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France and Germany Nuclear Energy Policies Revisited: A Veblenian Appraisal

Summary: Nuclear energy policy should have been a major area of cooperation for France and Germany, playing a lead role in the energy policy of the EU. Yet they have retained different options, especially regarding nuclear energy while the EU energy policy remained very indicative. These two “coordinated economies” should have been able to cooperate more closely on this issue. While the reasons for this difference in behavior have much to do with the specificities of the nuclear energy, they are more precisely related to the continuously rising level of security requirements, a learning process in which the magnitude of risks and time lengths appeared, even before Fukushima, to go beyond rational boundaries on which cooperation (as well as market) ventures could be based. This raises the issue in the present state of the technologies of the possibility of an international governance of this nuclear industry.

Key words: Nuclear energy, Coordinated economy, European Union, Energy transition.

JEL: N70.

The support of the FP7 project AUGUR
is acknowledged.
See www.augurproject.eu.

This paper is looking at the recent turn in French and German policies regarding the production of nuclear energy. Germany has decided to phase out its nuclear power within a few years; France will noticeably reduce the nuclear share of its electricity production from its current 75% to 50% by 2025. The two countries had followed different options after the oil crisis of the 1970s, with France investing in nuclear power stations to realize up to 75% of its production of electricity compared with up to 25% in Germany. This change in policy occurs when Europe is facing a double challenge: (i) the need to secure access to energy sources at reasonable prices at a time where the foreseen exhaustion of nonrenewable sources is pushing prices upwards; (ii) the need to reduce its emissions of greenhouse gas to comply with the Kyoto protocol that Europe has promoted to avoid dramatic climate changes in the not too distant future. The change also corresponds to the end of life of the nuclear power stations installed at the turn of the 1980s. When nuclear energy seems to be part of the solution to the double challenge evoked, one can question the reasons for such change. The Fukushima accident in Japan epitomizes the need for different nuclear policy, though it was not the cause for change as it occurred after Germany and France chose their new paths. It is also interesting to analyze this move through a comparison between the policies of France and Germany, where the balance between State and markets in the working of the economy is rather similar as both are consi-

dered *coordinated economies* in the literature on diversity of capitalism (see Peter Hall and David Soskice 2001; Bruno Amable 2003).

Our investigation begins with an overview of the structures of supply and demand of energy in both countries at the beginning of the economic downturn that followed the global financial crisis that began in 2008 to outline the different choices that were made in the late 1970s (Section 1). We shall then compare how the move away from nuclear energy has proceeded in each country (Section 2). It is of interest to outline that these moves do not follow from a common policy of the European Union (Section 3).

The lack of coordination between the energy policies of Germany and France does not come either from a bounded capacity of the two countries to cooperate (Section 4). Specificities of the nuclear energy, especially the scale of risk and time of the projects involved, as they have been progressively revealed, account for a large part of the moves (Section 5). The conclusions suggest that more active cooperation in energy policy will rapidly be back on the agenda of the EU to have a chance to overcome the double challenge it faces.

1. Supply and Demand of Nuclear Energy in Germany and France in 2009

We start comparing the structure of electricity production at the beginning of the economic downturn that followed the global financial crisis of 2008. Table 1 shows the different sources of electricity production in Germany and France.

Table 1 Electricity Production by Source in 2009

| | | Fossil Fuels | | | Nuclear | Renewables | Total |
|----------------|-----|--------------|-------|-------|---------|------------|--------|
| | | Coal | Oil | Gas | | | |
| Germany | | | | | | | |
| Total | TWh | 264.5 | 12.5 | 77.0 | 134.9 | 107.80 | 596.7 |
| Per capita | kWh | 3225.0 | 152.0 | 939.0 | 1645.0 | 1314.00 | 7275.0 |
| Share | % | 44.3 | 2.1 | 12.9 | 22.6 | 18.10 | 100.0 |
| France | | | | | | | |
| Total | TWh | 27.7 | 5.9 | 22.3 | 409.7 | 75.56 | 541.7 |
| Per capita | kWh | 444.0 | 95.0 | 357.0 | 6562.0 | 1208.60 | 8674.0 |
| Share | % | 5.1 | 1.1 | 4.1 | 75.6 | 13.90 | 100.0 |

Source: Institute for Sustainable Development and International Relations - IDDRI (2011).

