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The 1973 Oil Crisis and the Designing of a Danish Energy Policy

Mogens Rüdiger*

Abstract: »Die Ölkrise von 1973 und die Entwicklung einer dänischen Energiepolitik«. The Danish energy supply was well-functioning before the oil crisis began in 1973, but the country was highly dependent on imported oil. Thus, the crisis hit a key nerve in its society. This paper analyzes the energy supply before and after 1973, especially the immediate and long-term measures taken to ensure supply security. I argue that the two most important features were the establishment of a regulative regime and the construction of a diversified energy supply. Governmental regulation was considered a precondition for a successful turnaround of the energy sector from an extreme dependency on imported oil to a diversified energy mix. However, increased CO₂ emissions soon made evident that the multi-tier energy supply system was fairly short sighted, and, in the wake of the Brundtland Report, Denmark entered a new and more climate-friendly path.

Keywords: Oil crisis, energy policy, energy planning, wind power, diversification.

1. Introduction

The Suez Crisis in 1956 and, in particular, the Six Day War in 1967 were warnings that energy supply was a vulnerable issue of growing importance in modern Western society. Increasing portions of the energy supply were based on oil and oil products. The demand for oil was rising in all types of production, especially industrial production, and consumption within transport and housing was constantly increasing.

Growing consumption was a common feature of the Western countries, but the potential to meet demands differed between countries with their own energy resources and countries that had to import them. Denmark belonged in the latter category. Except for a small amount of wood and a small quantity of lignite, no national resources were available.¹ All energy had to be imported. Therefore, the post-World War II period was characterized by an ongoing quest for fuels. For the first many years, coal was imported at steady, relatively high

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¹ The first oil in the Danish part of the North Sea was produced in the summer of 1972.

prices from the United Kingdom and the United States, as well as from Poland and South Africa. The last-mentioned countries were at times difficult trading partners. In South Africa, the apartheid regime caused the country to be subject to an international embargo; trade with Communist Poland usually put the Danish at a disadvantage, since it was difficult to export industrial products to Eastern Europe without coming into conflict with Western strategic export controls.² Therefore, oil was a welcomed alternative. Increasing output, good quality, low prices, and the fact that it was much easier to handle than coal were factors that would cause all sectors of society to accept the transition from coal to oil.

In the 1950s and 1960s, the Western countries experienced a spectacular development of which the key watchword was “modernization,” understood as industrialization and mechanization. Enormous effort was invested in post-war reconstruction. The Marshall Plan facilitated increased productivity and international trade among Western countries, international institutions, and the restoration of the world market, with free trade as an objective.³ All of this transformed the Western countries to a degree that, unlike during the Interwar period, ordinary people did not need to fight to survive, but could concentrate on living – and, thus, consume energy. In short, energy was essential for the daily operation of society.⁴

Denmark was a latecomer in creating a welfare state. Until the late 1950s, it was predominantly an agricultural society, with the majority of the population living in the countryside and with jobs in industries dependent on agriculture. Energy consumption was correspondingly low. While the foundation of the country’s welfare state took hold in the 1950s, it was not until the end of the decade that it really unfolded. The industry and the service sectors grew rapidly, single-family homes became the preferred housing type, televisions and cars entered the lives of most families, and in the 1960s, the public sector expanded from being one of the smallest (measured relative to GDP) to the largest in Europe.⁵

Consequently, Denmark was also a latecomer in regard to the consumption of energy (cf. Table 1). Only around 1960 did consumption reach a level equivalent to that of the countries with which Denmark normally compares itself.⁶

² See Rüdiger 2011a.

³ Hogan 1989.

⁴ Chick 2007, 147-50. For the implications of the welfare state for the ordinary man, see Judt 2007. Chapter X and Hobsbawm 1994, chapter 9-11.

⁵ Christiansen et al 2006; De Coninck-Smith and Rüdiger 2007.

⁶ Wistoft, Thorndahl and Petersen 1992; Rüdiger 2011b.

Table 1: Electricity Consumption per Inhabitant (kWh/Person), 1950-2006

	1950	1970	1990	2000	2006
Denmark	484	2,648	5,598	6,330	6,330
Sweden	2,444	7,128	13,959	14,940	14,720
Norway	5,382	13,179	21,205	23,930	23,230
Germany	894	3,999	6,222	5,960	6,380
UK	1,377	3,699	4,813	5,620	5,660
France	801	2,355	5,363	6,360	7,010
The Netherlands	682	2,682	4,967	6,150	6,500
Italy	532	1,925	3,723	4,730	5,250
USA	2,630	6,576	10,555	12,110	12,430

Source: Wistoft et. al 1992, 111, and statistics on Danish electricity supply.

