

**Environmental Change Institute
University of Oxford**



**Consumer Information on Electricity
Final Report**

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Written by

Jane Palmer (jane.palmer@eci.ox.ac.uk), Environmental Change Institute

Brenda Boardman (brenda.boardman@eci.ox.ac.uk), Environmental Change Institute

Veit Buerger (v.buerger@oeko.de), Oeko Institut

Christof Timpe (c.timpe@oeko.de), Oeko Institut

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The Consumer Information on Electricity Project

The project ‘Consumer Information on Electricity’ (CIE) was carried out on behalf of the European Commission. The objective of this study was to assess the options for European guidelines for consumer information on electricity, in order to facilitate the Member States to fulfil the requirements of consumer information laid down in Directive 2003/54/EC.

Directive 2003/54/EC, repealing Directive 96/92/EC, concerning common rules for the internal market in electricity, asks Member States to ensure that consumers are informed about the fuel mix of the electricity supply. In a liberalised electricity, market environmental arguments are increasingly used in marketing. Therefore, agreeing common principles on how to give the consumer information about the fuel mix and the environmental consequences of the electricity produced is becoming vital.

The CIE project is very closely linked to the Altener funded 4CE (Consumer Choice and Carbon Consciousness for Electricity) project, which both the ECI (4CE and CIE project leader) and Oeko Institut are involved with. The 4CE project is investigating the potential and options for a European wide disclosure scheme and building the basis for an electricity label for Europe. The CIE project builds heavily upon the work done in the 4CE project, which has provided an essential springboard of knowledge and information for CIE.¹ The contribution of the four other 4CE project partners, the Central European University (Hungary), EVA (Austria), IT Power (UK) and SEI (Sweden), should be acknowledged in providing a sound basis for the CIE project.

This document is the final report of the CIE project, based on extensive research since the project started in February 2003, including a stakeholder consultation, undertaken in June 2003, involving suppliers, consumer associations and environmental organisations throughout Europe (details provided in Appendix D).

¹ For further details and project reports, please see the 4CE project website: www.electricitylabels.com

Executive Summary

The revised European Directive 2003/54/EC concerning common rules for the internal market in electricity was adopted in June 2003 and is due to be implemented in summer 2004. This Directive introduces the concept of electricity disclosure where consumers are provided with information about the attributes of the electricity they are buying.

At a minimum, the Directive requires that the disclosure information relates to the suppliers portfolio for the preceding year, with fuel mix information provided in or with the bill and promotional materials. Environmental information, in terms of at least CO₂ emissions and radioactive waste, must be provided at least on an existing reference source which must be referred to in or with the bill and promotional materials. Member States are required to ensure that the information provided to final consumers is reliable.

In interpreting of the text of the Directive, the following details have been defined as a basis for the discussion in this report:

- The disclosure information (fuel mix and environmental impact) should relate to the last calendar year.
- The portfolio refers to all the electricity sold to final consumers, both domestic and non-domestic, by the company that is named on the bill (i.e. not necessarily the parent company).
- ‘Promotional materials’ refer to material that is sent out directly to customers, rather than newspaper and magazine advertisements, and includes printed brochures, tender documents and price quotations.
- The requirement for reliability in the Directive implies that some form of tracking mechanism is required in the electricity market, rather than relying on statistical averages, to avoid double-counting of electricity attributes and large shares of electricity with unspecified attributes.

Four key criteria have been identified as the crucial factors against which any disclosure scheme should be assessed: consumer information, reliability, cost, speed (Section 3).

An approach which represents minimal compliance with the Directive (Section 6.1) is likely to take around 3 years to implement and so would not be a particularly high speed option. Such an approach is unlikely to provide a sufficient level of consumer information, reliability or cost-effectiveness and is therefore not recommended.

The recommended approach, which goes beyond the minimum specified in the Directive (Section 6.2), is likely to take around 4 years to implement and would ensure a significantly higher level of consumer information, reliability and cost-effectiveness. The following recommendations relate to this approach, dealing first with the information provided to consumers and how this is displayed, followed by recommendations on how this information should be gathered through the tracking mechanism.

Disclosure information display

This refers to the type of information that should be included as part of disclosure and how this information is presented to the final customer:

- There should be harmonisation of the disclosure information content and the layout in which it is presented to consumers at the Member State level, with some common criteria specified at a European level.
- Any supplier selling electricity outside of its own country must display the disclosure information in the style and language of the country that it is selling in.
- The disclosure information display should be the same for both domestic and non-domestic consumers as a minimum.
- Environmental information should be displayed in or with the bill and promotional material along with the fuel mix information.
- It is recommended that the disclosure information (both fuel mix and environmental impact) is displayed on a separate leaflet or insert which is sent out with the bill (examples given in Appendices A, B and C).
- It is recommended that there is a prominent link to the leaflet or insert displayed on the bill.
- Disclosure information displayed on promotional materials should use the same graphics as the information displayed in the separate leaflet.
- Comparative reference figures for both the fuel source and environmental impact information should be provided as part of the disclosure information. It is suggested that country averages are used initially but that European averages may become more appropriate over time with a liberalised European market.
- Reference figures should refer to average consumption in the relevant country or region rather than average generation.
- It is optional for Member States to decide whether to show the total proportion and country(s) of origin of imported electricity.
- Provision of personalised information (e.g. 'your electricity usage resulted in x kg of CO₂ emissions') on or with the bill should be optional at a supplier level.
- Member States should ensure that appropriate auditing and verification processes are put in place to ensure reliability of information displayed on bills, promotional materials or given over the telephone.
- Suppliers should be free to provide product information in addition to their portfolio disclosure but it is recommended that Member States should require that if a supplier chooses to differentiate one or more products, they must then provide product and portfolio information to all customers.

Frequency of distribution

- It is implicit in the Directive that the disclosure information is made available to consumers in or with the bills at least once a year. It is suggested that the decision as to whether this information should be sent out more frequently is decided at the Member State level. However, it is recommended that, in the early stages of the disclosure system, the information is sent out at least twice a year, if the billing processes allow, in order to raise awareness of the issues amongst consumers.

Fuel source information display

The following recommendations relate to the type of information on fuel sources that should be covered and the way in which this detail should be displayed:

- Fuel sources should be listed individually rather than in generic groups.
- Member States should agree a fixed list of fuels to be used by all suppliers, including a detailed breakdown of renewables and a category for 'other'.
- Member States should consider limiting the list of fuel source categories to around 10-12 (including any detailed listing of renewable sources) to limit complexity.
- Common definitions and terms for the various fuel sources should be agreed between the Member States. Definitions of renewables should be based on those given in the Renewables Directive 2001/77/EC.
- Suppliers display their fuel mix portfolio in line with the standard list, even if they have to show some sources at 0% (this is to ensure a uniform display within a country and comparability between suppliers).
- Any imported electricity is assigned to the relative fuel source category within the supplier's overall fuel mix.
- A combination of a pie chart and table should be used to display the fuel source information.
- It is recommended that the pie chart is only ever used to illustrate the supplier's portfolio while the table provides a more detailed breakdown of renewables and national averages for the total fuel mix (including details on renewables).
- If the supplier has chosen to display both product and portfolio information, the pie chart should be used to illustrate the portfolio (to ensure comparability with labels from other suppliers), whilst details on the product and national averages can be displayed in a table.

Environmental information display

These recommendations relate to the type of environmental information that should be included and how this should be displayed.

- Given the complexity of environmental impact information, it is suggested that the minimum list of indicators specified in the Directive (CO₂ emissions and radioactive waste) is sufficient as a European standard for the time being. This could be revised at a later date if a consensus amongst Member States on other significant environmental impacts emerges.
- However, Member States could still be given the option to include additional environmental indicators of particular relevance to their country (although it should be noted that this has implications for the tracking mechanism which may then have to be designed to satisfy the maximum data requirements of all Member States).
- CO₂ figures should be given as kilograms/kWh and radioactive waste should be expressed as micrograms/kWh.
- Absolute figures (expressed per kWh) should not be the only information provided. These figures should be displayed in combination with some form of ranking or indexing for ease of comparison between suppliers and to allow consumers to calculate their own personal emissions.
- Format for display of the environmental information is decided at the Member State level, but with some guidance on possible options from the EU (based on recommendations in Section 4.3.2).
- It is recommended that the environmental information is presented in a ranked or indexed display. Further consumer research is required in order to identify the most effective display format from a consumer perspective.
- Information on CO₂ emissions and radioactive waste should always be displayed together and not in separate locations.

Comparative information

- There should be an independent catalogue, provided by a body such as the industry regulator or national consumers association, comparing what is offered by all suppliers (based on the disclosure information on a portfolio basis at a minimum and on products, if applicable) within a certain region which is made available to all consumers (on the internet and in hard copy).

Tracking system

The tracking system creates unambiguous links between power plants and electricity sold to final consumers and uses them to allocate power generation attributes. The following points relate to the recommended approach for tracking:

- The disclosure scheme should not be heavily based on statistical averages. Such a system cannot convert consumer preferences into price signals for generators and therefore does not allow consumer choice to have an impact.
- It is recommended to introduce comprehensive tracking systems following the flexible approach to tracking (as outlined in Section 5.7), based on central registries in each Member State. Such a registry can hold both tags (which are transferred together with electricity contracts) and certificates (which are traded independently from these contracts). Market participants can choose whether to use a tag or certificate or convert one to the other. The registry can provide suppliers with all information which they have to disclose to their consumers. The operation of this system should be monitored very closely in order to allow for corrective action if required.
- The registries can be operated by regulators, Independent System Operators or any other independent body nominated by Member State governments. Member State should explore whether synergies can emerge from combining the operation of the registries and the carbon registries required under the Emissions Trading regime.
- Member States should develop their tracking systems with as much harmonisation as possible in order to support the internal market for electricity. This is one of the most critical points in setting up electricity disclosure schemes in Europe.
- The use of the tracking mechanism should be made voluntary and a residual mix should be introduced at least for an introductory phase. However, since the use of a residual mix reduces the accuracy of disclosure information, Member States should not allow extensive use of this option.
- The use of the residual mix and its impact on the accuracy and reliability of the disclosure information should be monitored closely by Member State governments and the Commission and regulatory action taken if necessary.
- The residual mix should not be split up by suppliers to create separate products.
- The registries should support disclosure of product information if this option is allowed by a Member State. In this case, suppliers should be required to maintain separate accounts at the registry for the attributes of their products in order to ensure transparency.
- The central registry provides an appropriate means of verifying the tracking mechanism and the data disclosed to consumers.
- Additional verification should be carried out on the input data to the registry by independent accredited auditors, based on existing verification mechanisms or those under development (e.g. the EU Emissions Trading Scheme) where possible.

- The overall level of accuracy and reliability of the tracking mechanism should be comparable in all Member States.
- The tracking mechanism should be merged with the system for Guarantees of Origin for electricity from renewables and cogeneration in the Member States.

Tracking system information coverage

The following recommendations relate to which data are included in the tracking system:

- Member States should agree on a common basis for how power plants are included in the tracking system. This can be done using e.g. either plant-specific or generic emission factors.
- The rules for selecting which fossil fuel plants are covered by plant-specific emissions factors should be based on rules for coverage under the monitoring procedures of the intended EU Emissions Trading Scheme.
- A minimum generation capacity should be established for the inclusion of individual plant data from nuclear and renewable power plants in the disclosure scheme. Low capacity plants should be integrated into virtual units of higher capacity in order to be included in the tracking scheme.
- Specific regulations should be considered by Member States for power plants using multiple fuels.
- As far as possible, the disclosure scheme should use data that are already available e.g. plant generation data from the settlement procedures in the electricity market.

Tracking of fuel source information

- Member States should agree on which fuels are covered by the tracking mechanism. For example, hard coal and lignite could either be tracked separately or could be integrated into one fuel category 'coal'.
- A European tracking mechanism must be designed to handle the full list of fuels which have been selected for disclosure by the Member States

Tracking of environmental indicators

- Member States should agree on which environmental indicators are included in the disclosure scheme (CO₂ emissions and radioactive waste at a minimum) and develop common standards on how they are defined and determined.
- CO₂ emissions should be used rather than greenhouse gas equivalents in order to reduce the complexity of the system and to adapt it to the reporting requirements for the Emissions Trading Scheme.
- The disclosed CO₂ emissions should be based on direct emissions factors initially, moving to life-cycle emissions of the power plant and fuel if the basis on which life-cycle emissions are calculated can be agreed amongst the Member States
- The disclosed radioactive waste should be based on the volume of spent nuclear fuel which is produced by the reactors.
- Environmental indicators should be tracked on a plant-specific basis using tags or certificates with two classes of generic emissions factors for each fuel type (e.g. in gCO₂/kWh) corresponding to the highest and lowest emissions factors from European power plants. The CO₂ emissions from each plant are then described reflected through an individual mix of tags or certificates with these two generic factors (e.g. 40% of the highest emissions factor and 60% of the lowest emissions factor). The same method can be used for radioactive waste.
- Tracking of the environmental indicators should reflect the impact of cogeneration by incorporating zero emissions tags or certificates.

Imported electricity

- Unit contracts or data provided by the exporting undertaking should only be used if the exporting country has implemented a Guarantee of Origin for the respective type of attributes. This will avoid double-counting of these attributes and limit the incentive for cherry-picking.
- In all other cases, the average generation mix of the exporting country can be used as a first step. The effects of this should be monitored closely by the Member States and the Commission.
- Further research is required on how other undisclosed imports can be handled and how effects such as ‘green-washing’ of electricity can be prevented.

1 Introduction

The revised European Directive 2003/54/EC¹ concerning common rules for the internal market in electricity, which was adopted in June 2003 and due to be implemented in summer 2004, will enable millions of households, public bodies and commercial businesses to choose their electricity supplier, in many cases for the first time ever.

Along with liberalisation of the electricity market, the European Commission has introduced the concept of electricity disclosure throughout Europe with the inclusion of a labelling provision in Article 3 of the Directive. To date, electricity disclosure has only been implemented in one European country, Austria, although it is more widely established in the US.

The labelling provision in the Directive is as follows:

6) Member States shall ensure that electricity suppliers specify in or with the bills and in promotional materials made available to final customers:

- a) the contribution of each energy source to the overall fuel mix of the supplier over the preceding year;*
- b) at least the reference to existing reference sources, such as web-pages, where information on the environmental impact, in terms of at least emissions of CO₂ and the radioactive waste resulting from the electricity produced by the overall fuel mix of the supplier over the preceding year is publicly available.*

With respect to electricity obtained via an electricity exchange or imported from an undertaking situated outside the European Union, aggregate figures provided by the exchange or the undertaking in question over the preceding year may be used.

Member States shall take the necessary steps to ensure that the information provided by suppliers to their customers pursuant to this Article is reliable.

This provision provides guidance only in general terms and leaves a number of details unspecified. Therefore there is scope to develop common principles on how to provide consumers with information on their fuel mix and the environmental consequences of their electricity use. The question is the extent to which such common principles should be agreed at a European level and the extent to which the details should be left to the Member States to decide. Some level of harmonisation is desirable to assist cross-border trade in a liberalised European market and to provide comparable information to consumers in a cost-effective way.

This report outlines the concept of disclosure and its constituent elements – the front-side and the back-side – and discusses them in relation to the Directive in terms of minimal compliance and a recommended approach. It then goes on to discuss the key aspects of a disclosure system in more detail with recommendations of what could be agreed at a European or Member State level. Finally, these aspects are brought together

¹ Referred to as the Directive in this report

into an outline of minimal compliance and a recommended approach, along with a timetable for implementation. The discussion incorporates results from the CIE stakeholder consultation, undertaken in June 2003, involving suppliers, consumer associations and environmental organisations throughout Europe.

The report is based upon the wording of the Directive and does not go into detail on those issues which are precluded by the Directive (e.g. a discussion of ex-ante disclosure). Details on such issues can be found in the work done under the 4CE project (see page iv for details) and are available on the project website at www.electricitylabels.com

2 What is electricity disclosure?

The majority of consumers throughout Europe do not currently know how the electricity they buy has been generated – for instance from coal, oil, gas, nuclear or renewable sources. Whilst the actual electricity that comes through the wires to each customer is homogeneous and cannot be identified according to source, it is possible to trace the fuel sources which consumers are supporting through their purchases.

Hence, the fundamental aim of electricity disclosure is to provide consumers with information about the electricity which they buy. It is not about promoting a particular type of electricity nor encouraging energy efficiency, although disclosure could form a firm basis for other policies or initiatives with such aims. Its essence is information provision and creating greater transparency in the marketplace by providing objective and standardised information about a product. Consumers can then make a purchase decision using their own criteria. Electricity disclosure is distinct from quality labels, such as the eco-label or green electricity labels which indicate to the consumer that a product has been officially approved and complies with a certain standard.

It is appropriate that the disclosure requirement is included in the Directive on liberalisation of the European electricity market since for a truly free market to operate this requires a free flow of information to all concerned, which includes the final consumers. However, it is not essential that a market is liberalised before disclosure is introduced – as in several states in the US (Appendix E & F), disclosure in a non-liberalised market is feasible and is still of benefit to consumers in terms of improved information and knowledge.

The benefits of electricity disclosure are far-reaching. Consumers have access to better information and are potentially able to choose electricity on the basis of their individual preferences, such as environmental values or social aspects. Electricity suppliers and traders are provided with a new marketing opportunity, being able to differentiate the electricity they sell on factors other than price – as demonstrated in the domestic appliance market following the introduction of the European energy label. Generators benefit from increased diversity of generation types and products. For governments, disclosure provides a tool to identify consumer preferences and upon which future policies can build.

In order to be able to realise these aims and benefits, a disclosure system requires two fundamental elements:

- A tracking system to create unambiguous links between the power plants and the final electricity sold to consumers – the ‘back-side’ of disclosure
- A labelling system through which this information is transferred and displayed to the final consumer – the ‘front-side’ of disclosure

These elements are discussed in detail in the following sections.

3 Objectives and criteria

The aims and objectives of a European disclosure scheme are ultimately for the EC and Member States to decide upon. However, the following is a list of guiding principles that is proposed for the implementation of disclosure schemes by Member States:

1. The disclosure scheme must facilitate consumer choice and allow consumers to have an impact on the generation mix by selecting their electricity supplier and product. This includes issues such as reliability, credibility and comprehensibility.
2. The system must be flexible, to allow for subsidiarity and further development, and be robust.
3. The system must be generally acceptable to Member State governments. This includes compatibility with existing or intended policies.
4. The system must be generally acceptable to environmental stakeholders. This includes a certain coverage of environmental issues related to electricity generation in a clear and comprehensible way.
5. The scheme must be compatible with the way in which the electricity industry operates, both in terms of tracking the information and the process by which the detail is displayed to consumers.
6. The implementation of the whole scheme must be possible within a period of not more than three to four years.²

In addition to these principles, four key criteria have been identified as the crucial factors against which any disclosure scheme should be assessed:

- Consumer information
- Reliability
- Cost
- Speed

These are discussed in detail below. There will be some necessary trade-offs between these criteria, depending on the overall aim of the disclosure scheme – it is up to the EU and Member States to decide their priorities.

3.1 Consumer information

One of the fundamental aims of electricity disclosure is to increase the information available to consumers. For maximum consumer information, the front-side of the disclosure system must be easy for consumers to use and understand and must also provide

² The Directive allows 1 year for the implementation of the regulation. It might then take another year until the first labels are issued (this time will be necessary to collect the first data set) and 2 years for a full tracking system to be established.

the necessary detail to enable consumers to exercise choice and have some influence on the generation mix through their choices.³ This will also require ease of comparison between suppliers for consumers to make an informed choice of electricity supplier (for example through an independent catalogue or website comparing offers from all suppliers).

It is not clear which tracking mechanism would be most effective at reflecting consumer choices. However, there will only be an impact on the generation mix if the demand for a particular source outweighs supply (market pull) or there is an insufficient market for a particular type of electricity (even at a low price). No one individual consumer is likely to have any impact on the overall generation mix, either through the selection of a supplier or type of electricity. Any noticeable influence will only come from a number of consumers making the same choices.

3.2 Reliability

Under the Directive, Member States are required to ‘*ensure that the information provided by suppliers to their customers...is reliable*’. Reliability is important in terms of consumer confidence and for future policies building upon disclosure. What this actually means in terms of a disclosure scheme depends on how the word ‘reliable’ is interpreted. Reliability certainly implies some level of accuracy in the scheme.

One aspect of ‘reliability’ is the level of coverage of the market. For instance, a contract based tracking mechanism is unlikely to achieve 100% coverage of the market because of the difficulty in dealing with power exchanges and balancing mechanisms under this approach. However, this would be possible with tradable certificates, which essentially bypass these aspects (Section 5.6.3).

Another aspect is the detail of the information provided by the tracking mechanism, such as the CO₂ (carbon dioxide) emissions factors used – these could be general for each type of fuel (coal-fired, gas, etc), or specific to an individual power station. This level of detail should be reflected in the front-side, since an accurate tracking mechanism will be ineffectual if combined with a front-side which provides summary data at a low level of detail (for example, grouping together fuel classes into coal, nuclear and other).

