RENEWABLE ENERGY POLICY IN GERMANY – INSTITUTIONS AND MEASURES PROMOTING A SUSTAINABLE ENERGY SYSTEM*

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Abstract

Of the large industrial countries, Germany is clearly leading with regard to new renewable energy sources (RES), occupying the first rank in terms of installed wind energy capacity, and the second rank in photovoltaics. This capacity is not due to an exceptional natural resource base but to its policy in this area, despite the fact that this policy was conducted in a rather lukewarm fashion until 1997. In any case, it led to a remarkable expansion of this sector. The red-green coalition, in office since 1998, developed the vision of achieving 50 percent and more of electricity generated from RES by 2050, a goal that seems well accepted by the public but not by the established energy interests or the leaders of the conservative-liberal opposition, even though its cost appears as comparatively modest.

A historical account of German RES-E policy will be given, focused in particular on the evolution of feed-in legislation from 1990 to 2004. After the first oil price crisis of RES-E policy was devoted to R&D. Market creation measures only came in the end of the 1980s; of these, the Feed-In Law was the most important. During the 1990s, it managed to survive, but several amendments were adopted. Significant improvement occurred after the 1998 election; the new red-green majority greatly strengthened RES-E support, particularly for photovoltaics and biomass. However, this legislation is not fully accepted on both the domestic and the EU levels.

Keywords: renewable energy, Germany, feed-in tariff

The Beginnings

Renewable energy policy in Germany began after the first oil crisis. For about a decade and a half, this policy consisted almost exclusively in the promotion of research from training personnel to development of prototypes and laboratory production. Spending was very modest in 1974 (about €10 million). It rose gradually until 1978 (about €60m) and reached its peak with €150m in 1982, declining thereafter until 1986 (€82m).

Since 1979, there were also first efforts to stimulate demand for RES-E by use of the tariff. At that time the government relied on the national competition law to oblige electricity distributors to purchase electricity from renewable sources produced in their area of supply based on the principle of avoided costs.

The accident in the Ukrainian nuclear power plant Chernobyl in 1986 had a deep impact in Germany. Public opinion had been divided about evenly on the question of nuclear power between 1976 and 1985. This changed dramatically in 1986. Within two years, opposition to nuclear power increased to over 70 per cent, while support barely exceeded 10 per cent (Jahn 1992). While the social democrats committed themselves to phasing out nuclear power within ten years, the Greens demanded an immediate shutdown of all plants.

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Also in 1986, reports warning of an impending climate catastrophe received much attention, and in March 1987 chancellor Kohl declared that the climate issue represented the most important environmental problem (Huber 1997). On the national level the Committee for the Environment, Nature Conservation, and Nuclear Safety of the German Bundestag agreed to establish an Enquete Commission on Preventive Measures to Protect the Earth's Atmosphere, with the mandate to study the ozone problem as well as climate change and to make proposals for action. An inter-ministerial working group "CO_2 reduction" was also established. The commission worked very effectively in a spirit of excellent co-operation between the parliamentary groups of both government and opposition parties. There was general agreement that energy use had to be profoundly changed. (Kords 1996; Ganseforth 1996).

The first climate Enquete Commission recommended a goal of 30 percent reduction of 1987 CO_2 and methane emissions by 2005, and of 80 percent by 2050 (German Bundestag 1991), and also a fundamental reform of energy policy. A series of proposals were formulated which included an electricity feed-in law for generation from RES (Schafhausen 1996). There was growing consensus among MPs of all party groups that it was time to create markets for renewable energy technologies (Lauber/Pesendorfer 2004).

First Steps to Market Creation

The measures adopted to create markets for RES-E technologies were in particular the 100/250 MW wind programme, the 1,000 solar roof programme and the creation of a legal basis for utilities to pay higher costs for RES-E than were "competitive" in the – actually quite distorted - market place.