Coal accounts for Germany's largest percentage of electricity production at 44.3% of total output, while in France coal accounts for only 5.1% of electricity production. Conversely, nuclear energy is overwhelmingly France's largest source of electricity production at 75.6% of total output, while Germany's nuclear energy contributes just 22.6% of electricity production.

Table 1 thus shows a big disparity between French and German uses of coal and nuclear sources. Meanwhile the electricity produced with renewable sources is roughly comparable between the two countries (with similar levels per capita) even if it is mainly hydroelectric energy for France and wind and solar energy for Germany.

To complete this picture one needs to have an idea of the imports and exports of electricity as well as a comparison of the structures of uses in each country. Table 2 thus shows that German industry is the biggest user of electricity (which is in accord with the relative importance of the manufacturing sector in Germany) whereas residential use is the largest consumer of electricity in France.

The lower price of 0.12 euros per kWh for households in France versus 0.22 euros in Germany (0.16 on average in Europe) partially explains the higher electric consumption of households in France, a pricing policy that brought some support to the production of nuclear electricity but slowed down the diffusion of more energy saving ways of life.

Table 2 Electricity by Uses in 2009

| Electricity balance sheet | Total Germany TWh | Total France TWh | Per inhab. Germany kWh | Per inhab. France kWh |
|---------------------------|-------------------|------------------|------------------------|-----------------------|
| Net Production | 560.5 | 517.8 | 6833 | 8293 |
| Import | 41.9 | 19.2 | 510 | 308 |
| Export | 54.1 | 44.9 | 660 | 719 |
| Industry | 218.8 | 125.5 | 2667 | 2010 |
| Transport | 16.0 | 12.9 | 195 | 206 |
| Agriculture | 8.7 | 4.1 | 106 | 66 |
| Services | 118.1 | 122.3 | 1440 | 1959 |
| Residential | 138.8 | 159.4 | 1692 | 2553 |

Note: Autoconsumption and losses have been omitted.

Source: Institute for Sustainable Development and International Relations – IDDRI (2011).

The figures shown in Tables 1 and 2 concern the production and use of electricity, which gives only a partial view of the energy uses in each country. Table 3 completes the picture with the share of the diverse sources in the final energy consumption of the two countries. It outlines the importance of oil and gas in final consumption (63.5 % for Germany, 61.1% for France). As both oil and gas have to be imported, the necessity to reduce this dependence in a context of rising prices is recalled. It renders the other sources of energy all the more desirable (providing they don't use oil and gas to be produced).

Table 3 Energy Sources in Final Consumption 2009 (Germany 83 Million, France 62.4 Million)

| | Coal | Oil | Gas | Electricity | Heat | Biomass | Total |
|----------------|-------|------|-------|-------------|-------|---------|-------|
| Germany | 0.137 | 0.92 | 0.671 | 0.525 | 0.132 | 0.123 | 2.507 |
| In % | 5.5 | 36.7 | 26.8 | 20.9 | 5.3 | 4.9 | 100 |
| France | 0.075 | 0.97 | 0.474 | 0.585 | 0.064 | 0.194 | 2.362 |
| In % | 3.2 | 41.1 | 20.1 | 24.8 | 2.7 | 8.2 | 100 |

Note: Units - tons of oil equivalent.

Source: Institute for Sustainable Development and International Relations - IDDRI (2011).

The options in terms of supply and demand of energy in the two countries under view evolved very differently. Yet both felt the need to turn away from nuclear energy at about the same time.

2. Turning Away from Nuclear Energy

Let us now recall under which conditions the two countries have been willing to reduce the use of nuclear energy. Energy policies have been marked throughout the past four decades by either oil market crises (sudden rises in price as in 1973), disastrous accidents (like Chernobyl) or international commitments to reduce greenhouse gas emissions such as the Kyoto agreement, not to mention the impacts of the recent Fukushima nuclear accident.

