Certifying Green Electricity

Handbook for Stakeholders

The European Electrolabel

A Green Electricity Certification Standard for the EU

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ElectroLabel team

Ole Langniss (leading author task 2)

German Aerospace Center
Institute for Technical Thermodynamics
Dep. Systems Analysis and Technology Assessment
Pfaffenwaldring 38-40
D-70569 Stuttgart
Germany

Tel +49 711 6862667, Fax +49 711 6862783, ole.langniss@dlr.de
http://www.dlr.de/tt/system

Joaquim Corominas

Ecoserveis
C/Ceramica 38
E-08035 Barcelona
Spain
Tel +34 93 4284167, Fax +34 93 4284167, ecoserv@eic.ictnet.es

Anders Mårtensson, Mattias Örtenvik

University of Linkoping
Department of Physics and Measurement
Environmental Technique and Management
S-58183 Linköping
Sweden
Tel +46 13 282287, Fax +46 13 122587, anders.martensson@ifm.liu.se

Rona Wilkinson (project co-ordinator)

Intermediate Technology Consultants Ltd
Schumacher Centre for Technology and Development
Bourton Hall, Bourton-on-Dunsmore, Rugby CV23 9QZ UK
Tel +44 -1788 661103 Fax +44 -1788 661105 RonaW@itdg.org.uk
http://www.oneworld.org/itdg

Rationale

With the increasing liberalisation of the electricity supply market in the EU, consumers will be able to choose their electricity supplier. In many European countries suppliers starts to offer 'Green Electricity' generated from environmentally benign sources. National certification and accreditation schemes for Green Electricity has been developed in several European giving Green customers the security on the creditability of Green Electricity products and suppliers. Still, in many countries no accreditation system has been established yet. A Single European Market for electricity demands that the different schemes are brought together in a coherent system, harmonised across the EU. Such a system will foster the further deployment of environmental sound electricity generation in line with the European Union's policy. However, this is a rather ambitious goal since environmental criteria and restrictions of the existing national schemes varies largely. The objective of this handbook is twofold:

1. It should facilitate the set-up of national certification schemes in countries where no certification scheme has established yet. This should be achieved by structuring the usually occurring questions within the set-up phases, presenting the answers to these questions as they have been developed within existing schemes and making the motivation of the different stakeholders transparent.
2. It should path the way to an harmonised European certification system for Green Electricity. The presentation and comparison of the existing national schemes should give a good basis for a discussion process on the European level. Especially, common criteria as well as national specifics get obvious.

This handbook is addressed to national stakeholders (electricity producers, electricity suppliers, consumer organisations, environmental organisations, public bodies) who are interested in establishing a national certification system. It is also addressed to stakeholders on the European level wanting to establish a harmonised European certification system.

For the development of this handbook, stakeholders in Germany, Spain, Sweden and the United Kingdom have been interviewed. Moreover, documents on Green Electricity certification from these countries as well from Australia, Finland, the Netherlands, Switzerland and the United States of America have been exploited. Finally, the various experiences of the researchers in this field are an integral part of this handbook.

In part 1 of this handbook, Green Electricity and other similar terms are defined. It should be clear which stakeholder has which interest in the set-up process (part 2). Ways to solve the key problems normally occurring in the set-up process should be documented (part 3). Administrational questions are addressed in part 4. Part 5 will describe overall situation on certification of Green Electricity in the covered countries.

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Content

page

Tables

page

Figures

1 Green Electricity

1.1 Definition of Terms

(1) There is no common definition on the term "**Green Electricity**". Usually, Green Electricity is understood as electricity from environmental sound generation facilities. Most renewable energy technologies are seen as environmentally sound. Green Electricity might stem from non-renewable sources, too (refer chapter 3.1). In the following, "Green Electricity" is understood to be the physical product with the specific quality of environmental soundness. The environmental soundness is documented.

(2) A term used similarly to "Green Electricity" is "**Green Power**". There is no difference between "Green Power" and "Green Electricity". However, the term Green Electricity is preferred in this handbook to distinguish between "power" (unit W) and "electricity" (unit Wh).

(3) The term "**Green Pricing**" is used for offers of Green Electricity on the market. It is only applied on Green Electricity offers which are marketed separately to conventional electricity stressing the specific quality of its environmental soundness. Sometimes, the environmental quality of the Green Electricity is marketed without the physical part of the Green Electricity (refer chapter 1.2.3). This is also understood as a Green Pricing scheme.

(4) Higher prices in comparison to conventional electricity supply is not an inherent part of Green Pricing products. There do exist offers on the market which are fully cost competitive to conventional electricity supply as there are environmental sound generation technologies which are cost competitive already under the present framework conditions (refer e.g. Table 1-2). However, the value added by the specific good environmental performance allows to market Green Pricing products with higher prices than other electricity.

(5) The term "**Green Tariffs**" is rooted in regulated markets. Thus, this term is used to distinguish between offers in regulated markets from offers in liberalised markets (e.g. Green-E certification system in the USA). However, Green Tariffs are seen as a sub-type of Green Pricing.

(6) There do exist several different methods how information on Green Electricity is presented and verified. In this context, **disclosure** means simply to make information on a certain electricity product available to the public. This might include for example the type of sources from which the electricity stems. Disclosure of certain information might be mandatory like it is already the case e.g. for nutrition information on any kind of food products.

(7) **Certification** means the process of verifying specific information on products by independent bodies. Thus, the creditability of the information is raised.

(8) The successful certification of information is indicated by a **certificate**. This is an official document issued by the certifying body. In the context of Green Electricity a certificate indicates that a certain product meats the standards the supplier says. Certificates do not

need to include value judgements. A certificate in its simplest form might just prove that the statements of an e.g. a certain power supplier. However, certain certification bodies create rather often their own minimum standards which involve value judgements.

(9) The term certificate is also often used in the context of quota-based public support mechanisms for renewable energy schemes. In such a system, the fulfilment of a public obligation to have a certain proportion of renewable energies can be proved by presenting an appropriate number of certificates. By that, the certificates get an own monetary value. In contrary to certificates for the purpose of marketing Green Electricity, these certificates must be tradable and could be compared e.g. to stocks. Thus, additional features are required for certificates issued for the purpose of quota-based support mechanisms.

(10) A **label** is a sign put on a product to signalise specific information to the customer. In the context of certification it indicates that the labelled product fulfils the certification criteria. Instead of deciding on multiple different criteria the customer may rely on the label and the specific criteria standing behind the label. Labels backed by NGO do include value judgements.

1.2 Types of Products

(1) There are basically three different types of products marketed as Green Electricity or Green Power.

(a) consumption based products (refer chapter 1.2.1)

(b) investment based products (refer chapter 1.2.2)

(c) contribution based products (refer chapter 1.2.3)

(2) Common sense expects usually consumption based or contribution based offers to be considered as Green Electricity. Private investments in Green Electricity facilities is an important source of finance in several European countries. Nevertheless, investment based products are rarely marketed as Green Electricity. However, also investment based products have gained some importance for the deployment of environmental sound electricity generation technologies. Therefore, certain national certification schemes do include investment based products in their certification regulations (refer Table 1-1).

Certification Scheme	Consumption based	Investment based	Contribution based
Blauer Engel (GER)	X		
Bra Miljöval (S)	X		
Naturemade (CH)	X		
Ecostroom (NL)			
Future Energy (UK)	X	X	
GREENPEACE (GER) *)	X		
Grüner Strom Label (GER)	X		X
Öko-Institute (GER)	X		X
TÜV (GER)	X		
WWF (GER) *)	X		
Eco-Logo (CAN)	X		
Green-E (USA)	X		
SEDA (AUS)	X		

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 1-1: Product types covered by different certification schemes world-wide.

(3) Not any type of certification criteria can be applied meaningful to any kind of Green Electricity product. Most of the criteria discussed in this handbook are applicable on consumption based products.

1.2.1 Consumption based Products

(1) With consumption based Green Electricity, customers are supplied with electricity generated by environmentally sound facilities. The customer has property rights on this electricity. The customer covers parts or his entire electricity consumption with Green Electricity. The supplier ensures with legal agreements that the electricity can be delivered through the electricity grid from the production facility to the customer. However, it is not possible to ensure that physically the Green electrons produced by the environmentally sound facility are going to the specific customers of Green Electricity since electrons follows physical principles rather than legal or economic rules. Thus, certification can not prove the delivery of green electrons.

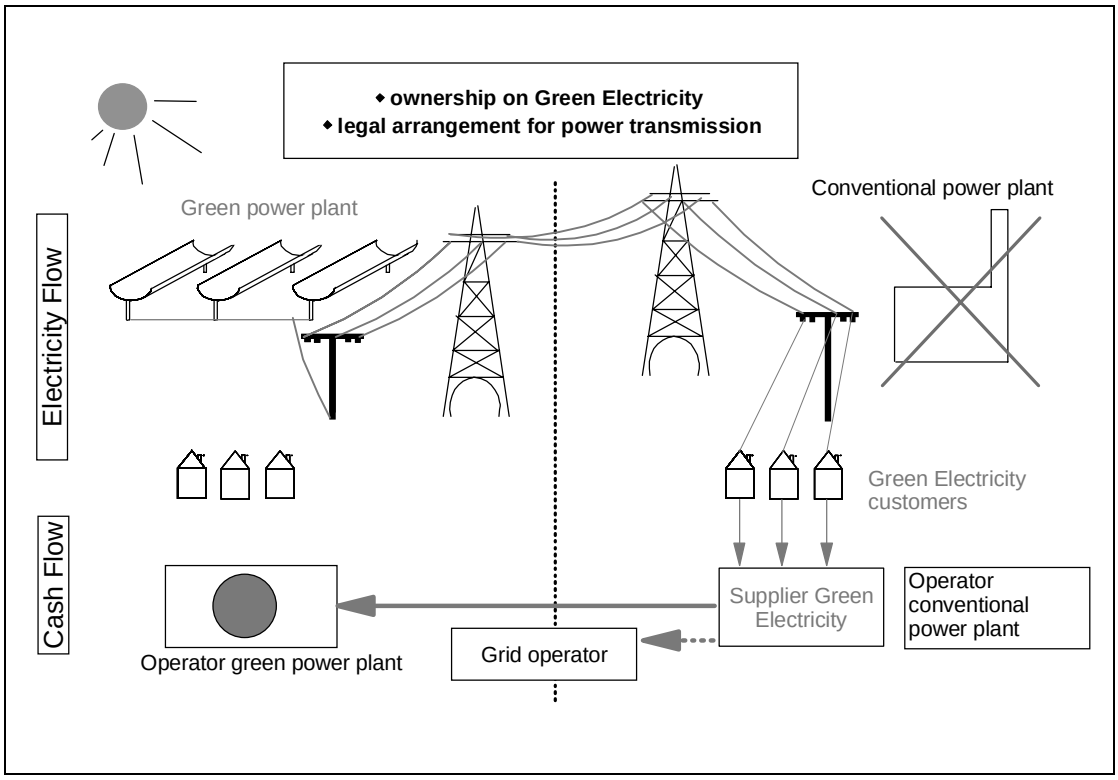

Figure 1-1: Legal arrangements on electricity transport and money flows in consumption based products.

(2) For the certification of consumption based Green Electricity it is necessary that the supplier can prove property rights on environmentally sound generated electricity in the same amount as he had supplied to his green customers. Secondly, he must prove that he owns legal rights to transport this electricity from the generation facilities to all of his customers.

(3) There are different concepts on the question to which extent it is necessary to prove synchronicity of production and consumption. Many certification systems demand prove of the synchronicity of production and consumption only on an annual basis. This means the quantity marketed as Green Electricity in a specific year must be the same as the amount produced by eligible power plants. Other concepts require the synchronicity of production and consumption for shorter periods than one year. This might go down to periods of 15 minutes. An intensive discussion on synchronicity as a criteria is presented in chapter 3.4.

(4) The interval of payments is no criteria for the definition of consumption based Green Electricity. Customers of Green Electricity usually pay in the same terms as for conventional electricity. However, there are certain products which offers a certain amount of electricity (sometimes from a specified plant) over a fixed numbers of years but requiring an one-time payment at the start of the contract. By this, plant operators reduce the risk of sale in the future. This model requires a specific design of fees for certification (see chapter 4.2.4)

(5) It is only possible to supply consumption-based Green Electricity in liberalised markets. Only customers who are eligible to operate in this market are able to purchase consumption based Green Electricity.

(6) Marketers of Green Electricity have chosen two different pricing policies up to now.

(a) premium products with prices 20 % to 80 % beyond the prices of conventional electricity. These offers includes mostly a significant share of PV as well as other new renewable energy technologies

(b) low cost Green Electricity with surcharges between 0 % and 20 %. These products mostly build on existing power plants especially large hydropower plants.

(7) A sample of contribution based Green Electricity products is presented in Table 1-2.

Company	Product	Country	Power Mix	Surcharge [1)]	Customers
NaturEnergie	Gold	GER	hydro, PV, wind	30 %	Mainly domestic
EnBW AG	Umwelt-Tarif grün	GER	Solar, wind, hydro	Premium of 0,08 DEM/kWh	Domestic
NUON	Natuurstroom	NL	Solar, wind	Premium of 0,10 NLG/kWh	
Delta	Groene stroom	NL	wind, biomass	Premium of 0,094 NLG/kWh	
HemEl	Bra Miljöval	SE	hydro	4%	
HemEl	Bra Miljöval, vind	SE	wind	21%	
The Renewable Energy Company	Ecotricity	UK	Landfill Gas	No surcharge	Business
SWEB	Green Electron	UK	Hydro and Landfill gas	5% or 10%	Domestic
Commonwealth Energy Corporation	Green Smart	US	Geothermal, biomass	?	Domestic
ACTEW	Green Choice	AUS	Minihydro, solar	Premium of 0,03 AUS$/kWh	All

[1)] based on a annual household consumption of 3000 kWh compared to average price in the specific country.

[2)] without taking into account taxes and distribution costs which is paid separately

Table 1-2: Examples of consumption based products.

1.2.2 Investment based Products

(1) With investment based Green Electricity, customers gain property rights on environmentally sound power plants. Their mostly one-time payment is an investment rather

than a price for electricity. Usually, the investor receives part of the profits resulting from selling the produced electricity. Thus, certification has to focus on the environmental soundness of the plant. With obtaining ownership of a plant, the investor shares all risk connected to the operation of the plant, as well.

(2) Investment based products can be also purchased in a non-liberalised framework. They are especially advantageous if there are favourable support mechanisms for Independent Power Producers (IPP). E.g. Denmark and Germany have favourable feed-in tariffs exclusively for IPP. In Germany, favourable depreciation regulations exist for private Investors giving them considerable tax advantages. Thus, investment based products have gained high importance for the deployment of certain renewable energy technologies in certain countries.

(3) As far as investment-based products does not supply Green Electricity instead of profits, the relationship between the different actors is similar to those with contribution-based products (see chapter 1.2.3).

