

Comments on the Innovation project

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The paper discusses the case of Danish refrigerator-industry's adoption of less energy-intensive products. The discussion is focussed on both specific measures within the refrigerator industry, as well as national energy and environmental policy tools.

A. The Danish energy- and environmental policy in a Nordic perspective

a) The Danish model

The Danish model makes extensive use of administrative planning and other instruments that provide the state control over the energy sector, and secure the implementation of the government's energy- and environmental planning as stated in *Energy 21*, the fourth official governmental action plan for the energy sector.

Energy 21 aims at contributing to the sustainable development of Danish society with strong emphasis on CO₂ reduction, placing Denmark in a position to "maintain and enlarge its role as a pioneering country for global, sustainable energy". Both the integrated energy and environmental governance structure, and the stated goals of energy policy, shows that the Danish energy policy is strongly intertwined with environmental policy. This is also confirmed in the Environmental Policy Statement 1995 which mentions energy policy as a major area of environmental policy.

The master plan, *Energy 21* spells out three fields of action: 1) Economic incentive structures; 2) electricity and heating legislation; and 3) incorporation of renewable energy. The plan here specifies dynamic processes that runs over several years where government will pursue their goals by:

- a) monitoring and assessing the implementation of energy policy;
- b) doing sectoral planning for electricity, heating and gas;
- c) targeting strategic programmes for research and development, with enhanced emphasis on renewable energy;
- d) preparing energy plans and action programmes; and

- e) engaging the public in the objectives of energy policy, through active public debate on energy and through participation in international environmental and energy discussions.

b) The Norwegian model

Norwegian environmental governance of the electricity sector has traditionally been through permits and concessions, following investment applications from energy companies. Besides single project licensing procedures, the Norwegian environmental policy instruments also include general nature protection plans that limit hydro power construction. The protection of watercourses against hydro power production has later been followed up by several protection plans, with the IVth Protection Plan as the most recent. In addition, the Master Plan for Water Resources has amended the Planning and Building Act of 1985, and supplements it by regulating the use of land, natural resources and water areas.

The most restrictive part of the Norwegian energy regulation concerns the ownership side. The Norwegian concession system gives preference to the Norwegian State, the county, or the municipality in issues related to building, running, or selling a power plant (Konsesjonsloven (1974:19) - the Concession Act §§6, 9 and 10). Also, according to the Industrial Concession Act from 1917, the state does not need a concession to build as in e.g. the cases of Sweden and Finland. The restrictive attitude to private and foreign ownership was drawn up to safeguard the interests of the state and the public.

As already mentioned, Norway has been characterised by less indicative planning and less direct government intervention in energy production investments than Denmark. The Norwegian government has in part been concerned with giving fairly general signals as part of its environmental policy. However, the public ownership of production may allow public authorities to take direct control if needed.

According to the Green Book 1997, which outlines the state's environmental initiatives in the budget, the government aims at sustainable development in line with the recommendations of the "Brundtland-Commission" report to the UN Conference in 1987. The Norwegian commitment to sustainable development is also confirmed in the Environmental Policy Statement 1995 by the Ministry of Environment.

As guiding principles for the power sector, mentioned in the Environmental Policy Statement 1995, the *precautionary principle* is stressed, meaning that the public has a right to be informed of the environmental impact of the power plants. When the impacts are large,

environmental impact assessments are required and the *best available technology* as well as the *best environmental practice* should be given priority. These are all incorporated in the process around the concession system. With almost 100% of the electricity production based on hydro power, it is easy for Norway to comply with high environmental standards.

c) *The Finnish model*

In the last report on energy policy to the Parliament¹, the main focus of Finland's environmental strategy has been related to the energy sector. Given its large energy deficit, a core issue has been to save energy, and thereby also to reduce emissions. Forecasts say that Finland will be in great need for more energy in the years to come (23% from 1994 to 2000 and 39% by 2005)². To fulfil this goal, the government's Energy Conservation Programme has been set up to use energy more effectively within different sectors. Hence, energy saving is one of the main instruments in the reduction of harmful emissions. Industrial energy conservation has been accelerated through voluntary agreements. The Ministry of Trade and Industry (MTI) has agreed on a special action programme with the main industrial organisations, and this action programme is supplemented by company-specific agreements. The public sector has been provided with energy conservation agreements, made with local authorities, in order to speed up the energy survey programmes in the tertiary sector.

