EREF

European Renewable Energies Federation

WORLDWATCH INSTITUTE

REFLECTIONS ON A POSSIBLE UNIFIED EU FINANCIAL SUPPORT SCHEME FOR RENEWABLE ENERGY SYSTEMS (RES):

A COMPARISON OF MINIMUM-PRICE AND QUOTA SYSTEMS AND AN ANALYSIS OF MARKET CONDITIONS

EREF's position regarding enactment of a unified financial support scheme for the promotion of renewable energies in the "Europe-25"- With analysis and contributions from the Worldwatch Institute

Authors:

Dörte Fouquet,
Claudia Grotz,
Janet Sawin,
Nikos Vassilakos

Brussels and Washington, DC
January 2005

Summary

We urge the European Commission to practice caution and restraint when preparing a proposal for a unified support scheme in the enlarged European Union, keeping the following observations and recommendations in mind:

- *To date, minimum price systems with guaranteed prices have been most successful at increasing rapidly the share of RES-based electricity, and promoting economies of scale in production and learning. They are well established and accepted in a number of EU member states. This report disproves the many arguments against feed-in systems, demonstrating that they can, in fact, bring about large-scale implementation of RES more rapidly and cheaply than can quota systems.*
- *Some member states have just introduced their own systems and need time to prove the viability of these systems to ensure investor confidence.*
- *Any harmonisation must take into account that minimum-price systems, such as the German or Spanish systems, are not state aid schemes in the light of Article 87 of the EC treaty. Therefore, even if a harmonized system is adopted, under the EU rules of competition, Member States that currently have minimum-price systems would not be required to abandon these systems since they do not fall under the competition rules.*
- *The European Commission must significantly increase its focus on existing market distortions that result from open or hidden subsidies to the traditional electricity market and conventional energy sources, and must encourage better calculation and internalisation of external costs into the pricing of electricity.*
- *A better use of EU structural fund regulation that favours investment in RES projects and a clear group exemption for various support schemes for RES technologies may better foster further increases in investment than will any harmonisation of the major support schemes in Europe towards a single "one fits all" system.*
- *Finally, the European Commission should require more ambitious and binding targets for the increase of RES-based electricity combined with measures to considerably decrease overall electricity consumption and increase efficiency.*

Introduction

EREF, the European Renewable Energies Federation, as the European umbrella organisation for national associations of small and medium sized producers of electricity from Renewable Energies, can rely on several years of hands-on experience with different financial support schemes. EREF monitors the market regularly, in regard to the capability of the Member States to reach their targets according to Article 3 of the Directive and in reviewing the various prices per kWh for electricity from renewable sources in the different Member States.

The Worldwatch Institute is a non-profit organisation that works to promote a more socially just and environmentally sustainable world, and it has a long history of work in the area of renewable energy technologies and policies. Its staff played a major role in the International Conference on Renewable Energies in June 2004, including writing of the background paper on "National Policy Instruments", and co-drafting the policy recommendations document—one of three concrete outcomes of the conference.

EREF would like to submit to the European Commission its arguments and recommendations, with input and analysis from the Worldwatch Institute, regarding the possible harmonisation via a "one-fit-all" support scheme for RES in Europe.

A Basic introductory points

Firstly it seems important to recall the conditions and specific situation and main objectives when EC Directive 2001/77/EC was introduced.

The European Directive 2001/77/EC of the European Parliament and the Council on the promotion of Renewable Energies in the Common Electricity Market entered into force on 27 September 2001.

The Directive underlined that it would be "too early to decide on a Community-wide framework regarding support schemes, in view of the limited experience with national schemes and the current relatively low share of price supported electricity produced from renewable energy sources in the Community."[1]

According to Article 4 of the Directive ("Support schemes"), and directly linking to the European Community Treaties' (ECT) regulations on state aid, the European Commission "shall evaluate the application of mechanisms used in Member States according to which a producer of electricity, on the basis of regulations issued by the public authorities, receives

[1] See introductory remark N. 15 of Directive 2001/77/EC.

direct or indirect support, and which could have the effect of restricting trade, on the basis that these contribute to the objectives set out in Articles 6 and 174 of the Treaty," meaning the question of protecting and enhancing the environment. Moreover, "the Commission shall, not later than 27 October 2005, present a well-documented report on experience gained with the application and coexistence of the different mechanisms referred to in paragraph 1. The report shall assess the success, including cost-effectiveness, of the support systems referred to in paragraph 1 in promoting the consumption of electricity produced from renewable energy sources in conformity with the national indicative targets referred to in Article 3(2). This report shall, if necessary, be accompanied by a proposal for a Community framework with regard to support schemes for electricity produced from renewable energy sources."

Any proposal for a framework should, according to Article 4 of the Directive 2001/77/EC:

(a) contribute to the achievement of the national indicative targets;
(b) be compatible with the principles of the internal electricity market;
(c) take into account the characteristics of different sources of renewable energy, together with the different technologies, and geographical differences;
(d) promote the use of renewable energy sources in an effective way, and be simple and, at the same time, as efficient as possible, particularly in terms of cost;
(e) include sufficient transitional periods for national support systems of at least seven years and maintain investor confidence.

Point 1: Reliable cost analysis for all energy sources should be top priority

Eref is opposed to a harmonised RES support scheme in Europe that is not "feed-in" based. It is crucial that the unified Europe avoid enacting a harmonised RES support scheme that is not minimum-price based, for as long as the market share of RES-based electricity is still far from the critical mass that is necessary to overcome market barriers. Market distortions associated with the traditional energy sector remain high and must be eliminated before a support scheme based on tradable certificates can be introduced in an open electricity market.

There is no real basis for comparing renewable energy costs and market prices to those of the traditional fuel sector until or unless all true costs—including externalities—are incorporated into the price. Therefore, we request that an evaluation and internalisation of electricity costs be conducted under the supervision of the European Commission, and that it consider all important costs and price-related mechanisms. The European Commission must acknowledge existing studies and must correct severe shortcomings in some of these studies, even in detailed studies such as the "Extern-E"[2]—particularly with regard to the nuclear power sector. In addition, further analytical work still needs to be done.

