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KPMG Sustainability

NUON ET&W

Protocol Fuel Mix reporting

Juli 2002

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Contents

1 Introduction

The protocol in this document describes a method for an Electricity Distribution Company (EDC) to account for the fuel mix of electricity that it delivers to its customers, based on the best available information. Own production, purchase and sale of electricity, and certificates trading are taken into account.

For renewable electricity a certificate system has been developed in order to give the end user of energy assurance about the 'colour' of electricity that is delivered to this customer. In The Netherlands, due to these developments, more and more insight is requested into the 'colour' of other electricity that is delivered to customers. Legislation has been proposed in 2001 by parliament[1] to introduce an obligation to producers and suppliers of electricity to make information available on the fuel mix of the produced or supplied electricity In reaction to this proposal, The minister for Economical Affairs has made a promise to develop a system for labelling of electricity, to be introduced in 2002 and implemented when the choice of supplier is open to the whole market[2]. The method described in this protocol could be the basis for such an information system.

NUON does not want to wait for an obligation to publish information on the fuel content or 'colour' of its electricity. NUON wants to be able to share its knowledge on the fuel mix of the electricity that is delivered with its customers and other stakeholders. In order to do so, NUON developed, with the support of KPMG, a protocol that describes the process how the fuel mix can be reported. The present document is the result of this project. This protocol can be used to prepare a fuel mix report and can be the basis for an external verification of the reported fuel mix.

The protocol has not been written specifically for NUON. It has been set up in such a way that all electricity distribution and production companies in The Netherlands can make use of it. It has been based on following sources and experiences:

- An internal NUON project to determine the fuel mix of its electricity over the year 2001;
- The Greenhouse Gas Protocol[3], which NUON has used to make an estimate of its greenhouse gas emissions.
- KPMG experience in the electricity sector, on greenhouse gas emission reporting and on verification of environmental data.

The quality (reliability) of the result of this fuel mix inventory depends largely on the quality (relevance/completeness/accuracy) of the underlying data that are taken into account. This protocol must be seen as a growth model: it is focussed on continuously improvement. Different quality levels (tiers) are defined per issue that is taken into account. Tier 1 offers the highest quality (reliability), tier 4 the lowest. Based on the available information per issue the

[1] Proposal 'Vos' Tweede kamer, 2001-2002, 28178, nr. 2

[2] Letter of the minister of Economical affairs, Tweede Kamer, 2001-2002, 25097, nr 54

[3] The Greenhouse Gas Protocol, WBCSD/WRI, October 2001

quality level is determined. As soon as more reliable information is available a higher level of reliability can be reached. Also within a certain tier improvements are possible.

The protocol is written for the Dutch market. The principles of the protocol can be used in other countries. However, there are many specific market situations that are applicable in The Netherlands only. To make use of the protocol to determine the fuel mix of electricity distribution companies in other countries it needs to be adapted to the local circumstances. For example, the definition of renewable energy can differ, certificates systems can differ and some organisations (e.g. Tennet) play a specific national role.

Book-marker

- In chapter 2 the actual protocol is outlined.
- In the appendixes additional (supporting) information is given:
  - A: Dutch Standard Fuel Mix, 2000
  - B: Calculation of the Dutch Standard fuel mix
  - C: Procedures to estimate and benchmark the fuel mix
  - D: Quality management
  - E: External verification
  - F: Recommendation for further development of the protocol
  - G: Reporting examples

2 Fuel mix protocol

2.1 Protocol structure

The protocol is structured as follows:

- In chapter 2.2 *General issues* starting points, reporting principles and definitions are presented.
- In chapter 2.3 an outline is given of the different types of fuel mixes that are used in this protocol.
- In chapters 2.4, 2.5 and 2.6 the calculation of the defined types of fuel mixes of an EDC is described.
- Chapter 2.7 gives guidance on how to determine the Dutch Standard Fuel mix.

2.2 General issues

2.2.1 Starting points

This protocol describes how an Energy Distribution Company (EDC) can account for the fuel mix of the electricity that it delivers to its customers. Starting points for this protocol are:

- The total volume of electricity that is physically supplied and delivered in The Netherlands, over the electricity grid is based on the e-program, as agreed with Tennet.
  - Production and supply not connected to the electricity grid is not taken into account.
  - (Financial) trading is not taken into account
- The reporting period is one calendar year.
- All types of production sources (relevant for CO2 emission) will be included, categorised according to definitions that are applicable in The Netherlands.
- The fuel mix sourced from or sold to specific suppliers or intermediaries is considered not to contain any electricity with additional value in the customers market, such as renewable energy, unless explicitly stated (*and preferably substantiated*) by the supplier.
- The fuel mix protocol follows definitions and structures that are introduced in the GHG protocol[4] as much as possible. This to enable the use of the fuel mix data for GHG reporting. The GHG protocol does not cover certificates trading in any way.
- Criteria for choice of information sources. The following criteria have been used to select information sources in case public available data are used:
  - Information sources should be consistent over the years.

[4] The Greenhouse Gas Protocol, WBCSD/WRI, October 2001

- Information sources should be continuous; it should be possible to use the same reference source each year for the coming years.
- Information should be as close as possible to the original source data (for example, for the Dutch market preferably Dutch data are used over European data).
- Sources should be generally acknowledged as reliable and independent.

2.2.2 Reporting principles

In line with the GHG Protocol, the following reporting principles are followed (within the limitations imposed by the quality of the underlying data), to ensure that:

- The reported information represents a true and fair account of the fuel mix of the electricity that is supplied to the customers of the reporting company.
- The reported information is credible and unbiased in its treatment and presentation of issues.

Reporting principles:

- Relevance. Define boundaries that appropriately reflect the organizational and operational boundaries of the EDC.
- Completeness. Account for all electricity sources, within the chosen organisation and operational boundaries. Any specific exclusion should be stated and justified.
- Consistency. Allow meaningful comparison of fuel mix data over time. Any changes to the basis of reporting should be clearly stated to enable continued valid comparison.
- Transparency. Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Important assumptions should be disclosed and appropriate references made to the calculation methodologies used.
- Accuracy. Exercise due diligence to ensure fuel mix calculations have the precision needed for their intended use, and provide reasonable assurance on the integrity of the reported information.

2.2.3 Definitions

- CHP installation: Installation for the cogeneration of heat and power
- ‘Colour’ of electricity. Electricity can be produced with different fuels and techniques, resulting in different types or ‘colours’ of electricity. Definitions of electricity ‘colours’ can vary from country to country, especially for renewable energy. For The Netherlands we distinguish the following ‘colours’ of electricity.

Non renewable 'colours'	**Renewable 'colours'**[5]
Gas	Solar
Gas (Cogeneration)	Wind
Coal	(Small) Hydropower (<15 MW)
Oil	Biomass (incl. Biogas)
Nuclear	
(Large) Hydropower (>15MW)	
Waste (non organic)	

Electricity produced by cogeneration is considered to be fuelled by gas. It is reported separately in order to be able to distinguish this type of electricity from other gas-fuelled installations, for example for CO_2 calculations.

