

## **Pathways towards the nuclear revival in Finland, France, and the UK**

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Dr Markku Lehtonen<sup>a</sup>, Mari Martiskainen<sup>b</sup>

<sup>a</sup> Sussex Energy Group, SPRU, The Freeman Centre, University of Sussex, Brighton, BN1 9QE, UK;  
Visiting fellow at the GSPR/EHESS - Ecole des Hautes Etudes en Sciences Sociales, Paris

<sup>b</sup> Sussex Energy Group, SPRU, The Freeman Centre, University of Sussex, Brighton, BN1 9QE, UK

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### ***Abstract***

*Nuclear power is undergoing a revival in a number of countries of both developed and developing world, and is increasingly presented as a solution to the problems of climate change and energy security. This paper analyses the history of and the debates on nuclear power in France, the UK and Finland, all of which are in the process of either planning or building new nuclear plants. The paper traces the history of nuclear power since the early post-War years, distinguishing five distinct phases of development, from the early period of nuclear enthusiasm, through the emergence of doubt and risk in the 70s and 80s, to the recent ‘nuclear renaissance’. Emphasis in the analysis is placed on issue framings, argumentative strategies, the role of independent expertise, public opinion and the degree of openness of decision-making. Key similarities, converging trends and differences between the countries are identified and tentative conclusions drawn on the potential stability of the current framing of nuclear energy as a response to the double challenge of climate change and energy security.*

## Introduction

Nuclear energy has in recent years been undergoing a ‘renaissance’; after having been for a long time perceived as a safety risk and a source of environmental problems, it is today increasingly seen as a solution to the problems of climate change and energy security. In Europe, this renaissance started in earnest in 2002, when the Finnish parliament approved the construction of a new nuclear power station of the type EPR – European Pressurised Reactor. France followed suit soon afterwards, deciding first to launch the construction of a new EPR in Flamanville, Normandy, and later, in January 2009, another EPR in Penly, also in Normandy. The British government, in turn, declared its support for new nuclear in 2005, and declared in 2008 its commitment to facilitating the development of nuclear energy by the private sector.

This paper reports on preliminary results from a Sussex Energy Group research project comparing the governance of nuclear energy in Finland, France and the UK. By drawing on documentary analysis and semi-structured key stakeholder interviews, the paper traces back the history of civil nuclear power in the three countries, to provide a background for understanding the current revival of nuclear energy. By focusing on the themes of issue framing, actors’ argumentative strategies, role of independent experts, public opinion, and transparency and public participation, the paper examines three key questions:

1. How have the arguments and the priorities in the debates concerning decision-making on the civilian use of nuclear energy evolved in the three countries since the birth of the industry in the 1950s? Which have been the key turning points in policy – the “critical discourse moments”<sup>1</sup> during the evolution of the debates?
2. Through which processes of interaction between actors have the framings<sup>2</sup> around nuclear energy emerged? Which have been the main actors, and actor coalitions, and which argumentative strategies have they employed in order to further their case and impose their own framings?
3. Which have been the main similarities and differences between the three countries in the factors conditioning the framing processes?

In the following, the ‘nuclear histories’ of the three countries are presented chronologically, divided into five phases.

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1 A critical discourse moment is here understood as an instance that magnifies the features of a frame by generating commentary and debate on a topic (Chilton 1987).

2 A “frame” can be defined as a coherent constellation of facts, values, beliefs, theories and interests held by the participants within a given policy area (Hajer and Laws 2006, 257). Framing involves selecting certain aspects of the perceived reality and render them more salient in a message in order to promote a particular definition of a problem, a causal interpretation, a moral assessment, and/or a recommendation concerning the treatment of the subject (Entman 2002; Brugidou and Escoffier 2009). The concept of “framing” seeks to render more explicit the ways in which discursive processes contribute to the formulation of policies by making them more comprehensible and manageable (Jasanoff 2005, 23).

## **Period I: The post-war nuclear technocracy (1945-1973)**

The development of civil nuclear power in the early post-war years followed similar trajectories in France and the UK, where civil nuclear was developed to produce plutonium to support the military nuclear programmes. Military needs dictated the plant design, and little attention was therefore paid to capital and electricity generation costs. In Finland, by contrast, nuclear power was purely used for civilian purposes. Indeed, the Finnish Nuclear Energy Act (1987/2004) prohibits nuclear explosives and their manufacture, possession and detonation in Finland. Decision-making on nuclear policy was in the hands of a small and closed elite of experts, and even parliaments had little say in policymaking. Nuclear energy embodied modernisation, industrialisation, and aspirations for technological achievement. In France, nuclear power was to contribute to the ‘radiance of France’ to counteract the country’s rapidly declining influence in the world politics (Fagnani and Moatti, 1984; Hecht, 1998). The state enterprises created to promote nuclear energy – in France the Commissariat of Nuclear Energy (CEA)<sup>3</sup> and EDF (électricité de France), and in the UK the UK Atomic Energy Authority (UK AEA) and the Central Electricity Generating Board (CEGB) – had a unique position with their privileged access to capital and virtually unchallenged influence over policy (Hall 1986, 44; Tweena 2006; Hecht 1998). The disagreements, doubts, and knowledge about the technical and economic problems detected in the nuclear plants were carefully kept inside this elite. Despite the economic and technical problems, including construction delays, the governments’ enthusiasm for nuclear power remained strong. (Tweena 2006).

