Comparison of certification schemes for electricity from renewable energies in Switzerland

	Quality seal				Proof of origin schemes (HKN)
Description	*naturemade basic*	*naturemade star*	EE01 product	EE02 product	Proof of origin Switzerland, renewable
Logo	naturemade basic !	naturemade star !	TÜV SÜD	TÜV SÜD	None
Sponsor, sponsor's domicile[2]	Association for Environmentally Sound Energy (VUE), Switzerland		TÜV SÜD, commercial group, Germany		Federal government, Switzerland
Share in the Swiss market for electricity products from renewable energies[3]	29% (2015)	9% (2015)	21% (2015)		Mandatory HKN registration of plants > 30 kVA since 01/01/2013
Environmental criteria					
Hydroelectric power	• Compliance with life cycle assessment (LCA) threshold[4]	• Compliance with LCA threshold[4] • Comprehensive scientific criteria[5] re.: – Residual flow management – Hydropeaking management – Reservoir management – Bedload management – Plant design • For new plants: Prohibition of deterioration[6]	None	None	None
Handling of pumped-storage power[7]	Only electricity generated from natural inflows can be credited, not from pumped storage Calculation: analogous to HKN regulations in Switzerland		Only electricity generated from natural inflows can be credited, not from pumped storage Calculation: 100% deduction of a production volume equivalent to the pumping energy consumed		Only electricity generated from natural inflows, not from pumped storage
Photovoltaic systems	• Compliance with LCA threshold[4]	• Compliance with LCA threshold[4] • Not on greenfields	None	None	None
Wind energy	• Compliance with LCA threshold[4]	• Compliance with LCA threshold[4] • Protection of surroundings	None	None	None
Biomass[8]	• Compliance with LCA threshold[4] • Organic portion in waste incineration plants: only for energy-efficient waste incineration plants	• Compliance with LCA threshold[4] • Low ammonia and methane emissions • FSC label for wood • From waste	None	None	None
Energy supplier/producer criteria	• Environmental management system (after 5 years at the most) • Sustainable corporate policy		• Sustainable corporate policy	• Sustainable corporate policy	None
Promotion of ...					
... environmental improvements	None	Upgrade fund for bodies of water: 1 centime per kWh sold[9]	None	None	None
... renewable energies[10]	• basic funding scheme: Product currently contains at least 10% electricity in *naturemade star* quality or subsidised electricity (min. 6% in *naturemade star* quality, min. 2.5% from new renewables (solar, wind, biomass) in *naturemade star* quality; remainder redistributed electricity subsidised under the KEV scheme for compensatory feed-in remuneration); funding scheme subject to regular increases.[0]	None	• 30% from plants ≤3 years at the time of certification and <10 years at any time or • Funds of 0.2 cents/kWh or • Mix of various renewable technologies with minimum portions, commissioning after 01/01/2000	• For products sold subject to surcharges that cannot be attributed to eco-electricity quality, at least 75% of the surcharge must be paid into the fund; this also applies to EE01.	None
Credibility					
Independent auditors[11]	Independent, accredited auditors from professional testing institutes		Auditors recognised and appointed by the accredited TÜV SÜD Climate & Energy certification body		Independent, accredited auditors from professional testing institutes and arm's-length operators of distribution networks for plants ≤30 kVA
Civic society representation	Equal representation of environmental and consumers' organisations and the energy industry		None	None	None
Limited validity of certification/accreditation	5 years, annual review		3 years, annual review	3 years, annual review	5 years, annual review unless production data are reported automatically
Energy accounting					
Plant-specific declaration of origin[12]	Yes	Yes	Yes	Yes	Yes
Prevention of duplicate sales of added environmental value	Yes	Yes	Yes	Yes	Yes
Simultaneity of production and supply	1 year	1 year	1 year	max. 60 minutes	1 year

Comparison of certification schemes for electricity from renewable energies: How to read this comparison.

1 Fundamentals

1a Scope of comparison
This comparison includes selected major quality seals and proof of origin schemes (HKN) used in Switzerland for the production, trade and sale of electricity from renewable energies. It only takes into account electricity produced within Switzerland, as legal compliance requirements for the generation of electricity differ from country to country (see also 1b below). Whenever *naturemade* receives enquiries regarding the certification of electricity produced outside Switzerland it examines, for example, whether the relevant legal compliance requirements are on par with those in Switzerland or whether additional criteria need to be imposed. However, all of the quality seals listed here are also used outside Switzerland.