When in 1988 two backbench conservative MPs in the *Bundestag* proposed a feed-in tariff to support wind energy, the government, to buy off the dissenters, initiated two important market creation programmes for RES-E: a 100 MW wind programme and 1,000 roof programme for photovoltaics (Kords 1993). From 1991 to 1995, under the 1,000 roof programme applicants received 50 percent funding of investment costs from the federal government plus 20 percent from the Land government. Eventually 2,250 roofs were equipped with PV modules, leading to about five MW of installations (Staiss 2000: I-140). As to wind energy, a programme for subsidising 100 MW – later 250 MW - of wind turbines (by a payment of € 0.04/kWh, later reduced to € 0.03) was legitimated by the need to gain practical experience with different approaches under real life conditions. As this programme in 1991 combined with the Feed-in Law, installed wind capacity grew rapidly. In subsequent years, these subsidies declined rapidly (Hirschl et al. 2002).

The 1990 Feed-In Law

Buying off support for a feed-in tariff was successful only for a short period of time. Soon afterwards, a new bill for such a tariff circulated among MPs, supported both by conservative (CDU/CSU) and green deputies who gathered support among the other parliamentary groups as well. In the Economic Affairs ministry and in parliament this idea got acceptance; support came also from the Ministries of Research and of the Environment. The bill secured consent from all parliamentary parties and became the Electricity Feed-in Law of 1990 (Kords 1993). The large utilities did not mobilise at that point, probably because they underestimated the importance of the law which was expected to support mainly small hydro.

The Feed-in Law required electric utilities to connect RES-E generators to the grid and to buy the electricity at rates of 65 to 90 percent of the average tariff for final customers. Generators

were not required to negotiate contracts or otherwise engage in much bureaucratic activity. Together with the 100/250 MW programme and subsidies from various state programmes, the Feed-In Law gave considerable financial incentives to investors, although less for solar power due to the high cost (Hemmelskamp 1999). One of the declared purposes of the law was to 'level the playing field' for RES-E by setting feed-in rates that took account of the external costs of conventional power generation. In parliament external costs of about 3-5 Eurocents per kWh for coal-based electricity were mentioned by CDU MPs. Before adoption, the law was notified to the European Commission for approval under state aid provisions. The Commission decided not to raise any objections because of its insignificant effects and because it was in line with the policy objectives of the Community. However, it announced that it would examine the law after two years of operation.

Challenges to the Feed-In Law

These incentives greatly stimulated the formation of markets and led to expansion for wind, from about 20 MW in 1989, to over 1,100 MW in 1995. This encouraged technological and political learning in this sector, but also strengthened the resolve of the large supra-regional utilities to attempt a rollback of this law, via both politics and the judiciary. This was more than just opposition to small and decentralised generation. First, no provision had been made to spread the burden of the law evenly in geographical terms; a satisfactory solution to this problem came only in 2000. Second, the utilities were by this time marked by the experience of subsidies for hard coal used in electricity generation which had grown from € 0.4 billion in 1975, the year the *Kohlepfennig* was introduced, to more than € 4 billion annually in the early 1990s. Two thirds of this was covered by a special levy on electricity, one third had to be paid by the utilities directly but was also passed on to the consumers. In 1994 the *Kohlepfennig* was ruled unconstitutional by the Constitutional Court.

In April 1998 the Energy Supply Industry Act was adopted to transpose electricity directive 96/92/EC and modified the Feed-in Law in several points. In particular, it created a new compensation mechanism for distributing the supplementary cost to the utilities. The 1990 law had provided a hardship clause which was practically never applied. Wherever RES-E exceeded five percent ("first ceiling") of the total electricity supply, the upstream network operator had to compensate that undertaking for the supplementary costs caused by this excess amount. A similar rule applied in favour of the upstream network operator, who could ask for compensation from a network operator situated further upstream if the compensation he had to pay exceeded 5 percent of his output ("second ceiling"). As it was obvious that in some coastal areas the 10 percent limit would be reached, wind power growth could stop unless an alternative solution was found. This conflict led to insecurity for investors and stagnating markets for wind turbines from 1996 to 1998.

