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Stability, participation and transparency in renewable energy policy: Lessons from Denmark and the United States

Miguel Mendonça [a,*], Stephen Lacey [c,1], Frede Hvelplund [b]

[a] World Future Council, England
[b] Department of Development and Planning Aalborg University, Denmark
[c] Renewable Energy World.Com, United States

Abstract

The expansion and long-term sustainability of the renewable energy industry will depend on many factors. Energy demand, energy access, energy security, the green collar jobs agenda and climate protection will all drive the industry forward. Public opposition and insufficient financial support can hold it back. To facilitate steady, sustainable growth of the renewable energy market, careful consideration of promotion policies will be necessary to ensure that the inherently distributed nature of renewable energy sources translates into diverse ownership, with broad support. Such support will drive the rapid deployment of these socially and economically beneficial and environmentally necessary technologies. This acceleration can be created through *innovative democracy*, which attempts to bring all actors into the decision-making process. When considered as a market driver for renewable energy, this equitable, participatory approach must be considered in conjunction with stable financial support schemes which allow diverse actors to engage the market. Lessons from Denmark and the United States show why this combination of conditions is central to the rapid deployment of renewable energy. Policymakers can assess the effectiveness of this approach by analysing which groups benefit most from the design of different policies. The authors suggest several criteria for performing this analysis.

1. The evolution of renewable energy policy in the United States

This paper explores how varied policy approaches in different countries can either encourage or hinder the participation of a diverse range of groups in climate and environment protecting activities, as well as discuss why this comparison is important for realising the social and economic benefits of renewables. The United States offers the example of the federal tax credits, which have been an important factor in fostering the initial growth phases of the country's renewable energy market, but are not suitable for expanding the renewable energy market as it pertains to the *innovative democracy* model outlined in greater detail in Section 9.2.

Compared with emerging European renewable energy markets, the United States is generally an exclusive one (Gipe, 2008). The use of non-refundable tax credits for incentives has ensured that only a few large corporate entities and wealthy individuals participate in the wind and solar markets. A tax incentive is a Government-issued credit that is obtained against taxes owed when an eligible citizen files a tax return. In order to take advantage of these tax credits,

* Corresponding author.
E-mail address: miguel@worldfuturecouncil.org (M. Mendonça).
[1] www.renewableenergyworld.com.

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one must have significant tax liability; however, most Americans do not owe enough in taxes to qualify for the credits. As a result, only 4% of the 20,152 MW of wind capacity installed in the country are smaller, community-owned projects (Mazza, 2008, p. 15), and the highly distributed solar industry is quickly turning toward more centralised, utility-scale installations. The outlook for solar projects in the U.S. suggests that in the next 3 years, a handful of concentrating solar power companies will develop and own more capacity than the hundreds of thousands of American home and business-owners who install photovoltaic systems (Farrell, 2008a,b). While these tax credits have been instrumental in stimulating the initial growth of the U.S. renewable energy industry, the next phase of market growth will require a revision of existing tax policies to make them more inclusive or an implementation of new policies that offer citizens greater access to the market. For the purposes of the paper, the authors will only be looking at tax incentives for wind and solar–electric systems as they relate to energy equity in the U.S.

If U.S. policies continue to limit who can participate in the market, the full range of benefits offered by distributed energy may not be fully realised. Those benefits include: Enriching local economies, encouraging greater interactivity with energy, diminishing ''social friction'', and enhancing the security of energy supply (Gsanger, 2008). Consequently, there is a growing movement within the U.S. to make the federal tax credits more inclusive or to shift from a tax credit-based incentive structure to something that more closely resembles the feed-in tariffs in countries such as Germany, France and Spain.

1.1. The formation of incentives

The U.S. is the birthplace of the feed-in tariff now seen in 37 countries around the world (Martinot, 2008, p. 22). Most feed-in tariffs currently in place offer all sizes and types of renewable energy generation facilities a premium payment over a long-term period for each kilowatt-hour of electricity fed into the grid. The original U.S. version was different. It was first adopted in 1978 as the Public Utility Regulatory Policies Act, or PURPA. Like Denmark and many other developed nations, the U.S. crafted national policies to support energy alternatives and conservation in response to the rising cost of fossil energies throughout the 1970s (Martinot, Wiser, & Harmin, 2006; Lazzari, 2005, p. 3). PURPA required utilities to purchase renewable electricity from qualified independent generators over long-term contracts. Unlike today's feed-in tariffs, which guarantee a premium for the renewable electricity delivered to the grid, PURPA payments were based upon the avoided cost of generating electricity from conventional sources. Approximately 12,000 MW of renewable energy were installed around the U.S. under PURPA from its implementation in 1981 until 1990. But the substantial drop in the price of oil and natural gas in the 1990s made these payments based on avoided cost too low for renewable energy projects to compete. Thus, PURPA has resulted in only marginal amounts of renewable energy development since the early 1990s (Martinot et al., 2006).

It was also in 1978 that the first Investment Tax Credits (ITC) were established for renewable energy technologies. The Energy Tax Act of 1978 created residential tax credits for 30% of the first $2000 invested in a solar or wind system and 20% of the next $8000 invested; business tax credits for 15% of investment in a solar, wind and geothermal system; and an excise tax exemption for gasohol, which was later turned into a tax credit for ethanol (Lazzari, 2005). Before this piece of legislation, tax credits had been available for the oil and natural gas industries but not for renewable energy.

1.2. The tumultuous political history of tax credits

The renewable energy tax credits have undergone many changes over the last three decades, largely because of the shifting political climate in Washington, DC. In 1985, the Reagan Administration encouraged Congress to allow the residential solar and wind investment tax credits to expire for the first time. In 1992, a Production Tax Credit (PTC) of 1.5 cent/kilowatt-hour (kWh) of electricity was created for large-scale wind projects. This tax credit was created partly in response to fraudulent developers who were installing turbines that did not function and taking advantage of the energy and investment tax credits, which were based on up-front capital costs (Gipe, 2008). In 1999, the PTC was allowed to expire for the first time, causing a 93% drop in wind development the following year. The PTC was also allowed to expire in 2001 and 2003, resulting in a more than 70% drop in development in 2002 and 2004 (AWEA, 2007). From 1986 to 1988, the business ITC for solar was reduced to 10%. In 2005, the residential and business ITCs were raised to 30% and extended for 3 years, resulting in a doubling of installed PV capacity in the U.S. (SEIA, 2008). The 2007–2008 political season capped off the tumultuous 30-year ride for these tax credits. After a 2-year political

stand-off over extending the credits before their expiration at the end of 2008, Congress finally passed a tax-extenders bill in October as part of a financial bail-out package for struggling Wall Street banks. Today, the wind industry has a 1-year extension of the PTC and the solar industry has an 8-year extension of the ITC. When looking at the brief history of renewable energy incentives in the U.S., it seems the only thing consistent about the tax credits has been inconsistency.

Despite their on-again, off-again status over the years, the tax credits have been the dominant incentive and therefore the lifeblood of the U.S. wind and solar industries. As these industries have exponentially increased installed capacity in recent years, the PTC and ITC have become more important in order to maintain strong market growth. During the summer of 2008, many U.S. and foreign businesses were preparing for a substantial reduction in jobs and projects in the country. Without an extension of the credits, Navigant Consulting predicted a loss of 116,000 jobs in 2009 (2008, p. 24). Although lawmakers recognised that looming economic impact, they still could not agree on how to pay for the tax credits—a disagreement that threatened to significantly dampen the industry's growth. The inability of Congress to extend the tax credits for so long had more to do with election-year politics than a lack of support for renewable energy from either party (Sklar, 2008). This all-too-familiar issue has fuelled the debate over the effectiveness of relying on unstable short-term tax credits that are easily impacted by politics to incentivise renewable energy. Part of that debate revolves around the inequitable nature of the tax credits.

2. The impact of tax policy on the wind energy market

2.1. The benefits and drawbacks of the PTC

When in place for multiple years, the tax credits have created strong growth in the wind and solar markets (Farrell, 2008a,b). The wind industry saw a 27% increase in capacity in 2006 and a 45% increase in capacity in 2007 (AWEA). Wiser and Bolinger (2007, p. 3) point out that market growth ''surpassed even optimistic projections from years past''. In September 2008, the wind industry passed the 20 GW capacity mark and overtook Germany as the leading producer of electricity from wind. These developments were due to a 3-year extension of the PTC (Wiser & Bolinger, 2007). When looking beneath the numbers, however, there is a different story playing out. As record amounts of capacity are brought online, few Americans are directly participating in the development and ownership of projects (Bolinger, 2004; Farrell, Gipe, & Daniels, 2008). This is opposite the trend seen in Germany and – at least until the late-1990s – Denmark. Around 200,000 Germans either own a share of a wind turbine or live in a community that owns a wind turbine. As the authors discuss in Section 2, even with the change in incentives in Denmark that hindered community development, roughly 100,000 homes in the country have an ownership stake in a wind project (Gipe, 2004).