- Energy Certificates. Certificates such as Renewable Energy Certificates, which guarantee that a specified amount of electricity has been generated by a specified installation, using a specified energy source. A certificate is considered to be genuine only if it is issued within a national or international system that includes an independent and regular verification of the source and volumes that are produced.
- End user. A final consumer of electricity.
- Fuel mix. The mixture of 'colours' of electricity, which is used to produce a certain amount of electricity, expressed in percentages of the total volume of electricity. Several types of fuel mixes are defined:
  - Sourced Fuel Mix of the EDC. The fuel mix of the electricity that is physically sourced by the EDC.
  - Total Delivery fuel mix of the EDC. The fuel mix of the total volume of electricity that is physically delivered to end users and intermediaries by the EDC, after a reallocation based on energy certificates.
  - Intermediary Fuel Mix of the EDC. The fuel mix of the volume of electricity that is delivered to intermediaries without specifying beforehand the type (or types) of energy source(s). Unless otherwise specified, this fuel mix does not include electricity with additional value, such as renewable energy..
  - End-user Fuel Mix of the EDC. The fuel mix of the volume of electricity that is delivered to end-users without specifying beforehand the type (or types) of energy source(s). This may include electricity with additional value, such as renewable energy.
  - Country Fuel Mix. (Annual) average fuel mix of electricity in a specific country (produced and imported) that is delivered to customers (in this country and abroad).
  - Supplier Fuel Mix. (Annual) average fuel mix of electricity that is supplied by a specific supplier to its customers (as the EDC).
- Intermediary. A trader of electricity.

[5] as defined in the Dutch Elektriciteitswet 1998

- Netting. Calculation of net volume of electricity that is bought or sold from a specific producer or intermediary over a defined period of time, by subtracting the volume sold from the volume bought. For transparency reasons, in this protocol 'netting' is avoided.
- Physical delivery of electricity. Electricity that is actually transported at a certain moment (directly or indirectly via an intermediary) over the grid to an end user. As basis for physical delivery, the e-program as agreed with Tennet is used, corrected for the imbalance corrections.
- Source data. The basic data on which the fuel mix estimate in this protocol is based. For the own production of the EDC these are the actual production data from the installations. For the electricity that is bought these are already aggregated data by the supplier or third parties.
- Tiers. Levels of certainty, to characterize the quality of data that are generated by the use of different data sources.

Tier	Certainty level
1	high
2	good
3	fair
4	poor

- Trading
  - Financial trading. Selling and buying of electricity by the ECD to and from intermediaries, which is never physically transported over the grid under the responsibility of the ECD.
  - Physical trading. Selling and buying of electricity by the ECD to and from intermediaries, which is physically transported over the grid.
- Scope. Used in GHG protocol to define the operational boundaries. In this protocol the following definitions are used.

Scope	
1	Electricity from production sources that are 100% owned by the EDC. If there are more shareholders for one production installation: the percentage of the total electricity production volume, equal to the percentage equity share held by the EDC is attributed to scope 1.
2	Electricity from production sources not owned or controlled by EDC. If there are more shareholders for one production installation. The % for which the EDC is not a shareholder is attributed to scope 2 (if this volume is supplied to the EDC)

2.3 Outline: different types of fuel mixes

Figure 1 gives an overview of different kinds of fuel mixes of an EDC that are used in this protocol, what they consist of and how they are related.

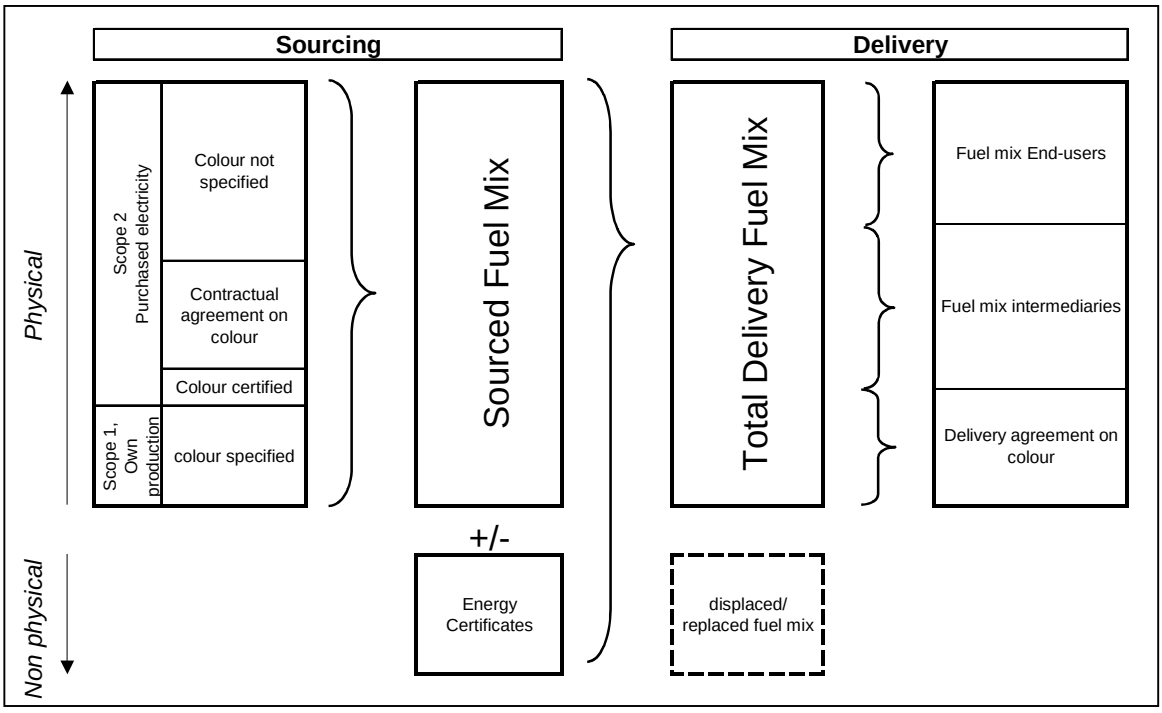

Figure 1. Relation between the different types of fuel mixes

- The Sourced Fuel Mix (SFM). This is the starting point. It is the fuel mix of the electricity that is physically sourced (and delivered to customers) by the ECD. The SFM is based on the sourcing portfolio of the EDC, including own production of the EDC. Basis for calculation of the SFM is the sourced electricity that is reported through the e-program as agreed with Tennet. Electricity that is traded without physical delivery is not taken into account.
- The Total Delivery Fuel Mix (TDFM). An EDC can buy or sell Energy Certificates independently from physically sourced or delivered electricity. This trade can influence the fuel mix. The TDFM is the fuel mix of the total volume of electricity that physically delivered to customers by the EDC, after a reallocation based on energy certificates. If no certificates trade (independent of the electricity itself) takes place, the SFM is equal to the TDFM.
- The Customer Delivery fuel mixes. A specific customer normally does **not** receive the Total Delivery Fuel Mix, because parts of this fuel mix have been reserved for specific customers. The following types of delivery can be identified:
  - Delivery agreement on colour. Customers (end-users and intermediaries) can have contracts that stipulate the type of electricity that is delivered to them (e.g. ‘green’ electricity customers).