The rise in oil prices in 1973 was a major shock that led the French government to invest massively in nuclear energy as a way to reduce its dependence on fossil fuels. After the Kyoto agreement, this turn towards nuclear energy also appeared as a means to reduce CO₂ emissions. The Commissariat à l'Énergie Atomique (CEA), founded by de Gaulle in 1945 to boost the development of a nuclear armament, provided know-how to support the production of nuclear energy for civil uses.

The turn to nuclear energy was much less marked in Germany despite its broad technological capability. On one hand, Germany could not, for geopolitical reasons, develop any use of nuclear weapons; on the other hand, a relatively strong pacifist movement was straightforwardly against this technique that was too much associated with its military counterpart. This difference of “culture” between the two countries regarding nuclear energy appeared clearly with the Chernobyl accident in 1986.

In France the accident was presented and seen as a remote accident that would not impact French territories (which in the end turned out to be wrong). In Germany the impacts were resented from the start much more strongly, which re-enforced the anti nuclear movement. The repelling effect of Chernobyl was somehow strengthened after German reunification in 1990. The fact that some nuclear power stations (like Fessenheim in Alsace, France or others in Czechoslovakia) were close enough to the borders of Germany to constitute a threat became an issue. A “not in my backyard” attitude boosted the claim that a “precautionary principle” should be applied, which and therefore strongly constrained any new implementation of nuclear power stations. A green party, rallying ecologists of West Germany with civil rights activists of East Germany, was founded in 1993 and won the election with the SPD in 1998 with a coalition pact that included a phasing out of nuclear energy.

In 2002, a law was effectively passed in Germany which forbade the installation of any new reactor and planned a phasing out of all nuclear power stations by 2022.

The great coalition between SPD and CDU (2005-2009) respected the 2002 deal (supported by a majority of Germans), despite a rather pro-nuclear feeling within the CDU. The elections of 2009, in the context of the global crisis, brought a coalition of CDU and liberal FDP into power that soon called to revise the 2002 law and delay the phasing out in order to wait until renewable sources of energy could be in position to replace the nuclear sources (a policy again backed by a majority of Germans, 50% versus 41% in a poll in February 2009).

By contrast, the anti nuclear movement in France remained relatively weak over the same period. No early retirement was planned for the 58 nuclear reactors that were installed by 2010 (when they were only 22 in Germany). The economic

recession that followed the financial crisis of 2008 somehow reinforced the legitimacy of nuclear energy (70% of support by 2009) seen as a means to keep energy prices down and to limit the emissions of greenhouse gas.

Yet over the past decades a general concern regarding nuclear safety started to develop, partly boosted by the observation of the scale and the time lags of the Chernobyl effects, but also by the discovery of the hazards linked to the decommissioning of nuclear power stations reaching their end of life, assessments which could not be left to Electricité de France (EDF), the by now private company, even if the state remained the prevailing shareholder with some 85% of the shares. This rising concern led to the creation of the “independent” agency *Autorité de Sureté Nucléaire - ASN* to control the production processes of nuclear energy. In July 2009, the agency ASN agreed to follow the requirement of the national electricity provider EDF to postpone the phasing out of its oldest 34 reactors (27 years old on average) beyond the initially planned 40 year lifetime of reactors.

Independent expertise has thus been developing recently in France while it has been active for a long time in Germany. The business world, though, remained divided if not fully supportive of the nuclear energy issue - even in Germany - arguing that new generations of nuclear reactors will be significantly more secure. Lobbying by producers (such as Foratom, where German producers are very active) largely accounts for the support for nuclear energy that one finds in EU energy road maps. In France, the support to the nuclear energy industry is much broader¹, including a long standing, steady support of the State. In Germany, not only is the State more constrained in its choices, but the Federal nature of the Republic gives place to the voices of the Provinces.