Consumers need reliable information on which to base their choice of electricity supplier and supply. This could also imply that ‘reliability’ involves a certain amount of precision. For instance, if all suppliers in a country used the same average figures for their portfolio, whilst these figures may be statistically reliable, from a consumer perspective such averages would be unreliable – all suppliers would appear to be providing the same electricity supply and consumers would be unable to select a supplier on the basis of these data.

³ For example, the information provided by the disclosure system must be more detailed and accurate than European or national statistical averages.

Reliability also requires some level of verification of the information provided – the greater reliability required, the more important verification becomes to reduce any fraud, error and double-counting to a minimum. Verification is also essential in terms of consumer confidence, which is vital if a disclosure scheme is to be effective.

3.3 Cost

The greater the degree of accuracy and level of detail of the information provided, the more a disclosure scheme is likely to cost. There will have to be a trade off between keeping the costs to a sensible level while still being able to ensure a sufficient level of accuracy, reliability and consumer confidence.

However, the cost of electricity disclosure may not be of primary importance, given the synergies that electricity disclosure has with other environmental policies, such as the Renewables Directive 2001/77/EC. The implementation of a disclosure scheme could be a cost-effective method of helping to deliver these broader policy objectives.

3.4 Speed

Speed may be an important objective initially in order to get some information out to consumers, but this could mean compromising on the detail, accuracy and level of harmonisation of the scheme. The speed at which various options could be introduced may indicate the useful steps in a phased approach.

Disclosure will be an evolutionary process and there is considerable uncertainty about many of the details and potential impacts. For this reason it may be appropriate to introduce some initial phases of a disclosure scheme as quickly as possible so as to begin to learn about its effectiveness. Careful evaluation in each Member State and a system for comparing results across Member States would then be required in order to reach an optimum scheme as fast as possible.

4 Front-side: label design

The key function of the front-side of a disclosure scheme is to present the information to consumers. It represents the interface between the electricity suppliers and the consumers and can be broken down into two main areas:

- detail of the information provided (Section 4.2)
- the format in which the information is displayed (Section 4.3)

These two aspects interact, since, to a certain extent, the format will be dictated by the type of information displayed. The tracking mechanism must be able to provide the information required at the front-side. Although the section in the Directive is referred to as the ‘labelling provision’, it may be that there is no physical label⁴ as such – depending on what and where information is displayed. The more complex and detailed the information, the more difficult it is to condense down onto a single label – a separate leaflet would become a more appropriate option in this case.

4.1 Harmonisation

A major issue is the extent to which the front-side is harmonised. The Directive defines the minimum that must be achieved in each Member State, but does not specify any level of harmonisation at any level and leaves the option open for Member States to go further. At one extreme, there would be no harmonisation of label design at a country or European level, with individual suppliers deciding what information they use and how this is displayed. At the other extreme, the elements could be fully harmonised at a European level, with both the criteria and ‘label’ design specified by the European Commission.

In between these two extremes lie three other main options:

- Member States develop their own criteria for the label, but the actual design is left up to suppliers to decide
- Member States develop their own criteria with a uniform label design within the country
- Member States agree on some fundamental criteria between them, but label design varies between Member States, although is uniform within any one country

Suppliers may be keen to develop their own style of label but this would be confusing and unhelpful for the consumer. This would have negative implications in terms of transparency and ease of comparability between suppliers, which is essential if there is to be proper, well-informed consumer choice. Consumer research in the US (Moskovitz et al, 1998) found that electricity disclosure information was far more effective if all

⁴ A ‘label’ is defined as a separate piece of paper associated with an item which identifies the nature of that item by outlining certain defining characteristics

products were labelled in a uniform manner, allowing easy comparison. Participants in the focus groups, conducted as part of the 4CE project, also expressed a strong desire for standardised and easily comparable disclosure information. Therefore a uniform label design, at least at the country level is preferable for maximum consumer impact. A country specific design has the advantage that the label could be targeted at the consumer views and attitudes within that country.

Full harmonisation at a European level rather than at a national level is unlikely to provide any additional benefit to consumers, since the majority (at least in the domestic sector) are only likely to see the 'label' for electricity that is being sold in their own country. However, European harmonisation could benefit the industry in terms of reduced cost and avoiding duplication of effort (e.g. in consumer research and developing a label design). Also, with the move towards a liberalised European electricity market, a common European label could help to facilitate cross-border trade. The European Energy label for appliances provides a good example of successful harmonisation across Europe.

Results from the stakeholder consultation indicate that there is strong support for some level of harmonisation of an electricity label, at least at a national level, amongst the electricity industry, consumer and environmental groups. Full European harmonisation appears to be more popular amongst consumer and environmental groups, particularly given the move towards a liberalised European electricity market, although it was recognised that national harmonisation maybe a necessary first step in the early stages. Suppliers tend to be more in favour of agreeing some criteria at a European level (such as content definition and calculation principles) with design issues decided at a national level, although some believe the label content and design should be left up to the individual suppliers to decide.

Opinion was divided amongst the consultation respondents as to whether European harmonisation would be of benefit to the electricity industry and consumers, although it was felt that it would ultimately be beneficial in terms of increased competition and cross-border trade and would not be a disadvantage to consumers.

Given the likely increase in cross-border trade as part of liberalisation, it is important to establish some rules on which label a supplier should use if they sell electricity in another country. If there is a common European label, this is fairly straightforward since the same label could be used in every country, with the necessary language adjustments. However, if each country develops its own label(s), then the situation becomes more complex. If there is a harmonised design at the country level, then any supplier wishing to sell electricity in that country would have to use the label design of that country. If there is no harmonisation at any level, then a supplier would be able to use any label they wish, in line with any general requirements of that particular country, which has negative implications for consumer choice, as described above.

Another issue concerning a liberalised market is that consumers must be able to compare what one supplier is offering against another if they are to be able to have free choice in the market place. Such information should be easily and freely available to

consumers. Even if there is a harmonised label across all suppliers allowing easy comparison, it is not always simple for consumers to actually find out what other companies are offering. One option is the provision of an independent catalogue comparing what is offered by all suppliers within a certain region (similar to the one provided on fuel efficiency for new cars under Directive 1999/94/EC). Most likely, this would be based upon the supplier portfolio, rather than products, since that is what is specified under the Directive. Compilation of the information would be much simpler and more effective if all suppliers within a region used a harmonised label. Such information could also be made available on a website (in addition to the catalogue). It may be of benefit to incorporate the catalogue into any verification process (the Directive requires Member States to ensure that the information is reliable) – once a supplier’s disclosure information has been verified as correct, it is then included in the catalogue, providing consumers with guaranteed reliable information.

There was strong support for such a catalogue amongst the respondents in the 4CE telephone survey and focus groups. The stakeholder consultation also demonstrated that there is broad support for such a catalogue amongst suppliers, consumer and environmental groups. The independence of the catalogue is one of its key features – it is suggested that this should be the responsibility of the industry regulator, national consumer organisation or environmental NGO.

4.1.1 Recommendations

- There should be harmonisation of the disclosure information content and the layout in which it is presented to consumers at the Member State level, with some common criteria specified at a European level. These criteria are identified and discussed in more detail in the following sections.
- Any supplier selling electricity outside of its own country must display the disclosure information in the style and language of the country that it is selling in.
- There should be an independent catalogue, provided by a body such as the industry regulator or national consumers association, comparing what is offered by all suppliers (based on the disclosure information on a portfolio basis at a minimum and on products if applicable) within a certain region which is made available to all consumers (on the internet and in hard copy).

4.2 Information provided

The Directive specifies that information on both the fuel mix and environmental impacts in terms of at least CO₂ and nuclear waste must be provided as a minimum, although there is scope to go beyond this level of detail. The level of detail possible, such as the type of emissions factors used (e.g. general or specific), should be specified by all Member States to ensure that this detail can be delivered by the tracking mechanism (Section 4.2.4).

The Directive also requires that information provided is annual for the preceding year (i.e. ex-post rather than ex-ante) and gives the overall fuel mix of the supplier (i.e. portfolio rather than product disclosure), although this does not exclude portfolio **and** product disclosure, as explained in Section 4.2.2.

The Directive does not specify how often the information needs to be sent out (Section 4.2.1) nor does it require comparative data or disclosure of the proportion of imported electricity. These issues are discussed in more detail in Sections 4.2.3 and 4.2.6.

4.2.1 Reference time period

The Directive already specifies that the information should cover the preceding year - this could either be for the last full calendar year, for the preceding four quarters (if the information is revised and distributed more frequently than each year) or relating to the financial year of the individual supplier. The former option is preferable so that suppliers do not have to update the information every quarter and to ensure that there is comparability across all suppliers. In any case, the third option would not be available under a harmonised tracking system anyway, since all suppliers would have to comply with the appropriate reference period for tracking of the data.

There is also the issue regarding the frequency with which information is distributed to consumers. It is assumed that suppliers will only want to send out the information with the electricity bill, rather than as a separate mailing. Therefore the two options for frequency of distribution are either the same as the electricity bill (monthly, every two months, quarterly, twice a year or annually) or annually for all customers. Sending the information out with each bill does not mean that the information has to be revised for each mailing – this could be the same annual information within any one year. The tracking mechanism must be able to provide data for the appropriate reference period.

Although the results from the focus groups and telephone surveys conducted as part of the 4CE project indicated that people would prefer the information on an annual basis, it may be beneficial to send the information out at least twice a year (where bills are sent out more frequently than once a year), at least initially. This may result in an increased cost compared to an annual circulation in some countries, although the postage costs for the bills would be incurred anyway. More frequent distribution would increase exposure to the information and raise awareness of the issues on a regular basis, thereby potentially increasing the impact of disclosure. If the information were only sent out on an annual basis, it is likely that people would forget about the issue in between each annual statement.

Responses to the stakeholder consultation show that the electricity industry is strongly in favour of sending the information out on an annual basis, with an option to send it out more frequently if a supplier chooses, whereas consumer and environmental groups would prefer the information to be sent out with each bill.

4.2.1.1 Recommendations

- The disclosure information (fuel mix and environmental impact) should relate to the last calendar year.
- It is implicit in the Directive that the disclosure information is made available to consumers in or with the bills at least once a year. It is suggested that the decision as to whether this information should be sent out more frequently is decided at the Member State level. However, it is recommended that, in the early stages of the disclosure system, the information is sent out at least twice a year, if the billing processes allow, in order to raise awareness of the issues amongst consumers.

4.2.2 Portfolio vs. product disclosure

The proposed Directive requires information on the supplier portfolio only. It is assumed that portfolio refers to all the electricity sold to final consumers, both domestic and non-domestic, by the company that is named on the bill (rather than the parent company). This level of information is likely to be more straightforward for suppliers to provide than product detail, since the information will be the same for all customers of any one supplier.

Portfolio-only disclosure avoids the problem of double-counting of electricity attributes (see discussion on product and portfolio disclosure below) and ensures that all customers get a full picture of what is provided by their supplier – the supplier cannot ‘hide’ its ‘dirty’ electricity – as can happen with product-only or optional portfolio disclosure. This was the experience under the recently introduced Austrian disclosure scheme, where it was optional to disclose product or portfolio information. In Austria, there was a strong demand from domestic customers for renewable energy, whereas the non-domestic customers were not interested in renewable supply and were happy to buy the remainder. So the suppliers just split their current portfolio between the two groups of customers – renewable energy being sold to domestic customers and the remaining ‘dirty’ electricity (fossil fuel and nuclear) sold to the non-domestic sector. Under product disclosure, the domestic customers were unaware that their supplier was still selling non-green electricity to its other non-domestic customers. This is clearly mis-leading for the domestic customers who believe they are supporting a supplier with a 100% renewable energy supply. In the light of this experience, the Austrian scheme has been revised and will be limited to portfolio-only disclosure from July 2004 (Herbert Ritter, pers. comm.).

However, there are some drawbacks to providing information just on the company portfolio. The main one being that it does not encourage suppliers to create different products, such as a green or low CO₂ tariff, which could address the preferences of different consumer groups. In several Member States, diversified products have already been developed by a range of suppliers. Product diversification can help to establish consumer preferences. Under a disclosure system purely based on the supplier portfolio, suppliers with diversified products would have to submit identical disclosure labels to all their

customers showing their total portfolio, which would not match the product descriptions.

In theory, suppliers could comply with the requirements of a portfolio disclosure system by setting up a daughter company for each product. But this has both time and cost implications and could be seen as mis-leading to the customers since they will not get the full picture of what the parent company provides (as with product-only disclosure).

Alternatively, information on both product and portfolio could be included in the disclosure information. This, of course, will increase the complexity of the information and there is a strong likelihood that the provision of both types of information will confuse people initially – in the 4CE focus groups, the difference between the product and portfolio was difficult for people to grasp. This could be dealt with by providing a suitable explanation and is likely to become less of a problem over time, as people become used to the way in which the information is displayed.

Where both product and portfolio information can be displayed but product information is not required on **all** electricity, there is a possibility that electricity with certain qualities could be accounted for twice. For example, if a supplier created a green product, they would provide product and portfolio information to those customers buying this product. Other customers would just receive portfolio information, which would include the green electricity being sold separately as a green product. Therefore, it would appear to these customers that they were buying a proportion of green electricity in the portfolio mix, whereas in actual fact, some or all of this electricity has already been sold exclusively to the green product customers.

Thus, whilst it could be optional to display product information with the portfolio information, as soon as a supplier differentiates one or more products, it is strongly recommended that they must then provide product and portfolio information to all customers. No consumer should believe they are buying the portfolio mix if this is not the case. There was general agreement of this principle amongst the electricity industry, consumer and environmental groups in the stakeholder consultation, although opinion was divided as to whether disclosure should be portfolio only or should include product disclosure as well.

4.2.2.1 Recommendations

- Disclosure information must be provided on the suppliers portfolio as a minimum, in accordance with the Directive.
- The portfolio refers to all the electricity sold to final consumers, both domestic and non-domestic, by the company that is named on the bill (i.e. not necessarily the parent company).
- Suppliers are free to provide product information in addition to their portfolio disclosure but it is recommended that Member States should require that if a supplier chooses to differentiate one or more products, they must then provide product and portfolio information to all customers.

4.2.3 Fuel sources

The Directive requires that ‘*the contribution of each energy source to the overall fuel mix of the supplier over the preceding year*’ be provided to consumers. The actual fuel sources available will vary in number and importance between countries, but is important that the fuel list is standardised at least within any one country. Common definitions and terms for the various fuel sources should be agreed between the Member States to ensure consistency and comparability.

It is recommended that there is a fixed list of fuels for all Member States, e.g. coal, nuclear, gas, other and renewables. Renewables are always listed last so as to allow the inclusion of a detailed breakdown of these sources e.g. hydropower, wind, biomass, solar and other. A supplier must always display the full list of fuels, including the detailed breakdown of renewables, even if a source is not represented in their portfolio. As well as ensuring comparability between suppliers within each country, using a fixed list means it would be straightforward to include national comparative data, since all the relevant categories are already displayed, and the list will remain relatively constant over time (i.e. it is unlikely that it will need to be altered if there is a change in fuels used nationally). It also alerts consumers to the fuel sources they are not buying from. This could be agreed as a standard approach for all countries whether or not there is a fully harmonised label at a European level.

The fuel source information could be provided in terms of generic classes of energy sources (e.g. fossil fuels, nuclear, renewables) or individual fuel sources could be specified, in which case it may be necessary to limit the number of fuel sources displayed to prevent the list becoming too long and cumbersome. This would need to be decided at the individual country level, depending on what fuel sources are available in each country.

In the 4CE focus groups, participants wanted to be given a full breakdown of the individual renewable sources, even if these only represented a small proportion of the total generation mix. At present, there are variations in the definitions of renewables between countries, as well as differences in attitudes towards various technologies. However there is now a move towards achieving some consistency in this area, with a set of common European definitions of renewables included in the Renewables Directive 2001/77/EC. It is suggested that these definitions are also used for the purposes of disclosure.

In the stakeholder consultation, opinion was fairly evenly divided amongst suppliers, consumer and environmental groups as to the benefit of listing fuels individually rather than in generic classes and individual listing of renewable sources. No one option was clearly favoured.

4.2.3.1 Recommendations

It is suggested that the fuel sources are listed individually (rather than generic groups) according to the following criteria which are agreed at a European level:

- Member States agree a fixed list of fuels to be used by all suppliers, including a detailed breakdown of renewables and a category for ‘other’.
- Member States should consider limiting the list of fuel source categories to around 10-12 (including any detailed listing of renewable sources) to limit complexity.
- Common definitions and terms for the various fuel sources should be agreed between the Member States. Definitions of renewables should be based on those given in the Renewables Directive 2001/77/EC.
- Suppliers display their fuel mix portfolio in line with the standard list, even if they have to show some sources at 0% (this is to ensure a uniform display within a country and comparability between suppliers).

4.2.4 Environmental indicators

The Directive specifies that any environmental information should be given in terms of ‘*at least emissions of CO₂ and the radioactive waste resulting from the electricity produced by the overall fuel mix of the supplier*’.⁵

However, the environmental impacts of electricity are wide ranging. The most obvious and easily quantifiable impacts are carbon dioxide emissions, other greenhouse gases, other air pollutants such as acidifying emissions and dust and production of nuclear waste. Other impacts include destruction of wildlife habitats (e.g. large hydro-electric schemes), visual impact (e.g. coal-fired power stations, wind turbines) amongst others. However, these latter impacts are difficult to quantify and carry strong value judgements.

Acidifying emissions such as SO₂ and NO_x have been drastically reduced within the EU through the European Large Combustion Plants Directive 88/609/EEC. Such emissions are still a major concern in the accession countries, but these countries will be required to comply with the Large Combustion Plants Directive on joining the EU. Therefore, these emissions are not considered relevant for inclusion as an environmental indicator for electricity disclosure since they are already being dealt with.

In general, the consultation respondents were in favour of limiting the environmental indicators to CO₂ emissions and radioactive waste – there were concerns that more information would be confusing rather than beneficial to consumers. Some consumer and environmental groups were keen to see a greater range of indicators included, although this may be more appropriate to decide on a country by country basis. One option might be to make additional information available (e.g. on a website or in company literature) to those consumers that are interested. If there was to be a common European label, some guidelines would be required on the option of including information on any additional environmental impacts at the country level. However, inclusion of more than two

⁵ The location of the environmental impact information is discussed in Section 4.3.3

environmental indicators would significantly increase the complexity of any tracking mechanism and data processing (Section 5.4.2).

In terms of the level of detail provided on CO₂ emissions and radioactive waste, it is necessary to agree some common definitions and principles. It is important that these calculations are standardised to ensure comparability and that this detail can be provided by the tracking mechanism. There are several options for the basis of the CO₂ emissions factors used in increasing level of accuracy and complexity: European average, country average, power plant specific direct emissions and plant specific life-cycle emissions. These options are discussed in more detail in Section 5.4.2.

In terms of radioactive waste, the Directive does not specify whether this refers to high, medium or low level waste. Calculation of high-level waste from spent nuclear fuel is reasonably straightforward, but the amount of medium and low level waste produced varies widely between the different methods for handling nuclear waste (e.g. reprocessing, interim storage) and so is more difficult to establish. Therefore, it is probably only possible to provide information on high-level waste only. A discussion on how these figures could be displayed is covered in Section 4.3.2.

The treatment of CHP on a disclosure label also needs to be considered. Since CHP is not in itself a fuel source, it is not required to be specified separately as part of the fuel mix information. However, in terms of the environmental information, this would mean that it would be assigned the same status as an average e.g. gas power plant, which is clearly not the case given the higher efficiency, on average, of CHP electricity generation. One possibility would be to ear-mark any electricity that has been produced from CHP on the disclosure information. The tracking mechanism would also need to provide details of the proportion and efficiency of the generation, to enable an accurate calculation of the emissions figure. This issue is covered in further detail in Section 5.4.3.

4.2.4.1 Recommendations

- Given the complexity of environmental impact information, it is suggested that the minimum list of indicators specified in the Directive (CO₂ emissions and radioactive waste) is sufficient as a European standard for the time being. This could be revised at a later date if a consensus amongst Member States on other significant environmental impacts emerges.
- However, Member States could still be given the option to include additional environmental indicators of particular relevance to their country (although it should be noted that this has implications for the tracking mechanism which may then have to be designed to satisfy the maximum data requirements of all Member States).
- Radioactive waste covers high level waste from spent nuclear fuel only.

4.2.5 Comparative information

Aside from a possible product/portfolio comparison, comparisons with the country or European average may be helpful in providing consumers with some kind of reference to set their electricity usage into context.

