Intelligent Energy Europe

Carbon Neutral Enterprises

Scientific Viewpoints

SECURE

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1. Introduction

IVL has carried out an evaluation of the procedures and results from the SECURE work package no 4 (WP4) on Carbon Neutral Enterprises. The evaluation is based on data and information received by Respect Europe, who has performed the work on Carbon Neutral Enterprises. The information given was very limited whereby some chapters of the evaluation are restricted to a discussion on methodological topics that are important when calculating emissions of greenhouse gases and reductions as a result of energy improvement actions.

The work on Carbon Neutral Enterprises performed by Respect Europe and evaluated by IVL is hereafter referred to as CNE (Carbon Neutral Enterprises).

2. Objectives

The objective of this report is to present scientific viewpoints of the procedure for carbon neutral enterprises developed by Respect Europe in the SECURE project (WP4).

3. Methodology

The evaluation is based on answers to a number of questions regarding the system used in WP4 and information extractable from the calculation tool developed by Respect Europe (Svante). We have not received any report describing the work, action plan, fulfilment of targets etc.

4. General description of calculation tool and action plan

The CNE method is based on an action plan, consisting of the following steps:

1. Calculation of greenhouse gas emissions
2. Emission reducing action plan
3. Review of calculation and actions
4. Climate compensation
5. Communication
6. Annual follow-up

The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol) is used for definition of system boundaries as well as some calculation prerequisites. The GHG Protocol is a standard developed by the GHG Protocol Initiative – a multi-stakeholder partnership aiming at developing accounting and reporting standards for greenhouse gases. For more information we refer to www.ghgprotocol.org.

The GHG Protocol defines three scopes for calculation of GHG emissions. Scope 1 refers to emissions from boilers and company owned vehicles. Scope 2 includes indirect emissions from use of electricity, district heating, district cooling and fuels. Other indirect emissions, e.g. emissions from outsourced activities, employee business trips and use of products are included in scope 3. Respect Europe bases their calculations on scope 1, scope 2 and employee business travel (part of scope 3). Furthermore, their method allows calculation of GHG emissions from extraction, refining and transport of fuels. Respect Europe also recommends reasonable estimations of emissions from subcontractors and employees' journeys to and from work.

To facilitate the accounting of climate profile, Respect Europe has developed a calculation tool for GHG emissions, called Svante. The tool helps the customer to make its own calculation by feeding in data. The data included for the different scopes are:

- Scope 1: Fuel combustion and fuel use in vehicles (physical or chemical processing as well as fugitive emissions are excluded or the customer can feed in data under "other emissions")
- Scope 2: Indirect emissions from use of electricity and district heating (district cooling is not included other than via optional reporting under "other emissions")
- Scope 3: Emissions from employee business travels and travels to and from work, transportation of goods, subcontractor's use of energy carriers and indirect emissions from exploration, production and refining of fuels. Other emissions of known size and origin can also be added.

When the emissions have been calculated, a plan is established for emission reducing actions. The action plan should focus on scope 1 emissions, i.e. direct emissions affectable by the company and at second hand on scope 2 and 3 emissions. CNE requires the companies to take action to reduce emissions in buildings, transports as well as the dominating source of emissions. The calculations and emission reducing action plans are then reviewed. IVL has neither received information on how the actions are prioritised and decided, nor the results from the reviews and what actions have actually been taken. Therefore, we can not comment on this step.

When the energy improvement actions have been taken to reduce the emissions of greenhouse gases the plan is to make climate compensation of the remaining part of the emissions. The climate compensation is only made through CDM projects on energy improvement and renewable energy. CNE has not used plantation of forests as climate compensation action because the long-term effects of such actions are considered too uncertain.

One aim in the SECURE project was to "certify" 30 companies in the city of Malmö and that the implemented action plans should result in a reduction of greenhouse gases of 30 kton CO_2 equivalents. We didn't receive any information on the target fulfilments, so we leave this outside the evaluation.