In the U.S., the wind industry has focused almost exclusively on larger projects to maximise economies of scale rather than as a tool for economic and social development (Farrell, 2007). This is due to the market domination of large, absentee corporate entities with enough tax liability to obtain the PTC. In order to qualify for the credit an entity must have large sources of ''passive income'', which is any revenue stream in which the tax payer has no material participation (IRS, 2004). That could include revenue from rental properties, intellectual property or investments. This leaves room for only a small number of investors with enough income from these passive sources to own wind projects. Because smaller projects do not offer the same return on investment for these players, the trend is to build larger projects that satisfy their scale of business. This puts the financial benefits of a project in the hands of a small number of players (Juhl, Farrell, Morris, & Daniels, 2008), encouraging corporate ownership models and discouraging local ownership (Kildegaard, 2007, p. 9). From this perspective, the PTC is an inherently inequitable incentive (Gipe, 2008).

2.2. The economic implications of the PTC

If market trends continue, most Americans will only play a peripheral role in the economic boom that the wind industry is creating. In 2007, wind development accounted for $9 billion in economic activity. Navigant Consulting (2008, p. 22) projects that the U.S. wind market will account for roughly $12.5 billion in economic activity in 2009. That activity has reached a large number of American individuals and communities in mostly limited ways. For example, many landowners around the country get lease payments for allowing developers to put turbines on their property. But with lease payments at around $3000 per year for each turbine, the financial benefits are only a fraction of the total benefits associated with direct ownership. A 1.65 MW wind turbine can generate $200,000 in gross revenue

for an owner every year (Kildegaard, 2007). When that money is held in the local economy, its positive impact on the community increases exponentially. Farrell (2007) writes that the economic impact of a locally owned wind farm can be 25–300% greater than one owned by an outside investor.

When smaller-scale, cooperative ownership of wind does occur, it often takes place within a complex incentive framework. This is primarily due to the role of the PTC. Some states such as Iowa, MI and North Dakota have recognised the immense financial, social and security benefits of local wind ownership and have crafted policies to explicitly encourage more equitable development (Kildegaard, 2007). Even with these state incentives, the federal PTC is still a critical piece of wind farm economics. In many cases, groups of small-scale investors do not have enough collective tax liability to take advantage of the credit. Therefore, an outside investor with a large tax appetite is brought on as an equity partner in order to utilise the credit. Whenever the investor has received an acceptable return – typically between 5 and 10 years – ownership of the project is transferred back to the local investors (Bolinger, 2004). Variations of this creative approach have resulted in hundreds of megawatts of community wind projects around the country. While the concept has proven somewhat effective, its complicated use of the PTC can act as a deterrent for many players trying to enter the market (Juhl, 2008). As a result, the market share of community-owned projects remains very low in the U.S.

2.3. The social implications of the PTC

Giving individuals and communities a financial stake in the wind industry could do more than just spread capital more equitably—it could allow wind to reach meaningful penetration levels in the U.S. with minimal social friction (Juhl, 2008). Wind energy currently makes up roughly 1.2% of electrical generation in the U.S. Even with such low penetration levels, the industry has faced a significant amount of opposition from residents and interest groups. Around 25% of wind projects in the U.S. are delayed or not developed at all because of siting concerns (DOE, 2008, p. 106). The American Wind Energy Association has set a target of reaching a 20% wind penetration level by 2030. That means installing 300 GW of wind in 22 years (DOE, 2008, p. 26). In order to achieve that goal, millions of wind turbines will need to be placed around the country, dramatically changing the landscape and impacting the lives of tens of millions of Americans. But assuming the PTC is the dominant incentive, most of those Americans will have little or no participation in the development. If wind development is not participatory and is seen as something that is forced upon people, the industry may experience heightened conflict with individuals and communities, thus harming the country's ability to reach the 20% goal.

While support for wind in national polls is high, that support does not always translate into easy development on the ground. Confusion over environmental impacts as well as distrust of outside corporate developers often sets the stage for social friction (Glickel, 2004, p. 3). Even though state and federal permitting processes ensure minimal risk to wildlife and human safety, concerns over those issues can pose large problems for wind power developers (DOE, 2008, p. 106). These issues are manipulated and used in disinformation campaigns by people who are more concerned about their views than the environmental impact of a project (Williams & Whitcomb, 2007, pp. 71–81). As Glickel points out, numerous surveys have shown that people with a good understanding of wind are more likely to support it in their community (2004, p. 5). However, because few Americans actually have first-hand experience with wind, there is a lack of good information on the citizen level (Daniels, 2008). As a result, information campaigns are often dominated by large corporate developers and opposing interest groups. To encourage more constructive dialogue, the federal Government and industry players are continually trying to make the proposal, siting and development processes more collaborative (DOE, 2008, p. 106). Increasing the number of citizens with an ownership stake in a project will diminish some of the misinformation and social friction that continues to be a barrier in front of the rapid deployment of wind in the U.S.

The PTC has played a vital role in driving the U.S. wind market. Since 1992, thousands of megawatts of capacity have been developed because of the credit—making wind a competitive, highly noticeable resource in the U.S. today. However, this rapid growth has been driven by a relatively small number of players. If the industry is going to reach the 20% penetration goal by 2030, consideration of a more inclusive incentive will be necessary. There are simply not enough corporate entities in the U.S. that can take advantage of the number of the tax credits needed to develop 300 GW of wind in 22 years (Daniels, 2008). And in the next two decades, the scale of U.S. development will be so large that the market will need to diversify to accommodate that growth. That means the role of smaller, more readily interconnected projects will be increasingly important (Juhl, 2008). In order to make these projects financially viable

for investors, more acceptable to citizens and more enriching to local communities, the U.S. needs to either modify the PTC to make it more inclusive, or adopt new incentives that bring a greater number of American citizens into the wind industry.

3. The impact of tax policy on the solar energy market

3.1. The benefits of the ITC

The U.S. solar market is much more diverse and equitable than the wind market. Millions of Americans are enjoying the benefits of owning a solar–electric or solar hot water system. In 2007 there were 83,000 solar–electric and solar–thermal systems installed around the U.S. (Sherwood, 2008, p. 11). Although state solar programs have played a key role in driving this growth, the 30% federal ITC has been the most important component. In its most recent report on the economic impact of the ITC, Navigant Consulting (2008, p. 7) projected that an 8-year extension of the residential and business credits could result in over 6000 MW of annual solar PV and solar thermal installations by 2016. If Congress had failed to extend the ITC in 2008, Navigant projected that annual installations would have fallen to about 1500 MW by 2016.

3.2. The drawbacks of the ITC

Now that the ITC has been extended for 8 years, debate over using tax credits to incentivize solar on the federal level may not be as prominent. That does not mean the conversation should be ignored. There is no doubt that the ITC is a critical piece of the solar market; however, there are limitations to the credit that create a barrier for a large number of homeowners. For many years, the residential credit was capped at $2000, reducing the incentive for homeowners looking to invest in a larger solar system. That cap was lifted as part of the tax-extenders package passed in October of 2008. Farrell (2008a,b, p. 9) says that this cap showed a lack of federal support for residential self-sufficiency. When in place, the cap made the ITC more valuable to commercial and utility-scale solar developers, effectively supporting large-scale projects over smaller, more distributed systems. This large-scale development is extremely important for the industry and should be encouraged in any way possible. But equal incentives for smaller players are necessary in order to develop all sectors of the market. Lifting this cap was the first step in making the solar ITC far more equitable for Americans.

As with the PTC, the other issue with the ITC relates to tax liability. The only people who can take advantage of the tax credit are those who have the required tax obligations. This excludes a large number of Americans who may not owe enough in taxes to qualify for the ITC (Farrell, Gipe). Because of the relatively high cost of a solar–electric or solar hot water system, it is natural that the early stages of market growth have been driven by wealthier consumers who are more likely to have the required tax liability. But in order for solar to be installed on millions of additional U.S. homes, a greater number of citizens will need access to effective, specifically crafted federal incentives.