The results from the 4CE focus groups and telephone surveys indicate that consumers would like comparative figures included with the information on their electricity. Support for a country or European average were about equal. A national or regional comparison may be more meaningful to consumers initially, but with the move towards a liberalised European electricity market, the European average may become more appropriate with time. Any reference figure should refer to average consumption rather than generation in order to reflect any imports or exports and system losses. These averages could be provided by the tracking mechanism and compiled by the industry regulator. It should be made clear that the figures relate to consumption not generation to avoid any credibility issues which may occur if national consumption is markedly different to national generation.

In the stakeholder consultation, there was strong support for a country average amongst suppliers, consumer and environmental groups, although not necessarily as a mandatory requirement. This was seen to be more relevant to consumers than a European average, at least in the short term, and was more likely to stimulate improvements within all countries, rather than just those countries that were below the European average.

In the interests of keeping the information as simple as possible, it is advisable to provide only one set of reference figures – i.e. either annual country or European averages.

4.2.5.1 Recommendations

- Comparative reference figures for both the fuel source and environmental impact information should be provided as part of the disclosure information. It is suggested that country averages are used initially but that European averages may become more appropriate over time with a liberalised European market.
- Reference figures should refer to average consumption in the relevant country rather than average generation.

4.2.6 Imported electricity

According to the Directive, aggregate figures for imported electricity may be used. It is not expected that the fuel mix of the imported electricity will be listed separately to the supplier's overall fuel mix. Rather the aggregate figures would be incorporated into the relevant fuel categories within the supplier's fuel mix through the tracking mechanism (Section 5.5). Therefore it would not be possible to identify the fuel mix of any imported electricity within the disclosure information.

However, evidence from the 4CE focus groups and telephone surveys demonstrated that consumers want to be given information on the share of imported electricity and the

country(s) of origin. The exact percentage of imports does not necessarily have to be assigned to the country from which it came – these data could be summarised for ease of presentation for example, ‘a total 10% of electricity was imported from the following countries...’.

Imported electricity could be defined as electricity from outside a particular country or electricity from outside of the group of countries included in a harmonised disclosure scheme. It is suggested that, at least in the early phases of the disclosure system, electricity imported from any country should be labelled as imported. In other words, no distinction should be made between imports from countries with disclosure and countries without, since such a distinction may be difficult for consumers to understand.

Support for provision of this information was limited amongst suppliers, consumer and environmental groups in the stakeholder consultation. It was felt that such detail would be confusing for consumers and that it could be difficult to determine at the level of an individual supplier, although possibly easier at a national level.

4.2.6.1 Recommendations

- Any imported electricity is assigned to the relative fuel source category within the supplier’s overall fuel mix.
- It is optional for Member States to decide whether to show the total proportion and country(s) of origin of imported electricity.

4.3 Information format

At a general level, this concerns where the information is displayed, e.g. on the bill, on promotional materials, on separate leaflets or inserts sent out with the bill or promotional materials or on a website. The more detailed level involves the way in which the information is presented, for instance the order in which fuel sources are listed, the breakdown of renewable sources, the use of graphics (e.g. pie charts or tables) and colour.

From the consumer perspective, the aim is to identify the simplest way to display the information which is easy for consumers to understand and provides them with all the relevant information they require. In order to draw consumers’ attention to the information, the display needs to be eye-catching and appealing. The use of colour can help in this regard.

From an industry perspective, there is the cost issue (which could be minimised if a common design was developed) and the feasibility of a particular design, in terms of the established printing and billing processes.

Any disclosure system will require some level of compromise between these two perspectives.

4.3.1 Display of fuel mix information

The Directive requires electricity suppliers to provide information on their fuel mix portfolio in or with the bills and in promotional material made available to final customers. There is a variety of ways in which information on the fuel mix could be displayed:

1. Text

The main advantages of text is that it is simple to reproduce, takes up very little space and allows a detailed explanation of the information. However, the amount of information that can be conveyed is limited, especially given the restricted amount of space available on many bills, and a section of text has a very low visual impact. Moreover, comparisons of different offerings based on textual information is more difficult for consumers. For example:

‘Sources of electricity provided by Supplier X in 2002: coal (71%), gas (25%), nuclear (1%), oil (1%), renewables (2%), other (0%)’

2. Table

A table is possibly the best format in which to communicate a substantial amount of data, including comparative figures. It is also possible to provide a detailed breakdown on fuel sources, such as the various types of renewables.

Fuel source	Supplier X %
Gas	25
Coal	71
Nuclear	1
Other	1
Renewables (total)	2
<i>Hydro-electric</i>	<i>1.5</i>
<i>Biomass</i>	<i>0.0</i>
<i>Wind</i>	<i>0.5</i>
<i>Solar</i>	<i>0.0</i>
<i>Other</i>	<i>0.0</i>

Figure 1 Example of table display for fuel mix information

3. Pie charts

In the consumer research conducted in the 4CE project, pie charts with percentages were the most popular option for the display of fuel mix. These have the advantage of a good overall visual impact, particularly if in colour, although it is also possible to use black and white shading. However, it is not easy to display a breakdown of renewables (as was favoured by the 4CE focus groups). This would have to be added separately e.g. in an additional table (which could also include comparative national figures). There is a limit

to the number of pie charts that could be displayed for comparisons – two is probably feasible, but three pie charts (as would be required for displaying the fuel mix for the product, supplier portfolio and the national average as a reference) becomes a little unmanageable in terms of space and comprehension. Again, these could be displayed in a table instead. In order to ensure comparability between suppliers and minimise confusion, it is recommended that a pie chart is only ever used to display the portfolio information, not for product information or national figures.

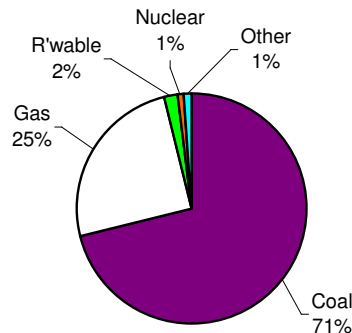


Figure 2 Example of a pie chart displaying fuel mix information

4. Bar charts

Bar charts also have good visual impact, particularly if in colour, and have the advantage that it is easier to make comparisons than it is with pie charts, although it is still difficult to provide a detailed breakdown of renewables. As with the pie chart display option, this detail could be provided in a separate table.

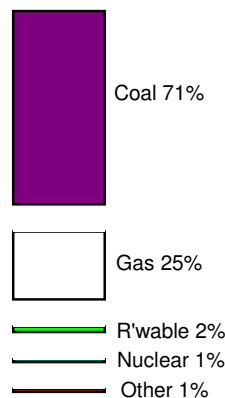


Figure 3 Example of a bar chart displaying fuel mix information

These design options are not necessarily mutually exclusive – a number of different options could be combined, which was an approach favoured by participants in focus groups conducted as part of the 4CE project. A combination of display formats has the advantage that the information may reach a wider audience since some people respond better to, for example, pie charts, whereas others find tables easier to comprehend. The recommended display option of a pie chart displaying the portfolio information combined with a table providing a detailed breakdown of renewables and comparative figures is shown in Figure 4.

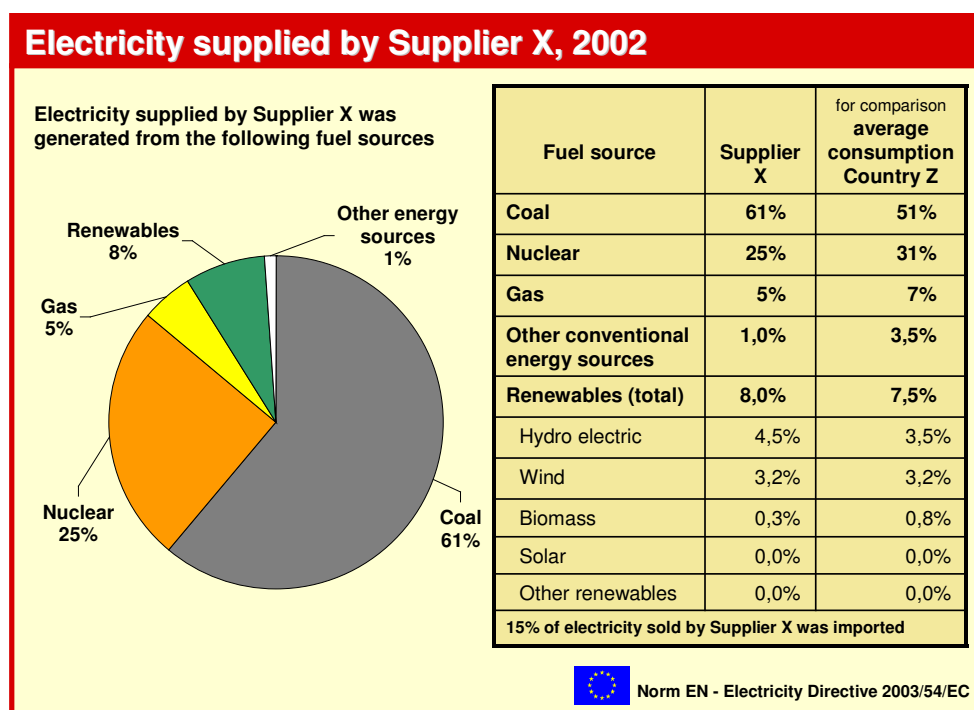


Figure 4 Recommended display format for fuel mix information

The option most favoured by suppliers, consumer and environmental groups in the stakeholder consultation was some combination of table and pie charts and, to a lesser extent, bar charts. This supports the findings of the 4CE consumer research. However, there is some resistance within the electricity industry against the display format being too heavily regulated.

4.3.1.1 Recommendations

- The choice of display format is ultimately left up to individual Member States (bearing in mind the recommendation of a harmonised label at a country level as a minimum), but there is guidance provided at a European level on the recommended display option of pie chart and table. This guidance should include sugges-

tions for the colours or black and white shading to be used for each fuel source, along with a minimum font size.

- It is recommended that the pie chart is only ever used to illustrate the supplier's portfolio while the table provides a more detailed breakdown of renewables and national averages for the total fuel mix (including details on renewables).
- If the supplier has chosen to display both product and portfolio information, the pie chart should be used to illustrate the portfolio (to ensure comparability with labels from other suppliers), whilst details on the product and national averages can be displayed in a table (an example of an integrated product and portfolio 'label' is provided in Appendix C).

4.3.2 Display of environmental information

The Directive requires that the information on at least CO₂ emissions and radioactive waste be provided for the supplier's portfolio. This does not exclude other environmental indicators, but only the two specified in the Directive have been considered here. These two indicators together provide a good indication of the environmental impact of the electricity. The Directive specifies that this information must be displayed at least on an existing reference source, such as a website, but does not exclude the possibility of displaying this information in or with the bill (this is further discussed in Section 4.3.3).

A key issue is whether the information on environmental indicators should be given in absolute figures e.g. kg of CO₂ and µg of radioactive waste per kWh. Research in the US indicates that domestic consumers find this information difficult to understand and therefore the effectiveness of such disclosure is greatly reduced (Moskovitz et al, 1998). However, whilst absolute figures by themselves may be hard for consumers to understand, it may be beneficial to include such figures in addition to some of the display formats discussed below. This would provide consumers with a reference figure to help put the information provided into context and also allows them the opportunity to calculate their own individual environmental impact. This information may be of particular interest to non-domestic customers who may require this detail as part of their environmental reporting or tendering processes.

CO₂ emissions can be expressed either in terms of carbon, CO₂ or greenhouse gases. In this case the Directive has specified that the information be given in terms of CO₂.

Radioactive waste can also be expressed in a variety of ways: either by weight in micrograms (µg) per kWh, or based on the level of radioactive radiation in Bequerels. Although neither of these units are likely to be familiar to the majority of consumers, it is recommended that micrograms per kWh are used for the disclosure information.

The following display options could be used either on a website or on or with the bill:

1. Text

As with information on the fuel mix, a limited amount of information could be portrayed through the use of text, although this lacks visual impact and makes comparisons more difficult.

This information could be given by kWh of electricity produced:

‘Over the past year, the electricity sold by Supplier X has resulted in the production of x kilograms of CO₂ and y micrograms of radioactive waste per kWh of electricity produced’

This type of information would enable consumers could calculate their personal emissions relatively easily on the basis of their electricity consumption and would make allow comparisons between suppliers on an equal basis. Alternatively, personalised information could be displayed directly, for example:

‘Your electricity usage in 2002 resulted in x kilograms of CO₂ emissions and y micrograms of radioactive waste.’

Such personalised information would be more suited to an individual’s bill, rather than a website and is likely to be particularly relevant to non-domestic consumers, as noted above. However, there are some difficulties with providing personalised data, as discussed in Section 4.3.3. An alternative option would be to incorporate an emissions calculator on the website to enable consumers to input their electricity consumption data from their bill and identify their own personal emissions in absolute figures.

2. Table

Absolute figures for CO₂ emissions and radioactive waste could be presented in a table, although, as noted above, these figures by themselves could be difficult for consumers to understand. An alternative would be to display the environmental impacts as an index in terms of the regional or national averages, as shown in Figure 5. Absolute figures could be included as a reference figure.

Environmental impact of Supplier X’s portfolio compared with the national electricity mix in country Y:		
CO ₂ emissions	68%	of the average electricity mix
Nuclear waste production	147%	of the average electricity mix

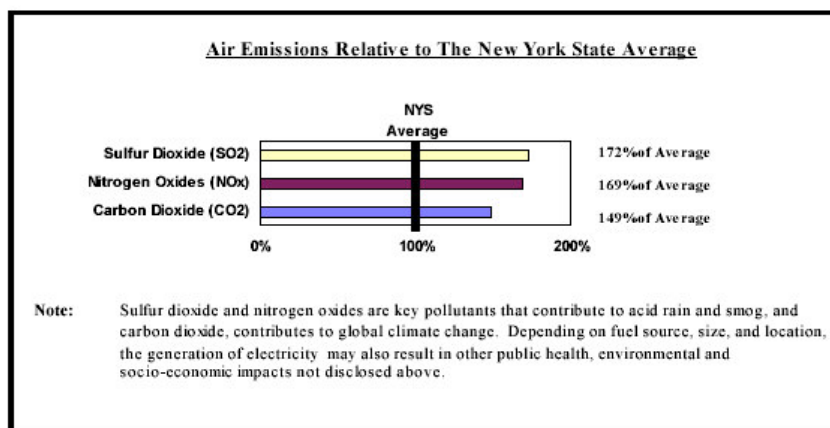
Figure 5 Example of a table displaying environmental information (indexed)

These indices could be based on the absolute figures or related to the proportion of total nuclear power or fossil fuel generation within a region. For instance, if a supplier’s portfolio is made of up 50% nuclear in a country which consumes an average of 34% (index 100) of its electricity from nuclear power, the proportion of radioactive waste assigned

to this supplier would be an index of 147 (50/34 multiplied by 100). In this case national or regional indexes are likely to be more meaningful than a European index.

3. Bar charts/indexing

This is the format commonly used on many of the US electricity labels (see Figure 6).



Source: www.dps.state.ny.us/envlabels/end_03_02/aci.PDF

Figure 6 Air emissions detail from New York State Electricity Label

However, when this type of format was tested in the 4CE focus groups, people found it very difficult to understand and it was not at all popular. One of the key problems was that people could not understand how something could be greater than the national average of 100, indicating that the use of an index was not well understood. This would require further explanation if this display format was used.

4. Ranking

Ranking of electricity in terms of environmental information would involve assigning the electricity sold a position on an agreed environmental impact scale (based on European or country specific reference figures), providing customers with a basis on which to judge the electricity they buy. This has the advantage that there is a comparison to other products on the market inherent within the scale, which aids switching decisions.

Such a ranking could be based upon the well-established European energy label, which appears on all cold appliances, washing machines, tumble driers, dishwashers, ovens and light bulbs, with a similar ranking being used by several European countries for new cars. This label is colourful, eye-catching and easily recognisable. Labelling electricity as e.g. 'FA rated' (F for high CO₂ and A for low radioactive waste), would be a good, clear simple coding for environmental impact, easy for consumers to use and relate to (Figure 7). However, the ranking of the environmental impact of electricity generation is more complex than the one-dimensional message of the cold appliances label since any ranking of the environmental impact of electricity generation must be at least two-

dimensional, covering CO₂ emissions and nuclear waste to comply with the Directive. It is not clear whether an agreement between the Member States can be reached to include nuclear waste into a ranking system – this tends to be a more controversial issue than CO₂ emissions since some countries do not perceive nuclear waste to be a problem. It is suggested that ranking should only be used if CO₂ emissions and nuclear waste are both displayed on a ranked scale.

When this style of label was tested in the 4CE focus groups, although it was the most popular out of the designs presented to them, people still had difficulties in understanding it. They also had concerns over who defined the ranking scale and on what basis.

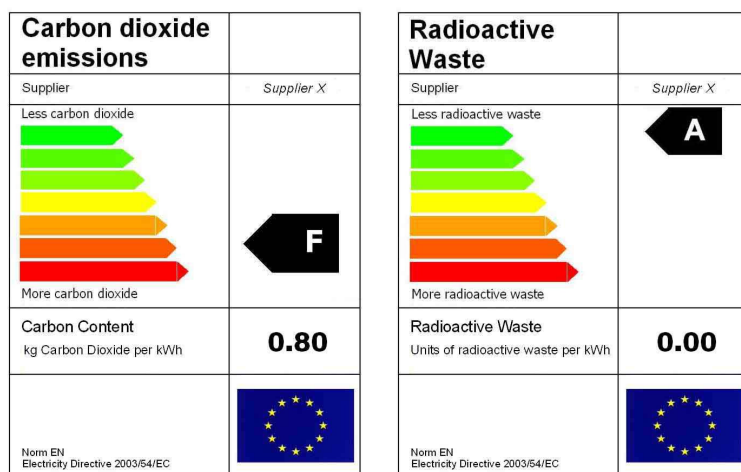


Figure 7 Example of environmental ranking labels for electricity

In the stakeholder consultation, bar charts appear to be the preferred option amongst suppliers, consumer and environmental groups, partly for simplicity and partly to avoid the perceived value judgements behind a ranking scale. Ranking was popular amongst some consumer and environmental groups but not favoured at all by the electricity industry – it may be that the industry is concerned that such a ranking would allow too great a consumer impact. As with the fuel mix information display, the industry is against the display format for the environmental information being too heavily regulated.

4.3.2.1 Recommendations

- CO₂ figures should be given as kilograms/kWh and radioactive waste should be expressed as micrograms/kWh.
- Absolute figures (expressed per kWh) should not be the only information provided. These figures should be displayed in combination with some form of ranking or indexing for ease of comparison between suppliers and to allow consumers to calculate their own personal emissions.

- Display format for the environmental information should be decided at the Member State level, but with some guidance on possible options from the EU.
- It is recommended that the environmental information is presented in a ranked or indexed display. Further consumer research is required in order to identify the most effective display format from a consumer perspective.

4.3.3 Location of environmental information

The Directive requires that the environmental information relating to the supplier's portfolio be displayed at least on an existing reference source, such as a web site. However, it is quite likely that a large majority of consumers will never see this information if it is only placed on an external reference source rather than together with the fuel mix information in or with the bill. Only 38% of households in Europe currently have access to the internet (Eurobarometer 2001) and only some of these will actually access the site displaying the environmental information. Therefore any information displayed in this way is likely to reach only a limited number of consumers. If the aim of disclosure is to ensure that all consumers are better informed about the environmental impact of their electricity, it is essential that the environmental information is included on or with the bill alongside the fuel mix information.

If information is to be displayed on a website, it may be difficult to regulate or define exactly how the information is presented. One possibility is that supplier websites have to meet certain criteria in order to be accredited or endorsed by an independent body, with an independent website containing the relevant links to all supplier's websites. In order to address the fact that not all households have access to the internet, a telephone number should be included alongside the website address on the bill so that those without internet access can call this number to request a copy of the information displayed on the website. Another option would be to include a reply-paid card for consumers to send off requesting the information. However, there is no guarantee that people will do so and this again creates a significant obstacle for consumers to access environmental information and causes additional costs for suppliers in terms of responding to telephone inquiries and postal requests.

The environmental indicators should be treated equally. For instance, if the environmental information is displayed in or with the bill, then both indicators, CO₂ emissions and radioactive waste, should be displayed together. Suppliers should be prevented from displaying one of the indicators with the bill and the other on a website, since this would give one indicator undue prominence over the other from the consumer perspective.

According to the stakeholder consultation, the electricity industry is strongly in favour of displaying the environmental information on a website rather than on or with the electricity bill – putting the onus on the customer to seek out this information if they are interested. Consumer and environmental groups are more interested in seeing this information made available with the bill and promotional materials and, in particular, when consumers are making a choice about their electricity supply. This would also be

assisted by displaying the information in the independent catalogue (and website) referred to in Section 4.1.1, so that consumers can compare what they currently buy with what is being offered by other suppliers.

4.3.3.1 Recommendations

- Environmental information should be displayed in or with the bill along with the fuel mix information.
- Information on CO₂ emissions and radioactive waste should always be displayed together and not in separate locations.
- If websites are used, Member States are required to set up an accreditation system for these websites, in line with the requirement to ensure reliability in the Directive. The effectiveness of the website with regard to informing consumers should be monitored and action taken if these external reference sources prove ineffective. The bill must contain a reference to both the website and a phone number or reply-paid card for those people without internet access to order the information.