4.1 Calculation basis

The CNE work is based on the following calculation assumptions:

- Electricity utilisation is based on Swedish annual average electricity OR on eco-labelled electricity (hydropower or wind power)
- Emission factors for district heating are based on fuel mixes from the respective local district heating plants
- Allocation between electricity and heat in combined heat and power is made by using the efficiency method as proposed in the GHG protocol
- All emission factors are presented in Svante where some references are specified. However, the reference list is not complete and it is not presented how the emission factors were calculated for e.g. electricity and district heating.

- Efficiency levels for conversion of fuel to useful energy have been calculated for each district heating plant from data on fuel use and heat output. However, no data is given in Svante.
- Efficiency levels for electricity production are not given
- The scope 2 calculations include direct emissions from fuel combustion in large-scale stationary electricity and heat production plants and do not include emissions from production, distribution and refining of the fuels/plants.
- Scope 3 allow for calculation of indirect emissions, including employee business travel, commuting, cargo transports, outsourced activities and production of energy carriers for individual combustion or transport fuel.
- It is not clear whether emissions from extraction, refining and transportation of fuel for large-scale electricity (not eco labelled) and district heating production are included in scope 2. It is clear that they are not included in scope 3 except for eco labelled electricity. On the other hand, the comparison to emission factors for coal condensing power mentioned in Svante seems to be based on LCA data[1]. In summary, a potential inconsistency.

5. Evaluation

To achieve massive GHG emission reductions it is of great importance to involve companies and organisations of all scales. Respect Europe's work on carbon neutral enterprises is one such effort to make companies more involved and take own actions to reduce their climate impact. Although most actions to reduce GHG emissions are good actions it is still important to use a holistic perspective to minimise the risk of sub-optimisation, i.e. that companies focus only on their own climate profile and don't see or understand the results of their actions on a wider system. This scientific evaluation made by IVL in the SECURE project has aimed at giving a holistic perspective of the actions taken within WP 4, Carbon Neutral Enterprises.

5.1 Evaluation of step 1 – Calculation

To make companies take action to reduce emissions of greenhouse gases, simplifications and tools are necessary. Respect Europe has developed a calculation tool, Svante, which offers a simplified calculation of companies' climate profiles. However, in reality the conversion of an action into change of emissions is not simple at all and simplifications may give an incorrect impression of the situation. It consists of many methodical difficulties and there are only few, if any, questions that have one answer, others have several answers. Consequently, simplicity and reality can seldom be combined. This evaluation will try to shed a light on these complications.

Firstly, it is very important to emphasise that conversions from energy use into emissions are approximations. It is not possible to give one conversion factor that is applicable to all situations and that represents what actually happens in the system. Therefore, comparisons of different energy carriers must be done with great precaution. For instance, the results of a comparison of one heating system to another depend completely on the assumptions made. The choice of method strongly influences the results and it is important to have an understanding of the effects of an action on the energy system and not to choose method based on the "wanted result".

[1] From the figures on coal condensing power it seems as though LCA perspective is included OR an unusually low efficiency level is assumed. Otherwise, the numbers are normally lower.

Secondly, one must separate bookkeeping of emissions from calculation of emission resulting from changes in energy use. Bookkeeping, e.g. for environmental accounting, involve allocating responsibilities for emissions from an energy system between different actors. This purpose requires a method that yields addable emissions and the results cannot be used as basis for decision making, only for bookkeeping purposes. For situations like this average electricity is a suitable method, preferably combined with product specific electricity when a reliable system is implemented in Sweden (see further discussion below). On the other hand, if the purpose is to calculate environmental effects from a change in energy utilisation or to calculate a climate profile as basis for decisions, the method must take into account what actually happens in the system as a result of a moderate change in energy utilisation. A change in energy utilisation influences the energy system on the marginal, i.e. both the operation marginal (the technique that increases or decreases at the moment when the energy demand is changed) and the expansion marginal (the energy investments that are affected when the energy demand is changed). Consequently, marginal approaches reflect (to some extent) the short term effects in the system of moderate change in energy demand.

An interesting dilemma is encountered when evaluating Respect Europe's work, since CNE involves both bookkeeping of emissions and changes in energy utilisation. Calculation of climate profile before the improvement actions should be based on a marginal approach because it forms the basis of a decision to make a change. Also the calculation of energy improvement should be based on marginal approach as it represents a change in energy utilisation. However, the calculation of climate profile as basis for climate compensation should be based on a bookkeeping approach because this aims at determining a company's contribution to emissions from an energy system and not at forming the basis for changing energy utilisation.