Other programmes

A federal energy research programme from 1990-1998 amounted to more than € 1 billion to all forms of renewable energy. The *Länder* contributed another € 0.85 billion for the period 1990-1997, most importantly North Rhine-Westphalia. Loan programmes by the federal government's banking institutions *Deutsche Ausgleichsbank* and *Kreditanstalt für Wiederaufbau* permitted more than €3 billion in reduced interest loans for RES installations in the period 1990-1998. Other measures privileged wind turbines under the construction code (every local community had to present a plan with zones appropriate for wind power, which

greatly facilitated permitting), reformed training programmes for architects, and stressed public information (Staiss 2000: I-140).

Makeshift support for solar photovoltaics

While the Feed-In Law of 1990, combined with the 250 MW wind programme, led to the breakthrough for wind, solar photovoltaics did not benefit similarly. The 1,000 roof programme of 1989 had been a success and led to installations of 5.3 MW by 1993, but this market volume did not justify the installation of new production facilities in the solar cell industry. The Feed-In Law provided little help since rates did not come near PV costs, and a new demonstration programme was not forthcoming.

But help came from solar activists and municipal utilities. The 1989 modification of the federal framework regulation on electricity tariffs permitted utilities to conclude cost-covering contracts for electricity using renewable energy technologies, even if these "full cost rates" exceeded the long-term avoided costs of the utilities concerned. While the supra-regional utilities generally rejected such an approach, local activists now petitioned local governments to impose such contracts on municipal utilities. Several dozen cities opted for this model.

Additional help came from several *Länder* market introduction programmes, most strongly in North Rhine-Westphalia. Some states acted through their utilities, subsidising solar installations for special purposes, e.g. schools. Some offered "cost-oriented rates" somewhat below the level of full cost rates. Finally, Greenpeace gathered several thousand orders for solar cell rooftop "Cyrus installations" (Ristau 1998). Due to these initiatives, the market did not collapse at the end of the 1,000 roof programme but continued to grow, attracting new firms and demonstrating public support for PV. Various solar energy organisations lobbied for a larger market creation programme.

Energy Reform and Liberalisation

Reforming Germany's electricity sector proved to be a difficult task. Most reform attempts were doomed to failure because of the political power of the German energy supply industry (ESI) which is one of the industrial pillars of Europe's largest manufacturing economy. Already before unification it was partly privatised and later opened for foreign investors. The powerful ownership links between the ESI and major financial and industrial interests in Germany indicate that this industry is an integral part of what Shonfield (1968) termed German "alliance capitalism" to describe the corporate culture of German industry, dominated by alliances with banking and insurance capital for decades. In contrast to competitive capitalism, alliance capitalism is characterised by collaborative relationships between commercial entities, and success relies on the concerted orchestration of large resources for common goals. With its huge turnover, vast profits and monopoly status, the ESI grew into the major cash cow of the German economy. Its political status was consolidated by links to state bodies at all levels and, through revenue sharing, to German municipalities by way of generous concession fees.

German electricity regulation traditionally relied on a mix of public and private law. Basic energy law was embodied in the Energy Supply Industry Act (*Energiewirtschaftsgesetz)* adopted in December 1935 and laying down the framework conditions for a cheap and secure electricity supply. It defined German state control of the sector for more than 60 years. The other important piece of legislation is the Monopolies Act, which generally exempted

electricity and gas supply. Contracts for concessions, territorial boundaries, supply to special customers, the technical conditions for feeding surplus electricity into the grid, reserve deliveries and other arrangements are all based on private law.