1b Legal compliance
All of the quality seals and proof of origin schemes listed require "legal compliance" as a fundamental criterion. Since this comparison only relates to electricity produced within Switzerland, the legal environment is identical for all of the quality seals included. If the comparison was to be extended to electricity generated in other countries, it should be noted that different countries of origin may have different legal compliance requirements, which could result in electricity from renewable sources being supplied in very different qualities.

1c Quality seals and proof of origin schemes
Quality seals and proof of origin schemes (HKN) are fundamentally different:
- Quality seals are voluntary quality assurance systems that are awarded based on clearly defined criteria.
- Proof of origin schemes have been mandatory in Switzerland for all electricity generated from plants with an output > 30 kVA since 01/01/2013. These schemes provide a guarantee that certain volumes of electricity have been produced from certain energy sources. Quality seals can be listed as ICS (Independent Criteria Schemes) on proofs of origin. Proofs of origin currently form the basis from which auditors verify the energy accounts prescribed under all quality seals.

However, this comparison includes both quality seals and proof of origin schemes, as proofs of origin for electricity from renewable energies are to some extent used as quality seals (declaration of origin, verification of no duplicate sales). The comparison is based on Swiss proof of origin schemes only. However, proof of origin regulations vary from country to country, as do other legal requirements that also impact on electricity quality (see also 1b above).

2 Sponsor and sponsor's domicile

2a The sponsor of a quality seal is the organisation that owns and manages the seal, defines relevant criteria and licenses the seal. Sponsors of quality seals can be companies, organisations, associations or governments. Quality seals are more credible if they involve a range of different stakeholders who are able to participate in defining relevant criteria (see also 11 below).

2b The "country of origin" of a quality seal is relevant to the extent that it partially explains particularities of different quality seals. The concept of what constitutes eco-electricity differs, for example, between Switzerland and Germany, as hydroelectric power accounts for most of the electricity generation in Switzerland.
- Swiss concept of eco-electricity: Eco-electricity is electricity from renewable energies, i.e. hydroelectric power, wind and solar energy, biomass and geothermal energy, that is additionally certified under the *naturemade star* quality seal or is of equivalent quality. The generation of eco-electricity must comply with comprehensive environmental criteria. This is particularly important for hydroelectric power: Power plant operators are required to go to considerable extra lengths and make payments into an environmental improvement fund in order to protect biodiversity.
- German concept of eco-electricity (found analogously in some German-language publications): Eco-electricity is generally understood to be electricity generated from renewable energies. Hydroelectric, wind and photovoltaic energy systems are largely uncontroversial in this regard, and electricity generated from biomass, geothermal energy and particularly efficient technologies is to some extent also included in this category, if it meets additional requirements.

3 Market shares

The market shares listed here relate to the market for electricity products from renewable energies. According to evaluations of electricity disclosure statements and eco-electricity surveys conducted by the Swiss Federal Office for Energy (BFE), about 15% of the electricity consumed in Switzerland is currently consumed in the form of renewable energy products.

4 Life cycle assessment thresholds

naturemade requires life cycle assessments for all energy systems, i.e. life cycle assessments must be produced for all energy systems to be certified under the *naturemade* scheme. A maximal environmental impact (life cycle assessment) threshold has additionally been defined: The environmental impact of a *naturemade*-certified production plant must not exceed half of the environmental impact of a modern combined-cycle gas-turbine power plant. This ensures that plants for the generation of electricity from renewable energies operate efficiently. With certain energy systems such as hydroelectric power, all relevant plants remain below this threshold, while plant-specific data need to be submitted for other types of plants (e.g. biomass plants) to verify that they remain below the threshold.

5 Criteria for aquatic ecology

The criteria for aquatic ecology under the *naturemade star* scheme have been defined to ensure that the environmental functions of bodies of water are preserved even with the use of hydroelectric power. The relevant, highly complex criteria are structured based on a so-called environmental management matrix in order to produce a simplified representation.
- 5 management areas: The management areas describe operational or structural impacts of the use of hydroelectric power: residual flow management, hydropeaking management, reservoir management, bedload management, plant design.
- 5 environmental areas: The environmental areas cover the most important aspects that are relevant for safeguarding the environmental functions of bodies of water: hydrological character, interconnections between bodies of water, sediment management and morphology, landscape and biotopes, populations.