In France, the ‘nucleocracy’ was composed of the government and ‘official’ technical experts belonging to the “grands corps” (notably the “Corps des Mines”), polytechnics from the prestigious engineering schools, (Topçu, 2006, 251). Expertise independent of the state was virtually non-existent. A broad cross-party consensus prevailed on the pivotal role that scientific and technological progress should play in the reconstruction and modernisation of the nation (Topçu, 2006, 250).

In the UK, discussions concerned the choice of the reactor type. The options under consideration were the AEA’s Magnox and the American Light Water Reactor (LWR) in the 50s, and the British Advanced Gas-Cooled Reactor (AGR) and the US Pressurised Water Reactor (PWR) in the early 60s. The choice fell on the AGR, the model preferred by the AEA – a further demonstration of the political clout of the nuclear technocracy. Foreign and industrial policy considerations weighed heavily in choices between e.g. British and foreign plant designs (Tweena 2006).

Initially, both CEA and AEA exercised simultaneously the function of the developer, safety expert and safety authority, and the separation of powers took place only gradually over the years (Foasso, 2003, 8-9).<sup>4</sup>

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<sup>3</sup> Commissariat à l’énergie nucléaire.

<sup>4</sup> For instance in France, the CEA lost its role as developer in 1967, when a new safety organisation was created, composed of participants from the EDF, CEA and industrialists.

Reactor choices were also high in the discussion in Finland, largely affected by politics of the cold war. The Finnish state-owned energy company Imatran Voima (IVO) invited 'turn key' tenders for the country's first nuclear power plant in the mid-1960s. The interest in nuclear power was very much led by engineers, such as Professor Erkki Laurila, who laid the foundations for technology transfer from western suppliers of nuclear power plants, especially the US (Michelsen, 2007). The Finnish government was keen to use western nuclear power technology and initially chose a West German AEG reactor. However, Finland was under pressure to opt for a Soviet reactor and the government agreed to order two Novo Voronesh -type VVER- light water pressurised reactors, despite the fact that the bid from the Soviets had failed to make the final stages of the tendering process (Michelsen, 2007). Finally, a turn-key contract could not be realised, for the lack of sufficient safety expertise by the Soviets, and hence IVO was left to build the reactors (Loviisa 1 and Loviisa 2) on its own accord (Michelsen, 2007). In the cold war climate, neither the government nor President Kekkonen was keen to jeopardise relationships between Finland and the Soviet Union (Sunell, 2004).

While the early days of the nuclear industry's development were heavily influenced by the presence of the neighbouring Soviet Union, Finland's industry did not give up hopes of building a western nuclear power plant. Energy decisions in Finland have always been strongly linked to issues of national security and sovereignty, particularly given Finland's relationship with neighbouring Soviet Union/Russia. Hence it is important to ask *who* is building nuclear power and *to whom* (Sunell, 2004).

Energy company Teollisuuden Voima (TVO) was founded in 1969 by 16 Finnish industrial (mainly forestry) and power companies, primarily to allow the forest industry to build its own nuclear capacity. As the Finnish state was in the process of buying its first nuclear plant from the Soviet Union, TVO decided in 1970 that it wanted to buy its own nuclear reactor. Even though electricity supply was state-run at the time, in December 1970 the government gave TVO the permission to buy a nuclear plant from Sweden (Sunell, 2004). However, the decision was not made public until September 1971 even though the Finnish media was kept up to date on the developments (and agreed to keep quiet about it) (ibid.). Parliament did not contest the decisions to build nuclear reactors. In fact, Parliament passed an "Atomic responsibility" law in 1972 and gave permission for the state to release part of Olkiluoto island for TVO's reactors in 1973 (Sunell, 2004), three years after the first reactors were bought from the Soviet Union.

TVO's key motivation was to establish western nuclear technology in Finland. Eventually also the Finnish state became a part-owner in TVO with a 25% share of ownership (Sunell, 2004). From the very beginning TVO was, and still continues to be, an unusual energy company in that its main operating principle is to supply electricity to its shareholders on a self-financing basis. Based on "the Mankala-

principle”<sup>5</sup>, TVO’s shareholders’ share gives them the right for equal amount of TVO’s energy production, and equally requires shareholders to be responsible for their share of any capital costs (Sunell 2004). Over 90% of TVO’s electricity production comes from nuclear, with the remaining just 9% from coal and the company has a small amount of wind power. TVO does not supply electricity directly to the electricity market.