A main point of this article is that this development took place while Denmark did not have a formulated national energy policy and even though all of the energy the country needed had to be imported. The political attitude towards energy before the 1973 crisis was that, as long as the market provided an abundant amount of primary energy at the lowest possible prices, there was no need for the government to interfere in the market. Except for a low tax on gasoline, the policy was one of free access to the energy market and no taxes on imported energy. This policy reflected the fact that Denmark did not produce primary energy before 1972.⁷ Consequently, the Danish state played a role in only trade negotiations with the Communist countries – for instance, in connection with the import of oil and natural gas from the Soviet Union and coal from Poland.⁸

2. Why was the 1973 Crisis a Shock?

Most of the articles in this HSR Special Issue state that the energy crisis was underway for some time before October 1973, and that the Arab action was merely the straw that broke the camel's back. In many Western countries, both policy makers and the public were aware that energy prices and supply security had become issues, with the potential to threaten economic growth and prosperity. Most countries were considering, or even acting upon, improving their energy supply. In that sense, the cut in energy supplies following the outbreak of the Yom Kippur War aggravated the problem, but did not change the game, as was the situation in Denmark.

Such awareness was not present to the same degree in Denmark. Not that the administration was not aware of the threat of a reduced energy supply, but this concern was overshadowed by the combination of political leaders choos-

⁷ Ministry of Commerce 1974, 52.

⁸ Boje 2012, 74-81 and 122-32.

ing to address other important issues and the lack of regulatory tools for addressing the complicated energy situation.⁹

In addition to the problems Denmark shared with most of the Western world, the country also faced growing extreme left and right wing political parties and an outspoken and widespread critique of the welfare state. Three major reforms in particular encouraged anti-statist attitudes: a new administrative division of the country in 1971, which reduced the number of municipalities; a fundamental restructuring of the tax system in 1970/71; and the country's decision to become a member of the European Community, decided by a referendum that passed on October 2nd, 1972, after a long and intense campaign and required Denmark to act in a new way within the international sphere as of January 1st, 1973. Besides, the oil embargo and price increase added a sense of crisis to the discontent of a large part of the population.

This whole melting pot of problems and conflicts turned the Danish Parliament upside down at the general elections on December 4th, 1973. The election campaign coincided with the culmination of the oil crisis and took place in the shadow of completely unusual provisions against the increasing prices and reduced supply of oil. In the new parliament, the extreme and protesting parties, which were not prepared to take part in the exercise of power, won more than a third of the 179 seats.¹⁰ In a Danish context, political polarization of such dimensions was exceptional, and the parliamentary system was to some extent malfunctioning in the 1970s. However, the efforts to curb the energy crisis won the support of all of the responsible political parties, center-right as well as center-left.¹¹

If we are to provide a rational explanation for the reluctance of Danish decision makers to pay much attention to the energy problems that arose during the early 1970s, this must be that they were focusing on other challenges and hardly had the capacity to address energy as a problem, at least not as long as it was not an urgent problem. All of the efforts put into the aforementioned reforms and into the negotiations around EC membership, which began in 1970 and were concluded summer 1972, probably overshadowed the emerging energy problem.¹²

As mentioned, this did not mean, however, that the administration just closed their eyes to the difficulties in providing energy security. Natural gas attracted much attention in the 1960s, probably because of the large finds at Groningen in the Netherlands. This was also the case in Denmark. But it was not only concerns about supply security that followed the Six Day War in

⁹ Villaume 2005, 92-6; Lidegaard 2009, 291-304.

¹⁰ Ibid., 95. Surprisingly, the oil crisis and related energy issues were not important topics in the election campaign (Dansk Data Arkiv: Indholdsanalyse af valgkampen i radio og TV1973 (1996) <<http://samfund.dda.dk/ddakatalog//ddppdf/doku0647.pdf>>).

¹¹ Lidegaard 2009; Rüdiger 1999, 99.

¹² The United Kingdom was in a similar situation; cf. McGowan 2011, 192.

1967; a small group of civil servants in the Ministry of Commerce became interested in what actions would be taken if natural gas was found in the Danish part of the North Sea. They opted for building a national grid, even outlining the routing of the grid and an organization to handle the gas. Their considerations ended up as merely paperwork, however. Gas production in the North Sea was years away, and some deadlocked negotiations with Philipps about the purchase of natural gas highlighted the fact that the Danish state held a weak bargaining position. Therefore, the only lesson learned by the Danish state was that the negotiators lacked the necessary competences to effectively act in the energy market. That said, the state did show an interest in energy problems and did consider acting upon them. Thus, in March 1972, a fully state-owned natural gas company, DNG Ltd., was established in order to build up expertise in the natural gas trade.¹³

In hindsight, but justified by political actions in other Western European countries, it is striking that Denmark did not succeed in creating alternatives to its reliance on oil imports. In my opinion, this reflects a lack of political understanding of the need for a national energy policy and national planning. As a consequence, Denmark had to start almost from scratch when the Arab countries launched its “oil weapon” against the Western world.

