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Wind Power Policy Options in Finland: Analysis of Energy Policy Actors' Views Using Regulation Theory

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Contents

Abstract

In this paper I present and discuss views expressed by Finnish energy policy actors on wind power policy options in Finland. Views were collected with a questionnaire and interviews. The views reflect criteria for good regulation and are analysed through criteria drawn from regulation theory literature. The arguments contain many elements from the regulation criteria, as well as political and value-based criteria. Increasing wind power's competitiveness is a paramount objective of policy, but there is no uniform view of the way to reach it. Emphasis on free competition is strong, setting boundaries to methods that are considered appropriate for promoting wind power. Information guidance instruments were not considered very effective, but nevertheless fairly probable and quite preferable, particularly consumer information. Financial incentives were considered very probable and rather preferable. They were deemed necessary for the competitiveness of wind power, but should be phased out (except R&D support). Unpredictability of support was found problematic. Command-and-control mechanisms were considered rather improbable, and the views about their preferability were sharply divided. They were criticised for not being suitable for liberalised electricity markets, and for having limited impact on innovation.

Keywords: Wind power; energy policy; regulation criteria

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About the Author

Vilja Varho is a doctoral student at the Department of Biological and Environmental Sciences, University of Helsinki. In 2004 she participated in the Young Scientists Summer Program at IIASA. This report contains the results of the work conducted during the program, in the Environmentally Compatible Energy Strategies Program.

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Vilja Varho

1. Introduction

Wind power is one of the renewable energy forms that have received a lot of attention worldwide in recent years. Wind power is being promoted mainly because it is non-polluting and lowers the overall emissions of the energy sector by offsetting other forms of energy production[1]. As it is currently more expensive than the so-called conventional energy forms, there are commonly some sorts of policy measures or incentives to make it more attractive to investors. These policy instruments differ greatly from country to country.

Current wind power policy in Finland consists mainly of an investment subsidy (approximately 30 % of investment costs), and refund of the electricity tax. Recently this latter form of support was detached from the tax rate and is simply a subsidy paid per produced kilowatt-hour (kWh) of wind electricity. Other support mechanisms include research and development funding, and information guidance.

In Finland wind power is still a marginal electricity production form, about 50 MW of installed capacity providing some 86 gigawatt-hours (GWh) in 2003, or only 0.1 % of the electricity consumption (Laakso, 2004). Nevertheless, there is substantial technical potential, especially if off-shore plants become feasible (according to one estimate, the technological potential of wind on the Finnish coastline and Lapland is some 10 TWh/a, and the offshore potential some 50 TWh/a (Kara *et al.*, 1999)).

In addition, the attitude towards wind power is rather positive in Finland, which has manifested itself in the nationally set target of 500 megawatts (MW) of installed capacity by 2010 (1 TWh/a) (Ministry of Trade and Industry, 1999). This would mean a tenfold increase from the current capacity. As the growth of wind power has been quite slow in recent years, only some 15 MW since 1998 (see Figure 1), there has been discussion whether new policy instruments should be set up. Also the ongoing process of opening European electricity markets has pushed towards some sort of harmonization in the policies of different countries.

[1] Naturally wind power also has emissions during the lifetime of the turbines, but during the operation of the turbine only noise is emitted.

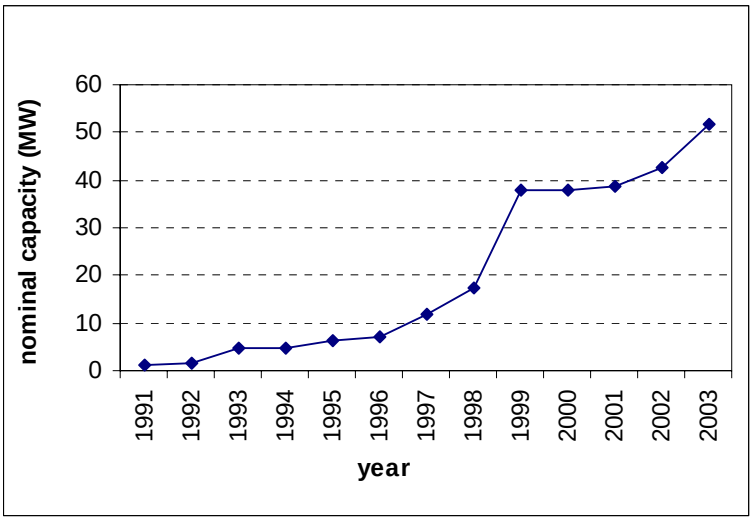

Figure 1. The Finnish wind power capacity from 1991 to 2003. Source: Laakso (2004).

Much of the scientific discussion on energy policy choices is based on statistics, legal aspects, economics, etc. Rarely are the views of the people who participate in the policy making decisions heard, in particular people who are not part of the government. Their opinions, however, have a crucial impact on what kind of policies are chosen, and the analysis of their views may also offer new thoughts, needs for research, and even a "reality check" for scientists.

The rather unique approach and the rich interview material used in this paper are aimed at delivering such benefits, as well as at systematising and clarifying the discussion on wind energy policy instruments, also for the benefit of the policy makers themselves. The aim of this study is to analyse the views of wind power policy actors on different policy options, using regulation criteria from regulation theory. The material consists of 25 interviews as well as a questionnaire given to the interviewees.

I will first describe the material and methods used (section 2), then discuss briefly regulation criteria, such as effectiveness and flexibility, based on the regulation theory literature (section 3), then present results from my empirical research (section 4), and discuss the results in section 5, concluding with a brief summary of findings in section 6.

2. Material and methods

The analysis is based on two types of material. These are interviews and a questionnaire, which the respondents filled in before the interviews. I collected the material mainly in the spring and summer of 2002, as a part of a research project on wind power policy in Finland. An additional interview was conducted in 2003 and two more in 2004 (using the same questionnaire). The interviewees were chosen to represent all the relevant fields of political and economic decision makers in the wind power

sector; policy making and implementation, business community, lobbying groups, and research sector. The interviews lasted approximately 1.5 hours each. The list of interviewees is given in Appendix 1.

The interviewees were chosen from different organisations, but in this study they only represented themselves as individuals. The interviews were confidential, which made them more open, and allowed the respondents to give their honest opinions instead of the political statements of their organisations. For this reason the statements have not been identified as having been said by any one individual. All quotes were translated into English by me.

Only two of the 25 respondents were female, and this gender bias seems to reflect the reality of the wind power sector (and energy sector in general) in Finland, which consists largely of men. In discussing the views of the respondents, they will all be referred to as "he" to preserve their anonymity. Most (18 out of 25) have a degree in technological or natural scientific fields. In fact, only one had not graduated from a university. While it is clear that the interviewees do not represent Finns in general, I believe the group to be representative of the sectors influencing Finnish wind power.

The interviews were semi-structured, meaning that questions were not identical in each interview, although the themes remained the same. This method allowed for additional questions and more freedom for the interviewees to express their interests and views. A number of topics were covered, such as the future of wind power capacity in Finland, the role of consumers in promoting wind power, and different actors' influence on the growth of the sector and on the formulation of wind power policy in Finland. These are discussed in forthcoming articles and in Varho and Tapio (2004). The analysis presented in this article is based on the discussion on the likely development and desirability of policy instruments.

The part of the questionnaire used in this analysis is presented as Table 1. As can be seen, it included many different types of policy instruments, representing information guidance, financial incentives and administrative or "command-and-control" type measures. The currently existing Finnish policy instruments were included, as well as some examples of policies used in other countries, and also new ideas were introduced and asked for.

The questionnaire had also questions about, for example, wind power capacity, electricity consumption, distribution of political power among energy policy actors, and different aspects of the development of the wind electricity market in Finland. Through these questions the respondents created two views about the future, a probable and a preferable one. Some of the answers were used for the scenarios presented in Varho and Tapio (2004), others will be analysed in subsequent papers.

Table 1. Question 12 in the questionnaire (translated from the original Finnish version).

12. In Finland there have so far been at least the following wind power policy instruments in use: investment subsidies, tax refunds, funding of technology programs and production of information for those who are interested in wind power.

Which of the following instruments will be used in promoting wind power in Finland? Please use scales 1-5 in your answers:

Probable future	Preferable future
1=very improbable	1=very undesirable
2=rather improbable	2=rather undesirable
3=probability 50 %	3=indifferent
4=rather probable	4=rather desirable
5=very probable	5=very desirable

	Probable future		Preferable future	
	2010	2025	2010	2025
Investment subsidy				
Tax subsidy (e.g. refund of energy tax)				
Research, development and demonstration funding				
Advice about wind power to energy companies				
Information campaigns on wind power to consumers				
A wind electricity quota set for electricity suppliers				
Guaranteed price for wind electricity				
Government label on ”green electricity” (as in the organic foods label)				
A duty to build wind power set to governmental energy companies				
Something else?				

21 of the 25 interviewees filled in the questionnaire, but some did not answer every question. For example, one respondent did not supply answers for the year 2025, considering it to be too far in the future to make any estimates.

The graphic presentations about some results from the questionnaire can be found in section 4. These are helpful in illustrating the views to be found among the interviewees, but they tell little about the reasons behind the numbers. The interviews provide answers on that. I searched the transcripts for any references to certain policy instruments, as well as for more general views about good wind power policy. Then I analysed the results to see which regulation criteria (for examples of these, see “Regulation criteria”, section 3) the respondents had used in connection to which instruments, and how they valued these criteria. Section 4 contains a more descriptive account of the views, and the discussion of the results is presented in section 5.

When looking at the graphs and other results from the questionnaire in the “Results” section, it is important to remember that they are not statistically representative. I believe that they do represent the prevalent views rather well, but the small sample size should be remembered.

Also, the question 12 used in this analysis was part of a questionnaire, where the respondents created through a series of questions two views about the future, a probable and a preferable one. Both had to be possible, according to the respondent. Therefore a value given in the questionnaire does not only reflect how preferable a policy instrument is, but also whether it is in the realm of possibilities. A respondent might consider a particular policy instrument preferable, but if he thought that it would not be possible to take it into use in Finland, for whatever reason, he might not mark it preferable.

Similarly, sometimes the number does not only reflect the probability or desirability of using an instrument, but also its volume. For example, one respondent considered research funding very important and probable, but suspected that probably the available funds would be smaller than hoped for, and therefore only gave a 3 for the probability.

Some respondents considered the instruments one at the time, so that many instruments could get high values simultaneously, others gave their answers considering the fact that all alternatives cannot be used at the same time. Even given these reservations, the graphs correspond well with the answers given in the interviews, and should be seen as indicative and illustrative representations of existing views.

When it comes to interviews, it must be noted that people were more likely to discuss in length and detail such instruments which they objected to. Therefore the material has some overemphasis of negative arguments.

