to serve as support for the implementation of reliable statistics on wood fuel consumption of households. The standard focuses on consumer based surveys e.g. with ‚face to face' interviews or interviews by ‚telephone' (ideally as a computer assisted telephone interview) and not on model based calculation of wood fuel consumption in households (like in the UK).

In instances where the importance of wood fuels consumption by households is negligible and less than 5% of applicable renewables, approximate methods based on modelling and expert estimates could be an acceptable alternative.

Why this standard

Compared to fossil fuels and standardized wood fuels, statistics on non-standardized wood fuel consumption is a tricky field, because of three problems.

1. Non-standardized wood fuels are very inhomogeneous, because of:
- Their composition of different wood species with different volume
  to mass conversion factors,
- Widely different energy contents, due to
- Widely different water contents.

2. Non-standardized wood fuels have a special market situation, because of:
- A high share of non-purchased quantities,
- Widely different sources,
- ‚Grey' or informal markets,
- Different consumption behaviour compared to fossil fuels and electricity
  (e.g. infrequent users, who may be unable to give reliable data on quantity of wood fuel
  used and frequency of use; careless use of wood fuels if they are free of charge; etc.).

3. Wood fuels are difficult to survey because of:
- Often inexperienced respondents,
- No standards available,
- Often no existing bills,
- Many different units used,
- No possibility for data check with information on amounts and values.

This makes it very difficult to produce reliable statistics on wood fuel consumption – including both standardised and non-standardised wood fuels. Therefore there is an increased necessity on transparent data collection, data validation procedures and comprehensive metadata documentation.

It is obvious, that if wood fuel consumption in a country is low and its share in reaching the 2020 goals is negligible, it does not make sense to put large efforts in good quality data but on the other hand the increasing importance of wood fuel consumption urges the need for high quality data. That's the reason why three levels of importance with different data quality needs are defined.

The 3 levels of importance
1. >30% of applicable renewables:
   in this case the sampling error (with 95% confidence) should not exceed ± 3%. That means
   the maximum influence of that error on the reported share is > ±0.9 and < ±3%.
2. 10 to 30% of applicable renewables:
   in this case the sampling error (with 95% confidence) should not exceed ±10%. That means
   the maximum influence of that error on the reported share is ±1 to ±3%.
3. <10% of applicable renewables:
   in this case the sampling error (with 95% confidence) should not exceed ±30%. That means
   the maximum influence of that error on the reported share is < ±3%.

Challenge
Meets Solution

Due to the proposed methodology the potential influence of the statistical uncertainty resulting from the respective accuracy on the overall share of RES is equal and in an acceptably low range at each level.

There are 9 steps to ensure a satisfying data quality for reliable information:

1. Consumption surveys with representative samples and adequate frequencies (ideally the survey should be part of an existing general energy survey to enrich the data available for analysis and to minimise costs).
2. Well trained and experienced interviewers and an appropriate questionnaire design.
3. Well defined common wood fuel mix at regional or national level (depending on the regional spread of the most frequent tree or wood species).
4. Defined regional or national average water content of wood fuel (depending on storage period).
5. Average mass by volume unit(s) based on wood fuel mix and water content.
6. Average calorific value(s) based on the defined wood fuel mix and water content.
7. Default values for consumption by purpose (space heating, water heating, cooking) based on experts experience as basis for data validation.
8. Well documented data validation procedure.
9. Availability of time series (at least 3 survey cycles are necessary to get an impression on data reliability).

Above all points 1, 2 and 9 - as resource intensive aspects - are closely linked to the three levels of importance whereas for the other steps, well established standards should be equally available for all three levels.

The proposed procedure guarantees that the data and resources needed to collect the information are in equilibrium.

Furthermore the standard provides hints for interviewer trainings, standard conversion factors and examples for calculation and data validation procedures as well as for standard documentation.

The level of experience required for data collection to meet the reporting obligations defined by the RES-Directive differs widely between the Member States. For instance some countries have over 30 years' experience in data collection of fuel wood consumption while others are just starting data collection in this field.

Fortunately for all the data needs methodological proposals were found to be used as a starting point to develop commonly agreed solutions. During this development process the relative importance of fuel types as well as resource needs were taken into account.