However, action within the energy market in the early 1970s was difficult for any country without its own energy resources. Four options to reduce the dependency of imported oil were available. One was a partial return to coal in power generation, and the second was to introduce new fuels into the energy mix – i.e., natural gas and nuclear power. Given that North Sea production was expected to begin in August 1972, the first position seemed hopelessly antiquated, while the other could be implemented only as a long-term strategy.¹⁴ A third option was energy conservation, but as energy consumption equated economic growth, this was not an issue before the 1973 oil crisis. Between 1970 and 1972, total Danish energy consumption stagnated, probably because of lower growth in industrial production; but the small price rise on oil might also have caused energy consumption to grow at a slower pace than the GDP for the first time since 1962.¹⁵

Finally, rather than promoting energy conservation, electricity companies spent a lot of effort on improving efficiency. The electricity system had been undergoing an ongoing centralization process since World War II, with the introduction of bigger and more efficient power stations. In 1950, 420 small

¹³ Rüdiger 1998, 28-36. December the 2nd, DNG Ltd. [Danish Natural Gas Company] was renamed to DONG Ltd. [Danish Oil and Natural Gas Company]. In 2006, DONG and five power companies merged into DONG Energy (Rüdiger 2011b).

¹⁴ Ministry of Commerce 1974, 52; Rüdiger 1998.

¹⁵ Ministry of Commerce 1974, 17-27. Prior to 1962, the GDP was growing faster than energy use, but during the rest of the 1960s, the opposite situation was the case.

power stations kept Denmark's electricity going, but by 1970, this number had been reduced to 140.¹⁶ In addition, combining heat and power became popular in the 1960s, with the establishment of 300 new power stations from 1960 to 1970, as compared to a total of 80 in 1959.¹⁷

All in all, when the crisis surfaced in October of 1973, around 90 percent of Denmark's energy consumption was based on oil, and 90 percent of the oil was imported from the Middle East. In hindsight, this 90-90 situation was problematic and short sighted, because it made Denmark vulnerable to fluctuations in the world oil market and, in particular, to the conflicts in the Middle East.¹⁸

The oil crisis thus initiated a change in the rules of the game, because the energy sector was no longer just left to market mechanisms. A national energy policy and a regulatory framework that would make it possible for the administration to guarantee energy security found their way into the political agenda. Consequently, a political and regulative regime was established between 1973 and 1979.¹⁹ In short, since 1973, the development of the energy sector has been policy driven, and the overall objective has been to secure a sufficient energy supply for the entire country.

This state intervention clearly fits into the classic welfare-state method of solving problems. A dynamic relationship between state and market was to be created, so that the state would assume responsibility for resolving market failures and provide a framework for fine-tuning the trajectory of the market. At the same time, the purpose of government intervention in the market was to provide supply security and low prices. This soon turned into a significant government intervention in the energy sector, such as the regulation of the energy mix and a reduction in energy companies' freedom of action. In this process, questions with a more overall relevance also surfaced, such as if and how the strong correlation between GDP growth and growth in energy consumption could be decoupled.²⁰

In the late 1980s, this newly established regulatory regime was confronted by two almost simultaneous challenges. First, the Brundtland Report and its focus on a sustainable development called into question Danish supply security policy. By 1990, this policy had already been redesigned as a more environmentally friendly energy plan with the neutral title *Energy 2000*. It soon turned out that this policy change was to be followed by a second challenge, namely the European Union-initiated plan to subject the energy sector to competition in order to improve the efficiency of power generation. In the course of 30 years, the rules of the game changed three times: in the 1970s, in 1990, and again in

¹⁶ Wistoft 1992, 68.

¹⁷ Skov and Petersen 2007, 30 and 50.

¹⁸ Ministry of Commerce 1974.

¹⁹ Rüdiger 2007.

²⁰ Rüdiger 2007, 57-69.

1999, when a policy reform introduced competition into the energy sector.²¹ Only the first (and probably the most comprehensive) volte-face is discussed in this article.

3. How the Crisis Hit Denmark

Economically, the oil crisis of 1973 and 1974 was a serious blow to a Western economy that was already suffering under the effects of the multi-year crisis of the Bretton Woods system, which was put under serious pressure when the United States dropped the gold standard in March 1971. Currency fluctuations and more uncertain economic growth were already a part of everyday life when Egypt and Syria began the Yom Kippur War on October 6th, 1973. The result was slower growth, higher inflation, high interest rates, and high unemployment. In Denmark, as in other countries, economic policy turned out to be a shaky and ambiguous struggle against unemployment and a deficit in the balance of payments.