3. Regulation criteria in the literature

Criteria for good regulation have been discussed in regulation theory. This theory owes much to the public-choice literature and economics, but is essentially a part of legal theory. One aspect of this field is the discovery and discussion of criteria for good regulation. Since all such criteria (e.g., predictability, explicitness, and flexibility) can rarely be met at once, the aim is not to find perfect, optimal regulations, but to consider their merits and drawbacks from different points of view.

Several criteria have been named in different articles and books. An exhaustive list cannot be compiled but the following list contains the most common criteria, in particular for environmental policy discussion. The following list is based mainly on a discussion by Määttä and Pulliainen (2003).

Perhaps the most obvious criterion for regulation is **effectiveness**. There is no point in having a regulation unless it creates an impact. It is important to distinguish effectiveness, which refers to achieving the intended targets, from having an effect, which refers to also unintentional impacts (Similä, 2002). Both are, naturally, important in considering the suitability of an instrument.

A method's effectiveness is not necessarily enough: also **efficiency** is important. Efficiency can be divided into several sub-categories. The first of these, sometimes thought to be the only one, is **cost-effectiveness**. This criterion is rather self-evident, as it certainly makes sense to try to achieve the maximum result with minimum resources. Certain researchers have, however, emphasised the difference between cost-effectiveness, which is often a static issue, and dynamic efficiency. When judging the efficiency of an instrument, it must be considered what is the time frame of the analysis. A method may be efficient at a given time, but **dynamic efficiency** takes into account the method's ability to foster innovation, so that in the future the task may be undertaken even more efficiently. "*So called 'technology forcing' policy aims at guiding technological development in such a way that what is not possible today would be possible in the future*" (Similä, 2002, p.190, translation Varho). Dynamic efficiency is therefore also connected to effectiveness: new technologies may enable the setting of stricter targets and the reaching of better results. Driesen (2003) discusses static and dynamic efficiency at length, paying particular attention to the differences of market-based instruments and "command-and-control" type instruments[2].

In energy policy discussions this theme emerges in the context of (technological) learning, sometimes in slightly different terms. Dynamic efficiency in wind power would mean, for example, having policies that foster or force innovation to more efficient (i.e. less expensive) wind electricity production. There are different ways through which cost reduction can take place, however, not all of which are about technological change. I will return to this issue in more detail in Discussion (section 5).

The third sub-category of efficiency is **administrative efficiency**, referring to low administrative and transaction costs, both for the government and for the participating companies.

Another important area of criteria is **flexibility**. This has also been divided into three sub-categories by Määttä and Pulliainen (2003): **external flexibility** measures how automatically the regulation adapts to changing conditions (such as changing the number of players in the market or technological development), **technological flexibility** refers to the freedom of choice the players have in choosing through which methods to comply with the regulation, and **normative flexibility** measures how easy it is to modify regulation, for example, when targets are changed. Normative flexibility is problematic in terms of **predictability and stability**: if it is very easy to change regulations, they cannot be relied upon.

There are also other, perhaps less obvious criteria that can be given to regulations: for example, **justness** of a measure can refer to burden sharing, i.e. how the costs are divided within the society. **Level of democracy in decision making** has been associated with the discussion on whether a regulation moves power to administration from elected bodies, for example, to a Ministry from the Parliament. This criterion has emerged in particular with environmental law. Market-based instruments have been

[2] There is no exact definition for "command-and-control" instruments, and they are sometimes called administrative instruments or legal regulation. All of these names emphasise the regulators' significant role and power.

considered more democratic in this respect than command-and-control type systems that tend to rely on case by case considerations within the administration. On the other hand, in public planning it is possible to hear different interest groups that the market forces ignore (Similä, 2002).

In this study a number of other criteria emerged. In the following section I will present the arguments on different policy instrument options in a fairly descriptive manner, and will return to the criteria later in the paper (Discussion).

4. Results

In this section I will present the results of the questionnaire and interviews. First, there will be some general findings, then, the results instrument by instrument. Using rather traditional way in regulation literature these have been grouped into three groups: information guidance, financial incentives, and administrative or command-and-control type instruments. The grouping is somewhat arbitrary, as will be discussed below, since policy instruments may have features from at least two of these classes. Nevertheless, it aids in seeing the differences between the policies. In the end of this section I will also introduce briefly some policy mechanisms that were mentioned by the respondents but were not included in the questionnaire.

4.1. General findings

The scale used in the questionnaire is a set of qualitative classes, which strictly speaking cannot be added together. Nevertheless, I believe that some general interpretations can be made using the average values given to each instrument. These results are only indicative, but they illustrate two trends that could also be identified in the interviews.

A clear trend in the numerical answers is that the average value of preferability for each policy instrument is smaller for 2025 than for 2010. This mainly reflects the assumption that wind power would be (at least more) competitive in the electricity market, and would not require (as much) support from the state any more in 2025.

Another finding is that the only two instruments that had higher value for probability than for desirability, for both 2010 and 2025, were the investment subsidy and the tax refund, i.e. the main instruments currently in use. It seems that while there was a general belief that these instruments would still be in use at least in 2010, there was a wish to change the system in some way.

4.2. Information guidance

There were three policy instruments representing information guidance in the questionnaire, two of which are grouped together here. First, there is advice and

information provided to wind electricity producers, and second (and third), there is information directed at consumers. The latter is in the form of campaigns directed at consumers, and governmental labelling of the so-called "green" electricity (i.e. electricity having lower environmental impact, from renewable energy sources).

Often information guidance, and production and distribution of information in general, were viewed as very neutral, non-political activity by the respondents. This probably increases the preferability of information guidance, especially among those who do not wish to see the state affect the liberalised market. In addition, information guidance is normally compatible with all other policy instruments, advocates of different policies can recommend information guidance as well.

4.2.1. Advice to energy companies

As wind power is a new, decentralised source of electricity, there have been doubts whether energy companies really know how to enter the wind electricity market. There were, in fact, several references to this kind of problem, although some of them referred more to the corporate cultures than the level of knowledge. Big companies were expected to be more familiar with big, centralised plants, and even though wind power could be run also by new small companies, these might lack the necessary expertise to function in the electricity market[3]. There has already been an attempt to solve this problem in Finland, as there has been at least one guidebook for wind power projects, published by the government-owned Motiva which promotes renewable energy sources and efficient energy use (Motiva, 1999).

As can be seen in Figures 2 and 3, the views on this type of advice were extremely varied, and were distributed particularly evenly for 2025. There were not many direct references to this policy instrument in the interviews and opinions were not expressed very sharply, although one respondent believed that it is a very inefficient way of trying to change anything.

[3] The liberalised electricity market and exchange, combined with carbon emission trading, and possibly with green certificate trading, was already seen to demand a great deal of expertise from electricity companies.

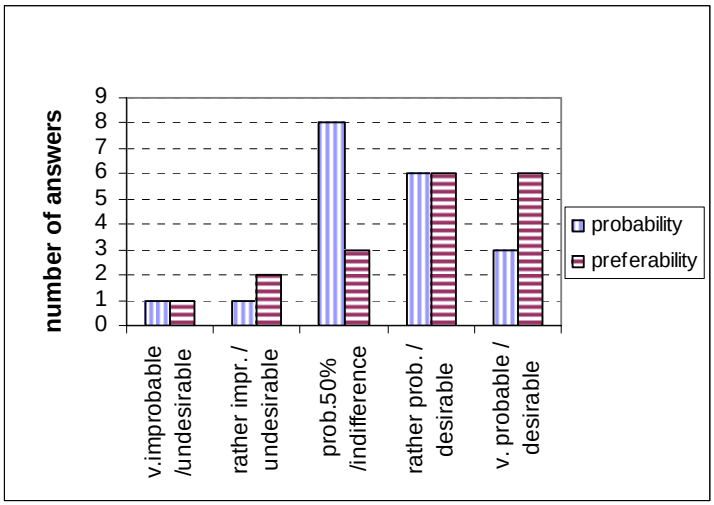

Figure 2. Probability and preferability of wind power related advice to energy companies in 2010, according to the respondents.

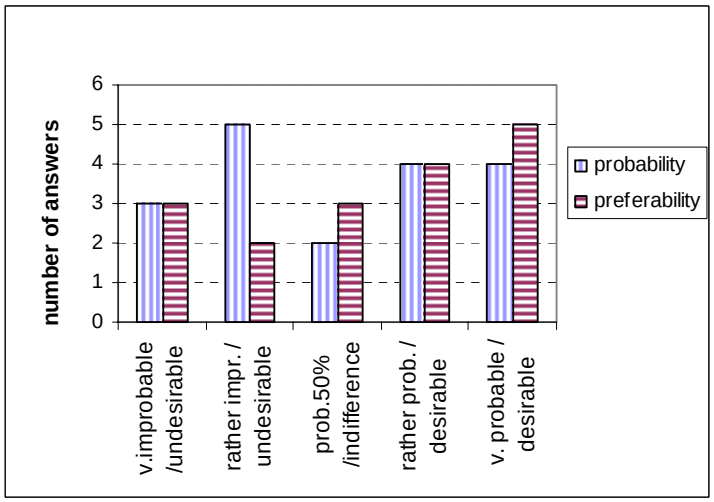

Figure 3. Probability and preferability of wind power related advice to energy companies in 2025, according to the respondents.

A few respondents expressed their opinion that companies already know or should know themselves what to do. One interviewee believed that such information could be distributed to only a limited degree from the outside, and that experience and learning-by-doing were more significant. Nobody seemed to believe that this policy measure was particularly important, but many had the opinion that it was nevertheless good to have in the palette.

Here emerged the first criteria that were not mentioned in section 3 (although it can be said that they are sub-categories to effectiveness). **Significance** refers to the importance of the immediate objective of the policy for the overall problem. For example, if the overall target is to increase the number of wind power plants in Finland, what is the

barrier? This has to be identified before a policy instrument can be chosen. Is the problem that is being solved with a regulation a significant one? Another criterion is **relevance**. Is the proposed policy instrument really relevant for solving the problem? As discussed, some interviewees did consider the energy companies lack of expertise with wind power to be a significant problem, but there were doubts whether advice given to them would really solve the problem.

In summary, it can be seen that the criteria associated with advice to companies were divided views about the **significance** of the problem, and assumed **limited relevance** and **low cost-effectiveness** of the instrument.

4.2.2. Consumer information

In the questionnaire consumer information was expressed through two policy instruments, namely information campaigns on wind power to consumers, and government labelling of "green" electricity. The aspect of consumer information will be discussed in more detail in another paper by Salmela and Varho, see also Salmela (2004). In short, it can be said that the views on consumers' role to promote wind electricity were very polarized. Some interviewees believed that only consumer demand could bring significant growth to wind sector, as

> "*the most important factor here are the consumers, for if there is no demand, then, you cannot sell by force, somebody has to buy*".

Others argued that as the increase of practically emission-free and renewable energy source benefits the whole society, the responsibility of change should not be left to individual households. Rather, the state should ensure that the benefits that are shared by all are also paid for by all.