- Intermediary Fuel Mix. This is the fuel mix that is sold to intermediaries without any specific contract that stipulates the colour/fuel mix of electricity that is delivered. Unless specified otherwise, this fuel mix is assumed not to contain any electricity with additional value, such as renewable energy.
- End-user Fuel Mix. This is the fuel mix that is sold to end-users without any specific contract that stipulates the type of electricity that is delivered.

2.4 Sourced Fuel Mix (SFM)

To determine the SFM, each 'sourcing' category needs to be described in terms of sources, amounts of energy per source and fuel mix of each source. This description should be based on documents or data that can be traced to the actual source. If this is not possible, the description should be based on traceable publicly available information. The following sourcing categories should be determined:

- Scope 1: Own production
- Scope 2: Electricity sourced from other parties

The Sourced Fuel Mix of the EDC is determined by the sourcing of electricity that is physically delivered via the ECD to end users and intermediaries. Basis for the physical flow that is delivered under responsibility of the EDC is the daily e-program as agreed with Tennet. The e-program is corrected for the imbalance corrections that are carried out under the responsibility of Tennet. If, based on the e-program, electricity is both bought and sold to the same customer (intermediary) in a certain period, the volume is not netted. In this case the total buy volume is considered as electricity sourced with the fuel mix of this specific supplier; the volume sold (without an agreement on a certain colour) is considered as delivered electricity produced with the Intermediary Fuel Mix of the EDC.

2.4.1 Scope 1: Own production

2.4.1.1 Definitions

- Own production. Own production is defined as the electricity production from installations in the Netherlands or abroad that are 100% owned by the EDC. If there are more shareholders for one production installation: the percentage of the total production volume, equal to the percentage equity share held by the EDC is attributed to scope 1. If the EDC buys (a part of) the remaining percentage for which the EDC is not a shareholder, this part is attributable to scope 2. Because the focus in this protocol is on the fuel mix of an ECD in the Netherlands, only that part of the own production is taken into account that is (physically) delivered via the EDC in the Netherlands to its costumers.

2.4.1.2 Data on fuel mix

For each production installation, information is collected on the amount of electricity that is supplied to the electricity grid, and on the 'colour' of electricity or the fuel mix, in cases where different fuels are used in one installation.

The EDC itself can create the conditions to produce a reliable (tier 1) fuel mix for its own production.

2.4.1.3 Specific issues

- Production capacity leased to third party. Other companies, (for example reserved capacity for imbalance corrections by Tennet) can have leased capacity in production installations owned by the EDC. If the production capacity is controlled by a third party, the produced electricity is considered to be owned by this third party and is not part of the EDC fuel mix.

2.4.1.4 Verification of data

Required data for verification are at least:

- A list of installations owned and partly owned by the EDC as well as the percentage of ownership (equity share)
- For each installation:
  - Amount of electricity supplied to the electricity grid, traceable to original measurements.
  - Type of installation and fuel input. If different fuels are used within one installation, there should be a detailed registration of the fuel input per installation throughout the year and an annual overview of the used fuel mix.
- For import of electricity into the Netherlands from installation owned by the EDC: (inter company) contracts, foreign e-programs and billing system can be used.

2.4.2 Scope 2: Electricity sourced in The Netherlands or abroad

2.4.2.1 Definitions

Electricity sourced in the Netherlands or abroad is defined as electricity that is bought by the EDC in the Netherlands from suppliers located in The Netherlands or abroad, as:

- Central electricity producing companies (as Essent, Reliant, E.on, Electrabel or other production companies). These companies can also act as intermediaries.
- Decentralised electricity producing entities (wind farms, CHP installations etc).

- Intermediaries, with or without own production installations.
- Power exchange (e.g. APX).
- Tennet imbalance corrections.

2.4.2.2 Data on fuel mix

There is not yet a generally accepted system to ensure the availability of the fuel mix information. To obtain information from electricity sourced (bought) in the Netherlands or abroad the following order of preference is used:

- Colour or fuel mix certified by independent verification (Tier 1)
  - The electricity is sold together with an accredited certificate that states the source (installation/location) and fuel mix of the supplied electricity.
  - The supplier guaranties in a letter or in a contract the source and fuel mix of the supplied electricity. This guaranty is substantiated by an independent verification.
- Contractual agreement on colour of fuel mix (Tier 2).

  The supplier guaranties in a letter or in a contract the source and fuel mix of the supplied electricity, including the guarantee that the supplier shall not use or sell these rights to other parties (or has used or sold in the past). This guarantee is given without an independent verification of the guaranty. Certain (basic) guarantees are required here, indicating that the supplier is a reliable party.
- Generic Supplier information (Tier 2 or 3).

  Information on the fuel mix of a specific supplier is based on publicly available information of the supplier on actual production and fuel use (for example the annual environmental report of a production entity[6] or information which becomes available when producers are obliged to publish information on their fuel mix). In this case the average fuel mix of the supplier is used. Possible imported electricity should be taken into account here.

  Generic supplier information can be regarded as Tier 2 when the method of calculation is clearly described and in line with generally accepted calculation and reporting methods, for example methods used for official reporting obligations. Otherwise, generic supplier information should be regarded as Tier 3.

- Country fuel mix (Tier 4)

  If no specific information on the fuel mix of a specific supplier is available, the fuel mix for this supplier is assumed to be the 'average' fuel mix of the country from which the electricity is sourced. For imported electricity the IEA figures can be used, unless there is

[6] The public annual environmental reports are available for all large production installations in July of the year following the year of reporting

an annually, generally accepted national fuel mix published by an independent organisation. Calculation of the Dutch average fuel mix is described in paragraph 2.7. The 'average' national fuel mix of countries from which electricity is imported is considered not to contain any renewable energy (or any other energy flows with additional value in the customers market)[7]. If public available information indicates the presence of such energy in the fuel mix, this amount of energy is pro rata distributed over the other fuel sources of same supplier.