In October 1973, the Arab Organization of Oil Producing Countries, OAPEC decided to implement a reduction in the oil supply, which added to OPEC's efforts to increase the oil prices.²² Since 1971, OPEC demanded higher export prices and tax rates, and the oil companies lacked the strength to defend the status quo. The OPEC countries also tried to limit their total production, so that oil companies could not neutralize the decline in production in one country by increasing production in another. On the top of this, American oil production declined, and the Nixon administration imposed price controls on gasoline in order to keep it cheap. In that sense, the well-known balance between supply and demand was already under attack as the Yom Kippur War broke out. The Arab oil producing countries agreed to a substantial reduction of output, cutting oil production by at least 5 percent from the September level and an additional 5 percent in each succeeding month until Israel withdrew from the territories they had occupied in 1967. Furthermore, OAPEC launched an embargo against the United States and the Netherlands because of the two countries' support of Israel during the war. The embargo, and especially OPEC's insistence on more favorable prices, led to a quadrupling of the posted price to \$11.65 per barrel of Arabian Light.²³

Although Denmark wholeheartedly supported Israel, the country was initially not on the embargo list. However, the country was just about to find itself on the list when, at a closed meeting in November 1973 in the small provincial

²¹ Lovinfosse 2008 describes the renewable electricity policy.

²² The Arab countries were the vast majority of OPEC.

²³ Nye 2001, 218; Yergin 1991, 625. The posted price was \$1.80 in 1970 and \$2.90 in mid-1973.

town of Middelfart, Prime Minister Anker Jørgensen commented that the Arab policy was actually a desire to drive Israel into the sea.²⁴ His statement was leaked to the press, and the Arab countries immediately threatened to embargo Denmark. But it remained only a threat. The embargo was lifted on March 18th, 1974. The high prices turned out to be long-lasting, however, and had a great impact on Western countries.

4. The Immediate Response

From a Danish perspective, the quadrupling of the prices represented a serious challenge to the economy, but the embargo threat also highlighted the country's unfortunate dependence on oil from the Middle East. So even if the price increase was the most significant challenge, the Danish government's response to the crisis primarily addressed the problem of supply security. Thus, in the 1970s and most of the 1980s, policy measures – both immediate actions and when a strategic restructuring of the energy supply was on the agenda – focused on securing the supply. These measures were similar to those taken in the Netherlands and West Germany, but the resulting energy plans or regulative regimes were still country-specific.

An important aspect of the response to OPEC's challenge was that the state assumed the responsibility of the energy supply by trying to change the behavior of the Danish people. Two types of responses were presented: bans on or guidelines for certain types of behavior, and subsidies for improving housing insulation and campaigns for energy saving, such as lowering room temperatures.²⁵

Danes spend a large portion of their total energy consumption on heating their homes, and when OPEC started their action, winter was approaching. Since supplies began to fall in October, the question arose as to how Danes could help by stretching out their stocks and utilizing them in a more efficient way. One of the most dramatic actions was imported from Holland – namely, the ban on private car driving on Sundays. The ban took effect on November 25th and lasted eleven Sundays (December 23rd was excluded). However, since Sunday was the day with the fewest cars on the road anyway, the effect was not great – perhaps with the exception of the Danish population's mood, positive or negative.²⁶ Speed limits were also introduced: 60 km/hour within towns and 80 outside of urbanized areas. Every other street lamp was turned off, and urban culture was hit with a ban on neon signs and illuminated shop windows at certain times of the night. Christmas exhibits shined less brightly, and family

²⁴ Villaume 2005, 95.

²⁵ Rudiger 1998, 47. For a discussion of the various regulatory instruments, cf Ministry of Energy 1981, appendix 2, 9-16.

²⁶ Mejlby and Wagner 2012.

visits were hampered, since the timetables for trains, buses, and air traffic were curtailed. Room temperatures were lowered. In public buildings, this was easy; the authorities simply had to issue an order. In private homes, it was far more difficult. Campaigns were launched to make people change their individual behavior – for example, to wear sweaters. Showers instead of bathtubs were also promoted, as well as shorter and colder showers, the insulation of windows and doors, and so on.²⁷

To many people, television campaigns were not required for them to change their behavior. The increased prices of oil products were effective enough in curbing energy use. Many older houses and apartments were heated by kerosene stoves. So when the price of kerosene soared, a price cap was imposed. Also, the price of fuel oil for heaters and electricity rose significantly within a very short period of time.

Prices remained high even after the OAPEC embargo was lifted in March 1974, and in 1979, they once again rose steeply, triggered by the outbreak of the Iranian Revolution. Stable and low energy prices were history.