This polarization could be interpreted as resulting from two different functions of the green electricity market: it can be seen as a market place, or as a tool for environmental improvement. If it is the former, consumer choice is paramount, if it is the latter, increase of wind power (through various means) is most important.

Finnish consumers were generally not expected to start buying green electricity in large quantities. The main reasons for this were considered to be the lack of environmental consciousness and the higher costs of wind electricity[4]. As can be seen in Figure 4, consumer campaigns were rather popular among the respondents. The main reason for this was the importance of consumer demand for the development of the sector.

The following reasons were named for giving lower values (undesirable or indifferent):

people should already know enough about wind power and environmental issues to act;

[4] Other studies have indicated that there are other problems as well, in particular the consumers' lack of experience of acting in the liberalised market, and their lack of trust towards green electricity products and energy companies (Salmela, 2004). There were some references to this type of unfamiliarity also in the interviews.

it should be left to energy companies to advertise their products, and the government should not interfere. There was also a view that it would not be possible for the state to promote one form of energy over others, as that would count as market distortion;

such campaigns have very low cost-effectiveness. They would require professional marketing style, and best efficiency could be achieved when targeting larger consumers rather than households;

one respondent (who did not answer to this part of the questionnaire) had doubts whether wind power even is an environmentally good choice, considering the whole life cycle of turbines.

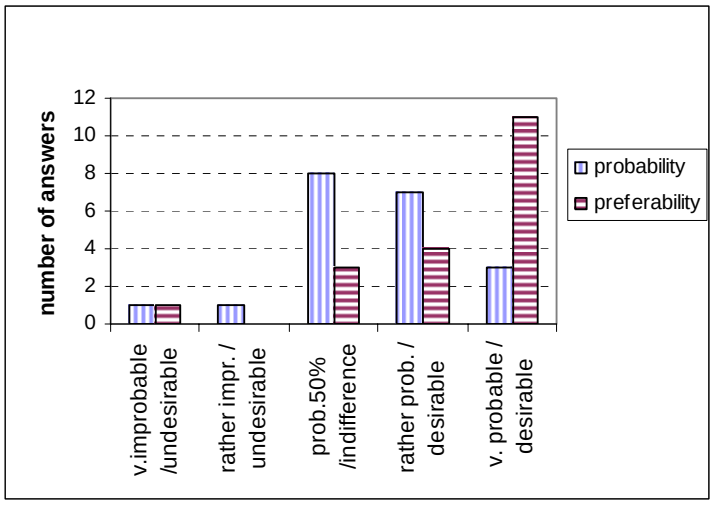

Figure 4. Probability and preferability of information campaigns on wind power to consumers in 2010, according to the respondents.

Despite the fairly high probability and high preferability of the use of this instrument, there was not very much enthusiasm about it in the interviews. Even when it was considered important that consumers would become active in the green electricity market, there was fairly little faith in their doing so. There were doubts about the effectiveness of campaigns, and real change in attitudes was thought to take long, even generations. Despite all of this, consumer information was hoped to legitimise the use of policy instruments and create overall understanding of wind power and its impacts.

In summary, the **cost-effectiveness** and **effectiveness** of this instrument were considered low, and there was disagreement about the **significance** of the problem of low consumer participation to the overall goal of increased wind power production. This was related to the **acceptability** of the instrument: is the use of the instrument **congruent with the existing legislation** and would the use of the instrument signify **unacceptable interference with the market**. Consumer information was thought to be a very acceptable method in general, but there were some doubts about the specific tool suggested.

Another aspect of this consumer information is the labelling of green electricity products. For many years it has been up to the energy companies and/or environmental organisations like the Finnish Association for Nature Conservation to distinguish between environmentally more benign forms of electricity production. More official, governmental labels were suggested in the questionnaire.

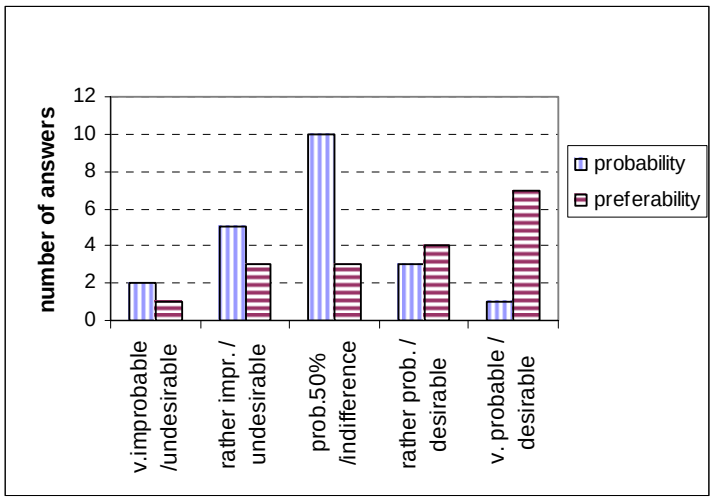

Figure 5. Probability and preferability of governmental green electricity labelling in 2010, according to the respondents.

As can be seen in Figure 5, there was a high degree of uncertainty about this instrument. This is interesting, as there was already the European Union directive requiring that

> "*Member States shall, not later than 27 October 2003, ensure that the origin of electricity produced from renewable energy sources can be guaranteed as such within the meaning of this Directive according to objective, transparent and nondiscriminatory criteria laid down by each Member State. They shall ensure that a guarantee of origin is issued to this effect in response to a request*."(Directive 2001/77/EC, article 5).

In the interviews it was usually considered preferable that different sources of electricity were somehow differentiated, but the particular method of labelling was not so uniformly approved of. Some argued that it is illogical to differentiate only green electricity, and to prove that it is somehow better for the environment. Instead, all (and in particular the less environmentally sound) sources of electricity and their impacts should be made known to consumers.

This is, in fact, now being done, as electricity sources are differentiated in electricity bills (see Directive 2003/54/EC). Some people did not consider this type of information governmental labelling, however, but rather something that the *energy companies* would do, even though it was required by law.

This type of information guidance was believed to cost little, and to clarify the existing situation of different green electricity criteria, which the consumers may find confusing.

However, the same doubts about the effectiveness of this kind of consumer information were present as with campaigns; Finns were not thought to be willing to pay more for green electricity, at least in the short run (up to 2010 or so). What impact the new sources of information will have on the market remains to be seen.

The main criteria that emerged here were **effectiveness**, which was considered low, combined, however, with the fairly good **cost-effectiveness**, made possible by the low costs of the method.

4.3. Financial incentives

In general, financial incentives in some form were usually considered necessary for the development of wind power in Finland, but it was also emphasised that they should be transitory in nature. These incentives should be lowered and finally removed, as wind power becomes more competitive in the market. There was disagreement over whether competitiveness on market terms could be reached by 2025.

In the literature on environmental regulation there is often a distinction between market-based regulation and command-and-control type regulation. In wind power policy the difference is perhaps not quite so clear, as all instruments operate within the electricity market, and even the command-and-control -type regulations rely on market activities. However, there is a difference between financial *incentives*, which ultimately depend on market actors' willingness to respond to them, and *commands* that force markets to operate in a certain way. The latter may still rely on competition and market mechanisms, but to a lesser degree. A prime example of this type of regulation is the wind electricity quota for electricity suppliers, as the suppliers can choose where they purchase the wind electricity from. The wind electricity producers are then competing against one another, but they do not compete against producers using other sources of energy.

Research funding is slightly difficult to place in this division to three types of regulations. It is clearly related to information guidance. It differs from the policies discussed in the previous section in that it is directed more towards wind turbine manufacture than towards wind electricity market. However, in this way it also differs from the other financial instruments discussed here.

The main reason that research, development and demonstration (RD&D) funding is included here among the financial incentives is that it can constitute a fairly significant financial benefit to companies that produce wind turbines or their components. In addition, research and development funding and the investment subsidy are to some extent both directed at improving technology. They are two instruments that have a common goal. Wind power in Finland is strongly tied to the Finnish wind turbine industry. Even though wind power policy aims at the increase of wind *electricity production* in Finland, the motive of supporting the *turbine industry* is not insignificant. Both the R&D funding and investment subsidy have been geared towards technological

development. This close tie makes it more sensible to discuss these instruments together, despite the difference in their nature.

4.3.1. RD&D Funding

In general the respondents were very much in favour of research, development and demonstration (RD&D) funding, as can be seen in Figure 6. This policy received the highest average value in terms of preferability, both for 2010 (4.68) and 2025 (4.12).

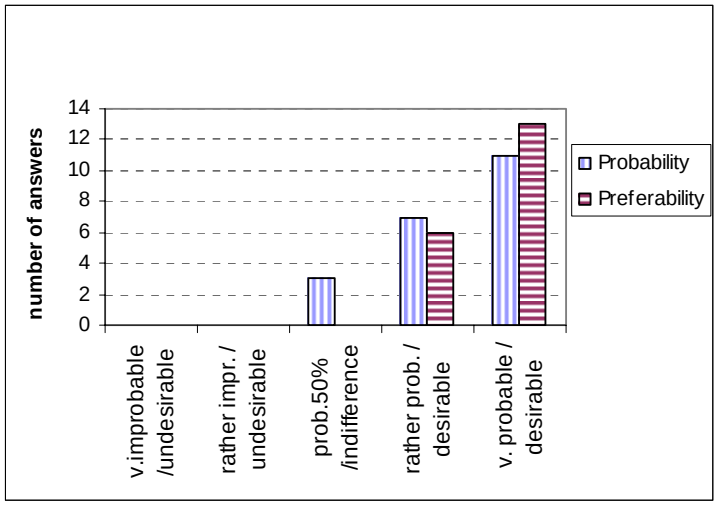

Figure 6. Probability and preferability of RD&D funding in 2010, according to the respondents.

There were several reasons for favouring this instrument. First of all, one of the main goals of wind power policy is to reduce the costs of wind power production. Many interviewees believed that this cost reduction would follow from technological innovation. Also the wish to support Finnish wind turbine industry contributed to the desirability.

One respondent also argued that this type of policy is most sustainable: when technologies are not yet mature enough, they may collapse when subsidies are removed. As he did not consider wind power to be very mature yet, he believed that it is most prudent to support mainly the technological development and not to create artificial market growth through state funds.

There was some disagreement over whether wind power is technologically mature or not. Some argued that the technology is mature enough and now the policy efforts should be spent on market pull (influencing the demand side of the market). One respondent accused policy makers of hiding behind a call for more research, when measures to make use of the technology are needed. The slow market growth in Finland was also seen as proof that the technology push of Finnish policy (influencing the supply side) is not an adequate approach.

Some views expressed, however, were of the opposite opinion. One interviewee argued that it is necessary to continue researching even more basic things, as the leap to the megawatt-class turbines poses problems to the existing solutions and technology. Fast global market growth does not mean that there are no technological problems to solve, as the product keeps changing rapidly.

