

Recently a number of documents on climate change have been published that have received worldwide attention in the media, which claim that today there is convincing evidence that global climate change is really under way and will, within a few decades, pose a serious threat to the environment and basic resources needed by mankind for its survival.

Al Gore

Former US vice president Al Gore's "An inconvenient truth", the Stern Review, documents by the UN climate experts IPCC as well as the European Commission, all of them point to the urgent need to take action to reduce greenhouse emissions to avoid the worst scenarios of climate change and limit the impact on human life.

Stern review

Most media attention seems to have been given the Stern Review, where British economist Sir Nicholas Stern urges politicians, other decision-makers worldwide and the international community to start acting without any further delay, to reduce the emissions. Stern maintains that early action will by far outweigh the long-term costs of not acting at all. He is confident that even if the impact of climate change cannot be avoided, it can be limited by strong and early action, and if efforts are shared by all countries – rich and poor – there will still be room for future economic growth, both for developed and developing countries.

EU strategy

The strategy of the European Union to meet the challenge of climate change, while at the same time securing en-

An effective system to promote more bioenergy

The electrical certificate

The information two issues ago regarding the system with electrical certificates resulted in several inquiries so we asked one of the experts Mr. Lennart Göhl in the Swedish Energy Authority to give us some more information. The certificates has proven to be very efficient to promote the investments in new power production capacity. He also gives some numbers regarding the paid price of the bought certificates.



ergy supply and promoting competitive energy markets and stimulating economic growth, is to propose an ambitious plan to reduce greenhouse gas emissions by at least 20 percent before the year 2020.

The European commission will promote higher energy efficiency and the use of renewable energy sources, such as biofuels in transports, biomass for heating and e.g. wind power and biomass for power generation.

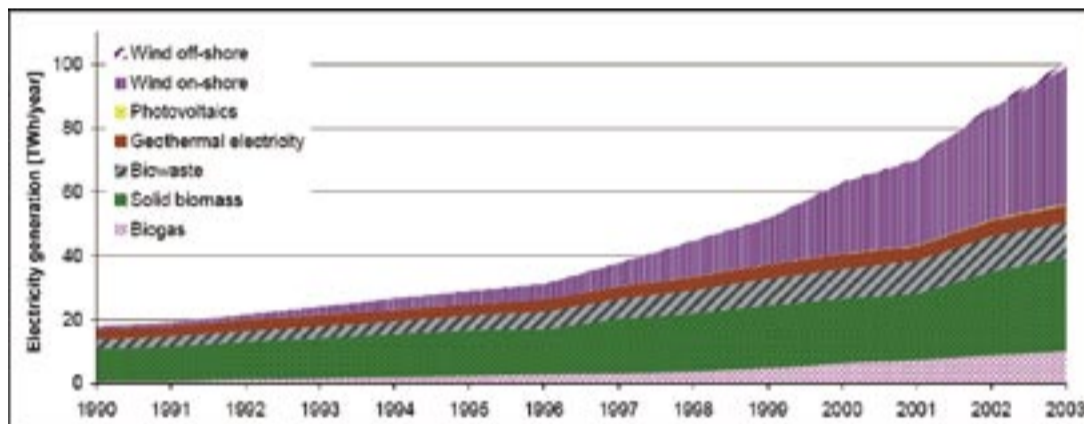
EC Directive

The support of renewables for electricity generation is based on the Directive 2001/77/EC of the European Parliament and the Council and its implementation has been assessed and evaluated in a communication from the Commission in 2005.

Support systems

The main support systems that have been used in the member states, often in combination, are as follows:

- (1) **Feed-in tariffs:** used in most member states
- (2) **Green certificates:** used in several countries, i.e. Sweden, UK, Italy and the Netherlands
- (3) **Tendering procedures:** in a few countries, combined with



other tools

(4) **Tax incentives:** usually in combination with other tools.

Due to largely different national backgrounds and discrepancies in the politico-economic framework, there are considerable variations in how different member states have implemented the 2001 Directive on electricity from renewable energy sources.

The Commission concludes that in the short term, a harmonization between the member states is unlikely. Currently, the aim is to encourage the implementation of the national schemes and the cooperation between member states. In the long run, however, a harmonization of the different supports systems will facilitate the creation of a system (market

for green certificates on the European level, render possible one single feed-in tariff for the entire European Union, and thus make electricity based on renewable energy sources more competitive.

Two most important systems

The two most important and effective tools used by EU member states to support power generation from renewable energy sources are feed-in tariffs and electricity certificates.