In this respect, EREF is specifically critical of important parts of the recent report of the European Environmental Agency (EEA) in Copenhagen on subsidies in the energy sector for several reasons[3]. First, the Agency failed to contact EREF for consultation before publishing its results, even though the report states that its outcome is partly based on "cross-referenced information from EREF"[4]. Second, the primary source for renewable energy support schemes and their evaluation in this EEA report is a study published by Eurelectric[5]. EREF disagrees with many of the statements and conclusions of the cited Eurelectric report, and regrets that EEA relied on it so heavily. The report represents the one-sided view of the dominant utilities in Europe and fails to include other perspectives. This is ironic considering the fact that the same EEA report underlines that utilities have played little role in the production of electricity

[2] Important EU funded research study undertaken over the past 10 years, has proven that the cost of producing electricity from coal or oil would double and the cost of electricity production from gas would increase by 30% if external costs such as damage to the environment and to health were taken into account. It is estimated that these costs amount up to 1-2 % of the EU's Gross Domestic Product (GDP), not including the cost of global warming. They have to be covered by society at large, since they are not included in the bills which electricity consumers pay. The EXTERNE project, which was undertaken by researchers from all EU Member States and the United States of America, was designed to quantify these socio-environmental costs of electricity production. It is the first research project ever to put plausible financial figures against damages resulting from different forms of electricity production (fossil, nuclear and renewable) for the entire EU; for details see: http://www.externe.info/.

[3] EEA Technical report, Energy subsidies in the European Union: A brief overview 1/2004.

[4] See Footnote 14 on page 13 of the EEA Technical report.

[5] FN 14 EEA Technical report.

from renewables sources to date, and that the RES market is driven predominately by small and medium-sized entrepreneurs and companies.

Point 2: Nuclear power has distorted the European electricity market

Concerning nuclear fuel, the aforementioned EEA report does not list all costs accrued in the use of nuclear power, including the costs for future dismantling of old installations, costs of waste disposal, and potential costs of a large-scale nuclear accident. Only in a footnote[6] does it acknowledge that the question of safe final disposal is not yet resolved. And even here it does not list the enormous costs related to the waste disposal and waste storage sector of nuclear power that are incurred by Member States.

To its credit, the report rightly reflects that existing fossil fuel and nuclear generators have lower marginal costs than new renewable technologies and are better able to manage the "downward price pressures" specifically because they were established with significant amounts of public money and have benefited from favourable depreciation of their assets. To some extent, the EEA report stresses that electricity prices in the EU-15 reflect only the marginal costs of production from existing capacity and do not include a contribution to the capital cost of the capacity used (or to the capacity that will be needed to replace it when it is retired). This fact, coupled with volatile energy prices, has created barriers to private investment in new capacity, resulting in falling reserve margins in a number of countries compared with those of the 1990s, as the replacement of old capacity lags behind retirement.[7]

However, the EEA report then shies away from internalising this conclusion into its overview of support schemes and its cost tables It explicitly underlines the following, concerning on-budget support to nuclear energy that comes from R&D grants by Member States (mainly France, Germany and Italy) and the European Community: "The figures in Table 2 exclude the potential cost of not having to pay for full-liability insurance cover for a critical nuclear accident or fuel incident since commercial and state liabilities are limited by international treaty. This risk would be too large to be commercially insurable."[8] The report then mentions only in a footnote that "the calculation of externalities from nuclear power excludes mortality and morbidity associated with human exposure to high-level nuclear waste and the contribution of civilian nuclear power programmes to the risk of nuclear proliferation and terrorism, all of which have been considered too difficult to value."[9]

[6] See Fn 4 of the EEA report: "The question of how to safely store long-lived radioactive nuclear waste remains unresolved".

[7] According to EEA report, page 8

[8] See ibid, page 14.

[9] See ibid, , page 17, Footnote 17.

In the same way, the risk of nuclear power accidents has not been fully priced. The EEA report itself indicates that according to Oosterhuis' report there have been various estimates of the economic cost of a large-scale nuclear accident, ranging from EUR 83 billion to EUR 5469 billion. However, liability for nuclear accidents is currently limited by the Paris (1960) and Vienna (1963) Conventions and the Joint Protocol (1988). Liability can be as little as EUR 6.5 million for a single nuclear operator, and EUR 390 million for national public liability. "This could mean that 'The risks associated with the use of nuclear energy (…) are socialised, because the producers are not fully liable for the damage' (Irrek, 2002)."[10]

The consequences of a nuclear accident are so great that nuclear power stations can be operated only because they are practically uninsured. In 1992, the German Ministry of Economy asked the well-known Prognos Institute of Switzerland to evaluate such costs. Prognos estimated that the cost of a nuclear disaster would be about €5,5 trillion. No commercial enterprise would provide that kind of insurance coverage. The Prognos Basel study also estimated that the price of nuclear power would rise to about 51 euro cents per kilowatt-hour if its insurance coverage were adequate[11].

Moreover, the estimates of costs for nuclear waste disposal over the entire period of its hazardous operation must be added. Currently, the tables for different externalities in the EEA report do not reflect any of these huge cost factors. As a result, the report provides incorrect and misleading signals about the cost of nuclear relative to renewable power. Nuclear power is portrayed as being a "cheap" energy source against which renewables are simply too expensive to compete. The data on all nuclear costs must be made available by operators and the respective public national and international agencies. Clearly, all external costs must be integrated into cost evaluations of the different energy sources in order to improve the accuracy of data in all relevant EEA tables and figures.

Concerning investment in new nuclear power utilities, EREF has identified severe and apparently illegal ongoing distortion of EC competition and other rules by several member states with regard to nuclear power. Specifically, these distortions have occurred in connection with the purchase of a new EPR (European Pressurised Water) nuclear reactor by the Finnish electricity utility TVO, to be delivered by FRAMATOME/SIEMENS. In order to clarify various points of possible infringement of European law, EREF filed a complaint to the European Commission in December 2004[12]. Such violations make it clear that some

[10] See ibid.

[11] for details see Prognos-Schriftenreihe Identifizierung und Internalisierung Externer Kosten der Energieversorgung, Band 2, 1992, Prognos-Gutachten im Auftrag des Bundeswirtschaftsministeriums, von Ewers/Rennings.

[12] The complaint filed by EREF and currently under official investigation by the European Commission calls attention to possible infraction of EU state aid, export credit, procurement, safety and other regulations. The document lists German, French, Swedish and Finnish entities in probable violation of EU laws and the Governments in those countries for having authorised such transactions. The widespread and complex

Member States still treat nuclear power as if it were not part of the overall electricity market, or as if the nuclear industry were somehow exempt from liberalisation of the electricity market

Another issue that must be addressed in order to achieve a better level playing field is the problem of utilities' tax-free nuclear reserve funds that are available for the future dismantling of nuclear power stations. Such funds are estimated to amount to more than 50 billion euro in Germany alone, and enable utilities with nuclear power to shop all over Europe, thereby having a significant advantage in the marketplace over independent non-nuclear power utilities aiming to develop new capacity, including those switching towards renewable energy sources.[13]

Point 3: Harmonisation cannot be forced upon non state aid-support systems

The European Commission should recognise that adoption of a unified state aid-based system, such as a quota system, for the whole of Europe would not necessarily affect Member States that do not have state aid-based support schemes, such as most feed-in/minimum price systems. It would oblige only those states that currently have state aid-based systems. This is because a harmonised support scheme that is not "feed-in based" (minimum price) would not have to be followed by those Member States which to date do not regulate RES electricity production and market penetration through state aid-based subsidy systems.