(4) Investment-based products, supplying Green Electricity instead of profits to the investors should be rated as consumption-based products from the point of view of certification (see chapter 1.2.1, para (4)).

Company	Project	Country	Description	Minimum Share	Expected return on investment
Ökobank	Bockelwitz	GER	10 wind power plants with 15 MW total	10 k€	10 – 13 %
HemEL	Several wind power plants	SE	Share equivalent to 1000 kWh annual production using tax advantages	470 €	Electricity costs reduced by 50 % + 0,2 % ROI
Triodos Bank	The Wind Fund	UK	Renewable Energy Investment Fund	£300	10-13%
Wind Prospect	Fenland Green Power	UK	10% Equity in New Wind Power projects	£250	Not detailed
Australian Inland Energy	Solar Future	AUS	New PV installations	US$40/ year	Return from use of PV system

Table 1-3: Examples of investment based products.

1.2.3 Contribution based Products

(1) With contribution based Green Electricity, the customer contributes money to a marketer. This marketer need not supply electricity physically or economically. The marketer ensures that this money is used to support environmental sound production facilities. The marketer of this product might use part of the contribution for administration. Since the customer does not achieve any property rights on the Green Electricity he supported his

payment bears the character of a donation. The customer of such a product will not receive any electricity from the plant.

(2) Rather often, contribution based products are marketed as a bundle with conventional electricity. The customer will receive conventional electricity and will pay a surcharge at the same time which will be used as a donation for environmental sound facilities. Like with consumption based products, customers will receive electricity and will usually pay on a regularly basis. However, compared to consumption based products, there are two major differences:

(a) The customer does not achieve any property rights on the Green Electricity. His property rights only cover conventional electricity.

(b) There are no legal agreements concerning the delivery of the Green Electricity through the electricity grid from the power plant to the customer.

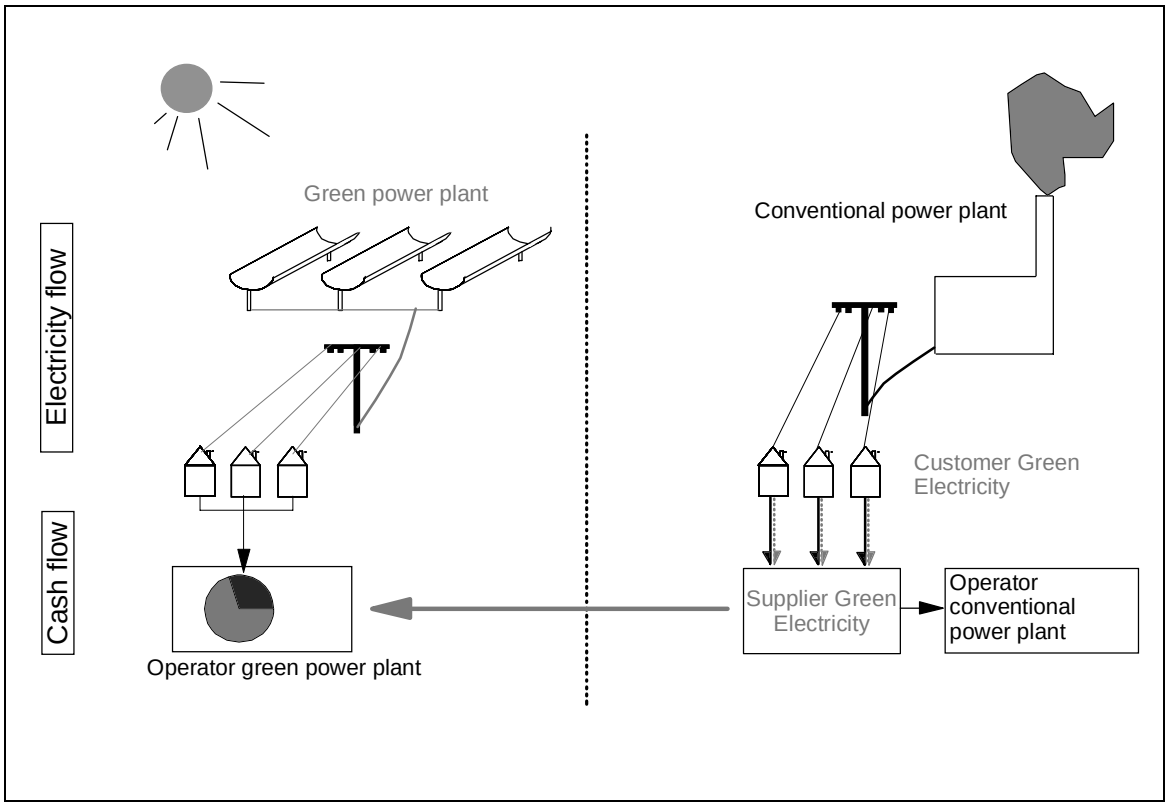

Figure 1-2: Legal arrangements on electricity transport and money flows in contribution based products.

(3) The concept of contribution based Green Electricity is very close to that of Joint Implementation measures known as an instrument mitigating Green House Gases. Since no additional electricity transport is evoked by purchasing contribution based Green Electricity products, this model is advantageous if there are long distances between the Green power plant and the Green Electricity customer (for the discussion on transport losses, refer to chapter 3.3, para (5) ff). In this model, there is even no need that the Green power plant and the Green Electricity customer are connected via a physical grid.

(4) In non-liberalised electricity markets contribution based products are besides investment based products the only possible Green Electricity product. Countries of the European Union have opened up their electricity markets to a different extent up to now. In many countries, households have not been eligible customers for the electricity market yet (refer Table 1-4). The single buyer principle applied in some European countries in accordance with the European directive on a single electricity market (96/92/EC) allows only the grid operating companies to market consumption based products directly to the final customer thus allowing other suppliers only to market investment based or contribution based products.

Country	Grid access	Households	Commercial
Austria	TPA	Customers of Green Electricity eligible	> 20 GWh/a (> 9 GWh/a by 2003)
Belgium	TPA	? *(decided by the regions)*	> 100 GWh/a (step by step lowered until 2007)
Denmark	TPA	Eligible by end of 2002	> 10 GWh/a (all by end of 2002)
Finland	TPA	Eligible	eligible
France	SB	Not eligible	> 40 GWh/a
Germany	TPA	Eligible	eligible
Greece		Not eligible	> 100 GWh/a + exemptions
Ireland	TPA	Customers of Green Electricity eligible	> 4 GWh/a
Italy	SB	Not eligible	> 20 GWh/a (> 9 GWh/a by 2002)
Luxembourg	TPA	?	?
Netherlands	TPA	Not eligible before 2007	> 20 GWh/a or > 2 MW
Portugal	TPA	?	> 9 GWh/a
Spain	TPA	Not eligible before 2007	> 9 GWh/a (> 1 GWh by 2004)
Sweden	TPA	Eligible	Eligible
United Kingdom	TPA	Eligible	Eligible

Table 1-4: Eligibility of households and commercial customers to liberalised electricity markets in the European Union. Explanation: SB = Single Buyer, TPA = Third-Party Access, '> 100 GWh/a' means, that any customer with an annual electricity consumption larger than 100 GWh gets the free choice of supplier. Source: DGXVII, own investigations.

(5) Moreover, this model is especially advantageous when grid access for customers and suppliers is hard to obtain, because there are no clear regulations or grid charges are high. Also in the light of complementarity of public driven support mechanisms and the demand for Green Electricity contribution based products might be favourable (see chapter 3.5). However, purchase of contribution based Green Electricity might not displace conventional

electricity to the same extent as consumption based products do. Therefore, influence of this type of products on the development of the entire electricity market might be smaller compared to the influence of consumption based Green Electricity products.

(6) Certification of contribution-based Green Electricity has to ensure, that the donations are going to the operator of environmental sound power plants. To stop misuse of the donations, certification might also include a survey on the costs and returns of the plants the donations are used for.

(7) A sample of contribution based Green Electricity products are presented in Table 1-5.

Company	Product	Country	Power Mix	Surcharge [+)]	Customers
Naturstrom AG	Naturstrom	GER	wind, biomass, hydro, pv	30 %	2000
ASEW	Energreen	GER	wind, biomass, hydro, pv	Flat rate of 0.37 DEM/kWh	Mainly domestic
Eastern Energy	Eco-Power	UK	Local Renewable Energy projects	5% or 10%	Not disclosed
Integral Energy	Community Green Power Prog	AUS	Community PV plants (especially schools)	Customer decides	Not disclosed

[*)] based on a annual household consumption of 3000 kWh compared to average price in the specific country.

Table 1-5: Examples of contribution based products.

2 Stakeholders

(1) There are several different groups of stakeholders who may have an interest in participating in a set-up process and/or the operation of a certification system for Green Electricity:

(a) Electricity producers

(b) Electricity suppliers

(c) Environmentalists

(d) Consumers

(e) Government

(2) It is not necessary that every stakeholder group is represented to the same extent within the development process. Particularly, certain groups might have not realised the importance of this issue for their own targets, since Green Electricity has not been widely introduced in the specific country. Overall targets of different groups might be too contrary to each other to make round-table talks possible (example anti-nuclear groups vs. nuclear power generators). However, one has to take into account that a widespread participation of

all potential stakeholders will raise the acceptance of the certification schemes in general. Thus, the criteria developed will shape the market for Green Electricity. From this point of view, a criteria easy to fulfil might be easier to be accepted if at the same time the application of all criteria on a larger amount of products is achieved.

(3) No matter which interest any of the stakeholders is focussed on they have to take into account that the product shaped by certification has to be accepted by the market. Thus, a stakeholder who gets the others to agree to his extreme strict or lax criteria within the negotiation process might gain only a pyrrhic victory since customers are not willing to buy such a product or suppliers are not willing to offer such a product.

(4) For the development process it is important that the motivations and targets of the different participating stake-holder groups are transparent to each other. The following sections describe the possible motivation and role of all typical stakeholders. Additionally, examples are given from different countries. One has to be aware, that motivations and target of specific groups might differ from country to country. Moreover, even within specific groups certain targets might have different importance for individual members of the group. In practice, groups might be less monolithic than they seem to be in theory.

(5) The extent stakeholders are involved in the set-up phase and the operation phase of a certification system can differ (refer chapter 4.1.3). For the involvement of different stakeholders in existing European certification systems refer Table 4-3)

2.1 Electricity Producer

Motivation for certification

- Raising demand for Green Electricity
- Raising specific revenues
- Raising creditability of Green Electricity
- Protection against dubious competitors

(1) In general, electricity producers seek to sell their production as expensively as possible. Marketing of Green Electricity is a way to add value to the product electricity thus enabling producers to sell their product more expensively. Generally, this means that there is a tendency that producers would like to lower the standards as much as possible to make as much as possible of their generation mix eligible for Green Electricity marketing.

(2) On the other hand, the added value will be only accepted – thus paid -, if consumers believe in the creditability of the product and the producers. Thus, there is a certain general level of standards beyond which consumers will not accept electricity as Green Electricity.

However, the perception which level is acceptable from the customer's perspective might vary largely among different producers and among stakeholders in general.

(3) Assumed, that stricter criteria for certification leads to higher generation costs (which is generally true), each individual producer is going for a level of certification criteria his own product could just fulfil, whereas products with lower standards as his own product should be not accepted from his point of view. This mechanism leads to the situation that producers of Green Electricity do not speak with one voice in set-up processes for certification.

(4) Raising public knowledge on the concept of Green Electricity is an important outcome of certification and labelling. Firstly, customers in most European countries were not used to having the freedom of choice between different electricity suppliers or products in the past. Secondly, the product Green Electricity is very much based on immaterial values thus the demand for explaining the product is high. Smaller producers as for instance independent power producers (IPP), often new on the market, have rather often not the capacities to undertake this general education needed to develop the market. Thus a certification and labelling process, is a way to bundle efforts for market development.

(5) In certain countries (like Denmark and Germany), Independent Power Producers (IPP) play an important role in running new RET facilities, mainly due to the legal framework. Thus, IPP who want to get more independent from public support are important drivers for the development of the Green Electricity market. Particularly these mainly small producers are keen in clear distinguishing the ecological quality of their production from other dubious offers.

(6) Conflicts might occur between operators of different renewable energy technologies. Generation costs of different technologies differ in a wide range as well as public awareness on the environmental impact of different technologies differs largely.

(7) Two generally different motivations of producers to supply Green Electricity can be observed:

(a) some marketers see in Green Electricity a new market opportunity. They expect to realise profits on this market.

(b) other marketers are primarily not focussed on realising profits with Green Electricity. They might see Green Electricity products as a possibility to raise their image, to complete their product mix or to defend against public support mechanisms.

Marketers might switch from one motivation to another.

2.2 Electricity Suppliers

Motivation for certification

- Raising demand for Green Electricity
- Raising specific revenues
- Raising creditability of Green Electricity
- Protection against dubious competitors

(1) Motivations of the suppliers are generally similar to these of electricity producers (see chapter 2.1). In practise, suppliers are very often producers at the same time. However, pure suppliers without any own generation facilities might be more flexible in their choice of production facilities as producers leading to more flexibility in definition of certain criteria, too. Stricter criteria might not touch their core business as much as producers. Additionally, aspects of marketing Green Electricity might be of higher importance for suppliers rather than for producers. Consequently, suppliers are keen to establish criteria which can be communicated clearly to the public.

(2) Motivation in marketing Green Electricity might differ from one supplier to another. For certain suppliers, marketing of Green Electricity will touch their core business since an important part of their production mix comes from renewable or other environmental sound sources. Others see in Green Electricity marketing more an opportunity to raise their image as an environmental conscious company in public perception. Suppliers of the first type have a high interest in a well designed certification scheme with a high acceptance in the public allowing them to market their own generation to higher prices. Suppliers seeking mainly to raise their public image rather then selling large amounts of Green electricity look more to which technologies have the best public image rather then trying to include more discussed technologies. Moreover, suppliers of the second kind might seek more to show that Green Electricity is expensive thus an economically enviable product for the whole electricity supply system.

2.3 Environmental Groups

Motivation for certification

- deployment of environmental benign electricity generation
- raising awareness for ecological questions
- social goals in connection with sustainable development (e.g. regional development
- be in the public

(1) Generally one has to distinguish between environmental groups taking part in a set-up process for certification to support the idea of Green Electricity and those who are mainly keen that high standards will minimise environmental impact of the green generation facilities themselves. Environmental groups with the first motivation wants to enlarge budgets available to establish environmental sound generation technologies. They are generally not interested in certain RET technologies rather than in the environmental benefits of RET in general. Therefore, they are keen of establishing criteria in the certification scheme, which ensures a maximum environmental benefit (e.g. standard on maximum specific CO_2 emission in the whole life cycle). Groups of the second type aiming on nature conservation. According to their view, any intervention in nature leads to an environmental impact. According to the different focuses of environmental groups these criteria might be highly specific. Bird protection groups might not accept wind power whereas others seek to protect natural rivers and lakes therefore fighting against hydropower.