2.4.2.3 Specific issues

- The electricity producing companies can also act as traders/importers of electricity. If use is made of publicly available information on fuel mix of their own production and no information is available on import, an attempt should be made to obtain information on the percentage of traded/imported electricity and the sources (fuel mix) of this electricity (Tier 3). If no information can be obtained, it is assumed that the supplied electricity is for 100% produced by the supplier (Tier 3 or 4).
- Electricity bought from power exchange (APX) and intermediaries in the Netherlands can be sourced in the Netherlands or can be imported from other countries. If no public information is available on the import, an attempt should be made to obtain information from APX or intermediaries on the percentage of imported electricity and the sources (fuel mix) of this electricity (Tier 3). If no information can be obtained, it is assumed that the supplied electricity is the Dutch Standard Fuel mix (Tier 4).
- Electricity sourced abroad:
  - Electricity bought from foreign power exchange and intermediates can also be imported from other countries. If no public information is available on their import, an attempt should be made to obtain information from the power exchange/intermediate on the percentage of imported electricity (and which countries) and the sources (fuel mix) of this electricity (Tier 3). If no information can be obtained, it is assumed that the supplied electricity is for 100% produced in the country of the power exchange/intermediate from which the electricity is bought (Tier 4).
  - The country from which the electricity is imported is assumed to be the country from the supplier that has a contract with the EDC unless specifically stated in a certificate, letter or contract that electricity is imported from another country.
- If a supplier sells part of the electricity they source or produce with certificates or contracts to specific buyers, a corresponding correction of the fuel mix of the remaining part is necessary. An attempt should be made to obtain this information. If no information can be obtained, the average fuel mix of the total E-production of this supplier is used, excluding electricity with additional value in the customers market (Tier 3).
- Electricity with additional market value. The fuel mix of specific suppliers is considered not to contain any energy with additional value in the customers market, such as renewable

[7] It is assumed here that renewable energy is sold separately with certificates.

energy, unless explicitly stated (and preferably substantiated) by the supplier. If public available information indicates the presence of energy with additional market value in the fuel mix of a specific supplier, this amount of energy is pro rata distributed over the other fuel sources of same supplier.

- Imbalance corrections.
  - If an EDC is corrected for being 'short' this extra volume that has been delivered is considered to be sourced from Tennet and produced with the Dutch standard fuel mix (tier 4).
  - If an EDC is corrected for being 'long' the reduced volume that has not been delivered is considered to be supplied to Tennet and consists of the Intermediary Fuel Mix of the EDC (tier depending on reliability data sources EDC).
  - The imbalance volumes are not netted.

2.4.2.4 Verification of data

Required data for verification are at least:

- A list of suppliers per country
- For each supplier:
  - Amount of electricity bought per hour, traceable to the EDC administration. Basis is the electricity program that the EDC has provided to Tennet.
  - Information on the fuel mix per period ('colour' and data sources).

2.5 The Total Delivery Fuel Mix – including certificates trade (TDFM)

The trade in Energy Certificates, independent from the electricity itself, is growing. Therefore it is important that this protocol accommodates for the implications of this kind of trade. Certificates guarantee that a specified amount of electricity has been generated by a specified installation, using a specified energy source.

An EDC can buy or sell Energy Certificates independently from sourced or delivered electricity. This trade can influence the (delivery) fuel mix.

- When buying and selling certificates with the same colour, not related to physical sourcing, this trade has no effect on the fuel mix. (see (1) in Figure 2) .
- When there is a net buy of certificates, not related to physical sourcing, the delivery fuel mix can be adjusted. In the TDFM part of the volume and colour(mix) of the original fuel mix (SFM) can be displaced by a comparable volume of electricity with a different colour(mix) from the (net) purchased Energy Certificates which are added to the fuel mix. (see (2) in Figure 2)

- When selling Certificates, related to physically sourced electricity, independent from the physical delivery, the sold volume (and colour) can be replaced with an average fuel mix or with an equal volume of bought certificates. It is assumed that the replacement with an average fuel mix consists of the original SFM fuel mix, excluding the fuel mix with additional value in the customers market.(see (3) in Figure 2).

Based on the SFM and the trade in Energy Certificates (traded independently from the electricity itself) the TDFM is determined.

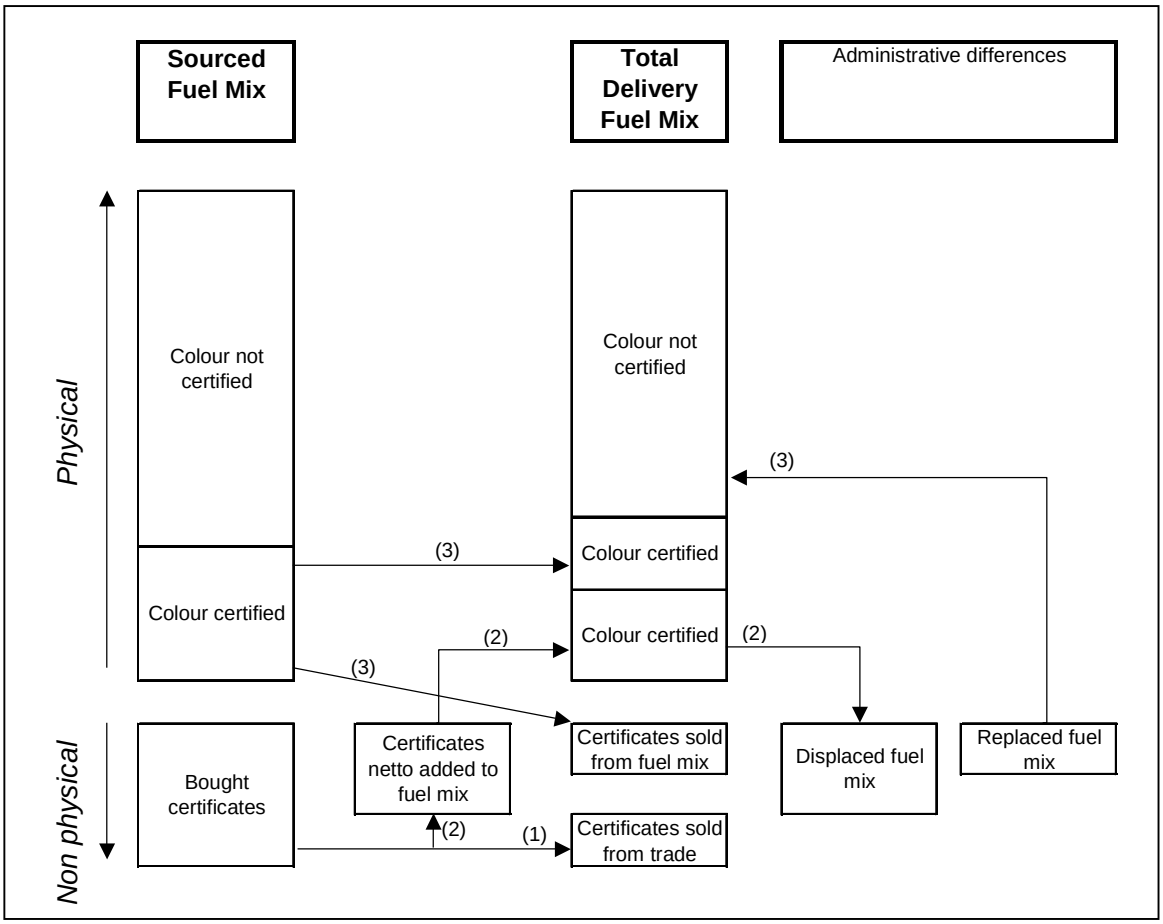

Figure 2. Introducing Energy Certificates in the fuel mix

Before introducing a certificate into the fuel mix of an EDC it has to be determined whether a certificate is genuine.

2.5.1 When is a certificate genuine?

A certificate is considered to be genuine only if it is issued within a national or international accepted system that includes an independent and regular verification of the sources and volumes that are produced.