When various European institutions discussed the draft Directive 2001/77 in early 2001, the European Court of Justice case Preussen Electra versus Schleswag (C –379/98) was still undecided. The Commission, especially DG IV/COMP, believed strongly that minimum-price systems constituted state aid in the sense of Article 87, 88 ECT. However, in March 2001, the ECJ ruled that the German minimum-price system is not a state aid system according to Article 87, 88 ECT. This ruling created divergent views within the European Commission and, thus, the ruling's consequences were not included in the Directive. But the clear legal consequence of this ECJ ruling is that even if the Commission were to propose a harmonised state aid-support system for the European Union, in line with the state-aid based approach of

transactions involve not only the Finnish power company, but also a Franco-German industrial enterprise and public and private financial or export credit guarantee institutions in both countries, and probably in Sweden as well. The complaint also underlines that, contrary to EU law, none of these states gave advanced notice to EU authorities of any incidents of state aid—in the form of low-interest loans, export credit and other advantages—for the purpose of prior examination; nor did states provide notification in connection with the authorisation procedure according to Article 41 Euratom Treaty.

[13] At present, D. Fouquet represents several German municipal power suppliers before the Court of First Instance of the European Communities against the European Commission in an annulment procedure concerning the question whether or not these tax free reserve funds constitute state aid (Court case T-92/02 Stadtwerke Schwäbisch Hall GmbH et alia against Commission of the European Communities).

the Directive 2001/77/EC, Member States with minimum-price systems would not have to move away from their market-based approaches to state aid systems. So, Europe will in such a case always face at least two different support schemes a EU promoted state aid based quota system and the non state-aid minimum price schemes of various Member States.

The European Commission's recent report titled "*The share of renewable energy in the EU,"* evaluates the EU-15's progress toward achieving the 2010 target of 22% of electricity consumption from renewable energy sources and the overall target of a 12% share of renewable energy use for all purposes. It concludes that: "*Only a few Member States have until now implemented an attractive framework for renewable energy sources. In view of the meagre results so far the Commission calls on Member States to ensure the fulfilment of the 2010 targets by the implementation of appropriate measures."*[14]

According to the Commission's own evaluation, Europe (based on EU-15 prognosis) with existing national policies and measures will achieve a share of only 18-19% of renewable energies in total electricity consumption, instead of the 2010 target of 22%. "The analysis shows that only four Member States (Germany, Denmark, Spain and Finland) are on track to achieve their national targets." The biggest RES growth is being realised in Germany and Spain, both countries with minimum-price systems, and in Denmark, which traditionally operated under such a system.

Concerning the wind energy sector, the Commission's report explicitly states: "It has been estimated that investments of € 10 to 15 billion per year are necessary to achieve the 12% target in the EU15. These investments can be provided by the public sector, but will have also to be supported by the private sector. Therefore, the success of wind energy in three Member States (Germany, Spain and Denmark) must be applied to the rest of the EU, including feed-in tariffs, green certificates, market based mechanisms, tax exemptions…."[15]

Therefore even the EU Commission via its documentation and evaluation seems to favour the minimum-price system and point to its success in promoting RES. In fact, EU documents themselves underline that, without this type of system, Europe would not come anywhere close to even the 18-19% share.

It should also be stressed that overall Energy Policy as such is not determined by the Community, but remains at the sole discretion of Member States. And clearly there is still much to be done on the level of Member States. Therefore, the Commission and Institutions at the European level should strongly encourage Member States to be more active in promoting advanced RES technologies and applications, and in removing obstacles to investment and development at the national level—including subsidies to conventional

[14] See press declaration IP/04/ Brussels, 25 May 2004 Renewable energy: Commission calls for a stronger commitment of Member States to achieve the 2010 targets.

[15] Ibid.

energy. It is especially important that they demand quantitative targets that are binding. At the same time, it is essential to respect the different historical paths and rules of public support schemes in the various Member States. Existing laws are based on divergent national traditions and philosophies of active state policies, and are often carefully moulded into overall social instruments of public policy and programmes.

We strongly recommend that the Commission encourage Member States to enact more ambitious and binding targets and to increase energy efficiency in order to prevent further increases in climate changing emissions. We also underline the necessity for the provision of clear and reliable signals to financing institutions and investors in general regarding the viability and duration of support schemes in the various Member States.

Finally, we encourage Member States to join forces—with their neighbouring States, in particular—to develop models of common approaches for ultimately combining their support schemes.

Point 4: It is time to give priority and weight to RES investment through the European structural funds and to enact group exemptions for state aid to the renewables sector

EREF welcomes recent arguments from the European Commission favouring a stronger support for RES development within the framework of the EC structural funds for the next programming period, which will run from 2007 to 2013. These funding instruments – Structural Funds and Cohesion Fund – provide billions of euro in development funds for many EU countries.

EREF certainly encourages the European Commission to elaborate a regulation on group exemptions for renewable energies. This would help to facilitate direct state support for RES technologies that still need an extra financial push to get into the market, such as photovoltaic technologies. At present, the Commission must be notified of all proposed aid or market support schemes for renewable technologies, and must receive approval before moving forward.

During the discussion in 2000/2001 on the first drafts of the new Guidelines on State Aid for the Environment[16], the Commission considered the introduction of a regulation for a *group exemption for state aid for renewable energies.* Under the "group exemptions", as long as the State aid fits all the terms of the exemption, the funding body is not required to undergo the full notification procedure or to await Commission approval. It would only need to provide

[16] Published in: *Official Journal C 37, 03.02.2001, pages 3-15.*

the Commission with summary information on the scheme and to submit annual reports on all activities under the scheme.
This "group exemption" could be a very helpful means and a strong positive signal for advancing Renewables, thereby helping to reach the RES Directive's targets faster. It would mean that all state aid to RES technologies would benefit from facilitated administrative rules.

B Evaluation and comparison of minimum-price/feed-in and quota support systems

The minimum-price system is characterised by a legally determined minimum price and an obligation on the part of the grid operator or utility to purchase "green" electricity. In contrast, the key components of quota schemes are government mandates for specified groups of market participants to purchase or sell a minimum quantity of capacity or amount of electricity from renewable energies. The government allocates certificates in order to ensure compliance with the mandated quantity. Bidding models also exist, under which renewable electricity producers compete in individual bidding rounds to cover a previously determined quantity contingent. The winning bidders then receive a fixed-term purchase guarantee for the electricity they generate.