4.3.4 Location of information

The Directive requires that information on the fuel mix must be displayed in or with the bill and the promotional materials, with at least a reference to an existing reference source, such as a website, displaying information on the environmental impact of the electricity. This leaves open the option to display the environmental information alongside the fuel mix information in or with the bill, which is strongly recommended, as discussed in Section 4.3.3 above. The following discussion therefore applies to both the fuel mix and environmental indicator information.

Considering any information displayed in or with the bill, there are four main options:

1. incorporated onto the front page of the existing bill
2. included as an extra page of the bill
3. detailed on a separate leaflet sent out with the bill
4. divided between the bill and a leaflet (with a link between the two)

The choice between these options depends on the current bill printing processes, time-scale and cost of bill redesign interacting with the complexity of the information to be displayed (depending on the formats chosen, as discussed in Sections 4.2 and 4.3). There is also the issue of visibility of the disclosure information, as well as its visual appeal to consumers, which is important if they are to take notice of it.

Option 1 is more feasible if only fuel mix information is to be displayed on the bill. There is unlikely to be sufficient room to display the environmental information as well, particularly if the aim is to provide this detail in an eye-catching and comprehensible way (which will probably require the use of graphics and colour).

If the information is displayed as text then incorporating the information onto the front page of the existing bill is fairly straightforward with minimal change to the bill design and printing, provided there is sufficient space available. However, this is the approach that has been used in some areas of Austria and Belgium and, from the consumer perspective it is not that effective – the text is lost amongst other writing on the bill and even if the customer locates the information, there is no further explanation to help the consumer make sense of it.

The cost and space required for including any graphics on the front page of a bill is likely to be high. This maybe less of a problem if the information is displayed on an additional page, but it would still require changes to the bill printing processes and the disclosure information would also be less visible than it would be on the front page of the bill.

The use of a separate leaflet increases the design options available, allowing use of colour, graphics and larger font (e.g. for the elderly), as well as providing more space in which to present the information and provide explanations to set it into context. This would make it easier to display the fuel mix and environmental information together and is likely to be a cheaper option than maintaining a phone or mail response service to provide environmental information to those consumers without internet access. An example of what the leaflet could look like is provided in Appendix A.

It is suggested that providing a link between the bill and the leaflet would mean that customers will be more likely to notice and read the leaflet, provided the text on the bill was prominent and eye-catching. The information provided on the bill may also have more impact if it is personalised for the individual customer. For instance, the bill could contain the following text:

‘Your electricity usage in 2002 has resulted in x kilograms of CO₂ emissions and y micrograms of radioactive waste. See accompanying leaflet for more detail’.

Such personalised information could be provided on an annual or quarterly basis, depending on what the current metering and billing practises are in each country.

Providing personalised environmental information is a potentially straightforward option in some countries, such as the Netherlands and Scandinavia, where annual consumption figures are already provided as part of the normal billing processes. Based on results from the stakeholder consultation, consumer and environmental groups appear to be generally in support of the provision of this type of information. However there are concerns amongst the electricity industry that such detail would be difficult and expensive to provide and they indicate that there is no strong evidence that domestic consumers would like to be given this type of information.

Estimates from suppliers in the stakeholder consultation indicate that suppliers would require notice of between 6 months to a year in order to incorporate any changes to the bill in the regular redesign processes, thus minimising the cost of any changes, although this will vary between suppliers. The more complex the information to be included, the greater the cost of redesign. This option becomes more expensive if the leaflet needs to

be segmented by product rather than using the same portfolio leaflet for all customers. The electricity industry would prefer that the location of the information was not regulated, but left up to individual suppliers to decide.

A separate leaflet was seen as an easier and more cost-effective option and received wide support amongst the consultation respondents, although there was some concern that information on a separate leaflet would not be as effective at reaching consumers as providing the detail on the bill, especially without a direct link between the two.

4.3.4.1 Recommendations

- It is recommended that the disclosure information (both fuel mix and environmental information) is displayed on a separate leaflet or insert which is sent out with the bill.
- It is recommended that there is a prominent link to the leaflet or insert displayed on the bill.
- Provision of personalised information (e.g. ‘your electricity usage resulted in x kg of CO₂ emissions’) on or with the bill should be optional at a supplier level.

4.3.5 Promotional materials

The Directive specifies ‘promotional materials made available to final customers’ – this is assumed to cover only material that is sent out directly to customers, rather than newspaper and magazine advertisements, and includes printed brochures for domestic and non-domestic customers and any tender documents and price quotations provided to any non-domestic customers when negotiating contracts for their electricity supply whether written or verbal (e.g. on the telephone) (Katrien Prins, pers. comm.).

Information provided with the bill will be most effective in raising consumer awareness of issues such as fuel mix and environmental impact on the electricity they have already bought. However, it is also crucial that people have this information when they are considering switching suppliers (Section 4.1.1).

In order to ensure easy recognition (and therefore effectiveness) and to avoid confusion amongst consumers, the best approach would be to use the same information display on the promotional material as is used in or with the bill. If a separate leaflet is used, the graphic elements could be integrated into a stand alone ‘label’ for display on the promotional materials. Examples of an integrated label are provided in Appendix B and C. In the stakeholder consultation, there appeared to be broad consensus amongst suppliers, consumer and environmental groups that this would be the best approach, although there is resistance amongst suppliers against the display being too tightly regulated.

Information on the environmental impacts may actually carry a stronger message than details of the fuel mix and also could be summarised, for example in the case of ranking, in a simple ‘AA rating’. This would be a straightforward message to convey to consumers on brochures, over the phone or on the doorstep and would be easy for consum-

ers to remember. This is also a useful shorthand that could be used by suppliers on the bills and promotional materials as a link to a separate leaflet or insert (providing the full disclosure information) and in newspaper and TV advertisements. However, there are problems associated with ranking environmental information (as discussed in Section 4.3.2) and inclusion of this type of information is entirely optional under the Directive.

The issue of reliability when it comes to promotional materials, particularly information given over the telephone, was generally not considered to be a major problem by suppliers, consumer or environmental groups. Responsibility for ensuring reliability should fall to the regulator, advertising authorities or independent auditor, although, under the Directive, this is ultimately a Member State responsibility.

4.3.5.1 Recommendations

- Disclosure information displayed on promotional materials should use the same graphics as the information displayed in or with the bill.
- Member States should ensure that appropriate auditing and verification processes are put in place to ensure reliability of information displayed on promotional materials or given over the telephone.

4.4 Domestic vs. non-domestic customers

The main focus of the discussion on the label design options has been the domestic consumer, although the discussion still applies to non-domestic consumers, including large industry and small and medium enterprises (SMEs). The back-side of the disclosure system would be identical for both groups of consumers, but the front-side could be designed differently for domestic and non-domestic customers.

The impact from non-domestic customers has the potential to be far greater than from the domestic sector because they purchase twice as much electricity. But commercial consumers tend to be more heavily motivated by price and most of them are therefore only likely to respond to disclosure if there are other requirements placed upon them, such as environmental reporting, which is becoming more common.

There is general agreement amongst suppliers, consumer and environmental groups in the stakeholder consultation that it is not necessary to develop a different label design for domestic and non-domestic customers – the front-side should be identical for both. It is possible that non-domestic customers may require more detailed information, for instance to help in their environmental reporting requirements. However, this could be provided in addition to the information made available under the standard disclosure scheme.

4.4.1.1 Recommendations

- The front-side of the disclosure scheme should be the same for both domestic and non-domestic consumers as a minimum. This does not exclude the option to provide further information to those customers that require it.

4.5 Costs of the front-side

A detailed cost estimate for two key options for the front-side has been made for Germany, Hungary and the UK under the 4CE project and the figures are summarised here⁶. The two options considered were:

1. Disclosure information displayed on the bill using some type of graphic e.g. pie chart or table, thus requiring bill redesign but using the suppliers' existing equipment;
2. Disclosure information displayed on a leaflet or insert, which is printed separately and sent out with the bill.

Table 1 Summary of front-side costs in Germany, UK & Hungary

	Germany		UK		Hungary	
	million Euros pa	€cent/ MWh	million Euros pa	€cent/ MWh	million Euros pa	€cent/ MWh
Bill redesign	18.9	3.8	0.3	0.1	0.3	0.7
Separate leaflet	25.1	5.0	1.0	0.3	0.2	0.4

Table 1 shows the total costs for both domestic and non-domestic customers. These estimates include the cost of bill redesign or printing of the leaflet, postage and manpower and were made using conservative assumptions. They do not include any costs for graphic design, the assumption being that the supplier is provided with the label design.

These three countries provide a good indication of the likely costs across Europe. The high costs in Germany compared to the other two countries are a consequence of high postage rates and a low number of customers per supplier. Bill redesign is the cheapest option in Germany and the UK, whereas a separate leaflet would be the cheapest option in Hungary. In terms of the total cost of disclosure (including the back-side, see Section 5.10), the costs of the front-side are more significant for Germany, representing between 40%-60% of the total cost. Hence, the choice between the two options for the front-side has greater impact on the overall cost of disclosure in Germany. In the UK and Hungary, the front-side costs are less significant: 3%-14% of total UK costs and 13%-23% of total costs in Hungary.

⁶ For more details see the 4CE phase 3 report on cost-benefit analysis, available on www.electricitylabels.com

5 Back-side: tracking electricity attributes

5.1 Introduction

The back-side of a disclosure scheme covers the interface between the electricity generators and the suppliers and is essentially a mechanism which assigns the electricity from power plants and its attributes to suppliers ('tracking mechanism'). Under the Directive, the attributes of electricity refer to the generation source and associated environmental impact in terms of at least CO₂ emissions and radioactive waste. The tracking mechanism has to incorporate the following features:

- the definition and collection of relevant data;
- the treatment of imports from countries without any disclosure system or with an incompatible tracking mechanism;
- the handling of balancing power and line losses;
- verification of tracking information.

5.1.1 Aim of the tracking mechanism

The purpose of the tracking mechanism is to create linkages between power plants and electricity sold to final consumers. It is not feasible to base these links on the physical electricity flows since any electricity generated is fed into a homogenous pool of power (the grid) and cannot be distinguished with regard to its source. However, it is possible to create links independently from these physical flows, as is already done in both liberalised and non-liberalised markets⁷ in order to facilitate electricity trading. Tracking of electricity is very similar to the accounting procedures used in electricity trading (and can even be based on trading data⁸). It is basically a tool that accounts for electricity generation and consumption and assigns (parts of) the generation of each power plant to the supply portfolios of individual suppliers. This information can then be disclosed to consumers.

5.1.2 Introduction to tracking options

The tracking mechanism defines much of the ability of a disclosure system to generate reliable information for consumers and therefore must be designed appropriately. There are basically three options for tracking electricity (discussed in more detail in Section 5.6):

⁷ The revised Electricity Market Directive requires Member States to fully open their electricity market to competition by 2007. However, electricity trading on the wholesale market is also common in those countries which have not yet fully liberalised the retail market.

⁸ However, it is not necessary to use a similar resolution in time to balance generation and demand: for electricity trading, the time unit for balancing is usually in the range of 15 minutes. For electricity tracking it could be the same, but it could also be up to one year.

- Tracking based on statistical data;
- Tracking based on electricity contracts;
- Tracking based on tradable certificates.

The different approaches to tracking of electricity have been discussed by several studies including the 4C Electricity project (Biewald 1999, SKM 2002, Timpe/Bürger 2003). These draw from experiences made in several states in the US, which operate tracking systems (see Appendix E). The options for tracking were also considered in the stakeholder consultation process in the course of this project. The results are summarised in Section 5.9.

Before the individual tracking options are discussed in detail, the context within which the tracking system has to operate (i.e. the current market structure) and the type of information that the tracking mechanism has to deliver will be considered.

5.2 Context of tracking – the electricity market

The tracking mechanism has to operate within the current electricity market structure throughout Europe. The market is made up of generation owned by suppliers, bilateral contracts and power exchanges and also includes balancing mechanisms and line losses. The proportions of each vary between countries.

The majority of trading is usually carried out via bilateral contracts, these might be either short-term or long-term. In a majority of Member States it is common for suppliers to own a significant capacity of generation, which they could buy from their generator through bilateral contracts. However, these suppliers do not necessarily buy their own generation and there is also a significant number of suppliers which do not own generation at all.

Power exchanges allow electricity to be traded on the open market and are an important instrument for electricity markets since they can determine current market prices. For electricity traders it is quite common to trade electricity several times to optimise their portfolio. The tracking mechanism does not have to deal with pure financial derivatives, such as futures, since tracking only accounts for physical trades.

In addition to these trading activities, there are line losses and balancing power, which makes up the differences between scheduled generation and consumption and the actual load curves. However, both only represent a few percent of the total market.

5.2.1 Bilateral contracts

Bilateral contracts make up the largest share of the market (estimated to be around 60% to 90% by respondents in the stakeholder consultation). Under such contracts it is relatively straightforward to identify the buyer and seller of electricity. Therefore, this sector of the market does not represent a significant obstacle with regards to tracking.

5.2.2 Power exchanges

The market share of power exchanges is usually around 5% to 20%, although, in the case of the Scandinavian Nordpool exchange, the share is around 30%.

At a power exchange, it is not usually possible to identify an unambiguous relation between the buyer and seller of the electricity since there are numerous trades within the homogenous exchange. This can represent an obstacle to a tracking mechanism based on electricity contracts, as will be discussed in Section 5.6.2, but tracking mechanisms based on tradable certificates are not affected.

5.2.3 Balancing power

In the electricity market, it is never possible to forecast the demand of consumers exactly in each time frame used for load balancing (e.g. 15 minutes). Neither is it possible to avoid unplanned outages of power plants. Therefore, surpluses and deficits of kilowatt-hours occur within the system on a regular basis. It is usually the responsibility of the transmission system operator to balance these out by buying and selling balancing power. The costs of this (or possible benefits of surplus production) are usually assigned to those who caused the imbalances. The result of this procedure is that, in terms of electricity contracts, most suppliers have a share of balancing power in their portfolio, which could be e.g. 5 % on average, which they are not able to control and which may be assigned any attribute. This can be a considerable concern for those generators who try to exclude certain energy sources from their portfolio, e.g. fossil fuels or nuclear.

In the framework of tracking, balancing power could be dealt with in the following ways:

- The issue could be ignored and no attributes are assigned to the balancing power. Only attributes acquired through the rest of the market are included in the supplier portfolio.
- Balancing power could be fully integrated into the tracking mechanism. In the case of contract-based tracking, this means that the attributes of balancing power generation are assigned to those suppliers requiring balancing. This would place a heavy burden upon the transmission system operator. In the case of certificate-based tracking, balancing power can easily be integrated into the system.
- All balancing power generation attributes are collected into an average mix, which forms part of the residual mix, discussed in Section 5.7.4. This mix is then assigned to those suppliers with a deficit in electricity attributes.

5.2.4 Line losses

Line losses occur in the transmission and distribution systems for electricity. The percentage of losses varies between approximately 0,5 % for high voltage and more than 5 % for low voltage. There are basically two ways to incorporate these losses in the electricity system:

1. Each participant is obliged to acquire additional generation to make up for the expected losses related to their load, or
2. The transmission system operator is responsible for purchasing the extra generation required and the costs for this are included in the system charges paid by all participants.

In the framework of tracking, the options for dealing with line losses are as follows:

- Under option 1, the extra generation could be fully integrated into tracking and its attributes would contribute to the overall portfolio of the supplier.
- Under option 2, the issue can be dealt with in a similar way to balancing power i.e. the extra generation could either be ignored or assigned to all suppliers on a pro-rata basis.

5.3 Tracking system coverage

The first step in the design of any tracking mechanism is to determine what level of coverage is required. This can be broken down into two aspects:

- which power plants are included
- the type of information which must be collected

5.3.1 Power plant coverage

It is important to establish which power plants are to be included in the disclosure scheme. According to the wording of the Directive, the disclosure scheme only has to cover the public supply system, therefore any plants outside of this, e.g. plants operated by autoproducers to serve their own load, can be disregarded. All other plants would be covered by the tracking mechanism.

However, it would be sensible to require a minimum level of generation capacity (e.g. 5 or 10 MW) before an individual power plant is included in the disclosure scheme in order to limit costs and complexity. This level could be determined in relation to the number of plants covered (which determines the cost) and the share of total electricity generation covered (which should be at least 97 % of generation for public supply).⁹ All plants below this threshold, such as some renewable plants, could be integrated into virtual units by a ‘production aggregator’ of higher capacity for inclusion in the disclosure scheme.

⁹ For example in Germany, a plant-specific coverage of 98.8% of total generation in the public power supply could be achieved by tracking all plants above 10 MW. This would be based on only 35% of the total number of plants (in absolute figures this would be approx. 350 plants). Note however that this information is based on industry statistics which do not include wind, solar, biomass and decentralised cogeneration plants. Since these plants would also be included if they exceed a certain capacity threshold, the actual figures might be somewhat different to those given here.

Another factor to consider is the availability of emissions data from other schemes e.g. the intended EU Carbon Emissions Trading scheme. This scheme will require fossil fuel power plants above a rated thermal input of 20 MW to monitor and report their fuel input and emissions. Therefore the disclosure scheme could cover individual data from these power plants and any nuclear and renewable generators above a certain capacity. All other plants could be included based on generic emission factors.

5.3.2 Information coverage

For the operation of an electricity disclosure scheme, three sets of data have to be collected:

1. Under the Directive, information on the fuel source and the associated CO₂ emissions and radioactive waste is required. Therefore at a minimum, information on the fuel used in each power plant is required. If Member States require the use of plant-specific environmental indicators (rather than generic factors), this detail must be determined on the individual plant level as well. Much of this information is already collected under existing and proposed schemes, e.g. the intended EU Carbon Emissions Trading Scheme (pilot phase due in 2005). This will significantly reduce the cost of data acquisition and verification.
2. The electricity generation of all power plants must be recorded on a regular basis. This is already done by generators as part of their energy balance and accounting procedures. The disclosure scheme can therefore be based on the generation data which are already available, but these data can be aggregated on a much larger time frame, e.g. weekly or monthly, rather than the short time frames used for balancing.
3. On the level of suppliers, the total volume of electricity sales to final consumers must be determined. These data are also already available, since they are recorded by suppliers for a range of purposes. If the disclosure scheme is extended to individual products, then the sales figures must be determined for each of these products.

The data for those plants that use different fuels (either simultaneously or at different times of the year) must be divided up according to the share of each fuel for that plant (based on the calorific value of the fuels). Possible variations in plant efficiency for the different fuels need to be taken into account.¹⁰

It can be concluded that most of the data required for the operation of the electricity disclosure scheme are already available. The main focus for electricity disclosure is therefore to collect these data and to process them in the tracking system to provide the disclosure information.

¹⁰ These data will probably be available from the monitoring reports under the Emissions Trading scheme. Otherwise, this would need a formal accreditation procedure at the plant level.

5.3.3 Recommendations

- Member States should agree on a common basis for how power plants are included in the tracking system. This can be done using e.g. either plant-specific or generic emission factors.
- The rules for selecting which fossil fuel plants are covered by the tracking mechanism with plant-specific emissions factors should be based on rules for coverage under the monitoring procedures of the intended EU Emissions Trading Scheme.
- A minimum generation capacity should be established for the inclusion of individual plant data from nuclear and renewable power plants in the disclosure scheme. Low capacity plants should be integrated into virtual units of higher capacity in order to be included in the tracking scheme.
- As far as possible, the disclosure scheme should use data that are already available, e.g. plant generation data from the settlement procedures in the electricity market.
- Specific regulations should be considered by Member States for power plants using multiple fuels.
- Procedures of how data are provided to the tracking mechanism and how these data are verified should be decided by Member States.

5.4 Information to be tracked

The tracking mechanism has to be able to provide the information required for the front side of the disclosure system. Under the requirements of the Directive, this consists of the fuels used to generate a certain amount of electricity and the related CO₂ emissions and radioactive waste as a minimum for the suppliers portfolio.

5.4.1 Tracking of fuel data

The Directive requires that suppliers disclose to their customers *‘the contribution of each energy source to the overall fuel mix of the supplier over the preceding year’*. Therefore the tracking mechanism has to provide information about how the electricity is generated i.e. which fuel source is used. The Directive does not specify a list of fuels for this purpose. It was recommended in Section 4.2.3 that Member States agree a fixed list of fuels to be used by all suppliers. The tracking mechanism in each country will need to cover this list of fuels. As recommended in Section 4.2.3 it may be necessary to limit the number of fuels in this list – this would help limit the complexity of the tracking mechanism. It would be sensible for all countries to use common definitions of individual fuels to ensure consistency and comparability.

