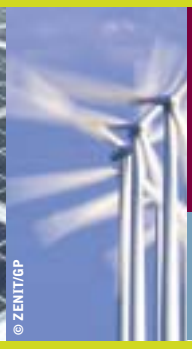

REPORT 2005

EUROPE NEEDS A TARGET FOR CLEAN ENERGY

THE GREENPEACE POSITION FOR A NEW RENEWABLE ENERGY ELECTRICITY DIRECTIVE

GREENPEACE

report | ree directive | **issue** renewable energy

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GREENPEACE

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Europe needs a target for clean energy

background: EU renewable energy policy ***"Renewable sources of energy have a considerable potential for increasing security of supply in Europe. Developing their use, however, will depend on extremely substantial political and economic efforts. (...) In the medium term, renewables are the only source of energy in which the European Union has a certain amount of room for manoeuvre aimed at increasing supply in the current circumstances. We can not afford to neglect this form of energy."***

European Commission Green Paper on Security of Energy Supply (2000)

In 2001, the EU adopted a Directive[1] on the promotion of electricity of renewable energy sources. This includes indicative targets for the proportion of electricity generated from renewable energy in 2010 by each of the 25 Member States. In 2004, the European Commission adopted a Communication[2] 'The share of renewable energy in the EU'. It concludes:

'The Commission will carry out regular reviews of progress in the development of renewable energy sources, with the aim also of ensuring compatibility with its overall sustainable development strategy. This will require an extended impact analysis of its policy. In the case of the economic dimension this will take into account the competitiveness of the EU economy on the one hand, and the security of supply on the other hand, as well as its technical feasibility. In the case of the environmental dimension, the required contribution to EU goals on climate change and other environmental priorities will be addressed. Finally the potential for the development of renewable energy resources should also be taken into account.

This review will be carried out for the first time not later than the end of October 2005 with a view to opening a debate in order to set in 2007 a target for the period after 2010.'

Greenpeace Position With a view to influencing this debate, Greenpeace is presenting its views on how the EU can guarantee a clean energy revolution in Europe, which will be a fundamental contribution in the global fight against climate change.

Greenpeace demands the adoption of a legally binding target to achieve a minimum 20% renewable energy from primary energy till 2020 in the EU 25. Under this overall target, sectoral targets are needed for:

* Electricity
* Heat
* Transport

This paper refers to the electricity target and to the EU Renewable Energy Directive which is vital to achieve these objectives. At a time when European governments are in the process of liberalising their electricity markets, renewable energy and its increasing competitiveness should lead to higher demand for clean energy equipment. Without political support, however, renewable energy remains at a disadvantage, because of distortions in the world's electricity markets created by decades of massive financial, political and structural support to conventional polluting and dangerous technologies.

New renewable energy generators (excluding large hydroelectric projects) have to compete with old nuclear and fossil fuel power stations. The latter produce electricity at marginal costs, because consumers and taxpayers have already paid the interest and the depreciation on the investments. Political action is needed to overcome these distortions, and to create a level playing field for renewable energy sources so they can deliver their full advantages to the environment, the economy and society .

The following is an overview of current political frameworks for renewable power and barriers that must be overcome in order to unlock renewable energy's great potential to become a major contributor to future global energy supply. According to a European Commission Green Paper on Security of Energy Supply, unless Europe changes direction , within 20 years it will be importing 70% of its energy (up from 50% today). Renewable power can plug the gap in European energy supply, and at the same time contribute greatly to the goals set out in the Lisbon Strategy: sustainable economic growth, high quality jobs, technology development, global competitiveness, and European industrial and research leadership. Furthermore, wind power and other renewable energy technologies will make a large contribution to climate protection and sustainable development

recommendations on the review of the renewable energy directive

In recent years, an increasing number of countries have established targets for renewable energy, as part of their greenhouse gas reduction policies. These are either expressed in terms of installed capacity or as a percentage of energy consumption. In 2001, the European Union adopted a Renewable Energy Directive establishing national targets for each Member State. Although these targets are not legally binding, they have served as an important catalyst in triggering political initiatives throughout Europe to increase the share of electricity supply from renewable energy sources.

Europe needs a legally binding target for renewable energy and electricity

The Directive aims to increase the share of renewable electricity from 14% in 1997 to 21% in 2010. If there is uncertainty that this target will be met, the most fundamental measure to correct the EU renewable course would be for the European Commission to push for 2010 targets to become mandatory.