Since quota based models have only very limited outcome in installed capacity so far and are still more on the level of a "quantité négligeable", comparison of the two systems is difficult. But since discussion in Europe suggests that quota systems have a certain standing, as outlined above under Part A, the following analysis will compare both systems and their effects. In the paragraphs that follow, we analyse the most important issues, parameters and arguments related to the two basic alternative RES financial-support schemes—minimum-price and quota—as they pertain to the ongoing debate in individual Member States as well as at the EU level. These issues include installed capacity, price of renewably-generated electricity, share of capacity or generation achieved, prevention of windfall profits, financial security, technological innovation and social benefits, geographic distribution, technological diversity, ease of policy implementation, and flexibility.

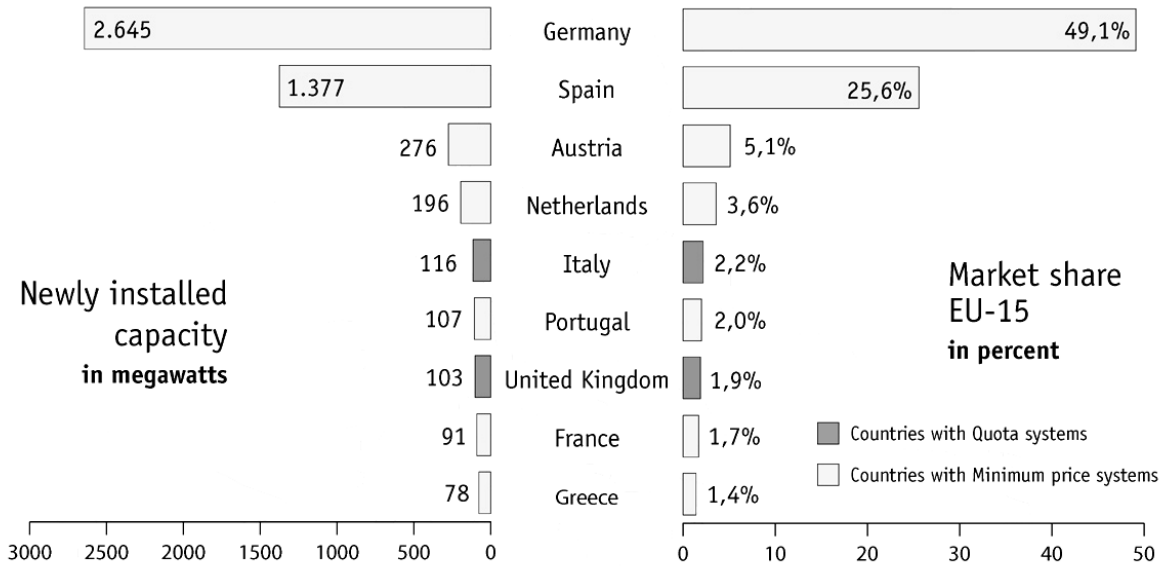
Issue number 1: Installed RES capacity

Government policy plays the most important role in determining a country's success with the development and use of renewable energy technologies and markets, and regulatory systems—or financial support schemes—have been the most important component. At the same time, the total RES capacity installed in a given country is a function not only of the financial-support scheme applied on the national (or even regional) level, but of other

important factors as well. These include the overall size of the country's technically and economically exploitable RES potential (wind, small hydro, biomass, solar, etc.), the specific RES licensing and spatial planning procedures that are required (and their resulting administrative problems, obstacles, delays), the possible co-existence of other fiscal incentives for renewables (tax breaks, etc), and the length of time that a given RES support system has been in effect. It is for this reason, that the annual growth rate of RES capacity is a more representative parameter than total installed capacity for comparing the success of various policy types.

When the annual growth rates of wind energy are examined, those countries with minimum-price schemes for grid electricity—within Europe and across the globe—are clearly at the top: in 2003, Germany, Spain and Austria recorded the highest figures in newly installed capacity (see graphic below). Eighty percent (80%) of the newly installed capacity in the EU–15, in 2003, was realised in these three countries. Denmark, Europe's wind pioneer, is also among the leaders. Denmark was the first country to enact a minimum-price scheme, which has been, until a fundamental change in Danish Government's policies, in operation for a long period of time and was a role model for many countries to follow.

Table 1: Newly installed wind power capacity and market share in EU-15 of selected countries with minimum-price and quota systems in 2003[17]

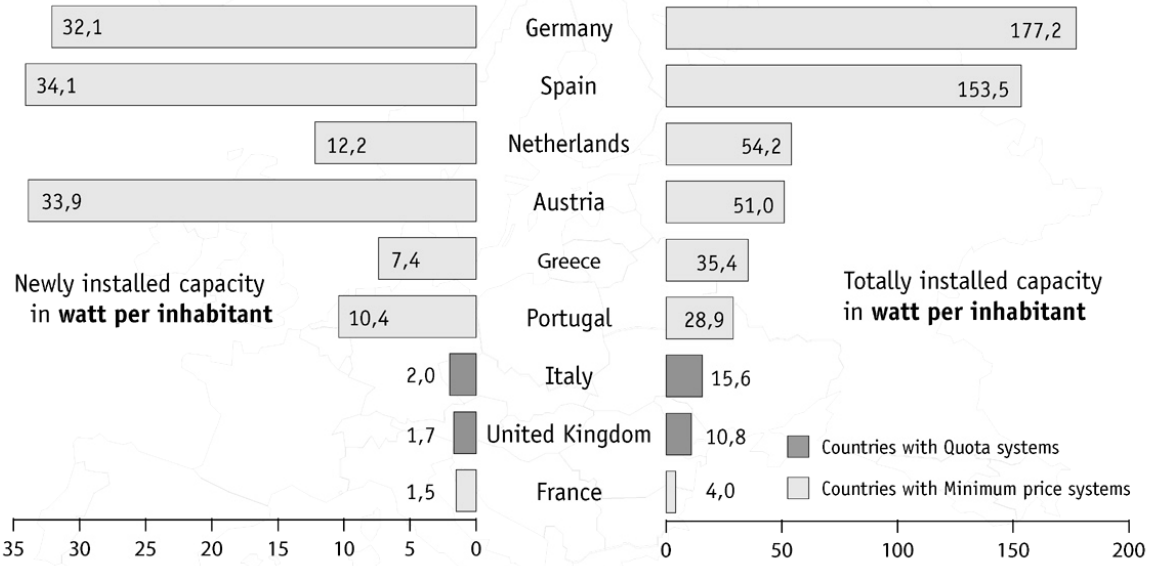


(Source: BWE 2004)

[17] See also: Grotz, Claudia: Minimum price system compared with the quota model – effectiveness and efficiency. BWE-background paper, 2004.

In addition to the percentage of newly installed capacity in general, the share per capita is also interesting: most minimum-price countries are far ahead of the quota countries.

Table 2: Per capita installations of wind power in selected countries in 2003



(Source: BWE 2004)

Issue number 2: Price of RES-generated electricity

EREF regularly scrutinises prices for RES electricity in Europe. Its latest report, was published in December 2004[18]. With this publication, EREF has the objective to help to provide information to the public and Member States on how the different countries deal with electricity from renewable energies and the relevant pricing schemes.