5.1.1 Electricity (Scope 2)

The results from environmental assessments of changes in electricity utilisation vary strongly depending on calculation method and assumptions. The emission factors of different alternative assessment methods differ substantially, and it is therefore of great importance to thoroughly define and motivate each assumption and preferably use ranges and sensitivity analyses to demonstrate the large variations between different methods. The aim of the study may also restrict the number of applicable approaches, complicating the definition of one single approach for all purposes.

Common approaches are marginal electricity and average electricity, which in the Nordic electricity system have very different emission factors, see table X. However, these approaches are not directly comparable because they are not applicable for the same purposes. Average electricity can be used for bookkeeping purposes whereas marginal electricity describes what happens in the electricity system as a result of moderate changes in electricity demand. The approaches are described in more detail below.

Methodology in Svante

The default electricity emission factor in Svante is based on Swedish average electricity utilisation including corrections due to import and export of electricity, resulting in a mix of 86% Swedish, 5% Norwegian, 3% Finnish, 4% Danish and 2% other produced electricity. Eco-labelled electricity, based on hydropower or wind power, can also be chosen. Svante presents emission factors for average Nordic electricity and coal condensing power to allow for comparisons. Svante also allows the user to use any preferred emission factor. IVL strongly supports this, but a discussion of background and consequences would strengthen the quality.

As far as we can see from the information received, Svante only includes direct emissions from electricity production (except for electricity from hydropower and wind power) and not emissions from extraction, refining and transport of fuels. It seems inconsistent not to include upstream emissions for all electricity production.

Discussion

The purpose of a project involving conversion of electricity utilisation into environmental effects should determine the method. As mentioned above, the purposes of bookkeeping and decision-making/studying changes in demand require different approaches. Common approaches are based on average electricity (with or without electricity disclosure) and marginal electricity (simple approach or energy system modelling). These methods are described briefly below. For detailed information we refer to the reading suggestions in the end of this document.

Average electricity for environmental assessment involves defining an electricity mix and calculating emission factors from annual statistics, efficiency levels and emission factors for each fuel in the average mix. Average electricity can be based on e.g. Swedish electricity production or Nordic electricity production. Sweden, Finland, Denmark and Norway have a common electricity market where electricity is bought and sold. Despite some "bottle necks" the electricity is freely flowing between the countries. There is also an increasing electricity exchange between the Nordic countries and other countries, mainly Germany, Poland, Russia and the Baltic countries. Average electricity is suitable for bookkeeping purposes as mentioned above, but not for environmental assessment of changes in electricity demand. This would imply that a change in electricity consumption, increase or decrease, would result in a corresponding increase or decrease in production of every energy source used in the electricity mix (every reduced or increased kWh is valuated likewise). The method does not explain the actual effects on the electricity system of a moderate change in electricity consumption, e.g. an energy improvement action and does not reflect what influence a change in electricity utilisation has on the future electricity system and emissions. Average electricity for bookkeeping purposes may be combined with **electricity disclosure** (customer specific electricity). However, there is not yet a Swedish consistent system to guarantee that the eco-labelled electricity is not also sold to other customers. There is an EU Directive requiring the electricity suppliers to specify to their final customers the contribution of every energy source to the overall fuel mix and some environmental information as well. However, there are not yet any Swedish regulations for electricity disclosure and thereby no reliable method for deduction of eco-labelled electricity from a certain mix (resulting in a residual mix). Neither is there today a responsible system administrator who could monitor the system and make the deduction. The risk of double counting environmental attributes is therefore obvious and no guarantees exist today that the eco-labelled electricity bought by one customer is not also sold to others.