To guarantee the future of renewable energy, the Commission needs to propose legally binding targets for 2020.

A time-horizon of six years is not long enough in an electricity sector where the investment horizon is up to 40 years. Fulfiling the renewable electricity target would be an important step to fulfil the EU overall target of 12% renewable energy share to total energy consumption in 2010 as stated in the White Paper.

1 | Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market.

2 | COM(2004) 366 final

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setting mandatory renewable energy targets

* Setting mandatory national targets for 2010 would be appropriate and lead to more efforts by all Member States.
* New ambitious, legally-binding, national targets for 2020 would demonstrate the EU long-term commitment to renewable energy and would significantly enhance investor confidence. 2020 targets would also dramatically increase the Community's likelihood of meeting 2010 targets.
* Achieving technological diversity within the renewable energy sector is crucial and the aim of any support mechanism should be to encourage and strengthen diversity.
* Indicative targets for the share of different renewable energy technologies in 2020 should be set at an EU level in a process similar to the one that established the EU 2010 White Paper targets. That would strengthen the aim of reaching technological diversity in the renewable power sector and enable each of the technologies to realise its competitive potential.

how to set the "right" targets:

binding targets for 2010, 2015 and 2020 The development of short-, mid-, and long-term objectives is necessary in order to be able to assess and measure progress towards fulfilment. Greenpeace suggests five-year intervals starting from 2010.

an expansion of renewable energy in European member states The existing size of the renewable component in electricity generation and primary energy consumption should be taken into account when proposing national targets. Member States that already have a high proportion of renewable electricity generation need to set higher targets than those that currently have a lower proportion. We need to guarantee that there is a real expansion rather than just bringing existing facilities into the equation. The renewable energy industry has already showed in its report '20% by 2020'[3], that a share of 33% renewable electricity by 2020 is possible. Other studies back up this figure and indicate that even higher percentages are possible if energy efficiency measures are successfully adopted. These are the targets that should be adopted by the European Commission.

state-specific targets related to previous energy supply Objectives for individual states must be defined according to the status quo in energy supply. The starting point for calculating targets must be a combination of both the state of primary energy supply (for heating, industrial heat processes, refrigeration and transport) and of the electricity generation structure. In order for the proportion of renewable energy to increase significantly, targets must be set in accordance with the local potential of each technology (wind, solar, available biomass, etc) and also according to local infrastructure, both existing and still to be built (ease of connection to networks, production and installation capacity, etc).

The market for renewable energy sources needs to grow by at least 30% annually. The example set in recent years by the wind power industry shows that manufacturers of alternative energy technologies are able to maintain a long-term growth rate of 30 to 35%. In conjunction with the European Photovoltaic Industry Association[4] and the European Wind Energy Association[5], Greenpeace has documented the development of both industries since 1990 and drawn up a prognosis for growth up to 2020. Research, development and a high standard of quality guarantees in planning, finance and installation are essential for long-term success. The basis for setting targets must be higher than the current 30% annual market growth rate.

what does this means in practice? Greenpeace has defined the quantity of installed capacity and the amount of generated electricity from new renewable electricity sources required to meet the targets. These figures should be adopted within the Directive.

TABLE 1: GREENPEACE RENEWABLE ELECTRICITY TARGETS – INSTALLED CAPACITY AND GENERATED ELECRICITY

INSTALLED CAPACITY IN MW	2010	2020
New renewables	110,000	300,000
Small Hydro	4,000	5,000
Wind - total	80,000	230,000
- onshore	70,000	160,000
- offshore	10,000	70,000
Photovoltaic	5,000	40,000
Geothermal (incl. CHP)	2,500	6,000
Biomass (incl. CHP)	17,700	20,000
Solar thermal power plants	900	4,000
Total generated renewable Electricity in TWh	260 TWh	770 TWh

Greenpeace demands for Europe's energy sector:

* Phase-out of all subsidies for fossil fuels and nuclear energy and internalisation of external costs
* Establish legally binding targets for renewable energy
* Provide defined and stable returns for investors
* Guaranteed and priority access to the grid
* No harmonisation of support mechanisms for renewable electricity before market distortions are removed