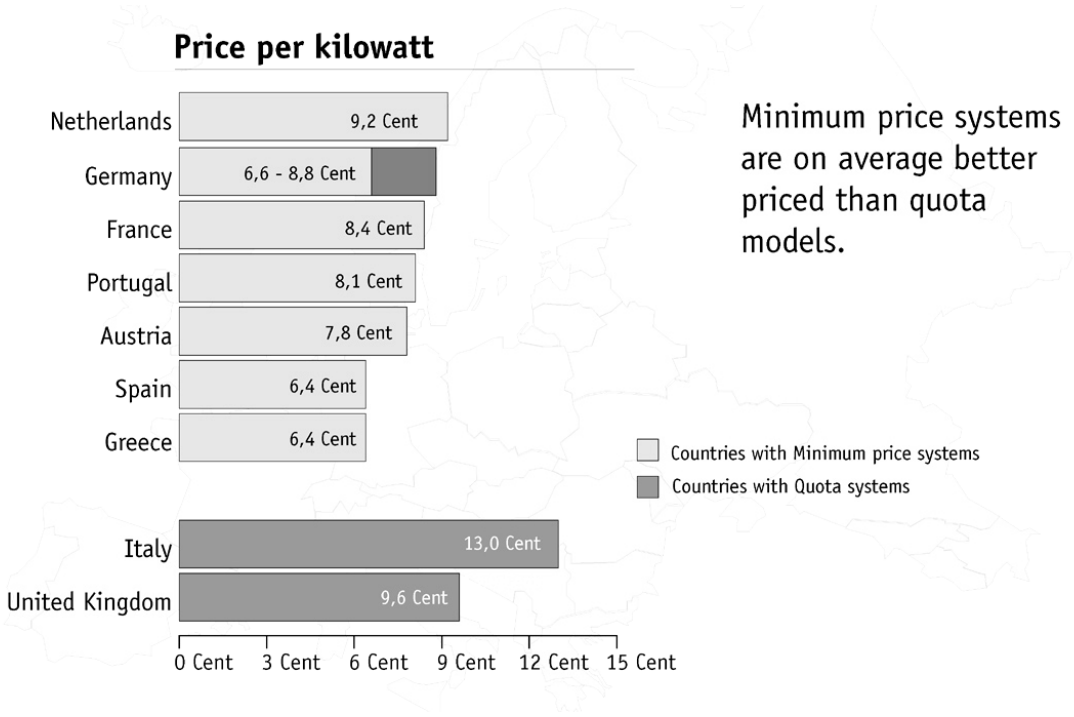
The Report shows a vast variety of pricing schemes. So far, the only the system that has been successful is feed-in and only in those member states having adopted proper long-term political commitments. It shows clearly that the established minimum price systems do not guarantee higher prices than certificate or quota regime based prices. A good example is the price difference for German Wind power (89 € MWh for the first 5 years, 61 € from 6 to 20 years, with digression factor and depending the location of the size) in comparison with prices

[18] See http://www.eref-europe.org/downloads/pdf/2004/pricereport2004.pdf.

paid in Italy (amounting to 119.4 €/MWh) and in the United Kingdom (in 1993: amounting to 98 €/MWh).

Those who advocate in favour of quota systems argue that they encourage increased competition among RES producers and bring about rapidly falling prices for electricity generated from renewable energies. Often they mention as an example the price reductions for wind power in the UK that occurred during the 1990s under the Non-Fossil Fuel Obligation (NFFO). However, as discussed below, quota systems do not necessarily result in lower prices to consumers over the long-term. The current prices for wind power in EU countries are exemplified in the following graphic. Note that those countries with minimum price systems have lower prices on average than do those with quota systems; this is despite the fact that many minimum-price countries have lesser wind energy resources.

Table 3: Comparison of prices per kilowatt for electricity from wind energy in 2003



(Source: BWE 2004)

Table 4: Explanations of national tariffs for wind-generated electricity

Country	Price (€ cents/kWh)	Explanation and Remarks
Germany	6.6-8.8	Depends on site; 20 year time span
France	8.38 5.95/3.05	8.38 cent for the first 5 years; thereafter the price drops depending on the number of full load hours (0-2000 = 8.38 cent, 2000-2600 = 5.95 cent, 2600-3600 = 3.05 cent). Compensation period totals 15 years.
Portugal	8.3 8.1	Tariff depends on the number of full load hours; 8.1 cent refers to plants with up to 2,300 annual full load hours. The tariff up to 2,000 annual full load hours was 8.3 cents/kWh.
Austria	7.8	Note that in 2003 and 2004 there was a fiscal investment cost premium of 10% on all **new** investments.
Spain	6 ~6.38	Two tariff options include: a fixed feed-in tariff (approx. 6 cent) or variable compensation rate. Variable compensation rate consists of a fixed premium of 2.66 cent (2003) and market price for electricity—on average, 6.38 cent/kWh.
Netherlands	9.2-9.8	Consists of (1) 4.9 cent fixed government surcharge (MEP) plus 2.9 cent tax exemption, plus (2) a surcharge (MEP). The MEP is granted for a total of 10 years or 18,000 full load hours.
Italy	12.0-14.1 (2003)	Includes certificate trading price (8.4 cents) plus average electricity price. Certificates are allocated for the first 8 years of operation.
United Kingdom	NA	Consists of (1) certificate trading price (7.0 cent/kWh in 2003); (2) tax exemption (climate change levy); and (3) price of electricity.

As Table 4 makes clear, systems are designed differently from one country to the next, and the duration of specific compensation levels varies from one system to the next. It is also important to point out that, more data are currently available for minimum-price systems than for quota systems. This is because quota models represent only a small percentage of the current installed capacity in Europe, and they have been employed for a shorter period of time. As a result of these factors, it is difficult to make a direct price comparison between minimum-price and quota systems within Europe. However, as seen in table 3 above, electricity prices are significantly higher in those countries with quota systems than in those with minimum-price systems. For example, customers in the "quota countries" Italy and the UK,[19] pay an average of 13.0 cent/kWh and 9.6 ct/kWh[20], respectively, for wind power—far

[19] Current quota scheme in Italy since 1999/2001, in the UK since 2002.

higher than the 6.4 cent/kWh price in Greece, or even the 9.2 cent/kWh price in The Netherlands. This is despite the fact that both quota countries have significant wind energy resources; in fact, the UK has the best winds in Europe.

Experience up until now indicates that there is more of a reluctance to invest in wind energy projects under quota systems because they produce more uncertainty regarding future prices. Under quota systems, medium- and long-term certificate and electricity prices are highly unstable, varying with changes in the market or meteorological conditions. As a result, developers can expect higher risk surcharges from investors and banks. Therefore, under quota systems, electricity is not necessarily cheaper even in countries with very favourable wind conditions.