6 Increased development of hydroelectric power generation

In many industrialised countries, above all in Switzerland, river systems are already impaired by the removal of water and/or other forms of water usage, which often have negative environmental impacts along the full river length. That is why the increased development of hydroelectric power with the construction of new hydroelectric power plants is not always environmentally desirable. For this reason, *naturemade star* applies the prohibition of deterioration principle to all new or newly expanded hydroelectric power plants: New plants can only be certified if they do not impair additional natural or near-natural habitats, populations or landscapes.

7 Handling of electricity generated from pumped-storage power plants

Pumped-storage power plants generate power from turbines driven by both water captured from natural inflows into water reservoirs and water pumped into the reservoirs specially for this purpose. Under proof of origin schemes, electricity can only be traded as electricity generated from renewable sources if the respective volume has been generated from natural inflows into reservoirs or water pumped into reservoirs using electricity from renewable sources. Where water is not pumped using electricity from renewable sources, the respective additional production volume must be deducted. Since the pumping process consumes more electricity than can subsequently be produced from the pumped water, somewhat less than the pumping energy needs to be deducted from the total energy produced from the reservoir. naturemade bases its calculation of this overall deduction on the relevant proofs of origin, which also require this deduction. TÜV SÜD takes a conservative approach and deducts 100% of pumping energy.

8 Criteria for biomass utilisation

In recent years, the increased use of biomass for energy purposes has given rise to various conflicts, depending on the type of biomass used. As a consequence, several quality seals and laws now define environmental criteria for biomass, in particular the source of the biomass used. Switzerland does not promote the cultivation of biomass crops (i.e. renewable resources such as maize or cereals) for energy production.

The life cycle assessment of naturemade-certified biogas plants mainly concerns the plant's energy efficiency, methane leakage, the type of fermented substrates and their transport miles. The naturemade criteria for biomass plants additionally ensure that plants are operated responsibly in terms of factors including landscape protection and minimal odour and noise emissions.

9 Promotion of environmental improvements

naturemade star requires hydroelectric power plants not only to comply with criteria for aquatic ecology (see 4 above), but also to establish environmental improvement funds for plants with outputs of >100 kW. These funds are used for measures such as the revitalisation of bodies of water, the creation of new interconnections between bodies of water and the establishment of new aquatic and terrestrial habitats.

Funds are primarily used for environmental improvements of the affected bodies of water (not only in stretches covered by licenses) and their hydrological catchment areas. If no first-priority measures can be identified, environmental improvements of other bodies of water or at-risk habitats of non-aquatic flora and fauna may also be funded. The allocation of funds is decided on by a local/regional body comprising representatives of the relevant power company, authorities and environmental organisations.

10 Promotion of new renewable energies

The increased development of plants generating electricity from new renewable energies is one of the core aims pursued by quality seal schemes. There are essentially two types of funding models:
- Financial support by establishing a relevant fund, where surcharges on electricity products are used to fund the construction of new power plants (TÜV EE01)
- Support by integrating new plants in the electricity supplier's electricity product (naturemade basic, TÜV EE01)

11 Credibility

The credibility enjoyed by quality seals depends on various factors, including the quality of relevant criteria, the independence of auditors, the institutional design of the quality seal and transparency, among others. This comparison includes not only the criteria described above, but also three additional criteria as indicators of the credibility of a quality seal:
- Auditors' independence (is the audit conducted by an independent third party?)
- Civic society representation (is this aspect integrated with the quality seal design and the definition of relevant criteria, for example?)
- Limited validity of certification (are regular, detailed reviews conducted to ensure that quality seal criteria continue to be complied with?)

12 Energy accounting

It is not always possible to supply selected electricity qualities directly from power plants to consumers' power points. The image of an "electricity pool" helps illustrate how it is ensured that the qualities selected and paid for by customers are in fact produced in the relevant quantities: All of the electricity generated, whether from renewable energy sources or conventional processes, is combined in this pool, and all consumers are supplied with electricity from the pool. Energy accounting ensures that inflows into and outflows from the electricity pool match the electricity qualities in the volumes produced and sold.

The introduction of proof of origin schemes for quality seals has simplified the process of verifying energy accounts (see also 1 above). However, quality seals additionally provide for energy accounts to be verified by an independent third party.