(2) Constructive engagement of nature conservation groups in certification set-up processes can be only achieved if there is a general agreement that there are electricity generation technologies which are more environmental sound than the present generation mix and these technologies are worth to be supported actively.

(3) NGO might also differ in the timeframe, they want to achieve their goals. Some groups have the long-term goal of switching to more environmental sound energy generation. Thus, they are interested in introducing a momentum towards this development. Other groups are targeting on the short-term improvement. Thus, these groups would only support Green Electricity schemes, if an enhancement of the environmental performance of the electricity supply system is achieved now.

(4) One has to take into account, that some environmental organisation are rooted deeply in the anti nuclear power movement. For them, renewable energies - thus Green Electricity - are a tool to displace nuclear power. These groups experienced confrontations with the established electricity supply industry rather than consensual policies which are needed to

create a joint certification scheme for Green Electricity. This might cause trouble within the set-up phase (refer also chapter 3.1.1, para (7)).

(5) A side effect of supporting certification schemes is that the supporting organisations themselves gain higher public awareness. At the same time, public awareness on environmental issues of electricity supply can be raised. Moreover, environmental organisations can justify their existence. With not taking part in set-up processes for certification schemes these organisations get into the danger of decreasing influence on energy politics.

2.4 Consumers

Motivation for certification

- Protection against dubious offers
- Raising transparency of market
- Facilitation of information acquisition

(1) Consumers of Green Electricity might have two different motivations to acquire Green Electricity. Some customers want to raise the environmental performance of the whole power system. Their payments for Green Electricity should support the installation of new environmentally sound power plants. In certain countries with already high share of RET in the power mix raising the environmental performance of the overall power system means raising the environmental performance of certain RET plants rather than installing new plants.

(2) Other customers want to get Green Electricity themselves no matter if this stems from new or old plants or whether their payments leads to a better environmental performance. This motivation can be found for instance with companies being eco audited according to e.g. the European Environmental Management System EMAS or ISO 14001. These companies are forced to improve their environmental performance all the time. A possible way to do so is to purchase Green Electricity. On the short view, these customers will not contribute to the expansion of environmental sound technologies as long as their demand can be covered with existing plants[1]. Nevertheless these customers are important indicators for the general demand for Green Electricity.

(3) Protection against dubious offers is a central motivation for customers taking part in set-up processes for certification. They want to be sure, that they really get what they want and

[1] Calculations for all EU-15 countries show that the whole potential demand for Green power (market share with households 20 % can be covered with existing plants. However, taking a national perspective, in certain countries these potential demand might be not covered with existing plants.

what is promised by the suppliers. Certification by independent bodies is a central tool to achieve this goal.

(4) Labels awarded due to an independent certification are a help for customers to raise transparency in the market. Certification will set certain standards so the products certified are easier to compare.

(5) Also acquisition of information gets easier since customers can check directly the certification criteria instead of asking each supplier on specific information. Therefore, customer organisations might go for a disclosure of certain data on each product.

2.5 Government

Motivation for certification

- fair competition
- deployment of environmental benign electricity generation
- reducing public financial support
- governmental bodies as customers

(1) From the point of view of politics it has to be clarified in which relation the market for Green Electricity products stands to public measures to support environmental benign electricity generation. Generally, government has two possibilities:

(a) The market for Green Electricity can be seen as a substitute for public support measures on the short or long run. By fostering the private demand for Green Electricity on the market, the government can accelerate withdrawal of public engagement.

(b) The market for Green Electricity is seen as a welcomed addition to public support mechanisms.

(2) For the accelerated deployment of environmental benign electricity production, guideline (a) would be only an alternative if the demand for Green Electricity grew fast enough. Experiences so far show that demand for Green Electricity marketed with premium prices will be not sufficient to meet i.e. the European goal of doubling the share of renewable energies by the year 2010 (Langniß 1998). Therefore, only guideline (b) can be accepted as a part of a environmental driven and climate protecting energy policy. However, politics should be aimed on substituting public support by market demand on the long run, since restrictions in public budgets will limit growth of environmental benign electricity generation solely based on public support.

(3) Governmental players in the certification process should therefore ensure that

(a) there is fair competition on the market for Green Electricity;

(b) that the market-demand for Green Electricity leads to additional capacity for environmental benign generation, which would have been not occurred if the private demand wasn't expressed[2]; it should not lead to decreased legal burdens;

(c) that Green Electricity marketed comprises only electricity from facilities with features which are in line with the governmental understanding what is environmental benign.

(4) Besides supporting directly development processes for the certification of Green Electricity governmental bodies can foster the development of the market for Green Electricity by:

(a) Ensuring fair grid access for all producers and traders,

(b) Monetarising the environmental benefits of Green Electricity through e.g. introducing CO_2-taxes,

(c) Designing support mechanisms that complement the Green Electricity market;

(d) Buying Green Electricity for their own facilities.

(5) For aspect (d), it is important to note that a generally accepted certification scheme might be a pre-requisite for the purchase of Green Electricity by public bodies in certain countries as far as Green Electricity is more expensive than other electricity. Public bodies are forced to purchase the cheapest offer of any good. Specific qualities of products are only allowed to be included in public calls for tender as far as this quality is based on a generally accepted definition.

3 Key Questions

(1) In the following section, key questions will be described which have been occurred with the formulation of certification rules for Green Electricity. This comprises

(a) the eligible power sources (refer chapter 3.1)

(b) the question, to which extent existing plants should be eligible (refer chapter 3.2)

(c) import of Green Electricity (refer chapter 3.3)

(d) the necessity of synchronicity of production and consumption (refer chapter 3.4)

(e) the relation to public initialised support mechanisms (refer chapter 3.5)

(f) possible criteria on suppliers (refer chapter 3.6)

(g) the need of monitoring generation costs (refer chapter 3.7)

[2] This could mean the construction of new plants or the enhancement of the environmental performance of existing plants (see chapter 3.2)

Solutions are presented. Pros and cons are discussed.

(2) One has to take into account that some key questions are interdependent. That means that the solution for one key question might effect the solution of another question, too. In the best case, there is coherence between solutions to different questions. An example: The question whether hydropower should be eligible for certification is very much connected with the question whether exclusively new or also old plants should be eligible since hydropower is the dominant existing renewable energy for electricity generation in many countries.

3.1 Eligible Power Sources

(1) Any type of energy transformation and use cause environmental impacts. The decision which types and which level of environmental impacts is accepted is clearly value based. Thus, there is no strict, scientifically based definition, which power sources are eligible for being included in Green Electricity.

(2) Generally, all kinds of renewable energy are seen as possible sources for Green Electricity. However, certain renewable energy generation technologies have been in discussion in different countries because of their environmental impact. This includes especially

(a) hydropower (refer 3.1.2)

(b) different types of energetic use of biomass (refer 3.1.3)

(3) It is also discussed, to which extent high efficient fossil power plants might be included in the definition of Green Electricity, since their environmental benefits might be as high as through generation with facilities based on renewable energies (refer chapter 3.1.1).

(4) There are different possibilities to deal with doubtful energy sources and technologies within certification:

(a) the specific technology or energy source is excluded entirely. Example: Municipal Waste excluded as a renewable energy source in Germany.

(b) for reasons of market introduction, a specific technology or energy source is only accepted as Green Electricity for a limited time.

(c) a certain technology is distinguished in several sub-groups by a specific attribute; certain subgroups are then excluded respectively only certain groups are eligible. Example: In the US, hydropower plants with a capacity higher than 30 MW are excluded from Green Electricity certification.

(d) a plant of a specific technology will be only included, if it meets certain standards. Example: According to Swedish certification rules, ashes from burning energy crops in power plants have to be returned to the farming area. This principle might be also combined with the approach described under (c).

(e) the standards the plant has to meet might be also based on comprehensive calculation methods. Example: According to German GREENPEACE, plants are excepted whose specific CO_2-emissions over the whole life-cycle are not higher than 210 g/kWh$_{el}$.

(f) finally, comprehensive assessments and valuation methods like those developed for the calculation of external costs might be applied for the definition of Green Electricity. However, it has to be taken into account, that these methods include value judgements rather often, thus these methods are adapted to the values of the body setting the criteria for Green Electricity.

(5) For certain reasons, it might be desirable that a certain technology has to be included with a minimum share in the power mix. This touches especially photovoltaics, a still expensive technology but with very good prospects for the future (refer 3.1.4).

3.1.1 Fossil and Nuclear Power

(1) Generally, any electricity generation technology improving the environmental performance of the energy supply system might be seen as Green Electricity. Beside most of the renewable energy technologies, high efficient fossil power plants can reduce the environmental impact compared to the average impact of the entire electricity generation system. At the same time, additional costs of high efficient plants might be rather low giving Green Electricity suppliers the opportunity to offer price competitive products. Moreover, fossil driven plants are able to generate electricity according to the actual demand.

(2) Therefore, some certification systems accept electricity from high efficient power plants as Green Electricity. However, public perception usually connects the term Green Electricity with renewable energy technologies. To visualise the difference between pure renewable based Green Electricity and efficiency based Green Electricity, some certification systems different levels of certified labels have been created. Labels with lower requirements also include high efficient fossil generation, whereas renewable energy technologies are exclusively eligible within the premium levels of the certification system. However, creating two different labels under one umbrella might confuse customers in practise. A clear communication strategy has to be undertaken.

(3) Due to presently low fuel costs high efficient technologies are often not applied in existing or new plants. The eligibility of these technologies for Green Electricity gives an additional economical motivation for earlier application. On the other hand, efficiency in new plants is raised automatically due to technical progress. Therefore, eligibility of high efficient power plants should be restricted to the Best Available Technology (BAT). Examples of presently used BAT are fuel cells or combined gas steam turbine plants. BAT might be defined along certain technologies or along a minimum efficiency e.g. 50 %.

(4) Combined heat power plants (CHP) are also high efficient energy conversion technologies. Compared to the separate production of power and heat, CHP can significantly reduce the fuel input thus environmental impact. Additionally, district heating

networks as one prerequisite for large CHP are costly, sometimes leading to non-competitive heat supply costs respectively electricity supply costs. Therefore, certain certification schemes exclusively accept electricity from CHP as fossil Green Electricity. For definition of eligible CHP, some certification schemes requires a certain overall capacity factor e.g. 70 % on an annual basis taking into account power and heat production.

(5) Another way for definition of efficient generation technologies is to assess the environmental impact along certain criteria e.g. specific green house gas emissions accepting all facilities with specific emissions under a certain threshold. In this context, CHP gets a bonus from heat production by subtracting avoided emissions from heat production from the emissions of electricity production. By this, electricity production from CHP driven by renewable sources might even gain negative specific green house gas emissions.

(6) Creating environmental performance criteria, which are related to the actually produced amount of electricity, might be a way to include high efficient energy generation technologies as Green Electricity. This kind of criteria, e.g. for specific emissions to air, takes into account the efficiency of the power plant and says more about the environmental performance than a requirement of minimum efficiency, e.g. 50 %. Environmental performance criteria are however more complex than a single requirement of minimum efficiency.

(7) From the point of view of climate protection, nuclear power plants might be seen as a advantageous technology. However, large share of the public do not perceive nuclear power as a sustainable energy supply option. Additionally, many environmental organisations involved in set-up processes for Green Electricity certification are strongly rooted in the anti-nuclear power movement. Moreover, the motivation for supporting renewable energies is often based on the opposition against nuclear power. Thus, nuclear power is excluded entirely from being marketed as Green Electricity in all certification schemes.

(8) Besides nuclear power, also some fossil fuels might be not acceptable from the environmental point of view under certain national conditions. German environmentalists are arguing that burning of lignite causes higher green house gas emissions than any other fossil energy carrier. Moreover, opencast mining causes serious impact on the landscape.

Label	Cat	Fossil Power
Blauer Engel (GER)		< 50 % of power mix, only natural gas fired CHP, CHP must have total annual η > 70 %
Bra Miljöval (S)		not eligible; simultaneous burning of fossil and biomass fuels not eligible; balancing system power (undefined sources) must not exceed 10 % net of supplied electricity
NATUREMADE (CH)		Not accepted, exclusively renewable energy sources
WWF (NL)		Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)		Electricity from the pool generally non-eligible
GREENPEACE (GER)		< 50 % of power mix, only natural gas fired CHP, dependent on specific CO_2 – emissions; for system power up to 15 % of the total supplied Green Electricity combined cycle power plants with η > 50 % are eligible
Grüner Strom Label (GER)	silver	Exclusively CHP; no lignite, no nuclear; < 50 % of power mix
	gold	not eligible
Öko-Institute (GER)	eff.	< 50 % of power mix, dependent on specific GHG – emissions
	reg.	not eligible
TÜV (GER)		not eligible
WWF (GER)		$\leq$ 50 % of power mix, only natural gas fired CHP
Eco-Logo (CAN)		Supplementary non-renewable fuels are used in no more that 65% of fuel heat input
Green-E (USA)		$\leq$ 50% of power mix; conventional part must not have higher air emissions (SO_X, NO_X, and CO_2) than an equivalent amount of system power, nuclear share must not be higher than in average system power mix; with products only covering partly the customer's electricity demand, no conventional power is accepted
SEDA (AUS)		All generation must be from RE sources

Table 3-1: Eligibility of fossil or nuclear power in existing certification schemes.

3.1.2 Hydropower

(1) Hydropower has been a source for electricity for more than a hundred years. Today, hydropower contributes with nearly 20 % to world-wide electricity production. In certain European countries, the share of hydropower on total electricity production is rather high (refer Figure 3-1).