A final, immediate tool to address energy security was that, in accordance with the International Energy Agency's targets for government-controlled strategic oil reserves, the national gas company, Danish Natural Gas Company, Ltd. (DNG), was instructed to buy oil for Danish stocks. The company then changed its name to DONG Ltd. (i.e., Danish Oil and Natural Gas). This action was unsuccessful, however. In the winter of the first oil crisis, the company failed to buy any oil, probably because it was a state-owned company. The oil companies demanded higher prices of DONG than of their own subsidiaries, and only the Saudi Arabian company showed an interest; but a deal was never reached.²⁸

Thus, the government took a broad spectrum of measures to get the Danes to use less energy. This did have an impact, especially on heating in private households. One conclusion to be drawn is that, at the time, the price increase was the most efficient way to regulate energy consumption, which clashed with the pre-1973 narrative (i.e., as much as possible, as cheaply as possible). This experience facilitated future taxes on the production and use of energy.

But why were such strong measures applied? And why did the Danish population accept these measures as precautions with which they simply had to comply? An answer can only be assumed, and I would suggest it can be found in the combination of the strong interventionist welfare state and the heavy dependence on Middle Eastern oil. Action needed to be taken to prevent Danish society from being strained by lacking or unstable energy supplies. This was, at least, the message conveyed in reports published by the Ministry of Commerce.²⁹

²⁷ Villaume 2004.

²⁸ Rüdiger 1998, 53.

²⁹ Ministry of Commerce 1974, 1975 and 1976.

5. The Strategic Response

The long-term response also focused on supply security and was based on a very thorough effort over several years to make the puzzle pieces fit together. As was the case in other Western countries, the Danish administration did a comprehensive job of finding long-term responses to the crisis.

The main actors were in the Ministry of Commerce. In 1968, the parliament authorized the ministry to take countermeasures if international conditions threatened to create a shortage of required commodities, especially raw materials for industrial or agricultural production, but also fuels.³⁰ This was where the proposals for immediate actions, as well as all of the strategic ideas, were conceived. In the 1970s, the number of civil servants addressing energy issues in the ministry grew rapidly. In 1976, the Danish Energy Agency was established as a ministerial branch, and in 1979 a Ministry of Energy was established as a spin-off.³¹

The strategy's formation can be followed in four increasingly comprehensive reports from 1974 to 1979. The reports document that, in questions of the energy supply, the decision makers had to start almost from scratch, and the basis for decisions constantly expanded and was becoming more and more specific. Therefore, in 1979 it was possible – based on built up expertise in the ministry and with assistance from private consultants – to make a decision that resulted in a multi-tiered energy supply.

The four reports – published in 1974, 1975, 1976, and 1979 – outlined three tasks to accomplish.³²

- Reduce the vulnerability of the energy system by a) initiating a diversification process and establishing a multi-tier energy supply, and b) building up stocks in accordance with the IEA and EC guidelines.
- Slow down the growth rate of energy consumption by improving efficiency in both production and consumption, and by subsidizing conservation efforts.
- Coordinate and promote research and development in energy-related issues.

The first task also included attempts to redirect the total energy consumption away from imported and toward national energy sources. Since the ministry did not expect renewables to become a reliable source before 1995, the plan stressed the necessity of intensified exploration in the Danish part of the North

³⁰ In October 1968, the Ministry of Commerce published a report on natural gas, and it stressed that Denmark lacked a coordination of the energy supply. The report discussed the option of introducing natural gas to the Danish energy mix, but the only outcome was vainly negotiations with Phillips Petroleum Company in 1970-1971 and the Petronord-group in 1973 (Rüdiger 2007, 50-3).

³¹ Nissen 1981, 176; Rüdiger 2003, 190-2.

³² Ministry of Commerce 1976, 24-5. From a strategic point of view, this report was the far most important.

Sea, in order to make natural gas an important fuel in the future energy system. Nuclear power was also expected to become one of the pillars of the system, but conflicts between the state and the utilities, as well as popular protests, postponed the decision, and in 1985, nuclear power was finally excluded from Danish energy planning.³³

6. The New Design

The 1974 report already gave an outline of the strategy. The starting point was a discussion of the weaknesses resulting from the many years of inaction:

- energy consumption per capita was among the highest in the world;
- ninety percent of the oil came from the Middle East;
- the storage capacity was far too small; and
- the oil crisis hit the country at a time of economic difficulties.

Therefore, the report suggested increased diversity as the strategy to be followed. This had to take into account the following:

- Security of supply was a high priority, but prices were also of great significance.
- The energy supply should be made more efficient.
- Behavior should be regulated to reduce the amount of imported fuels, and the search for oil and natural gas in the North Sea should be intensified – i.e., supplies should to a greater extent be based on national fuels.

A diversified energy supply was probably an obvious conclusion. The problem was how to achieve the diversity and how to define the relationship between the different fuels.

According to the Department of Energy, the overall scenario was a society with continued growth. Thus, the main goal was to ensure sufficient energy for future growth. One tool was to increase energy efficiency and thus break the historical relationship between GDP growth and growth in energy consumption. Daniel Yergin coins efficiency as the fifth fuel,³⁴ and he is right that it probably has been a major – perhaps the most important – reason for the decoupling process from the 1980s onwards.