In any case, it was expected that the technology would improve over time, and the need for further state funds for R&D would diminish. Nevertheless, this type of state funded research was considered valuable even in 2025. There seemed to be a rather common belief in the intrinsic value of increased knowledge and expertise, and it was considered acceptable for the state to take part in the funding of this increase. The state was, in particular, expected to fund long-term basic research that may not have direct commercial applications.

The fact that almost all respondents have university degrees may of course have influenced their positive attitude towards knowledge and research, but I believe that there is a fairly strong agreement about their importance in Finland in general.

However, even some interviewees who advocated R&D funding had some reservations about the appropriate amount. In particular, it was pointed out that the Finnish funds are only a small part of the global R&D expenditure on wind power, and Finns should consider carefully where to spend their limited resources: perhaps research on other sources of energy would be more cost-effective. Even if the Finnish turbine industry does have a significant share of the market (in 2001 the Finnish wind power components had a global market share of approximately 5 percent, (Holttinen *et al.*, 2002)), it was remarked that the real strength of Finnish renewable energy (technology) lies in the biomass.

On the whole, the biggest disagreements seemed to be about the sufficient level of R&D funding, as well as about its relative importance within Finnish policy, not about the desirability of research funding as such. It is also notable that R&D funding can be used in conjunction with any other policy instrument, so advocates of any kind of policy can support this instrument.

Here the most important criteria seem to be **high significance and relevance** (wind power production costs are too high and R&D brings them to more competitive level). However, there were a few strongly expressed arguments, emphasising the need to create markets, achieve economies of scale, and in general to make use of the technology rather than concentrate on perfecting it. These statements contested the relevance of R&D.

Some considered the use of R&D as the most **sustainable** policy. The **acceptability** of the instrument was quite high. However, even some respondents who supported this instrument had doubts whether the limited available funds should be given to wind power technology or rather to biomass, for example. In fact, with practically all suggested instruments there emerged the question of **sufficiency of funds**. It is not only a question of what is the best strategy, but also whether there is enough money for it. In this respect the respondents seemed rather sympathetic to the state's problems, and

advocated the phase-out of subsidies as well as new ways of finding more money, as will be discussed in the following sections.

4.3.2. Investment subsidy

Investment subsidy is, along with the tax refund, the main element of the Finnish wind power policy. Monies available for subsidy are decided yearly in the Parliament, when the state budget is approved. The sum is available to different energy investments. Applications for the subsidy are directed usually to the Ministry of Trade and Industry, which has the power to determine how large the subsidy will be (up to 40 % of the investment cost), or can deny it altogether. If the investment represents new technology, the percentage can be higher than with conventional technology. Wind power projects are normally all considered "new" technology (Anttonen, 2004). On average the subsidy has been approximately 30 % of the investment cost (Helynen *et al.*, 2003). The investment subsidy stands for approximately half of the financial incentives, and the production subsidy for the other half, when the lifetime of turbines is assumed to be 20 years (Mäki, 2004).

Views about the investment subsidy were also rather polarized in the interviews. Its use was considered very probable, at least until 2010 (see Figure 7), but there were a number of critical opinions about its benefits, so that the preferability is less than probability (see Figure 8). In fact, investment subsidy and tax refund were the only instruments mentioned in the questionnaire that received smaller average values for preferable future than for probable future.

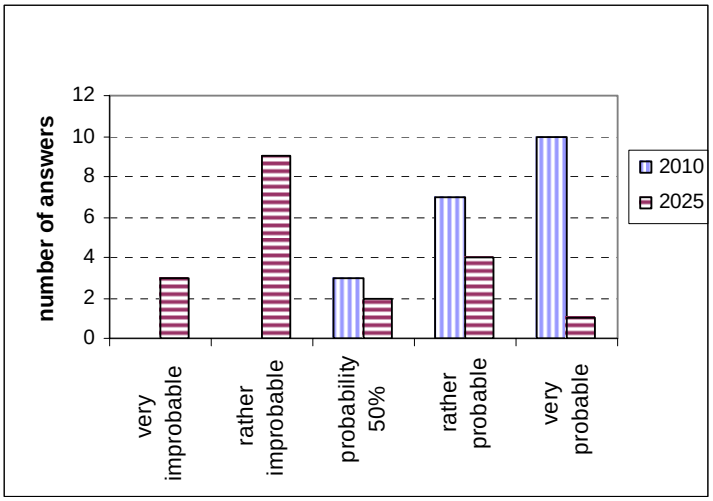

Figure 7. Probability of investment subsidy in 2010 and 2025, according to the respondents.

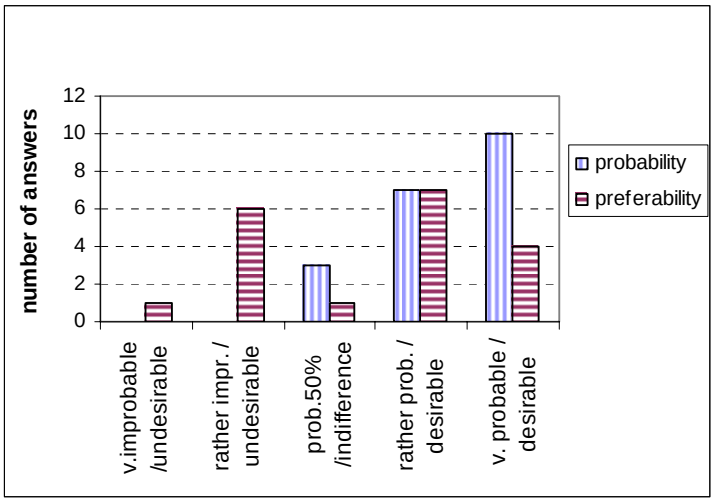

Figure 8. Probability and preferability of investment subsidy in 2010, according to the respondents.

The main reason why the probability is so much lower in 2025 is that by then wind power is assumed to be competitive, or at least require much less subsidisation[5]. The very high probability for 2010 resulted from the assumption that there would be no rapid changes in wind power policy. As there are already certain policies in place, there is always a certain lag before new policies can be decided upon, the design detailed, and the new rules and bureaucracy set in place to replace the existing ones. Another delaying factor is that the energy policy sector is undergoing significant changes, for example, the electricity market liberalisation on European level, and the carbon emission trading within the European Union. It was thought that there was a wish to wait and see what impact these changes bring, before modifying the policies directed specifically at renewable energy forms. In fact, in 2004 a working group discussing the impacts of emission trading ended up recommending no changes to wind power policy (Ministry of Trade and Industry, 2004).

A wish for more predictable wind power policy was both a reason to oppose and to support investment subsidy, but the apparent conflict lies mainly in the way investment subsidy is organised in Finland. Investment subsidy was thought to be safe from political and policy changes, as it is paid all at once. Other subsidies get paid over the years, and are therefore less predictable.

On the other hand, the predictability of investment subsidy suffers from the fact that the money available for them is decided yearly in the state budget negotiations, so there is no certainty about the funds available for investment subsidy in future years. This makes it more difficult to plan the company strategy and investments for future years.

[5] Some respondents gave a lower value for policy instruments in 2025 than 2010, when they expected the *amount* or *relative importanc*e to decrease, although the probability or preferability of the use of the instrument might not change.

A few interviewees proposed the creation of some sort of fund for subsidies, for example, through collecting a small sum per kilowatt-hour from consumers. In addition to the issue of predictability, the idea of such funds or trusts is related to sufficiency. Even now it is not possible to give investment subsidy to very big projects. So far the wind power projects have been small, rarely more than 10 MW, and bigger projects would quickly consume all available funds. If the pace of construction increases, the need for funds would increase as well, even taking into account the possible cost reductions. If funds could be collected in advance and put into some kind of trust, there would be more money available for the future projects. This type of fund would work equally well for production-based subsidy, which will be described in the following section.

Such a system would certainly solve some difficulties, but these kinds of funds have been considered very problematic. For example, they were thought to create a sum of money "without a master", difficult to control and monitor. Also, they were simply considered to be against the unwritten norms and conventions of the country, and possibly even against the constitution.

One interviewee believed that investment subsidy would require less bureaucracy than continuous support mechanisms like production subsidy which is paid by kWh, whereas some others found investment subsidy to be quite bureaucratic. Even more problematically, it was considered arbitrary, being solely in the control of the Ministry of Trade and Industry:

> *"A: Plus that it is always the process of granting the subsidy which is rather bureaucratic and takes long, and there is no certainty on how the subsidies will develop in the future, there is always this lottery in the fall in the Parliament, deciding how much money will be given for the following year. […]*
> *Q: Well what should the investment subsidy be like then?*
> *A: It should be an automatic system as it used to be in Sweden. That a certain subsidy will be granted automatically to projects that fulfil certain requirements, and you know what the requirements are when you start planning a project. Now this Finnish system is like a black box, you're told that you have to fulfil certain conditions in order to get the higher percentage subsidy, but you do not ever really know yourself what the conditions are."*

To some extent the opposite side of predictability is flexibility: policies that are very predictable and stable can be quite inflexible. There were only few comments where flexibility was emphasised in the interviews, in general the stability and predictability of instruments were valued most. However, one interviewee pointed out that the use of investment subsidy makes it possible to direct funds to wind power projects in particular, as they can be given as a subsidy a higher percentage of investment costs than other energy projects. In particular, biomass tends to be more competitive in Finland, and such projects receive smaller subsidies. More automatic systems, such as green certificates, would treat all renewables equally.

Investment subsidy was considered by some respondents to be suitable for new technologies, not for creating market demand. As mentioned before, it is possible to get

higher subsidy percentage for a project that includes new technological innovations. Of course, the main goal of all wind power policy is to make the policies unnecessary, by increasing wind power's competitiveness in the electricity market. It can be said that there are two main ways of reaching this competitiveness, namely, technological development and economies of scale. Much of the criticism against Finnish investment subsidy was that it concentrates on technological development, when (according to this argument) creating market pull would result in learning-by-doing and economies of scale, lowering the costs of wind electricity more rapidly. Many critical respondents approved, nevertheless, the investment subsidy as a sort of special case, only to be given to true demonstrations of new technology, but not used as the main support instrument. Those who emphasise technological development were naturally pleased with the existing system.

The **significance** of the problem is rather obvious here: some way must be found to compensate for the higher costs of wind power, if it is expected to enter the market. However, there was disagreement on what the most effective way of lowering costs is: technological development or economies of scale. If the strategy is the latter, investment subsidy in its current form may not be particularly **relevant**. It is clear that the definition of the problem to be solved is crucial for finding the relevant policies.

Predictability was thought to be both a plus and a problem with the Finnish investment subsidy, as was **administrative efficiency**. **Limited transparency** of the method was criticised, as well as the way it leaves power to the administration (**democracy in decision making**). **Sufficiency of funds** was a reason to oppose the use of investment subsidy, at least if new methods of collecting the funds were not introduced. The method discussed, a fund or trust, was criticised on the grounds of incompatibility with the existing legislation and "the common way of the country".