With 750 MW of installed capacity, solar makes up less than one-half of 1% of the electricity mix in the U.S. Solar hot water and space heating technologies are an even smaller portion of the market, accounting for only 193,000 installations nation-wide (Sherwood, 2008, p. 11). The dramatic increase in solar installations that must take place in the coming decades offers a unique opportunity to re-formulate how Americans think about energy. Making energy a more intimate economic and social experience will be an important part of the renewable energy economy (Howes, 2008). Realising that vision will require incentives that offer any citizen, business or corporation the choice to participate in that process on an equal basis. A limited tax credit does not seem to be the best incentive for the job.

4. Conclusions (U.S.)

Federal tax credits are only one piece of the policy environment. Creating a more stable, equitable, participatory renewable energy market in the U.S. will take many different approaches to policy on both the state and federal level. Important policy considerations will include state rebate programs, renewable energy certificate trading platforms, fair interconnection standards, robust renewable energy metering laws and favourable zoning ordinances, among many others. But these federal tax credits are arguably the most important symbolic and financial tool for the industry today. Examining their impact on the U.S. market should be a top priority for policy-makers, renewable energy professionals and every other American with a stake in the nation's energy future.

With the recent 8-year extension of the ITC for solar, the debate over the effectiveness of tax policy for the solar industry is likely to diminish in the short-term. The PTC for wind, however, has only been extended for 1 year. As industry representatives and politicians work in 2009 to expand this policy, careful consideration should be taken of the long-term implications of extending an incentive that primarily benefits the largest players in the market.

Shifting the discourse on U.S. renewable energy incentives will not be easy. Policy-makers and business leaders in the country are often very narrowly focused on these tax credits because of their historical role in the conventional energy sector. However, the distributed nature of renewable energies offers an entirely different set of social and economic benefits than do fossil energies. Taking full advantage of these benefits will require a revision of existing tax policies to make them more inclusive, or a new look at other policies that can induce the participation of as many Americans as possible. It is for these reasons that many renewable energy professionals have begun aggressively promoting the idea of a feed-in tariff (also known as Renewable Energy Payments) for the U.S. on both the state and federal level. To date, six states have introduced Renewable Energy Payment bills in their legislatures and one piece of federal legislation has been introduced in the House of Representatives. Many politicians and business leaders who support the concept point to the ability of European countries with feed-in tariffs to rapidly deploy renewable energies in a way that promotes wide-scale individual and community ownership. The early Danish experience with FITs discussed below shows how this policy can open up the market to a larger number of players, and blend the participatory *innovative democracy* model.

Adding additional capacity is only one part of the broader U.S. energy framework. Spreading wealth within local communities, maximising job growth, enriching the energy experience and empowering citizens should necessarily come with that increased capacity. Instead of simply focusing on centralisation and consolidation as the energy industry has traditionally done, distribution and diversification should be key factors as well. A policy that encourages all sizes of projects and all types of players equally will be most effective for growing the market. The next phase of development – which means bringing renewable energy to the terawatt scale – will require the direct involvement of hundreds of millions of American citizens. While not all citizens will choose to participate, it is necessary to give people the option. Clearly, the tax credits as currently designed do not provide the opportunity for every American to participate. Therefore, as the nation's business and political leaders consider how to stimulate rapid growth of the U.S. renewable energy industry in a sustainable way, it is critical to review these traditional tax policies in order to create a stable, democratic market for all.

5. The Danish cooperative model of wind ownership

5.1. Recent Danish energy history

Denmark was the original pioneer nation in wind energy, but has suffered a decline in domestic expansion which provides extremely useful lessons on the importance of stable renewable energy policy and local ownership. It also offers lessons for other countries in how they can integrate renewable energy socially, not just technically. Both the incentive and ownership structures are important, as well as the political, social and cultural dynamics at work. The feed-in tariff (FIT) support scheme and the wind cooperatives are the prime objects of study, and the political decision-making processes which have formed the various policy landscapes are analysed. Firstly, some details are given on the main actors and actions in the successful development phase of the sector.

The Danish socio-cultural phenomenon of cooperatives has even lead to jokes about two Danes forming a cooperative over just about anything. This proclivity can be traced back to the influence of the 19th century Danish theologian N.F.S. Grundtvig, who espoused education and free thinking which had a profound effect on rural communities, leading to cooperative approaches to Danish agriculture (Andersen, 2008). For wind power, cooperatives became a critical form of ownership from the 1970s, arguably until the first years of the 21st century. From a few friends and neighbours up to much larger community investments, Danes built their world-leading industry upon this approach. Today around 20% of installed capacity is owned by cooperatives (Sorensen, 2008).

Meyer (2007), Lipp (2007), Hvelplund (2005) and Bolinger (2001) provide historical background on the development of the Danish wind industry. In brief, it was driven from the bottom-up, with enthusiasts influencing the political process in such a way that Government then engaged in providing the enabling conditions to boost the development of the sector, through economic incentives and favourable ownership restrictions (Andersen, 1998; Bolinger, 2001). This created a combined top-down and bottom-up success story, through a process which Hvelplund

calls *innovative democracy*. This is the active collaboration of a number of actors, including politicians, new small private firms, the energy companies and the grassroots energy movement (Hvelplund, 2005, p. 87). This success continued until the mid-to-late-1990s, when key changes to support for renewables began to manifest themselves through the faltering and seizing up of the domestic market (see Section 8). The Government is at the time of writing engaged in efforts to revive domestic deployment (see Section 10).

As with many countries, the energy crisis of the 1970s prompted a search for alternative sources, which continued despite the discovery of significant fossil fuel resources in Danish waters. National energy plans were developed through wide discussions, with energy security, self-sufficiency and efficiency as principal objectives, as well as greenhouse gas reductions. There was significant public opposition to the inclusion of nuclear power in the plans, and alternative energy plans without nuclear power and with a higher contribution from renewables were published by energy experts from Danish universities (Meyer, 2007, p. 4). The role of the wind sector was supported by an organised grassroots movement and also by two new NGOs – the Organisation against Nuclear Power (OOA) and the Organisation for Renewable Energy (OVE) – both of which worked on public awareness campaigns (Lipp, 2007, p. 5486; Meyer, 2007, p. 4). The Wind Turbine Owner's Association (WTOA), representing many small investors and producers, played a significant role also.

The official plans (published in 1976, 1981, 1990, 1996) included measures to support renewable energy, CHP and district heating, and included a feed-in tariff (FIT) (see Section 7), an investment subsidy, tax exemption for wind power owned by households and the establishment of a public wind-power test station (Lipp, 2007, p. 5486).

From 1979, interconnection and grid reinforcement costs were in part paid by utilities, effectively making this a subsidy or payment for modern infrastructure from other electricity customers. Costs for the latter were relatively low until the mid-to-late-1980s since the distribution grid was robust enough to handle smaller turbines with minimal or no reinforcements (Cohen & Wind, 2001, p. 11).

In 1980, the Social Democratic Government introduced the 30% investment subsidy for new wind energy installations. Until the early-1990s, most of Denmark's wind farms were erected by local co-operatives and individual farmers, resulting in more than 120,000 people becoming owners of shares at that time, which bolstered public support for wind power. It also drove a strong wind power industry that was able to export wind turbines to California from 1983, and in the peak year of 1985 sold 3500 55 kW wind turbines for around US$ 345 million in 2008 prices. This sudden explosive growth in the market was due to specific tax rules introduced by Governor Jerry Brown.

From 1980 to 1989 oil prices decreased from US$ 90 to US$ 30, and the favourable wind power tax rules were abolished in 1986. The U.S. market consequently collapsed from 1986 to 1987, and several Danish wind turbine manufactures faced bankruptcy. The years between 1987 and 1994 were defining ones for the Danish wind turbine industry. It survived solely on the small domestic market, due to the subsidy, the tax exemption for households, and the relatively favourable prices via the FIT for electricity sales. The legal guarantees of the FIT made it possible to borrow money for wind turbines through the banks.

These relatively favourable conditions were maintained due to the political support created by the cooperative ownership model, in combination with the particular balance in the Danish Parliament, which had a ''green majority'' and a strong and well-organised grassroots energy movement. It was this combination of favourable and politically generated institutions that allowed the Danish wind energy industry to survive the meagre years from 1987 to 1994. In this period the 600 kW wind turbine was developed, which lowered costs by 20%. Based on this more competitive wind turbine, the export industry was re-established.