3 | Renewable Energy Target for Europe: 20% by 2020, http://www.erec-renewables.org/publications/default.htm#publications

4 | SolarGeneration, www.epia.org

5 | Windforce 12, www.ewea.org


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I CURRENT SITUATION

i end subsidies to fossil fuel and nuclear power sources

Conventional energy sources receive an estimated $250-300 billion in subsidies per year world-wide, heavily distorting markets. The Worldwatch Institute estimates that total world coal subsidies are $63 billion, while in Germany alone the total is $21 billion, including direct support of more than $85,000 per miner. Subsidies artificially reduce the price of power, keep renewable energy out of the marketplace, and prop up non-competitive technologies and fuels. Eliminating direct and indirect subsidies to fossil fuels and nuclear power would help move us towards a level playing field across the energy sector. As the 1998 OECD study, "Improving the Environment through Reducing Subsidies", noted:

"Support is seldom justified and generally deters international trade, and is often given to ailing industries. ...support may be justified if it lowers the long term marginal costs to society as a whole. This may be the case with support to 'infant industries', such as producers of renewable energy."

The 2001 report of the G8 Renewable Energy Task Force goes further, stating that *"re-addressing them [subsidies] and making even a minor re-direction of these considerable financial flows toward renewables, provides an opportunity to bring consistency to new public goals and to include social and environmental costs in prices." The Task Force recommends that "G8 countries should take steps to remove incentives and other supports for environmentally harmful energy technologies, and develop and implement market-based mechanisms that address externalities, enabling renewable energy technologies to compete in the market on a more equal and fairer basis."*

Renewable energy would not need special provisions if markets were not distorted by the fact that it is still virtually free for electricity producers to pollute. Subsidies to fully competitive and polluting technologies are highly unproductive, seriously distort markets and increase the need to support renewables. Removing subsidies from conventional electricity would not only save taxpayers' money and reduce current market distortions in the electricity market. It would also dramatically reduce the need for renewable energy support.

In 2004, the European Environment Agency estimated that energy subsides in the EU-15 for solid fuels, oil and gas amounted to more than €23.9 billion and for renewable energy to €5.3 billion.'[6]

ii removal of energy market distortions

In addition to market barriers there are also market distortions which block the expansion of renewable energy. These distortions come in the form of direct and indirect subsidies, and the social cost of externalities currently excluded from costs of traditional, polluting electricity from nuclear power and fossil fuels.

A major barrier preventing wind power from reaching its full potential is the fundamental lack of pricing structures in the energy markets that reflect the full costs to society of producing energy. Furthermore, the overall electricity market framework is very different today from the one existing when coal, gas, and nuclear technologies were introduced. For more than a century, power generation has been characterised by national monopolies with mandates to finance investments in new production capacity through state subsidies and/or levies on electricity bills. As many countries are moving in the direction of more liberalised electricity markets, these options are no longer available, which puts new generating technologies, such as wind power, at a competitive disadvantage relative to existing technologies.

internalisation of the social and environmental costs of polluting energy The real cost of energy production by conventional energy includes expenses absorbed by society, such as health impacts and local and regional environmental degradation, ranging from mercury pollution to acid rain – as well as global negative impacts from climate change. More than 30,000 Americans die prematurely every year due to emissions from power plants, for example. Hidden costs also include the waiving of nuclear accident insurance that is too expensive to be covered by the nuclear operators. The Price-Anderson Act, for instance, limits the liability of US nuclear power plants in the case of an accident to a subsidy of up to $3.4 billion annually. Environmental damage should as a priority be rectified at source. Translated into energy generation that would mean that, ideally, production of energy should not pollute and that it is the energy producers' responsibility to prevent it. If they do pollute they should pay an amount equal to the damage caused to society as a whole. The environmental impacts of electricity generation can be difficult to quantify, though. How do we put a price on homes lost on Pacific Islands as a result of melting ice-caps or on deteriorating health and human lives?

An ambitious project, funded by the European Commission - ExternE – has tried to quantify the true costs, including the environmental costs, of electricity generation. It estimates 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, in the form of damage to the environment and health, were taken into account.