4.3.3. Tax refund / Production subsidy

This subsidy is based on the amount of electricity produced. It used to be the equivalent of electricity tax (~0.7 c/kWh) (Helynen *et al.*, 2003), but since 2004 is no longer attached to the tax rate. Therefore even when the tax rate is changed, this does not necessarily mean changes to the subsidy, and the other way around. Obviously this means that it is not strictly speaking a tax refund any more, but the same arguments that were aimed at tax refund mostly apply to any other production-based subsidy as well. Some also remarked that as the tax is not collected from the producers but the consumers of energy, and then paid to the producers, it is misleading to call it a "refund".

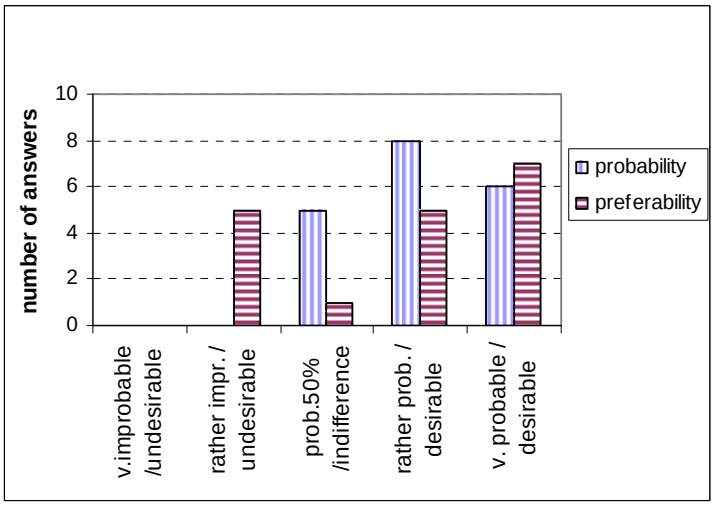

Figure 9. Probability and preferability of tax refund in 2010, according to the respondents.

The main problem with tax refund (or any production-based subsidy) was thought to be its unpredictability. There is no guarantee that the subsidy would still be in place after 10 or 15 years, because the political priorities may change. This obviously increases the investor's risk, and was referred to as political risk. On the other hand, some considered this type of subsidy more predictable than the investment subsidy. This is because a production-based subsidy is automatic, and requires no decision-making in the Ministry. Removing the connection to tax rate may increase the predictability of the production-based subsidy, as it is no longer tied to the tax systems that can change yearly.

As was discussed above, the predictability and stability of policy instruments were considered extremely important. To some respondents it mattered little what instrument was used, as long as the system was stable. While all respondents understood this need, it was sometimes pointed out that long-term commitment to financial instruments is not "the way of the country", the way things are usually done in Finland. There is a general reluctance to commit the state to certain policies for a long time; perhaps it is not even fair to tie the hands of future governments in this way.

The main theme in most reasoning for or against policy instruments was compatibility with the free market. Some believed that tax refund would distort the market least, whereas others argued that a continuous form of support introduces a continuous distortion, more harmful than an investment subsidy which is given just once.

One respondent considered also tax refund to be a command-and-control type mechanism. He advocated for positive methods to create voluntary purchases, not for mechanisms that punish some energy forms while rewarding others.

> "*If citizens do not wish this, then the mechanism starts from the wrong end, with these old-fashioned control mechanisms you punish others so that you can support wind power, so that citizens get it [=wind electricity] for the same price as other electricity, you don't […] people's own activity, consider it good and promote it*"

He also argued that this “punishing” type of policy would increase the overall costs of the system. To some extent the argument suits the “real” command-and-control systems better. After all, here it is, to a large extent, a fiscal energy tax which is being collected for the state, and the state simply waives its right to these funds in the case of some renewable forms. It is really no different from any other state subsidy, as discussed above.

The main argument, however, that punishing some forms of energy is somehow wrong, is in contradiction with most respondents’ arguments. They often considered the internalisation of external costs to energy costs, for example, through taxation, to be the most effective and just way to promote renewables. This issue will be discussed in more detail in section 5 (Discussion).

In summary, production subsidy was both supported and opposed on the grounds of **predictability**. Equally divided were views about its **compatibility with the free market**. There were some doubts about the **justness** of the approach. It was also accused of being **old-fashioned** and of having **high costs for the economy**.

4.4. Command-and-control

Much of the discussion on environmental policy has been about the choice of market-based mechanisms and command-and-control type mechanisms. The former have often been called more cost-effective, as the market mechanisms in principle produce optimal resource allocation. Criticism against this reasoning has pointed out that command-and-control mechanisms may have a higher dynamic efficiency, i.e. increase innovation (e.g. Driesen, 2003).

Command-and-control type instruments are not currently in use in Finnish wind power policy. Traditionally, however, their role has been fairly large in the environmental policy, in particular in natural conservation and pollution control. The environmental policy is also moving towards new policy instruments. Ministry of Trade and Industry has been more positive towards deregulation in general than the Ministry of the Environment (Sairinen, 2003). Wind power policy, as part of energy policy, is the domain of the Ministry of Trade and Industry in Finland.

The positive attitude toward deregulation and competition in the electricity market can be observed throughout the energy sector and even beyond it. In fact, there was no group among the respondents where market-based mechanisms and voluntary purchases of green electricity would not have been valued, even though there were naturally differences of degree among the attitudes of the respondents.

Some saw a clear difference between financial incentives, and those described as command-and-control. Others, however, saw little difference:

"*actually this guaranteed price or production subsidy or tax refund or green certificate are all the same. Just giving the electricity producer more money for his product. […] So in fact, I don't think we can talk about anything else but a subsidy based on production, or an investment subsidy, these two.*"

Three command-and-control type instruments were introduced in the questionnaire. The first one was formulated as guaranteed price for wind electricity, and it refers to such systems as the German feed-in tariff. The second is a wind electricity quota, which is often linked to green certificates, as will be discussed later. The third suggestion was governmental energy companies' obligation to build wind power. All of these instruments would mean a stronger deviation from normal competition than that caused by subsidisation.

4.4.1. Guaranteed price for wind electricity

A guaranteed price for wind electricity has been used, for example, in Germany. The tariffs there used to be connected to the market price of electricity, but since April 2000 the tariffs have a previously set level. The tariff for new projects will be lowered by 1.5 % yearly, in anticipation of cost reductions in the sector (Ministry of Trade and Industry, 2002; Twele, 2002).

In the UK wind electricity tariffs were guaranteed for 15 years through the so-called Non-Fossil Fuel Obligation (NFFO), but there was a competitive bidding process through which companies could enter into the system. Although there are still a number of old contracts running under NFFO, no new contracts are being made, and the new support system is based mainly on the renewable energy certificates and a quota for renewable energy (Ministry of Trade and Industry, 2002).

A guaranteed price is certainly a financial incentive to build wind power, but it has certain aspects which distinguish it from the instruments discussed above. First, the state regulates the price of wind electricity, but the electricity is being paid by consumers. In this way the "extra" money comes from the market (=consumers) directly, whereas in the previously discussed methods it comes from the state funds. The more fundamental difference, however, is that it is a forcing method, a mandatory rule to the markets, rather than an incentive to act voluntarily. Where investment subsidy and tax refund reduce the financial risk, a guaranteed price (and the certain market, as this type of policy is normally associated with the obligation to buy all produced wind electricity into the grid) nearly removes financial risk. The investor knows from the beginning that all produced electricity will be sold for a certain price. However, income depends naturally on wind conditions and therefore varies from year to year.

Nevertheless, it is again more a question of a continuum than clearly separate categories. The main reason for my emphasis here is that many respondents had a very different view about such methods as investment subsidy and guaranteed price. The former was considered to be much more suited to free electricity markets than the latter, and thereby much more suited to Finland.

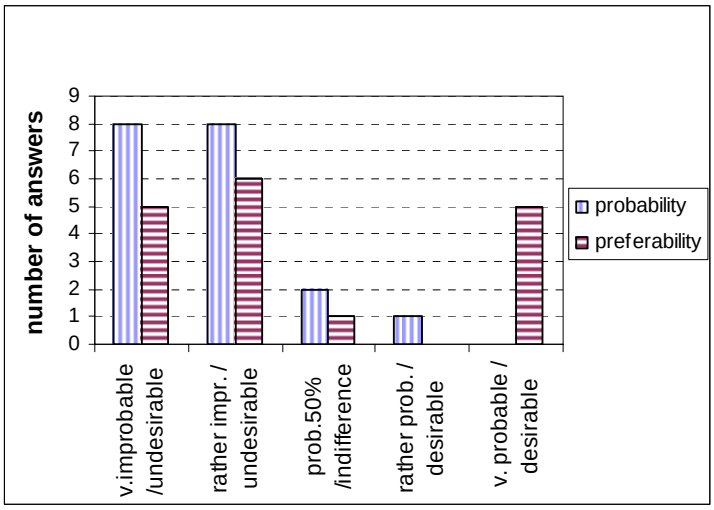

Figure 10. Probability and preferability of a guaranteed price for wind electricity in 2010, according to the respondents.

The probability of the use of this method in Finland was considered very low. This was attributed to general dislike towards it in Finland, and even to a lack of will to develop methods that would really benefit wind power in Finland. There were also concerns that if a new method was developed for wind power, the representatives of other renewables would protest, unless they were also included in the new system.

The views about desirability were sharply divided as can be seen in Figure 10, with 5 respondents considering it very undesirable and 5 very desirable.

The main reason to favour this instrument was its perceived effectiveness. In fact, few people questioned the effectiveness of this instrument. (One respondent, however, considered it a "short-term gimmick" that could not ensure long-term development, as the technology itself is not mature enough, and another implied that any forcing system would somehow be stopped or sabotaged by the energy sector, stating that any "stick" method simply does not work and "carrots" are needed instead). Many made references to the very fast growth of wind power in Germany under the feed-in tariff, and acknowledged its effectiveness in creating market activity.

There were several points by which the method was criticised, however. For example, the guaranteed prices would require governmental commitment to a certain system for 15 or 20 years which is largely not considered appropriate in Finland, as discussed above.

Guaranteed price was criticised for being expensive and not cost-effective. Since the price is guaranteed, it was argued, there is little incentive to build wind power to optimal sites and to use better technology to drive down the costs. It is possible to build wind power also to areas where it is far from profitable without subsidisation. As the system does not force wind power producers to compete against one another, it does not drive to lower costs of the technology. This argument was repeated in the recent

working group paper (Ministry of Trade and Industry, 2004), where the use of guaranteed tariffs was not recommended.