The media reporting on nuclear energy in Finland, France and the UK was highly positive. Criticism generally concerned only the military use of nuclear technology, seen as an example ‘abuse of science’, and contrasted with the ‘responsible’ use of science to promote peace and well-being of the humanity through civil nuclear power (Topçu, 2006). Public fears concerning nuclear safety were predominantly interpreted through the ‘deficit model’ of public attitudes, as an ‘infantile regression’ of a kind, a fear felt by the citizens when confronted by scientific progress, the details of which were beyond their comprehension (Barthe 2006; Wynne 1991).

Despite the enthusiasm and the ambitious plans, the share of nuclear power in electricity supply remained modest. In France, nuclear power generated less than 1% of the country’s electricity in 1960 and only 4% in 1970s (Fontaine, 2006, 20). The slow progress was largely due to the scepticism of the Ministry of Finance towards the allegedly overoptimistic economic appraisals made by the EDF engineers (Hadjilambrinos 2000, 1115). In Finland, electricity was generated mainly by hydropower until the early 1970s. Loviisa 1 nuclear power plant became operational in 1977 and had a capacity of 488 megawatts (MW), supplying only a small proportion of Finland’s total electricity demand, but nuclear generation has since risen to around 27% of total electricity production.

## **Period II: The emergence of risk, radical contestation and fear (1974-1980)**

### *UK*

By the mid-70s, notably as a result of the first oil crisis in October 1973, first cracks emerged in the positive image of civil nuclear in the UK. The ‘technocratic rules of the game’, secrecy and the unquestioned legitimacy of scientists, had hitherto ensured that nuclear energy retained its positive image, as a range of issues, including safety, cost, need and risk were kept off the policy agenda (Saward 1992, 95; Rough 2009, 14). The technical, safety and economic problems now gradually entered public discussion arenas. Three key turning points, or ‘critical discourse moments’, contributed to the emergence of anti-nuclear opposition and a discourse centred around the risks of nuclear, beginning from the mid-70 (Rough 2009, 14-15).

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<sup>5</sup> Mankala Oy was one of the first power companies established by several industrial operators in the 1930’s, and TVO based its operating principle on the Mankala Principle, i.e. shareholders receive energy supply equal to the amount of their shares in the company.

Firstly, the oil crisis put an end to the ever-increasing growth of electricity demand and led a radical revision of future demand forecasts. Financing the capital-intensive nuclear projects became a major issue, and the behind-the-scenes disputes between the AEA and CEGB on the scale of the nuclear programme became public, as energy issues entered on the political and media agendas. A new breed of environmental organisations emerged to challenge the nuclear programme on social, ethical and moral grounds.<sup>6</sup> Partly as a result of the opposition, and partly because the Tory government was busy dealing with the economic crisis and miners' strikes, the launching of UK's third nuclear programme was postponed until the entry in power by the Labour in 1974 (Greenaway et al. 1992, 128).

Another 'critical discourse moment' was the publication of the Royal Commission on Environmental Pollution (RCEP) report *Nuclear Power and the Environment*<sup>7</sup> in September 1976. The report authoritatively questioned the UK AEA's tacit acceptance of the inevitability of the Fast Breeder Reactor and the potential harm that the resulting 'plutonium economy' could cause to civil liberties and national security (Rough 2009, 13; see also Flood and Grove-White, 1976). The report argued that nuclear power raised particularly complex long-term issues of not only technical, but also of political and ethical nature. The RCEP also blamed the authorities for having neglected the issue of radioactive waste management (RCEP 1976, 198).

The public opposition and RCEP's criticism did not change the substance of the UK nuclear policy, yet they forced the government to adopt a more open policy style, epitomised by the six-month Windscale Public Inquiry in 1977. The inquiry was held in response to British Nuclear Fuels' (BNFL) application to build a thermal oxide reprocessing plant (THORP) for spent UK and overseas nuclear fuels (Hall 1986), a project which critics argued would turn the UK into the "World's Nuclear Wastebin" (Williams 1980, 289, in Tweena 2006, 12). While the inquiry has been hailed as a 'landmark in British nuclear policy making' (Hall, 1986: 161), for its broad scope and participatory approach (Shore 1977 cited in McAuslan 1979, 15), the final report was criticised for failing to justify why the arguments of the opposition had been rejected. (Patterson 1985, 126, in Rough 2009, 16).