In environmental terms, Finland's is as ambitious as the other Nordic countries, and has committed itself to carry out a sustainable growth policy. To this purpose, it has introduced a number of instruments³, including: a) legislation (i.e. the Environmental Impact Assessment Act (468/1994) and the Waste Act (1072/1993), the Nuclear Energy Act from March 1 1988, the Water Act, the Planning and Building Act and the Act on Nature Conservation (1096/1996), the Electricity Act (386:1995)); b) regulations governing the planning processes and other administrative actions, e.g. requiring that the practice for assessing environmental impacts be applied to all projects and plans; c) allocation of subsidies in a way that the detrimental environmental impacts of measures will be minimised; d) voluntary agreements, arrangements, fees and aid; and e) increasing the level of environmental knowledge and awareness.

The Act on Environmental Impact Assessment (468/1994) and the Waste Act (1072/1993) are seen as crucial for the attainment of energy and resource saving goals because

¹ Council of State Report to Parliament on Energy Policy, Helsinki, Autumn 1993

² Ministry of Trade and Industry: Annual Report 1994.

³ Finland's Natural Resources and the Environment 1995

they require environmental impact assessment whenever various industrial projects, including the building of new power plants, involve using natural resources. These matters are supervised by the Ministry of Environment and the Environmental Administration.

The Ministry of Trade and Industry launched an energy technology development programme for 1993-1998, in order to give the Finnish energy technology financing and guiding. These programmes are targeted at non-nuclear energy options and comprise eleven national energy technology research programmes. They concern renewable energy sources, energy conservation and greater industrial efficiency, in addition to ways of reducing the harmful environmental effects of the energy sector.

B. The Swedish model

The Swedish energy system is in a period of transition. It has traditionally been oriented towards the large industry clusters. However, a referendum in 1980 decided to phase out nuclear power. The nuclear reactors are now to be phased out, starting with a Barsebäck reactor in 1998, according to a party-agreement between Social Democratic Party, the Centre Party and The Liberal Party⁴. Radical changes had to be made, and the Swedish authorities have produced a range of reports (particularly the SOU 1995:139⁵) in order to solve the problem of a rising consumption and reduced production.

The new focus of Sweden's environmental policy is recently expressed in the vision of a sustainable development of society, clearly stated by the Prime Minister Göran Persson, when he gave his first speech to the Parliament⁶. The plans for the new energy system moves Sweden in the direction of the Danish model with a targeted development of sustainable energy sources, however, securing important spill-over effect to benefit Swedish industry⁷.

Part of the new policy is an environmental impact assessment which is compulsory whenever a power plant is to be built. The impact assessments, is mainly handled at the county level (länsstyrelsen). However, the level of decision depends on the size of the project. Concessions for emissions and the use of watercourses will be given by regional environmental courts, but large facilities will need a permission from the government as always has been the case.