The study further estimates that these costs amount to 1-2 % of EU GDP, or €85 billion to €170 billion, not including the cost of climate change. If those environmental costs were levied on electricity generation according to their impact, many renewables, including wind power, would need no support. If, at the same time, direct and indirect subsidies to fossil fuels and nuclear power were removed, the need to support renewable electricity generation would seriously diminish or cease to exist.

introduce the "polluter pays principle" The 'polluter pays' principle has been adopted in the EC Treaty and the new European Constitution. As with the other subsidies, external costs must be factored into energy pricing if the market is to be truly competitive. This requires that governments apply a "polluter pays" system that charges the emitters accordingly, or applies suitable compensation to non-emitters. Adoption of polluter pays taxation to polluting electricity sources, or equivalent compensation to renewable energy sources, and exclusion of renewables from environment-related energy taxation, is important to achieve fairer competition on the world's electricity markets.

6 | 2005 Commission Coommunication 'Winning the Battle Against Global Climate Change': 'Similarly, abolishing distorting subsidies will help to create a level-playing field among different energy sources. http://eu.greenpeace.org/downloads/energy/EUsubsidiesReport.pdf

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II ELECTRICITY MARKET REFORM

While some stakeholders in the conventional European power sector are calling for competition amongst renewable energy producers, it should be recalled that effective competition in the more than 95% of the market based on conventional electricity is a far cry from reality, as pointed out in the European Commission´s three benchmarking reports on the Internal Electricity Market. It seems premature to call for competition in the renewables power segment at a time of non-competition in conventional power. Renewable energy technologies could already be competitive if they had received the same attention in terms of R&D funding and subsidies, and if external costs were reflected in power prices.

Essential reforms in the electricity sector are necessary if new renewable energy technologies are to be accepted on a larger scale. These reforms include:

i removal of electricity sector barriers to renewables

Complex licensing procedures for renewable projects constitute one of the greatest obstacles to renewable energy projects. The existing European rules (Art. 6 of the 2001 Renewable Energy Directive) seem to be either too weak or not properly transposed into national law. These rules should be strengthened in favour of renewables. A clear timetable for approving projects should be set for all administrations on all levels. Priority should be given to renewable energy projects.

The Commission should propose more detailed procedural guidelines to strengthen existing legislation at EU level and at the same time increase the efforts at national level to implement current EU legislation in the sense in which it was intended.

Current energy legislation on planning, certification and grid access has been built around the existence of large centralised power plants, including extensive licensing requirements and specifications for access to the grid. This favours existing large-scale electricity production and represents a significant market barrier to renewables. Furthermore it does not recognise the value of not having to transport decentralised power generation over large distances. Legislation needs to reflect the following recent changes:

* *In technology:* renewable and gas generation have emerged as the fastest growing electricity generation technologies.
* *In fuels:* coal and nuclear power are becoming increasingly less competitive.
* *In size:* small modular renewable and gas generating plants are now producing competitively priced power.
* *In location:* the new modular technologies can be distributed throughout a network.
* *In environmental and social impacts:* fossil fuel and nuclear power sources are now widely acknowledged to cause local and regional environmental and social impacts; fossil fuels also have global impacts on the climate.

Administrative barriers such as long and complex authorisation procedures persist in some Member States due to insufficient co-ordination between different administrative bodies. The 2001 Renewable Directive calls upon Member States to implement national laws or best practices to achieve this goal.

"At Community level, the necessary legal and policy framework has been put in place, but responsibility for progress lies clearly with the Member States. Now is the time for Member States to step up their own action at local, regional and national level".

Another major barrier is the short to medium term surplus electricity generating capacity in Europe. The costs of producing renewable energy are falling, but still need special provisions. Due to over-capacity in the electricity market, it is still cheaper to burn more coal or gas in an existing power plant than to build, finance and depreciate a new wind power plant.

The effect is that, even in situations where a new technology, such as renewable energy, would be fully competitive with new coal or gas fired power plants, the investment will not be made. Until we reach a situation where new capacity is needed and electricity prices start reflecting the cost of investing in new capacity rather than the marginal cost of existing capacity, support to renewable energies has to level the playing field in the absence of internalisation of external costs.

Other barriers include the lack of long term planning at national, regional and local level; lack of integrated resource planning; lack of integrated grid planning and management; lack of predictability and stability in the markets; no legal framework for international bodies of water; grid ownership of vertically integrated companies and a lack of long-term R&D funding.