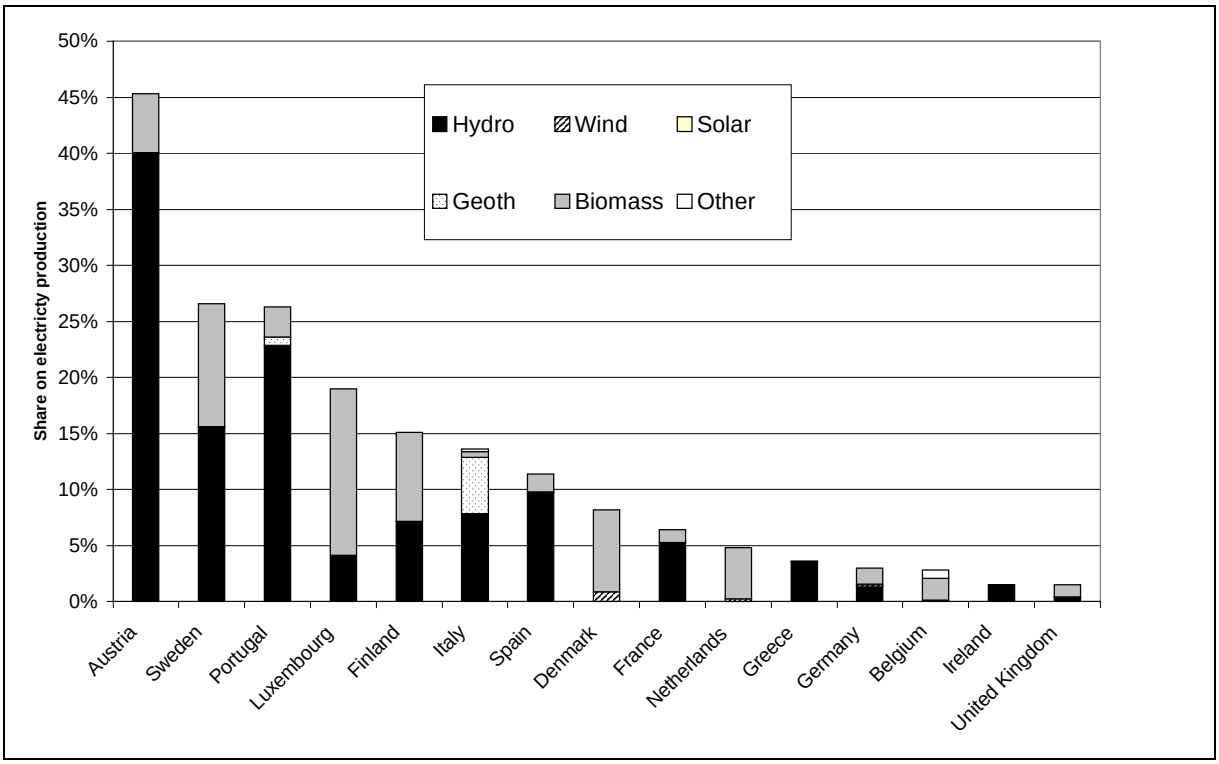

Figure 3-1: Shares of renewable energy technologies on electricity production in the European Union (Annual 1998).

(2) Hydropower plants allow electricity to be generated according to the actual electricity demand in a certain range. Hydropower might supply base load. At the same time, existing plants often generate with low costs making hydropower attractive for Green Electricity suppliers. However, the generation costs of hydropower plants varies in a wide range depending on size and age of the plant as well as individual local circumstances. Environmental groups look suspicious on these low costs and often argue that hydropower does not need any additional support thus making it unnecessary to include them in certified Green Electricity products. Since there is such a large offer on hydropower in Europe, even a fast growing demand for Green Electricity might be easily covered by existing hydropower plants for many years.

(3) Environmental impacts of hydropower plants might be immense thus making hydropower to a focus of discussion. In Europe, the potential for large hydropower plants is generally well exploited making flows without human interference very scarce. Thus, the value of the eco-systems of these naturally remained flows are often assessed high. Under this aspect, the use of such untouched flows should be avoided.

(4) Mainly large hydropower plants have been looked at as environmental crucial. Since the impact of large hydropower plants on the landscape are big, environmental impacts are also very obvious. In contrary to that, small hydropower plants are generally more accepted from the environmental point of view. Therefore and with taking into account, that small plants have usually higher generation costs than large ones (refer para (2)), only small hydropower plants are accepted in several certification approaches whereas large ones are excluded.

(5) In Europe, most hydropower generated electricity comes from large facilities. Thus, excluding large hydropower plants will reduce the possibility to market electricity from plants as Green Electricity which do not need any additional support (refer discussion in chapter 3.2). Also the import of hydropower from countries with high shares of hydropower on the power mix is restricted in this way.

(6) On the other hand, scientific studies show that the environmental impact of many small hydropower plants might be assessed higher than that of one large hydropower plant with the same electricity output (Meyerhoff 1998).

(7) The additional environmental impact depends on whether it is an entirely new hydropower plant, a reactivated plant which uses existing dams etc. or an existing plant (Jorde, Truffer 1999). It becomes clear, that general rules taking the size of a hydropower plant as the only decision criteria are not sufficient for evaluating the eligibility of plants for Green Electricity certification if a high level of justice is targeted.

(8) Another way to avoid additional environmental impact from hydropower is to accept only existing plants arguing that only new plants cause additional environmental impact. As long as the impact of the existing power plants is rated lower than the impact of the average power mix and as long as the existing power plant would be shut if its production could not be market as Green Electricity the natural environment would benefit from this rule. Under these circumstances, the buyer of Green Electricity would avoid worsening the environmental impact of the total power generation system. However, this rule does not enhance the overall environmental performance of the entire power generation system. It is in contradiction to the target of reducing the environmental impact of power generation by installing new facilities (refer chapter 3.2). Again, it becomes clear that simple criteria for the assessment of eligibility of hydropower plants do not give sufficient solutions for all stakeholders.

(9) A way to take into account exclusively existing hydropower plants in the eligible sources but raising at the same time the environmental performance of the power supply system is to require additional measures enhancing the individual environmental impact of a plant. One could require that a certain percentage of the income or the profit from Green Electricity marketing is used for these measures. These required measures might be defined through a comprehensive environmental assessment procedure which ensures the individually correct measures. Another way is to require the operators of existing plants to pull forward certain measures which are required by law for new plants. In both cases the overall environmental performance of the power supply system is raised without installing new plants. Taking into account individual circumstances in criteria for Green Electricity is however hard to implement, because it is hard to achieve consistency when applying such criteria.

Label		Hydropower
Blauer Engel (GER)		2 alternatives in discussion: 1) > 100 kW, low rotating turbines, fish protectors, good biological transit, requirements on remaining flow 2) plants with reservoir excluded
Bra Miljöval (S)		only existing plants erected before 1995, enlargement of existing allowed if no additional environmental impact
NATUREMADE (CH)	Basic	Any kind of hydropower
	Star	Comprehensive assessment with 42 criteria; minimum investment in ecological enhancement of hydropower plant 5,8 m€/kWh sold + 0,6 m€/kWh hydropower generated
WWF (NL)		Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)		only plants erected before 1990; hydropower must not have exceed a share of 33 % at the power mix; power plants with reservoir excluded
GREENPEACE (GER)		all new plants and plants > 10 MW only with environmental impact assessment hydropower must not be the only power source
Grüner Strom Label (GER)		< 10 MW (definition follows German Electricity Feeding Law)
Öko-Institute (GER)		preferred re-installation, no plants with reservoir
TÜV (GER)		all hydropower eligible except power plants with reservoir, which are only eligible if pump power comes from renewable sources
WWF (GER)		plants < 10 MW
Spain		Legal definition: < 50 MW
Eco-Logo (CAN)		< 20 MW
Green-E (USA)		< 30 MW
SEDA (AUS)		only new plants, must not cause any flooding, must have sufficient residual water flow

Table 3-2: Eligibility of hydropower in existing certification schemes.

(10) More comprehensive assessment methods may help to judge on the eligibility of an individual plant for certification. Additional costs caused by this comprehensive assessment methods might be more acceptable with hydropower than with other generation facilities since size and output are generally high with hydropower plants.

3.1.3 Biomass and Waste

(1) There is a wide range of sources of biomass useable for energy purposes. This includes residuals from farming like straw or animal litter, residuals from forestry, organic residuals from industry like paper pulp or sawmill residuals, the organic part of municipal waste directly or via landfill gas use and sewage gas. Additionally, there are a lot of different energy crops like rape or willow. Also a wide range of technologies exists converting biomass into electricity and heat. Examples are combustion in plants specified on biomass, co-combustion in conventional power plants, gasification for use in combined heat and power plants of different types and so on. Both the different sources of biomass as well as the different technologies to use lead to different levels of costs and cause different levels of environmental impacts. Thus, different stakeholders in the set-up process of a certification system for Green Electricity might like to include or exclude certain sources or technologies.

(2) In a similar way like hydropower, the production of electricity in biomass fired power plants can be controlled according to the actual electricity demand. This is a clear advantage compared to a fluctuating production from e.g. wind power or photovoltaics. With biomass fired power plants, base load production is possible. Moreover, depending on sources and technologies, biomass fired power plants might generate to very competitive prices allowing to market a cost-competitive product. From the point of view of suppliers, it is favourable to include biomass in Green Electricity.

(3) There are certain national differences in the definition of what sources of biomass are acceptable within Green Electricity. In some countries (e.g. Germany) municipal waste to power plants are not accepted as a type of renewable energy, since resources are restricted. Moreover, it is argued, that the environmental sound treatment of waste should be not the task of energy policy but of environmental policy. In these countries, comprehensive legal regulations exist that force the environmental sound treatment of waste. Therefore, no extra money from Green Electricity customers is needed to build up a environmental sound waste treatment system. The same is true for landfill gas use. In certain countries (e.g. Germany), landfill operators are forced to collect and burn gas from the landfill. From the point of view of a power plant operator, landfill gas is available for free, making landfill gas driven power plants economically feasible, thus no additional support through Green Electricity customers is needed. In other countries (United Kingdom, Spain), waste treatment has been not regulated to that far extent. Green Electricity customers might be willing to support a better waste treatment system in these countries, since a better environmental performance is achieved.

Label	Cat	Municipal waste	Sewage gas	Landfill gas	others
Blauer Engel (GER)		not eligible (17. BimSchV)	eligible	Not eligible	-
Bra Miljöval (S)		eligible, if organic share ≥ 90 %	not eligible	Not eligible	Others where ash from combustion is returned to land where fuel is grown
Naturemade (CH)		Not eligible	In discussion	Not eligible	
WWF (NL)		Criteria not defined, negotiated with user of WWF logo			
Future Energy (UK)		Eligible	Eligible	Eligible	biogas from chicken litter not eligible
Greenpeace (GER)		no recommendations			
Grüner Strom Label (GER)	silver	not eligible	Eligible	Not eligible	residual gas from coal mines not eligible
	Gold				
Öko-Institute (GER)	eff.	not eligible (17. BimSchV)	Eligible	Not eligible	only chemical untreated waste wood
	reg.				
TÜV (GER)		not eligible (17. BimSchV)	Eligible	Eligible	
WWF (GER)		not eligible	Eligible	Eligible	
Eco-Logo (CAN)		Not eligible	Eligible with restrictions on emissions	Eligible if leachate management programme in place	Wood and agricultural wastes eligible only if generator and waste source share common ownership
Green-E (USA)		eligible, if air emissions are lower than if the waste is treated in the usual way	Eligible	eligible	
SEDA (AUS)		Not eligible	Eligible	eligible	-

Table 3-3: Eligibility of biomass from residuals in existing certification schemes.

(4) In other countries (e.g. United Kingdom), chicken litter is excluded from being accepted as a source for driven Green Electricity plants, because large-scale animal husbandry should be not supported by certification systems backed by environmental organisations. It becomes clear, that the definition of eligibility of certain biomass sources and technologies is highly dependent on national circumstances and specific stakeholders involved in the criteria definition process. Both questions of the economical feasibility of certain technology and value judgements on the certain sources and technologies are involved.

Label		Energy Crops
Blauer Engel (GER)		eligible, no additional requirements
Bra Miljöval (S)		peat excluded
Naturemade (CH)	Basic	Eligible
	Star	Compensation for any relevant negative impact required
WWF (NL)		Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)		eligible, no additional requirements
Greenpeace (GER)		eligible, no additional requirements
Grüner Strom Label (GER)		only energy crops according to certified ecological farming rules
Öko-Institute (GER)		only energy crops according to certified ecological farming rules; wood according to Forest Stewardship Council certification rules
TÜV (GER)		eligible, no additional requirements
WWF (GER)		eligible, no additional requirements
Eco-Logo (CAN)		Eligible if production meet certain rules and has a sound environmental management system
Green-E (USA)		eligible, no additional requirements
SEDA (AUS)		eligible, no additional requirements

Table 3-4: Eligibility of biomass in existing certification schemes.

(5) Besides these detail questions and judgements, there are approaches to assess the environmental soundness of certain biomass sources and/or technologies in a more comprehensive way. There are

(a) one-dimensional decision criteria (refer para (6)) and

(b) multi-dimensional decision criteria (refer para (9))

(6) Several discrete one-dimensional criteria on the use of biomass are possible:

(a) one can generally exclude residuals or energy crops.

(b) the cultivation of energy crops must follow specific regulation (e.g. ecological farming, Forest Stewardship Council). The requirements in these regulations might be multi-dimensional.

(c) ashes from energy crop burning must be recycled to the farming area.

(d) energy demand for transportation of biomass to the plant must be not more than 10 % of total energy output.

(e) with energy crops, the quotient of energy output to total conventional energy input (e.g. fertiliser) should be higher than a certain number, but at least higher than 1.

(f) specific CO_2-emissions per kWh, including the whole life-cycle must not exceed a certain number

(7) By using certain one-dimensional criteria, the most important environmental aspects for biomass generated electricity can be regulated. Such criteria, can for instance include requirements of the environmental impact from the transportation of the biomass, making sure that the use for fossil fuels to transport the biomass is limited. Another kind of one-dimensional criteria, is criteria that are based on other certification programs, e.g. forest stewardship council. Through that kind of requirement one can be sure that certain environmental standards are met without carrying out an extensive verification process. However, constructing criteria that rely on other certification programs can create problems, for example it can complicate things for the electricity producer/supplier.

(8) One-dimensional criteria are fairly easy to apply, but they do not cover all the environmental aspects for the biomass generated electricity. More comprehensive approaches use multi-dimensional criteria.

(9) Multi-dimensional criteria consider the environmental performance throughout the whole life cycle of the electricity produced with biomass. It is important to consider the full life cycle, because of the fact that the environmental impact caused by produced electricity from any energy source arise in different parts of the life cycle. There are two interesting methodologies that can be applied as a basis for multi-dimensional assessment, Life Cycle Assessment and external costing methods, e.g. the ExternE project.

(10) LCA is the process of evaluating the effects that a product has on the environment of the entire life cycle covering all the processes required. The ExternE project uses an impact pathway approach to evaluate the external costs associated with a range of different fuel cycles. The advantage with both these methods is that specific data is created in each case making it possible to assess the impacts on the environment for that specific case. This is of great importance since the impacts on the environment caused by the life cycle of electricity generated with a renewable energy source often are local and are very dependent of specific local conditions. For this reason it is important that each case and place are assessed individually, which can be carried out using any of the methods LCA or ExternE. The application of these comprehensive approaches in criteria for Green Electricity does however create a both time consuming and expensive verification process, which leads to problems for especially small electricity producers and suppliers.

(11) Generally, the verification of the fuel input of biomass driven power plants is ambitious since most of these plants can be also driven with fossil fuels or other not recommended fuels. This is especially true for co-combustion plants. Spot checks can ensure the compliance with the certification criteria. Another way of control is to check bills proving the sufficient purchase.