The industry grew despite resistance from the large power companies, the Association of Danish Industries, and from certain sectors within the trade unions. This period was one of the most important for the development of the Danish wind industry. It demonstrates first-mover advantage with a technology that did not have the support of existing companies. The opposition from large industries requires a strong Parliament and strong NGOs to establish the needed policies. This combination was present during these years, and represents an example of *innovative democracy* and its potential (see Section 9.2).

The OVE, the Danish wind turbine manufacturers and the WTOA initiated important information-sharing activities well before a voluntary 1984 agreement created the first standard nationwide electricity purchase price. They supported owners and manufacturers politically, and established infrastructure that assisted the market to move forward quickly once the purchase agreement was in place. The OVE and the WTOA have been significant agents in the development of the industry, partly through providing its members with technical assistance and information, and bargaining leverage with manufacturers (NWCC, p. 11). As a result, over 175,000 households owned 80% of all wind turbines in Denmark by

2001, either on an individual basis or through ''cooperatives'' (Wassink, 2001 is in Bolinger, 2001, p. 9). The politically supported local ownership model helped create widespread support for renewable energy, especially wind, because the benefits were distributed across a wide group of people (Meyer, 2006; Maagard, 2006; Lipp, 2007, p. 5486).

In 1988, a newly elected Liberal-Conservative Government cut the 30% subsidy in half. However, the return on investment in wind energy continued at 15–25% because of three pillars of the Social Democratic policy for community-owned wind energy: The right to connect to the electrical grid; a legal obligation for electrical utilities to purchase wind energy; a guaranteed fair price (Christianson, 2005).

The specific target for renewable energy sources in the 1990 plan, *Energy 2000*, was 12–14% of primary energy by year 2005, and 35% coverage by year 2030 (Meyer, 2007, p. 4). Wind power was given an important role in these plans with targets for installed capacity of around 1500 MW in 2005 and 5500 MW in 2030, covering 10% and up to 50% of Danish electricity consumption, respectively. The 2030 target includes 4000 MW of offshore wind capacity. In practice, the 2005 target was exceeded by a factor of two by 2003, with installed wind power capacity of around 3000 MW. This corresponds to around 19% of Danish electricity consumption (Meyer, 2007, p. 4).

6. Ownership structures

In formal terms, the wind co-operatives are ''general partnerships,'' or ''Interessentskab''. This is a contractual relationship between several entities – in this case electricity consumers – to pool certain resources in order to run a business, and is the only joint form of ownership to qualify under Danish power law (Bolinger, 2001).

In 1980, when the first private wind turbine cooperative was formed, the only limitation to cooperative turbine ownership was a residence criterion. Members had to live within the same municipal area and within 3 kilometres of the turbine (NWCC, p. 11). The success of the cooperative model of wind ownership was largely due to the recognition by OVE that local people directly experiencing the visual and aural presence of the turbines should be compensated. This NGO policy was successfully transferred to Governmental policy until the mid-1990s (Bolinger, 2001, p. 13).

A key policy change came in 1985 when the Government introduced limitations to the size of cooperative investment shares. This encouraged distributed development and prevented developers from using a centralized development approach to dominate the market. The move was in response to developers beginning to favour larger wind farms. Ownership shares were based on each owner's consumption, with one share allotted per kWh, and a cap of 6,000 kWh set per owner (NWCC, pp. 11–12).

In 1993, the Social Democrats were again elected and held office in various coalition Governments until 2001. This period is considered the golden age for wind energy in Denmark, with production more than tripling from 1200 to 4100 GWh. Eighty-five percent of the turbines were owned by local co-operatives and individual farmers. In the mid-1990s, individual ownership increased greatly due to declining turbine costs and lower interest rates, and Government incentives for repowering older turbines replacing older turbines with new, more efficient ones). By 2001, wind farm production was providing 12% of Denmark's electricity, enough for 1.2 million Danish households (Christianson, 2005). By 2004, 23% (600 MW) of Denmark's wind capacity was owned by co-operatives, with 100,000 members owning over 3200 turbines (DTI, 2004).

7. The Danish feed-in tariff

As mentioned in point 1.1 above, FIT policies first emerged in the late-1970s, via the U.S. Public Utility Regulatory Policies Act of 1978 (PURPA). In the mid-1990s, the basic FIT concept entered Europe, firstly in Denmark and Germany. Under this design, utilities were obligated to purchase renewable energy from generators in their service area, at a price set by the Government. The rationale was to compensate renewable energy developers for the environmental benefits of generation (Lipp, 2007, p. 5482).

Through all the variations on the design of a national FIT, a guaranteed price remains the central feature. For this reason, a FIT is commonly described as a 'fixed price incentive,' a renewable energy market development scheme which is now commonly designed as a set price paid over a long-term period to electricity generators. This should be calculated to cover costs of production for each technology, and offer a small bonus on top. For example, for solar photovoltaic electricity, one might receive around four times the rate paid for 'brown' electricity (generated from fossil fuels), over 20 years. Another approach, used successfully in Spain, is the market-linked ''premium tariff.'' The electricity is sold on the spot market, and in addition the producer receives a pre-defined premium payment for the

greenness of the electricity. In combination, both components should be sufficient for a certain return on investment (7–9%). In order to avoid wind fall profits in the case of high electricity prices, and too little remuneration in case of low electricity prices, the Spanish legislator has introduced a cap and a floor to the premium tariff.

The costs for most feed-in tariff systems are paid by the energy retail companies, who then pass this on via a small increase to all customers. Studies have shown that so far FITs deliver the greatest deployment at lowest costs (Mendonça, 2007, pp. 17–18). Feed-in tariffs are now in use in an estimated 46 countries, states and provinces around the world (REN21, 2007), with many more jurisdictions currently debating or working on implementation. This is at least partly attributable to the early success of the Danish law.

The Danish feed-in policy was an 'early' FIT design, which instead of a fixed tariff, set according to generation costs of each technology, calculated the price paid to generators using a fixed percentage (85%) of the consumer price for 20,000 kWh per year in the area of the specific distribution company. The price would typically amount to around 5.1 US cent/kWh. In addition, the wind cooperative would receive a full refund of the CO_2 tax (1.7 cent/kWh) and a partial refund of the energy tax (2.9 cent/kWh) (Bolinger, 2001; Meyer, 2007). The distribution company had an obligation to buy all of the electricity produced by wind turbines in its area. As above, other measures complemented the FIT, including a direct subsidy and tax exemption to private turbine owners, a 30% investment subsidy and tax-free electricity generation up to 7000 kWh (Meyer, 2006).

8. Changes

8.1. Changes to the FIT

In 1999, a large majority in the Parliament supported a Governmental decision to abandon its feed-in policy and move towards a renewable portfolio standard (RPS) with a system of tradable green certificates (TGCs) (Bolinger, 2001, p. 11). The association of Danish Power Producers supported the introduction of the RPS, whereas all green NGOs opposed it. The European Union (EU) has had regular discussions about harmonising the national support schemes of member states, and the Danish Government assumed that the EU Commission preferred what they considered to be more market-oriented support systems (Meyer, 2007, p. 8). Under an RPS, or 'quota' system, renewable energy producers would receive the spot market price, plus the selling price of the green certificate. A quota system incorporates a renewable energy deployment target for the jurisdiction in question to reach by a certain time.

This model was accepted by the Parliament, and was originally planned to commence in January 2000, but owing to a number of complications related to the operational principles of the system – including high transaction costs in a small national market – the Danish Government postponed the starting date of trading several times. It has not been implemented as of December 2008, and there does not seem to be any serious plans for doing so. In place of the postponed RPS, a complicated set of transitional rules for renewable energy were introduced from 2000 (Meyer, 2007, p. 8). A premium tariff design was introduced for onshore wind turbines that were connected to the grid after 31 December 2002. For older plants, fixed feed-in tariffs were paid (Ragwitz et al., 2007, p. 117).

Wind turbines sold after 1 January 2000, and installed before 1 January 2003 would get relatively good conditions, with a fixed price of 5.6 US cent/kWh in their first 22,000 ''full production hours'' (around 10 years for an inland location). On top of this they would receive 1.7 US cent/kWh as a payment for CO_2 free electricity, and if repowering, an extra 2.9 US cent/kWh for the first 12,000 ''full production hours'').