As part of the Thatcher government's liberalisation agenda, the Department of Energy White Paper from 1988, *Privatising Electricity*, proposed to decentralise and remove electricity supply and generation from public ownership (Department of Energy 1988; Nuttall 2005). However, the privatisation revealed the poor economics of nuclear power: once the industry came under the economic appraisal by the City, its reputation as a cheap source of electricity vanished quickly. It was widely recognized that nuclear power stations, with their poor reliability record and uncertain decommissioning costs, would present particular difficulties for privatisation plans.

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6 New NGOs included Friends of the Earth (FoE), the Council for the Protection of Rural England (CPRE) and the Town and Country Planning Association (TCPA) gathered momentum throughout the 1970s and 1980s (see, for example Flood and Grove White 1976; FoE 1978; Lovins 1977; Stott et al. 1980).

7 Frequently referred to as 'the Flowers report', according to the commission's chairman, Sir Brian Flowers.

Despite the mounting criticism, the government announced a new nuclear programme in 1982. Ten PWR reactors, providing a further 15,000 MW of capacity (Greenaway 1992, 130), were to be built, officially to enhance energy security, but allegedly also to crush the political power of the coal miners' union (Hall 1986, 173, in Tweena 2006, 12).

The first plant was to be constructed in Sizewell, Suffolk, and – in keeping with the environment minister's promise – A broad public consultation held between January 1983 and March 1985 in Sizewell, Suffolk – the first of the ten plants to be built – gave the public an unprecedented right to participate (Greenaway et al. 1992, 130). Yet the opposition criticised the process for having been a “meeting of closed minds” as the CEBG's construction plans were approved without any major modifications (Kay 2001). The nuclear programme ran into problems also due to technical problems in the AGR plants, the deteriorating relations between the CEBG and British Nuclear Fuels (BNFL), and the chronic underestimations in cost calculations (Rough 2009, 18). Doubts over the economic viability of the stations, eventually led the government to retreat from its plans to privatise the nuclear industry. Instead, a public company, Nuclear Electric, was created to run the AGRs and Sizewell B (Greenaway et al. 1992, 132). Thatcher's ambitious programme of ten new reactors shrunk to one as Sizewell B remained the last nuclear reactor built or ordered in the UK (Tweena 2006, 12).

Attempts were made to find a suitable way of dealing with radioactive waste – a problem first highlighted by the RCEP in 1976 and later to become nuclear power's ‘Achilles Heel’.<sup>8</sup> The AEA's search for geologically suitable sites for a high-level radioactive waste repository in Scotland's Highlands faced intense local opposition, and finally, in 1980, led to the first public inquiry on the disposal of radioactive waste in the UK (Simmons and Bickerstaff 2006). The Nuclear Industry Radioactive Waste Management Executive (NIREX) was created in 1982 to oversee waste disposal. Financed by the nuclear industry, Nirex failed to engender the public and stakeholder confidence needed to gain acceptance to its planned disposal sites for low and intermediate level radioactive waste (Blowers 1999, 244; Simmons and Bickerstaff 2006).

The slowly emerging ‘discourse of fear’ around nuclear energy was buttressed by increasingly critical media reporting. In 1983, a TV programme revealing child leukaemia rates twelve times the national average among Sellafield families led to media and public demands for an investigation (Dalquist 2004, 22; Tweena 2006, 16) The earlier positive and enthusiastic media reporting was now increasingly replaced by critical accounts by environment journalists, echoing views from the rising environmental movement. Parliament gradually emerged as an actor in decisions concerning nuclear energy. (Tweena 2006) While the public opinion remained predominantly positive towards nuclear energy (Rough 2009), the AEA and the

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<sup>8</sup> "The popular opposition that was once in evidence against the building of nuclear power stations is now directed against the construction of these storage sites" (Zonabend 1993, 128).

nuclear industry were greatly weakened by the rising public doubt and opposition (Tweena 2006). The financial sector actors gained a central position at this period, while, despite the rising public fear and scepticism, the anti-nuclear NGOs remained weak.

### *France*

The French government responded to the first oil crisis by implementing in 1974 a massive programme of nuclear power known as the ‘Messmer plan, designed to guarantee the country’s energy independence. The following 15 years saw the construction of 56 nuclear reactors, and an increase in the share of nuclear in electricity supply from 4% in 1970 to 24% in 1980 and further to 74% in 1990 (Fontaine, 2006, 20). The programme triggered a wave of at times violent opposition, which lasted until the entry into power of the socialist government in 1981.