To conclude, on the eve of the Fukushima accident the phasing out of nuclear energy was already planned in the near future in Germany, while France was only considering a partial decommissioning of nuclear power stations by 2020, lowering to 50% the share of nuclear energy in the production of electricity. A similar move to reduce the share of nuclear energy was recommended at the EU level, though in a non-committing way².

3. To What Extent Does an EU Energy Policy Impacts French and German Policies

Somewhat surprisingly, there has not been any strong EU plan on energy security since the 1973 oil shock crisis, which showed the vulnerability of the EU countries. The recent rises in oil prices have been warning of the pressure that the rhythm of exhaustion of oil was putting on market prices. The 2000s have shown that the emergence of some large economies like China, India or Brazil was putting a strong upward pressure on oil and gas energy prices (see <http://www.worldwatch.org/node/5936>). The worldwide slowdown that followed the financial crisis of 2008 did not

¹ The pronuclear lobby still actively tries to counter the plan to reduce the share of nuclear electricity down to 50% (see the debate on the energy transition in France this spring 2013).

² For updated information on nuclear power in France and Germany see World Nuclear Association (2013a, b).

release this pressure. The threat is still there even if there are current speculations on new energy sources. Shale gas has been presented in the more recent years as one of these new sources that could revert the rising trend of energy prices. Many observers consider that it will indeed put a strong downward pressure on energy prices, especially if large economies like the US are going to fully exploit this source. This exploitation, however, also presents environmental hazards (it is forbidden in France, for instance) and reserves are sometime disappointing (as in Poland where it was for a while considered as a major new energy resource, but turned out to be relatively secondary). Much of the buzz around shale gas is linked with the special conditions of its extraction in the US: a wide country where the extraction of gas comes along with some valuable oil products while a relatively dense circuit of pipelines helps with the distribution. The private ownership of the soils decentralizes the decisions of exploitation, while the relatively low environmental concern helps to downplay the risks of pollution of water sources and the damages of methane leaks (a gas 25 times worse than CO₂ in terms of the greenhouse gas effect) often accompanying extraction (one estimates that it can be as high as 9% of the shale gas extracted). These negative externalities should lead to drastically constrain the exploitation of shale gas in the other countries, as well as in the US in the long run. The use of shale gas in the US and the ensuing reduction in energy prices may disturb the energy market for a while, with a sometimes surprising substitution effect. Thus the rising use of shale gas in the US brings down the price of coal in the US, which is finally being used in Germany to cope with the hazards and delays of the production of renewable energy sources. Overall, though, this windfall is unlikely to release the long term pressure on energy access at reasonable prices. In that sense, shale gas does not constitute an alternative.

More positively, the EU encourages shifts to renewable sources of energy (be it solar, water or wind) even if a panacea is not immediately available. It is more of a long term objective, but by no means a short or mid-term solution to the rising problem of energy access. There has indeed been some concerted actions at the EU level to increase the rate of renewable energy in all member states; but this is a long term process as such shifts are taking time and speculations on big plans like the German-led Desertec project (to produce solar energy in the Sahara to be transmitted to Europe) or huge wind farms in the UK are often being shut down once the difficulties of implementation and large underestimation of costs are becoming clearer.

Finally, one is led to think that reduction in uses remains the major way to meet objectives of climate preservation. But even if the European Union takes a leading role in such action (see the Energy Efficiency Directive: <http://www.euractiv.com/energy-efficiency/energy-efficiency-directive-links dossier-514483>), the target to reduce by 20% the overall energy consumption by 2020 remains modest and unlikely to check the pressure on energy prices. Moreover, this target may not be achieved in the context of slow growth where investments in new equipments that would facilitate such energy savings are difficult to make and when non-EU competitors are not forced to meet the same targets of energy saving. The fact that the Kyoto protocol, initially committing countries for a first period from 2008 to 2012, was not renewed after 2012 by most non EU partners leaves some doubt on the capacity of the EU to go forward. Moreover, the countries that have taken commitments over a second pe-