Onshore wind turbines installed from 2003 to 2007 would get the Nordpool market price plus up to 1.7 cent/kWh for 20 years. There was a price ceiling of 6.1 cent/kWh, so that wind turbines will get nothing if the Nordpool price is 6.1 cent/kWh, and 0.9 cent/kWh if the Nordpool price is for instance 5.2 cent/kWh. In 2005 the ceiling on 6.1 cent/kWh was removed. For large-scale offshore wind farms, the Government switched to a tendering system.

In 2000, 600 MW of new capacity were installed based on the FIT, but during the first half of 2001 new installations dropped to a mere 18 MW, bringing construction of wind power plants almost to a standstill (EPIA, 2005). Since 2001 the major contribution to increased capacity on land has been repowering of existing wind turbines with higher capacity turbines, rather than opening up of new sites (Meyer, 2007). As can be seen from Fig. 1, deployment began to decline drastically from 2003. This downward trend has continued in subsequent years, except in 2002 where a 160 MW offshore wind farm was installed at Horns Reef in the North Sea. Turnover trends fluctuated significantly between 2000 and 2004, and reached a 20-year low in 2004, attributed to a sharp drop in domestic sales (Lipp, 2007, p. 5492). From 2004 to 2006 developers installed less than 40 MW of capacity (Sovacool, p. 35).

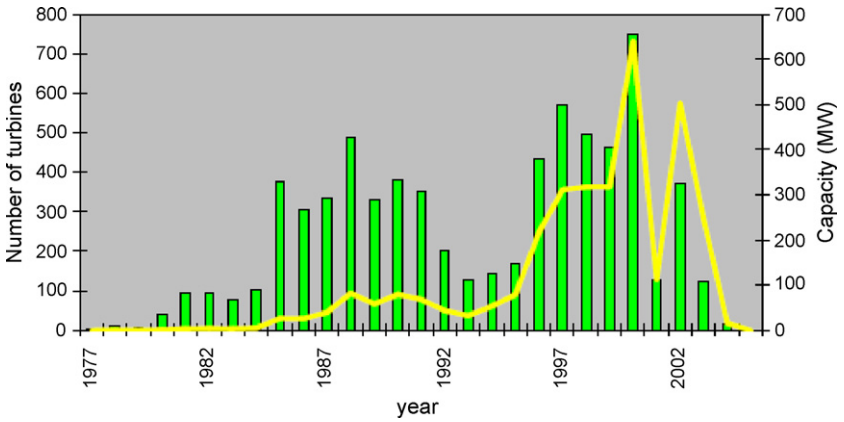

Fig. 1. Yearly growth in number of turbines in Denmark (columns) and annual installed capacity (curve) from 1977 to 2005 (Danish Energy Authority) (in Meyer, 2007).

8.2. *Changes in ownership structures*

From the original limitation of 3 km in the early-1980s, geographic eligibility for investment in a wind turbine was gradually expanded to include those living within 10 km (1985), those living in neighbouring boroughs (1992), those who work or own property in a borough but do not live there (1996), all of Denmark (1999), and finally in 2000, the entire European Union (Bolinger, 2001, p. 13). The 1992 Law for Wind Turbines relaxed restrictions on cooperative ownership share size, and criteria for qualifying as ''local'' ownership participation. Private owners also received tax advantages including reduced rates on project revenues, deduction of expenses and interest, and accelerated depreciation (NWCC, pp. 11–12). A regulatory loophole allowed the small patch of land upon which a turbine stands to be legally detached from the surrounding property and re-registered to another piece of real estate, perhaps located far away, thereby enabling more individuals to own turbines (Andersen, 1998; Helby, 1995; European Wind Energy Association, 1997; Bolinger, 2001, p. 10).

The major increases in sectoral growth around 1990 and 2000 were both driven by private investments, but of different kinds. Co-operatives were the most common form of investment around 1990, while single ownership, mainly by farmers, became most common after 1994. The change in ownership restrictions was the key reason for this, but also other factors contributed to this change such as less perceived technical risks and developers' focus on farmers (Olesen, Maegaard, & Kruse, 2002, p. 6).

While the Government relaxed geographic ownership constraints, they imposed stricter siting guidelines in order to concentrate development in the windiest areas. The complementary incentives for repowering (see Section 8.1) resulted in a large number of old cooperative wind farms closing down as they were based on very small turbines less than 100 kW in size, affecting the national ownership profile (Sorensen, 2008).

Public support for wind was weakened in the mid-1990s through the gradual removal of ownership restrictions, allowing ''distant ownership'', and the trend towards ownership by single farmers. The support given to single farmers could be stigmatized as ''large landlords getting financial support from public monies.'' So already in this period, local support was diminishing due to policies that did not assure local ''open access'' to co-operative ownership. This process made it easier for the new conservative Government which came to power in 2001, to cripple the development of further onshore wind power, as in Section 8.1 above. The Government cancelled all renewable energy development programmes in its finance bill presented to Parliament in January 2002. This was announced as part of a general budget trimming policy, with the stated aim of increasing funds for hospitals and senior citizens without tax increases. The costs of the renewable energy programmes were around €2 million per year (Krohn, 2002).

9. The politics behind the changes

In order to understand some of the underlying forces behind the Danish energy policy as described above, it is important to be aware that the construction of a concrete market design has been made in a political setting consisting of different ministries, different lobby groups and a specific balance of power in the Parliament. And further, that these actors all have

their different paradigms of political economy, both as their honest belief in how the economy functions and as the way they want to make people understand the world. The fight has been, and continues to be, between different interest groups, each with their political and economic interests and corresponding understanding of the political economy.

The interest groups that have been important in the period are: The Ministry of Finance, the Ministry of Environment and Energy, the association of large energy companies, the political parties and the green NGOs. These groups can each, as mentioned above, be associated with their ''Political Economy'' paradigm within which they will argue their case. Below we briefly describe two ''Political Economy'' paradigms, namely:

1. The neoclassical approach.
2. The ''concrete institutional economy/innovative democracy approach.

The Danish experiences between 1974 and 2008 show that the development and implementation of sustainable energy technologies was brought to a halt in periods where the neoclassical approach has dominated, and accelerated when the concrete institutional economy/*innovative democracy* approach was given preference in the political processes.

9.1. The neoclassical approach

This approach is in general the paradigm adopted in the Econometric models and the policy suggestions from the Ministry of Finance, the way of arguing used by the association of the large energy companies and the right wing political parties in the Parliament. Clearly fragments of this paradigm will be used by other actors also.

In this approach the role of the Parliament is to keep the ''free market'' institutions in order (arrow 3), to establish research programmes (arrow 7) and to make sure that the external climate costs of energy production are internalised in the market prices (arrow 6). This is illustrated in Fig. 2, where the market is embedded in the free market institutions that are kept in order by the Parliament. Once the market is considered to be functioning in accordance with the ''free market'' institutions, the outcome of the market process is regarded *as representing an economic optimum*. Here, we are living in the best of all worlds, and energy policy should just be regarded as a policy where a few ''market failures'' are corrected. One of these failures is that the environmental effects such as climate effects from greenhouse gases are not automatically internalised in the market prices.

A well designed neoclassical energy and climate policy thus consists of only three policy areas:

a. An attempt to internalise the external costs by means of a system of CO_2 taxes, CO_2 trading, and CDM and JI market tools. Regarding the distribution of CO_2 quotas in a carbon trading system, the quotas are – in the EU – distributed

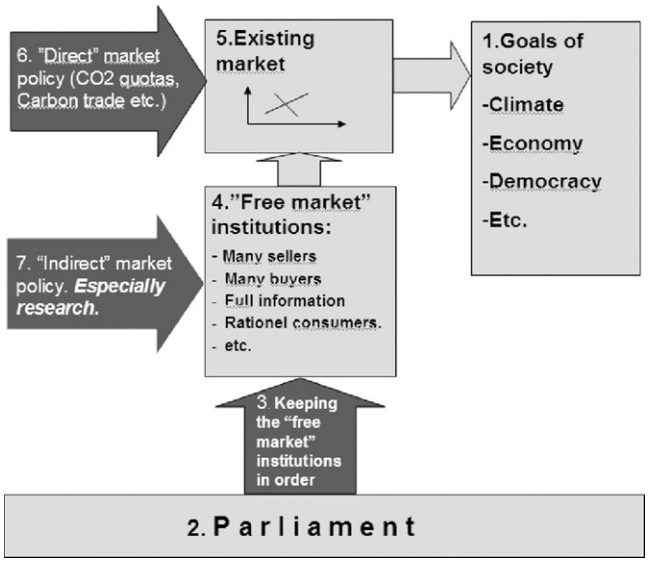

Fig. 2. The neoclassical approach. *Source*: Forthcoming book: ''*Concrete Institutional Economy and Innovative Democracy*'', Frede Hvelplund, 2009. *Comments*: The existing market (box 5) is assumed to be embedded in the ''free market'' institutions listed in box 4.

according to the ''grandfathering principle'', where the established energy companies will get a CO_2 quota for free, and in that way be given a financial advantage, compared to newcomers on the energy scene.

b. In the EU and consequently also Denmark, an attempt to establish ''free market'' competition, for instance by trying to establish open access to the transmission network. Here it is important to underline that the Green Certificate trading model for renewable energy technologies is located in a neo-classical model.

c. A research policy mainly based in universities and large research laboratories.