5.4.1.1 Recommendations

- Member States should agree on which fuels are covered by the tracking mechanism. For example, hard coal and lignite could either be tracked separately or could be integrated into one fuel category ‘coal’.
- The definition of individual fuels should be harmonised at a European level (this should be based as far as possible on existing definitions in EU Directives).
- Any European tracking mechanism must be designed to handle the full list of fuels which have been selected for disclosure by the Member States

5.4.2 Tracking of environmental indicators

The Directive also requires that the disclosure scheme determines the environmental indicators, at least in terms of CO₂ emissions and radioactive waste. As outlined in Chapter 4, it is up to the discretion of Member States whether or not additional environmental indicators are included in the disclosure information. As with the fuel sources, this has implications for a European tracking mechanism, which would have to cover any additional environmental indicators that Member States choose to include. This could add considerably to the complexity of the tracking. Therefore there needs to be some agreement amongst Member States as to which indicators are to be covered. It is also important to agree on common definitions for the environmental indicators and the process by which they are determined, to ensure consistency and comparability.

Emission factors can be based on the direct emissions from a power plant or on total life cycle emissions. The latter would result in some renewable electricity technologies and nuclear power being associated with a proportion of CO₂ emissions. In order to reduce the complexity of the disclosure scheme it is suggested that only direct emissions figures are tracked. However, in order to reflect any indirect emissions, which can be considerable, standardised correction factors for different generation technologies and fuel sources should be applied to the direct emissions figures to give total life-cycle emissions.¹¹ These factors should be determined on the national level on the basis of common guidelines agreed amongst Member States.

The impact of the different sources would also appear different if all greenhouse gas emissions, rather than CO₂ emissions alone were used. However, this is not required by

¹¹ If life-cycle emissions are not included, this would mainly favour photovoltaics (118 g/kWh including life-cycle emissions), hydro power (39 g/kWh) and nuclear power (31 g/kWh). All these sources have 0 g/kWh direct emissions. For a gas-fired CCGT plant, life-cycle emissions are 11% higher than direct emissions and for imported hard coal they are 8% higher. All data are taken from the GEMIS model, version 4.14 (Oeko-Institut 2002) and are valid for Germany.

the Directive and would again add to the complexity of the disclosure scheme and so is not recommended at this stage.¹²

The indicator on radioactive waste could include different types of waste (high radiation level, medium level and low level waste) and could include all outputs from the nuclear fuel cycle. In order to reduce the complexity of this indicator, it is recommended to only use the volume of spent nuclear fuel which is produced by the reactors.

There are three major options for how environmental indicators can be tracked:

1. The easiest solution would be to only track the fuel types and derive the environmental indicator information by applying generic emission factors for each fuel type at the level of each electricity supplier. These emission factors could be based either on European or national averages.
2. A second option would be to track the individual emission factors of the power plants in order to determine the environmental indicators with high accuracy. The emission factors could be stated explicitly for all electricity that is traded and so market players can see the characteristics of the electricity they are buying at every stage.
3. A third option would be to use two generic emission factors for each fuel type, corresponding to the highest and lowest emission factors of any power plant within Europe using this fuel. Electricity would then be assigned an individual mix of these generic factors (e.g. in the form of high and low emission tags or certificates), depending on the efficiency of the power plant where it was generated. For example, using simplified figures, if the highest CO₂ emission factor from coal in Europe is assumed to be 1,500 g/kWh, the lowest factor might be 900 g/kWh. A power plant operating with an emission factor of 1,100 g/kWh can then be mapped with a mix consisting of 33.3% tags or certificates representing 1,500 g/kWh and 66.7% of tags or certificates representing 900 g/kWh.

This option can in principle be used for several environmental indicators and many different fuels. However, the complexity of the approach may increase significantly with every indicator to be covered. This is because two types of tags or certificates

¹² If only CO₂ emissions are regarded instead of the CO₂ equivalent of all GHG emissions, this would mainly favour photovoltaics (GHG 10% higher than CO₂), hard coal (GHG 9% higher than CO₂ in the case of imported coal), gas (GHG 8% higher than CO₂) and nuclear power (GHG 6% higher than CO₂). All data include life-cycle emissions and are taken from the GEMIS model, version 4.14 (Oeko-Institut 2002) and are valid for Germany.

(high and low emissions) have to be handled for each environmental indicator and each fuel and this could reduce market liquidity.¹³

Option 1 is not desirable, at least for CO₂ emissions, since the actual emission factors vary significantly between power stations of the same fuel types, depending on power plant efficiency and fuel quality. For instance, there is a 25% variation on specific CO₂ emissions between the best and worst coal-fired power stations in the UK (National Power, 1998). Neither European nor national averages would provide an acceptable level of accuracy.

The drawback of assigning individual emissions factors in option 2 is that the electricity from each power plant is different to all other items on the market. Such a wide variety of products on the market would cause significant problems in terms of liquidity of the market if emissions factors became the basis upon which electricity was traded. Therefore this option is not desirable either.

Hence, of the three options, only option 3 provides an acceptable way to map environmental indicators with high accuracy.

5.4.2.1 Recommendations

- Member States should agree on which environmental indicators are included in the disclosure scheme (CO₂ emissions and radioactive waste at a minimum) and develop common standards on how they are defined and determined.
- CO₂ emissions should be used rather than greenhouse gas equivalents in order to reduce the complexity of the system and to adapt it to the reporting requirements for the Emissions Trading Scheme.
- The disclosed CO₂ emissions should be based on direct emissions factors initially, moving to life-cycle emissions of the power plant and fuel if the basis on which life-cycle emissions are calculated can be agreed amongst the Member States.
- The disclosed radioactive waste should be based on the volume of spent nuclear fuel which is produced by the reactors.
- Environmental indicators should be tracked on a plant-specific basis using tags or certificates with two classes of generic emissions factors for each fuel type (e.g. in gCO₂/kWh) corresponding to the highest and lowest emissions factors from European power plants.

¹³ If, for example, the total number of fuel types within the tracking mechanism is 9 including coal, gas and oil, then these three could be replaced by six fuel types (low emission coal, high emission coal, low emission gas, high emission gas, low emission oil and high emission oil). This would result in a total of 12 different tags or certificates on the market, which could be handled more easily than different tags or certificates from each individual plant. If the production of radioactive waste is also to be tracked, then the fuel type 'nuclear' would be replaced by 'low waste production nuclear' and 'high waste production nuclear', resulting in a total of 13 different tags or certificates on the market.

5.4.3 Cogeneration

The environmental impact of electricity from cogeneration is a special case and needs to be considered separately since the efficiency of power plants operating in cogeneration mode can be much higher than conventional power stations using the same fuel.

The European Parliament requested that the share of cogeneration be shown explicitly on the disclosure label, although this was not included in the final Directive.¹⁴ However, Member States are free to go beyond the minimum requirements of the Directive and can decide to show the share of cogeneration on the label.

This could be reflected in the tracking mechanism by assigning an ‘earmark’ to any electricity from high-efficiency cogeneration. This earmark could then be followed through the trading steps and allows for the calculation of the cogeneration share within the suppliers’ portfolios in addition to the standard fuel list. However, this approach would not facilitate adequate tracking of the benefits of cogeneration in terms of environmental indicators. Therefore, a better solution would be to integrate the emission factors of cogeneration into the recommended approach for tracking environmental indicators given in Section 5.4.3. This would require a third type of generic tag or certificate with an emissions factor of zero which could be assigned to cogeneration on a pro-rata basis in order to reflect the emission benefits.¹⁵

5.4.3.1 Recommendations

- Tracking of the environmental indicators should reflect the impact of cogeneration by incorporating zero emissions tags or certificates.

5.4.4 Product vs. portfolio disclosure

Under the Directive, disclosure information is only required on the suppliers’ portfolio. However, in Section 4.2.2, it was suggested that there should be the option of disclosing differentiated products (e.g. a green electricity product) in addition to the supplier portfolio. If Member States choose to go down this route, then the tracking mechanism must be able to provide data on the individual products.

If the supplier portfolio is calculated on the basis of statistical averages at the national or EU level (Section 5.6.1), it would not make sense to also provide product disclosure, since there would be no way of determining the attributes of the individual products. Therefore, product disclosure is only feasible if a tracking mechanism based on contracts or certificates is used. In this case, it is important that the integrity of attributes of

¹⁴ The European Parliament and the Council are currently discussing criteria for the definition of ‘high efficiency’ cogeneration plants in the framework of the draft Directive on the promotion of cogeneration.

¹⁵ For a more detailed analysis of options for the assessment of cogeneration plant efficiencies see Minett 2003 and Timpe/Matthes 2003.

the particular fuel source is maintained, e.g. it should not be possible to detach the CO₂ emissions from coal generation.

In order to provide reliable disclosure data for product labels, suppliers could be required to keep separate accounts for their different products (Section 5.7.3).

5.4.4.1 Recommendations

- If suppliers are allowed to disclose product information in addition to their portfolio, then they should be required to maintain separate accounts for the attributes of their products in order to ensure transparency.

5.5 Imported electricity

Following from the Directive, all Member States and Accession Countries will establish electricity disclosure schemes. This means that the transmission systems of UCTE, NORDEL, UK, Ireland, EES/VES (including Estonia, Latvia and Lithuania), and Cyprus and Malta will be affected by electricity disclosure. Many of these transmission systems are connected to the electricity systems of other countries which are not members of the EU-25 and may not have disclosure schemes in place.¹⁶

When electricity is imported into a country with a disclosure scheme in place, there needs to be a procedure for how information on this imported electricity is disclosed. There are three possible interfaces between countries with regards to electricity disclosure:

- Both countries have a harmonised tracking mechanism in place (this could happen between countries within the EU or between an EU member and a country outside the EU which may have chosen to implement a compatible disclosure scheme e.g. Norway).
- Both countries have disclosure schemes in place but they are not harmonised (this could involve a country outside the EU but could also happen within the EU if a sufficient level of harmonisation is not reached).
- Only one of the countries has a disclosure scheme in place (this might happen between an EU Member State and a non-member).

In the first case the attributes will be provided by the disclosure scheme. For the latter two cases, there are a number of options for how the attributes of imported electricity could be determined:

1. No attributes are assigned to the imported electricity and it is disclosed separately as 'imported' or 'unknown electricity' and is not assigned to the relevant fuel sources;

¹⁶ As Norway and Switzerland are integrated in European electricity markets, they will most likely adopt electricity disclosure schemes compatible to those in the EU.

2. Statistical averages – there are a number of different methods for determining such averages (see below);
3. Imports are only permitted on the basis of unit contracts which are associated with attributes from the relevant power plants.

The latter two options will be discussed in turn.

5.5.1 Statistical averages

There are a number of ways in which statistical averages could be determined:

- Aggregate figures provided by the exporting undertaking for the preceding year are used to assign attributes. This is proposed under the Directive for electricity imported from outside the EU. One of the drawbacks of this approach is that the verification of such information could be difficult and could incur high costs.
- All imports could be assigned with e.g. the UTCE mix (as is the case in the Austrian disclosure scheme). However, once electricity disclosure is implemented in all EU Member States, then most of the UCTE mix (and those of the other regions listed above) will already be disclosed by the individual countries and therefore the use of the such a mix would lead to significant double-counting of attributes.
- The average generation mix of the exporting country could be used. This approach is straightforward and easy to understand. However, it incurs a risk of so-called ‘green-washing’ of electricity.¹⁷
- The average of all undisclosed electricity generation in the transmission system region within which the exporting country is embedded could be used, (e.g. the UCTE system). This would consist of the power generation portfolio of the transmission system not accounted for by electricity disclosure or Guarantees of Origin. However, there are concerns that assigning such a mix to all imports from undisclosed sources could conflict with international trade laws. This issue requires a more detailed analysis.

5.5.2 Unit contracts

An alternative could be to allow imports on the basis of unit contracts on the condition that the exporter of the electricity provides evidence that the electricity is associated with attributes of certain power plants (e.g. through a Guarantee of Origin). However, this can lead to two problems:

¹⁷ ‘Green-washing’ of electricity can occur if imports are assigned with the average attributes of the exporting country: assume that there are three countries A, B and C with no compatible tracking systems. Generators or traders from country A with less favourable sources could export their electricity to country B, which has a more attractive generation mix, and then export it from there to country C. The importer in country C would treat this as an import from country B and assign the average attributes of country B to the respective electricity, which would not reflect reality.

- If the exporting country does not have a reliable tracking system or a system of Guarantees of Origin in place, then there is the possibility of double counting, i.e. the generator could sell the attributes of a certain power plant several times to different buyers.
- It is also possible that the importers start ‘cherry-picking’, i.e. they buy up those attributes in other countries which receive the highest price within the electricity disclosure system. The exporting country would then be left with the unfavourable attributes, although this would not be apparent to consumers in this country because there is no disclosure scheme.

High shares of undisclosed imports and exports remain a challenge to Electricity disclosure and may deteriorate its basis: a reliable tracking system. The most effective way to reduce the share of undisclosed imports to a negligible size would be to implement electricity disclosure in a harmonised way in all or most of the countries in Europe with interconnected transmission systems.^{18,19} Imports would then have a minimal effect on the disclosure scheme.

Chapter 4 recommended that Member States had the option to indicate the share of imported electricity on the disclosure information along with a list of exporting countries. This can be facilitated through the tracking mechanism by including the country of origin as part of the electricity attributes (besides the fuel source and environmental indicators).

5.5.3 Recommendations

- Member States should develop their tracking systems with as much harmonisation as possible in order to support the internal market for electricity. This is one of the most critical points in setting up electricity disclosure schemes in Europe.
- Unit contracts or data provided by the exporting undertaking should only be used if the exporting country has implemented a Guarantee of Origin for the respective type of attributes. This will avoid double-counting of these attributes and limit the incentive for cherry-picking.
- In all other cases, the average generation mix of the exporting country can be used as a first step. This effects of this should be monitored closely by the Member States and the Commission.
- Further research is required on how other undisclosed imports can be handled and how effects such as ‘green-washing’ of electricity can be prevented.

¹⁸ For an assessment of different clusters of EU Member States for disclosure see SKM (2002). It must be noted though that the data used for this assessment only represents the physical exchange of power. The volume of contracts for physical delivery in both directions might be significantly higher.

¹⁹ For additional discussions on the implications of imports and exports on electricity disclosure see Grace/Wiser (2002).

5.6 Options for the tracking mechanism

The task of the tracking mechanism is to create links between the kilowatt-hours which have been generated by a power plant or mix of power plants to the kilowatt-hours sold to final consumers. Through these links, the attributes of power generation (fuel used, emissions, country of origin) can then be assigned to the portfolios of suppliers, which determine the data to be disclosed to consumers.

The following sections discuss the options for the three basic approaches to tracking.

5.6.1 Statistical data

Under this approach, certain mixes of power plants are assigned to suppliers, such as national averages or the mixes of multi-national transmission systems (e.g. the UCTE mix) or the mix of power plants owned by the supplier. Tracking on this basis would be unaffected by the proportion of power exchanges, balancing power and line losses in the market.

The lowest cost option would be an approach based on national or EU averages because this would not require the collection of data from individual plants or the incorporation of electricity attributes into the trading mechanisms. However, this approach significantly reduces the accuracy of the data. If all suppliers in Europe were assigned the national average, there would be no possibility for consumer choice since each supplier in any one country would have the same portfolio. In this case electricity disclosure would be reduced to a very general educational instrument about the average characteristics of the European or national electricity systems.

Another approach would be to use the average values of power plants owned by a generation company affiliated to the supplier to establish a certain level of differentiation and consumer choice. This will not cover the whole market since most suppliers acquire a significant share of the portfolio through trading and there is a significant number of suppliers that do not own any generation. Also, suppliers do not necessarily buy their own generation. Therefore all electricity that is traded would be assigned the transmission system averages (e.g. UCTE or NORDEL). The major shortfall of this option is that there would be significant double-counting: a considerable part of the UCTE mix would consist of supplier owned generation which has already been assigned to their respective customers. Any attempt to separate this out from generation which is not owned by suppliers would require the development and operation of a basic tracking system.

Therefore, tracking based on statistical data alone does not provide a sufficient level of reliability.

5.6.2 Contract based tracking

Under this approach, a tracking mechanism is established that uses data from the trading of electricity to assign power plants to supplier portfolios. Attributes of power genera-

tion are accounted for at every step of trading (Figure 8). There are basically two options of how this could be implemented:

- Individual energy management systems operated by market players; and
- Standardised ‘tag’ system within a central registry.

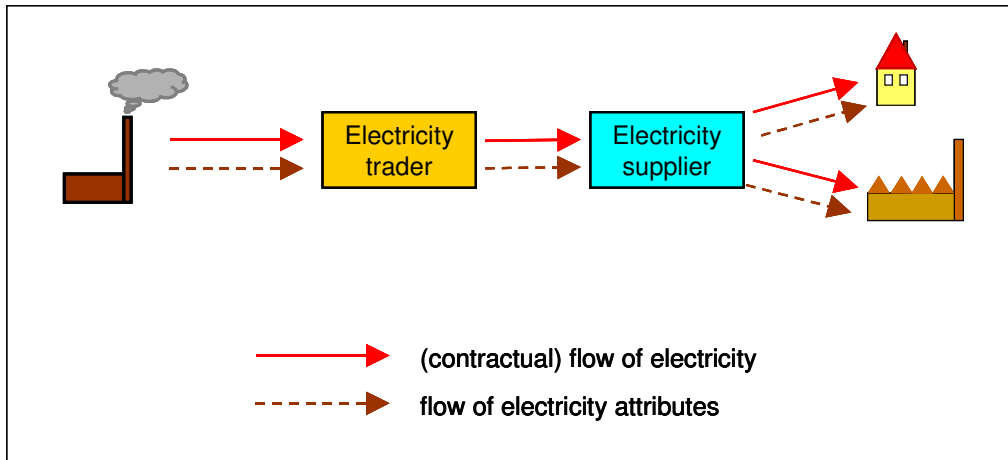


Figure 8 Contract based tracking

5.6.2.1 Individual energy management systems

This option features energy management systems which are set up and operated by all generators, traders and suppliers to account for the attributes of electricity when it is generated, traded and sold. For example, if a supplier concludes a bilateral contract with a generator, the generator will provide the attributes of its power plant which are then added to the supplier's energy management system. Similarly the generator has to keep track of the volume and attributes of the electricity it sells.

In order to deal with electricity from power exchanges, some flexibility would be required. Market participants could be allowed to handle a certain share of the market without attributes, i.e. as ‘grey’ electricity. This could be disclosed to consumers as ‘electricity with unknown origin’. However, this would limit the accuracy of the disclosure system if significant shares of electricity are traded via power exchanges. An alternative would be to assign attributes to the ‘grey’ electricity on the basis of statistical data such as the UCTE mix (as is currently the case in the Austrian disclosure scheme). However, the use of such an approach all over Europe would have two major disadvantages:

1. Firstly, this would lead to double-counting, since any statistical mix would also contain the volumes of electricity already accounted for in the energy management systems. This would significantly reduce the accuracy of the disclosed in-

formation. In order to remove these volumes from the statistical mix, a comprehensive system of tags would have to be developed.

2. Secondly, the application of a default mix could suggest a higher degree of precision to the consumer than it is actually achieved through the accounting systems.

As mentioned in Section 5.4.4, the integrity of attributes associated with the electricity must be preserved within the energy management systems. For example, it should not be possible to detach the CO₂ emissions from a certain volume of generation from coal and assign it to other volumes of electricity.

The operation and results of the energy management systems would need to be subject to independent verification, i.e. certified auditors would review the procedures and the results of the energy management systems. This would incur a significant cost since verification would have to be performed on a decentralised basis for each individual system.

5.6.2.2 *Standardised ‘tags’*

A second option would be to introduce a tracking mechanism based on ‘tags’, which represent the attributes of a certain volume of electricity generation (e.g. 1 MWh), and which could be transferred from generators to suppliers attached to electricity contracts. All participants in the market would have to use the tag system.

The main difference to the first option is that the tags are standardised and could be maintained in a central registry (Section 5.7). Tags would be issued based on generation data and would facilitate transfers of attributes on a uniform basis, which could reduce costs. Market participants would transfer tags between their accounts in the registry with each physical electricity transaction.²⁰ Electricity suppliers must redeem a sufficient number of tags to cover their sales to final customers. Within the power exchanges, attributes of all electricity sold through the exchange could be recorded and an average value could be determined over a certain period of time (e.g. a week, a month or even longer). All electricity which has been bought from the exchange during this period would be assigned with this average.²¹ This option can be implemented fairly easy if tags are used for tracking contracts. Another advantage of the tag option is that it would easily facilitate independent verification of the disclosure information through the central registry.

²⁰ Because the contracts are concluded prior to the actual generation of electricity and tags are issued only afterwards, there will be a time lag between the electricity contract and the transfer of tags between seller and buyer.

²¹ This option is equivalent to a certain extent to the suggestion in Article 3(6) of the Directive: *"With respect to electricity obtained via an electricity exchange or imported from an undertaking situated outside the European Union, aggregate figures provided by the exchange or the undertaking in question over the preceding year may be used."* Note however that this regulation is optional, i.e. other solutions are possible as well. For example, the period over which averages are determined may be shorter than one year.