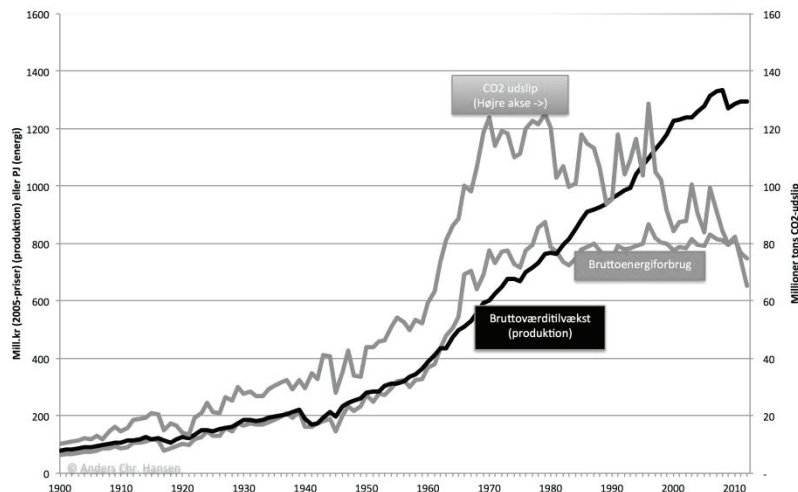
If an increased use of domestic fuels was to be implemented, a conflict between private and public producers was unavoidable. The strategy aimed specifically at expanding the production of both oil and natural gas in the North Sea. As a consequence, the concession, which was held by the private company

³³ Petersen 1996.

³⁴ Yergin 2012, 620-31.

Maersk Oil and Gas, Ltd., had to be reformulated.³⁵ The fight between the government and Maersk went on for a while, but in the end, Maersk agreed to increase the production of oil, as well as to stop flaring (and thus wasting) gas³⁶ and, instead, send it ashore to be used in Denmark's natural gas network.

Figure 1: Growth of GDP and Energy Consumption, 1900–2012



Source: Anders Chr. Hansen: Progress in energy efficiency in Denmark in the twentieth century. Presentation at a symposium on the delinking of energy consumption, Roskilde University, 1 June 2007. Updated 2014 (forthcoming).

The legislation of the late 1970s and the early 1980s represents one of the very few cases in which the Danish state was directly involved in the creation of resources, and it must be seen as a result of the oil crises of the 1970s, which made it obvious that supply security was a fundamental challenge in a modern industrialized society. Moreover, the state's direct involvement was consistent with the welfare state tradition that developed after World War II. That is, to an increasing extent, the state assumed responsibility of the country's development, in case society or the market failed to function properly.

As mentioned above, the plan for establishing a diversified energy supply set the stage for the introduction of both natural gas and nuclear power. However, nuclear power was excluded from energy planning because of the problems with nuclear waste storage and the accident at Three Mile Island in 1979, which led to strong opposition against nuclear power plants in Denmark.³⁷

³⁵ Maersk Oil cooperated with Shell and Chevron in the Danish Underground Consortium, DUC; cf. Hahn Pedersen 1997.

³⁶ Flaring gas is the burning of natural gas associated with oil extraction processes.

³⁷ Petersen 1996.

Probably the most far-reaching decision was the construction of a natural gas grid from 1979 to 1984,³⁸ based on gas coming from the Danish part of the North Sea. The fully state-owned natural gas company, DONG Ltd., was responsible for the construction process and for the transmission of the gas, while five regional companies took care of the final distribution to end users. During the first years, the natural gas project encountered serious problems. Since gas prices were tied to the price of oil, and because oil prices dropped in the 1980s, the economic basis for the entire project evaporated. It was rescued by parliament,³⁹ however, which pumped more money into it.⁴⁰

Thus, other measures remained for ensuring diversification. A third tool was forcing the Danish power plants into a large-scale transformation: from using oil to burning coal, a change that was initiated in the late 1970s and concluded in 1984/85 (i.e., the process lasted approximately five years). The legal foundation for this operation was a law enacted in 1976. This legislation regulated the electricity sector as a whole for the first time. One of the main points was that the Minister of Commerce⁴¹ could instruct a power plant to adjust production to a certain type of fuel. The minister immediately used this authority, asking several power stations to substitute coal for oil.⁴² Today, we know this was not a wise strategy. One more subsequent shift has been made, and today the majority of Danish electricity is produced with natural gas.