Furthermore there is a complete absence of grids for large scale renewable energy sources such as offshore wind power or solar thermal power plants; weak or non-existing grids onshore; little recognition of the economic benefits of embedded/distributed generation; effective separation of transmission and distribution grids from vertically integrated utilities has not happened leading to obscure and discriminatory requirements for grid access that do not reflect the nature of the technology.

The reforms needed to address market barriers to renewables include:

* Streamlined and uniform planning procedures and permitting systems and integrated least cost network planning;
* Fair access to the grid at fair, transparent prices and removal of discriminatory access and transmission tariffs;
* Fair and transparent pricing for power throughout a network, with recognition and remuneration for the benefits of embedded generation;
* Unbundling of utilities into separate generation and distribution companies (The costs of grid infrastructure development and reinforcement must be carried by the grid management authority rather than individual renewable energy projects);
* Disclosure of fuel mix and environmental impact to end users to enable consumers to make an informed choice of power source.

ii give grid access priority to renewable energies

Rules on grid-access, transmission and cost sharing are not sufficient at the European level. Article 7 of the 2001 Renewable Energy Directive is not clear enough on all aspects, especially concerning cost distribution and transmission fees. As already demanded by the European Parliament during the negotiation of the Directive, these rules should more clearly favour renewables, and their implementation into national law should be more strictly controlled and enforced by the Commission.

Where necessary, grid extension or reinforcement costs should be borne by grid operators and shared between all consumers, because the environmental benefits of renewables are a public good and systems operation is a natural monopoly. A strict legal unbundling and strong regulation should be implemented in this field.

* The rules on grid access for and transmission of renewable electricity should be further harmonised and strengthened in favour of renewable energy technologies. Member State transposition of existing legislation on grid access must be secured.
* Recommendations from the Commission should be given for national promotion mechanisms, that include long-term stability, technological diversity and effectiveness in reaching the national mandatory targets.
* For the expanison of offshore wind energy:

1. More uniform procedures and practices throughout Europe e.g. EIA, zoning, approval procedures.
2. Increased transparency, continuity and simplicity of legal procedures.
3. Measures to reduce the risk for financiers and insurance companies.
4. Provision of common grid facilities: an offshore grid and high voltage connections for offshore wind farms.

iii support mechanisms for renewables and why we don´t need to harmonise them yet

The idea of harmonising support mechanisms to avoid further market distortions in the European power market is currently high on the agenda. But such harmonisation must be well prepared to avoid disturbing existing markets. The first step towards harmonisation for renewables must be a well-functioning, undistorted, Internal Electricity Market and a truly level playing field.

A harmonised Community-wide support mechanism for renewable energy at this stage would be premature, since there is not yet enough experience as to which system would be the most effective on a EU level to guarantee market development of all the renewable energy technologies. As a result of the adoption of the Renewables Directive in 2001, several national support mechanisms have been introduced during the past years and many are still at the implementation stage.

feed-in systems and fixed-premium mechanisms are by far the most successful instruments Experience to date shows that only feed-in systems and fixed-premium mechanisms have proven their ability to be effective in attracting investments, creating investor confidence, reaching the national targets and creating technology diversity. Introducing any harmonised, Community-wide system at this stage would lead to serious market instability and threaten technology development as well as the world's largest markets for renewable energy technology.

Harmonising support systems now would seriously threaten the development of the European renewable industry, especially if an untested mechanism is pursued. It should also be stressed that even systems that have proven successful at national level are not easily adapted to multilateral cross-border trade. Furthermore, many examples have shown that even small adjustments to a framework can have a profound negative effect on the markets for renewables. More fundamental changes will have an even greater effect on the markets. A dramatic shift in all Member States' frameworks would jeopardise national renewable targets and undermine investor confidence.

The European framework for renewable energy must be improved and the preparation for a Community-wide mechanism without harmonising the support mechanism at this stage must take priority. At a later stage, when more experience has been gained with the full range of policy options and when serious market distortions in the conventional power markets have been overcome, harmonisation might be considered. Instead, the EU should introduce detailed recommendations for the Member States and improve legislation at European level where necessary. Such recommendations would limit the variety of systems and could lead to bilateral cross-border agreements between Member States having similar systems.