5.6.2.3 Advantages and disadvantages

For consumers the main advantage of a tracking system based on electricity contracts is that it reflects the actual trading of electricity (as opposed to a system with tradable certificates, which are detached from the trading of electricity – see next section). This may be important in terms of the credibility of the disclosure scheme from the consumers' perspective. Under contract based tracking, the disclosure label will show consumers which power plants their supplier bought electricity from and therefore where their money is going, at least for the proportion of the market covered by bilateral contracts.²² However, there could still be a significant proportion of the market which would not directly reflect where consumers' money is going e.g. 'grey' electricity from power exchanges.

For the electricity industry, there are two major disadvantages of a contract based tracking mechanism:

1. Firstly, the required effort to incorporate electricity attributes in each and every electricity contract would be immense and would incur considerable transaction costs. In addition, the markets for electricity would be split up into different qualities and this could reduce market liquidity.²³
2. Secondly, a full tracking system based on electricity contracts means there is a risk that competitors might get a better insight into market positions of other market participants through the disclosure information. This could lead to distortions of the market process.

5.6.3 Certificate based tracking

The third option for tracking is based on the concept of tradable certificates, issued at the point of generation, which detach the attributes of power generation from the electricity contracts and make them tradable on a separate market, thus avoiding some of the disadvantages of a contract based mechanism. The 'grey' electricity is traded separately from the attributes of the electricity and then brought together again at the supplier level (Figure 9). All suppliers would be required to acquire a sufficient number of certificates to cover their sales and therefore determine their portfolio. The allocation of generation attributes to suppliers would therefore, in theory, be independent from all aspects of electricity trading, e.g. suppliers' ownership of power plants, bilateral trades, power exchanges and balancing power.

However, trading of certificates will still incur some transaction costs. Therefore it can be assumed that the majority of the certificates related to generation owned by suppliers

²² Note however, that electricity generation costs represent only a relatively small share of the retail price of electricity, e.g. in Germany this share is around 16% for domestic customers.

²³ See e.g. SKM 2002. This has also been stated in interviews with industry representatives in interviews and during workshops conducted under the 4CE project.

will be kept by this supplier as part of his portfolio. Long-term contracts for certificates and a spot market might also be established.

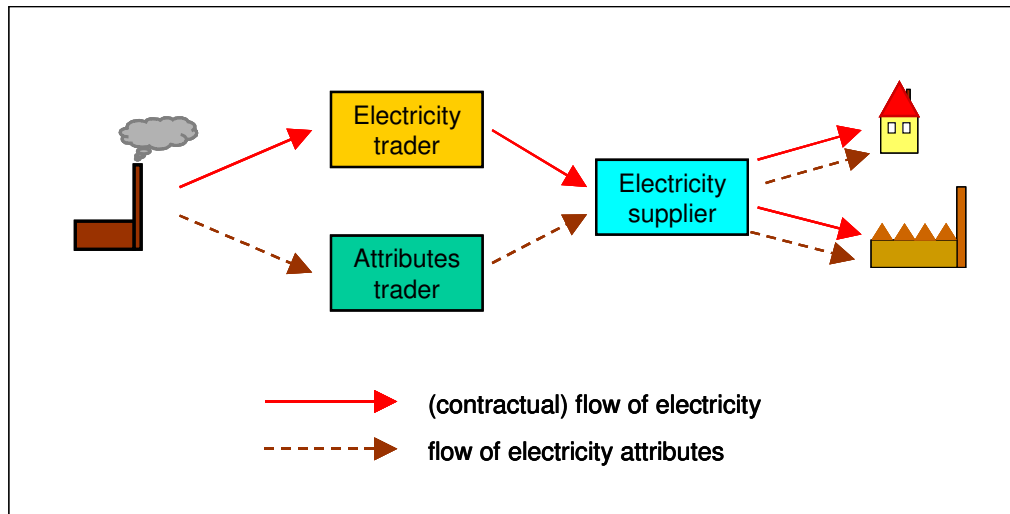


Figure 9 *Tracking based on tradable certificates*

Certificates would be kept exclusively in central registries, which are set up by Member States. There could be one single registry for each geographical domain, such as Member States or super-national regions such as Scandinavia. The registries issue certificates to the accounts of generators based on their generation data and allow for transfers of certificates to other account holders within the registry or in registries of other Member States. The data to be disclosed by suppliers would be determined in the course of a settlement process, which could take place e.g. eight weeks after the end of each calendar year.²⁴ Such a registry must be operated by an independent actor and confidentiality of the information maintained at all times.

The introduction of tradable certificates would split up the financial flows in the electricity industry into two parts. The first part (and most likely the larger one) will be determined by the value of the commodity electricity.²⁵ Because the attributes of electricity have been detached, there will be no difference in the market price for generation from different sources such as renewables, nuclear or fossil fuels.²⁶ Any differences in the market value of individual energy sources or the related emissions will be incorporated into prices on the certificate market. Those certificates with attributes which have a high

²⁴ This allows for some time to issue and transfer certificates which relate to power generation at the end of the calendar year.

²⁵ This value will be differentiated for different times of the day and during the year as it is the case on the electricity market today.

²⁶ Note however that support mechanisms for certain energy sources or generation technologies such as renewables and cogeneration will still be in place and will result in premium payments above the market price.

demand will obtain higher prices than other certificates. The revenue of generators is the total of the market price for the commodity electricity and the price of the certificates.

There is a large degree of similarity between tags used for tracking based on electricity contracts (Section 5.6.2.2) and tradable certificates. Both represent the attributes of a certain volume of electricity and could be handled as entries in the same central registry database (Section 5.7). The crucial difference is that tags are traded attached to electricity contracts, i.e. with every contract, a corresponding number of tags is transferred, while certificates are separated from contracts and are traded on a separate market.

An international mechanism of tradable certificates has been introduced on a voluntary basis for electricity from renewable energy sources through the Renewable Energy Certificate System (RECS), which is operated by more than 80 companies and organisations from the European electricity sector.²⁷ Experience from this system could be used to develop the registries for a tracking system for all electricity.

5.6.3.1 Advantages and disadvantages

The high flexibility of the certificate approach, which is beneficial to electricity market participants, can at the same time be seen as a significant disadvantage since the certificates bought by a supplier may not reflect the attributes of the power plants from which the supplier actually bought the electricity. This could undermine the credibility of the tracking system from the consumer perspective. For example, if a major supplier owning a large capacity of coal-fired generation sold the coal certificates to other suppliers and in exchange bought a large volume of hydropower certificates, he could then disclose a CO₂-free portfolio to his customers. Although this allocation of attributes would be correct under the certificate system, many customers of this supplier might not regard this information as credible, because it obviously contradicts the assumed portfolio on the electricity market (based on the actual generation). Hence there is a trade-off between the higher flexibility for traders and suppliers and the credibility of the system to consumers.

Any measures to increase the credibility of the certificate system to consumers are likely to limit the flexibility of the system for electricity market participants. For example, the free flow of certificates could be restricted to the service areas of individual transmission system operators (TSOs), with exports and imports of certificates from these areas only allowed if there are corresponding electricity contracts or if the relevant interconnector capacity has been booked. This would ensure that there are no major swaps of attributes with other TSO service areas without the corresponding electricity contracts.²⁸

²⁷ See the RECS website for details www.recs.org.

²⁸ However, it is not clear how cross-border electricity contracts can be monitored to get a clear picture of how much electricity really has been delivered between TSO service areas.

If a certificate system is used, suppliers will need to recognise the credibility issue and implement strategies to limit this problem. It is essential that consumer confidence in any tracking system is maintained – once lost it is difficult to recover.

5.6.4 Recommendations

- The overall level of accuracy and reliability of the tracking mechanism should be comparable in all Member States.
- In order to ensure the reliability of disclosure data as required by the Directive, double-counting of attributes and large shares of electricity with unspecified attributes must be avoided. This requires some form of tracking – at least of all supplier owned generation and most bilateral trades.
- The disclosure scheme should not be heavily based on statistical averages. Such a system cannot convert consumer preferences into price signals for generators and therefore does not allow consumer choice to have an impact.
- Tracking should be based on tags or certificates held in a central registry. This avoids double-counting of attributes and facilitates easy verification of disclosure data.

5.7 A flexible approach to tracking

In order to ensure a high degree of reliability, a comprehensive tracking system based on tags (linked to contracts) or tradable certificates could be established. There is no clear overall preference for tags or certificates, so a flexible system should be implemented that can handle both options. This means that the attributes of electricity generation are recorded in standardised sets of data and the decision as to whether these are transferred as tags together with electricity contracts or traded independently as certificates, is left to the participants in the electricity market. Therefore it is possible that a certain tag, which has been transferred in one market transaction attached to an electricity contract, could then be detached from this contract and sold onto a third party as a certificate. However, the operation of such a flexible system should be monitored very closely in order to allow for corrective action if required.²⁹

The following key features of the system are discussed in detail below:

- A central registry
- Settlement period
- Product disclosure

²⁹ For example, if the flexibility of this system leads to major shifts of certificates around Europe which could undermine the credibility of the disclosure system to consumers (Section 5.6.3), then a requirement could be introduced that the attributes must be more closely linked to electricity contracts, movement of certificates is restricted or a minimum share of tags (as opposed to certificates) is introduced for all suppliers.

- Additional flexibility through the use of a residual mix

5.7.1 A central registry incorporating Guarantees of Origin

A central registry allows the use of both tags and certificates within the same system since, from a technical point of view, both are identical database entries with exactly the same features, i.e. they represent the attributes of a certain volume of electricity, such as 1 MWh. If both are issued and kept in one registry, then it is easy to ensure that for a certain volume of electricity generation only one database entry is created which then can either be used as a tag or a certificate. Therefore, a major benefit of a central registry is that it can guarantee a high reliability of data provided and double counting is easily prevented.

Within the registry, all market participants maintain their tags and certificates in trading accounts. All suppliers keep a second account, the redemption account, and all tags or certificates which they transfer into this account, until a certain point in time, are counted towards their portfolio. This deadline is the beginning of the settlement process, which could be e.g. eight weeks after the end of the respective calendar year. At this point in time, all tags and certificates which have been issued for electricity generation in the previous year and which are still in the trading accounts of generators, traders or suppliers, will be collected to form the residual mix (Section 5.7.4).

The registries are set up by Member States, or in collaboration of several Member States, and should be operated by bodies which are fully independent from the interests of electricity generation, trading and supply. The operators could be regulators, Independent System Operators or any other body nominated by the governments.

There is already an option for a central registry for electricity attributes in relation to the Guarantee of Origin (GO), which is one of several policy initiatives based on EU Directives that interface quite closely with disclosure. The Renewables Directive 2001/77/EC requires each Member State to set up a methodology for authenticating the quantity and source of renewable electricity. The use of the system, in any one Member State, is voluntary for the individual generators. The GO has to be implemented by October 2003. A similar system of GO is contained in the draft directive on the promotion of cogeneration, which is currently being discussed in the European Parliament and the Council.³⁰

Several Member State governments, such as Austria, the Netherlands and Italy have already decided to provide a central database that will track the generation, transfer and supply of renewable electricity with GO, if the generator requests such a guarantee. These GOs will be in the form of renewable tags that can be transferred attached to electricity contracts. However, in other countries, such as Germany, there will be physical documents for the GO, but no central registry.

³⁰ Proposal for a Directive of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market, COM(2002) 415.

The approach of using tags for the GO which are administered through a central database would provide a useful starting point for tracking electricity for disclosure since it would put into place all the relevant procedures and mechanisms, including the required software system for a tracking system based on tags or certificates.³¹ In order to be used for electricity disclosure, the coverage of the registry would need to be gradually extended from optional use for renewables to a comprehensive system for all sources of generation. In fact, the tags or certificates would take over the roles of Guarantees of Origin and no separate mechanism for the certification of origin of electricity from renewables or cogeneration would be required.

In Austria, renewables represent around 70% of electricity generation and the vast majority of the total number of power plants. Therefore, the GO database could cover most of the production facilities and the majority of the electricity volume. A similar situation would occur in Scandinavian countries and also in many other countries, where renewable plants constitute a significant share of the total number of plants. Therefore, it would not be difficult for these countries to extend the system to cover all generation. There could be one single registry for each geographical domain, such as Member States or super-national regions such as Scandinavia.

Combining the central registry for GOs and the tracking mechanism for electricity disclosure means that the cost of setting up such a scheme will be minimised. Another benefit is that most of the verification procedures required for the disclosure scheme can be integrated into the central registry.

5.7.2 Settlement period

The Directive states that the disclosure data must be determined ex post on an annual basis. Section 4.2.1 of this report recommended that the disclosure information be provided on the basis of the calendar year. It would be possible for the tracking system to generate data on a more frequent basis. For example, the NEPOOL-GIS system in the US uses a quarterly settlement scheme. However, this raises transaction cost for all participants compared to an annual settlement procedure. Therefore, taking the settlement period as a year, during this time tags and certificates could be transferred by market participants as they wish. Because issuing and trading of tags and certificates relating to power generation at the end of the calendar year requires some time, it would be sensible to allow an additional period of, e.g. eight weeks after the end of the year. After this point in time, transfers of tags or certificates relating to generation from the previous year would not be possible and the supplier portfolios would be determined from an inventory of their registry accounts.³²

³¹ Both procedures and software might still have to be amended to be able to cover the full electricity market instead of the renewable part only, but this could be an evolutionary process and will be less costly than starting from scratch.

³² See Section 5.7.4 on how a residual mix could fit into the settlement procedure.

5.7.3 Product disclosure

Product disclosure could be implemented fairly easily under the central registry approach. In such a system, suppliers could maintain sub-accounts at the registry for each product. These sub-accounts would provide full transparency and would facilitate easy verification of suppliers' claims to consumers. Note however that suppliers can transfer tags or certificates between their sub-accounts any time until the settlement process for a certain calendar year begins. The registry can provide suppliers not only with the disclosure information on their portfolio, but also with all information on products.

5.7.4 Use of a residual mix

If a comprehensive tracking mechanism based on tradable certificates or tags is in place then there are two options with regard to its usage by generators, traders and suppliers:

- The tracking mechanism could be mandatory for the whole market, i.e. suppliers must acquire sufficient attributes to match their electricity sales to final customers. After the end of each calendar year, the portfolio of each supplier is determined from the average of attributes of his certificates³³.
- The use of the tracking mechanism could be voluntary, i.e. suppliers can choose whether or not to participate in tracking and actively acquire attributes which match their electricity sales to final customers. Suppliers would maintain trading accounts and redemption accounts in the central registry. Only those tags or certificates which have been transferred into a redemption account by the date of the settlement procedures³⁴ would be used directly to determine the supplier's portfolio. All other attributes, including those which remained in the accounts of generators and suppliers, would then be collected into a 'residual mix', which represents the balance between the attributes which have been redeemed and the total fuel mix sold in that year. This residual mix would then be assigned to all electricity which has been sold to final consumers without redemption of any tags or certificates. When disclosure is first introduced, the residual mix should be generated at the national level or, in the case of Scandinavia, on the level of a multi-national power pool. At a later stage, the mix can be generated at the European level.³⁵

The second option is being used by the New England Power Pool Generation Information System (NEPOOL-GIS).³⁶ This was developed as a comprehensive tracking mechanism for electricity disclosure and at the same time is used to facilitate the Re-

³³ For practical reasons, a limited allowance between the volume of electricity sold and the volume covered by certificates purchased could be granted and carried forward to the following year to allow for any deficit or excess.

³⁴ This could be eight weeks after the end of each calendar year, see Section 5.7.2.

³⁵ This should be harmonised with the reference values displayed on the disclosure labels, which can be either national or European averages.

³⁶ <http://www.nepoolgis.com>

newable Portfolio Standards (RPS) in several New England states.³⁷ The use of a residual mix could restrict the impact of the disclosure scheme to those parts of the market where electricity attributes are considered relevant (e.g. because suppliers offer specific products such as green electricity or because suppliers have set up company policies to meet certain fuel mix and/or emissions targets). All other electricity transactions could be assigned the residual mix. This means that suppliers (and their associate generators and traders) who do not make any specific claims towards their customers would not have to deal with tags or certificates when trading electricity.

The introduction of a residual mix could lead to a reduced operating cost for the tracking system, because only those market actors who actively want to steer the attributes of their portfolio would have to deal with tracking. It may also increase acceptance of the disclosure scheme within the electricity industry because it reduces the impact on market players. On the other hand, it reduces the precision of the disclosed information. It would be possible that large parts of the market rely on the residual mix and only dedicated 'green' consumers will receive differentiated products. This would not improve market transparency compared to the situation today.

Because of these potential shortfalls of using a residual mix, the operation of such a system would need to be closely monitored by Member State governments and the Commission and regulatory actions taken when necessary. For example, if the use of the residual mix is too high compared with the requirements of a reliable tracking mechanism, then the use of the residual mix could be limited, e.g. to 20 % of the portfolio of each supplier.

The residual mix should not be used for creating differentiated products, because neither the consumer nor the supplier would have any influence on the generation attributes of this mix. In particular, splitting up the residual mix into products, e.g. using the share of electricity from gas in the residual mix to create a gas product, should not be permitted. However, the use of the residual mix as an additional part of a product, e.g. a product could be made up of electricity from renewables in combination with the residual mix, could be allowed.

5.7.5 Recommendations

- It is recommended to introduce a comprehensive tracking system following the flexible approach to tracking using central registries in each Member State. The operation of this system should be monitored very closely in order to allow for corrective action if required.
- The tracking mechanism should be merged with the system for Guarantees of Origin for electricity from renewables and cogeneration in the Member States.

³⁷ RPS is similar to a minimum (quota) obligation on suppliers to include a certain share of renewable electricity or the corresponding certificates in their electricity sales.

- The registries should support disclosure of product information if this option is allowed by a Member State. In this case, suppliers should be required to maintain separate accounts at the registry for the attributes of their products in order to ensure transparency.
- The registries can be operated by regulators, Independent System Operators or any other independent body nominated by Member State governments. Member State should explore whether synergies can emerge from combining the operation of the registries and the carbon registries required under the Emissions Trading regime.
- The use of the tracking mechanism based on tags or certificates should be made voluntary and a residual mix should be introduced at least for an introductory phase. However, as the use of a residual mix reduces the accuracy of the disclosure information, Member States should not allow extensive use of this option.
- The use of the residual mix and its impact on the accuracy and reliability of the disclosure information should be monitored closely by Member State governments and the Commission and regulatory action taken if necessary.
- The residual mix should not be split up by suppliers to create separate products.

5.8 Verification Issues

In order to ensure that the data provided to consumers are reliable, there has to be some level of verification. One of the benefits of a tracking mechanism based on tags or certificates held in a central registry is that all transactions and all data disclosed to consumers can be verified easily at the level of the registry. Additional verification might be required at the plant level to ensure the correct assignment of fuel types and generation data. Generation data can be provided by the electricity market settlement process and the monitoring procedure of the EU Emissions Trading Scheme can provide reliable data on fuel input and CO₂ emissions of the fossil fuel plants covered under the scheme. This reduces the requirements of additional verification to the fuel input and emissions of non-fossil plants and the generation data for all plants. Because of the complexity of the issues, any verification on the plant side should be performed by accredited technical auditors. Verification does not have to take place on an annual basis. For example, plants not covered by the Emissions Trading scheme and using only a single fuel type could be verified every five years, while multi-fuel plants should be verified more often, such as once a year.

On the supplier side, the data on sales to final consumers must be verified. This could form part of the annual audit by public accountants.

5.8.1 Recommendations

- The central registry provides an appropriate means of verifying the tracking mechanism and the data disclosed to consumers.

- Additional verification should be carried out by independent accredited auditors, based on existing verification mechanisms or those under development (e.g. the EU Emissions Trading scheme) where possible.

5.9 Results from stakeholder consultation

The stakeholder consultation process showed that if a tracking system is implemented, there is a preference amongst the electricity industry for tradable certificates rather than using tags linked to contracts. However, there were considerable concerns about the costs associated with any tracking scheme. Some industry stakeholders objected to a comprehensive tracking scheme and favoured approaches based on statistical data, combined with the option to link attributes to long-term electricity contracts, but not using a comprehensive system of tags.

In contrast to the industry view, all consultation respondents from consumer and environmental organisations preferred a comprehensive tracking system based on tags linked to electricity contracts. The main arguments in favour of this were the insufficient reliability of any approach based on statistical data and the fact that in a system of tradable certificates it is not possible to guarantee that no money from e.g. a green consumer goes to producers of fossil or nuclear power. This is because a proportion of the consumer's money will go towards the 'grey' electricity that is traded in the electricity market, while only other parts would go towards the quality of electricity on the certificate market. There was also concern that a free movement of certificates around Europe could blur consumers preferences and therefore some restrictions to free trading of certificates should apply.