The work done by WG 2 is a success story. All methodological problems were discussed and adequate solutions were developed. Furthermore the selected procedure enabled broad agreement to be reached as well as the possibility of achieving a harmonised reporting system in the midterm.

Solar heat

The discussion on the definition of solar heat focused mainly on the dilemma of whether or not to include solar air heating systems. These systems are in use mainly in North America and Canada. In Europe at the moment the market is dominated by solar water based heating systems; the solar air heating systems are not a big issue as yet.

Therefore WG 2 recommends focusing on prevailing technologies i.e. solar water based heating systems only. Active solar air heating systems should be kept in mind for the future, but not taken into account for the time being.

As regards solar cooling it was clarified that this is a consumption issue (intended use like solar water heating and solar space heating), where the energy carrier "solar heat" can be used and the focus should clearly be on final energy. Therefore, solar heat is the energy carrier used for cooling, whereas (solar) space cooling is a consumption purpose of solar heat consumption like (solar) space heating or (solar) water heating, and shall thus not be treated separately.

The proposed calculation methodology was first drafted in the frame of the EU-project Therra and was then improved in the IEA SHC programme and by ESTIF, where it was adapted to different panel types by taking into account reference systems. The method was applied in the Solar Heat World Wide report.

After intensive discussion WG 2 agreed that this IEA/ESTIF method is a good starting point for Member States who have not developed their own methodology, mainly for four reasons:
- Simple to calculate.
- Data needed is available for all MS.
- Takes into account all relevant systems for the time being.
- Follows the Eurostat/IEA fuel definitions.

Heat pumps
Annex VII of the RES Directive determines the methodology how to calculate renewable heat from heat pumps. The only problem with the given methodology is that it is practically impossible to exactly meter all data needed. Therefore a supplementary methodology to provide these data has to be developed.

Work on heat pumps started with the first draft methodology proposed to calculate renewable heat from heat pumps by Eurostat and DG-Energy. The first discussion of this topic resulted in the following main conclusions:
- Generally, there are no official statistics on heat pumps for the time being. At the moment the only data available comes from subsidies data or from heat pumps associations. The proper calculation of ambient heat from already installed heat pumps based on different technologies with different efficiencies cannot be assured without using more detailed data.
- The group agreed that heat pumps used only for water heating should also be taken into account.
- Although the average durability for heat pumps is not studied in depth in most countries figures of around 10-20 years were discussed and mostly accepted.
- The group does not agree with the proposal to completely exclude reversible air-air heat pumps as applicable RES. There is a general view that the operating hours of such installations in warm climates would not normally be 100% in heating mode, nor 0%. Therefore these heat pumps should not be excluded, but a correction factor should be applied to the

reversible air-air heat pumps in warm countries.
- The proposed $Q_{useable}$ factors, that are needed to calculate the applicable share of ambient heat properly, are too optimistic and should be replaced by more reliable (conservative) ones.
- Although participating Member States claimed some amendments, the group generally welcomed the second proposal from Eurostat and DG Energy.

This feedback influenced the further development of the drafted calculation methodology that provides guidelines for Member States on calculating renewable energy from heat pumps from different heat pump technologies pursuant to Article 5 of Directive 2009/28/EC of the European Parliament and of the Council released by DG Energy in February 2013.

SHARES
The presentation and discussion on SHARES was fruitful and the group will assist Eurostat in finding decisions on planned adaptations concerning the implementation of biofuels and bioliquids as well as of heat pumps. Eurostat will do its best to add to SHARES outputs, the exact tables of which are part of the Progress report (tables to be included are subject to data availability in the SHARES application). In that way consistency of data between progress reports submitted to DG Energy and SHARES application data - that are sent to Eurostat annually to calculate the shares of applicable RES - will be ensured as required in Article 5 Paragraph 7 of Directive 2009/28/EC.

Main Findings
and Achievements

4

The following list highlights the results achieved chronologically:

As a follow up to the proposals of WG 2 an adopted methodology for calculating renewable heat from heat pumps was presented in the Eurostat Energy Statistics Working Group by Eurostat and DG Energy. This most recent version predominantly meets the claimed amendments of the Group by proposing lower Q_{usable} factors for average climate and the inclusion of reversible heat pumps. This quick response highlights the fruitful results of the Group's work and the good collaboration with Eurostat and DG Energy.