Member States with the same design of support mechanisms could start clustering their systems and by that seek to create and test cross-border mechanisms. In this way, more experience would be gained about the full palette of options and a decision on future harmonisation can be based on concrete knowledge and experience. Finally, it must be stressed that successful frameworks require not just a good payment mechanism and the encouragement of public support, but also effective policies to remove the numerous barriers to grid access and transmission, and barriers in the form of administrative procedures and non-transparency.

harmonisation criteria:

* A harmonised Community-wide support mechanism for renewables at this early stage would be premature, since there is not yet enough experience as to which system would be the most effective on a EU level to guarantee market development of all the renewable energy technologies.
* There is no practical evidence yet of effectiveness beyond feed-in and fixed premium systems. Quota based mechanisms have not yet proven their ability to provide investor security, attract investment and provide considerable deployment. These must be given time to develop further in order to provide real experience rather than theoretical hypothesis.
* Any national support mechanism should guarantee an adequate return on investment to ensure attractiveness of investments adapted to the level of costs of all RES technologies .

criteria for good mechanisms A good mechanism must allow renewable energy sources stable growth in the coming decades. A market phase-in programme for renewable energy must be:

* Easy to handle
* Independent of governmental budgets
* Accelerate the renewable energy industry, to achieve a stable annual market growth of min. 30%

Policy measures need to be acceptable to the requirements of the investment community in order to be effective. There are two key issues:

* The price for renewable power must allow for risk-return profiles that are competitive with other investment options.
* The duration of a project must allow investors to recoup their investment.

The power sector in general needs long term regulations in order to make multi-billion euro investments. This is not only true for renewable energies, but also for conventional power sources. Long term power contracts for fossil fuel power projects are (like the feed-in system) the usual practice, therefore the same should be introduced to clean energy sources.

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III OVERVIEW: SPECIFIC POLICY MECHANISMS

The most important measures for establishing new renewable energy power markets are those where the market for generated power is clearly defined in national laws, as well as providing stable, long term fiscal measures, low investor risk and a sufficient return on investment. The main purpose of the wide range of available economic measures to encourage renewable energy technology investments is to provide incentives for technological improvements and cost reductions of environmental technologies. That will ensure that we will have competitive, clean technologies available in the future as a competitive alternative to conventional, polluting power sources.

It is less important whether markets are controlled through prices or through quantities. What matters is that control is achieved in a rational and effective manner. In order to attract wind power companies to establish manufacturing facilities, markets need to be strong and stable, with a clear commitment to long-term expansion. A number of mechanisms have been introduced in different countries to further these aims.

overall, there are two types of incentives to promote deployment of renewable energy:

1. Fixed Price Systems where the government (or the EU) sets the electricity prices (or premiums) paid to the producer and lets the market determine the quantity.
2. Renewable Quota Systems (referred to in the USA as Renewable Portfolio Standards) where the government sets the quantity of renewable electricity and leaves it to the market to determine the price.

There are many variants of the fixed price system. The term is rather misleading as not all of them actually fix the total price per kWh paid to the producer but for analytical purposes it is valuable to make a distinction between fixed prices and fixed quantities:

1. Investment Subsidies
2. Fixed Feed-in Tariffs
3. Fixed Premium Systems
4. Tax Credits.

Two types of renewable quota systems have been employed in national wind power markets:

1. Tendering Systems
2. Green Certificate Systems.

At a national level, the UK, Ireland and Australia tend to prefer to fixed quantities, while a majority of countries on the European continent lean towards fixing prices. The USA is currently somewhere in between with its dual system of a federal tax credit (fixed prices) and renewable quotas (fixed quantities) at the state level. In addition to the financial mechanisms described below, two other factors are crucial for the development of an overall framework for renewable power investments: grid access and planning procedures.

i investment subsidies

Usually, investment subsidies are given on the basis of the rated power (in kW) of the generator. If used in isolation, these systems can be problematic because a subsidy is given whether or not production is efficient. In some countries investment subsidies have in the past resulted in poor siting of wind turbines, and manufacturers followed customer demands to use larger generators than necessary for optimal production of electricity. It improved project profitability but reduced production, because the turbines were not optimally designed. Systems that base the amount of support on generator size rather than on electricity output are problematic because they lead to less efficient technology development.