In response to the radical anti-nuclear protest, the government launched a campaign to reassure teachers and local politicians about the safety of the French nuclear power (Topçu, 2006, 252). The critics focused their arguments on the health and radiation effects, impacts on the natural environment, and the distribution of benefits disproportionately in favour to the ‘big capital’ and the large cities (Hadjilambrinos 2000, 1116). The conflict concretised in the siting decisions for nuclear installations (Foasso, 2003, 10), and since 1971, mass protests were organised at nearly every planned nuclear site until the massive demonstration at the Superphénix breeder reactor in Creys-Malville in 1977 culminated in violence (Nelkin and Pollak 1982, 3). In 1976, 55% of the French population was hostile to nuclear power and the anti-nuclear movement had managed to penetrate the local representative politics (Hadjilambrinos 2000, 1116). As in the UK, the protest had little impact on actual decision-making, for a number of reasons. Firstly, the government made only symbolic gestures to accommodate the demands of the anti-nuclear movement.<sup>9</sup> Secondly, the anti-nuclear movement remained isolated in the face of the broad cross-party consensus on the orientation of energy policy, and the power exercised by the nuclear technocracy in policymaking. The French electoral system barred the entry to Parliament by minority parties, keeping anti-nuclear views out of official policy arenas (Hadjilambrinos 2000, 1117). Finally, and somewhat paradoxically, the entry into power of the socialist government in 1981 depoliticised the choices concerning nuclear energy. The left-wing oriented anti-nuclear movement lost speed, as the ruling socialist party embraced nuclear as part of its highly ‘scienticist’ convictions (Topçu, 2006), supported by the highly pro-nuclear trade unions (Chateauraynaud and Torny 1999; Topçu 2008). Once in power, the Mitterrand government adhered to its electoral promise to reconsider the nuclear programme, but the EDF engineers managed to persuade the president that the abandonment of the nuclear programme would incur excessive on the French society (Hadjilambrinos 2000, 1118).

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<sup>9</sup> For instance, a public inquiry process was to be required prior to construction of a nuclear plant, yet this process was essentially controlled by the developer, the EDF, and never led to the rejection of a construction project (Hadjilambrinos 2000, 1117).

Despite the change of government, even the most contested elements of the nuclear programme remained in place, notably the extension of the La Hague nuclear waste processing plant and the development of fast breeder reactors (Barthe, 2006). Discussions concerning nuclear safety almost disappeared from the media from 1980 onwards, as economic problems attracted the bulk of the attention. (Chateauraynaud and Torny, 1999)

Yet, the vibrancy of the environmentalist and anti-nuclear movement in the 1970s helped to bring about ‘counter-expertise’ on nuclear matters. A group of scientists launched in February 1975 a petition against what they considered as an excessively ambitious nuclear programme, pointing out a number of environmental and security problems overlooked by the ‘official’ nuclear experts. The “*Appel des 400*” openly challenged the hitherto prevailing idea of the neutral, objective and apolitical scientist, and gave rise to the first “counter-expertise” organisation in the French nuclear policy, the GSIEN<sup>10</sup> in November 1975. The GSIEN scientists scrutinised official documents and systematically monitored health impacts caused by radioactivity from nuclear installations. (Topçu, 2006, 252-254)

Despite the emergence of ‘counter-expertise’, decision-making remained firmly in the hands of the engineers, and the government sought to reassure the public, rather than foster transparency. The technical problems detected in the French reactors in 1979 were kept secret and led to yet more powers being delegated to technical safety experts, who had until then in vain called for several improvements in safety control (Foasso, 2003).

A first attempt away from the technocratic policy style in radioactive waste management was the establishment of a multistakeholder expert commission in 1981, in response to the failures to gain public acceptance for a disposal site. The national radioactive waste management authority (ANDRA) was created in 1979 within CEA, thus in practice institutionalising geological disposal as the preferred long-term objective of radioactive waste management. Local liaison committees (CLIs) were established in 1981, to inform populations in the proximity of nuclear installations. The nuclear establishment began to see anti-nuclear protest no longer as a sign of individual irrationality, but as an element of larger, political and social mobilisations (Barthe, 2006, 77-87).

### *Finland*

The 1970s oil crises gave TVO the motivation to increase its nuclear generation. TVO had agreed on a capped price with Swedish AB ASEA in 1972 for a possible second reactor. Given the high prices of oil and nuclear reactors, increasing generation seemed like an attractive opportunity for TVO (Sunell, 2004). In August 1974 TVO published its decision to buy a second 660 MW reactor from Sweden. In the meantime, construction of IVO’s Loviisa 1 reactor had started and the work was

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10 Groupement des scientifiques pour l’information sur l’énergie nucléaire.

completed on schedule in 1977 (Sunell, 2004). Loviisa 2 reactor was finally completed late of the schedule, in 1981. TVO's Olkiluoto 1 became operational in 1979 and Olkiluoto 2 in 1982. With Finland having four reactors built in a short space of time, the country had considerable electricity supply capacity in the late 1970s early 1980s (ibid.). The Finnish labour movement and trade unions were strong supporters of the nuclear industry, arguing that sovereign electricity production was crucial for the country's heavy industry, especially forestry, metal and paper sectors (Sund, 2009). This argument has persisted amongst the largest trade unions to this date (ibid.).