There have been numerous attempts at reforming the German energy sector, but both bottom up and top down approaches always failed. In the mid-1980s, after the Chernobyl disaster, a strategic about-turn in energy policy and the re-municipalisation of electricity supply (Hennicke et al. 1985) were articulated and widely discussed. This has remained the policy position of the SPD and the Green party, and is also supported by local activists.

The introduction of environmental concerns into the German system was more successful than initiatives towards liberalisation. The Ordinance on Large Combustion Plants introduced 1983 strict limitations on all emissions such as SO_2, NO_x and particulate matter. With the restrictions it places on private property rights in favour of the environment, it constitutes an exemplary top-down policy tool (Mez 1995). The same applies to the Technical Guidelines on Air Quality. The Electricity Feed-In Law, enacted 1990 on the initiative of the German parliament, provides yet another notable environmentally oriented change in the framework conditions.

In response to long-standing criticism of monopolistic practices in the electricity industry brought forward by the German Monopolies Board (Monopolkommission 1976), the Deregulation Commission and international deregulation discussions, the CDU/FDP-led federal government after 1991 wanted to subject the energy sector to more competition and more effective public control. A first concrete reform proposal drafted by the Ministry of Economic Affairs in October 1993 included a partial break-up of the industry, third party access and stricter control of electricity prices. However, it was heavily modified subsequently and finally retracted in March 1994 because of open resistance from the municipalities and opposition signalled by the majority of the SPD-governed *Länder* in the *Bundesrat*, the upper chamber of the German parliament.

In autumn 1996, the German government submitted a second draft, this time backed by the EU reform process around the directive on the internal electricity market (96/92/EC, enacted on 19 December 1996). The reform's main goal was to reduce electricity and gas prices in order to strengthen Germany's international competitiveness. The draft included provisions to remove both the demarcation treaties and the single supplier formulae in concession treaties. Proposals for state control of investment in new power stations and transmission lines were dropped however. More than a year later, after much controversy, the Energy Reform Act (*Gesetz zur Neuregelung des Energiewirtschaftsrechts*) was passed, amending the Energy Supply Industry Act (*Energiewirtschaftsgesetz*) of 1935, the Monopolies Act (*Gesetz gegen Wettbewerbsbeschränkungen*) and the Electricity Feed-in Law. It entered into force on 29 April 1998. Only a few days later, PreussenElektra (now E.ON) took the law to the Constitutional Court, joined shortly afterwards by the SPD federal parliamentary party group and its *Land* counterparts from Hesse, Saarland and Hamburg. The energy policy spokesman for the SPD announced that a review of the new Energy Reform Act would enjoy priority under a newly elected, SPD-led federal government.

However, after the change of government in October 1998, the SPD lawsuits were suspended. Finally, on 28 September 1999, the government, the parliamentary parties of SPD and Greens as well as leading unionists signed a common statement confirming the basic principles of the energy law reforms, namely the end of demarcation treaties, full opening of the network for

all suppliers and free choice of supplier for all customer groups (ARE 2000, 12). Liberalisation made a little more headway in 2003 and 2004.

Electricity liberalization favoured the expansion strategies of the energy giants. The trend towards internationalisation and globalisation of German energy undertakings is evident and led to mergers and higher yields. After protected markets and guaranteed returns, the new period is characterized by risk and insecurity. Deregulation was followed by some re-regulation.

The New Energy Policy of the Red-Green Coalition

The new red-green Federal Government emphasised ecological modernisation and climate change policy as well as job creation and socio-economic development; energy policy was to be a leading example. It included tax reform (eco-tax on energy), phasing out nuclear power, and strengthening of renewable energy sources and of combined heat and power (CHP). Additional reform of the Energy Supply Act and of the Association Agreements followed in a second phase, in response to a 2003 court judgement that ruled a recent Associations Agreement illegal. This led the government to agree to the obligatory provision of a regulator in the new electricity directive of 2003, to be implemented in 2004.