3.1.4 Photovoltaics

(1) Among the different renewable energy technologies (RET) photovoltaics (PV) has an outstanding position. PV still has considerable higher costs compared to other RET. On the other hand, potentials to exploit PV are immense. Due to its modularity, there is a wide range of possible application from power supply for non-grid connected appliances to large power plants. Moreover, large cost reductions are predicted for the future, if the market will widen. In public, PV has a very good appeal stemming from e.g. the fascination of the direct conversion of sun light into electricity without any moving parts and the fact, that everybody can produce his own power with PV. Thus, public identify RET rather often exclusively with PV.

(2) The high public awareness for PV leads to a strong demand for including power generated by PV into Green Electricity products. Thus, many products on the market do include a certain share of PV in their power mix. However, the share is limited by the presently still high costs of PV. Suppliers of Green Electricity targeting on low prices might obey to include PV in their power mix or restrict the share of PV to a minimum.

(3) For designing criteria for certification there are generally two alternatives:

(a) no minimum shares are required (refer para (4))

(b) minimum shares are required (refer para (6))

(4) Concerning solution (a), it is often argued that customers should have the freedom of choice whether PV is included in an offer or not. Moreover, PV is not more environmentally sound than the average of other renewable energy technologies thus under this aspect there is no reason why PV should be put in a better situation than any other renewable energy technology. A minimum share of PV higher than a few percent of the overall generation would make it impossible to offer cheap Green Electricity since, as described in para (2), PV is expensive compared to other environmental sound technologies.

(5) Parties supporting solution (b) stress that PV has an outstanding position concerning potentials and future cost reductions. According to these arguments, a sustainable energy supply system must include also PV in the future to achieve a high share of renewable energies. Taking into account the public popularity of PV, especially environmental groups might argue for introducing a PV-quota in the certification criteria. A PV-quota might however create problems for small electricity producers and suppliers.

(6) Up to now, only certification criteria in Germany (Grüner Strom Label e.V., Öko-Institute, requirements of the WWF Germany, GREENPEACE Germany) requires a minimum share of 1 % PV on the total Green Electricity distributed in a certain year.

(7) The Swiss Naturemade star label accepts only building mounted PV-installations.

3.2 New vs. old plants

(1) The answer to the question of whether new or old plants are feasible for certification is very much dependent on the status of environmental benign electricity generations in the specific country. Countries with already high shares of renewable energies (e.g. Austria, Sweden, Switzerland) are tending to improve the environmental performance of existing plants rather than building up new facilities. In contrast, in countries with low shares of environmental sound electricity production the way to increase the environmental performance of the overall electricity system is to raise the share of renewable energies and other environmental sound technologies (refer Figure 3-1).

(2) A second aspect in this discussion is how far a certain resource is used for anthropogenic purposes. If e.g. most of the rivers in a certain region or country are already used for hydropower the environmental value of the remaining natural rivers will be rated generally high. The environmental impact of an additional hydropower plant would be rated higher compared to a situation when no other hydropower plants exist. If the certifying bodies wish to avoid further energetic use of the scarce resource, they should exclude the resource and/or the technologies using this resource from being eligible for certification (see e.g. chapter 3.1). So, one has clearly to identify within the certification criteria development if Green Electricity is (primarily) aimed

(a) to build up new plants and capacity or

(b) to improve the environmental performance of existing plants.

It is also possible to combine both targets which means new plants and existing plants with improved environmental performance are eligible for certification. Implication from target (a) are discussed under paragraphs (3) – (17)). Implication from target (b) are discussed under paragraph (18)ff.

(3) Existing facilities are very important for the market development. During the start-up phase of the market, only existing plants can supply Green Electricity. The same is true for new suppliers, who can firstly only trade with Green Electricity from existing plants. Especially for small start-up companies concentrating their business on Green Electricity supply, investments in new plants lead to high risks. Existing plants are also important for a competitive pricing of Green Electricity since existing plants like large hydropower plants are able to generate Green Electricity with low prices. Investments in older plants might be already fully depreciated, which means that the plant might offer electricity to low marginal respectively running costs. However, one can argue that these plants do not need special

support by Green Electricity marketing to survive on the electricity market, whereas new plants do need additional support.

(4) Including existing plants means, that the push for new plants through Green Electricity demand is lower compared to a situation when only new plants are eligible for certification. The eligibility of existing plants should be carefully considered with the development of Green Electricity market.

(5) Variables for the explicit formulation of certification criteria for new / old plants are

(a) the definition of what is old, what is new (see para (6)ff.)

(b) the share of new plants (see para (12)).

Obviously, the choice of these variables are interdependent. A required share of 100 % new plants is only practical with a definition of new plants which is oriented on one certain date e.g. introduction of the label.

(6) For the definition of which plants are rated as new the start of plant operation is usually used. This date might be compared with

(a) the actual year of certification

(b) the date of introduction of the label

(c) the date of individual application for the label

to decide whether a plant has to be rated new or old. Examples:

- Case (a): In the year 2000, all plants erected in this year are rated new. The rule can be also designed that all plants erected in the actual year and in a certain number of past years (e.g. 2 years) are rated new
- Case (b) and case (c): All plants erected after this deadline are rated new.

(8) With dead-line rules it is advantageous that they are easy to understand for the customer. On the other hand, the dead-line has to be revised from time to time to sustain a certain dynamic in the requirements for new plants. Rules based on (c) have the advantage compared to rules based on (b), that it includes a motivation for the supplier to apply for the label as early as possible. On the other hand, stricter requirements might be a high hurdle for later applicators.

(9) Deadlines might be softened by accepting plants erected before this dead-line to a certain extent. Example: Erected 1 year before deadline: 75 % of the electricity generated by this plant will be eligible for certification; erected 2 years before deadline: 50 % will be eligible;...

(10) In connection with the definition of what is new, a specific problem occurs with renovated or reactivated plants. The certification rules have to ensure that minor

improvements or investments in existing plants do not lead to an upgrading of this plant to be new. Several approaches has been developed:

(a) a certain threshold of specific investments per kW is defined for each technology under which renovation does not lead the plant being defined as new. The threshold might be formulated as percentage (e.g. % of original investment) or as specific number (e.g. 1000 €/kW windpower).

(b) If the renovations leads to additional capacity, the additional capacity might be accepted as new.

(c) The renovated plant must meet certain ecological or technical standards to be accepted as new.

(d) Renovated plants are not accepted in general as new.

A discussion on the assessment of environmental improvements is done under para (18).

(11) Another definition of what is new is to look at the age of the specific plant. This means the difference between the year of erection and the date to compare with (see (x)) must be smaller or equal than the number of years accepted. This number of years might be derived from the usual terms for depreciation for that specific type of technology as they are fixed by tax authorities. As long as the plant is not fully depreciated, it is rated as new. This method enables the plant to gain its investment costs within a period when it is rated as new. This is especially important, if the share of new plants is set high in the criteria.

(12) The share of new plants required to achieve the certificate might be formulated as follows

(a) each year a fixed share (e.g. 10 %) of the electricity marketed as Green Electricity must stem from new plants

(b) an increasing share of electricity from new plants year by year (e.g. 1st year 10 %, 2nd year 20 %,...)

(c) only the growth of demand from a specific supplier must stem from new plants

(d) overall market growth of demand must stem from new plants

Rules (a) and (b) are favourable in the sense that after a fixed number of years a certain proportion of the Green Electricity will stem from new plants. Rules (c) and (d) are taking into account the dynamics of the market and are reducing the risk for suppliers.

(13) The requirements might be softened by introducing penalties in case requirements are not met in a certain year. A possibility is to allow the supplier to prove the missing new generation in the following year but then with a certain surplus. Example: If a supplier fails to prove generation of 100 GWh electricity from new plants in a year x, he is allowed to prove it in the year x+1 with a surcharge from let's say 30 %, which means he has to prove generation of 130 GWh in year x+1 in addition to the requirements he has to fulfil from his supply in year x+1. To motivate suppliers to high proportions of electricity from new plants as well as to omit disadvantages for large facilities, one should also introduce premiums in

case requirements on the age of the plants are more fulfilled than required by the certification rules. Surpluses in a certain year can be accounted with a premium in the following year. Example: If a supplier has an extra 50 GWh produced from new plants than is required by certification in a certain year x he is able to reduce the requirements from supply in year x+1 by 50 GWh plus a surcharge from let's say 30 % meaning another 15 GWh.

(14) The target of new plants and new production might be also achieved without direct requirements on certain shares as described above. Other certification rules like these on the eligible technologies might have the same effect in practise. Example: Assumed electricity from hydropower is the only Green Electricity existing in relevant amounts then excluding hydropower from eligibility would directly lead to new facilities.

(15) Basing the eligibility of a product on CO_2-mitigation or mitigation of all green house gases (GHG) might also influence the requirements on the age of the plants as far as only power from new plants is defined as being able to mitigate CO_2 respectively GHG in the whole. E.g. the certification rules of Öko-Institute require that the eligible generation mix have to emitted 50 % respectively 75 % less GHG compared to a modern coal driven power plant.

(16) Certain schemes require that revenues from marketing Green Electricity have to be invested in new plants (e.g. SEDA). Thus, it is ensured, that payments from Green Electricity customers lead to additional plant without putting suppliers of Green Electricity at the risk of building plants before customers have been acquired. Certification of such approach might be difficult in practise. A clear definition of the returns is a strict pre-requisite. Moreover, the economical pressure of markets to realise inexpensive products is undermined.

(17) So far, the following combinations of criteria have been realised:

Label	Cat	Definition new	Required share		Exceptions
Blauer Engel (GER)		not defined	10 % of revenues must be invested in new plants		-
Bra Miljöval (S)		not defined	Not defined		-
Naturemade (CH)		No requirements			
WWF (NL)		Criteria not defined, negotiated with user of WWF logo			
Future Energy (UK)		Not defined	Supplier must introduce 'significant' new RE capacity within 5 years of accreditation		-
Greenpeace (GER)		start of operation within 2 years of certification	Growth of electricity supply must be covered by new plants within 2 years		-
Grüner Strom Label (GER)		start of operation in year of certification	10 % of last year electricity supply in actual year		with missing or extra electricity, penalties/ surpluses in the following year: < 25 % no penalty, 25 % - 50 %: 20 % penalty, > 50 %: 40 % penalty
Öko-Institute (GER)	Eff.	start of operation after 31.12.1997; "new" as long as tax depreciation term	required GHG-reduction from new plants:	50 % (= 25 % from new RET plants)	Plants erected between 1995 and 1997 are defined partly new: 1995: 25 % of output, '96: 50 %, '97: 75 %
	Reg.			75 %	
TÜV (GER)		no requirements			
WWF (GER)		no definition	all Green Electricity should stem from new plants		
Eco-Logo (CAN)		no requirements			
Green-E (USA)		not on the marketplace before 1 January 1997	5 % in first year of liberalisation, will be continuously raised to 25 %		-
SEDA (AUS)		commissioned after 1 January	by end of 1999 60 %		-

Table 3-5: Criteria on the age of the plants in existing certification schemes. GHG = Green House Gases; RET = Renewable Energy Technologies).

(18) Improvement of the environmental performance can be assessed through

(a) looking on certain criteria to be in focus of the stake holders or

(b) by a comprehensive assessment procedure (e.g. Life-Cycle-Assessment) comparing the environmental impact before and after improvement. Refer 3.1.3 para (10) for a discussion of the application of comprehensive assessment procedures, e.g. Life Cycle Assessment, in criteria for Green Electricity.

3.3 Import of Green Electricity

(1) In a single European electricity market, imports of Green Electricity from one European country to another is daily business. Thus, stakeholders within the set-up process for a Green Electricity certification scheme are confronted with the question of whether imported Green Electricity should be eligible for certification (refer (2) ff.). In this context, one might restrict imports to a certain extent, e.g. a certain share on the totally marketed Green Electricity. If one gives consent to this question, one will have additionally to decide, under which regulations imported Green Electricity should be eligible (refer (7)).

(2) One might argue, that national regulations causing national frontiers are out of date in a single European market with European wide trade. Therefore, imported Green Electricity should be eligible in national Green Electricity certification schemes. However, only national approaches to set up certification schemes for Green Electricity has been successful up to now and these naturally only take into account mostly national aspects.

(3) It is favourable to install renewable energy plants on sites where natural circumstances are advantageous. Taking the case of wind power: Generation costs of wind power plants are strongly dependent on the average wind speed. Moreover, potential on coasts and off-shore are very high compared to the inland potential. The potential for wind power in the UK e.g. represents 40 % of the total potential for wind power in the European Union. Similar circumstances can be found for PV: In southern Europe, global solar radiation is twice as high as in northern Europe. Hydropower is applied favourably in countries with high altitude differences (e.g. Austria, Norway). With a European wide trade of Green Electricity it is possible to maximise Green Electricity generation with a given amount of financial resources. Thus, import of Green Electricity might be seen as advantageous from the customer side since a maximum amount of Green Electricity is generated on a low price level. With the import of Green Electricity, suppliers are able to offer Green Electricity at competitive prices. This argument is usually especially supported by large international electricity suppliers.

(4) On the hand, the different sources of renewable energy have by far not been exploited in any European country[3]. One might argue, that it is needed for a fast and comprehensive

[3] Still, expansion of certain technologies (e.g. hydropower) are restricted in certain countries (e.g. Austria, Sweden) as well as certain countries has relatively compared to their energy demand lower potentials of inexpensive renewable energies than others.

dissemination of environmental sound generation technologies, that all kind of technologies and sites are exploited. Thus, it makes sense e.g. to install wind power plants in sites with lower average wind speed in a certain country even if better sites are still not exploited in other countries.

(5) Transport of electricity causes losses. Cross-border trade might cause longer transport distances thus losses than national trade. Reduction of electricity losses is in line with the target of reducing the environmental impact of electricity production. Therefore, some certification approaches (e.g. Greenpeace Germany) supports the idea of low distances between generation and consumption.

(6) However one has to take into account, that with electricity trade money flows need not to induce a counter flow of physical electricity since electricity does not follow commercial treaties but physical laws. For instance, an import of English Green Electricity to France might even reduce the electricity flow between France and the UK since French nuclear power is imported to the UK. A comprehensive life-cycle assessment can show the impact of a specific Green Electricity trade on the electricity losses in the grid. The problem of additional losses through long distance Green Electricity trade can only occur with consumption based Green Electricity (refer chapter 1.2.1) but not with contribution-based Green Electricity (refer chapter 1.2.3).

(7) With the eligibility of imported Green Electricity, certification gets more complex. From the point of view of a national certification scheme there are two possibilities to deal with imported Green Electricity:

(a) imported Green Electricity must fulfil the national requirements of the country where the electricity is consumed, thus where the certification rules are developed (refer (9))

(b) if a national certification system exists in the country of Green Electricity generation, those rules may be applied (refer (11))

(8) In any case, a central European registrar to register certified plants and production is essential to avoid double counting.

(9) Applying the same certification requirements on imported Green Electricity as for domestic generation gives high transparency to the customers. This way, the customer can be sure that the entire electricity purchased meets the same homogeneous requirements. Since the specific wishes of customer are taken into account in the development of certification rules influence of these customers on the design of the product is higher and more direct.