2.5.2 The effect of buying and selling certificate(s) on the TDFM

Buying and selling Certificates with the same colour, independent from the electricity itself has no effect on the fuel mix. Only in case of a net buy of certificates not related to physical sourcing, and in case of selling certificates related to the SFM, independent from physical delivery, the TDFM can respectively will be effected.

2.5.3 The effect of buying a certificate on the TDFM

If an EDC has bought Certificates, not related to physical sourcing, and wants to add these to the Total Delivery Fuel Mix, the colour and volume of electricity represented by the certificate displaces the same volume of the Sourced Fuel Mix. The choice of the colour(mix) of the displaced volume within the SFM is in principal free, as long as no national or international regulations/agreements exists on this point. The displaced volume and colour needs to be well administrated. (In future further steps might be necessary with respect to this displaced fuel mix).

The following procedure has to be followed to determine the TDFM:

1. Determine the total volume and mix of colours that will be included in the fuel mix, based on the certificates, not related to physical sourcing, which are hold by the EDC. When added to the fuel mix, these certificates should be administrated as ‘used’ and cannot be sold anymore.

2. Determine the colour(mix) of the same volume within the original SFM that will be displaced;

3. Subtract the volume as determined under (1) from the SFM with the fuel mix as determined in (2);

4. Add the volume and colour of the certificates as determined under (1).

2.5.4 The effect of selling a certificate on the TDFM

If an EDC has sold certificates, related to SFM, independent from physical delivery, these transactions have to be incorporated in the Total Delivery Fuel Mix. It is assumed that the same volume consisting of the Sourced Fuel Mix, without the fuel mix with additional value in the customers market, replaces the colour and volume of electricity represented by the certificate. Another possibility is that these sold certificates are replaced with an equal volume of bought certificates. The following procedure has to be followed:

1. Determine the total volume and mix of colours that will be removed from the fuel mix, based on the sold certificates;

2. Determine the original SFM without any electricity with additional value in customers market, such as renewable energy; or identify the (bought) certificates which will replace the sold certificates
3. Subtract the volume and colour of the certificates as determined in (1) from the fuel mix;
4. Replace this volume using fuel mix as determined in (2).

2.6 Customer delivery fuel mixes.

In general a specific customer does **not** receive the Total Delivery Fuel Mix. The following types of delivery can be identified and calculated:

- Delivery agreement on colour. Customers (end-users and intermediaries) can have contracts that stipulate the type of electricity that is delivered to them (e.g. 'green' electricity customers).
- Intermediary Fuel Mix. This fuel mix is based on the Total Delivery Fuel Mix, excluding the fuel mix representing the electricity delivered under the 'colour agreed' contracts. and excluding, any electricity with additional value in the customers market, such as renewable energy (unless specified otherwise).
- End-user Fuel Mix. The remaining fuel mix, after the fuel mix representing the electricity delivered under the 'colour agreed' contracts and the intermediary fuel mix have been subtracted from the General Delivery Fuel Mix, is the End-user Fuel Mix. This is the fuel mix that is sold to end-users without any specific contract that stipulates the type of electricity that is delivered.

2.7 Reference: Dutch Standard Fuel mix

The Total Fuel Mix of the EDC can be compared with the Dutch Standard Fuel mix (DSF).

2.7.1 Definition

There is not yet a generally accepted definition of the DSF. Possible definitions are:

a. fuel mix of all (net) E-production in the Netherlands, centralised and decentralised (including industrial own production and production delivered via the net);
b. fuel mix of all (net) E-production in the Netherlands, centralised and decentralised but excluding industrial production, not delivered to the national grid; this means only the E production that is delivered via the grid is taken into account;
c. as (a), but corrected for import and export;
d. as (b), but corrected for import and export.

Above definitions are listed in order of preference, with definition (d) being the most preferred as reference for the fuel mix of an EDC.

2.7.2 Data on fuel mix

There is not yet a generally accepted system to ensure the availability of information on the DSF. To obtain information on the DSF, the following order of preference is used:

- Tier 1. The total electricity sold and delivered via the net in the Netherlands with a certificate. This is only possible if all the electricity in the Netherlands is sold with a certificate. If this is possible for only part of the electricity, combinations with tier 2-4 methods, as mentioned below are necessary.
- Tier 2-3. An actual and annual independent report of an external expert authority on the DSF especially made or suited for this purpose and conform the chosen definitions (tier 2 - 3, depending on the reliability of the data that are available and taken into account).
- Tier 3-4. Available public information on the total Dutch electricity supply and fuel mix, as published by ECN[8] (in the 3rd quarter of each year) and/or CBS data[9], supplemented by information of (central) E-suppliers on the fuel mix (for example in environmental reports) and information (quantities/fuel mix) on in- and export (from individual suppliers, CBS, IEA and Tennet). If information on the actual fuel mix is not available the fuel mix can be estimated, using public information on the total installed and operational electricity production capacity.

2.7.3 Specific issues

- At this moment available public information from different sources is not always comparable. Different definitions have been used related to specific goals in different studies. Furthermore import and export quantities can differ between different information sources. At this moment calculations based on public available information have a tier 4 reliability level. In future, more complete, consistent and reliable public information can lead to a tier 3 reliability level.
- If the in- and exported electricity cannot be traced to the fuel mix of specific suppliers, the exported electricity is assumed to have the average Dutch (production) fuel mix. The imported electricity is assumed to have the average (production) fuel mix from the country from which is imported. The fuel mix of specific countries should be based on the latest IEA overview. The imported quantity per country of CBS[10] can be used.
- As long as there is not a generally accepted system for determining the fuel mix of the total Dutch E-production, the data of CBS can be used as these are published every year in a

[8] "Energieverslag Nederland" and "Energie markt trends"

[9] Nationale Energiebalans

[10] 'Statistieken buitenlandse handel'

reasonably consistent manner, are 'close' to the actual sources and collected in an independent way.

2.7.4 Verification of data

Required data for verification are at least:

- Total electricity supply in the Netherlands conform definition.
- The corresponding fuel mix.
- Used data sources.
- Method and calculation of the Dutch fuel mix estimation.

2.7.5 Calculation Dutch Standard Fuel mix

Based on (public) available information, the Dutch Standard Fuel Mix for the year 2000 has been calculated (see appendix A and B).