riod from 2013-2020 represent only about 14% of global greenhouse gas emissions. In other terms, the EU does not have a policy that would secure to its members in the next two decades access to energy sources at reasonable prices. There is a good reason for such low key strategy. Any alternative would require a strong industrial policy with direct actions to organize the supply and constrain use. But the EU central coordination mechanism has been progressively reduced to standard market mechanisms (see Gary A. Dymksi 2011 for an analysis of the success of neoliberal coordination mechanisms in the present phase of globalization). The core of the new energy plan of the European Commission is to make sure that the deals of member states with non EU energy producing countries are transparent. Market transparency is the only means of adjustment put forward at the EU level. The interventionism that was done for the construction of the Coal and Steel European Community could not be repeated today to face the challenge of energy security that is somehow bound to come. Finally, if it is not a strong EU policy that grounded the respective energy policies of France or Germany, the reverse may well be true: the mildness of the EU policy would stem directly from the policies of these two leading countries.

4. On France and Germany Cooperation Capability: A Long Term View

At a time of global crisis, when the exhaustion of some non-renewable resources is foreseen in a mid long term future, all of which increases the risk of strongly rising prices, one could have expected a strengthened coordination of energy policies in the EU, led by France and Germany. Indeed, both countries have always played a leading role in the construction of the European Union. Both have developed a similar type of capitalism. They are *coordinated market economies* in the sense given to it in the literature on the diversity of capitalism (see Hall and Soskice 2001; Amable 2005; Eyüp Özveren, Utku Havuç, and Emrah Karaoğuz 2012, for an overview of the literature on varieties of capitalism). Even more symbolically, let us recall that both countries launched this construction of the EU with the construction of the CSEC (Coal and Steel European Community). This strong initiative (only a few years after World War II) has been celebrated as a cornerstone in the struggle for peace at the root of the EU integration process. It has been a major factor leading to the consecration of the EU construction process with a Nobel Peace Prize in 2012. Why then so little cooperation between France and Germany on such a major issue as nuclear energy, when energy security is bound to become a crucial issue for the entire EU?

When assessing France and Germany's actions towards the EU, one tends rightly to oppose the ordo-liberalist approach of Germany (see Brigitte Young 2013, forthcoming) to the Stato-centrism followed in France. Both *coordinated market economies* have indeed a different view of the role of the State and other public administrations in this "coordination". In France, actions of the central State seem to have a legitimacy dating back to the times of the Versailles monarchy and reinforced by a series of central governments set in Paris, from the times of the Revolution to the various Republics that followed, not forgetting the reign of Napoleon. In Germany, where the construction of the Nation State is more recent, the figure of the

State is more balanced between an authoritarian Prussian version of the State, coming from the East, and a more parliamentary administrative regime as promoted by the rising industrial bourgeoisie of the Rhein countries, trying to follow the English example. Thorstein Veblen's essay on "Imperial Germany and The Industrial Revolution" (1915) helps to feature the kind of synthesis between these two sides that the German State represents. Retrospectively, after the two world wars, it is quite understandable that such synthesis could change. The ordo-liberalism which became prominent in the aftermath of World War II is an expression of such a shift. The legitimacy of State actions has to be framed *ex ante* within a set of rules agreed to by the main stakeholders. The very process of construction of the EU was prone to follow such an ordo-liberalist pattern that clearly set to each Nation candidate a finite list of what they had to comply with.

The successive enlargements of the EU re-enforced this trend, all the more so that after the crisis of the mid 1970s and the collapse of the gold exchange standard, a wide ranging economic liberalism started to diffuse with Reagan and Thatcher as preminent promoters - a successful diffusion that does not seem to be at the root of the 2008 financial crisis (see Howard Stein 2012). It directly influenced the process of the EU integration and market led principles progressively became the driving forces. Taking this long term view, it is clear that the EU integration process has been clearly influenced by the German ordo-liberalism. It is also clear, however, that the German attitude towards State actions remains composite. The reunification of Germany in the 1990s certainly reinforced this duality. East Germany had the experience of an authoritarian, centralized State for nearly fifty years in the post war period. This experience may have amplified rejection of some specific authoritarian State actions, but people may still want to rely on State actions when confronted with major market crises. In cases of emergency, some common views on the State's direct involvement could be cooperatively developed between France and Germany. If cooperation on direct State actions remains feasible under certain circumstances, then the reason for the lack of cooperation on nuclear energy issues may have to be looked for in the very specificity of the nuclear energy.