(10) Certification according to the rules of the country of consumption might cause problems in the approval of certain requirements, because design of approval might build up on country specific documents. Also the legal framework concerning e.g. grid access or support mechanism (refer chapter 3.5) might differ largely from country to country making the application of one national certification scheme in another country unfeasible. Usually, the same bodies who certify the domestic production will process certification of imported

Green Electricity. Therefore, translation might be needed, making the certification more expensive. Also on-site approval might be more costly.

(11) If a certification system exists in the country where the imported Green Electricity stems from one might also apply these certification rules for the imported electricity. By that, national specifics in the country of production are taken into account. This is important for the assessment of certain environmental impacts and also technologies (refer chapter 3.1). These assessments might differ highly from country to country as the judgements are value based. Since a lot of environmental impacts are of a local or regional kind it is reasonable to assess according to the rules of the people in the country of production.

(12) On the other hand, the certification according to the rules of the country of production makes the statement of the label less transparent for the customers. This label states that the certified product meets the national requirements or – in case of imported Green Electricity – equivalent requirements in other countries.

(13) One has to decide under which conditions foreign certification rules are excepted for imported Green Electricity. Different approaches might be chosen for decision varying in the degree of harmonisation and the expenditure for development:

(a) Bilateral recognition of certification rules. Every certification system is assessed as to whether the results of the certification are in line with the own targets.

(b) Common principles on how the certification rules have been developed. If these principles are followed the certification system itself is also accepted. (Example: environmental and consumer protection groups must be involved in the set-up process. If this principle (among others) is fulfilled the foreign certificate is accepted).

(c) Minimum requirements. Certain minimum requirements are defined whereas other requirements are seen as country specific. (Example: the exclusion of nuclear power is seen as a minimum requirement. Thus, if (among others) the foreign certification system does include this requirement, this certificate will be accepted).

Whereas approach (a) gives the largest freedom to the developers of the certification scheme transparency for customers is highest with approach (c).

(14) All approaches more or less pave the way to a harmonised unique European certification scheme.

Label	Import	Certification Rules
Blauer Engel (GER)	Eligible	country of consumption
Bra Miljöval (S)	eligible only from Norway and Finland	harmonised within Sweden, Norway & Finland
Naturemade (CH)	not eligible	-
WWF (NL)	Criteria not defined, negotiated with user of WWF logo	
Future Energy (UK)	Under review	Under review
Greenpeace (GER)	not eligible	-
Grüner Strom Label (GER)	Eligible	country of consumption
Öko-Institute (GER)	not eligible as long as no unique European registrar exists	-
TÜV (GER)	Eligible	country of consumption
WWF (GER)	eligible, but not more than 50 % of total supplied electricity 10 % of total supplied electricity must be generated close to the customer	country of production
Eco-Logo (CAN)	No criteria	
Green-E (USA)	No criteria	
SEDA (AUS)	not applicable	

Table 3-6: Eligibility of imports and certification in existing certification schemes.

3.4 Synchronicity of Production and Consumption

(1) A Green Electricity supplier who wants to be certified has to approve that the sum of its Green Electricity production equals or is more than the sum of its Green Electricity supply. That is true for all Green Electricity certification systems world wide. However, the different certification systems differ in the time-frame equivalence that has to be approved (refer Table 3-7). Basically, the discussion is focussed on the question whether equivalence should be on a quarterly hour basis (“high synchronicity”) or on an annual basis (“low synchronicity”). In the following, different aspects of both models are presented.

Label	Synchronicity
Blauer Engel (GER)	quarterly hour basis
Bra Miljöval (S)	annual basis; balancing system power (undefined sources) must not exceed 10 % net of supplied electricity
Naturemade (CH)	Annual basis
WWF (NL)	Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)	annual basis
Greenpeace (GER)	quarterly hour basis balancing system power (from eligible sources and combined cycle power plants with $\eta > 50$ %) must not exceed 15 % of supplied electricity
Grüner Strom Label (GER)	annual basis
Öko-Institute (GER)	annual basis
TÜV (GER)	annual basis, but shorter terms are also certified
WWF (GER)	annual basis, but higher synchronicity appreciated
Eco-Logo (CAN)	Annual basis
Green-E (USA)	Annual basis
SEDA (AUS)	Settlement period must be clearly identified to customer, monthly reporting to accreditation authority with annual audit

Table 3-7: Requirements on the synchronicity of generation and demand in existing certification schemes (η = efficiency).

(2) A Green Electricity product with a high synchronicity gives customers the maximum possible security that their electricity demand is covered by environmental sound production facilities. In spite of the impossibility to ensure that green electrons are delivered to the Green Electricity customer, customers can be sure that the equivalence of their electricity demand is fed into the grid at any time.

(3) With high synchronicity, Green Electricity customer uncouple their electricity supply as much as possible from the conventional electricity supply. This means, that the Green Electricity supplier does not purchase any non eligible power on a regular basis for the supply of his Green Electricity customers. No money will go to conventional power producers. Thus, power suppliers of this conventional power are given stronger signals on the customers' wishes and demands. However, this effect can be also achieved by restricting the share of system power[4] from non-defined sources to a certain extent of the total supplied Green Electricity in a certain year (as it is required by the Swedish Bra Miljöval certification system or Greenpeace Germany).

[4] System power is defined as the power needed to regulate short term short falls between demand and production. it is delivered by the grid system operator.

(4) In debates on the future energy policy and supply systems, doubts are often expressed, that a electricity supply system on the basis of 100 % renewable energy (with fluctuating generation) is not technically feasible. In reply to this argument, Green Electricity with high synchronicity can show in practise the feasibility of a electricity supply entirely based on renewable energy or other environmental sound production facilities.

(5) However, scientific based calculations for Germany shows, that the existing electricity supply system can easily incorporate 10 to 20 % of electricity from fluctuating generation facilities before specific power plants with fast power control will be needed. In many European countries, there is no need of high synchronicity of Green Electricity products from the technical point of view at the moment. This is even more true if one looks on the entire European electricity supply system as a single market with a renewable share of around 10 % (EU 15 in 1996).

(6) With a requirement of high synchronicity, power demand and power generation has to be monitored continuously causing additional metering costs. However, power metering can be displaced through standard load profiles for customers to a certain extent (e.g. for households). Additionally, national grid-codes usually require power suppliers to document continuously power load and the power production. These documents may serve as a reliable source for monitoring as long as consumption based Green Electricity and not contribution based Green Electricity is concerned.

(7) Approval of high synchronicity is more expensive than the approval of low synchronicity. These are additional costs non Green Electricity customers do not have to bear. Thus, the requirement for high synchronicity causes a cost disadvantage for Green Electricity suppliers compared to Non-Green Electricity suppliers making marketing Green Electricity harder.

3.5 Relations to public Support Schemes

(1) Green Pricing schemes are targeting on the deployment of environmental sound electricity generation. In most countries, public support programmes with the same objective exist, too. Green Pricing might complement these public support schemes or it might substitute parts or the entire support programme.

(2) The different stakeholder groups might have different ideas on whether Green Pricing schemes should complement or substitute public support measures. Environmental groups will clearly target on complementing public support measures. In terms of climate protection policies, this should be also true for governmental bodies (refer chapter 2.5). Environmental driven customers of Green Electricity will also go for complementing public support, whereas customers without that motivation might be indifferent about this question (refer chapter 2.4). Electricity producers of Green Electricity will also support the idea of complementing public support measures. Electricity suppliers might like to substitute public schemes by Green Pricing schemes in case, that they have to bear directly or indirectly

financial burdens from these public support mechanisms. In the following, measures are discussed which should ensure the complementing character of Green Pricing schemes.

(3) Green Pricing schemes do not adversely influence supply side support mechanisms like grants and soft loans for electricity suppliers. In case, public support schemes do not support certain environmentally sound electricity generation technologies (e.g. combined heat power plants) but those that are eligible for marketing as Green Electricity, Green Pricing will enhance the performance of the electricity supply system, too. Nevertheless, certification has to check payments from that kind of support schemes in case contribution based products are certified (refer also chapter 3.7, para (3)).

(4) Exclusively public support mechanisms creating demand for Green Electricity might be displaced by Green Pricing schemes. Especially, minimum price standards (e.g. German Electricity Feeding Law, Spanish Real Decreto, Denmark) and quota based systems (English NFFO, the Netherlands) are concerned. There is the danger, that costs from legal obligations will be transferred from the obliged body to a few Green Electricity customers without creating any new plants or generating any additional electricity. For the discussion on effects with minimum price standards refer para (5), for quota based mechanisms refer para (9).

(5) With minimum price standards for Green Electricity, grid operators or electricity suppliers are forced by law to purchase Green Electricity at a fixed minimum price. Thus, a demand is created which is only limited by the production costs of the electricity generators. To create additional demand for Green Electricity with Green Pricing, electricity already paid through minimum price standards **must not be eligible** for marketing as Green Electricity to final customers. Otherwise, the obliged grid operators /electricity suppliers would offer the electricity to Green Electricity customers by transferring the financial burdens to these customers without creating any new capacity or generating any additional Green Electricity.

(6) By excluding electricity paid through minimum price standards from Green Pricing marketing, the minimum price of Green Electricity on the Green Pricing market will be at the same level as the price in the standard. Green Electricity producers eligible for the minimum price standard will not offer their production under the price level of the minimum price standard. Then, minimum price standards with high guaranteed prices (in comparison to final consumer prices) are likely to hinder the development of a Green Pricing market, as far as consumption based products are concerned.

(7) With transferring contributions to generators of Green Electricity which was already paid within minimum price standards additional capacity can be achieved if the surplus cost beyond the level of standard minimum price is proved as reasonable by the certification (refer also chapter 3.7). As an exception to the rule expressed under para (5) Green Electricity paid through minimum price standards should be therefore eligible for marketing as contribution based Green Electricity.

(8) The state forces suppliers / grid operators to pay higher prices within minimum price standards because of the environmental benefit of renewable energies and other environmental sound generation technologies. Since parts of the environmental benefit is

already paid through the minimum price standard system, it is reasonable, that only a part of the Green Electricity, the customer contributed to, is eligible for certification. The public willingness to pay for the environmental benefit is the minimum price minus the opportunity costs for electricity generation. To calculate the eligible amount of Green Electricity, the specific payment of the Green Pricing scheme has to be set in proportion to the total costs of the environmental benefit thus the total costs of electricity minus the opportunity costs.

(9) With quota based support mechanisms, electricity suppliers or electricity customers are forced to cover a certain share of their power mix and respectively the electricity consumption by environmentally sound generated electricity. Usually, the obliged body will prove the fulfilment with tradable certificates. These certificates are issued to operators of eligible power plants. To ensure an additional effect of Green Electricity marketing certification of Green Pricing should require this certificate, too. Thus, an additional demand for the certificates and Green Electricity is created.

(10) The eligibility of Green Electricity which is dependent on which kind of public support they received is presented in Table 3-8 for different national certification approaches.

Certification Scheme		Type of Support		
		Grants Soft Loans	Minimum Price Standards	Quotas
Blauer Engel (GER) *)			not eligible	-
Bra Miljöval (S)		Eligible	Eligible	-
Naturemade (CH)		Eligible	Eligible	-
WWF (NL)		Criteria not defined, negotiated with user of WWF logo		
Future Energy (UK)			not eligible	
GREENPEACE (GER) *)		eligible	not eligible	-
Grüner Strom Label (GER)		eligible	eligible with contribution based products	-
Öko-Institute (GER)		eligible	eligible with contribution based products	-
TÜV (GER)		eligible	eligible	
WWF (GER) *)		eligible		
Eco-Logo (CAN)		No specific criteria	No specific criteria	No specific criteria
Green-E (USA)	liberalised market	No specific criteria	No specific criteria	No specific criteria
	regulated market	No specific criteria	No specific criteria	non-eligible
SEDA (AUS)		eligible	eligible	eligible

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 3-8: Eligibility of public supported plants with existing certification schemes.

3.6 Criteria on Suppliers

(1) Usually, certification and labelling concentrates on the attributes of a product. Since the electrons from environmental sound power plants cannot be distinguished from electrons from other power plants, the production process has to be certified. This approach can be found with other products than Green Electricity (e.g. organic food, forest stewardship council). From the view point of international trade, certification on the basis of criteria on production methods is viewed as a discrimination of foreign suppliers. As far as governmental bodies are involved in the certification this discrimination is forbidden by international trade treaties[5].

[5] However, one could find cases where such certification criteria issued by official bodies have not been rated as a discrimination (e.g. the struggle on trade with alcoholic and malt beverages).

(2) In many certification rules, one could also find requirements on the supplier / producer himself (refer Table 3-9). However, most of these supplier targeted requirements are of a “should” type rather than of a “must” type.

Label	Criteria on suppliers / producers
Blauer Engel (GER)	None
Bra Miljöval (S)	None
Naturemade (CH)	0,5 % of any electricity supply to final customers must come from solar, geothermal, wind or biomass (= "new" renewable energy sources) within 5 years; EMAS or ISO 14001 is required for any generator > 10 MW Efficient and sustainable electricity supply must be part of the company's policy
WWF (NL)	Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)	None
Greenpeace (GER)	owner of supplier must not run any nuclear power plants
Grüner Strom Label (GER)	supplier is not allowed to supply other than Green Electricity; owner of supplier must not run any nuclear or lignite power plants
Öko-Institute (GER)	
TÜV (GER)	company’s general policy should support renewable energies
WWF (GER)	share of Green Electricity must grow continuously with suppliers offering also conventional electricity “should” regulations: periodical environmental report, eco-audit, Green Electricity offers to households and commercial customers
Eco-Logo (CAN)	Strict set of environmental management rules
Green-E (USA)	Company must disclose sources of electricity and undergo biannual review of advertising materials
SEDA (AUS)	Annual targets for new ‘green’ generation must be set, all accredited generation mus tbe from RE technologies, Green supply can be a blend with ‘non-green’, but blend must be made clear to customers

Table 3-9: Criteria on suppliers/producers in existing certification schemes.

(3) In order to gain credibility of a certification scheme for Green Electricity, one interesting requirement on suppliers and producers might be to demand openness through some kind of environmental product declaration, giving the customer a possibility to study the environmental aspects of the current electricity product. The required information in the environmental product declaration can be in accordance with the information and data that must be collected and assessed in order to verify that criteria for Green Electricity are being fulfilled.

(4) In practise, the possibility to set direct requirements on suppliers might be quite restricted. One has to decide whether all involved companies have to fulfil the criteria on suppliers or only the one supplier who holds the supplying contract with the final consumer? Moreover, should only the direct supplier or also the owner(s) of this supplier fulfil these criteria? In case one exclusively sets the criteria on the final supplier neglecting its owners and/or its power suppliers, suppliers can easily avoid these requirements by founding new affiliates. In case of criteria targeted on the owners and/or pre-suppliers of the final supplier monitoring can be rather costly and non-transparent especially in case of longer supplying chains with several involved electricity producers and traders. Long supply chains might get more usual with the growing integration of the liberalised single European electricity market.