Nuclear power phase-out

The fundamental revision of nuclear policies reflected the consensus among Greens and many social democrats since the Chernobyl accident. The basic decision against the future construction of nuclear power plants was enshrined in the 2001 Nuclear Energy Phase-Out Act; licenses of existing plants were reviewed and limited in time. The legislative process was characterised by the government's endeavour to reach a consensus with nuclear power interests and to avoid legal disputes before the courts. Due to the powerful position of nuclear vested interests, these negotiations entailed many setbacks for nuclear opponents.

Climate change policy

Within the framework of the Kyoto Protocol and the European burden-sharing agreement, Germany committed to reduce GHG emissions by 21 percent from 1990 to 2008/12. In addition, the government in 1995 had pledged a 25 percent reduction of CO_2 emissions by 2005. Until 2000, a reduction of about 18 to 20 percent, corresponding to 180 to 200 million tons of CO_2, was already achieved, so that the gap amounted to 50 to 70 million tons of additional reduction. This was to be achieved by the government's Climate Change Policy Action Programme of October 2000. Both RESA and the CHP Act are integral parts of this programme. These two areas of activity are expected to contribute reductions of 15 Mt CO_2 and 23 Mt CO_2 respectively, or about 50 percent of the target (Bundesregierung 2000, pp. 9, 77, 80).

Government support for these two policy fields is likely to persist in the near future. For one, this policy area has been given high priority by Germany as host of various climate change conferences. Second, the two action packages mentioned above are likely to achieve real reductions, which is not true for all measures. However, within the current governmental actor's constellation, it is primarily the Green Party and the Environment Ministry together with energy policy experts of the SPD - with a comparatively weak link to the Chancellor's Office or the Economic Affairs Ministry - which promote an active approach to German

climate change policies and have shown serious commitment. In contrast, the Economics Ministry seems rather sceptical, stressing potential conflicts with German industrial competitiveness.

The Eco-Tax Reform

This reform was passed as one of the first environmental initiatives of the new government in two consecutive laws which introduced a tax on the consumption of electricity (at a reduced rate for industry) and raised existing mineral oil taxes, i.e. on petrol, diesel, natural gas and various mineral oils. Tax levels for petrol, diesel as well as electricity increased in five steps until 2003. Coal and nuclear fuels were not affected. The tax is not levied on fuels used in CHP and decentralized production (up to 5 MW), nor for natural gas-fuelled power plants with an efficiency of 57.5 percent or more. The advantage for these sources of is up to 1.53 ct/kWh. But on the at times low price market, this was not sufficient to bring about their expansion.

The main part of the revenue - rising from € 4.3 billion in 1999 (€ 8.8 billion in 2000, € 11.8 billion in 2001 and € 14.3 billion in 2002) to € 18.7 billion in 2003 (BMF 2004) - is earmarked to lower the retirement pension contributions from employees as well as employers, lowering the production factor cost of labour while increasing that of energy. A small amount of about € 102 million per year (1999 and 2000) was reserved for renewable energy subsidies, particularly to finance the 100,000 roof programme. The promotion of renewable energy sources increased to € 153 million in 2001, € 190 million in 2002 and € 250 million in 2003. The eco-tax reform is expected to reduce GHG reductions by about two to three percent by 2005. For 2002, its impact on CO_2 reduction stood at 7 million tons.

Combined Heat and Power and end use efficiency

The efforts to increase efficiency are also reflected in support for CHP, whose share is to increase substantially from 12 percent in 1999, substantially below that of other European countries. CHP plants are under severe pressure since electricity liberalisation. The new act for the support of CHP plants for public supply entered into force in April 2002 and was supposed to create incentives for modernisation until 2010, leading to a reduction of some 11 million tons of CO_2. It seems unlikely that the reduction goal will be reached (Mez 2003a). Additional support is provided for small-scale CHP and fuel cells.

As to end use efficiency, activities were initiated in line with EU policy. As a first step, the Energy Savings Ordinance entered into force in February 2002. It set the total energy requirement of new buildings at 30 percent below current standards; for old buildings insulation requirements and exchange of heating systems were prescribed.