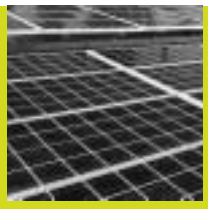
Any incentive should be related to efficiency of producing power rather than efficiency in completing the construction phase. For wind energy, the global trend is to reject investment subsidies as the only means of encouraging wind power investments. However, investment subsidies can be effective if combined with other incentives as in the UK. In order to take account of the current higher cost of offshore wind power compared to the more mature onshore market, the British government offers investment grants to offshore projects to complement the ROC (Renewable Obligation Credits) system (a renewable quota system).

ii fixed feed-in tariff systems

Mechanisms based on fixed feed-in tariffs (FIT) have been widely adopted throughout Europe and have proved very successful in expanding wind energy in Germany, Spain and Denmark. Operators of wind farms are paid a fixed price for every kWh of electricity they feed into the grid. In Germany, legislation fixes the price of electricity from renewable energy in relation to the generation costs of renewable technologies. The price will decrease 2% each year. In the Spanish system the wholesale price of electricity from renewable energy follows the market price for electricity, after which an environmental bonus is added per kWh. A key characteristic of the fixed price system is that the government sets a price on the societal value of generating a significant share of renewable energy in the electricity system.

As production costs decline, for instance as a result of improved technology and economies of scale, renewable energy become profitable, expanding this technology further. Fixed feed-in tariff systems encourage competition among wind turbine manufacturers, pressuring them to produce ever more cost effective turbines and thus lower the cost to society of expanding wind power. The most important advantage of fixed price systems is that they enable investors to plan ahead for new renewable energy plant. The challenge in a fixed price system is fixing the "right" price.

The main benefit of fixed feed-in tariffs is that they are simple and often encourage better planning. They are not associated with a formal Power Purchase Agreement (PPA) and have no definite term. In principle, therefore, the level of the tariff can be changed at any time or removed by repealing the Law. The disadvantage is the political uncertainty that may arise over how long the system will continue, which means that investors must calculate a risk premium in case the price falls during the life of the project. Germany has been able to reduce much of the political risk by guaranteeing tariffs for 20 years.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iii fixed premium systems

A "Fixed Premium" or "Environmental Bonus" mechanism is another variant of the fixed price system. Rather than fixing the total price paid, the government fixes a premium to be added to the electricity price. In principle, a mechanism that is based on a fixed premium/environmental bonus that reflects the external costs of conventional power generation could establish fair trade, fair competition and level the playing field in the Internal Electricity Market between renewable energy sources and conventional power sources.

Together with taxing all power sources in accordance with their environmental impact, fixed premium systems are theoretically the most effective way of internalising external costs. In reality, however, fixed premiums for renewable energy technologies, such as the Spanish model, are based on estimated renewable electricity production costs and comparison with the electricity price rather than the environmental benefit of the renewable energy source compared to conventional power technologies.

iv tax credits

A tax credit is another variant of the fixed price system. Whether an incentive is given in the form of a tax credit or a cash payment does not make a big difference from a socio-economic or investor perspective. But politically it can make a difference whether an incentive is paid by the electricity consumer or by the taxpayer. The largest wind power market to make use of a tax credit is the United States. Canada is also considering introducing a tax driven system. The United States market is driven by a federal Production Tax Credit (PTC) of approximately 1.8 cents per kWh. It is adjusted annually to take inflation into account.

v competitive bidding, tendering

Tendering systems or competitive bidding have been used to promote especially wind power in Ireland, France (for wind farms larger than 12 MW) and the UK. Scotland and Northern Ireland have also made use of the mechanism and the Danish government is finalising a tender procedure for the future development of offshore wind power. Developers of wind farm projects are invited to bid for a limited wind energy capacity in a given period. The companies that bid to supply electricity at the lowest costs win the contracts to do so.

Usually 15 to 20-year power purchase agreements are entered into. The difference in price between these contracts and the price of conventional power represents the additional costs of producing green electricity. Allocation of development rights is usually achieved by letting the suppliers of electricity from renewable energy sources (the wind turbine owners) compete for the power purchase agreements. The system removes much of the political risk for investors as the price is agreed upon for a defined period, and the power purchase agreement is enforced under civil law.