(5) Within the problem of direct criteria on suppliers one topic has been discussed extensively. This is the question of whether Green Electricity suppliers who also run nuclear power plants should be eligible for certification. It has been argued that operators of nuclear power plants have had to fight against renewable energies for a long time. Therefore, these operators cannot plausibly offer Green Electricity at the same time. Moreover, environmentalists rooted in the anti nuclear power movement have seen difficulties in awarding a label on environmental soundness to companies who they fought against because of their nuclear power investments. Finally, some stakeholders see the Green Electricity market as an important tool to relieve the existing power system by more environmental sound generation facilities.

(6) Other stakeholders doubt that the Green Electricity market is a powerful tool for the change of the power supply system. They see in the Green Electricity market a welcomed addition of other support mechanisms rather than the central tool and substitute of any other measure. They expect only a limited share of Green Power on the total electricity demand which means that power producers would never shut down their nuclear power plants in favour to take part in the Green Electricity market. In contrary, these stakeholder argue that due to the immense investments needed to put in place a more environmentally sound electricity supply system the established power suppliers with their large financial and organisational capacities need to be involved. This is also true for developing and establishing the Green Power market.

(7) The fact, that a Green Power product does not receive a certified label, because the Green Power supplier also supplies nuclear power might be difficult to be effectively explained to the customers. Customers might see such a criteria, which is not connected directly to the product as a kind of ideological assessment of the producer. This might decrease the acceptance of the certification system to the public.

3.7 Assessing Costs and Pricing of Products

(1) Generally, market mechanisms are an effective tool to control prices since vital competition forces marketers to offer their products at marginal costs. In a well established market, it is up to the customer to find the least expensive product with the required

qualities. Thus, certification of Green Electricity should focus on certifying the environmental quality rather than controlling generation costs.

(2) However, assessment of costs is crucial with contribution based offers. At least, it has to be proved that the contributions are handed over to the operator of an eligible Green Electricity plant. A higher security will be given against misuse if costs of plants which exceed the economical feasible costs are proved. Usually, the investment costs can be proved with bills. Additionally, the investment costs as well as the resulting generation costs can be compared with typical costs of the specific type of technology. As with all kinds of subsidies, misuse is nevertheless hard to prevent.

(3) Additionally to the costs, the income from other than selling via Green Pricing must be monitored. This includes e.g. opportunity costs of the produced electricity and payments from public support schemes.

(4) With giving suppliers an economical motivation to pay as low contributions as possible certifying bodies need not control the cost of electricity generation. A regulation of that kind has been developed within the certification system of German Öko-Institute.

Certification Scheme		Assessment of Costs and Pricing
Blauer Engel (GER) *)		not assessed
Bra Miljöval (S)		not assessed
Naturemade (CH)		not assessed
WWF (NL)		Criteria not defined, negotiated with user of WWF logo
Future Energy (UK)		not assessed
GREENPEACE (GER) *)		not assessed
Grüner Strom Label (GER)		with contribution based products costs and pricing assessed
Öko-Institute (GER)		with contribution based products pricing assessed, rules on eligibility gives an economic motivation to pay contributions as low as possible
TÜV (GER)		not assessed
WWF (GER) *)		not assessed
Eco-Logo (CAN)		not assessed
Green-E (USA)	liberalised market	not assessed
	regulated market	assessed by board & local stakeholder groups; direct program costs & reasonable overhead (incl. marketing costs) accepted
SEDA (AUS)		not assessed

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 3-10: Assessment of costs and pricing with existing certification schemes.

4 Administration

4.1 Organisation of set-up process

4.1.1 Initiation

(1) On the beginning of any set-up process somebody has to organise an initial meeting. This initiator should have a high interest in the certification (refer motivation of stakeholders), giving him the power to push forward the process.

(2) At the same time, the initiating person and/or organisation should have also mediating abilities to integrate the different targets of the different stakeholders as far as possible. One might commission an independent mediator to organise the discussions.

(3) The certification schemes in Europe as well as in overseas have been mainly initiated by environmental groups (refer Table 4-1).

Certification Scheme	Initiation					Comment
	Producer	Supplier	Environmentalists	Consumer	Government	
Bra Miljöval (S)			X			
Blauer Engel (GER) *)			X			Greenpeace has submitted a formal request
Naturemade (CH)		X	X			Joint initiative of WWF Switzerland and Utility of Zürich
WWF (NL)			X			
Future Energy (UK)					X	
GREENPEACE (GER) *)			X			
Grüner Strom Label (GER)			X			
Öko-Institute (GER)						developed within a research project on behalf of public-privately owned agency
TÜV (GER)		X				request for certification of products
WWF (GER) *)			X			
Eco-Logo (CAN)					X	
Green-E (USA)			X			Established by Centre for Resource Solutions, a private environmental research agency
SEDA (AUS)					X	

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-1: Initiators of certification schemes for Green Electricity.

4.1.2 Process Steps and Duration

(1) Different processes have to be undertaken within a set-up of a certification scheme. This includes:

(a) request to all stakeholders

(b) discussion of criteria

(c) organisation of certification

These processes are usually run through step by step. However, certain overlaps are feasible and can accelerate the set-up.

(2) For an initial meeting, the different stakeholders it might be best to bring them together for a conference. This conference should outline the general importance of Green Electricity for the energy supply system, for nature conservation and for climate protection. Secondly, the need for independent certification should be clear. An alternative to a conference might be a more informal and smaller meeting reducing efforts for organisation and giving more flexibility for discussion. However, due to its more informal character compulsory statements might be harder to obtain. In any case, a formal decision to start developing criteria and organisation for a certification scheme should be the outcome of an initial meeting. Moreover, it should be decided there, which stakeholders in which way should be involved in the set-up process.

(3) In best case, an independent mediator should lead discussions on criteria and organisation. Thus it is ensured, that no stakeholder group will get a higher influence on the set-up process by leading the discussions. A working paper may help to foster the discussion on criteria and organisation. This handbook covers already most of the relevant questions thus reducing the need for a business plan to country specific questions. General topics should be discussed in the entire group whereas the design of minor criteria might be transferred to a technical board. For central questions, impulse papers might be useful, too.

(4) After having decided about the criteria for certification, the certification process itself must be organised. This can be a very time consuming process since a lot of the rules on operation do directly influence the outcome of certification. However, the operation rules should be developed by a technical board or by an external expert via a business plan, since it involves a lot of detail questions.

(5) In Table 4-2 the duration of the process steps within different national schemes are presented giving a hint what duration might be expected to establish a new scheme. One has to take into account, that future set-up process can be based on the experiences which had been already made in the set-up of existing schemes.

Certification Scheme		Initiation	Discussion	Organisation	Total
Bra Miljöval (S)		1 year	ongoing	ongoing	1 year to initiate, further developments ongoing
Blauer Engel (GER) *)		1 year	6 month	?	?
Naturemade (CH)		1 year	1 year	ongoing	2 years
WWF (NL)		-	-	-	-
Future Energy (UK)		6 months	9 months	6 months	1 year, 9 months
GREENPEACE (GER) *)		N/A	N/A	N/A	N/A
Grüner Strom Label (GER)		6 months	9 months	1 year	1 ½ year
Öko-Institute (GER)		6 months	6 months	6 months	1 year
TÜV (GER)		1 month	2 months	2 months	3 months
WWF (GER) *)		1 month	3 months	?	
Eco-Logo (CAN)		Process not complete			
Green-E (USA)	liberalised market	Not disclosed	Not disclosed	Not disclosed	-
	regulated market [6]	2 months	3 months	-	-
SEDA (AUS)		6 months	1 year	6 months	2 years

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-2: Duration of necessary steps of the set-up process with existing certification schemes.

4.1.3 Decision Procedures

(1) As already stated, stakeholders in a set-up process for Green Electricity certification scheme have often to decide on the basis of value judgements rather than on scientific based data. To keep into account the whole range of value judgements it is worth it to include all kind of stakeholders in the set-up process. At the same time, this will raise the feasibility and the acceptance of the scheme.

(2) The extent that different stakeholders are involved in the set-up process and the operation of the certification system might vary:

[6] The numbers only include the duration for the development of general rules for the whole US. Specific regulations has to be developed state by state by stakeholder groups according to the general rules.

(a) stakeholders might be just consulted

(b) stakeholders might have decision rights during the set-up phase

(c) stakeholders might have decision rights during the operation phase

(d) stakeholders might finance the set-up phase giving them additional influence on decisions

(3) From the point of view of any stakeholder group, it might be reasonable to restrict participation of other stakeholder groups to a certain extent. Environmentalists might argue, that the involvement of producers and suppliers should be restricted to the consulting level in order to show the independence of the certification system from economic interests. In contrast, producers and suppliers might argue, that environmentalists should only decide on the basic principles leaving the formulation of details to experts.

(4) All stakeholders are participating voluntarily in the set-up process. This means also, that any stakeholder can leave the process at any time in case the development of criteria does not fulfil his expectations. As far as all stakeholders groups should be involved, discussions and decisions within the set-up phase are a delicate balance between creating ambitious regulations and keeping all parties involved in the process.

Certification Scheme	Involved Stakeholders				
	Producer	Supplier	Environmentalists	Consumer	Government
Blauer Engel (GER) *)	C	C	C	C	D,F
Bra Miljöval (S)			X		-
Naturemade (CH)			X		C
WWF (NL)			X		
Future Energy (UK)	C	C	C	C	F
GREENPEACE (GER) *)	C	C	D		-
Grüner Strom Label (GER)	C,D,E	C,D,E	C,D,E	C,D,E	-
Öko-Institute (GER)	C, F	C, F	C	?	F
TÜV (GER)	C	C			
WWF (GER) *)	C	C	D		-
Eco-Logo (CAN)					X
Green-E (USA)			X		-
SEDA (AUS)	C	C	C	C	F

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-3: Type of involvement of different stakeholders in the process of existing certification systems world wide. Explanation: C = consulted during set-up process, D = decision right during set-up process, E = continuos decision rights during operation, F = financier, X = not disclosed.

4.2 Organisation of Certification

(1) . Within a certification scheme for Green Electricity different functions have to be incorporated. This includes the questions

(a) Who certifies according to the regulations? (refer chapter 4.2.1)

(b) Who decides in matters of dispute or question?

(c) Who will oversee, verify and actualise the criteria?

(2) In case that it is not one single body that exclusively develops and maintains the certification scheme it is reasonable to form an association whose members are all supporting bodies of the certification scheme. This is true for e.g. the German Grüner Strom Label e.V. or the Swedish Bra Miljöval as well as for the US-American Green-E programme.

Some certification systems are only launched by single organisations or only one stakeholder group. In that case, a associated body is not necessary (e.g. German TÜV).

(3) For the rational process of tasks within the bearing association it is reasonable to establish certain bodies (refer Figure 4-1). There should be an executive body (e.g. assembly of all members, executive board) to oversee the criteria and to decide in matter of questions. For the daily work, a technical body should be established. If the association only involves a few members, no separate technical and executive body might be needed.

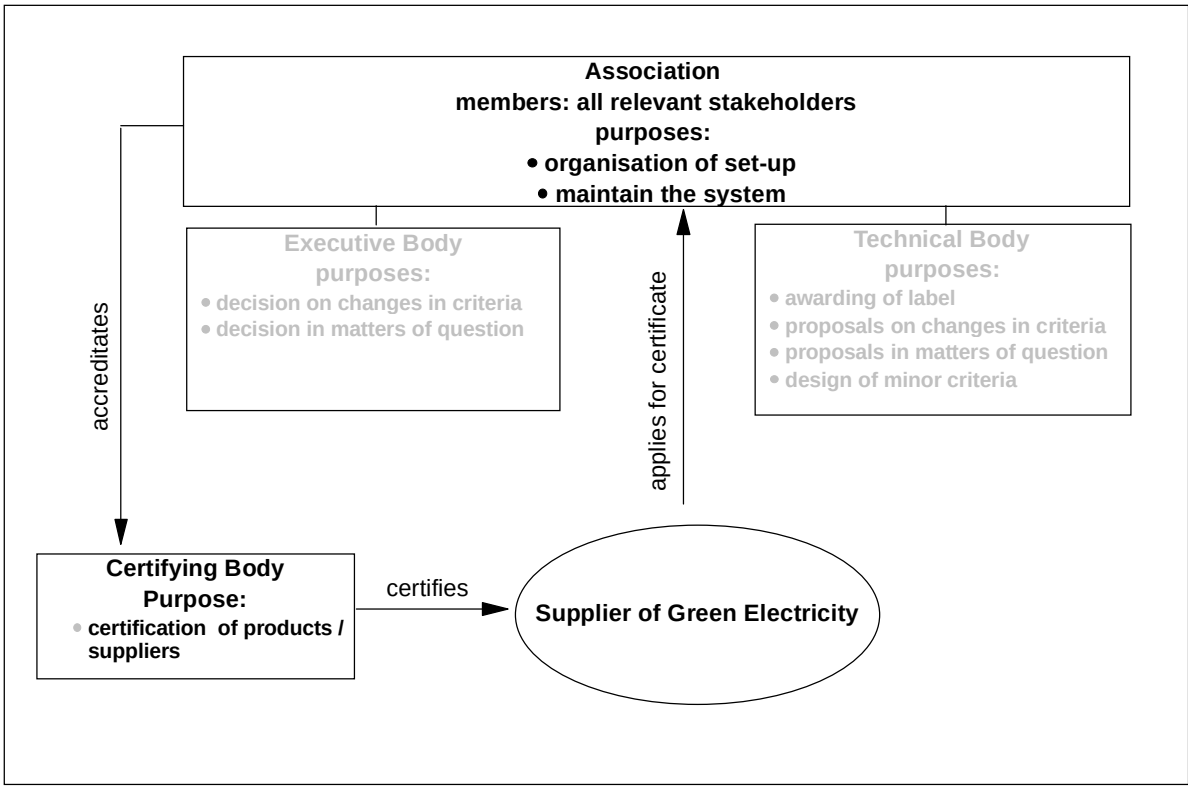

Figure 4-1: Typical elements of the organisation of a certification system for Green Electricity.

(4) Within the existing certification schemes, certification criteria have been continuously developed. However, any changes in the certification requirements are introduced with certain transitional periods of e.g. two to three years. It must be decided whether transitional periods are only applied to suppliers of Green Electricity who have applied for certification before introducing the new rule or also for those suppliers who applied after the introduction of the new rule. The first solution would accelerate putting the new rule into action whereas the second solution gives the same framework conditions for all certified suppliers of Green Electricity.

4.2.1 Certifying Bodies

(1) It has to be decided whether

(a) the bearing organisation itself certifies applying companies (refer para (2))

(b) one single third party certifies applying companies (refer para (3))

(c) several third parties are accredited for certifying companies and products (refer para (4)).