Renewable energy

The government formulated a target to increase the share of RES-E in the electricity supply to 12.5 per cent in 2010 and 50 per cent in 2050; in 2004 the goal of 20 percent by 2020 was added. The long-term target must be viewed as a programmatic goal, which in concert with energy efficiency programmes is ambitious but not unrealistic either technically or economically.

Several measures were taken in favour of renewable energy. They included a five-year market incentive programme for RES which provided about € 445 million from 1999 to 2002. A tax break on bio-fuels was applied in keeping with an EU directive on the subject. On the international level, the German government in 2004 hosted the international conference on

renewable energy in Bonn. As to RES-E, the most important measures adopted were the 100,000 roof programme for photovoltaics and above all the Renewable Energy Sources Act (RESA) adopted in 2000 and substantially amended in 2004.

The 100,000 Roof Programme

Solar photovoltaics had not been able to develop much during the 1990s. The red-green government wanted to provide new impulses. As the design of a new feed-in regulation was expected to take time, another market creation programme along the lines of the 100 MW wind and 1,000 roof programme (both 1989) was adopted in January 1999 as a stopgap measure. It provided for reduced loans for PV roof installations; the goal was to achieve an installed capacity of about 300 MW. The programme was taken up slowly at first, but took off when RESA was introduced. By 2003, the two measures had led to installations of 350 MW. At that point, the 100,000 roof programme was terminated and PV market development turned over to improved feed-in tariffs.

The Renewable Energy Sources Act of 2000

While the parliamentary party groups of the red-green majority pressed for more favourable feed-in rates for RES-E, the Economic Affairs Ministry repeatedly delayed and diluted efforts (Lauber/Pesendorfer, 2004). The big utilities were of course opposed; they placed their hope on a lawsuit pending before the European Court of Justice which challenged the old Feed-In Law as state aid, an argument that could be applied also to the new act. This was also the view of the opposition. The Economic Affairs ministry at one point even managed to persuade the government to postpone this legislation until the Commission had had a chance to react to it. But the two parliamentary party groups of the red-green majority managed to find important allies, particularly with the association of the investment goods industry (VDMA) and the metalworkers union. In April 2000, the Act on Granting Priority to Renewable Energy Sources (RESA) was adopted; its declared purpose was to double RES-E production by 2010. This act, which became one of the pivotal acts of the red-green coalition (Mez 2003), repealed the Feed-In Law of 1990 but maintained an essential feature, i.e. feed-in tariffs to stimulate the development of RES-E. In many respects the law brought improvements for generators in terms of rates and above all of security. It also declared expressly that RES-E compensations should take external costs of conventional generation into account, and also support an industrial policy aiming at the long-term development of renewable energy technologies.

While under the Feed-In Law compensation rates were expressed as percentages of average end customer tariffs, the new rates were now fixed for 20 years. For wind power, they were made dependent on the quality of the location: all operators would receive a favourable rate for at least five years, thereafter the rate would decline, but later in the case of less favourable locations. Rates were particularly favourable for PV, offshore wind and biomass. At the same time, there now was an annual decline in compensation for most sources, not for existing installations but for new installations and determined by the year they would go on line. A key regulatory element of the act was the distribution of costs from RES-E compensation across all power grid operators on a pro rata basis, calculated on the ratio of RES-E in nationwide electricity sales. Also, the utilities were now entitled to benefit from the special feed-in rates for their own RES-E generation facilities. This had not been the case earlier and might become lucrative for utilities, particularly in the case of highly capital-intensive

investments such as those in offshore wind farms where they may beat back the new RES-E generators that arose in recent years.