The changes in the 1970s involved the centralization of the energy supply. This was not a new situation for the electricity supply, but the gas (coal gas) grid had previously consisted of small distinct units, each supplying power to a town or a part of a town. The coal gas was used especially for cooking, but this had been on the decline since 1945, because it was no longer associated with being modern. Moreover, since the gas was wet, it was greasy in comparison to electricity.⁴³

However, there was one exception to centralization. District heating and combined heat and power (CHP) continued to be a decentralized structure, in part because of technical limitations, but also because this was a local political desire. Decentralization was further strengthened in the 1990s, when the Minister of Energy established a large number of small plants in the countryside,

³⁸ The grid closest to Germany was taken into use in 1982 as a test of the gas project; Ruhrgas delivered the gas.

³⁹ From 1973 to 2001, the legislation and other parliamentary decisions on energy policy was headed by the Social Democratic and the Liberal party and supported by most of the other political parties in the parliament. Thus, energy policy was not sensitive to the changing colors of governments. This is not to claim an overall agreement; certain issues, such as energy taxes and the relevance of a state-owned company (i.e., DONG Ltd), were subject to ongoing disputes (Rüdiger 1999).

⁴⁰ Rüdiger 1998, 2007.

⁴¹ From 1979 the Minister of Energy.

⁴² Wistoft 1992, 176.

⁴³ Rüdiger 2011.

mainly based on natural gas. They were not welcomed by the more traditional power stations, and many investments and reconstruction efforts were spent on turning them into feasible CHP stations.⁴⁴

To sum up, the first oil crisis changed the rules of the game from a largely market-driven model to a policy-driven system; planning and regulation were the preferred tools implemented to guarantee supply security in the electricity and natural gas sectors, to reduce dependency on oil, and to curb the increase in energy consumption; and the latter was to be accomplished by either improving efficiency or urging the Danes to conserve energy. In the effort to meet these targets, planning was the main instrument, but taxes and financial incentives were also used to change consumer behavior. The Danish energy sector entered onto a new path.⁴⁵

7. The Response to the 1979 Crisis

In 1979, the second oil crisis caused another substantial price increase and elucidated the fact that the energy market had become volatile with sudden and unexpected price changes.

The crisis once again stressed the need to diversify the energy supply and for the continued efficiency of both power generation and consumption. In addition, the high prices once again taught consumers the benefits of saving energy, and the state introduced new incentives to improve energy efficiency and curb energy consumption.⁴⁶ But the Social Democratic government also put effort into expanding the state control of and the political impact on the energy sector.

In October of 1979, the Ministry of Energy was invented as a spin-off of the Ministry of Commerce. The first-appointed minister was Poul Nilsson, a Social Democrat who wanted to go further down the path of state interventionism. He insisted that the public should have a significantly greater impact on the exploration and production of hydrocarbons in the North Sea. The inspiration for this came from Norway and the United Kingdom, and the task was to change the actual concession, which was unfavorable for the state and society, to an agreement that was more favorable.⁴⁷ The Danish Parliament passed a series of laws in 1981, and Maersk Oil and Gas was forced to relinquish a large part of the licence area not in production to the state, which would then periodically provide licences according to the open-door principle. Furthermore, the state-

⁴⁴ Skov; Petersen 2007, 147.

⁴⁵ Before 1973, gasoline was almost the only fuel subject to taxes. Tax on electricity was introduced in 1977 and was raised in 1985 and 1986. Natural gas was exempted from taxes until 1996.

⁴⁶ Ministry of Energy 1990, 27-34.

⁴⁷ Hanisch and Nerheim 1992, chapters 5 and 6.

owned company DONG Ltd. was to be a “carried partner” in all licences. Finally, it was determined that the oil would be transported ashore to Denmark. This legislation introduced a new regulatory regime, and the Danish state adopted the policy of exerting greater influence on the exploration and production of hydrocarbons. This regulatory regime, in combination with improved energy efficiency and a focus on energy saving, constitute the permanent result of the crisis. The growth in the gross energy consumption began to level out in the late 1970s (cf. figure 1),⁴⁸ whereas the increased direct state influence was rolled back by the EU’s demands for liberalization and competition in the energy market.⁴⁹

8. Wind Power

The plan for diversification left only a small space for alternative energy – only 4 percent was supposed to come from renewable resources in the 1990s. But the plan also claimed that more money was to be invested in R&D on renewables, especially wind energy.⁵⁰ The oil crisis revitalized the construction of wind turbines, which had a long history in Denmark for very good reasons. Popular and political interest in and support for alternative energy was increasing in the 1970s. Those strongly opposed to nuclear power saw wind and solar power as alternatives. A very popular slogan linked the fight against the Swedish nuclear power plant (to be located in Barsebäck, 20km from Copenhagen) with the fight for sun and wind power.⁵¹

The interest in wind power originated from idealistic engineers and was anchored in left-wing NGOs inspired by the *Limits to Growth* movement and its effort to create a non-market-based society. However, from the mid-1970s, the idea of alternative energy resources found its way to commercial companies. In 1976, the first modern wind turbines appeared in the landscape, and in 1979, the Danish company Vestas began producing turbines. The third oil crisis in the mid-1980s, with extremely low prices, was devastating for wind power, however. Vestas, for example, almost went bankrupt when California phased out its subsidy for wind turbines in 1986.