Marginal electricity is defined as the electricity produced in the power plant with the highest variable costs at every moment. The marginal electricity thus changes over time, both during a certain year and between different years. It is the marginal electricity production that is affected when (moderate) changes in electricity utilisation occur in the Nordic countries and therefore marginal electricity is by many considered the best base to use when studying environmental effects of changes in electricity utilisation. However, this is true at the moment when the change occurs. The problems arise when defining what is actually marginal electricity at every moment when the change in utilisation has an effect? The short-term annual average marginal electricity in the Nordic electricity system has a large element of coal condensing power; whereas natural gas combined cycle is believed by many to become marginal electricity in a few years. Changes in electricity utilisation affect the investments in electricity production and distribution. If a change in electricity utilisation is constant and has a lifetime of many years, the calculation method should take into account that changes in electricity utilisation affect the whole electricity system and the possibilities to make investments in new electricity production. This requires advanced **energy system modelling** and is not easily applicable. Sköldberg et al (2008) has analysed long-term effects, in terms of electricity generation mix and CO_2 emissions, of changes in electricity utilisation and/or production by using the MARKAL model for northern Europe (Nordic countries, Germany, Poland). The results show that moderate increases as well as decreases in electricity utilisation (about 5 TWh) affect a broad mixture of generation technologies, both fossil and renewable and i.e. not only coal condensing power. A general conclusion from the study was that the effects on CO_2 emissions were in the order of 700 g/kWh.

Table 1 below presents some assessment methods and approximate GHG emission factors.

Tabell 1. Description and comparison of different methods for environmental assessment of electricity. The GHG emissions are very approximate and presented only to give an understanding of the orders of magnitude. Emissions are including emissions from extraction, refining and transport of fuels (LCA perspective). Sources of emission factors: Uppenberg et al (2001), Sköldberg et al (2008).

	Approximate GHG emissions (g/kWh)	**Principle and scope of use**
Average electricity	~25 (Swedish), ~85 (Nordic)	• Statistic based using historic data • Suitable for book-keeping purposes.
Electricity disclosure	Depends on choice of electricity	• Eco-labelled electricity is credited, deduction from a mix should be done • Suitable for book-keeping purposes.
Marginal electricity	~850-1200 (coal condensing power), ~350-450 (NGCC)	• The average marginal electricity is used • Suitable for assessment of changes in electricity use
Energy system modelling (Sköldberg et al, 2008)	~700 (0-800 depending on scenario and assumptions for CO_2)	• Attention is paid to the future investment possibilities • Suitable for assessment of changes in electricity use

5.1.2 District heating (Scope 2)

A change in district heating utilisation affects the marginal fuels/techniques in the local district heating plant. Marginal techniques should therefore be taken into account when calculating environmental effects of changes in district heating demand.

Methodology in Svante

Respect Europe has used national district heating statistics for calculation of emissions from most Swedish district heating nets. They base the calculations of annual averages for every district heating net. This means valuating every kWh likewise, thereby not taking into account what actually happens in the system when the demand is changed moderately.

Discussion

There are marginal technologies in district heating systems as well as in electricity generation systems. The district heating demand is varying considerably during a year, affecting the fuel mix and thereby the marginal technologies. In district heating the marginal technology is thereby power dependent. The marginal technology is, correspondingly to electricity, defined as the production alternative with highest variable cost at every moment. The marginal production may change seasonally; it may be fossil or renewable and may have higher or lower emission factors than the local district heating average. An approximate comparison is that the CO_2 emissions from average Swedish district heating is 90 g/kWh (including fuel extraction, refining and transport), whereas marginal average Swedish district heating has been estimated to around 85 g/kWh[2]. Svante presents 87 g/kWh (only direct emissions) for Swedish average district heating.

Local marginal data would therefore be a better approach to explain how the system is affected by a moderate change in demand. However, the method requires data on variation of fuel consumption in relation to district heat utilisation for each plant at each moment and there is yet no simple and generally available method, although methods are being developed and generalised. Since the marginal technology and emission factors vary during a year, the properties of the actions are also of importance. E.g. a measure resulting in increased demand for district heating in the winter, but not in the summer, may affect the district system differently from a measure which affects the demand all year around.

Many district heating plants have a flexibility to substitute between different fuels. Evaluation of changes in use of district heating with long lifetimes should therefore preferably take into account possible variations of the fuel mix, e.g. as a result of political decisions, changed fuel prices etc.