It has been argued that minimum-price systems could be more expensive (per kWh of electricity produced) than quota systems for the national economy. However, several studies in Germany have concluded that the average additional cost per household has been minimal. A BET-study estimates that the price increase for electricity consumers caused by the German pricing law was only 0.11 €cent/kWh in 2000, and will be 0.19 €cent/kWh in 10 years assuming a doubling of renewables' share of total generation[21]. The German government estimates the extra cost to be an average of € 12 per German household each year.[22] According to this latest study, issued by the Ministry for Environment, it is projected that the EEG extra cost for final consumers will be 0.34 eurocent per kWh in real terms in 2005. This may increase as the share of electricity derived from RES rises—perhaps up to 0.37 cent. However, it is projected that this figure will decline to approximately 0.20 cent/kWh in additional costs by 2014, as a result of the digressive factor built into the guaranteed price scheme. A third estimate puts additional costs at 0.25 €cents/kWh in 2001, a number that has been accepted by authorities of the German federal states[23] .

Further, there is evidence that at least some shares of past price reductions brought about under quota systems (e.g., under the UK's NFFO in the 1990s) were due to the pricing policies of other countries, which drove technological improvements and brought down costs. In addition, some of the later cost reductions under the NFFO were due to changing terms and conditions, including a longer contract period. There is also speculation that low costs and prices driven by the quota system are due, at least in part, to the availability of wide-open spaces with good resources. Taking into account the relationship between wind speeds and the

[20] According to the Department of Trade and Industry, prices for offshore wind power for the British certificate trading model totalled 11-13 cent/kWh in 2003. These prices came about because offshore projects in the UK additionally receive large investment grants from the State.

[21] Krizkalla, N.: Auswirkungen des EEG und des KWKG auf die Endkundenpreise. BET, 2001.

[22] See publication of the German Federal Ministry for the Environment: "Gesetz für den Vorrang Erneuerbarer Energien (Erneuerbare-Energie-Gesetz-EEG) vom 21. Juli 2004- Abschätzung der Entwicklung der Stromerzeugung aus erneuerbaren Energien bis 2020 und finanzielle Auswirkungen, 2004.

[23] Ibid.

resultant power output (wind power is proportional to the cube of wind speed), any lower costs that exist under quota systems are expected to come more in line with those of minimum-price laws once the best resources are no longer available.[24]

There is also evidence that it may be cheaper to provide significant national investment for renewable energy (through a minimum-price law, for example) over a period of perhaps 15-20 years to bring renewable energy technologies rapidly down their learning curves, and thus reduce costs very quickly, rather than to introduce renewable energy relatively slowly and over a longer period of time—with an associated slower reduction in costs.

Furthermore, as discussed below, minimum-price systems encourage development of local manufacturing industries, which leads to a large number of companies and in itself creates price competition. And even where minimum-price laws are more expensive per unit of energy produced, they drive technological development and strengthen or establish new businesses, thereby supporting industry and agriculture (biomass), leading to job creation and furthering economic growth.[25]

Issue number 3: Achievement of government objectives

It is assumed that because quota systems establish specific targets for renewable capacity or generation, they provide greater certainty regarding the future RES share of the market. Furthermore, quotas can be tied directly to other government policies, such as emissions reductions. Quotas are supposed to provide producers and manufacturers with a predictable, steadily growing market for renewable energy.

With minimum-price laws it is not possible to know in advance how much generation or capacity will result or, indeed, if the share of renewable energy generation will increase over the long-term. However, tariffs can be adjusted up or down to encourage more or less investment in renewable energy in order to bring installations in line with desired targets.

In addition, under a quota system, the speed with which technologies are introduced is based on a political decision that might be largely unrelated to technical progress and the efficiency of using renewable energy. And, depending on the level of enforcement and penalties in a given scheme, having a quota system does not necessarily mean that mandated targets will be achieved. For example, the UK quota for 2003 under the nation's new Renewable Obligation Certificates systems was set at 3%, yet energy companies fell far short of this target,

[24] The above three paragraphs are an excerpt from Janet L. Sawin, "National Policy Instruments: Policy Lessons for the Advancement and Diffusion of Renewable Energy Technologies Around the World," Thematic Background Paper 3, January 2004, prepared for the International Conference on Renewable Energies, Bonn, Germany, June 2004. http://www.renewables2004.de/pdf/tbp/TBP03-policies.pdf.

[25] Janet L. Sawin, "National Policy Instruments".

achieving only 1.8%. In contrast, those countries with minimum-price laws have regularly surpassed national renewables targets.[26]

Issue number 4: Prevention of windfall gains

Many assume that the quota system forces manufacturers into price competition during bidding rounds and as they conclude contracts, helping to drive down consumer prices. By contrast, it is generally assumed that minimum-price systems encourage little competition and discourage price reductions. Many believe that manufacturers and project developers utilise cost reductions solely to increase their profits, rather than passing them on to electricity customers. But this is not necessarily how things have worked in practice.
Under the minimum price system, possible windfall profits can be avoided by designing the respective system properly to avoid such practices. For example, the German Renewable Energy Source Act (EEG) contains an integrated price digression of 2% for wind energy, 5 % for photovoltaic. Similar mechanisms were introduced in France and Portugal, for example. Altogether, wind power costs in Germany have fallen in real terms by around 55% since 1991 (when the Electricity Feed-In Law, which preceded the EEG, took effect).

Issue number 5: Financial Security

Under a minimum price system, the long-term certainty that results from guaranteed prices over perhaps 20 years means that companies are willing to invest in technology, to train staff, and establish other services and resources with a longer-term perspective. This certainty also makes it easier to obtain financing, since banks and other investors are assured a guaranteed rate of return over a specified period of time.

With quota systems, there are potential uncertainties through many steps in the process from project planning to operation. For example, there can be substantial preparation costs for projects submitted for bids—costs that must be incurred without guarantee of winning a contract, adding an element of risk and uncertainty that many potential developers cannot afford. Further, without long-term contracts, existing developers operating under quota systems could be undersold by future projects, and will always be competing against new developments.

In addition, under quota systems potential investors must assess future supply and demand balance during the lifetime of the project (often 20 years or more) by developing a forward price curve. Yet, demand is created by political targets, which could change, thereby resulting in a degree of uncertainty. In addition, estimating supply is a complex process that requires an understanding of a broad range of factors. These include, for example, the current

[26] Janet L. Sawin, "National Policy Instruments."

competitiveness of all eligible energy technologies; future costs – determined by learning curve effects; and cost-resource curves, or the impact on costs when the best resources are no longer available and projects must be sited where wind speeds are lower, or must rely on more expensive biomass feedstock. All of these factors add to the level of uncertainty. Under these circumstances, banks will also be less willing to provide financing for renewables projects.