The theory is, that if these tools are correctly introduced into the market (box 5, Fig. 2), the goals of society will be achieved automatically through a well-functioning market. In Denmark this way of thinking has been prevalent at various times during the period from 1974 to 2008. The Ministry of Finance, as one example, has always advocated this paradigm. But in long periods this way of looking at the economy has not been dominant, and therefore all the wind power-supportive institutions as described above have been introduced despite resistance from the proponents of the neoclassical approach.

This approach is partly supported by the Ministry of Finance, in general by right wing parties and also partly by the left wing in the Parliament. It is to some extent based upon the belief that ''an energy company is an energy company'' and that the present fossil fuel companies will be able and willing to make the transition to renewable energy technologies. They are regarded as having the financial power to do this, and as the former Danish Minister of Environment and Energy said: ''Now we cannot any longer just rely on twelve idealistic schoolteachers,'' implicitly saying that now the time had come for the large energy companies to be the dominant agents in the development and implementation of the nation's renewable energy technologies.

In the periods of the Danish energy policy where this approach has been dominating, and especially since 2001, the development of new renewable energy technologies, the implementation of wind power and other well established renewable energy technologies and the implementation of energy conservation technologies have been brought to a halt.

In the following section we will discuss another approach which is behind the relative success of a green Danish energy policy from 1974 to 2001.

9.2. The ''concrete institutional economy and innovative democracy'' approach

Behind this approach is an understanding of economic processes that can be called the *''concrete institutional''* approach. In this approach it is recognised that economy is embedded in a human-made concrete institutional market design (box 4) in Fig. 3. It is furthermore understood that the design of the concrete market institutions are, and

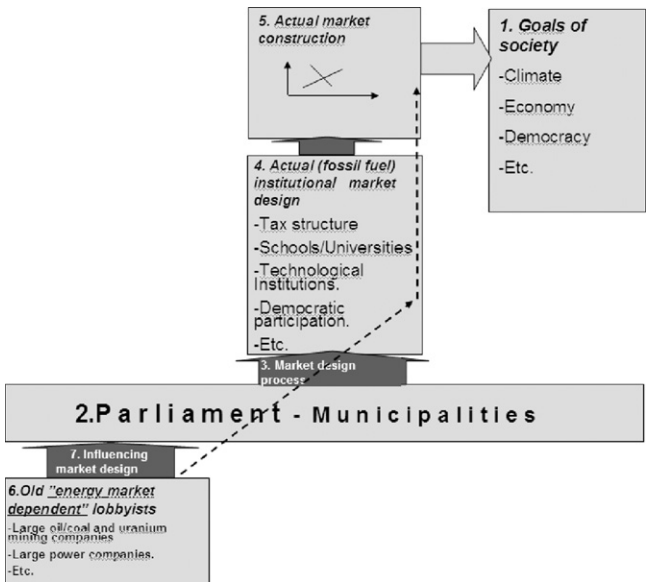

Fig. 3. The ''Concrete Institutional'' Approach. *Source*: Forthcoming book: ''*Concrete Institutional Economy and Innovative Democracy*'', Frede Hvelplund, 2009.

historically have been, influenced by the large actors in the energy scene, such as the large power and fossil fuel companies, and that the institutional market design often has been developed so that it benefits these companies. Consequently the present market rules does not represent an optimised and optimising free market construction, but a market design influenced by the strongest existing actors in the market.

The companies that are dependent on this market design are playing an important role in the political processes, and thus are defending their position as dominant market actor leaders through their influence upon the political processes (box 6, Fig. 3 below).

The understanding of economy as political economy with an ''institution'' generation process dominated by the largest actors in the market, is basically different from the neoclassical approach. And it produces an economic world where the outcome cannot be considered as automatically representing an optimum. There will be systematic historically based institutional conditions generating ''path dependencies,'' leading to fossil fuel solutions, built into the historical institutional market design (box 4, Fig. 3).

This understanding of economy differs from the neoclassical approach in Fig. 2. It sees economy as a political economy by underlining that established lobbyists are influencing the Parliament (Fig. 4, box 6) in such a way that the market design (box 4) is not living up to the institutions of a free market. And also by having the general understanding that the institutional setting in which the market is embedded is a historical political construction and not just the outcome of an economic optimisation process.

The above ''concrete institutional approach'' thus indicates that there are political and institutional imbalances in the economy and in the political processes. We are not living in an optimised economy, and the imbalances cannot be cured solely by means of neoclassical policy reforms, such as CO_2 taxes and CO_2 quota systems in combination with research programmes. Owing to the fact that there is a fossil fuel path dependency built into the institutional design of the market (Fig. 2, box 4), and that there is a political imbalance with the old fossil fuel companies being too influential in the political process, it is necessary to develop new policy measures in these areas.

If people have this understanding of economy as political economy, they amongst others will tend to think that it is necessary for new and independent actors in the energy scene. Understanding this need is illustrated in the ''*concrete institutional economy and innovative democracy*'' approach in Fig. 4 below. This is a ''Political Economy'' paradigm that has been adopted to a large extent by the Ministry of Environment and Energy, the Social democrats, the left wing parties in the Danish Parliament and the green energy NGOs.

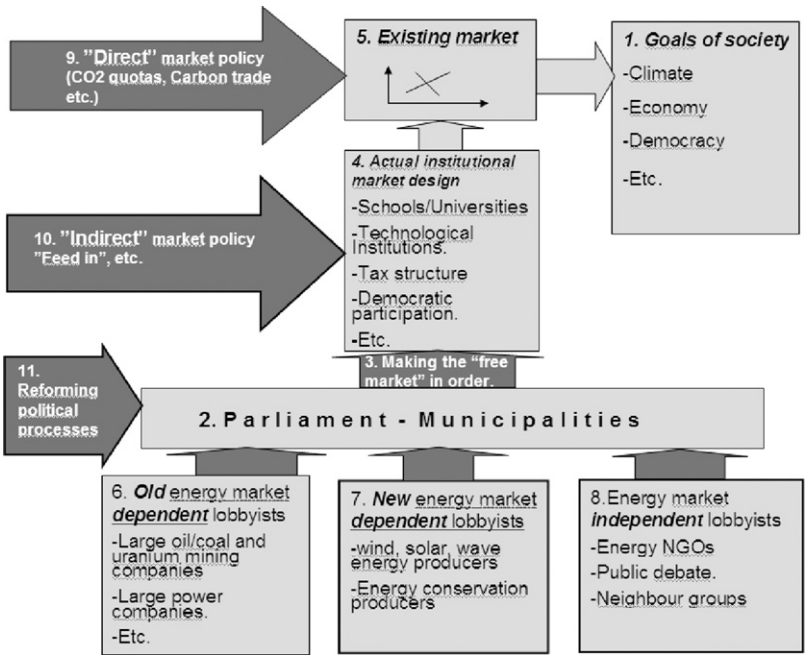

Fig. 4. The *innovative democracy* approach. *Source*: Forthcoming book: ''*Concrete Institutional Economy and Innovative democracy*'', Frede Hvelplund, 2009.