In a system with **feed-in tariffs**, power producers of RES-E (electricity from renewable energy sources) are paid a special price, fixed for a period of several years, which is passed on by suppliers to end-users (consumers).

In a system with **electricity (green) certifi-**

cates, power producers of RES-E obtain certificates for the generation of green power according to the volume: usually one certificate per MWh.

The consumers (or suppliers) are obliged to buy a number of certificates, corresponding to a certain percentage (quota) of their consumption (volume), the so-called quota obligation.

If they do not comply with this obligation, they must pay penalties.

Thus, a supply and demand situation is created, and a secondary market for certificates can develop.

When evaluating the effectiveness and cost efficiency of the two support systems, and also the level of support given by various EU member states to

renewables like biofuel and wind power, it is necessary to underline that the national energy resources can vary very much between the different states.

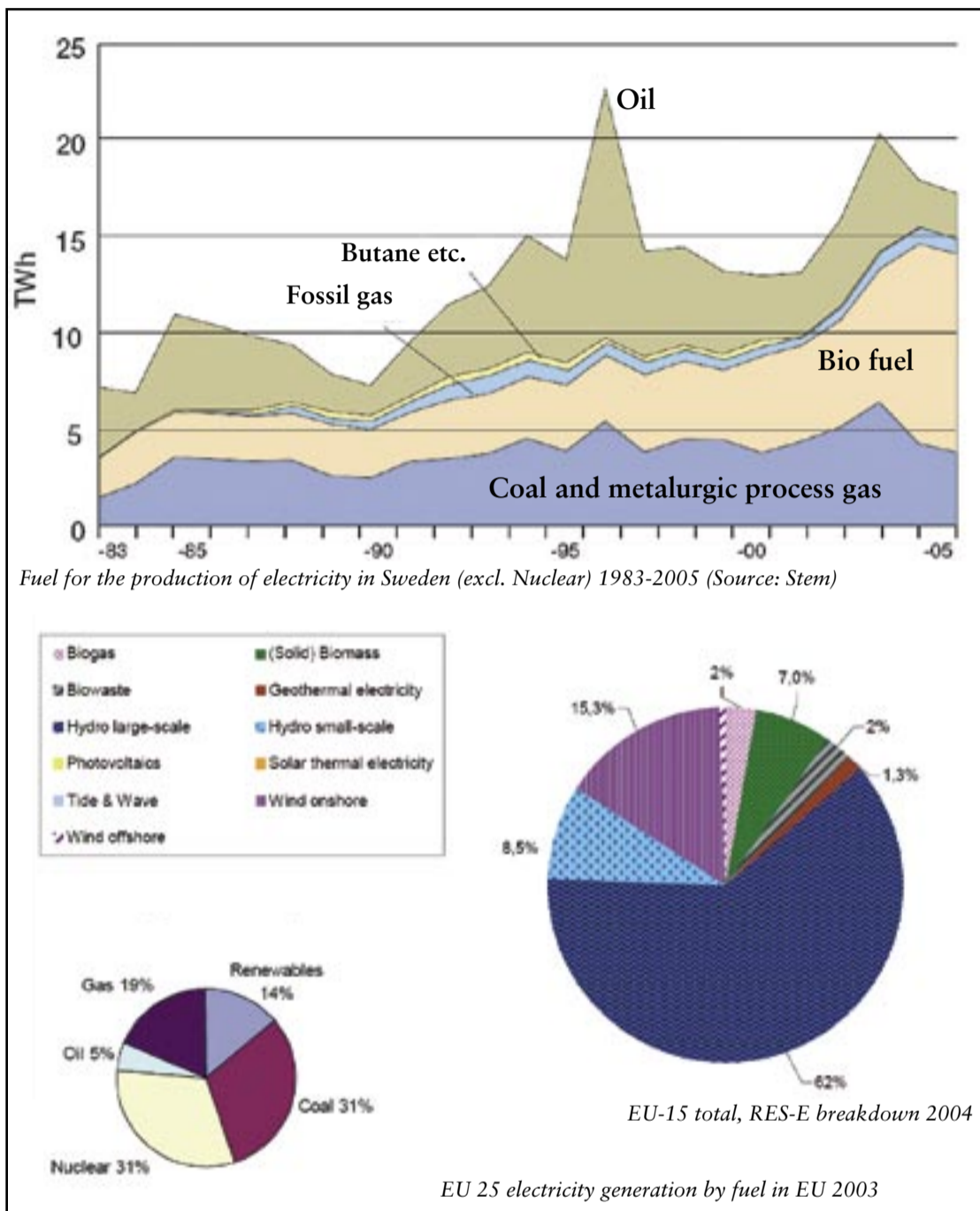
And so does the level of the support to RES-E. Wind power is better supported by most EU member states than biofuel, to cover the additional generation costs.