Financial security is also reduced under quota systems if there is uncertainty regarding rules related to green certificate trading. For instance, as system designs are altered—such as changes in penalties, borrowing or banking provisions, and the status of imports—prices can be affected dramatically. In general, many believe that the higher risks and lower profits associated with quota systems make them less attractive for investors than minimum-price laws.[27]
An example of this is Italy's green certificate trading model, which started in January 2002. Initially it required an additional 2% of renewable electricity share of total electric capacity. This meant installing another 116 MW of wind power capacity in 2003..[28] This goal was achieved. The quota is scheduled to increase annually for additional 0,35 % between 2005 and 2012. However, because the quota is valid for a period of only 8 years, investor security is limited.

In 2002, the UK introduced a quota system with a certificate-trading model (Renewable Obligation Certificates). Under this system, energy supply companies are expected to produce green electricity, purchase certificates, or to buy themselves out of their obligations.[29] Certificate prices rise or fall depending on the number of companies that succeed or fail in meeting their obligations, and resulting supply or demand of certificates on the market. The income obtained through the buy-out funds, provided by certificate purchases, is distributed to the owners of ROCs to help finance future renewable energy projects. The ROC price in England and Wales in 2004 was 7 cent/kWh, and in Scotland 8.1 cent/kWh. Since this programme was established, the political framework has been set for the long-term: by 2015, renewable energies must account for 15.4% of the nation's power consumption rate. In spite of this longer-term target, the price of certificates continues to fluctuate, and investor insecurity for the medium and long-term has not been eliminated.

[27] Section is an excerpt from Janet L. Sawin, "National Policy Instruments."

[28] Conventional energy producers and importers must prove that a minimum of 2% of the total quantity of electricity produced and fed into the grid in the previous year was generated from renewable energies.

[29] Currently for a price of approx. 45 £/MWh.

Issue number 6: Technological innovation and benefits to domestic economies

Many analysts have argued that minimum-price laws do not encourage innovation. It is true that generous tariffs alone, provided under minimum-price systems, are no guarantee that a domestic industry will develop. For instance, for most of the 1990s, renewable energy producers in Italy received more generous payments than did those in Germany, yet there was little impact on manufacturing industries in Italy despite significant wind resources. However, others argue that once producers achieve a certain level of profit, they invest in private R&D to lower costs and increase their profit, a situation that is more favourable to "radical innovations" that require long payback periods than the circumstances created under quota systems. With minimum-price systems, technological improvements increase profits, thereby encouraging innovation.

Under quota systems, the surplus may go entirely to consumers and, as a result, producers do not receive enough profit (or reliable long-term profits) to invest in R&D in order to reduce their costs. At the same time, pressure to minimize costs under quota systems often encourages producers to turn to overseas manufacturers of technology. In the United Kingdom, under the Non-Fossil Fuel Obligation, developers turned to foreign technology to keep costs down, and it became unprofitable for domestic manufacturers to remain in the market.

Furthermore, bidding rounds can be time-consuming, costly, and can create cycles of stop-and-go. Because quotas often create on-off cycles, they do not allow for continuous development of the market, they discourage innovation, and they make it difficult to establish a strong domestic industry because investment in production facilities will take place only within a short-term perspective. This in turn limits potential job growth and economic development benefits associated with renewable energy.

No matter what type of policy is used, companies will try to maximise their profits. But in order to drive down system costs, it is essential to have sustained and growing markets and, to date, payment systems have most consistently provided such markets.

Success of the wind industries in Denmark, Germany and Spain seems to bear this out. Turbine manufacturers in these three countries account for the majority of the world's turbine market, supplying more than 70 percent of the market in 2003, and have driven most of the technological development in the wind industry. About 100,000 people worldwide are employed in the wind industry; of these, three fourths live in the EU and nearly half are in Germany. Approximately 130,000 people work in the renewable energy industries in Germany. In Spain, about 350 companies are involved in renewables industries and, in

Navarre and Castilla-La Mancha alone, a new high-tech industry and more than 3,600 new jobs have been created because of the growth in renewable energy markets.[30]

Issue number 7: Geographic and ownership distribution

Quota type schemes tend to promote the least-cost projects, thus restricting them geographically to the areas with the best resources and encouraging larger-scale, centralised projects. In an EU-wide system, a quota scheme would likely result in significant wind development in the United Kingdom, while solar development would occur (if at all) primarily in sunnier southern countries.

This situation raises concerns among some analysts that quota systems could have negative impacts on public acceptance of renewables (due to heavy development in particular regions) and on political support. Countries with relatively few resources (and thus experiencing less development, little job creation, etc.) would be less willing to support the more ambitious promotion of renewables in the future. The Netherlands provides an example of this case: the government established a voluntary quota system with tradable credits that resulted in increased use of renewable energy. But about three-fourths of the credits and accompanying subsidies went to foreign producers, leading the government to abandon this system.

With minimum-price systems, the lack of need for negotiated contracts, combined with the fact that anyone has the right to install renewable technologies on their property and sell it into the grid, tends to ease entry into the marketplace. Minimum-price laws tend to favour smaller companies (even individuals or cooperatives) and incremental investment, leading to varying sizes of companies and projects.

Quota systems are more likely to fully integrate renewables into existing electricity supply infrastructures as they put utilities in charge. At the same time, they could also result in serving primarily the interests of major suppliers or utilities. Because they rely on competitive bidding, quotas can limit participation to the large players, concentrating renewable energy development in the hands of a few, often the major power generators. Local or smaller projects are often unable to compete with larger ones on the basis of cost alone. Local investors are rarely wealthy, particularly in rural areas, and can seldom assume the risks and uncertainties associated with development under quota systems.[31]

[30] Section is an excerpt from Janet L. Sawin, "National Policy Instruments." 2003 data for turbine manufacturers' shares calculated by Worldwatch Institute with data from BTM Consult ApS.

[31] Section is an excerpt from Janet L. Sawin, "National Policy Instruments."

Issue number 8: Technological diversity

Because quota systems tend to encourage the least-cost technologies, they are best at promoting technologies that are closest to market competitiveness. Higher-cost renewables, such as PV, offshore wind, wave and tidal energy will not be able to compete against the lowest-cost technologies, meaning that quota systems will be less likely to create markets for them and thus will not drive them down their "learning curves". Specific technology targets or quotas can help, but are not likely to advance these technologies and to reduce their costs as rapidly as can well-designed minimum-price laws.

Minimum-price laws, on the other hand, can encourage a diversity of technologies, assuming that payments vary according to technology type. Because they can create a market for all renewables, they can more easily support technologies from early development to market competitiveness.[32]

Issue number 9: Ease of implementation

In general, minimum-price laws are easy to administer and enforce, and they are highly transparent. As with quota systems, policy makers are required to establish targets and timetables, and to determine which technologies are qualified (type and scale). Where applicable, minimum-price laws also require the setting of tariffs for each technology type. Once the system is established, the only government follow-up required is regular adjustments of tariffs (assuming this is done).