5. Energy Security and Safety: A Major Challenge for the Next Two Decades

Energy security, seen as the possibility to access to energy sources at a reasonable price (e.g. that does not put drastic constraints on households or firms uses), has become a rising concern for the decades to come for most countries. The foreseen exhaustion of non-renewable sources is bound to push prices upward as previously outlined. To meet this challenge, countries are led to develop sources of renewable energy, a lengthy process which by all means cannot avoid relying partly on non-renewable to ensure a continuous supply which solar, wind or water cannot do. The emission of greenhouse gases by these non-renewable sources of energy is another aspect of the problem. In this context, nuclear energy seems rather appealing providing that one assumes that the supply of uranium is not exhausting and that the safety issue of radiation can be overcome. France chose to develop its nuclear energy in the

1980s at a time when the oil crisis of the 1970s had shown the risk of shortages. When the issue of global warming started to be raised this option looked optimum. Other countries followed similar turns, but in much more moderate ways.

In retrospect, what is striking is to what extent the economic rationale of this option has been overlooked. The time scale of such a project as well as the scale of the risks is obviously far beyond what standard assessments of economic projects could embrace. No analysis could really consider the average life cycle of the project. Such life cycle analysis of the nuclear project might have shown that at the end of the day the nuclear project was indirectly emitting as much green house gas as a production of energy based on fossil fuels. The huge costs of decommissioning power stations, of disposing for centuries of the waste and even the costs of maintaining the skills that had been mobilized during the first phase of construction, were all, if not neglected, largely underestimated. The actual cyclical nature of the building process of nuclear power stations means that know-how has disappeared; controllers have lost experience. Costs are always dangerously underestimated as well as construction times (see the report made for Greenpeace by Stephen Thomas et. al 2007). The scale of the risks of dramatic accidents have always been underestimated, even if on this ground one has learned in time from the various accidents from Three Mile Island to Fukushima to Chernobyl. Certainly this knowledge was not widespread and the accidents have boosted the debates and the consciousness of the scale of the risks and of the costs. The magnitude of the commitment to nuclear energy thus tended to reflect the confidence given to a “public” technocracy. In France, it mixed experts from the ministry of industry, from the public supplier of electricity (EDF Electricité de France) and from the CEA (Centre de l’Energie Atomique), a public research body working on both military and civil uses of nuclear energy. Ex post the economic rationale of the project seems extremely contestable, all the more so since new risks have appeared in the mean time, such as highly organized terrorism (World Trade Center attack on September 11, 2001) or global warming effects on climate hazards (Fukushima). So there is clearly something specific about nuclear energy which we can sum up as a scale issue in terms of risks and life cycle which makes such project overall quite unmanageable. Not only does it come out of contemporary debates on the issue but it is also very telling that private firms refuse to ensure nuclear power stations or that the World Bank never engaged in the construction of a nuclear power plant. After the Fukushima accident in March 2011, the EU has been asking for audits on the safety of all power stations without requiring in these tests to take into account the risks of terrorist attacks or the safe treatment of waste, all of which clearly demonstrate that the nuclear technology is far from a safe technology. Even raising the safety norms to unprecedented levels which much affected the economic rationale of the construction of new reactor did not turn out to bring back the confidence of the populations frightened by the magnitude of risks. An accident like Chernobyl happening in one power station near Paris (Nogent sur Seine) would force the evacuation of the whole Parisian region (10 million inhabitants) for decades. Safety at this stage clearly would imply the controlling power of a totalitarian central state, a point at which the “coordinated capitalist economies”

France and Germany clearly depart, and where even France is bound to retreat from its much too-exposed pro-nuclear option.