Linked to this, there is also disagreement on the possibility to use a central registry both for tracking and the Guarantees of Origin. Consumer and environmental organisations tend to favour the central registry approach, whilst the electricity industry was rather divided over this issue. Some felt that the GO and electricity disclosure have different aims and therefore it would not be sensible to combine the tracking mechanism with the GO. The reason behind this scepticism about a joint central registry is probably a general objection to comprehensive tracking.

5.10 Costs of the back-side of disclosure

As for the front-side, a detailed cost estimate for back-side has been made for Germany, Hungary and the UK under the 4CE project and the figures are summarised here³⁸. Three options for the tracking mechanism were considered:

1. Tracking using contracts without a central registry;
2. Tracking using contracts (tags) in a central registry;

³⁸ For more details see the 4CE phase 3 report on cost-benefit analysis, available on www.electricitylabels.com

3. Tracking using certificates in a central registry.

Table 2 *Summary of back-side costs in Germany, UK & Hungary*

	Germany		UK		Hungary	
	million Euros pa	€cent/ MWh	million Euros pa	€cent/ MWh	million Euros pa	€cent/ MWh
Contracts (no central registry)	31.1	6.2	7.7	2.3	1.1	2.8
Contracts (with central registry)	21.9	4.4	9.3	2.8	1.1	2.8
Certificates (with central registry)	15.9	3.2	6.0	1.8	0.9	2.4

Table 2 provides an illustration of the range of possible costs of the back-side of a disclosure scheme within Europe. The high costs for Germany are due to the specific structure of the German electricity industry (a relatively high number of power plants and suppliers) – it can be assumed that the cost for other Member States will not exceed those outlined here.

In terms of the total cost of disclosure (including the front-side, see Section 4.5), the costs of the back-side are more significant in the UK and Hungary, representing between 85%-95% of total UK costs and 75%-85% of total costs in Hungary, compared to between 40%-60% of the total cost in Germany.

It must be stated, that although much of the data used for the estimate are based on experience gained under systems such as RECS, these figures still represent a rough estimate. Its purpose is not to determine the cost in detail, but provide an indication of the order of magnitude of likely costs. It should also be noted that these estimates are conservative, e.g. they do not take into account the cost reduction for market players through the synergies with the Guarantees of Origin for electricity from renewable energy sources and from cogeneration and with the RECS system, all of which could be facilitated by the tracking system as well.

6 Minimal compliance and the recommended approach

The preceding discussion of the various options available for both the front-side and back-side of disclosure has illustrated the complexity of the issues and indicated the range of possibilities that exist for the design of a disclosure system.

A disclosure system consists of a certain combination of the options discussed. The particular combination used depends on the importance attached to the four key criteria outlined in Section 3: consumer information, reliability, cost and speed. This chapter illustrates what two different combinations could look like, ‘minimal compliance’ approach and the recommended approach and evaluates them in terms of the four key criteria.

It is unlikely that either approach could be implemented immediately in all Member States, since this might simply not be feasible in terms of time and cost. Rather it could require a phased approach, with some intermediate steps which may take place over a number of years. An indication of the timeframe and steps required to implement both systems is also given in Section 6.3.

The starting point for the implementation of a disclosure system in Member States must be the current Directive. How far beyond the Directive a Member State decides to go is ultimately up to the individual countries, but it would be most efficient and cost-effective if all countries were moving towards a common goal. This would also have benefits in terms of consumer impact and free trade in liberalised markets. It is crucial that this common goal is established from the outset so that the early steps can be designed appropriately, rather than having to redesign everything at a later stage. Obviously there will need to be some flexibility to incorporate experience and feedback from the initial stages, thus ensuring a more successful outcome.

6.1 Minimal compliance approach

The minimal compliance approach represents the minimum that needs to be done in order to comply with the Directive and to meet the guiding principles outlined in Section 3. Any issues which are not covered explicitly by the Directive have been dealt with sensibly in line with these principles. The description summarises the key features of such an approach and refers to the various options discussed in detail in the preceding chapters.

6.1.1 Front-side

In terms of the front-side, there will be limited harmonisation at a Member State level (e.g. definitions and calculations used) to assist in verifying that the information provided to consumers is reliable, as required by the Directive. There should be agreement on rules for the list of fuel sources displayed and units used for environmental indicators.

Consumers will be provided with information on the fuel mix of their supplier relating to the preceding calendar year with their bill, distributed on an annual basis. This would be displayed in a simple text or table (Section 4.3.1) either on the front page or as an additional page of their bill, minimising additional postage costs (although would still incur some bill redesign costs). The same format would be used to display the information in any promotional material provided to customers. The list of fuels would be standardised for each country, based on common definitions (Section 4.2.3). No reference figures are provided, nor details on any imported electricity.

Environmental information will be provided on CO₂ emissions and radioactive waste only. This detail is available on a distant reference source, such as the suppliers' websites and not provided with the bill. It will therefore only reach the small proportion of customers who have access to the internet and are motivated enough to seek it out (Section 4.3.3). A phone number or reply-paid card should be included with the bill for those consumers without internet access to request the information. The display of this information is left up to individual suppliers and only provides absolute figures (emissions and radioactive waste per kWh), although there is standardisation of the units used to express these data within each country (Section 4.3.2).

Both the fuel mix and environmental indicator information are based upon the supplier portfolio only. Suppliers may choose to give additional information on specific products, but this is not required or regulated in any way (Section 4.2.2).

There are no requirements to provide consumers with information with which they could compare what they buy to what is offered by other suppliers, such as an independent catalogue. However, consumer or environmental organisations may choose to provide this information voluntarily.

The cost of implementing this option, requiring bill design, would be in the range of 0.1 - 3.8 ¢cents/MWh.

6.1.2 Back-side

Even under the minimal approach, it is essential that the tracking mechanisms of Member States are harmonised to some extent in order to facilitate the proper functioning of a European market for electricity. Therefore, Member States will need to ensure that the interfaces between the tracking mechanisms in each country are compatible, whatever system they choose to implement. The interaction between tracking systems in different countries should be monitored closely in order to avoid any distortions of the European electricity market.

The Directive requires Member States to ensure that the information provided to consumers is reliable. Therefore, the aim should be to limit the use of statistical data and incorporate some element of tracking and verification within the disclosure scheme. A minimalist solution would work with accounting systems set up by individual market participants in each country (Section 5.6.2) which keep track of the attributes of electricity when it is generated, traded and sold. This would include a contract-based tracking

system to track the attributes for the majority of the bilateral trades. In order to guarantee a sufficient level of reliability, the operation and results of such systems would be subject to independent verification by certified auditors, e.g. on an annual basis.

Given that it would be difficult to achieve 100% market coverage under a contract-based tracking system (Section 5.6.2), market participants would be allowed to handle a certain amount of electricity without assigning any attributes, i.e. 'grey' electricity e.g. for electricity traded through power exchanges or used for balancing. To ensure reliability, this 'grey' electricity should be disclosed to consumers as 'electricity with unknown origin', rather than assigning attributes based on statistical averages.³⁹ Also, the total share of 'grey' electricity should be restricted to a reasonable level, e.g. around 10 % of the total national or regional market⁴⁰ to ensure a sufficient level of coverage (90%) of the rest of the market (although this would reduce accuracy to a certain extent). This would prevent heavy usage of 'grey' electricity and therefore stop suppliers from hiding their 'dirty' electricity. For example, if a 30 % share of 'grey' electricity was allowed, it would be possible to 'hide' nearly all nuclear power generation in Europe. If the proportion of 'grey' electricity exceeds the threshold, Member States should introduce a comprehensive tracking system, based on tags or certificates. Therefore the industry would have to decide between limiting the use of 'grey' electricity or implementing comprehensive tracking.

The systems for Guarantees of Origin for renewables and cogeneration should be linked to the energy management systems for disclosure to avoid any conflict between these two parallel approaches.

Member States could decide either to use average CO₂ emission factors per fuel type, which are applied at the level of the supplier portfolio, or require all market participants to use plant-specific CO₂ emission factors in their accounting systems. Radioactive waste is determined from the volume of spent nuclear fuel produced by each reactor. 'Grey' electricity should not be included in the calculation of the average environmental indicators of a supplier portfolio or a product.⁴¹ If average emission factors are used, suppliers should not be allowed to also use plant-specific data at their own discretion since this could lead to double-counting of those plants with low emissions.⁴²

³⁹ As discussed in Section 5.6.1, the use of attributes from statistical averages such as the UCTE mix would lead to double counting and would suggest a higher degree of accuracy to the consumer than it is actually achieved through the accounting systems.

⁴⁰ This would mean that in the case of Scandinavia, where Nordpool has a market share of more than 30 %, either the power exchange would have to develop a system that deals with attributes or the respective countries would have to set up a comprehensive tracking system.

⁴¹ This inclusion could be done by using the attributes of statistical average mixes such as the UCTE mix. However, as discussed above, this is not recommended because it would lead to double counting of attributes.

⁴² However it might be accepted that separate average emission factors are applied for high efficiency cogeneration plants as defined in the draft cogeneration Directive.

Member State governments and the Commission should closely monitor the effectiveness of the minimal compliance approach, in conjunction with independent verification of the tracking system, with special attention to the degree of reliability of the information provided by the tracking systems.

The cost of implementing this option would be in the range of 2.3 - 6.2 ¢cents/MWh.

6.1.3 Evaluation

Consumers will receive better information than previously regarding the sources of the electricity they are buying, provided that they notice the information. However, it will be difficult to put the information into context since there are no reference figures provided, therefore consumer impact and understanding is likely to be limited. It is possible that people may use this information as a basis on which to educate themselves (since there are no educational programmes required by the Directive) or outside sources, such as consumer or environmental groups, may provide additional information, although, this is by no means certain and cannot be guaranteed.

Raising awareness on environmental issues regarding electricity generation is likely to be limited, since the environmental information will only be available to the low number of consumers who actually access the websites where this detail is displayed. Even those who access the information may find the absolute figures on the environmental indicators difficult to understand.

Since consumers will only have easy access to fuel mix information and do not necessarily make the correct links between electricity generation and climate change (based on evidence from the 4CE telephone survey), they are likely to base their decisions on nuclear issues rather than climate change – nuclear issues will be more prominent in the fuel mix detail than climate change, since the details on CO₂ emissions are only on the website. People will therefore exercise their existing knowledge of the various fuel sources rather than basing their decisions on any new information, such as the CO₂ emissions of different fuels.

In terms of the electricity market, it is assumed that there will only be a limited range of differentiated products developed under this approach since disclosure is only required at a portfolio (company-wide) level. However, since suppliers can choose to provide information on individual electricity products (e.g. green electricity), there is a risk of double counting if product information is not provided to all consumers (Section 4.2.2).

Reliability of this approach is low. Limited harmonisation of the front-side may result in suppliers producing different label designs and display of the website information is not standardised in any way. This will also prevent consumers from easily comparing what is offered by different suppliers and so they will be unable to make a proper informed choice. Also, there may not be any simple means by which consumers are able to compare information from various suppliers, since there is no requirement to provide this information together at a single location. The onus will be on the consumer to obtain all

the detail from each individual supplier. This, again, acts as a barrier to consumers being able to exercise free choice.

Lack of harmonisation of the backside will also reduce reliability and may lead to high verification costs due to the decentralisation of information since each tracking system operated by the market players is different. It is not clear what level of verification will be possible under this approach, but at the very least it must ensure reliability to some degree. Due to the lack of common standards for the collection of plant data, errors and fraud can not be prevented to a satisfactory degree. There are also no common standards to establish the quality of individual energy management systems (since this would incur a high cost).

In terms of speed, the minimal compliance approach is not a particularly high speed approach, due to the complexities of the tracking mechanism. It is estimated that it would take at least three years following implementation of the Directive in Member State legislation before disclosure information can be issued (Section 6.3).

Regarding cost, the likely range for the minimal compliance approach is between 2.4 - 10.0 ¢cents/MWh. Compared to final selling prices of electricity, this level of cost is close to negligible. However, the recommended approach is likely to have even lower cost (see Section 6.2.3). Reducing the costs further or opting for a faster approach (e.g. through the use of statistical data instead of a tracking mechanism) would result in a significant reduction in consumer information and reliability (Section 5.6.1). Although the minimal approach represents compliance with the Directive, it is not necessarily the most cost-effective option in terms of the level consumer information and reliability achieved.

Therefore there is likely to be limited impact from this approach – additional policies would be required to ensure a greater impact. Since it is probable that there will be only one opportunity for major investment in a tracking mechanism, it may be preferable for Member States to disregard the minimal compliance approach and to move in the direction of the recommended approach from the start. This would ensure that all parties involved are working with a common system to allow for harmonisation at least at a later stage, if not immediately.

6.2 Recommended approach

The recommended approach represents a disclosure system over and above that required as a minimum by the Directive. There are numerous ways in which the requirements of the Directive could be interpreted. However, this approach has been designed with the aim of maximising consumer information and reliability whilst keeping the costs and timescale for implementation realistic.

6.2.1 Front-side

The recommended approach requires harmonisation of the front-side, with a single label design at a national level based on common European criteria. Both fuel mix and environmental information are provided on a separate leaflet with the bill (and on promotional materials), but there is a link between the bill and leaflet to draw attention to the information displayed there. The leaflet is sent out at least twice a year (where bills are sent out more frequently than once a year, otherwise the leaflet should be sent out annually) with the electricity bill, although the information displayed on the leaflet relates to the preceding calendar year and therefore is only revised once a year. This is to help reinforce the information for consumers and may only be necessary in the early stages of the system whilst consumers become used to noticing and acting upon the information.

Fuel mix information is displayed in a colourful eye-catching format, such as pie charts, with supporting text and tables providing more detail where necessary, e.g. a detailed breakdown of renewables, product information and reference figures. Environmental information is presented either in indexed bar charts or on a ranked scale, based on national figures, from A-G for both carbon dioxide emissions and radioactive waste. The design must be clear and simple to understand in order to be effective.

Comparative data are also provided in the form of national averages for both fuel mix and environmental information along with details on the proportion of imported electricity in terms of the overall proportion of imports.

Information on the suppliers portfolio is provided in all cases and where a supplier chooses to give details of any one product, they are then required to provide equivalent product information for all their customers (including the default products). This would minimise costs to suppliers (since they would not be required to set up a daughter company if they wished to market e.g. a green product) whilst ensuring that the consumers are not misled about the electricity they are being sold.

Consumers will be provided with an independent catalogue and website which compares all products available in their country. An educational campaign at the Member State level would be an effective way of ensuring the maximum impact of the disclosure information.

The cost of implementing this option, requiring printing of a separate leaflet, would be in the range of 0.3 - 5.0 ¢cents/MWh.

6.2.2 Back-side

The recommended approach for the back-side follows the flexible tracking proposal outlined in Section 5.7, requiring a tracking mechanism with a central registry, e.g. in each Member State using data, most of which are already available. The system is based on common rules for the definition and calculation of the required information inputs. Certificates or tags are issued for all electricity generation and include an allowance for

line losses⁴³. Suppliers must acquire and redeem the appropriate number of tags or certificates to account for their portfolio. Market participants decide whether to transfer the attributes of electricity as tags linked to electricity contracts or as tradable certificates. The use of a residual mix is permitted, based on any certificates and tags from the calendar year which have not been redeemed by a supplier (i.e. are still in the trading accounts of the market participants after the settlement date). This mix is assigned to any suppliers who do not have sufficient certificates or tags for their total electricity sales to cover the deficit. Initially the residual mix could be calculated at the national level or, in the case of Scandinavia, for the multi-national power pool, moving to a European residual mix at a later stage.⁴⁴ This approach requires no additional rules for power exchanges or balancing power.

It may be necessary to restrict the share of residual mix in each supplier's portfolio since there is a danger that suppliers could avoid using any tags and certificates and rely solely on the residual mix. This would mean that the attributes disclosed to customers would be identical for each supplier (i.e. the same outcome as using national averages instead of tracking) and would not facilitate consumer choice. Therefore Member States and the Commission should closely monitor the use of the residual mix and impose restrictions if necessary.

In addition to this, it is not clear whether the flexibility of the central registry approach will lead to major shifts of certificates around Europe. This could undermine the credibility of the disclosure system to consumers (Section 5.7). This could be avoided by requiring attributes to be more closely linked to electricity contracts, thus restricting movement of certificates. For example, the transfer of certificates between countries could only be allowed if there is evidence that the corresponding capacity through the relevant interconnector has been booked. Alternatively, a minimum share of tags, which have to be transferred together with electricity contracts, could be set for each supplier account.

With regard to the tracking of CO₂ emissions, plant-specific emission factors should be applied for electricity from all relevant fossil fuels (e.g. coal, gas and oil) according to the efficiency of the power plant (Section 5.4.2). These emission factors can be determined on an annual basis from the CO₂ emissions reported by the plant operator under the Emissions Trading monitoring scheme and the annual power generation. Tracking of these emission factors is possible by the system of tags and certificates as described in Section 5.7. The same mechanism is used to track the production of radioactive waste in the form of spent nuclear fuel.

The cost of implementing this option would be in the range of 1.8 - 3.2 €cents/MWh.

⁴³ e.g. if average losses in the system are 5 %, then for every 1.05 MWh of generation, a tag or certificate for 1 MWh would be issued

⁴⁴ This should be harmonised with the reference values displayed on the disclosure labels, which can be either national or European averages.

6.2.3 Evaluation

This approach will be of maximum benefit to consumers and the level of consumer information will be high on both fuel sources and environmental impacts. The inclusion of national averages as reference figures will assist in consumers' understanding of the information. Harmonisation of the label design will mean easy comparability between suppliers and will assist in consumer choice. The independent catalogue will help in this regard.

The option to disclose information on a portfolio and product basis (for all products) means that a wide range of products will be available and it will be clear to consumers what they are buying as well as what their supplier is providing to other customers.

Reliability under this option is high – full harmonisation of the front-side means that verification of this information is more straightforward. Any verification is done through an independent body, providing greater confidence in the results. The harmonised tracking system covers 100% of the electricity market in Europe and all electricity attributes are tracked through the central registries, hence there is no undisclosed electricity or double-counting of attributes. Standardised rules for the acquisition of data on generation and consumption of electricity ensure a harmonised level of data quality and interfaces and therefore assists operation of the European electricity market.

The central registry approach allows maximum flexibility for generators, traders and suppliers since they are able to choose whether to use tags, tradable certificates or rely on the residual mix. Reliability is dependent on careful monitoring of the system regarding the use of the residual mix and movement of certificates. Action should be taken if it appears that reliability and credibility of the system is likely to be undermined. There could be concerns amongst consumers about the credibility of a system which uses tradable certificates (Section 5.6.3).

The total cost of this approach is in the range of 2.1 - 8.2 €cents/MWh and is therefore potentially lower than the cost of the minimal compliance approach. These costs could be passed onto the final consumers and are negligible in terms of the final selling price of electricity. Moreover, the disclosure scheme will not exist in a vacuum. Any costs undergone in establishing an effective disclosure scheme should be considered in the light of the fact that the system would underpin existing climate change policies and regulation and help any targets under these other policies be achieved. Also developing a harmonised system, both on the front and back side, will be more cost-effective and avoid the duplication of effort that would occur without any harmonisation.

In terms of speed, it will take some time to put the necessary measures in place before the scheme is fully functioning. However, even the initial stages will bring some benefit. It is estimated that it would take four years following implementation of the Directive in Member State legislation before disclosure information is available to be published (Section 6.3) – one year longer than the minimal compliance approach.

6.3 Timetable for implementation

Table 3 and Table 4 provide a detailed timetable for the various steps required to implement a disclosure scheme under the recommended approach and minimal compliance. The steps provided here are only a suggested path. The most important feature is that the phases are all moving towards the same common goal, agreed at the outset. It is important to be transparent about what is involved at each step so that all stakeholders have time to prepare and make the necessary adjustments.

It is clear from these timetables that it is possible for Member States to move towards the recommended approach on a realistic time scale and in not much more time than it would take to achieve minimal compliance.

Given the investment in time and money that would be required to set-up even the minimal compliance approach, it does not make sense to work towards minimal compliance first and then move towards the recommended approach. This would mean that many aspects of the minimal compliance disclosure scheme would become obsolete and would require reinvestment to bring in line with the recommended approach.

Therefore, it is recommended that the recommended approach should be followed from the outset.