Under quota systems, many of the requirements are far more challenging. Picking optimal target levels is critical (if they are set too high, they can push prices up dramatically; if they are too low, they will not produce the economies of scale needed to reduce costs), as is the choice of timetables. In addition, policy makers must decide which technologies are eligible, and if there should be technology-specific targets—this will depend on the readiness of technologies, their costs, available resources, and other factors. In order to make successful choices, it is also important to understand the cost and learning curves for the relevant renewable technologies. Policy makers also need to determine which category of parties must meet the obligation (e.g., retail suppliers, grid companies, or distribution companies), and whether all or just a few of those parties are required to meet the targets. The penalty for non-compliance must be established, and the tradability, life-span and price (e.g., will they be floor- or ceiling-prices?) of certificates or credits chosen. These decisions will all determine the impact of the quota system. Once these matters are resolved, government agencies (or other bodies) must certify renewable energy producers, issue and control certificates, monitor

[32] Section is an excerpt from Janet L. Sawin, "National Policy Instruments."

compliance, and collect penalties, all of which increases administrative requirements, complexities and costs.

Thus, quota/certificate systems tend, by their very nature, to be more complex than minimum-price systems, difficult to administer and open to utility manipulation. Bidding processes are bureaucratic, have significant transaction costs, and are time-consuming for authorities and renewable energy developers.[33]

Issue number 10: Flexibility

Historically, minimum-price laws have been criticised for being inflexible. For example, once tariffs are established, it could be difficult to reduce them. However, it is possible to set up the system so that payments can be adjusted on a regular basis to reflect changes in technologies and market conditions. This flexibility was incorporated into the German system in 2000 and again in 2004, and is now featured in other national minimum-price systems as well. Thus, once a government sets the price to be paid for renewably-generated electricity, it is subsequently possible to adjust these payments up or down to affect the amount of new capacity coming on line as desired.

On the other hand, with a quota system, once targets and timetables are established, they are difficult to adjust. Even as markets change and technologies advance, experiencing major breakthroughs in efficiency and/or cost, it is is difficult to alter targets or timetables—or, at least to make them more ambitious—without lead-times of several years.[34]

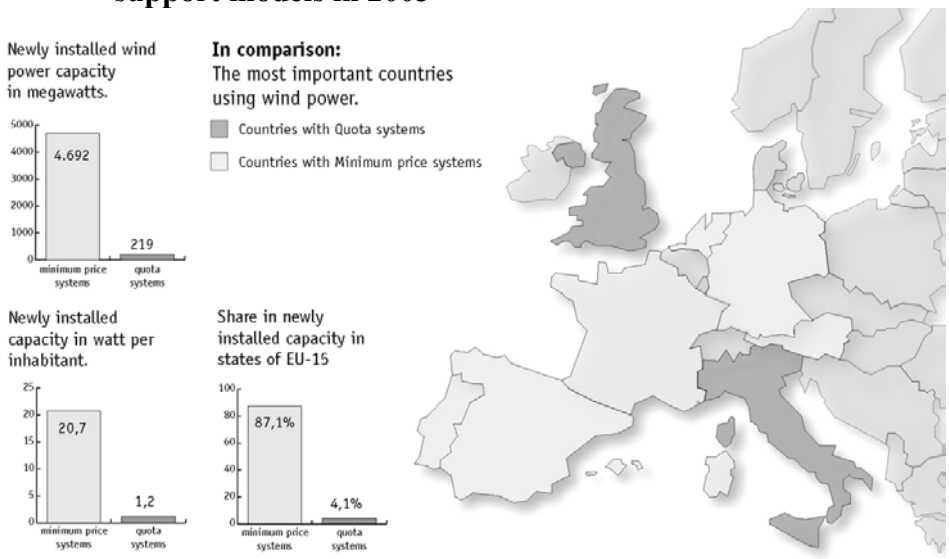
C Summary and conclusions

Up to now, minimum-price systems have undoubtedly been most successful at advancing the development and use of renewable energy technologies. These systems are flexible in design, and can be adjusted to account for advances in technology and changing market conditions, which can make them more effective and efficient. Minimum price systems work to promote small and medium-scale companies in particular. This is critical because small companies tend to be more innovative than large ones, and thus can play a major role in driving technology advances. Finally, under minimum-price systems, transaction costs are low and the necessary financing mechanisms are easily implemented.

[33] Section is an excerpt from Janet L. Sawin, "National Policy Instruments."

[34] Section is an excerpt from Janet L. Sawin, "National Policy Instruments."

Table 5: Overview of newly installed capacity in relation to the different support models in 2003



(Source: BWE 2004)

By contrast, in practice, quota systems have thus far involved excessive insecurities for investors despite their theoretical attractive features (increased competition, etc.). As a result, under quota systems, most small and medium-sized companies cannot bear the high risks associated with the required long-term investment in renewables. Despite the implementation of a variety of designs in a number of countries, none of those countries with quota systems has yet developed a large, independent industrial sector to manufacture renewable equipment and parts. In the long term, such developments are critical if further development of RES technology and realisation of full cost-reduction potential (by increasing efficiency and performance) are to be achieved.

It should also be noted, as discussed above, that wind power prices are currently higher in countries with quota systems than they are in countries with the minimum price-systems. Moreover, quota systems result in considerable transaction costs for organising, implementing and monitoring.[35] .

In any case, unlike minimum-price systems, quota systems have a relatively short and rather fragmented history of application. Therefore, they need considerably more time to prove, beyond a reasonable doubt, their ability and effectiveness to steadily foster RES investment and to promote a healthy and dynamically growing RES industrial sector, under a wide range of national and local conditions. Overlooking the crucial need for a gradual approach and for solid proof in practice, any rushing to generalise the application of quota systems, before

35 This concerns the design of the model as well as its implementation of allocating and regulating certificates, monitoring compliance and if necessary, implementing disciplinary mechanisms.

theses systems reach maturity, can have catastrophic consequences in the EU's drive to establish renewables as a key instrument in achieving the Community's energy and environmental objectives.

Finally, it should be emphasised that applying any RES minimum-price system must be supported by the creation of additional positive framework conditions. Among other things, this means that grid capacity must be strengthened and expanded, building laws must be adjusted to ease and encourage the use of renewable technologies, and public acceptance must be encouraged through broad participation models and controlled land usage. In combination with such policies and regulations, well-designed minimum-price systems can surely achieve their greatest potential impact: a rapid development of renewable energies that is cost-efficient, creates jobs, and fosters economic development at the local level. Under such circumstances, renewable energy can make a continually increasing contribution to the local energy supply, while creating a more equitable society, improving human health, and truly becoming a central pillar for preserving the world's climate.