However, investors are faced with another risk element under tendering. All developers that enter a bid risk losing the planning costs if the bid is not accepted or if planning permission is not given on the location in question. Therefore, the model may be better suited for large projects than small ones. Furthermore, the method tends to encourage only development of the most economic (windy) sites. From an electricity system's integration point of view, a reasonable geographical spread of wind power is a clear advantage, as it reduces the balancing costs of the system. One of the major drawbacks of the tenders made so far, e.g. in the UK, has been that they have encouraged 'gaming' of the system. Renewable energy technologies get cheaper over time.

Therefore, a contract holder will wait as long as possible to build a project. Partly because of this inherent flaw, the British NFFO (Non-Fossil Fuel Obligation) tender system did not result in many projects being built. Another flaw of the NFFO model was that it did not penalise developers if they failed to install the capacity for which they had secured a power purchase contract. Therefore, the model should be combined with a performance bond and meaningful penalties for failing to meet the contract. Tendering systems with high penalty clauses appear to be economically efficient, but they are probably only workable for large investors, and not smaller operators such as cooperatives or individual owners, at least not unless they are part of a larger risk-sharing arrangement through a joint project organisation. Experience has shown that the aggressive competition created for lowest price leaves only small margins, which will deter investors and force developers go for highly centralised projects. The majority of these projects never made it past the planning phase.

vi tradable green certificates

A Tradable Green Certificate (TGC) system is, in principle, the same as the tendering system described above. The main difference is that the price for the power and certificates are settled on a daily basis on the electricity market, alongside a separate market for tradable certificates (tendering systems are typically based on 15-20 year power purchase agreements). With daily settling of prices the TGC model is more risky for the investor unless an effective market is developed for long-term certificate contracts (probably financial futures or options). Under a TGC system, the government sets a specific and gradually increasing quantity – or minimum limit – for the amount of renewable electricity in the supply portfolio. An obligation is placed on either the electricity suppliers or endusers.

The generators (producers), wholesalers, retailers or consumers (depending who is obligated in the electricity supply chain) are obligated to supply / consume a certain percentage of electricity from renewable energy sources. At the settlement date, they have to submit the required number of certificates to demonstrate compliance. The TGC mechanism is more complex in nature than other payment mechanisms. Operators from renewable energy power plants will have to be active in two interrelated financial markets: one for TGCs and one for power.

One of the challenges in developing such systems is that there seems to be an asymmetry between the demand and the supply side in the markets. Therefore, especially wind turbine owners would prefer to have as long contracts as possible to minimise risk, while the electricity companies on the demand side seem to prefer short contracts. Another aspect to consider is whether all renewables technologies should be included in a single "umbrella certificate" or whether a certificate for each technology is the answer. One certificate only ensures development of the cheapest

renewable energy technology, while several certificates will result in markets with dangerously low liquidity, at least at the start of development. As with the auction / tender model, it is important to introduce penalties for not purchasing green certificates that are sufficiently high to deter non-compliance. One drawback of a system with fixed quantities of renewables is that the speed with which they are introduced into the electricity supply system is largely independent of technical progress and the increasing efficiency of using renewables, and hence could become a cap on development.

vii emissions caps

Whereas taxation provides a pre-defined cost, much like the tariff system, an emissions cap can set a standard for the industry, but leave it to the market to decide how best to comply with the standard. This can also allow for the introduction of energy saving measures which are often cheaper than new low emission generating capacity. The Kyoto Protocol is a system based on emissions caps, although it does allow for the use of flexible mechanisms that effectively raise the level of the emissions cap within an individual national territory. Emission trading is an effective and potentially powerful tool to meet targets for emissions of greenhouse gasses. But its limitations must be recognised. It will not fully internalise external costs – a condition for a level playing field between polluting and clean technologies.

The philosophy behind emissions trading is that greenhouse gas reductions should be made at the lowest possible cost to society. However, it is important to acknowledge that the cheapest solution in the short run is not necessarily the cheapest long-term solution. In fact it is unlikely to be so. If we take on a short-term approach to combating climate change, and only focus on once-in-a-lifetime solutions such as shifts from coal to natural gas (fuel-switching); or only focus on (very necessary but insufficient) energy efficiency measures such as installing thermostats and insulating buildings, we risk creating a gap in the technological development of those new and renewable energy sources that are a precondition for combating climate change at the lowest possible cost in the long run.

Therefore emissions trading should not be seen as a substitute for environmental taxes or policies to promote renewable energy.

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EUROPE NEEDS A TARGET FOR CLEAN ENERGY

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