The RESA Amendment of 2004

After the re-election of the red-green coalition in autumn 2002, responsibility for RES changed from the Economic Affairs Ministry (held by a social democrat and always sceptical of RES-E) to the Environment Ministry (held by a Green); the parliamentary committee in charge changed in a parallel fashion. This opened new perspectives. The first draft by the Environment Ministry led to a lively conflict with Economic Affairs minister Clement, a well-versed politician from coal state North Rhine-Westphalia. Clement attacked the very principle of the feed-in tariff and wanted to replace it by a tender system, arguing that particularly for wind energy, rates were excessive. His main concern seems to have been to protect coal interests. After a compromise within the government, the red-green majority in parliament proceeded to revise the government bill largely against the preferences of Clement. However, Clement was successful in obtaining reduced rates for wind and in defending coal interests.

In the *Bundesrat*, the *Länder* ruled by conservative governments opposed the bill. The *Bundestag* majority could simply have insisted on its earlier version. However, the red-green coalition negotiated with the conservatives in an effort to secure support for maintaining RESA beyond 2007. Some of the *Länder* wanted an expiration date of 2007 for the Act, or a declaration reversing the nuclear energy phase-out; some criticised the 20 percent RES-E target for 2020. But the Conciliation Committee was content with more modest changes, and the bill was adopted in both houses.

Chief changes are a general strengthening of generators vis-a-vis the utilities; reduction of rates for onshore wind and exclusion of low-wind zones, but also improved rates for off-shore wind; inclusion of hydro plants up a 150 MW, and significant new incentives for bio-mass (especially small plants) with additional bonuses for innovative technologies (Bechberger & Reiche 2004). Probably most important was the increase of photovoltaics rates, which made them commercially attractive without additional support. This was introduced already in late 2003 and led to a veritable solar boom in 2004, expected to continue for several years.

Summary and Perspectives

How did Germany come to occupy such a special position with regard to RES-E, and what precisely is the evolution and status of installed capacity? Is German RES-E regulation – particularly the feed-in tariff – successful in terms of usual economic and commercial criteria? Is it of such excellence as to invite imitation by other countries, and is it likely to survive in the future?

German leadership in this area is the result of a complex process. With few colonies in the nineteenth century, Germany until the late twentieth century was one of only two large industrial states without oil resources and no large oil corporation of its own (Karlsch & Stokes, 2003), the other one being Japan. It came to rely with particular intensity on domestic coal, and later on nuclear energy. During the energy crises of the 1970s, coal and nuclear were nursed to impressive dimensions, politically as well as economically. But this policy also led to intense controversies and the rise of a strong anti-nuclear movement in the 1970s, a strong environmental movement in the 1980s, the spread of green ideas throughout society and the

first big Green party in Europe. This counter-movement viewed renewable energy sources as an alternative to a nuclear plutonium economy, not merely as another additional source. Under pressure from this movement, governments reluctantly supported the development of renewable energy sources on a modest scale when compared to the funds spent on coal and nuclear energy, and not even for domestic use at first.

When the red-green government came into office in 1998, its parliamentary party groups – once more against the Economic Affairs ministry – soon took measures to improve the economics of RES-E. They also made PV attractive for the first time. For this purpose, the coalition drew in yet new actors into the RES policy network, composed of environmental associations, the renewable energy sector such as equipment producers, owners and operators of installations and their associations, but also "conventional" associations such as investment goods industry association VDMA or the metalworkers union, which had joined the coalition during the preceding years. In 2003/2004, this coalition, supplemented by new allies, repeated this feat against renewed opposition from nuclear and coal interests.

In absolute terms, German wind power installations represent today slightly more than a third of the total stock worldwide; for solar photovoltaics the figure is similarly impressive. For the sake of perspective it must be added that all this capacity, together with hydro, still supplies less than 10 percent of electricity in Germany. However, there are plans to reach 50 percent by mid-century. At the same time, Germany developed a wind turbine industry which is second only to that of Denmark, and a PV industry second to that of Japan. These industries are expected to make key contributions to future exports.

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