In order to obtain a Dutch Fuel Mix according to definition (d) (see paragraph 2.7.1) the following public sources have been used:

Netto production volumes	CBS, Dutch energybalance (NEH) over the year 2000
Renewable energy	Novem, monitoring renewable energy 2000 and CBS
Production efficiency	ECN, CBS
Import volumes	CBS, Dutch trade statistics over the year 2000
Fuel mix of imported electricity	IEA data over the year 2000
Central production: share of cogeneration	ECN.Powerplants in The Netherlands, end 2000; Energie in cijfers
Decentral production, share of cogeneration	CBS, Dutch energy balance (NEH) over the year 2000

A Dutch Standard fuel mix, 2000

Dutch Standard Fuelmix, 2000

	Non renewable								Renewable					
	in PJ's													
	Gas without cogen	Gas with cogen	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Total NR	Solar	Wind	Hydro small <15 MW)	biomass	Total R	Grand Total
central electricity production (e-companies)	24,07	63,34	93,43	0,26	13,56			194,67				0,70	0,70	195,37
decentral electricity production (e-companies)	9,79	41,71						51,50				1,13	1,13	52,63
decentral electricity production (others)	9,46	40,31						49,77				0,55	0,55	50,32
electricity production waste incineration							3,93	3,93				3,32	3,32	7,25
Green winning								0,00	0,02	2,98	0,51		3,52	3,52
Import	8,91		29,71	0,82	34,12	2,30	1,03	76,88		0,83	2,30	0,12	3,25	80,12
Total	52,23	145,36	123,14	1,08	47,68	2,30	4,96	376,74	0,02	3,81	2,81	5,83	12,47	389,21
In percentages	13,4%	37,3%	31,6%	0,3%	12,2%	0,6%	1,3%	96,8%	0,0%	1,0%	0,7%	1,5%	3,2%	100,0%

Assumptions

central electricity production (e-companies)
Efficiencies of electricity production for coal and nucleair are assumptions, based on literature (ECN), no CBS data available
Efficiency of gas (total) is calculated, based on the available CBS data, the outcome is in line with literature data (ECN)
Division between gas with and without cogeneration is based on installed central capacity, not on actual production volume

decentral electricity production (e-companies)
Assumed is that all decentral production is gasfueled, with some addition of biomass
Division between with and without cogeneration is based on CBS data on the total volume of decentralised cogeneration

decentral electricity production (others)
Assumed is that all decentral production is gasfueled
Division between with and without cogeneration is based on CBS data on the total volume of decentralised cogeneration

Import
IEA data make no distinction between large and small hydro, assumed is that 50% is large Hydro and 50% is small hydro.
IEA data make no distinction between solar and wind, the import igure for wind contains a small amount of solar
IEA data make no distinction between 'gas' with and without cogeneration,
assumed is that all imported gasfueled electricity is produced without cogeneration

All imported electricity from waste is assumed to be non organic

Remarks

Figures based on netto production of electricity
Data on import volumes are known to differ from the corresponding data of the exporting countries

Data sources

Netto production volumes	CBS, Dutch energybalance (NEH) over the year 2000
Renewable energy	Novem, monitoring renewable energy 2000 and CBS
production efficiency	ECN, CBS
Import volumes	CBS, Dutch trade statistics over the year 2000
fuel mix of imported electricity	IEA data over the year 2000
central production: share of cogeneration	ECN.Powerplants in The Netherlands, end 2000; Energie in cijfers
decentral production, share of cogeneration	CBS, Dutch energybalance (NEH) over the year 2000

B Remarks to the Dutch standard Fuel mix over the year 2000

B.1 Introduction

In order to be able to benchmark the EDC's Total Fuel Mix to the Dutch Standard Fuel Mix, NUON has asked KPMG to calculate the Dutch Standard Fuel Mix, based on the protocol and making use of available information. As the most relevant statistical data over the year 2001 were not yet available, the DSF is calculated over the year 2000.

B.2 Used data

We have chosen to use CBS data for production in the Netherlands and import to the Netherlands and IEA data for the fuel mix of the imported electricity. These sources have been chosen because they are yearly published and in a reasonably consistent way, 'close' to the actual sources and collected by an independent organisation.

Data	**Sources**
Electricity production data (central production and decentralised production; renewable and non renewable	CBS Nederlandse energiehuishouding (NEH) 2000, Energy balance
Additional info on renewable energy	Novem, Monitoring Renewable Energy, 2000
Efficiency data on production of coal, gas, oil and nuclear electricity	ECN, CBS Literature
Electricity import (volume)	CBS foreign trade statistics 2000
Fuel mix imported electricity per country (Germany, France Belgium, UK)	IEA 2000 (provisional data)

B.3 Reliability of data

B.3.1 Electricity production data:

KPMG has not carried out any verification of reliability of the electricity production data. According to CBS the production data are considered to be reliable. They have published the following uncertainty margins over the 1999 figures:

Table: uncertainties in energy usage data CBS[11]

	Volume 1999 in PJ	Uncertainty margins (%)
Winning	2484	0,5
Import	6842	0,5
Export	5812	1,1
Storage	677	2,1
Total usage Volume	2974	2,6
Total energy companies	593	2,9
- Refineries	171	9,8
- Production installations	242	0,7
- Waste incineration	32	2,3
- Distribution companies	33	1,8
Total end users	2381	1,5
- Industry	1027	0,9
- Transport	457	2,0
- Households	421	2,9
- Other end users	476	6,4

Source: W. Tinbergen, CBS, 2001

B.3.2 Comparison to IEA data on the Dutch Fuel mix

We have compared the CBS Electricity production data with the available (provisional) IEA data on the Dutch fuel mix over 2000 (see Figure 3). Remarkable is the difference in usage of oil (CBS: 0,1 %; IEA 7%). Other differences are gas usage (CBS 61%, IEA 55%) and renewables (CBS 3%, IEA 1%).

Figure 3 Comparison of DSF with IEA data on the Dutch fuelmix

Comparison with IEA data on the dutch fuel mix
Preliminary IEA data on the Dutch Fuelmix over the year 2000

	Non Renewables							Renewables					
DSF (excl import)	Gas (total)	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Total NR	Solar	Wind	Hydro small <15 MW)	biomass	Total R	Grand Total
in PJ	188,68	93,43	0,26	13,56	0,00	3,93	299,87	0,02	2,98	0,51	5,70	9,22	309,09
	61%	30%	0%	4%	0%	1%	97%	0%	1%	0%	2%	3%	100%
in TWh	52,41	25,95	0,07	3,77	0,00	1,09	83,30	0,01	0,83	0,14	1,58	2,56	85,86
IEA data (in TWh)	49,13	24,8	6,5	3,93		3,75	88,11	0,9		0,14	0,29	1,33	89,44
	55%	28%	7%	4%	0%	4%	99%	1%	0%	0%	0%	1%	100%

[11] Bron: Protocol Monitoring energiebesparing, CPB, ECN, Novem, RIVM – Appendix E

The efficiency data that have been used to calculate the produced central electricity are assumptions, partly based on literature (coal, nuclear and gas) and partly deducted from the CBS data (gas)

B.3.3 Electricity import (volume)

The reliability of CBS data on import volumes has not been verified by KPMG. Comparison with the import volumes in 2000 as mentioned in the ECN report “de kleur van stroom” and “Energieverslag Nederland 2000” show some differences. It is also known that the data on the volume of imported electricity in certain countries differ from the corresponding data of the exporting countries.

B.3.4 Electricity import (fuel mix)

The reliability of IEA data on the fuel mix of the electricity output per country has not been verified. The used IEA data are provisional. In June 2002 definite data over 2000 can be expected.

C Procedures to determine and benchmark the ECD fuel mix

C.1.1 Determine Sourced Fuel mix

1. Separate the financial trade from the physical trade and delivery within the administrative system. Basis for physical trade and delivery is the e-program as agreed with Tennet.