(2) The bearing body can only certify itself if it has the personal and organisational capacities to process time consuming certification. This approach ensures a short feed-back between the certification practise and the development of certification criteria.

(3) Several commercial institutions have specialised in certifying any kind of products according to any kind of certification rules. Such organisations have a large knowledge on the certification process enabling them to commission certification inexpensively. Especially in the set-up phase and the first years of existence of the scheme it might be useful to commission exclusively one third party with certification because certification rules might to adapted quite often in light of actual market developments. During that time, the feed back between the bearing organisation and the certifying body should be very close. The certification should be offered in a call for tender.

(4) Accrediting several third parties gives the Green Electricity supplier who is applying for accreditation the freedom of choice by whom they want to be certified. Thus, market mechanisms regulates pricing certification. However, demand for certifying Green Electricity might be rather restricted in the beginning and lead to rather restricted market opportunities for certifying bodies. Multiple bodies must be accredited in case imported Green Electricity according to the rules of the country of generation is eligible (refer chapter 3.3).

Certification Scheme	Certifying Bodies		
	Bearing organisation itself	**Single third party**	**multiple third parties**
Blauer Engel (GER) *)			X
Bra Miljöval (S)		X	
Naturemade (CH)			X
WWF (NL)	X		
Future Energy (UK)	X		
GREENPEACE (GER) *)		X	
Grüner Strom Label (GER)		X	
Öko-Institute (GER)			X
TÜV (GER)	X		
WWF (GER) *)	not in operation		
Eco-Logo (CAN)		X	
Green-E (USA)	X		
SEDA (AUS)	X		

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-4: Certifying bodies within existing certification schemes.

4.2.2 Term of Repetition

(1) Usually, suppliers of Green Electricity are assessed annually (refer Table 4-5). First time certification differs usually from follow-up assessment. Especially, data requirement are reduced with follow-up assessments.

Certification Scheme		Repetition of certification
Bra Miljöval (S)		Annual
Blauer Engel (GER) *)		Annual
Naturemade (CH)		Annual
WWF (NL)		Annual
Future Energy (UK)		Annual
GREENPEACE (GER) *)		Annual
Grüner Strom Label (GER)		Annual
Öko-Institute (GER)		Annual
TÜV (GER)		Annual
WWF (GER) *)		Annual
Eco-Logo (CAN)		annual, dependent on right to unannounced inspection
Green-E (USA)	liberalised market	Annual
	regulated market	Annual
SEDA (AUS)		Annual

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-5: Repetition of assessment of Green Electricity schemes with existing certification schemes.

4.2.3 Which information is needed?

(1) Formats and presentation of information needed for certification is highly country specific because the required information should be based as far as possible on legal and other public information demands to reduce information procurement costs.

(2) For exemplification, the forms used within the Grüne Strom Label certification process can be found in the Annex (in German).

4.2.4 Typical costs

Certification Scheme	Fees for Certification			
Bra Miljöval (S)	-			
Blauer Engel (GER) *)	Not defined yet			
Naturemade (CH)	Licence fee 320 €/5years + 130 €/year + 22 €/GWh Costs of certification dependent on individual certifier			
WWF (NL)	Not disclosed			
Future Energy (UK)	£5000 for first offering, £2000 for any subsequent offerings			
GREENPEACE (GER) *)	Not applicable			
Grüner Strom Label (GER)		**base**	**3 – 10 GWh/a**	**> 10 GWh/a**
	Initial	1700 + 150 travel expenses-		
	Repetition	600 (incl. 1st 3 GWh/a)	0,18m€/kWh	0,1m€/kWh
Öko-Institute (GER)	**< 2,5 GWh/a**	**2,5 – 10 GWh/a**	**over 10 GWh/a**	
	2,27 m€/kWh	1,38 m€/kWh	0,77 m€/kWh	
TÜV (GER)	-			
WWF (GER) *)	not defined yet			
Eco-Logo (CAN)	Depends on sales volume – initial fee CAN$ 750 – 3500, annual license fee based on gross annual sales of certified products: 0,6 % on the 1st 1 MCAN$, 0,1 % on the remainder			
Green-E (USA) liberalised market	-			
Green-E (USA) regulated market	-			
SEDA (AUS)	-			

*) These organisations have developed certification criteria but have not set-up an entire certification scheme yet.

Table 4-6: Fees for the certification of Green Electricity products and suppliers with existing certification schemes (if not other stated, all prices in € without VAT).

5 Specific Situation in certain European Countries

5.1 Germany

5.1.1 German Producers and Suppliers

(1) In Germany, traditional utilities have not been involved directly in set-up processes for certification schemes. However, several utilities sought independent certification after

implementing Green Tariffs. They asked individually well-know independent research facilities and auditors for independent auditing of their products. The Green Electricity product of the largest German Electricity supplier RWE is audited for instance by the research institute Fraunhofer Institut für Solare Energiesysteme, Freiburg. With growing interest in the Green Electricity market, traditional utilities sought for a standardised certification scheme. Motivated by several requests from traditional utilities, German Technischer Überwachungsverein (TÜV) has developed Germany's first certification scheme.

(2) The Association of German Electricity Supply Industry is not involved in any set-up processes for certification schemes. Interest in Green Electricity within the members of this organisation differ too largely to develop their own scheme or take part as a representative of producers and/or suppliers in a set-up process for a certification scheme. Especially the opinions regarding the German *Stromeinspeisungsgesetz* (Electricity Feeding Law) varies largely among the member utilities.

(3) A lobby organisation for the dissemination of energy efficient and resource saving technologies is the ASEW formed by 200 municipal utilities. ASEW take part in the consultation processes within the set-up process of the Grüner Strom Label e.V. as a member of the certification body which is fixing the details of certification. The members of ASEW have strong interests in Green Electricity. They operate a lot of traditional but also new RET power stations, partly erected within own support programmes in the last years under monopolised conditions. Due to liberalisation, they are faced with stronger competition making it harder to include the higher costs of RET in their tariffs. Therefore, ASEW has also developed an own Green Electricity product (refer chapter 1).

(4) Within the set-up process, ASEW want to ensure, that

(a) their product will be eligible for certification

(b) criteria are feasible

(c) a large demand for Green Electricity is evoked

(d) criteria gives enough space for creative development of products within the field of Green Electricity

(e) doubtful offers for Green Electricity are eliminated from the market.

(5) Fostered by the favourable conditions of the German Electricity Feeding Law (EFL), independent power producers operate a considerable share of renewable energy driven power plants. In the past, traditional utilities introduced Green Pricing schemes to defend against the EFL. They were arguing that the low participation rates within their Green Pricing schemes show the missing support of the public for renewable energies in the whole and thus there does not exist sufficient public support for the EFL.

5.2 Sweden

5.2.1 Swedish Producers and Suppliers

(1) The Swedish Power Association (SPA, in Swedish: Kraftverksföreningen), which is the trade association for major power producers in Sweden, holds the view that low CO_2 emissions should be the major criteria for inclusion of a particular energy source for production of green electricity. This means that both renewable energy sources and nuclear power would be eligible. However, the SPA also notes that the inclusion of nuclear power would not be accepted on the international level. There also seems to be differing opinions on this issue among members of SPA as for example Sydkraft AB, one of the largest power producers in Sweden, does only consider renewable sources as eligible for green electricity.

(2) The above mentioned organisation SPA wants to pursue the introduction of green certificates with rules harmonised at the EU level. The major criteria, according to SPA, for issuing green certificates to a certain producer should be based on emission (CO_2) level from this producer's production compared to "normal" emission levels.

(3) There is no common view on green electricity or certification issues among the Swedish suppliers as represented by the organisation Swedish Electricity Distributors (in Swedish Svenska Elverksföreningen) except that a green electricity standard for the EU would be appreciated. It seems also that a large share of the suppliers have accepted the Bra Miljöval certification system.

(4) The Swedish Power Association considers the Bra Miljöval as a system which does not promote the expansion of green electricity and subsequently does not contribute to decreasing the environmental impact. Swedish power producers and suppliers have not been involved in the set-up process for the Bra Miljöval certification system.

5.2.2 Criteria for hydropower

(1) There is a general debate in Sweden on the eligibility of different kind of hydropower as green electricity. In particular, the opinion within environmental organisations, e.g. the Swedish Society for Nature Conservation, founder of the Bra Miljöval certification scheme, is split in this issue. One side argues that all hydropower has an unacceptable impact on the environment and thus cannot be accepted as green. This is regardless of the size of the plant (see also chapter 3.1.2). The other side accepts hydropower from existing plants as green electricity because the largest impact on the environment has already occurred namely in connection with the construction of the plant.

(2) There is also a tendency to favor small scale generation facilities to large scale. Before 1999 the Swedish state support for renewable energy included investments in small scale hydro power built in an "environmentally adapted" way. By small scale plant capacity below 1,5 MW is meant. However, following the indications that small scale hydropower plants

may be even more damaging to the environment than larger ones, this investment support has been (temporarily) cancelled.

(3) The current criteria for Bra Miljöval include only existing hydropower plants. As the share of hydropower in the Swedish electricity system is nearly 50 % this means that a large amount of the produced electricity can be, and actually is, classified as green. One argument against the Bra Miljöval scheme is that to promote investments in new green electricity production facilities this scheme must exhibit a very high penetration rate among customers. Until all hydropower is sold within the scheme there is little incentive to invest in other green electricity production. Also, the pricing policy for electricity sold with the Bra Miljöval label varies largely between suppliers. As the production costs of power from old hydropower plants is very low it can be argued that green electricity in Sweden should not have a higher price than other electricity (except to compensate for transaction costs).

5.2.3 Criteria and support for biomass

(1) Swedish bioenergy resources are large. Generally power generation from bioenergy is considered as having low environmental impact. It is anticipated that biomass will contribute a large share of the future energy supply in Sweden. A specific issue is how to consider the use of peat. Peat is not accepted in the Bra Miljöval scheme. However, it is argued by some that peat should be regarded as a renewable energy source as long as the rate of extraction of peat does not exceed the growth rate. Even if this criteria is currently fulfilled in Sweden, there are other non-acceptable environmental aspects, like emission of heavy metals at burning and impact on the biological diversity from the extraction stage. Interestingly, the power producers as represented by the Swedish Power Association, do not consider peat for green electricity production.

(2) Power production from biomass is supported by the Swedish state: investment in bio-fuelled CHP, either new plants or retrofit of existing heat production plants, is supported by about 350 ECU/kW_e.

5.2.4 Other general issues on certification criteria

(1) A kind of certification program available in Sweden is the Certified Environmental Product Declarations (EPD) which was launched for electricity in 1998. A certified EPD is based on information from a life cycle assessment (LCA) according to internationally accepted procedures following completed and upcoming ISO-standards for LCA. A declaration may include information about raw material acquisition, energy use and efficiency, pollutant emissions to air, soil and water, waste generation and other environmental impacts associated with the product. Information about the environmental management work at the importer, manufacturer or retailer may also be included. EPD's for electricity have been issued by some large producers, for example Sydkraft AB.

(2) The inclusion of LCA as a method to refine and streamline the criteria for green electricity seems to be considered as valuable both by producers and large consumers of green electricity. On the other hand most stakeholders consider LCA as being too cumbersome to include in practice. One exception is the organisation SIS Ecolabelling Board, which is a board appointed by the government and which leads the product environmental labelling work in Sweden (in co-operation with the other Nordic countries and as the second labelling organisation in Sweden besides the Bra Miljöval labelling). This organisation holds the view that LCA should be the base for environmental impact assessment in a European green electricity certification scheme.

(3) Requirements that the producer of green electricity should have implemented an Environmental Management Systems like EMAS or ISO14001 are generally not considered as important by most stakeholders even if some recognize its value. In contrast, there seems to be general support for requirements on producers/suppliers of openness in regard to information on environmental performance of power production facilities like emission data etc.

5.3 United Kingdom

(1) In the UK the Government awarded a contract to the Energy Saving Trust to launch an accreditation scheme for renewable energy schemes from electricity suppliers. The Trust was set up following the Rio Earth Summit in 1992 as part of the then Government's response to the challenge of meeting the (voluntary) CO_2 saving targets by the year 2000. It runs and oversees a number of initiatives throughout the UK designed to reduce CO_2 emissions, primarily for domestic and small business consumers. Its activities are overseen by a Board of Directors.

(2) The main objectives of the Trust were to:

- Confirm that suppliers' claims regarding the environmental credentials of particular tariffs are legitimate;
- Address customer confusion and provide customer reassurance that their adoption of a qualifying tariff will have a positive environmental impact;
- Help to develop the market for renewable energy in general and environmental tariffs in particular by promoting the scheme and stimulating customer awareness;
- Demonstrate Government support for renewable energy;
- Provide a means of identifying renewable energy to allow exemption from the Climate Change Levy (an form of Energy tax on business use of energy)

(3) The Trust held meetings and discussions with interested parties that included

- all of the Regional Electricity Companies that supply electricity in the UK,
- Independent Power producers

- The two large generating companies, Powergen and National Power
- Association of Electricity producers and Consumers Association
- NGOs such as Greenpeace, Friends of the Earth, WWF, RSPB
- Government bodies such as OFGEM, DTI and DETR
- Consumers and other interested parties

Electricity Supplier	Accredited Scheme	Type	RET included	Region	Target Customers
Eastern Energy	Eco-Power	Fund	Solar/Wind/Biomass	Eastern Region	Domestic
London Electricity	N/A	Supply	Energy from waste	National	Non-domestic
Npower	EverGreen	Fund	All Renewables	National	Domestic
Northern Ireland	Eco-energy	Fund/Supply	All Renewables	N.Ireland	All
Powergen	Green Supply	Supply	All renewables	National	Non-domestic
Powergen	GreenPlan	Supply	All Renewables	National	Domestic
Seeboard	Go Green	Fund	All Renewables	Seeboard Region	Domestic
Scottish & Southern Energy	ACORN	Supply	All Renewables	Southern ElectricRegion	Domestic
Scottish and Southern Energy	RSPB Energy	Supply/Fund	Hydro/Wind/Landfill/Sewage gas/Energy from waste	National	Domestic
Scottish Power Manweb	N/A	FundSupply	Hydro/Wind	SP and Manweb Regions	All
Scottish Power Manweb	Green Energy	Supply	Hydro/Wind	SP and Manweb Regions	Non-domestic
SWALEC	Green Energy	Supply/Fund	Hydro/Tidal/PV/landfill gas	SWALEC Region	Domestic
SWEB	Green Electron	Supply	Hydro/Wind/Landfill gas	England & Wales	All
Unit Energy Ltd	Unit (e)	Supply	Wind/Hydro	England & Wales	All
Yorkshire Electricity	Green Electricity	Supply	Wind/Biomass	National	All

Table 5-1: Green Electricity suppliers in the UK (Status May 2000).

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