The existing power companies opposed wind power, as they found it too expensive and too cumbersome. The Brundtland Report changed the picture with its demands for energy conservation and renewable energy. In Denmark, the center-right government proposed a new energy plan in 1990, *Energy 2000*, which included ambitious targets for reducing energy consumption and CO₂ emissions. This plan changed the energy discourse from giving priority to

⁴⁸ Ministry of Energy 1990, 28.

⁴⁹ See Bartle 2005.

⁵⁰ Ministry of Commerce 1976, 33.

⁵¹ Petersen 1996.

supply security to placing energy's impact on the environment high on the political agenda. Energy saving, improved efficiency, and "cleaner" energy were the main targets of the future energy sector. The term cleaner energy indicated that renewables – especially wind and biomass – in combination with natural gas were planned to be the backbone in the energy mix, thus reducing the negative effect of diversification and the reintroduction of coal as the main fuel in electricity generation.⁵²

The plan also set the scene for a more active use of energy taxes and for more active and serious participation in international institutions for the purpose of paving the way for a sustainable development.⁵³ Sustainability had irrevocably entered the vocabulary of Danish energy planning, and the government had paved the way for Denmark's international position as one of the frontrunners in greening the energy sector. There was a long way to go, however, as the response to the energy crises of the 1970s turned Denmark into one of the world's most CO₂ emitting countries.⁵⁴

9. Concluding Remarks

The role of the 1973 oil crisis as a game changer can be described as a major showdown with the *laissez-faire* approach to energy consumption prior to the onset of the crisis. Before 1973/74, there were taxes on gasoline and heating oil and only few rules on electricity supply. The Suez Crisis in 1956 was an eye-opener, which made clear that energy and supply security had become a pair that were indispensable to modern society; yet the crisis had many practical consequences, as well. The Six Day War in 1967 inspired the Ministry of Commerce to outline a plan for the introduction of natural gas, but this effort foundered because it was not possible to buy gas in sufficient quantities at an acceptable price.

However, the oil crisis of 1973/74 was a challenge that was big and concrete enough to make it clear that the Danish energy supply could not continue on its current path. New measures had to be taken. One such measure was government regulation of the market, which had two consequences. After 1973/74, energy policy was conceived of in national terms – i.e., the state and the state owned oil and gas company, DONG Ltd., played an increasingly important and privileged role. In this regard, Denmark was a latecomer, as compared to Norway and the United Kingdom. Furthermore, although the state dirigism did not come to characterize the Danish energy policy to the same degree as in Norway, the implementation of the EU Internal Energy Market became a chal-

⁵² Ministry of Energy 1990, 89-102.

⁵³ Ministry of Energy 1990, 105.

⁵⁴ Ministry of Energy 1990, 18.

lenge, which had no solution until a dramatic consolidation and reorganization process of the energy supply was implemented from 2003 to 2006.⁵⁵

The second consequence was the establishment of a strong regulative regime. As indicated, in its early stage, this was already a regime with many regulatory tools, such as prohibition, injunction, subsidies, standards, incentives, etc. It was classic welfare-state regulation, characterized by bureaucratic or sometimes even command-and-control regulation, in which the state carried the overall responsibility for development.

Subsequently, the regime has undergone changes, but the very existence of a state regulatory regime has facilitated the transformation of Danish energy policy to be more in line with the greater international emphasis on the environment and the climate. This does not necessarily mean, however, that government regulation itself is good for the energy sector.

The oil crisis of 1973/74 was an international crisis, but in the Western world, the responses to the crisis were national. Denmark acted on the decisions in the EC, OECD, and IEA, but the mindset and the initiatives launched in the 1970s and 1980s and during the years preceding the *Energy 2000* plan focused on the national level. As the articles in this HSR Special Issue demonstrate, the different countries used the same tools, more or less, to reduce the effects of the 1970s oil crises. This would suggest that an exchange of ideas and experiences took place across national borders, but for Denmark, this is still a topic to be examined.

In conclusion, the oil crises of the 1970s caused a substantial change in Denmark's energy sector and its energy policy and planning. The focus was on supply security and, thus, on the creation of a diversified supply. An unintended consequence of the reintroduction of coal as an alternative to oil was very high per capita CO₂ emissions. Therefore, when environmental and climatic issues captured the focus of the political agenda in the 1990s and 2000s, another reformulation of the country's energy policy was needed. Consequently, sustainability became the determining issue of Danish energy planning in the 1990s and paved the way for a fast greening of the energy sector.

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⁵⁵ Rüdiger 2011b.

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