⁴ Socialdemokraterna, Centern, och Venstre

⁵ Omställning av energisystemet, SOU 1995:139

⁶ Government declaration, March 22 1996)

⁷ Press note, The Ministry of Industry and Commerce, 04.08.1997: *Miljötänkandet skapar nya affärsmöjligheter.*

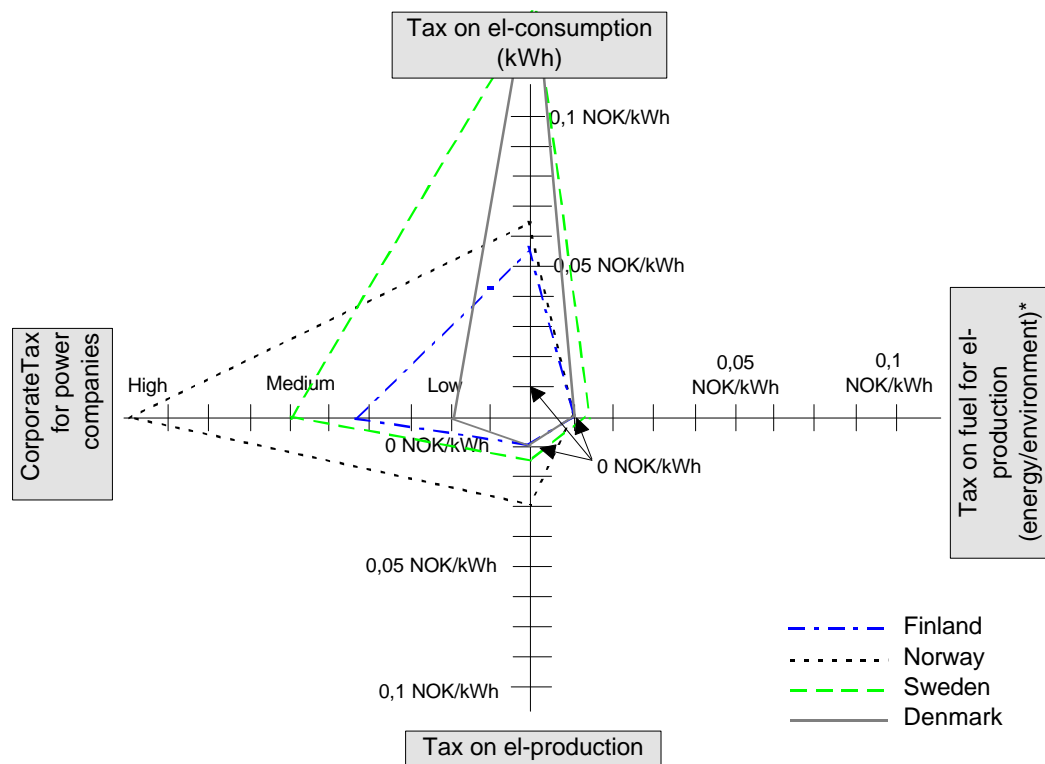
Permits and concessions have traditionally been important energy and environmental policy instruments. The most important legislation in relation to environmental issues and the energy sector is the Natural Resources Act (1987:12). This Act functions as an “umbrella”-legislation to eight other acts regulating the use of natural resources. Concessions are given according to these, and other laws, such as the Planning and Building Legislation from 1947.

C. Nordic patterns of energy taxation

The total tax burden levied on electricity for each national energy tax system in a four-dimensional matrix as presented in Figure 0-1. The figure sums up the tax burden pr. kWh for an average national energy company, based on an average fuel/production mix for the country.

Figure 0-1

The tax structure in the Nordic power sector, a general overview.



As far as corporate taxation is concerned, Norway ranks high on this scale due to the resource rent tax on hydro-power production, and because of several other taxes related to production activities which are special to the Norwegian tax regime for hydro generation. Sweden ranks in a middle position due to a resource rent taxation system for companies with hydro production. The total tax burden on Swedish hydro is, however, somewhat lower than the Norwegian. In general, Swedish electricity companies pay ordinary corporate tax rates. Next on this scale comes Finland with ordinary corporate taxation of income and a normal tax rate on property.

Denmark scores lowest on the corporate tax scale, as there are no corporate taxes on income for the municipal, consumer owned, and regional utilities. There is currently one private power utility in Denmark and this company has, in principle, to pay a rather high corporate income tax. In practice, the real tax rate is somewhat lower due to the particularities in the tax legislation. Except from this, Danish utilities only have to pay a property tax.