This approach is characterised by:

a. Introducing political balance between the technological first-movers or fossil fuel companies, and proponents for the solar energy technologies both as NGOs and as small firms (see Fig. 4, boxes 7 and 8 above, ''*new energy market dependent*'', and ''*energy market independent*'' lobbyists), and by reforming the political processes (Fig. 4, arrow 10).
b. Supporting research in renewable energies and especially the required infrastructure for variable renewable energy sources. Emphasising that this research has to be linked closely to pilot plants and practical experiments with funds also being distributed to new research groups (arrow 10).
c. Support a ''feed-in'' support scheme for renewable energy technologies. This is necessary mainly because it opens up market opportunities for local and new investors.
d. Establish ownership rules that support local and regional ownership of renewable energy technologies.
e. Establish an infrastructure that supports flexible energy sources such as solar, wind and wave energy. This means that it is not enough to establish open access and unbundle the power and heat distribution network.
f. Internalise the external environmental costs (Fig. 4, arrow 9), but reject the ''grandfathering'' model for allocation of quotas for greenhouse gas emissions.

In Table 1 the two political economy paradigms are allocated to different actors in the Danish scene.

Comments: Table 1 distributes the two ''Political Economy'' paradigms upon different important actors. When the Ministry of Finance has 3 crosses it simply indicates that this is a ''pure'' neoclassical institution. When the Ministry of Environment and Energy has two crosses linked to the *innovative democracy* approach, and one linked to the concrete Institutional approach, it indicates that its approach is mixed, and very different from the approach of the Ministry of finance. When the established fossil fuel companies have three crosses in the neoclassical paradigm, it illustrates both their paradigmatic approach and their position, where it is beneficial for them, as strong actors in the market, to say that the market is a free market. The *innovative democracy* paradigm had a strong foothold in the period 1974–2001.

Table 2 indicates that there has been a strong foothold for the *innovative democracy* paradigm in all periods since 1974 except for the periods 1990–1991, where there was a very passive conservative Minister for Energy, and the period 2002–2008, where there has been a right wing majority in the Parliament. The period 2002–2008 is the only period since 1974 where there has been a right wing majority in the Parliament, and also where the Ministry of Finance has gained substantially in power at the expense of the Ministry of Environment and Energy. It should be underlined that during all periods there also has been some foothold for the neoclassical approach. Thus there has never been a situation with a pure *innovative democracy* approach.

Table 1
Relevant actors and their ''political economy'' paradigm.

	Ministry of Finance	Ministry of environment and energy	Established fossil fuel energy companies	Newcomer green energy firms	Green energy NGOs	Right wing parties	Left wing parties
Neoclassical approach	XXX	X	XXX	X		XX	
''Innovative democracy'' approach		XX		XX	XXX	X	XXX

Source: Forthcoming book on *Innovative democracy*, Frede Hvelplund, 2009.

Table 2
''Political economy'' paradigm from 1974 to 2008.

	1974–1979	1980–1983	1984–1989	1990–1991	1992–2001	2002–2008
Government		Left/social democrat	Right/green	Right	Left/social democrat	Right
Neoclassical approach	XX	X	X	XX	X	XXX
''Innovative democracy'' approach	X	XX	XX	X	XX	

Source: As Table 1.

9.3. Conclusions on policy approaches from 1974 to 2008

How can the Danish energy policy development from 1974 to 2008 be described when considered in relation to the three economic models above? The *innovative democracy* model illustrated in Fig. 4 was developed and more or less implemented in Denmark in the period 1974–2002. This model created the relative Danish success (the fastest snail in the forest), within global renewable energy development in this period.

The neoclassical approach in Fig. 2 was underlying the policy landscape during the whole period from 1974 to 2008, and it was mainly marketed by the Danish Ministry of Finance. But in long periods it was, as mentioned above, overruled by the *innovative democracy* approach, which was mainly marketed by the Danish Ministry of Environment.

If one were to describe the period 1974–2008 in brief, one can say that both economic approaches were alive during the whole period, with the *innovative democracy* model dominating during important periods between 1974 and 2002. At this time there was always a ''green majority'' in the Parliament, where it was not possible to be in Government without being dependent upon the Radical Liberal Party (Det Radikale Venstre). So whether there was a Social Democratic Government or a Liberal Conservative Government, it was always dependent upon the votes coming from the Radical Liberal party. This completely altered in 2002 when Denmark had, for the first time since 1945, a Government that was totally independent of both the Social Democrats and the Radical Liberal Party. Hence the policy was totally changed in 2002, and hundreds of people working in renewable energy around the country and within the Ministry of Environment were dismissed, and all subsidies for renewable energy projects were removed.

The whole period 2002–2008 has been characterised by a very weak renewable energy policy linked to neoclassical economic thinking, and with increased influence upon politics by the strongest fossil fuel actors like the Danish power, oil and gas company, DONG.

Around 2006–2007, this discourse was changed once more, by the same prime Minister, Anders Fog Rasmussen, who now called for 100% renewable energy as the only sustainable solution for the future. Whether this will result in any fundamental changes in national energy policy remains to be seen.

What we now see in 2007 and 2008 might be an earnest will and effort by the Government to support renewable energy, but an unrealistic belief that the present market, in combination with CO_2 quotas, CDM and other direct market solutions, can assure a sufficient deployment of renewable energy. The historic lesson from the Danish case is that the relative success of sustainable energy development in Denmark has its roots in an *innovative democracy* approach. Therefore it is the conclusion here that the present mainly *verbal green conversion* of the Danish Government will not result in an efficient sustainable energy policy if not combined with an *innovative democracy* approach.

10. New Government incentives

In 2008 a new agreement between the Government and the opposition was made. It contains a target to reach a share of renewable energy, which should increase to 20% of gross energy consumption by 2011. At the time of writing it stands at 16%, including 2% import of biomass.

Onshore wind turbines will receive the Nordpool market price plus 4.25 cent/kWh for 22,000 ''full production hours'' (approximately 10 years), plus 0.4 cent ''balancing costs'' plus 0.06 cent/kWh from the ''green fund'' (see below). Wind turbine owners will effectively receive 4.2 cent/kWh. On top of this, removal of an old wind turbine will net the owner 1.2 cent/kWh for around 6 years. For offshore wind, two projects of 200 MW each should be established before 2012. The ''green fund'' money should be used to help finance feasibility studies for local wind cooperatives under establishment. This provides specific support to co-operatives for the costs in the relatively risky and expensive pre-investment examination phase.

In the proposal for a new renewable energy law any wind power project with wind turbines taller than 25 m, and where the projects are not a public procurement (typically large offshore projects), shall offer local people the opportunity to buy at least 20% of the installed capacity. People living within a distance of 4.5 km have priority. And if they do not buy 20%, people living in the municipality where the wind turbines are placed have the right to buy the remainder, up to 20% of the capacity. The price should be based on documented costs of the wind turbine (Danish Ministry for Climate and Energy, 2008).

Those living near wind turbines are eligible to receive compensation from the owner or owners for potential visual and noise costs. This is problematic, as this is a special case linked to wind turbine projects. Such compensation is not given, for example, in connection with road construction, industrial building work in residential areas and so on. It

makes investment problematic due to the difficulty of estimating beforehand how big the compensation will be, and the process of determining this can be long and costly. The above changes are improvements compared to the period 2002–2008, but the compensation procedure described above clearly has its practical difficulties.

Seen in relation to the paradigms of political economy discussed above, the present Government remains embedded in a neoclassical approach, and its energy plans are linked to the econometric models of the Ministry of Finance. The *innovative democracy* expertise in the Ministry of Environment was either been dismissed in 2002, or is still not listened to.

Bearing this in mind, it is probable that the present Danish Government can succeed in developing 400 MW of offshore wind power, but also that there will be no reestablishment of the *innovative democracy* processes that lead Denmark to a leading position in ''green energy'' in the eighties and the nineties. Meanwhile there is a small chance that the right to up to 20% local ownership will open the door for a revitalising of the innovative democracy approach.

11. Conclusions (Denmark)

The case study of the Danish wind industry provides several key lessons for policymakers, chief among them being the old adage, ''if it ain't broke, don't fix it.'' Stability, and the opportunities for participation which lay in the feed-in tariff and the ownership restrictions were eroded over time, leading to a rapid slump in the industry. It can be shown that the FIT was removed for two reasons. Firstly, it was funded from the state budget, and was therefore considered to be one of the causes of rising electricity prices. Secondly, the incoming Government showed no political interest in supporting renewable energy.