Like in the UK and France, the 1970's saw also the rise of the anti-nuclear movement in Finland, even though the majority of the population still saw nuclear power as unproblematic (Kantola, 2004). Anti-nuclear movements formed especially near suggested reactor sites and small groups were set up in Inkoo and Sipoo in 1974 (Kojo, 2004b). Further groups and campaigns formed in the following years, including "Association for Energy Policy - Alternative for nuclear energy" in 1977 and the first Scandinavian anti-nuclear campaign in 1978 (ibid.). Like in the UK, nuclear energy was now contested on its technical, safety and economic aspects, especially following the Three Mile Island accident in 1979. The government started to note the environmental impacts of nuclear power and these were mentioned in the government's Energy Policy Strategy in 1982 (Kyllönen, 2004). Furthermore, a decision in principle was made in 1983 regarding research and development in nuclear waste (Kojo, 2004b). The government initially wanted to export Finnish nuclear waste but in the end opted for the Swedish (and American) radioactive waste management solution. This does not involve reprocessing but used radioactive material is considered as waste for long-term disposal. Finland started identifying possible domestic nuclear waste depository sites in the early 1980's (Kojo, 2004a). Despite opposition for nuclear power and issues concerning safety, IVO and TVO wanted to build a 5th reactor and started a joint campaign for this in 1982 (Kojo, 2004b). However, it would take another twenty years for Finland to decide on a 5th reactor.

### **Period III: Post-Chernobyl, liberalisation and the retreat of the nuclear industry (1987-1996)**

#### *UK*

As a powerful visual symbol of the nuclear opposition's fears over nuclear safety and risk the Chernobyl accident marked the definite end to the already ailing nuclear sector's hopes of recovery, as nuclear power was now predominantly framed in terms of its risks. "[t]he power, knowledge and authority of the UK AEA, the CEGB and the government was challenged, destabilised and ultimately discredited" (Rough 2009, 16). New groups had gained access to the policy arena, and opened up the previously closed nature of decision-making on nuclear energy. However, the 'new' framing around the risks of nuclear energy did not erase, but came to compete against and coevolve with the original framing around the 'promise of civil nuclear energy'

(Rough 2006, 17). The technocratic nature of energy policy persisted, as decision-making was led by energy ministry officials, with little involvement from the public and Parliament, and only weak political leadership from the Cabinet.<sup>11</sup> Economics came to dominate debate on nuclear power, and security of supply faded to the background as the influence of OPEC declined, the miners' union was defeated, oil prices fell, and the North Sea oil and gas fields provided cheap domestic energy. (Rough 2009, 18)

A *de facto* moratorium on new nuclear build was declared in 1989, pending a five-year review (Wakeham cited in Stenzel 2003, 16; Tweena 2006, 13). British Energy (previously Nuclear Electric) was privatised in 1996 and has been struggling financially ever since. (Tweena 2006, 13)

In response to recurrent problems and local opposition to waste disposal sites, Nirex changed its strategy in 1987, most notably involving efforts to develop a more participatory planning approach (Simmons and Bickerstaff 2006).

### *France*

Despite Chernobyl, the French nuclear programme continued, and the share of nuclear in electricity supply reached 74% in 1990. However, the expansion was slowed down by the high capital costs of the massive investments, and the need to export oversupply electricity at below-cost price (Hadjilambrinos 2000, 1118).

The Chernobyl accident had three significant impacts: it accelerated the separation of powers between actors responsible for the development and control of the industry, contributed to an increasing public scepticism towards the state 'nucleocracy', and fostered the rise of counter-expertise.

The numerous technical problems detected in the French reactors in the late 1980s increased safety authorities weight in decision-making<sup>12</sup>, and the separation of technical, regulatory and developmental functions within the industry. 'Counter-expertise' earned a more legitimate role in safety control, and the safety authorities increasingly saw themselves as defenders of the rights of the citizens, rather than as advocates of state interests. The ability of a government body to control industries in the name of public interest was increasingly called into question. (Foasso, 2003)

The government's overt attempts to conceal from the public the full extent and impact of the fallout from Chernobyl<sup>13</sup> was among the first events sowing the seeds of the

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11 Emblematic to the prevailing ethos in this era of liberalisation was the famous announcement of the 'death of energy policy' by the Nigel Lawson, then Prime Minister Thatcher's Secretary of State for Energy, and the abolishment of the Department of Energy ten years later.

12 Buttressed by the pressure from the IAEA, with its urge to develop a 'culture of safety' to prevent similar accidents from happening again.