Table 3 *Outline of a phased recommended approach*

	General	Front-side	Back-side
PHASE 1: Implementation			
2003	<ul style="list-style-type: none"> Guidance on disclosure issued by EC (September) 		
2004	<ul style="list-style-type: none"> 10 Accession Countries join the EU Implementation of the Directive into national legislation (July) Appointment of a regulator to oversee disclosure in each MS Report back to EC by each MS on progress with disclosure First annual Commission progress report on the Directive 	<ul style="list-style-type: none"> Notice given to suppliers to revise bill format and promotional material at a MS level MS jointly establish a standard list of fuel sources to display to consumers Testing of possible display options for fuel and environmental information at a MS level Each MS develops a standard format for display of disclosure information in a leaflet Agreement on a ranking scale for environmental information (if applicable) 	<ul style="list-style-type: none"> Agree common definitions for disclosure information (fuel sources and environmental indicators) at the EU level Agree common principles for central registries and their interfaces at the EU level Commissioning of registries at MS level
2005	<ul style="list-style-type: none"> Start of the Emissions Trading scheme pilot phase. Plant operators start collecting data for monitoring Report back to EC by each MS Annual Commission progress report on the Directive Detailed Commission progress report on the Directive (due 1 Jan. 2006) 	<ul style="list-style-type: none"> Ongoing preparation of information display format 	<ul style="list-style-type: none"> If allowed by the MS, market participants decide whether to disclose differentiated products. Average emission factors per fuel type determined at MS level Registries finalised and tested at MS level

	General	Front-side	Back-side
2006	<ul style="list-style-type: none"> • Plant operators file first monitoring reports under the Emissions Trading scheme (March) • Advertising campaign at MS level in anticipation of the full disclosure label being introduced in the following year • Ongoing adjustment of national policies • Report back to EC by each MS • Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> • Ongoing preparation of information display format 	<ul style="list-style-type: none"> • Tracking system using central registries starts operating in all MS, tags and certificates issued only reflect fuel sources (1 January) • Market participants use tags or certificates for transferring attributes or decide to rely on residual mix (1 January) • Registries monitor the market for tags and certificates and report transaction volumes on a monthly basis • Preliminary evaluation of the tracking procedure on a MS level, identification of urgent actions if required (June) • Plant-specific emission factors are determined on a MS basis • Registries are made ready to track environmental indicators (December)

	General	Front-side	Back-side
2007	<ul style="list-style-type: none"> • Bulgaria and Romania join the EU ? • Full market opening in all MS (July) • Ongoing information campaign to assist in consumers' understanding of the disclosure information • Report back to EC by each Member State • Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> • Suppliers provide their consumers with the first disclosure information (July) • Disclosure leaflet is introduced with a harmonised design at a national level with full colour and graphics • There is a link between the bill & leaflet, with the option of making this personalised • Leaflet is sent out twice a year or annually • Leaflet includes both fuel mix and environmental information • Promotional material displays disclosure information in the same format as the leaflet • Disclosed fuel mix information is based on tracking, environmental indicators are based on national average emission factors (for first year only) • Comparative data is provided • Disclosure of import information is optional at a MS level • Suppliers can choose to provide disclosure information on a portfolio only or product and portfolio basis (for all customers) • Compilation of an independent catalogue of suppliers based on disclosure information at a MS level 	<ul style="list-style-type: none"> • Market participants start second period of working with the registries, now also tracking plant-specific environmental indicators (January) • First settlement process: Registries determine national residual mix and supplier portfolio data for 2006 (fuel mix only, April) • Registries apply average emission factors and determine environmental indicators for 2006; disclosure information is transmitted to suppliers (May) • Evaluation of first year of tracking on a MS level, identification of urgent actions if required (June) • Ongoing monitoring of registries and monthly transaction reporting

	General	Front-side	Back-side
2008	<ul style="list-style-type: none"> Major review of procedures for electricity disclosure on EU level (October) Annual Commission progress report on the Directive 2003/54/EC, includes proposals for measures by MS to further improve electricity disclosure procedures 	<ul style="list-style-type: none"> Suppliers provide their consumers with the second round of disclosure labels (July) Both disclosed fuel mix information and environmental indicators based on tracking Independent catalogue comparing disclosure information of suppliers at MS level made available to consumers Evaluation of effectiveness of disclosure information at MS level 	<ul style="list-style-type: none"> Second settlement process: registries determine residual mix and supplier portfolio data for 2007 (fuel mix and environmental indicators, March) Evaluation of first two years of tracking at MS level (June)
<i>RECOMMENDED APPROACH TO COMPLIANCE ACHIEVED</i>			
PHASE 2: Further Improvements			
2009	<ul style="list-style-type: none"> Report back to EC by each MS Annual Commission progress report on the Directive 	<ul style="list-style-type: none"> Suppliers provide their consumers with the third round of disclosure labels (April) Both disclosed fuel mix information and environmental indicators are based on tracking Ongoing evaluation of effectiveness of disclosure information at MS level 	<ul style="list-style-type: none"> Decision on changes to the tracking systems on a MS level (February), these could include <ul style="list-style-type: none"> Conversion of residual mix to European level Restriction of the use of residual mix Restriction of certificate transfers Third tracking data settlement process (March) Implementation of changes to the tracking systems at MS level (October) Ongoing evaluation of the tracking scheme at MS level

Table 4 *Outline of a phased approach to minimal compliance*

	General	Front-side	Back-side
PHASE 1			
2003	<ul style="list-style-type: none"> Guidance on disclosure issued by EC (September) 		
2004	<ul style="list-style-type: none"> 10 Accession Countries join the EU Implementation of the Directive into national legislation (July) Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> Each MS establishes standard list of fuel sources to display to consumers (based on average national consumption) Notice given to suppliers to revise bill format and promotional material at a MS level Each MS develops standard format for display of disclosure information 	<ul style="list-style-type: none"> Agree common definitions of disclosure information (fuel sources and environmental indicators) at the EU level Agree common principles for the accounting systems operated by market participants and their interfaces at the EU level Commissioning of accounting systems by market participants
2005	<ul style="list-style-type: none"> Start of the Emissions Trading scheme pilot phase. Plant operators start collecting data for monitoring Adjustment of national policies to bring in line with disclosure Report back to EC by each Member State Annual Commission progress report on Directive 2003/54/EC Detailed Commission progress report on Directive 2003/54/EC (due 1 Jan. 2006) 	<ul style="list-style-type: none"> Ongoing preparation of information display format 	<ul style="list-style-type: none"> If allowed by the respective MS, market participants decide whether they want to disclose differentiated products. Average emission factors per fuel type determined at MS level Accounting systems finalised and tested

	General	Front-side	Back-side
2006	<ul style="list-style-type: none"> Plant operators file first monitoring reports under the Emissions Trading scheme (March) Report back to EC by each Member State Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> Ongoing preparation of information display format 	<ul style="list-style-type: none"> Market participants start using individual accounting systems for tracking and transfer attributes (only fuel sources) on a bilateral basis (1 January) In those MS which allow to use plant-specific emission factors, these factors are determined and market participants adjust their accounting systems accordingly
2007	<ul style="list-style-type: none"> Full market opening in all MS (July) Ongoing information campaign to assist in consumers' understanding of the disclosure information Report back to EC by each Member State Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> Suppliers provide their consumers with the first disclosure labels (July) Disclosed fuel mix information is based on decentralised tracking by suppliers and includes shares of 'grey' electricity, environmental indicators are based on national average emission factors Disclosure on portfolio only Customers provided with fuel mix information on the bill and in promotional materials in the form of tables No comparative data No details on imports Environmental information displayed on supplier websites – format optional at MS level 	<ul style="list-style-type: none"> Market participants start second period of working with their accounting systems. In some MS, tracking of plant-specific emission factors starts (January) First accounting process: suppliers determine their portfolio for 2006, including shares of 'grey' electricity, based on the data from their accounting systems (fuel mix only, February) Suppliers apply average emission factors and determine environmental indicators for 2006 (February) Auditors review the operation of the accounting systems and the results of suppliers' calculations and verify disclosure data (May)

	General	Front-side	Back-side
2007 cont.		<ul style="list-style-type: none"> • Environmental information is limited to CO₂ emissions and radioactive waste • Information is distributed on an annual basis • Evaluation of effectiveness of disclosure information at MS level 	<ul style="list-style-type: none"> • Evaluation of first year of tracking at MS level, assessment of the share of 'grey' electricity, identification of urgent actions if required (October)
<i>MINIMAL COMPLIANCE ACHIEVED</i>			
PHASE 2: Further Improvements			
2008	<ul style="list-style-type: none"> • Ongoing adjustment of national policies • Report back to EC by each Member State • Annual Commission progress report on Directive 2003/54/EC 	<ul style="list-style-type: none"> • Suppliers provide their consumers with the second disclosure labels (July) • Disclosed fuel mix information based on decentralised tracking by suppliers, environmental indicators based on national average emission factors in some MS, in other MS based on plant-specific factors • Ongoing evaluation of the disclosure information at MS level 	<ul style="list-style-type: none"> • Second accounting process: suppliers determine their portfolio for 2007 based on the data from their accounting systems (fuel mix, in some MS also environmental indicators, February) • Auditors review the operation of the accounting systems and the results of suppliers' calculations and verify disclosure data (May) • Ongoing evaluation of the tracking scheme at MS level

7 References

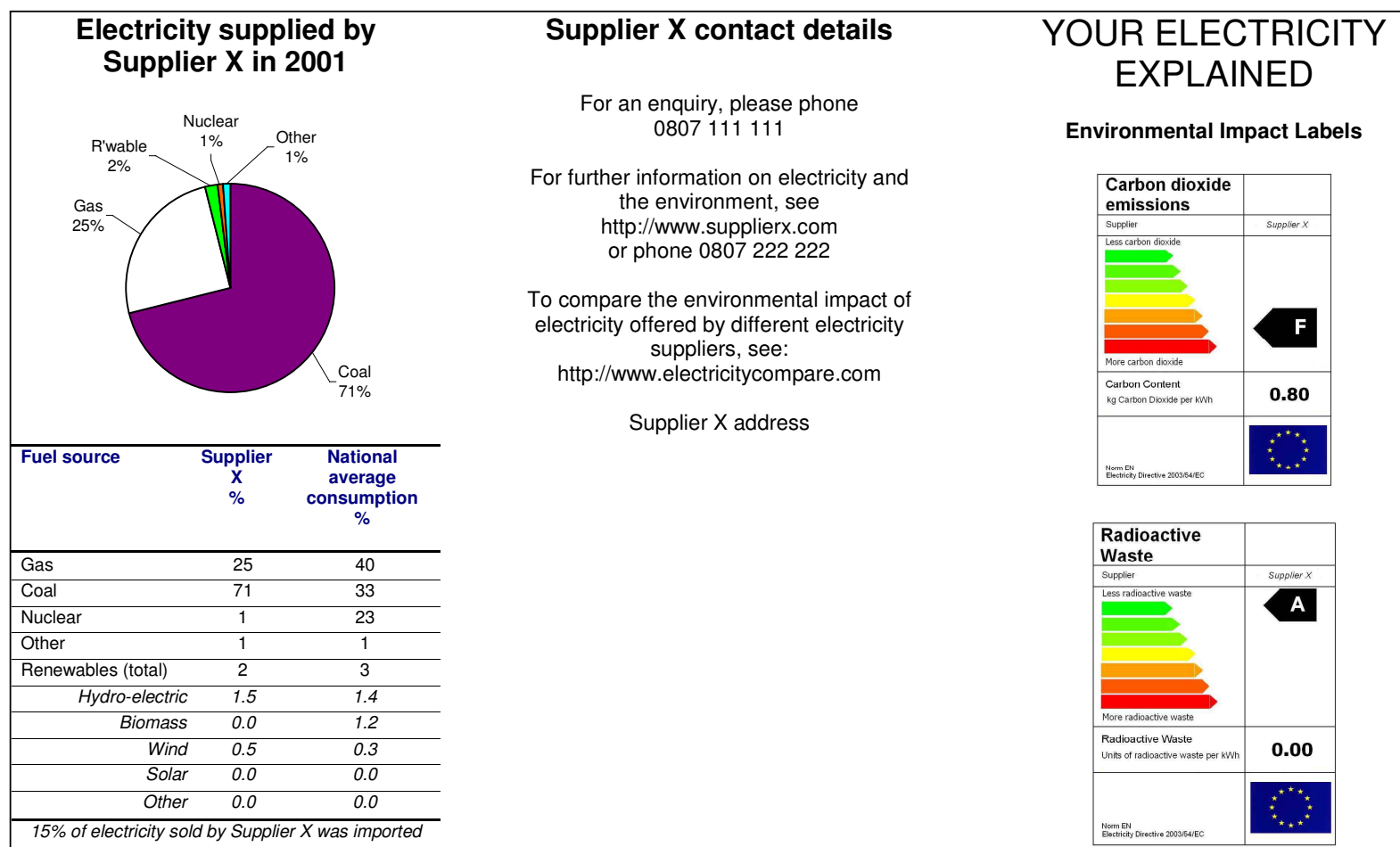
- Arvidson, A., 2003: Domestic and Small and Medium Enterprise Consumer Views on Electricity Disclosure – summary of Focus Group research in Europe, 4CE Project. Stockholm Environment Institute.
- Biewald, B. 1999: Follow the Money: A Method for Tracking Electricity for Environmental Disclosure. The Electricity Journal, May 1999
- Boardman, B., Palmer, J., Arvidson, A., Buerger, V., Green, J., Lane, K., Lipp, J., Nordström, M., Ritter, H., Timpe, C. and Urge-Vorsatz, D. 2003: Consumer Choice and Carbon Consciousness: Electricity Disclosure in Europe. 4CE Project Final Report. Environmental Change Institute, University of Oxford.
- Eurobarometer, 2001: Internet and the public at large, Flash Eurobarometer 112, prepared by EOS Gallup Europe for the Directorate-General Information Society, European Commission, November 2001.
- Grace, R., Wiser, R. 2002: Transacting Generation Attributes Across Market Boundaries: Compatible Information Systems and the Treatment of Imports and Exports, November 2002
- Lane, K., 2003: Electricity Disclosure in Europe: Scenarios: impact on renewables. 4CE Project, Phase 3. Environmental Change Institute, University of Oxford.
- Lane, K. and Palmer, J., 2003: Electricity Disclosure in Europe: Policy consideration. 4CE Project, Phase 3. Environmental Change Institute, University of Oxford.
- Minnett, S. 2003: CHP definitions. Report prepared as part of the European Cogeneration Certificate Trading Project (ECoCerT), 2003
- Moskovitz, D et al. 1998: Synthesis Report: Summary of Research on Information Disclosure, The National Council on Competition and the Electric Industry, USA, October 1998.
- National Power Environmental Performance Review, UK, 1998.
- Nordström, M., 2003: Large Industry Views on Electricity Disclosure in Europe. 4CE Project, Phase 2. Stockholm Environment Institute.
- Oeko-Institut 2002: Global Emission Model for Integrated Systems (GEMIS), Version 4.14, Darmstadt 2002
- Palmer, J., 2003: Telephone Survey on European Attitudes to Electricity Disclosure, 4CE Project. Environmental Change Institute, University of Oxford.
- Palmer, J. and Lane, K., 2003: Electricity Disclosure in Europe: Cost-benefit analysis. 4CE Project, Phase 3. Environmental Change Institute, University of Oxford.
- SKM 2002: Electricity labelling – Requirements for establishing a reliable well functioning system within the EU, June 2002, Amsterdam, The Netherlands

Timpe, C. and Buerger, V., 2002: Electricity Disclosure in Europe: A policy paper. 4CE Project, Phase 1. Oeko Institut, September 2002.

Timpe, C. and Buerger, V., 2003: Electricity Disclosure in a liberalised European market (4CE Phase 1 report). Oeko Institut, June 2003.

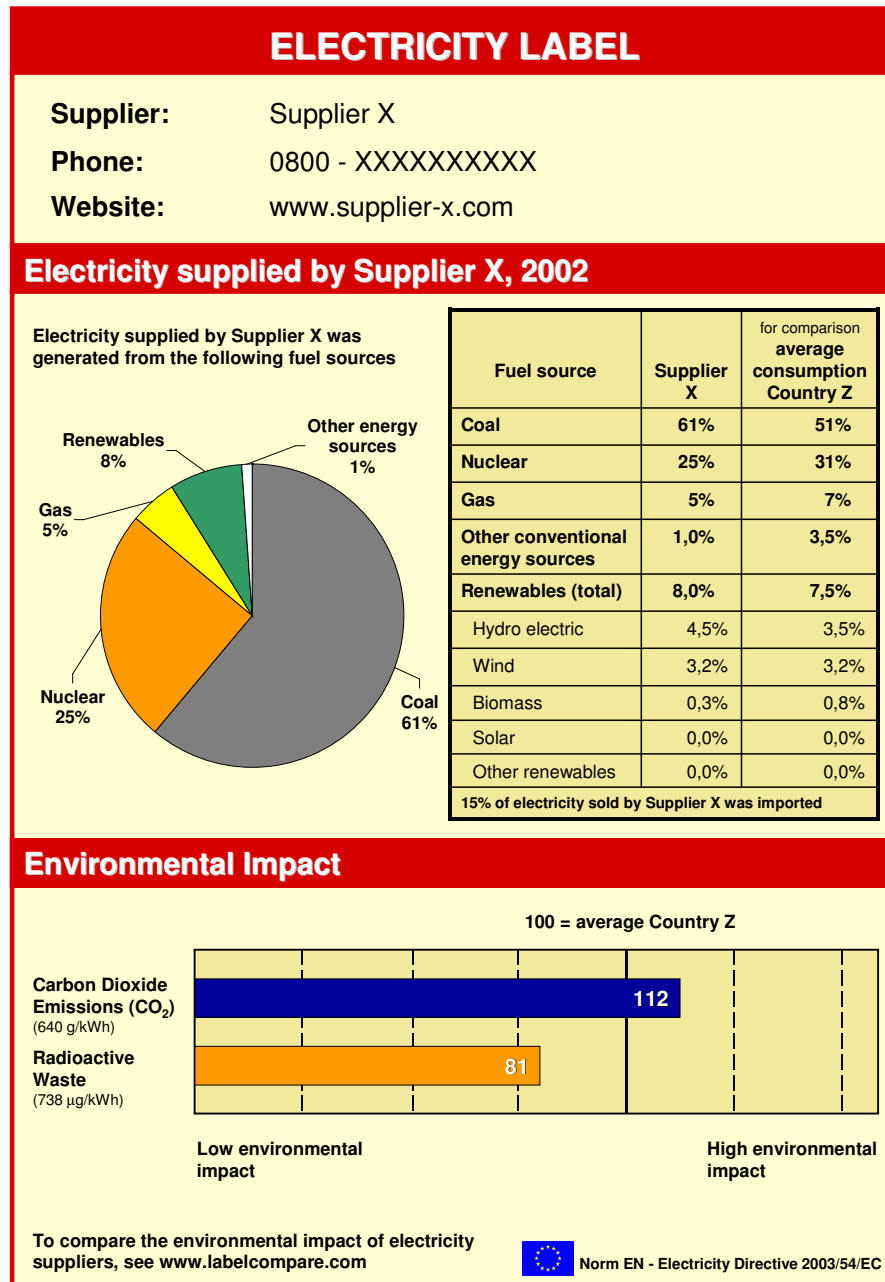
Timpe, C. and Matthes, F. C. 2003: Outline design of an EU-wide scheme for tradable cogeneration certificates, Report prepared as part of the European Cogeneration Certificate Trading Project (ECoCerT), April 2003

Appendix A – Example of disclosure information leaflet (A4 folded into three)



How your electricity is generated	What impact your electricity has on the environment	Where your electricity comes from
<p>The electricity provided by Supplier X comes mostly from coal (71%) and natural gas (25%). Other energy sources such as nuclear, oil and renewables account for 4%. Renewable sources of energy include solar, wind and hydro-electric power.</p> <p>15% of the electricity is imported. The rest is generated in country X.</p> <p>You can use the information provided in this leaflet to compare the electricity sold by Supplier X to electricity sold by other suppliers.</p>	<p>Each unit of electricity – a kilowatt hour (kWh) – supplied by Supplier X results in 0.0 micrograms of radioactive waste and 0.8 kilograms of carbon dioxide, a greenhouse gas.</p> <p>The labels on the front of the leaflet give a rating for the environmental impact of your electricity in terms of carbon dioxide emissions and radioactive waste. The level of these environmental impacts depends on the power plants used to generate your electricity.</p> <p>Carbon dioxide is released when certain fuels are burned. It is a greenhouse gas and a major contributor to climate change.</p> <p>Radioactive waste is produced when electricity is generated by nuclear power stations.</p> <p>On a scale of A to G, where A is the least damaging to the environment and G the most damaging, the electricity supplied by Supplier X has the label F for carbon dioxide and A for nuclear waste. This is because of the high proportion of coal and low proportion of nuclear energy in the fuel mix.</p>	<p>The actual electricity you use is indistinguishable from the electricity used by your friends and neighbours. There is no way to identify the actual power plant that produced the electricity consumed in your home because once it is fed into the distribution and transmission system it becomes a general pool of electricity.</p> <p>However, it is possible to track the money you pay for your electricity. Your electricity Euros support electricity generation from various energy sources in the proportions listed in the table on the front of the leaflet. The national average column is provided as a comparison and represents the breakdown of sources used to generate all electricity that was sold in country X.</p>

Appendix B – Example of a disclosure information insert (portfolio only)



Appendix C – Example of a disclosure information insert (portfolio and product)