Another issue often mentioned when changes in district heating demand are studied is how to handle decreases in district heating demand from CHP plants, since this affects the possibilities to produce electricity from the CHP plant. The electricity loss may then have to be compensated by imports of fossil power. However, one may also argue that the released

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[2] Based on Gode et al (2007), Sahlin et al (2004), own calculations, estimations, allocation according to efficiency method, LCA perspective including emissions from fuel extraction, refining and transport, raw data on emission factors for different fuels according to Uppenberg et al (2001). The corresponding values without indirect emissions are estimated to 75 respectively 70 g/kWh.

fuel amount (e.g. biomass) may be used for other production, e.g. for co-firing with coal in European power plants.

We agree that local district heating data is a realistic method to use today, but it does not completely explain what happens to the fuel mix at moderate changes in demand.

No information was received on how the emission factors were calculated (efficiencies, handling of waste fuel and waste heat, potential leakage of refrigerants from heat pumps etc.) except which reference was used for fuel emission factors.

5.1.3 Fuels for heating (Scope 1 and 3)

Fuels affect the climate both directly due to emissions of greenhouse gases where the fuels are combusted (Scope 1) and indirectly at the extraction, refining and transport of the fuels (Scope 3).

Methodology in Svante

Svante allows calculation of direct GHG emissions from the following fuels:

- Heating oil – environmental class 1 and 2-5
- Natural gas
- City gas
- RME
- Pellets

Discussion

Svante allows calculation with or without upstream emissions from the extraction, refining and transport of the fuels. We strongly recommend using LCA perspective, i.e. including both scope 1 and scope 3.

Emission factors are presented and in some cases the sources are presented. However, we miss some source data, e.g. for heating oil, natural gas and city gas.

The CO_2 emissions from biomass combustion (scope 1) are not considered to contribute to climate change as Svante uses emission factor 0 for biomass combustion (emissions of CH_4 and N_2O are taken into account). No motive or reference is presented, although certainly based on the assumption that the uptake of CO_2 equals the emissions in the long run. However, this approach does not take into account the importance of the time aspect, i.e. that the uptake of CO_2 is a much slower process than the release which is almost instantaneous when the biomass is combusted or correspondingly that the natural release of CO_2 – if the biomass would be naturally degraded instead of combusted – is also a substantially slower process. This assumption is generally accepted although there are reasons to question it. More information about the relevance of the time aspect is presented in Holmgren et al (2007).

The most important fuels for individual fuel combustion in Sweden are included in Svante. Although wood firing may not be that common in business premises, it does exist, both in boilers and stoves. Svante could maybe be complemented by data on wood.

Correspondingly to electricity and district heating there are marginal fuels as well, i.e. fuel production techniques with high variable costs. The Swedish Energy Agency has presented some examples of marginal fuels. One example is marginal oil produced from coal which when used for heating purposes has an estimated emission factor of 850 g/kWh compared to conventional oil with an emission factor of 310-320 g/kWh[3]. A discussion of marginal solid biofuels is presented as well, but the uncertainties and variations are considerable (Swedish Energy Agency, 2008). The knowledge about marginal fuels and their emissions is still considered insufficient to recommend Respect Europe to change their emission factors, but a discussion would increase the quality.

5.1.4 Transports

The transport sector is the largest individual source of greenhouse gas emissions in Sweden and stands for almost one third of the total greenhouse gas emissions and therefore measures and incentives for reducing emissions from transports are very important. Emissions occur mainly during the combustion of the fuel but there are also indirect emissions from extraction, refining and transport of the fuel.

Methodology in Svante

Svante includes transports in scope 1 and scope 3, where scope 1 is compulsory and scope 3 optional:

- Scope 1
  - Company owned vehicles – emissions calculated from fuel consumption
- Scope 3
  - Employee business travel (aviation, train, bus, car) – emissions calculated from travelled distance
  - Commuter travelling (train, bus, car) – emissions calculated from travelled distance
  - Cargo transports (aviation, train, shipping, lorry) – emissions calculated from travelled distance
  - Indirect emissions from extraction, refining and transport of scope 1 transport fuels – emissions calculated from fuel consumption

The fuels included in Svante are petrol, diesel, natural gas, RME, ethanol (E85), biogas, aviation fuel, LPG, propane and butane.