2. Gather information on own production in all countries in which the ECD produces electricity that is sold in The Netherlands:
   - Maintain a list of production facilities that fall under scope 1 (including type of installation and fuel input).
   - Ask each installation to report on a regular basis the volume of electricity supplied to the electricity grid and the fuel mix used.
   - Ask each installation to maintain a detailed registration of:
     - production data;
     - used fuel or fuel mix;

     (data should be traceable to original measurements or delivery receipts).
   - Collect information on the import into the Netherlands of the produced electricity
3. Electricity sourced externally in The Netherlands and abroad (and imported) to The Netherlands:
   - Check for the different suppliers in the Netherlands which data as mentioned in paragraph 2.4.2.2 are available and chose the data with the highest certainty (best tier).
   - Gather these source data for individual suppliers and/or groups of suppliers, per country.

4. Determine per owned production installation (scope 1) and per supplier or group of suppliers (scope 2), the total volume in kWh, and the ‘colour’ of electricity.

5. Determine the Sourced Fuel mix, of:
   - the EDC’s own production in The Netherlands;
   - the EDC’s own production abroad, imported into The Netherlands;
   - the externally sourced electricity in The Netherlands;
   - the externally sourced electricity imported into The Netherlands.
6. Determine the Sourced Fuel Mix for the EDC.

C.2 Determine Total Delivery Fuel mix

To determine the Total Delivery Fuel Mix the traded Energy Certificates (traded independently from electricity) are incorporated into the Physical Fuel Mix.

1. Determine which certificates are genuine.
2. Incorporate (netto) bought certificates into the SFM, according to the described procedure.
3. Subtract sold certificates from the SFM, according to the described procedure.

C.3 Determine Customer Delivery Fuel Mixes

To determine the Customer Delivery Fuel Mixes, the 'colour agreed' deliveries should be subtracted from the Total Fuel Mix.

1. Determine the Total Delivery Fuel Mix.
2. Subtract from the Total Delivery Fuel Mix electricity that is supplied to customers, which have a contract that specifies the type of electricity that is supplied. This is done by subtracting the total volume of 'specified' electricity and the fuel mix that is attached to this volume.
3. The resulting fuel mix is the basis for the CustomerDelivery Fuel Mixes. This is the fuel mix that is supplied to customers (end users or intermediaries) that do not specify the 'colour' of electricity they want to receive.
4. Determine the Intermediary Delivery Fuel Mix.
5. Determine the End-user Delivery Fuel Mix.

C.4 Benchmark to the Dutch Standard Fuel Mix (DSF)

The Total Delivery Fuel Mix can be compared to the Dutch Standard Fuel Mix. The Intermediate and End-user fuel mixes should not be compared with the DSF, as the electricity with additional value of all EDC's is included in the DSF and is (largely) excluded from the delivery fuel mixes.

The Dutch Standard Mix is determined as follows:

1. Check which data as mentioned in paragraph 2.7.2 are available and chose the data with the highest certainty (best tier).
2. Gather these source data and calculate the DSF.

D Quality management

The protocol as described in chapter 2 is a guide to determine the fuel mix. It leads you through the steps that have to be followed and gives the data sources to be used as far as available. The way the protocol is actually used and the confidence we can have in the result is further determined by organizational and administrative requirements. The protocol should be embedded in a quality management system[12] that guarantees the proper use and continuously improvement of it. For all the steps in the protocol it needs to be clear: who is responsible, what should be done, how to register/document the results etc. The complete trail from source data to end result must be transparent for the whole of the reporting period.

The following major elements are to be considered in the development of a quality management system for the Fuel mix inventory.

- An inventory co-ordinator within NUON responsible for coordinating activities
- Formal (written) procedures and responsibilities
- Data registration systems and transparant data trail
- QC/QA procedures
- Documentation and archiving procedures
- Reporting.

D.1 Inventory coordinator

The inventory coordinator is responsible for coordinating the activities for the NUON fuel mix inventory. The inventory coordinator is responsible for:

- Planning the process, including a scheduled time frame that follows inventory preparation from its initial development through to final reporting in any year, determining at what time what information should be available.
- The gathering of the necessary data/information outside the NUON organization.
- Ensuring that other involved parties within the NUON organization are aware of and follow applicable procedures concerning the preparation of the inventory.
- Performing quality control and quality assurance procedures.
- Reporting on the fuel mix.
- Following and stimulating external developments with respect to available data and guarding continuously improvement to achieve more reliable results.

[12] developed for this specific use or as part of an overall quality system

D.2 Procedures and responsibilities

Clear procedures have to be developed for the gathering, processing, handling, documenting, archiving and reporting of inventory data. All the persons within the NUON organization that are involved in the fuel mix inventory have to be aware of their task in it and the procedures that has to be followed. In this protocol is the main activities are indicated. Further elaboration can be necessary.

D.3 Data systems and transparent data trail

All the available data that are relevant for and used in the inventory should be known and traceable. This concerns the source data, as well as the aggregated data. The total data trail from source data via aggregated data to the end result (the Total NUON fuel mix) should be transparent for the whole of the reporting period. The arrangement of the (supporting) data systems and spreadsheets needs special attention in this respect.

D.4 QC/QA procedures

To improve the confidence in the result of the fuel mix inventory, the following quality control and quality assurance procedures are relevant:

- Comparison of data with comparable data from other available sources as a check.
- Independent (internal) review of the internal NUON data (own production) and the aggregation.
- Routine and consistent checks to ensure data integrity, correctness and completeness.
- Identify and address errors and omissions.
- Objective review to access the quality of the inventory and underlying data and identify areas where improvements could be made (for example the availability of more reliable source data). Guarantee comparability between the fuel mix in subsequent years in case the methodology changes (improves). Evaluate the protocol and actualize it on a regular basis.
- External verification of the resulting fuel mix and the process in which is has been established (see chapter A).

D.5 Documentation and archiving procedures

As part of general QC procedures it is good practice to document and archive all information required (inventory material) to produce the NUON fuel mix estimate.

D.6 Reporting

Results can be reported for internal and external purposes. In the external reports information can be given on (for a specified reporting year):

- the total NUON fuel mix estimate (see an example in Appendix G);
- the method that has been used;
- major issues regarding the quality of input data (and uncertainties);
- external reviews that were conducted;
- plans for the future.

More extensive information on the entire inventory (including underlying data, activities that were performed internally, external reviews that were conducted etc.) can be reported in the internal reports. The information in the internal report depends on the goals and purposes NUON has.

E External Verification

E.1 General

The overall aim of performance reporting is to communicate information to interested parties on the actual situation, progress and future improvements. However, in order for the information to be credible the performance reporting process must:

- Deliver information that is useful and relevant.
- Incorporate information that is complete, accurate and comparable over time.
- Have a level of assurance appropriate to the existing circumstances and stakeholder interests.
- Be clear about the limitations of the reporting process.