13 The government famously claimed, through the voice of TV weather forecasters, for instance, that the radioactive "cloud" stopped at the country's border.

continuous erosion of public trust in the nuclear technocracy in particular and the ‘official’ state expertise in general.<sup>14</sup> Two associations of ‘pluralist expertise’, each with their own independent laboratories for measuring radioactivity, were created in reaction to the ‘Chernobyl cloud scam’: ACRO (Association pour le contrôle de la radioactivité à l’Ouest) in Normandy and CRIIRAD (Commission de recherche et d’information indépendantes sur la radioactivité) in the Southeast. These organisations set up their. Scientists were no longer at the heart of the movements, but instead provided advice to the movements driven by citizen activists. Like the GSIEN in the 1970s, ACRO and CRIIRAD still remained moderate and ‘responsible’ in their criticism, not calling into question nuclear power as such, but aiming to ensure its proper functioning through continuous surveillance.<sup>15</sup> (Topçu, 2006, 254-255)

The radioactive waste management policy faced a stalemate in the end of the 1980s, as a result of vehement local protest against test drillings, which led the government to declare in February 1990 a moratorium in the investigations. The subsequent ‘Bataille Law’ (1991) on radioactive waste management marked a step towards a more democratic decision-making process, designed to put an end to the “cult of secrecy” that had hitherto prevailed in nuclear policy. The Bataille Law reopened the research on alternatives to long-term geological disposal, and introduced new participants (including social scientists) in the debate. It also fostered a change in the role of experts, who would no longer be expected only to answer pre-defined policy questions, but also to facilitate the exploration of different policy options (Barthe, 2006).

European legislation on transparency and citizen participation<sup>16</sup> pushed the French nuclear establishment towards more openness. A number of laws were enacted to foster local, participatory democracy.<sup>17</sup> In particular, the creation of a National Commission of Public Debate (CNDP) in 1995, as a response to criticism concerning the shortcomings of the ‘public inquiry’ process<sup>18</sup> marked a major milestone. CNDP was entrusted with a mandate to organise public debates and ensure public participation in infrastructure projects and policies of national interest, which have significant socio-economic or environmental impacts or implications for land use planning. The CNDP’s operating principles are very close to those of the Habermasian deliberative democracy,<sup>19</sup> and the commission has the mandate to

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14 A process that would continue in the subsequent years with a number of public scandals and controversies such as the ‘contaminated blood’ affair (1991), BSE, asbestos, and GMOs (e.g. Chateauraynaud and Torny 1999; Chateauraynaud 2009).

15 Later on, the state granted the laboratories of ACRO and CRIIRAD the status as official laboratories for monitoring radioactivity.

16 For instance the EURATOM Directive 89/618 and the Directive on Environmental Impact Assessment (1985).

17 For instance, the Loi d’orientation sur la Ville 1991, Loi sur l’administration territoriale 1992, and the Loi Barnier (1992), which included provisions on citizen participation.

18 A procedure created in the 1830s to consult landowners in major infrastructure projects, and since the 1970s incorporating the Environmental Impact Assessment (EIA) procedure.

19 The Habermasian deliberative democracy adopts as its key normative starting point the so-called ideal speech situation, characterised by the absence of any other force than that of the better argument. Rather than representativeness in terms of traditional interest group representation, the Habermasian

ensure that the voices of the less powerful get heard. The CNDP does not have decision-making power, nor does it give recommendations.<sup>20</sup>

### *Finland*

The Chernobyl accident had its effects in Finland too, not least since it took place in the neighbouring Soviet Union. This had a long lasting effect on Finnish energy policy, much to the dissatisfaction of the nuclear industry. While the country had built four nuclear reactors in a relatively short space of time in the 1970s and early 1980s, Chernobyl meant that plans for new reactors were put to rest and IVO and TVO pulled out their application for a 5th nuclear reactor in 1986. The accident was also reflected in Finnish opinion polls. While in 1983 Finnish Energy Attitudes survey showed that 24.4% supported the increase in nuclear power (Hoikka et al, 1983), in 1986 this had dropped to 16.3% (Kiljunen et al, 1986). Furthermore, the amount of people who wanted to phase out nuclear power increased considerably after the accident, from 21.3% in 1983 (Hoikka et al, 1983) to 34.5% in 1986 (Kiljunen, 1986).

Debate during the post-Chernobyl period in Finland largely centred around the issue of safety and nuclear waste. Having made a decision-in-principle in 1983 about nuclear waste, much of the late 1980s were spent finding the best waste management solution. In 1987 the government passed the Nuclear Energy Act (1987/2004) which required that “the use of nuclear energy, taking into account its various effects, shall be in line with the overall good of society” (Section 5 of the Nuclear Energy Act). Furthermore, the Act requires that all nuclear waste generated in Finland must be “handled, stored and permanently disposed of in Finland”. The only exceptions, laid down by decree, are small amounts of nuclear waste which are delivered abroad for research purposes or nuclear waste generated in a research reactor in Finland. The same applies to waste from abroad: “nuclear waste generated elsewhere than in Finland, shall not be handled, stored or permanently disposed of in Finland”, except for “small amounts of nuclear waste which are delivered to Finland for research purposes; or (2) nuclear waste of unknown origin referred to in section 80(1)”. (1987/2004). Posiva, the company responsible for radioactive waste management in Finland and partly owned by the state, applied for a “decision-in-principle” in 1999 to have Eurajoki, the location of the Olkiluoto plants, as the site for final deposition of nuclear waste. The Finnish government gave permission in 2000 for Posiva to start site investigation and construction of an underground research facility in Olkiluoto. Posiva estimated at the time that waste disposal would start in 2020. Funding for nuclear waste management in Finland is collected as a “nuclear waste management fee” which is included in the price of electricity from nuclear plants. A state-run