Discussion

Svante offers the possibility to cover an extensive part of the emissions arising from a company's use of transports, provided scope 3 emissions are included. We support the extensive data and possibilities included in Svante. However, if scope 3 emissions are excluded from a CNE project, the risk of sub optimisation is obvious. In fact, a company may reduce its emissions substantially by switching from own transports to bought transports. Hopefully, this is not the purpose of the project, but the risk should be observed and mechanisms or models for avoiding such sub optimisation should be established, even if the calculation method is in line with the GHG Protocol.

It is important to emphasise that calculation assumptions has a considerable influence on the results when calculating emissions from especially public transports where allocation of

[3] The emission factors include emissions from extraction, refining and transport of the fuel as well as emissions from combustion (estimated efficiency level of 90%).

emissions between passengers is necessary. Not only assumptions of allocation and occupancy levels influences the results, the type of vehicle and the way it is used may also have substantial effects on the emissions. A deeper explanation of the assumptions would strengthen the quality of CNE.

The emission factor for aviation is defined as 2,7 times the direct GHG emissions with reference to IPCC's Forth Assessment Report from 2007. By multiplying the direct emissions by 2,7 the indirect climate impacts from e.g. contrails are taken into account. By doing so, some kind of precautionary principle is applied. However, the knowledge is still limited and IPCC states that the climate impact from aviation may be in the range 2-4 times higher than the impact from CO_2 emissions only (IPCC, 2007). The same approach for shipping should not be, and is not, applied. The climate impact from shipping is negative when respect is paid to indirect effects but uncertainties are substantial. Taking indirect effects into account may have a negative effect on transboundary air pollution. Although somewhat inconsistent we do support taking indirect climate impact into account for aviation but not shipping. We believe that indirect climate effects and the connection to other environmental issues are not fully understood yet, and that more research is needed in this area.

There are marginal fuels in the transport sector as well as the previous mentioned sectors. However, the knowledge is considered too low or the uncertainties too large to recommend the use of marginal transport fuels.

Other viewpoints:

- No information was received regarding source data for emissions from shipping and road transport by lorry
- Assumptions on occupancy levels were not presented for all relevant cases.
- Vague source data in some cases.
- The emission factors for ethanol are based on Uppenberg et al (2001) which summarises an LCA from 1996 on Swedish production of ethanol from wheat. The data might need updating. Furthermore, the utilisation of ethanol today is only covered by 15-20% from Swedish ethanol; the majority is imported from e.g. Brazil.

5.1.5 General viewpoints

Comparisons of different energy carriers

All methods for converting changes in energy utilisation into corresponding emission changes are approximations. Therefore, we recommend great precaution when comparing different energy carriers to each other. With the methodology chosen by Respect Europe there is an obvious risk of sub optimisation and/or "odd decisions", e.g. conversion from district heating to electricity based heating may in some cases yield a better climate profile.

Allocation of GHG emissions from CHP

Respect Europe uses the efficiency method for allocation of GHG emissions between electricity and heat from CHP plants. The principle of this method is to give credit to both electricity and heat for increasing the utilisation of the fuel compared to separate production. The allocation is made according to the amount of fuel energy needed used to produce each final output, but separately (not combined). The method is standardised both in the GHG Protocol and in ISO 14040-43.

Other alternatives are e.g. (with concise explanations);

- Primary energy method: the whole CHP credit is allocated to the heat/steam (electricity is assumed to be produced in condensing plant)
- 200% efficiency method: the whole CHP credit is allocated to the heat/steam (200% efficiency is assumed for heat production)
- Energy method: the whole CHP credit is allocated to the electricity (allocation is made according to the output of electricity and heat/steam)
- Work potential method: emissions are allocated based on energy content of the steam and electricity products
- Economic allocation: allocation is based on the economic value of each output stream

The efficiency method is recommended in the GHG protocol, whereas the primary energy is implemented in a European standard (EN 15316-4-5:2007 ”Heating systems in buildings. Method for calculation of system energy requirements and system efficiencies”). The major difference between these methods is that the former allocates more emissions to the heat/steam than the latter[4]. Some argue that the primary energy method better describes what actually happens in the Swedish system (see e.g. SOU 2008:25). The primary energy method also requires less data to perform. The choice of method may have significant influence on the results and sensitivity analyses may be recommended.