The external verification process seeks to assure interested (external) parties that the information and/or data presented by the EDC are reliable (i.e. accurate, complete and comparable) within the reported limitations of the criteria (protocol) used to generate the information. Verification does not, therefore, give a guarantee that the reported fuel mix as such is reliable. The reliability of the result depends on the reliability of the available (underlying) data and on the used methodology. It should be noted that there are no internationally accepted standards for the verification (auditing) of non-financial data. Most verifiers rely on guidelines (GRI etc) and accepted financial auditing techniques, using a mixed team of financial auditors and subject matter (in this case environmental) experts. Due to uncertainties surrounding the generation of non-financial (e.g. environmental) performance data, a “moderate” level of assurance is aimed for in this type of assurance engagement. This is lower than the “high” level of assurance given, for example, in financial audit opinions.

The amount of work needed to reach a conclusion on the reliability of the reported information largely depends upon the presence, quality and functioning of the information system that generates the data. Two verification approaches can be distinguished:

- A system-based approach.
- A substantive approach.

In a **system-based approach** the reliability of the reported information/data is deducted from testing the presence and correct application of the protocol and the functioning of the underlying (information) systems and procedures that deliver the data, and confirming that internal checks and controls at each stage of the process have been undertaken. The presence of a good and well functioning protocol/system provides the verifier with guarantees that the data are derived conform the procedures that have been established.

A substantive **approach** is normally used when an information system is newly established or when a system is tested and it does not appear to be fully functional. In this case the

verifier must perform far more detailed procedures on the actual data (e.g. by re-performing calculations and extensively checking back to source data).

In most assurance engagements for non-financial data a mix of the two approaches is often used, depending on the functioning of each part of the information system.

E.2 Verification of the EDC's fuel mix

The fuel mix protocol offers the base for estimating the EDC's fuel mix. With respect to the relevant source data (concerning own production and externally sourced electricity) different levels of accuracy can be distinguished (tier 1 –3), depending on the accuracy of available data. According to the protocol the available data with the highest reliability have to be used.

Not all the available data have a high level of reliability yet. Although the data relating to the EDC's own production should be reasonably accurate, this is not (yet) the case for the data for bought electricity (especially the import data). This means that the reported fuel mix, based on this protocol, cannot be very reliable at this moment. It is, however, the best figure that can be produced at this moment, based on the available information.

The result of an external verification could be a statement on the reliability of the reported fuel mix estimation related to the company "criteria" which have been used to produce the information. The criteria include the chosen method (tier) and inherent levels of uncertainty (limitations), which also need to be reported by the company. It should be noted that an external verifier operates independently. It is not possible to describe beforehand what the exact content of the statement will be.

E.3 Continuously improvement

Part of the protocol is that the EDC follows all developments and actively stimulates opportunities, as far as reasonably possible, to improve the level of accuracy of the different data sources. This means that over the years the level of reliability of the fuel mix can improve. The realization of a reliable system demands the cooperation of all the parties (inside and outside the Netherlands) involved.

F Recommendations for further development of the protocol and reference documents

General acceptance and further improvement of the protocol and reference documents is very much dependant on cooperation within the electricity sector. Ideally, a platform or working group within the sector is set up which should discuss the following issues:

- Further improvement and acceptance of the fuel mix protocol, including
  - Developing clear and generally accepted definitions.
  - Guidelines how to separate financial trading and physical delivery in the administrative systems of EDC's.
- Reference for the Dutch Standard Fuel Mix. No generally accepted 'Dutch Standard Fuel Mix' exists. Ideally an independent organisation is assigned to publish annually a generally accepted 'Dutch Standard Fuel Mix'.
- Cooperation of all the parties involved to report the necessary source data for a reliable fuel mix estimate. This concerns especially:
  - Tennet, (and also Elia, E.On Net and RWE Netz)
  - APX (and also the LPX)
  - All central E producers
  - Suppliers in other countries

G Reporting

Both the Total Delivery Fuel Mix and the customer delivery fuel mixes (Intermediary Fuel Mix and End-user Fuel Mix) can be reported. The differences between these fuel mixes should be clearly indicated. As information for comparison, the Dutch Standard Fuel Mix can be reported.

As supporting information the following information should be published:

- description of the methodology used to determine the fuel mix.
- information on uncertainty of the different sources (Tier 1, 2 or 3).
- information on certified and non certified sources.
- Information on Energy Certificates which have been sold from physically sourced electricity.
- information on Energy Certificates which have been sold independent from physical delivery of electricity.
- information on Energy Certificates which have been bought independent from physical delivery of electricity.

Examples of the required (internal) underlying information and publicly available information can be found below

G.1 Fuel mix presentation matrix: Public Information

	Non renewable							Renewable			
	Gas	**Gas Cogen.**	**Coal**	**Oil**	**Nuclear**	**Hydro (large >15 MW)**	**Waste (non organic)**	**Solar**	**Wind**	**Biomass**	**Hydro small <15 MW)**
Overview											
Total Delivery Fuel Mix											
Enduser Fuel Mix											
Intermediairy Fuel Mix											
Dutch Standard Fuel Mix											
Breakdown of Total Fuel Mix to uncertainty tiers											
Total Tier 1											
Total Tier 2											
Total Tier 3											
Overview of Energy Certificates											
Certificates added to the fuel mix											
Certificates sold from (physically sourced) fuel mix											

G.2 Fuel mix presentation matrix: Underlying information

Sourced Fuel mix, general overview				Non renewable							Renewable			
				Gas	Gas Cogen.	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Solar	Wind	Biomass	Hydro small <15 MW)
Scope 1	Own production in NL	*Per BU*	*list of installations*											
	Own production abroad	*Per country*	*list of installations*											
Scope 2	Sourced in NL		*list of suppliers*											
	Sourced abroad	*Per country*	*list of suppliers*											
			Total Fuel Mix											

Sourced Fuel mix matrix, uncertainty			Non renewable							Renewable			
			Gas	Gas Cogen.	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Solar	Wind	Biomass	Hydro small <15 MW)
Scope 1	Own production i	Tier 1											
	Own production a	Tier 1											
Scope 2	Sourced in NL	Tier 1											
		Tier 2											
		Tier 3											
	Sourced abroad	Tier 1											
		Tier 2											
		Tier 3											
		Total Tier 1											
		Total Tier 2											
		Total Tier 3											

Overview of Energy Certificates	Non renewable							Renewable			
	Gas	Gas Cogen.	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Solar	Wind	Biomass	Hydro small <15 MW)
Certificates added to the fuel mix											
Certificates sold from (physically sourced) fuel mix											
Displaced fuel mix (exchanged for bought certificates)											
Replaced fuel mix (exchanged for sold certificates)											

Customer Fuel Mixes	Non renewable							Renewable			
	Gas	Gas Cogen.	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Solar	Wind	Biomass	Hydro small <15 MW)
Total Delivery Fuel Mix											
Intermediairy Fuel Mix											
Enduser Fuel Mix											

Dutch Standard Fuel Mix	Non renewable							Renewable			
	Gas	Gas Cogen.	Coal	Oil	Nuclear	Hydro (large >15 MW)	Waste (non organic)	Solar	Wind	Biomass	Hydro small <15 MW)
Central production											
Non central production											
import											
export											
Total Dutch Standard Fuel Mix											