You get what you ask
An assessment of the effectiveness of the various support systems depends of the criteria used.

If e.g. the building of more wind power capacity is the foremost priority, the feed-in tariff system seems to show the best results so far in leading wind power countries like Denmark, Germany and Spain.

Feed-in tariffs, however, imply a higher risk

Certificates



Fuel for the production of electricity in Sweden (excl. Nuclear) 1983-2005 (Source: Stem)

of over-funding of RES-E than a market-based system like green certificates, which in turn represents a higher risk for investors.

The experience of the green certificate system is shorter than of feed-in tariffs, and thus less conclusive.

Biomass

In the case of biomass, the picture of the effectiveness of the various support tools is more complex. The forestry resources vary considerably between the European countries: differences in sources, differences in processing, size of power plants, cost

level etc. are creating very different conditions in different countries.

Northern Europe

In Northern Europe, however, where a high potential of forestry biomass is available, and due to the cold climate, district heating has an important share in energy supply, combined heat and power generation (CHP) can improve the competitiveness of biomass considerably.

In Sweden, where bio-fuels represent 75 percent of the RES-E, the green certificate system has been quite successful, and this market-based solution to RES-

E support has resulted in a rapid expansion of biofuel-based CHP generation capacity.

Introduced 2003

The green certificate system was introduced in Sweden in 2003, replacing the previous government subsidies and investment support.

The green certificates are a market-based solution, aiming at long-term stability and predictability for investors and competition between renewable energy sources.

One certificate for each MWh

Producers eligible for the certificates and with

plants approved by the Swedish Energy Agency – with generation based on wind, solar, geothermal, bio, wave, peat and certain hydro power – obtain one certificate for every MWh power produced.

The certificates are issued every month by Swedish Grid (the national electricity system operator) and electronically registered.

The quota obligation for consumers, to buy a certain percentage (quota) of their power from renewable power producers, is taken care of by the suppliers. They must submit a declaration of the volume sup-

plied during a year to the Swedish Energy Agency, and buy green certificates corresponding to the quota for that year.

At the end of March each year, a sufficient number of certificates must be available on their account.

Non-compliance is penalized, requiring the supplier to pay 150 percent of the average certificate price of the previous year, for every certificate missing.

Certificate price may double the income

The average certificate price has usually been between 50 and 100 percent of the power market spot price, which means the renewable power producers will get up to twice as much for every MWh compared with producers of non-renewable power.

24 Euro/MWh

With an average certificate price of 216 SEK (24 Euro), and over 10 million certificates issued, the additional revenue in 2005 for producers of RES-E amounted to 2.2 billion SEK (240 million Euro).

99 percent buys certificates

Fulfilment of the quota obligation rapidly reached the level of 99 percent.

Quota 15 % in 2007

In 2007, the quota will be 15 percent, and of Swedens total electricity production of 150 TWh, almost 11 TWh came from renewable production eligible for green certificates in 2005, an increase by 4.2 TWh from 2002.

More than 2/3 of the green certificate power comes from biofuels.

CHP a success

A real success story in Sweden are the CHP power plants, where the energy efficiency is considerable higher than in other biofuel plants,

since heat is used for district heating.

There is a considerable potential for further expansion of CHP plants. Today's generation from biofueled power plants corresponds to 6 or 7 percent of the total Swedish power production, but may soon approach 10 percent if the current trend of biofueled CHPs will continue.

During the first years of the green certificate system, existing CHPs replaced the fossil components by biofuels. Now several new CHP plants based on biomass are planned or under construction.

Adjusted rules and now prolonged until 2030

The green certificate system has proved to be a well-functioning tool to promote renewable energy sources in Sweden, and from January 2007 the legislation has been amended, prolonging the system until 2030 and raising the level of ambition from increasing RES-E by 10 TWh from 2002 to 2010, to 17 TWh by 2016, or 12 % of Swedens total power consumption.

In order to increase the efficiency of the certificate system, the quota obligation will be handled exclusively by the suppliers (previously individual consumers could handle it). To avoid over-funding RES-E, a renewable producer will obtain certificates during at most 15 years.

The certificate cost is no more required to be indicated separately on consumer bills. This will enable consumers to better compare the total price of suppliers and also serve as a driver for further cost efficiency and lower administrative costs in the system.

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