Emissions within EU ETS

Measures influencing utilisation of electricity, heat/steam and fuels included in the international emissions trading system (EU ETS)do not actually result in changed GHG emissions in the short time perspective as long as the system is working properly and there is not a substantial excess of emission rights. “Working properly” implies that there is an realistic emission ceiling for all plants included in the trading and that emission rights are bought if emissions are exceeded and vice versa. Emission reductions from one plant allow others to increase their emission by the same amount. However, reduced utilisation of electricity/heat/fuels included in the EU ETS implies that it will be easier and cheaper to achieve the target as somebody else has already made the reduction and the price of emission rights will decrease. All these factors make it easier to achieve stricter future targets which will lead to reduced emissions in the long term perspective. We therefore support Respect Europe’s approach to not take this into account, although a discussion would be suitable.

Waste and waste heat

We can’t find any information on how waste and waste heat have been treated and therefore we cannot comment on this.

Life times of improvement actions

The lifetimes of any emission reducing actions are extremely important when calculating climate profiles before and after a project. If the action has a lifetime of one year only, the emission reductions may be correct the first year, but what happens then? No discussion whatsoever is included in the documentation IVL has received.

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[4] A calculation example with assumed outputs of power 30%, heat 60%, and assumed efficiencies for individual generation of electricity and heat of η_p=40%, η_h=90% gives the following results;
Efficiency method: allocation power = 53%, allocation heat = 47%
Primary energy method: allocation power = 75%, allocation heat = 25%

LCA data

The methodology and approach chosen in Svante mainly influences emissions within Sweden. For instance changes in electricity mainly affect emissions in Sweden as Swedish average electricity is chosen. Corresponding reasoning is applicable to transports, fuel combustion and use of district heating as well. However, emissions from extraction, refining and transports of fuels (in those cases included) may occur in other countries. We strongly support the use of LCA data, but a discussion on this topic would be valuable.

District cooling

District cooling is not included in Svante, although a rising demand (individual electricity based cooling is included through changed use of electricity).

5.2 Evaluation of step 2 – Action plans

Very limited information was received about this step.

Methodology in CNE

The action plans focus on scope 1 emissions, but should preferably also include scope 2 and 3 emissions. The companies are required to take action to reduce emissions from both buildings and transports as well as from the dominating source of emissions.

Comments about methodology

As far as we can see from the information received there seems to be a risk of sub optimisation, since emissions in scope 3 must not be included. An effective way of decreasing a company's climate impact is thus to move emissions from scope 1 to scope 3, e.g. by moving transports from company owned vehicles to bought transports. There should be a mechanism to prevent such measures.

Based on the assumptions and emission factors chosen by Respect Europe, changing from district heating to individual electricity based heating may be one way to improve the climate profile. This situation may occur if the local district heating emission factor is moderate to high (> 47 g/kWh for direct electricity heating or > 100-150 for heating pumps) or if a company at the same time changes to eco-labelled electricity. Generally, IVL recommends extreme precaution when comparing different energy carriers to prevent sub optimisation like this example. We hope that the guidelines given by Respect Europe to the companies do take considerations like this into account.

The CNE procedure requires the companies to take action to reduce emissions from the dominating emission source. We hope that this implies that if the dominating source of emissions is within scope 3, actions must be taken to reduce these emissions even though scope 3 is optional. Otherwise, there is a risk that dominating emission sources are ignored.

5.3 Evaluation of step 3 – Review

No information was received on this step.

5.4 Evaluation of step 4 – Climate Compensation

After implementing action plans and reviewing of these, the next step in CNE is climate compensation. Very limited information was received so we can only present a short discussion.

Methodology in CNE

Climate compensation is part of the CNE procedure. Only CDM projects within energy improvement and renewable energy are included, whereas reforestation/afforestation is considered too insecure. This approach is also in line with the original SECURE plan which states that only Kyoto mechanisms (CDM and JI) should be included.

Discussion

No information was given about the procedure for calculation of carbon offset size; is it calculated directly from remaining climate profile after implementing action plan or is some multiplicator applied? Are the same emission factors used when calculating the remaining emissions as when the potential emission reductions were analysed? Which companies deliver the climate compensation services?