Improvement of statistics on renewable energy sources.
During the last two years in many Member States the quality of statistics on renewable energy sources improved significantly based on experience exchange in the WG 2 CA-RES. In several countries this improvement also resulted in revisions of data sets.

Agreement on heat pumps methodology was reached.
On the whole the members of WG 2 agreed to follow the drafted methodology from Eurostat and DG ENER for the calculation of renewable energy from heat pumps but insisted on developing more reliable and realistic $Q_{useable}$ factors. Furthermore several Member States insisted that the heating share of reversible heat pumps had to be considered.

Need for common quality standards for fuel wood consumption in households statistics was recognized.
In WG 2 the need to define a common quality standard for fuel wood statistics was recognized. It is difficult to implement fuel wood consumption into energy statistics properly because wood is an inhomogeneous fuel and often it is not purchased, that means it is missing from economic statistics. Therefore the WG 2 agreed to develop such a standard by taking into account the relative importance of fuel wood consumption in the different Member States.

Quality standard for fuel wood data was accepted.
In WG 2 a common quality standard for fuel wood statistics was developed by taking into account the relative importance of fuel wood consumption in different Member States. With this action WG 2 wanted to assist the Member States. WG 2 recommends the NSIs to apply this standard to achieve comparable and high quality data on fuel wood consumption in households.

Agreement on solar heat methodology was reached.
The members of WG 2 agreed to follow the methodology developed by IEA-Solar heat and cooling program and ESTIF (European Solar Thermal Industry Foundation) as a basic common approach. As a main precondition WG 2 insisted on maintaining the methodology by considering technical development.

Solar heat calculation problems solved.
The difficulties in calculating solar heat, pointed out by several Member States, could be solved. The methodology developed by IEA Solar heat and cooling program and ESTIF (European Solar Thermal Industry Foundation) can be used in all Member States.

SHARES 2011 was presented by Eurostat and welcomed by WG 2
Eurostat presented their plans for the new SHARES version 2011. SHARES is a computing tool that assists Member States in calculating the applicable share of renewables relating to the RES directive. The planned adaptations of the previous version (SHARES 2010) were discussed and welcomed in general.

The Way Ahead

Topic	Issue	Outcomes	Future
Statistics on solar heat (WG 2)	To identify and agree on a simple but sufficiently exact methodology.	Adaptation of the methodology developed by IEA/ESTIF.	Development and use of more adequate global irradiation factors. Improvement of national sales statistics for solar panels.
Statistics on non-standardised wood fuel consumption (WG 2)	Implementation of reliable statistics on wood fuel consumption of households. Necessity of transparent data collection, data validation procedures and comprehensive metadata documentation.	Quality standard for statistics on wood fuel consumption of households.	Application of the standard within the participating countries due to the increasing importance of wood fuel and significant role in reaching the EU 2020 targets. Application of the guidelines.
Statistics on renewable heat from heat pumps (WG 2)	To assist the EC to develop a simple but sufficiently exact methodology.	Guidelines published by DG Energy.	

The Working Group has solved the crucial methodological problems and will not be continued as own Working Group in the second phase of CA-RES, but any issues concerning calculation methodology that may arise, will be treated horizontally between the continuing WGs. The 30 participating countries are now invited to implement the agreed solutions and to apply the quality standard on fuel wood consumption in households. Therefore the CA-RES was an important but only a first step to harmonized data on renewable energy sources. Especially for those countries that have no experience in renewable energy sources statistics the real work, namely to collect all the data needed, is still ahead of them.

Abbreviations

Abbreviation	Full name
CA-RES	Concerted Action on the Renewable Energy Sources Directive
ESTIF	European Solar Thermal Industry Foundation
Eurostat	Statistical office of the European Union
IEA SHC	International Energy Agency - Solar Heat and Cooling program
RES	Renewable Energy Sources
SHARES	A calculation tool to calculate the applicable shares of RES
WG 2	Working Group 2