It is true that the feed-in tariff enables building also to non-optimal sites. However, there certainly have been significant cost reductions in Germany, and the analysis by Klaassen *et al.* (2004) indicates that the cost reductions through learning have been specific to wind power technology, not country specific. Hemmelskamp (1999; p.85) discusses the German policy and argues that "*in contrast to investment cost subsidies, the introduction of returns-dependent financial support for companies awakened interest in functional, economic wind farms*." He also states that "*returns-dependent financial assistance in particular stimulated demand oriented around cost-efficiency and indirectly triggered the corresponding innovation from manufacturers. Every improvement in the performance and value for money of the equipment increased the subsidised component. In this way, a powerful incentive for further development of wind energy equipment was created*" (Hemmelskamp, 1999, p.79). Certainly it makes sense, even with the guaranteed price, to lower production costs in order to increase profits.

In addition, there were some remarks in the interviews that seemed to contradict the view of feed-in tariffs not having any impact on technological innovation. According to one respondent, the way the very large German market dominated the industry for several years forced the turbine manufacturers to constantly strive for bigger and bigger turbines, which were optimal for the German market:

> "*instead of developing turbines that produce electricity as cheaply as possible, it was better to develop turbines that produce as much electricity as possible, that is as big ones as possible. […] because it was best for the client to buy as big a turbine as possible and to get as much energy from the small land area as possible*."

If this is indeed true, it would mean that there has been significant technological innovation, but at the expense of cost reductions. It would help this analysis if the costs for more conventional, smaller turbines were distinguished from the larger turbines representing new innovation.

A representative of the German wind power association believed that the very fast technological development and innovation has meant that there is not enough time for product optimisation:

> "*we could have much better cost if we had one product longer in optimization, instead of having a new development, which is very cost-intensive, three years later, every two years a new development keeps the prices high, because you have to share the development cost in the product, and if you have a product which is running since five years and the development costs are depreciated, then you can offer it for a lower price in the market. And if you have an optimization of a product, you can also have cost optimization, but if there is no optimization anyway in the product, technically and economically, the price level stays high. So, I think there will be a cost reduction in the future, if the market calms down a*

little bit, and we don't have such short period of product development which we have had in the last years."

The most significant benefits from having bigger turbines will probably emerge with offshore wind farms, as there the costs of foundations and connections to grid (per turbine) are much higher than onshore. In the future it can be expected that also these large turbines can be optimised and their costs brought down.

The question of cost reduction and technological innovation was certainly important in the discussion, but in the end there was an even more fundamental reason to oppose this policy instrument: its incompatibility with the free electricity market.

The process of opening the electricity market to competition was quite lengthy, and some respondents considered it irrational or undesirable to now introduce methods that restrict competition and reintroduce state control. Some respondents, however, anticipated that there might be a step back towards more regulation, as, for example, the market does not sufficiently take into account the issue of security of supply, or long-term planning and investing in general.

Those respondents who saw the free competition as the most important feature of the market did not see these instruments as compatible with the market. Interestingly, some other respondents referred to guaranteed price and wind electricity quota as market-based instruments, probably because they are about creating a market, not about pushing the technology. One respondent described these methods (or any subsidies etc.) as ways to create instability to the market. As the market actors respond to the changed situation, they increase the use of renewables and a new balance is reached.

Some arguments were about particular practical difficulties with incompatibility with free market, such as an instrument being in conflict with EU legislation. Often, however, the defence of free markets was more about the "spirit" of competition. A few statements were philosophically or politically motivated:

"*I have a very positive image of people, I believe in the goodness of humankind, so I trust, maybe a little too much, in people's coming to their senses […] environmentally good things will be seen as important and their importance will increase. […] So in this way very positive and in this respect individualistic […] I don't believe in top-down politics very much, at this moment somehow this free, should I say real market economy, solutions that are based on people's free choice, somehow these seem natural. And dictating things from above is far from this*."

"*Q: What about this free market is so good that we should…?*
A: Well I don't know if there is anything (laughs) so good, but of course it will keep the price of electricity right, they say, and maybe it is after all a part of the structure of our society."

"*For me, in general, talking about any form of electricity production, subsidizing it till the end of the world just doesn't fit this western thinking.*"

These type of arguments about markets and competition apply, of course, to all command-and-control type instruments.

In summary, guaranteed tariff was considered **effective**, but **expensive** for the society. It was **not** considered **acceptable** for the Finnish policy system, or for free market conditions. Its **dynamic efficiency** was thought to be **low**. As a forcing method it was also criticised for being **dictatorial** and against western values.

4.4.2. Wind electricity quota for electricity suppliers

There was some confusion among the interviewees in regard to this policy instrument, mainly because of the way it was formulated in Finnish in the questionnaire. Even though the question mentioned quotas, some people seemed to interpret it as an obligation to buy all produced wind electricity into the grid. Such an obligation was considered rather ineffective, if it is not accompanied with a guaranteed (minimum) price. When asked whether there could be a situation where some wind electricity could not be sold, it was usually stated that all produced wind electricity can be sold. This results from wind powers low variable costs. Whether this price is enough to keep the company solvent is another issue (the investment cost is high).

Quotas are in use at least in the UK and Sweden. In these countries the quota is for renewable energy, however, not specifically wind power. One way to manage this quota is to have green certificates and a trading system for them[6]. Some voluntary green certificate trading has already been tried in Finland[7]. A quota belongs to the category of command-and-control instruments as it introduces a certain market to renewable energy, which is not in competition with the conventional energy sources.

[6] There seemed to be some confusion in the interviews between having green certificates in general, and a system of mandatory quotas for green certificates. Green certificates on their own are not really a policy instrument, merely a way of separating electricity and its "greenness" i.e. environmental benefits. If these certificates are created under state system, it is a question of governmental labelling.

[7] see e.g. GreenStreamNetwork, http://www.gsn-trade.com/index_comp.htm

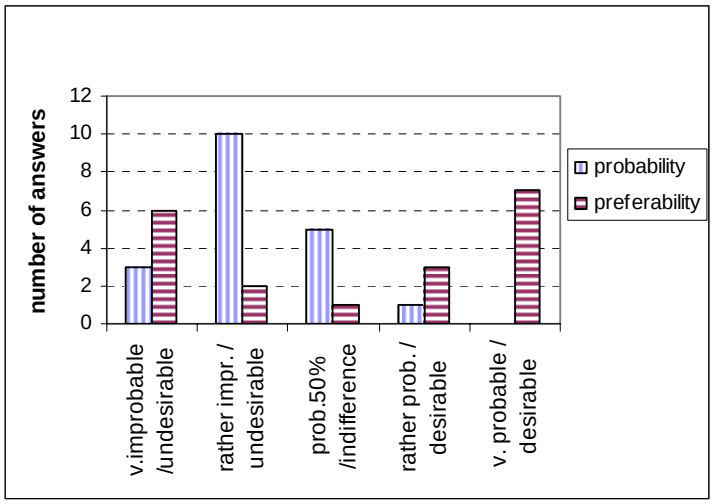

Figure 11. Probability and preferability of a wind electricity quota for electricity suppliers in 2010, according to the respondents.

As can be seen in Figure 11, the probability of this instrument was thought to be low, and the views about its desirability are polarised, much like those about guaranteed price. Also similarly to the previous instrument, a wind electricity quota set for electricity suppliers was usually considered effective in reaching the target, in part because it does not depend on consumer choices. One respondent remarked that this type of policy instrument would not require as much state funds as many other instruments.

However, despite the benefits, a quota was not always approved of. The main objection was this instrument's incompatibility with free markets and existing legislation. The same wish to distort markets as little as possible and the belief in benefits of competition that were discussed with previous instruments were brought up here as well. Sometimes it was remarked that voluntary purchases would be ideal, but if they do not take place, the state has to interfere. These interferences can be dictatorial or cause market distortions, but they may turn out to be necessary for public good:

> "*People don't think what is green and what is not, no. It is money that talks. […] The society has to say that this is the way we want it. Whether it is the green certificate or emission trading or this quota, which seems a little dictatorial, but apparently we have to. If we want to live in a pleasant environment, then we have to agree in the society that darn it, this is how we will do it now.*"

In addition to more general views, there were some specific arguments about the practical application of this instrument. It was argued that if the system was based on some sort of renewable energy certificate trading, wind power would not benefit, as it would lose in the competition to the more affordable biomass, as well as to imported wind electricity from very windy sites, for example.

Sweden has recently introduced a quota system where all renewables are treated equally, and one respondent remarked that the high proportion of hydropower in the

Swedish electricity market, combined with the yearly variances in precipitation, cause instability to the price of certificates. This can cause problems to wind power as well. It might be necessary to create separate quotas for different renewables, if the target is to increase wind power capacity. Another interviewee was reluctant to bind the electricity sector with wind power quotas, as wind power production also changes yearly as a result of variations in the amount of wind.

One respondent considered green certificates problematic for energy companies, which already have to deal with rather complicated electricity trading, carbon emission permit trading, etc. Another remarked that big producers might be able to dominate the market and control the price of green certificates.

Quotas were considered **effective**, but possibly **incompatible with the free market** and **dictatorial**. **Low administrative efficiency** was expected, as there would be a need for careful planning if the system was to benefit wind power, and transaction costs to companies were thought to be high.

4.4.3. State-owned energy companies' obligation to build wind power

I introduced this policy instrument to the questionnaire in the hope that it would inspire the respondents to look for new, perhaps radical instruments. I did not believe myself that such a method would ever be taken to use. None of the interviewees considered its use probable in 2010, however, one respondent considered the use of this method "rather probable" in 2025, without mentioning reasons.

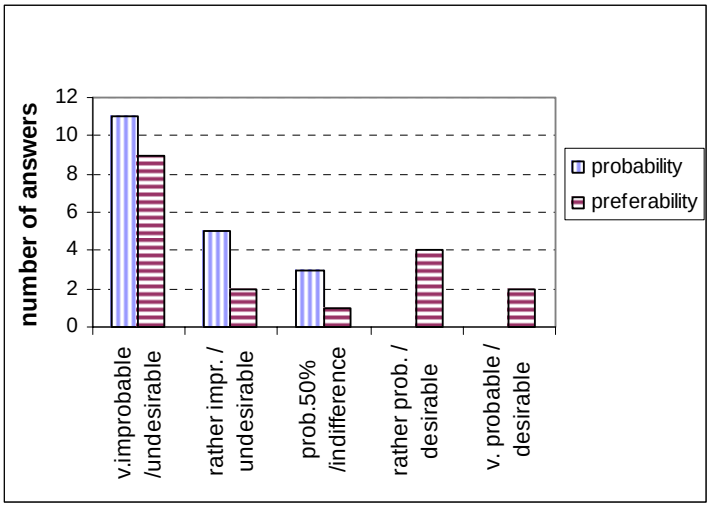

Figure 12. Probability and preferability of state-owned companies' obligation to build wind power in 2010, according to the respondents.