The Swedish Energy Agency, who is the Swedish Designated National Authority for Clean Development Mechanism (DNA) and Designated Focal Point for Joint Implementation (DFP) only recommends climate compensation by purchasing emission reduction units from EU ETS or from CDM and JI projects, i.e. only CER, ERU and EUA are recommended today, whereas VER are not recommended at present due to lack of control system[5]. They state that the emission reductions must be additional, verified, surveilled and registered. The Swedish Energy Agency also recommends some reliable companies who deliver climate compensation services. These recommendations should be followed.

5.5 Evaluation of step 5 – Communication

No information was received on this step.

5.6 Evaluation of step 6 – Annual follow up

No information was received on this step.

6. Concluding remarks

The participation of companies of all sizes in the mitigation of climate change is very important and CNE provides a valuable effort and tool to reduce energy use and emissions. However, there is a potential for improvements of the tool which is summarised below:

- The system lacks a holistic view, e.g. a company may improve its climate profile by outsourcing activities (moving activities from scopes 1 or 2 to the optional scope 3). The method should be complemented by routines to prevent sub optimisation like this. Furthermore, a company may improve its climate profile by changing from district

[5] CER = certified emission reduction (emission reductions from CDM projects), ERU = emission reduction unit (emission reductions from JI projects), EUA = EU allowances (emission allowances within the EU ETS).

heating to electricity heating (if eco labelled electricity is chosen and/or if the district heating net to some extent is based on fossil fuels).

- The method only includes emission from use of energy and fuels. Emissions from use of products are not included although recommended by the GHG protocol[6].
- LCA perspective is not compulsory and upstream emissions are not included for district heating and electricity heating (except for hydropower and wind power).
- No information was received on the target fulfilment presented in the SECURE project description.
- A more extensive list of references should be added.
- The description of calculation procedure, assumptions and source data should be added.
- Life times of improvement actions are not taken into account.
- Eco labelled electricity can be chosen although there is no mechanism today to avoid double counting of environmental attributes from the eco labelled electricity.
- Average electricity and district heating is not the best way to assess environmental effects of changes in demand of electricity and district heating[7]. For electricity there are better alternatives which are simple to use, whereas assessment of district heating may have to be based on averages due to lack of data.

7. Reading suggestions

Gode J and Axelsson U (2007); "Ursprungsmärkning av el i de Nordiska länderna – förstudie med fokus på kundperspektiv", Elforsk report no 07:10, 2007

Holmgren K et al (2007), "Biofuels and climate neutrality – system analysis of production and utilisation", Elforsk report no 07:35, June 2007

Sahlin et al (2004); "Effects of planned expansion of waste incineration in the Swedish district heating systems", Resources Conservation and Recycling, 41 (4) pp 279-292, 2004

Sköldberg H et al (2008); "Effekter av förändrad elanvändning/elproduktion – modellberäkningar", Elforsk report no 2008:30, 2008

Sköldberg H et al (2006); "Marginalel och miljövärdering av el", Elforsk report no 06:52, 2006

SOU 2008:25; "Ett energieffektivare Sverige", Delbetänkande från Energieffektiviseringsutredningen, 2008

Swedish Energy Agency (2008); "Koldioxidvärdering av energianvändning – Vad kan du göra för klimatet?", Energimyndigheten underlagsrapport, September 2008

Swedish Energy Agency (2007); "Klimatkompensation – Frivillig kompensation av växthusgasutsläpp", Energimyndigheten PM, November 2007

[6] Emissions from products can be added as "other climate impact", but it requires the company to actively calculate these emissions.
[7] The tool allows the user to choose any preferred emission factors and some examples are given. This is strongly supported.

Swedish Energy Agency (2007); ”Energy Performance Contracting – en modell för minskad energianvändning och miljöpåverkan”, Författare: Gode, Strömberg, Axelsson, Särnholm, Energimyndigheten report no 2007:35

Swedish Energy Agency (2002); ”Marginal elproduktion och CO_2-utsläpp i Sverige”, Energimyndigheten report no 14:2002, 2002

Uppenberg S et al (2001); ”Miljöfaktabok för bränslen – Del 2. Bakgrundsinformation och Teknisk bilaga”, IVL B-rapport 1334B-2, 2001