Importantly, this case study shows that local acceptance is central to successful deployment of wind power. Ownership restrictions had a clear relationship with local acceptance. The fact that wind turbines turning in your local area means money being generated for local people has a powerful effect on behaviour and attitudes. One caveat for ownership restrictions is necessity. If an area is not population-dense, and no community is impacted by turbines or other installations, restrictions may not be pertinent. However, as turbines increase in size, and concentrating solar power (CSP) and other large-scale renewable technologies are deployed, there will be an increasing need for local populations to support their presence. This was achieved from early on in Denmark, until the incoming conservative Government effectively rolled back the enabling conditions for effective deployment.

A successful programme will take an *innovative democracy* approach, with wide stakeholder engagement, and involve national energy plans and targets, Government research, development and demonstration support, and it will address planning, grid connection, variability and storage issues. These supporting conditions will affect, to a lesser or greater extent, the efficacy of the support scheme itself. It is true to say that much of this would still be relevant even if renewables competed with conventional energy on a more equitable basis.

12. Overall conclusions

The lessons from Denmark and the United States are clear. Long-term, stable support schemes which allow a multiplicity of actors to invest in the sector will provide a secure basis for development of the industry in a decentralised way. This can be supported by ownership restrictions which direct investment opportunities to the communities closest to the installations themselves. This is especially pertinent for wind farms, but large solar systems, which can increasingly become a common feature of the landscape and cityscape, will also benefit from this to an extent. *Innovative democracy* provides a formal process for bringing all relevant stakeholders together, to solve problems and accelerate project development.

The combination of these factors can help to overcome many of the common barriers which confront renewable energy deployment. In addition, it will allow many more citizens, either privately or professionally, to become personally involved in climate and environment protecting activities. Further, it will help develop the green economy. The cumulative effect will be greatly increased contact between people and the industrial and social changes that we must make in order to protect the climate. The swift transition to a renewable-based energy system is not only necessary for climate protection, but can provide a global demonstration of the positives of greening the economy, in which citizens have been involved.

The contact between people and such activities will improve transparency and understanding, and provide conditions for further green policy development. Participation can also influence empowerment, removing the sense

that the problems of climate change are too big for individuals to solve. Local resilience – communities becoming more self-reliant, in this case with regard to energy supply – can be facilitated by feed-in tariffs and an ownership/investment restriction. The key battle for hearts and minds must be won by the renewable energy industry and its supporters if it is to make the kind of rapid progress that the climate and environment requires. In addition, the slowing global economic machinery can be restarted through vigorous activity in the clean energy sector (Obama, 2008; Jones, 2008).

Following are some final recommendations to policymakers, NGOs, academics and others, based on the above conclusions. Most policies are designed according to the needs and wants of various interest groups, often the entrenched interest groups who benefit most from the status quo. The creation of policy according to the principles outlined above will benefit individuals and communities that have previously been under-represented in the political conversation around the future of energy. The U.S. tax credits and the mooted Danish green certificate system are examples of policies which have not addressed wider participation, and are arguably not designed to allow this. By contrast, feed-in tariffs generally do encourage wider participation, and an ownership restriction can support the policy itself in delivering this. If these policy considerations continue to be sidelined, it may be that the future of renewable energy will mirror the energy market of today: Centralised, inefficient, exclusive and increasingly costly. Renewables offer a unique mix of economic, social and environmental benefits that should be captured, not lost through the inadequate policymaking.

13. Policy recommendations

In determining what different policies can achieve, and who they are designed to benefit, policies can be examined more critically than they have been in the past. In general, renewables policies have been typically analysed in terms of effectiveness and efficiency, by assessing how much deployment is generated at what cost (Ragwitz et al., 2007, p. 1).

This is a suitable starting point for analysis, but cannot account for other emerging concerns, particularly local acceptance, in the case of wind farms and other such large-scale projects. As we have seen above, local acceptance is an increasingly important factor in renewables deployment as renewable energy technologies continue to grow in size and number. One caveat is that these conditions may obtain in industrialised, democratic economies, but not necessarily in less developed countries (LDCs) and non-democratic countries. An exploration of the applicability of this material to such jurisdictions is beyond the scope of this paper.

Therefore, for industrialised democracies, the following criteria for analyzing the efficacy of renewable energy policies are proposed:

- *Local acceptance*—how does the scheme account for and influence this?
- *Equity*—how open is it to investment from all sources?
- *Simplicity*—how simple and intelligible is the scheme?
- *Benefits*—whose interests are furthered or protected?
- *Transition*—how does the policy link to previous and supporting policies?
- *Policy creation*—how are NGOs and new RE technologies represented in policy creation processes?
- *Infrastructure policy*—to what extent is a new infrastructure for renewable energy technologies established?
- *Analytical approach*—to what extent are the concrete institutions in which the market is embedded analysed?

These criteria could be assessed both during design and consultation, and after the policy is implemented. Past experience from different countries, states and provinces will provide historical material to analyse. This process can create greater transparency in future policy design.

Local acceptance and participation will reflect the peripheral conditions of the policy, in terms of ownership restrictions. The criteria *Equality* and *Simplicity* will provide a means of assessing how easily different players can enter the market via the incentives within the policy framework. If contracts for electricity sales are overly complex, this in itself can present a barrier. The simple one-page German feed-in contracts are a good example of simplicity. This can be compared with much longer documents from power purchase agreements in the U.S.

Benefits is a critical criterion, as this will also make transparent who is most likely to financially benefit, and how the market will develop in terms of which agents are likely to participate. In the example of FITs, the field is open and equitable, but could be abused by monopoly capital if ownership restrictions are not observed. The case of Denmark

stresses this. In the U.S., we see that the tax credits are applicable mostly to large producers, creating an exclusionary market. If in place for multiple years, a tax credit-based incentive framework is effective in stimulating market growth for large businesses and wealthy individuals with enough money to access the incentives. This incentive structure is neither the simplest, the most equitable nor the fastest way to deploy renewable energies on a meaningful scale. The U.S. political discussion in the past has not centred on these important factors, so the market has not effectively addressed them. If the political discussion is changed to fully address the economic and social benefits of distributed renewable energies, new policies that reflect those benefits will emerge.

Transition is less connected with equity than it is with market stability. The incentives must be designed so as to not create a stall in the market, or create doubt in the minds of investors, manufacturers, developers and customers. The Danish transitional arrangements as above were complex and ineffective. In the U.K., it is argued that a transition from the renewables obligation (RO), a quota system, to a FIT, would create uncertainty. It has been shown, however, that there are ways of doing this without creating this uncertainty (Toke, 2007).

Policy creation in an *innovative democracy* approach requires participation of NGOs, local stakeholders and representatives of new renewable energy technologies. This helps create balance in the policy formation process, and the suggested reforms will, at an early stage in the political process, take the needs of renewable energies into consideration. The case of Denmark shows that policy design, and the supporting conditions in an *innovative democracy* approach, were originally very effective. The present Government's treatment, based upon a neoclassical approach, brought the deployment to a halt, and is only just restarting domestic deployment after a number of barren years. It remains to be seen what effect their present plans will have.

Infrastructure policy is very important, as variable energy sources such as solar, wind and wave energy requires an infrastructure that is able to handle these fluctuations. At an early stage of renewable energy expansion it is very necessary to analyse infrastructural needs and to develop policies and technologies that can handle a large proportion of variable renewable energy sources.

The analytical approach is necessary to analyse the concrete institutional conditions in which the market is embedded, in the specific jurisdiction. The devil is in the institutional details, and it is not enough to perform a general textbook-grounded analysis of concrete projects. The market is embedded in historically constructed institutions, and does not represent any optimised or optimising market. So the policy should take its point of departure in a concrete institutional analysis of the market conditions. The devil is in the details. The economic, planning and ownership conditions might be beneficial for a project, but details within the rules regarding payment of compensation to neighbours could still stop such wind power projects. Therefore it is necessary to examine the detailed institutional conditions.

If the above criteria were applied to a comparative study of FITs and their supporting conditions in Germany, and the Renewable Obligation (quota system) in the U.K., it would be found that, as many studies have already concluded, the U.K. has high cost, low deployment, and low public acceptance. Germany has low cost, high deployment, and high public acceptance (Mendonça, 2007, pp. 17–18).

When the latter conditions are created, the public, and the industry as a whole allow policymakers to make easier choices on support schemes, as well as send clear messages to the investment sector—which should firmly include civil society. The implications for meeting national commitments to climate change mitigation, as well as safeguarding energy supplies and creating new jobs, are equally clear. If policymakers wish to create rapid, low-cost, deployment of renewable energy, the above lessons and criteria should be considered as fundamental in devising an effective programme.

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