There were a few respondents who considered state-owned companies' obligation to build wind power preferable, but mostly it was considered undesirable. The reason was that this was thought to be quite unsuitable for market environment. As long as state-owned companies compete in the same field as privately owned ones, it was not thought

to be right or even legally possible to put them in a different position from their competitors. The fact that the stock of state-owned companies such as Fortum are also traded in the exchange was significant, as forcing a company to build wind power could lower the value of the company. These reasons explained also the improbability of the instrument.

One respondent believed, however, that state-owned companies could easily be ordered to build more wind power, although he suggested that the state would buy all the produced wind electricity, lessening the company's financial risk. He believed that if an energy company is owned by the state, it would have less trouble negotiating with state officials, such as the Ministry of the Environment for land use planning, etc. In his opinion this method would increase the wind power capacity in Finland very effectively.

Main criteria that emerged with this instrument were **effectiveness** and **incompatibility with existing legislation and market environment**.

4.5. Other methods

Some interviewees came up with instruments that were not mentioned in the questionnaire. These will be given a brief overview here.

Some activities could be classified as information guidance. The most important of them was not directed (only) towards market actors, but towards government itself: the land use planning (i.e. zoning) practices and existing plans have not taken the needs of wind power much into account, which has delayed wind power construction noticeably. In Finland it is the Ministry of the Environment that is responsible for zoning guidelines, and it has responded to the problem by, for example, setting up a working group to study the requisites for building wind-power plants under Finnish environmental legislation (Ministry of the Environment, 2002). In addition to the authorities, this type of work was also hoped to help companies planning to build wind power, as they would have a better idea what to expect from the process, and what environmental aspects to take into account.

According to some respondents, the environmental authorities' lack of experience with wind power projects has also been a delaying factor. Educating officials on wind power was seen as a way to solve this problem.

Another field of information production that the state was hoped to take part in (or pay for) is the compilation of wind data. Existing data has been collected mainly for lower heights (~50 m), and as new turbines are much taller than this, reaching faster wind speeds, this data is not very useful for planning further wind power projects.

It was also suggested that the state and other public bodies, such as municipalities, should purchase green electricity for their consumption. This would not only create markets, but would also set a good example, and inspire other consumers.

It was also thought possible to auction subsidised wind power contracts, perhaps in the way it was done under the Non-Fossil Fuel Obligation in the UK. One interviewee criticised this system for granting contracts only to those who have access to the windiest, most profitable sites, leaving all others without any subsidisation. It has also been argued that this has pushed the British turbines to windy but environmentally sensitive areas, which has increased local resistance to wind power (Hemmelskamp, 1999; Klaassen *et al.*, 2004).

There has been much discussion about new policy instruments within the environmental sector. One of the topics has been voluntary agreements (e.g. Sairinen, 2003). All wind power investments are (at least up to now) voluntary and the above-mentioned auctions might be the only mechanism that would introduce agreements between state and companies to wind power policy. The agreements would be binding, however, and more in the nature of a normal contract, so the definition does not perfectly apply.

Another use for the green certificates was to use them to reach targets in (carbon dioxide) emission reductions instead of targets in percentage of renewable energy. It could be seen that this would increase the **technological flexibility** of the emission reduction systems.

Other suggested policy instruments were the requirement that all municipalities would name sites for wind power production, that the bureaucratic process of getting building permits was speeded up, and that renewables were prioritised when there is oversupply of electricity to the grid.

It was also suggested that subsidies could be directed to earlier projects, for example it could be announced that the subsidy would be “X” up to year 2006 or up to 200 MW of installed capacity, and “X-Y” after that. This might encourage companies to take early action, as they would know about the changes in advance. This suggestion refers very clearly to the question of predictability as well.

All in all, there seemed to be a number of ideas and suggestions that could be used for wind power policy. These different methods were supported mainly on the grounds of **significance** and **relevance**. There was also a call for a more vague virtue of **innovativeness** in energy policy instruments. In this respect, and considering the slow growth of capacity in Finland, it is unfortunate that there does not seem to be plans to introduce any new methods in the near future (see Ministry of Trade and Industry, 2004)

5. Discussion

Before discussing the findings of my study, I would like to point out one feature of the method and discuss its significance.

In this paper I have preserved the anonymity of the respondents. I have not referred to their answers even through a category, such as “a representative of the administration”. There were two reasons for this. Firstly, sometimes the respondents represented more than one group, for example, some researchers participate also in the activities of the lobbying group Finnish Wind Power Association. Secondly, answers could be quite different even among representatives of a single group. Responses could not be deduced on the basis of the organisation the interviewee worked in. Therefore a statement by one representative of a group does not necessarily reflect the views of the other representatives. Using any kind of identifying label could not only jeopardize their anonymity but also possibly give a wrong impression about the groups to the reader.

I believe that the unexpectedness of some answers tells us two things: First, the goal of the anonymity was reached, as the interviewees were able to give their honest views that might be slightly different than those of their organisations. Second, wind power policy may be such a new issue in Finland that there has not been time for the opinions to become entrenched.

5.1. Defining wind power policy

What is wind power policy? In this study it was defined as governmental wind power programs and policy instruments, such as the setting of national wind power capacity targets and the use of the investment subsidy. During the interviews it became clear that this definition leaves some important areas out of the discussion. First, the issues related to siting wind turbines were not addressed, as these are not part of energy policy. Siting and permit problems turned out to be one of the reasons why the growth of the installed capacity has been slow, however, in spite of the existing wind power policy.

It is not only a question of local resistance, even though this has been encountered in many projects, but also a question of unclear regulations. In addition, existing land use plans do not normally take wind power into account, as they have been designed before the issue was actual. Some work has been done to overcome these problems, but siting can be expected to remain an important topic in wind power development. One of the main challenges will be the integration of local people into the wind power development, seeing them as a valuable resource and stakeholder group instead of a difficult opposition (see Varho, 2003).

Another crucial aspect of wind power policy are the actions directed towards *other* energy forms which indirectly affect wind power’s competitiveness in the market. Perhaps the most effective, and to many interviewees the most just way of promoting wind power would be the internalisation of external costs of competing energy forms, for example through a sufficiently high CO_2 tax. This aspect was not discussed in the questionnaire, but it emerged often in the interviews.

One respondent argued that the Finnish electricity tax is an attempt to internalise the external costs, and obviously such energy forms that do not cause these external costs should be exempted. Therefore calling the tax refund a subsidy is misleading: you’re

simply not taxing something that is not there. Whether the Finnish electricity tax in reality has a directive function or is simply a fiscal tax cannot be discussed here.

The importance of such measures as CO_2-taxes or emission permits to support wind power has been established by Hadley and Short (2001), for example, and in the recent study of Finnish energy sector by Honkatukia *et al.* (2003). These instruments can be expected to have a significant importance, even though there is yet little information on how much, for example, the European Union carbon trading will affect the situation. It is likely, however, that also policies directed specifically to the renewable energy forms will be needed. Internalising the externalities does not address many of the barriers mentioned in this study, such as informational deficiencies.

5.2. Objectives of the policy

The objectives of the Finnish wind power policy have not been very clearly stated anywhere. There is the official target: 500 MW of installed capacity by the year 2010, and the "vision" of 2000 MW by the year 2025 (Ministry of Trade and Industry, 2003). However, increasing the capacity is only one of the existing objectives.

One of the reasons for promoting wind power production is the reduction of CO_2 emissions from the Finnish energy sector. The impact of subsidies on emissions has been very limited so far, as was recently reported by the State Audit Office (VTV, 2003). It is not quite fair to consider only the reductions that result directly from these subsidised projects, however, as they are part of the process of creating knowledge and expertise that can benefit also future wind power projects. Indirect benefits can be obtained through emission reductions from new projects in the future.

In the 1993 plan to promote wind power production in Finland (Ministry of Trade and Industry, 1993) there is a mention of the objective of supporting Finnish wind turbine industry and its export activities. In subsequent programs this has not been mentioned (VTV, 2003). The reason for this might be the restrictions the European Union places on subsidising business activities. There is no doubt, however, that the motive of supporting Finnish industry, and thereby creating economic and employment benefits, is very real and present in the minds of the respondents. This motive was found in all respondent groups (see Varho, 2003).

Perhaps the most important objective is to make wind power competitive in the long run. Even if this is not clearly stated in official documents, it was very obvious to all interviewees. It was said that subsidies are necessary in order to make wind power competitive, but that the aim of subsidies *has to* be to make themselves unnecessary in the future. The disagreement was not over this overall goal, but over how it could best be attained.

5.2.1. Dynamic efficiency

It is the criterion "dynamic efficiency" that best corresponds with the ability of the policy instruments to make wind power competitive by lowering its costs. The two main routes to competitiveness can be defined as market pull and technology push. They represent two different components of learning; learning-by-doing, and economies of scale result from market pull, and learning-by-searching and technological development result from technology push.

When asked about the ways wind power costs will be brought down, both technological innovation and economies of scale were mentioned. Economies of scale referred to increasing turbine size, increasing project size, and mass production of turbines. Some interviewees also referred to the improving know-how in the companies. The dominant view in the wind power policy, however, seemed to be that it is through research and constant technological inventions that the competitiveness can be reached. Therefore R&D funding was considered very preferable. In addition, as discussed before, Finnish investment subsidy is directed to projects that include some new innovation.

Several interviewees emphasised the need to create market pull which would result in economies of scale and learning-by-doing. There were conflicting views on who would create the market pull; the household consumers, the industrial or public consumers, or the public authorities. Some references to the economies of scale and learning-by-doing seemed to assume that this development would take place without state interference. It has been argued, however, that on their own the markets are unlikely to produce this development, and that judicious government activity and co-operation with market actors is needed (IEA, 2003). After all, before the product is commercially competitive, it makes most sense to all actors to wait for others to be the first movers. Even in Finland it has been suggested that Finns should wait until the costs have been brought down, before investing into wind power. Internationally it may be possible to wait for other countries to subsidise wind power and therefore bring the costs of technology down, but national market, company know-how, operation and maintenance network, land use planning practices, etc. have to be adapted and developed in individual countries. These are unlikely to happen without governmental initiatives. If, however, only the costs of technology are seen as the barrier, sufficient action may not be taken.

Consumer demand would obviously create market pull. The way it was discussed, however, did not address the impact this would have on further costs, it was its other benefits that were discussed: voluntariness, acceptability in the market environment, and that it would not require either state funds or state bureaucracy.

Based on mathematical analysis of economic policy, Tinbergen (1952) came to the conclusion that there should be (at least) as many policy instruments as there are targets for policy, in order to reach the goals. This has been called Tinbergen's rule. Regardless of whether the rule always applies to policy, it is a useful starting point for the discussion. As noted, there are various targets for Finnish wind power policy. In addition, there are several policy instruments in use but they are not necessarily directed

at different targets. In particular, the investment subsidy in Finland has more than one goal: One is to lower the costs of technology, by forcing innovation, another is to increase the installed capacity. Since the growth of capacity has been slow, it seems that this approach has not been optimal.