A full open debate would be quite timely as many power stations have reached the end of their planned period of activity and should be decommissioned. But the process is costly and one observes many demands of postponements even if, as we shall see afterward, the trend in developed economies is more towards a reduction of the share of nuclear energy.

Finally, the use of nuclear energy for all the above reasons still seems to be in an experimental phase which has been prematurely put to use. This is exacerbated by the fact that it has been operating for the last two decades in a free market environment where producers have often tried to cut costs at the expense of maximum safety (which itself has been continuously underestimated).

Pushing this process of adjustment and confirming its experimental nature belies the belief that new generations of nuclear reactors will indeed bring a manageable, cheap, everlasting source of energy.

It explains that a large set of EU countries are participating in the big international research project ITER that aims to develop a new phase of nuclear power, namely nuclear fusion which would bring an inexhaustible source of energy, with little waste to look after, but similar risks in terms of radioactivity in case of accidents. This very expansive research project is always postponing the horizon of its achievement, making it rather doubtful.

6. Towards a Reinforced Cooperation on Active Energy Policies in the EU: A New Deal in the Aftermath of the Fukushima Disaster

The Fukushima disaster in spring 2011 provoked a new shift in favor of the precautionary argument: the magnitude of potential disasters is too big; accidents can come in ever increasing number of ways; costs of decommissioning are enormous; new generations of reactors are not the ultimate required. Germany went back right away to its initial plan of phasing out nuclear power by 2022. Italy massively rejected any return to nuclear production. In France, the anti-nuclear energy movement gained an unprecedented importance, even if EDF still maintained its claims to delay phasing out reactors. The case of reactors close to borders (such as Fessenheim) became a major issue fueling the growth of anti-nuclear militants.

The setback of nuclear energy is not the only result of broader acceptance of the precautionary principle. It comes also from a wider recognition that the costs of a reactor to meet the constantly updated safety norms are ever increasing.

The nuclear energy production follows a learning process; lessons drawn from major accidents lead to new requirements on the equipment. The third generation of reactors (Gen III) is supposed to be ten times safer than Gen II, but it costs much more and takes much longer to be made with the outcome still uncertain. Moreover, the life time of such equipment as well as the huge costs of decommissioning them takes the business model out of the range of standards projects not only for the finance industry, but for industries.

The rise in costs also depends on the model of production. It is more costly in the context of multi-producers as in Germany (with more independent control agencies) and less costly, but with controls less independent, in the French monopolist system (Dominique Finon 2011, 2012), which explains why the levels of requirements in Germany are both higher and more difficult to meet.

There are also limits to the kind of risks that can be covered (terrorists attacks, earthquakes or extreme weather conditions), risks that could concern many activities (transports, etc.) and are bound to evolve with new technologies. This is not to mention the risks of dissemination of techniques more and more destructive into criminal hands (see Martin Rees 2003).

The drawbacks of nuclear energy, which finally appears as rather experimental, does not tell the end of the story of common EU energy policy. The transition to renewable sources of energy still has a long way to go and, not surprisingly, will play a leading role in this development. A project called / titled the German-French Renewable Energy Coordination Office has been announced recently by the two Ministers of Environment.

Nuclear energy does not seem mature enough to achieve the energy transition. Developed economies seem to have realized the potential danger and have pulled back. The fact that nuclear reactors have been installed in the last decade in developing countries, especially in Asia, is more problematic. This is likely to raise an international governance issue to avoid new mega accidents.

Part of the solution could come from a successful energy transition largely based on renewable sources. This road is also difficult with the need to adapt the grids, to wisely use the remaining fossil fuel sources and to develop intensive energy-saving ways of life and production.

A strong common European policy seems necessary in order to face this broad challenge. The forthcoming energy transition policies will have to rely on energy saving on a major scale, implying an unprecedented financial effort that cannot be made but at the regional level. It does offer a new opportunity for a strong cooperation between Germany and France in an EU context.

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