In Figure 0-1, tax on all forms of electricity production are weighted according to each technology's relative share of the total production. Norway has the highest figure with an average tax rate of 0,0188 NOK/kWh for 1997. In 1998, this figure is expected to drop down to about 0,012 NOK/kWh. Sweden comes second due to its production tax on nuclear power, which equals 0,022 NOK/kWh (only including the energy tax). Denmark and Finland at present, have no specific taxes on production of electricity.

In the other end of this scale is taxes on consumption. This scale is totally exploded by the extreme consumer taxation in Denmark. For households, the tax is currently 0,509 DKR/kWh, whereas industry pays a much lower tax rate. In Sweden, which ranks second on this scale, the tax for households equals 0,152 SEK/kWh, with some lower rates for certain northern areas of the country and for energy and water utilities. In Norway, the general consumption tax is 0,055 NOK/kWh, and there exist discount schemes for certain northern regions and for industry. Finland has just introduced consumer taxes, and they are differentiated for households and industry. Households pay 0,044 NOK/kWh, while industry pay 0,024 NOK/kWh.

As far as taxes on fuels for energy production are concerned, Sweden is currently the only Nordic country that has implemented real taxes on fuels for the production of electricity. There are two taxes that are specifically oriented towards the environment, and two taxes of a more fiscal nature. Of the two environmentally oriented taxes, the NO_x tax does not provide any net income to the state. The arrangement is as follows: The generators with the lowest emission levels get an economic bonus, while the most polluting generators becomes net contributors to this tax fund. The tax thereby provide incentives for increasing efficiency and lowering emission of oxides of nitrogen (NO_x) - especially in combustion of natural gas and fuel oils. The tax on emissions of sulphurdioxides (SO_2) does generate income for the state, and is meant to hit the most polluting fuel oils according to the polluter pay principle. Both taxes provide incentives for investments in pollution abatement technology, and will possibly stimulate fuel switching. The two more fiscal oriented taxes in electricity production in Sweden, are the general energy tax and the CO_2 tax. These taxes may not be classified as

standard production taxes, as they are both meant to be taxes on internal energy use in the power stations. Even if these two taxes are only on internal fuel use, and calculated as a marginal share (3 or 5 percent) of total fuel input, they represent a significant additional cost to the generators. Bio-energy such as wood, dung, waste etc. has reduced tax rates - particularly when used in combined heat and power generation.

To sum up, the analysis of Nordic energy taxation regimes illustrate that there is high taxation if compared with other OECD countries, though there is little consistency as far as environmental orientation of the national energy-systems is concerned, across different production technologies and energy carriers. There is, for instance, no systematic application of the polluter pay principle. Instead, fiscal concerns seem to play a central role both in the Norwegian and Swedish case. Industrial policy concerns also seem to play a prominent role, as illustrated through extensive tax exemptions for both energy consuming and energy producing industry.

Norway has, with its surplus rent taxation, basically taken a commercial fiscal perspective. Denmark, in many ways, figures as its counter-pole, with a public service orientation and a greater need for environmental reorientation. Sweden and Finland here take up middle positions.

Some co-ordination between national tax regimes has taken place in response to the emerging Nordic electricity market.

The new Finnish system contains no taxes on primary energy for the power sector, nor for other industry. In addition, the import tax on electricity and taxes on hydro and nuclear power, have been abandoned. What remains is now only tax on electricity end-use, and this tax is differentiated between households and industry. The tax burden has instead been shifted to primary energy, utilised for heat and combined heat and power (CHP) generation, where Finnish industry is not competitively exposed. These energy fuel taxes also apply for some industrial and private applications.