In light of the views presented in the interviews, it must be assumed that R&D funding will continue in Finland. The policies could also include more effective volume generating instruments, leading to learning-by-doing. The optimal allocation of funds for different policy instruments could be studied using the two factor learning curves (2FLC), which incorporate both types of learning (see Klaassen *et al.*, 2004).

5.3. Criteria

Considering the type of material the analysis is based on, it is obvious that the emerging criteria is not only "legal" in nature. In fact, both more process oriented "legal" criteria and more political, value-based criteria were brought up. The latter includes justness, voluntariness, and "western values" as intrinsic values. For example, information guidance was often valued indirectly for encouraging voluntary, responsible, individual, and market-based action. Voluntary purchases by environmentally concerned citizens were even seen as most fair (if, and only if, someone wants wind power, he or she should pay for it).

Significance and relevance were strong criteria. As these relate to the effectiveness of instruments in reaching the overall goals, it can be seen that effectiveness was one of the most fundamental criteria. This is hardly surprising. Efficiency was quite important as well. Dynamic efficiency was discussed often, even though the term dynamic efficiency was not used. Administrative efficiency was mentioned a few times, although the strongest comments referred to building permits and siting, which were outside the scope of this paper.

The interviewees were quite concerned with cost-effectiveness. There was a wish to use scarce state resources as efficiently as possible. The respondents also worried about the sufficiency of funds. A new way of collecting money for actual support instruments was suggested. Some criticism against the use of specific instruments was that there would not be enough funds available for them. Perhaps this insufficiency of funds could be called a regulation criterion, but it did not influence the respondents' choice of policy instruments as much as the way an instrument could be used, its volume.

Flexibility in any of its forms was mentioned only a few times, external and technological flexibility almost not at all. The counterparts of flexibility, predictability and stability, on the other hand, received a great deal of attention. Flexibility was used mainly as the explanation why long-term commitments are not acceptable in Finland, but this seems to be a rather strong argument.

The energy production sector prefers knowing what the policies will be like. One respondent even said that it would make little difference what form the subsidies would

take, as long as they could be relied upon. There was little faith in the continuation of the policies, however, so that the projects always include some "political risk". Clearly the administration prefers flexibility, the industry stability, but there is some question about which instruments are predictable and which are not (in particular investment subsidy vs. production subsidy).

Here it could be pointed out that the whole wind power policy is based on set targets. These, in particular the target of 500 MW of installed capacity by the year 2010, are seen to be very significant (see Varho and Tapio, 2004). It was often assumed that since the state is committed to this target, it would somehow find means of reaching it (even if the means were unreasonable, some interviewees feared). Interestingly this target was considered to bind also future governments, whereas commitment to particular policy instruments cannot be expected.

Some criteria emerged from outside of the regulation theory discussion and may be rather specific to wind power policy. The most important of these was the compatibility of instruments with existing legislation and in particular with the liberalised electricity market.

5.3.1. Compatibility with other legislation and market environment

Legislation should obviously be consistent, so compatibility with other legislation is a natural criterion. However, here it did not only refer to impossibilities, such as an instrument being unconstitutional, but also to more vague barriers. "Not the way things are done in Finland" is not a very specific criterion, but it is a strong one. In models of policy analysis "*nation's policy culture and policy style"* (Linder and Peters, 1989) and "*political and institutional framework conditions"* (Jänicke, 1997) have been found to be important in determining the policy instrument choice. Sometimes, of course, a government may decide to make an exception, if the issue is significant enough (see DTI, 2000; 9).

The existence of liberalised, deregulated markets also places certain boundaries. The acceptability of policy options to these conditions emerges as one of the main criteria for wind power policy in Finland. This reflects the debate of command-and-control regulations vs. market-based regulations, so prevalent in environmental regulation discourse.

Jänicke (1997) mentions "*strategy"* as another factor influencing policy instrument choice. By this term he refers to the general long-term approach to the problem under regulation. For the past decade or so, the most significant strategy that relates to electricity policy has been the deregulation and liberalisation of the market. There was a feeling among many respondents that the liberalisation was a long and difficult process, and going against this strategy now, for something as relatively insignificant as wind power is in Finland, would be difficult or even a little absurd.

Since one of the reasons for the deregulation was to increase efficiency and competition, it is not surprising that any interference with the market, in particular such strong

methods as guaranteed price, are seen as problematic. However, it is perhaps unjust to blame the liberalisation process as such, since according to Pineau and Hämäläinen (2000) the Finnish market was exceptionally "free" even before the deregulation of the 1990s. Competition is not something new in the market, but rather, to a large extent, the way the Finnish market has always operated. There were changes, nevertheless, one of which was that the consumers were able to freely choose their supplier. This was a significant change, which is reflected in the way consumers' choice was emphasised in the interviews.

An interesting question, worthy of further study, is whether the claims and arguments presented here can be proven right or wrong. For example, the research on learning curves tries to answer the question of how policies and trends foster innovation. The real impact of policies on innovation in Finland and in other countries should be studied further. Another example would be the way some instruments are in conflict with the free market; is it just the spirit of free competition that is being violated, or are there legal or economic problems?

The spirit is certainly important on its own. There were some quite liberalistic tendencies in the interviews, where the benefits of free competition and minimal state interference were pointed to. Finding out conclusively what kind of policy is optimal is obviously impossible, since different economic and political schools of thought have not been able to resolve the issue in hundreds of years of study. More limited and practical issues could perhaps be solved, however, for example, whether the investment subsidy really interferes less with the market than other suggested instruments, as was claimed.

It must be remembered, however, that there may be different reasons to emphasise certain criteria. For example, financial incentives are likely to be cheaper to the energy sector than command-and-control regulation. Voluntary purchases by households, in their turn, would be easiest and cheapest to the state, and emphasising the importance of (voluntary) demand moves the responsibility of the structural change in the electricity sector to the consumers. Therefore, the emphasis on consumer demand and limited state interference do not necessarily represent only "pure" ideas of best policy, but also normal (financial) interests of a group. Nevertheless, I believe that there was also honest trust in the benefits of free competition, and genuine belief that consumers *should* direct the wind power development by their preferences. The Finnish actors are not alone in this thinking, on the contrary the International Energy Agency describes the approach "*which favours minimal interference by governments in the operation of markets*" as "*the current political ethos*" (IEA, 2003; p.16).

5.4. Will there be change?

As can be seen from the results presented in this paper, there are very conflicting views about the policy instruments. These different views are problematic for the policy makers, as there is not even a uniform view within the energy sector that receives the subsidies. Guaranteed price and other command-and-control methods are so unpopular, however, that it does not seem likely that they would be introduced to Finland.

There seems to be little enthusiasm to try new methods, in particular at the same time as such changes as carbon emission trading are starting. This is evident in the working group report (Ministry of Trade and Industry, 2004) where no changes to the existing system were proposed. One respondent also stated that Finland already has a lot of renewable energy production and there is therefore not as much need for strong measures as there is in countries with little renewable energy production.

It is perhaps not so much a question of reluctance to support wind power, but rather a reluctance to mess up the existing system which is up and running, in particular in the uncertain situation of emission trading. Also, any methods that raise the price of energy in Finland are often considered problematic, because they might jeopardize the competitiveness of the Finnish energy intensive export industries.

However, there are pressures to change the policy. Different policies in different countries, in particular if they are part of the same electricity market, are bound to cause problems. This is very actual now that Sweden has completely remodelled her renewable energy policy. Harmonisation efforts are undertaken also within the European Union. There are no perfect policy instruments, and no matter how the policies change, they will require careful design and learning from results of other countries.

6. Summary

In this paper I have presented and analysed views on wind power policy options expressed by Finnish actors in the wind power policy field. The empirical material was collected through interviews and a questionnaire. The views and arguments were discussed in relation to the criteria for good regulation, drawn from literature on regulation theory.

The objectives of the Finnish wind power policy are not very clearly stated, although increasing wind power's competitiveness seems paramount. There is no uniform view of the way competitiveness could be reached. The arguments used in the discourse contain many elements from the regulation criteria, as well as political and value-based criteria. Emphasis on free competition in the liberalised electricity market is strong, and it sets boundaries to methods that are considered appropriate for promoting wind power in Finland.

In summary, information guidance instruments were considered fairly probable, and quite preferable, particularly information to consumers. Some respondents put much emphasis on the importance of consumer demand for the growth of the sector. However, these instruments were not expected to be particularly effective, and evoked rather little enthusiasm for or against.

Financial incentives were considered very probable and rather preferable as well. Criticism against them was more detailed, perhaps because there is more experience on

these instruments in Finland. They were deemed necessary for the competitiveness of wind power, but should be phased out as soon as possible (with the exception of R&D support). Unpredictability of support was thought to be one of the main problems, making it more difficult to invest in wind power.

Command-and-control mechanisms were considered rather improbable, and the views about their preferability were sharply divided. They were criticised for not being suitable for liberalised electricity markets, and for having limited impact on technological innovation.

Changes to the existing policy system are expected to be slow, but pressures exist for harmonisation on the European level or at least in the countries participating in the Nordic electricity market.

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Appendix 1

List of interviewees.

Name	Organisation
Mika Anttonen	Ministry of Trade and Industry
Esa Holttinen	Electrowatt-Ekono (consultant)
Hannele Holttinen	Technical Research Centre of Finland
Veli-Matti Jääskeläinen	WinWinD (turbine manufacturer)
Jorma Keva	Ministry of the Environment
Aarne Koutaniemi	Lumituuli Ltd. (a small wind power producer)
Simo Kyllönen	Finnish Association for Nature Conservation
Jerri Laine	TEKES, Technology Development Centre of Finland
Ari Lampinen	University of Jyväskylä
Peter Lund	Helsinki University of Technology
Folke Malmgren	Vindkraftföreningen (wind power association)
Timo Mäki	Hyötytuuli (producer of wind electricity)
Bernt Nordman	Natur och Miljö (a nature and environment association)
Jaakko Ojala	Ministry of the Environment
Mauno Oksanen	Vapo Oy Energia (medium-size producer of wind electricity)
Leo Parkkonen	Ministry of Treasury
Esa Peltola	Technical Research Centre of Finland
Jouni Punnonen	The Confederation of Finnish Industry and Employers
Gustav Tallqvist	Oy Synoptia Ab (agent of BONUS Energy turbines in Finland)
Bengt Tammelin	Finnish Wind Power Association
Martti Tiuri	Member of Parliament, chairman of the committee for the future (2002)
Pentti Tiusanen	Member of Parliament, chairman of the environment committee
Harry Viheriävaara	Finergy, Finnish Energy Industries Federation
Sirkka Vilkamo	Ministry of Trade and Industry
Jyrki Virtanen	Metso Drives Oy (producer of turbine components)
Interviewed abroad	
Jochen Twele	Bundesverband WindEnergie e.V. (German wind power association)