Recent tax reforms on hydropower in Norway and Sweden have mainly had a fiscal orientation. The common surplus rent philosophy has, however, given both systems greater similarities. The 1996 tax reform for hydro power in Norway, introduced a surplus rent tax to be calculated on the basis of the running production. This rent-tax collects a certain margin (27 percent) of the so called super-profit the generator may collect in the power market. The tax is specific for each generator, based on specific calculations of his productions facilities. Under

the previous tax system for hydro there were also other production related tax arrangements, and many of these continue in the new system as well.

Sweden has also modified its energy production tax system since 1994. First, in 1996, some minor adjustments were made in the tax level for hydro and nuclear power. Then, in 1997, the production tax on hydro generation was converted into a combined property and rent tax. At the same time there was an increase in the consumption taxes on electricity. For nuclear power the production tax equals the 1994 level.

The current preparation of a new tax reform in the energy sector in Sweden clearly illustrates the limited national orientation of its taxation philosophy. Preliminary signals from this process indicate that there are particularly two driving forces that will affect the outcome. Firstly, there is the planned transformation of the Swedish energy system, and secondly focus is on the relative competitiveness of the domestic power intensive industry. In addition, the government does not wish to take away the competitiveness of its domestic power supply industry. Similar tax reform processes have the last years taken place in the other Nordic countries, which all have had studies performed by so called "green tax commissions". These commissions have largely had the same point of departure and been based on the same environmental logic.

D. Nordic patterns of energy/environmental governance

The diversity of energy- and environmental policies in the Nordic countries also translate into different patterns of energy and environmental governance, which, broadly speaking, can be summarised as follows:

- Denmark has pursued a tight integration of energy and environmental policy, with less tight couplings to industrial or agricultural policy. The strong environmental focus in energy policy is organisationally manifested in the merger between the Ministry of Energy and the Ministry of Environment in 1994.
- Sweden has been pursuing more integrated energy and industrial policies with a looser coupling to environmental policy. Compared to Denmark, the integration between energy and environmental policy is not as overriding, with energy subordinated the Ministry of Industry. Compared to Norway, the energy sector in Sweden is not as dominant, and therefore capable of constituting a policy area with a ministerial representation of its own. As far as environmental policy is concerned, Sweden follows the Norwegian model, with an independent environmental policy area organisationally distinct from energy and industry.

However, the current picture has evolved after stages with different organisational models. In the aftermath of the Swedish nuclear referendum in 1980, the Swedish energy and environmental policy area gained a prominent and integrated position, as illustrated by the creation of the Ministry of Environment and Energy in 1987. For a two year period, until 1989, therefore, Sweden in fact predated the Danish model as it appeared in 1994. The present nuclear replacement policy may possibly also move the Swedish model closer to the Danish, with stronger elements of planned intervention.

- The Finnish energy and environmental governance structure resembles the Swedish in so far as energy is subsumed under the Ministry of Trade and Industry, and environmental governance under the Ministry of Environment. Before 1983, when the present structure was established, environmental issues were mainly handled by the Ministry of Agriculture and Forestry. The Finnish model is somewhat special since the Ministry of Agriculture has continued to have an important role in energy and environmental issues related to hydropower in particular, under their primary responsibility for water resource management. Their role in energy policy is also increasing through the fact that they regulate the use of natural resources such as peat and wood, and bio-mass which are gaining increasing popularity as an alternative source of energy.
- Norway has pursued an energy policy built up around its export-oriented oil cluster and its highly competitive hydropower industry, where the dominating weight of especially the oil cluster has turned it into *the* dominating industrial policy of the country. Environmental policy is rather loosely coupled from this complex. The dominant position of the oil-cluster is illustrated in the appellation of the Ministry of *Oil* and Energy in 1979, and again in 1996. As opposed to Denmark, energy policy is not integrated with environmental policy, but has been closer linked to industrial policy, in the 1960's and 1970's when energy in Norway mainly referred to hydropower. In the 1980's and 1990's, the reintegration of energy and industry in the early 1990's was more a recognition of the oil-cluster's dominant industrial position than anything else.