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ideal therefore emphasises equity between the participants and equal, unconstrained access to deliberation by all participants.

20 A group of six independent experts, a ‘Commission particulière du débat public’ (CPDP), is set up to organise and facilitate the debate. Interested parties are invited to submit position papers, which the CPDP uses to compile a summary view from the participants. CPDP then often invites new participants to provide counter-appraisals. Within three months from the end of the four-month debate, the developer must inform about its decision and the way in which it has taken the debate into account in decision-making.

Nuclear Waste Management Fund holds the collected fees, which are then returned to nuclear power operators during various phases of the waste management process. However, there is still a lack of evidence as to what is a “secure” disposal of nuclear waste as much of the research is based on probabilities and lacks previous experience in long term disposal of nuclear waste (Kojo, 2004b).

#### **Period IV: Return of radical criticism (FRA 1997-2002), the ‘death of nuclear’ (UK 1997-2005) and round 1 plans for a 5th reactor (FIN)**

##### *UK*

When taking office in 1997, Tony Blair’s New Labour government introduced the principles of ‘evidence-based policy’ and New Public Management, in an attempt to increase efficiency of state bureaucracy and strengthen its political steering. New Labour also promised to enhance local-level democracy through greater citizen engagement and decentralisation.<sup>21</sup> Nuclear power continued to be framed in terms of economics, perceived essentially as an expensive form of electricity generation.

At the turn of the century, the UK energy policy saw a shift both in form and substance. Climate change took centre stage in energy policy, partly in response to the UK Royal Commission on Environmental Pollution (RCEP) report calling for the a 60% greenhouse gas emission reduction from 1998 levels by 2050. The subsequent Energy Review by the government’s newly established Performance and Innovation Unit (PIU) picked up the RCEP’s recommendations and placed climate change at the heart of energy policy. Importantly, the preparation of the review was unusually open and engaged a variety of stakeholders. Emphasising energy saving and efficiency, renewables, and reduction of transport-related GHG emissions, it remained lukewarm about nuclear energy. Markets and competition were no longer the centrepiece of energy policy, and greater government intervention was advocated to respond to the climate and energy security challenges. (MacKerron 2009)

The new Energy Review process, launched by the DTI in May 2002 in preparation of an Energy White Paper, displayed openness and transparency never before seen in UK energy policy, involving both public and stakeholder engagement<sup>22</sup> (DTI 2007; (MacKerron 2009)

The White Paper established four general goals for the UK energy policy: combating climate change was flagged up as the primary objective, followed by those relating to energy security, competitive markets, and fuel poverty eradication. It devoted little space to nuclear energy, which was considered uneconomical in the prevailing circumstances, and hampered by the unresolved issue of radioactive waste

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21 Characterised by Duffy and Hutchinson (1997) as ‘turn to the community’.

22 Such as stakeholder workshops, meetings, conferences, seminars, citizen focus groups, deliberative workshops, an outreach programme to school students, and a web-based questionnaire.

management. The ‘fullest public consultation’ and a further White Paper would precede any decision to build new nuclear power stations.<sup>23</sup>

As part of the ‘new transparency’ in energy policy the Committee on Radioactive Waste Management (CoRWM) was set up in November 2003 as an independent body to advise the government on the management of the country’s legacy radioactive waste. The committee was novel in its plural composition and its ambition to integrate scientific analysis with public and stakeholder engagement (PSE). CoRWM was to inspire public trust and re-establish the credibility of experts, which had suffered not only because of the failures in nuclear waste policy, but also due to crises such as the BSE (CoRWM 2006)(Chilvers and Burgess 2008). In its final report in July 2006, the committee concluded in favour of geological disposal, but called for an accompanying robust programme of research on interim storage (CoRWM 2006).

Many interpreted the White Paper 2003 as a final blow to nuclear power in the UK, and as the beginning of a new era of openness and transparency in energy policy. Already in the late 1990s, notably after the success of the Friends of the Earth in 1997 to block planning permission for an underground research laboratory on geological disposal at Sellafield, the belief in the ‘death of the nuclear’ had led NGOs to scale down their anti-nuclear campaigns and focus instead on climate change, energy efficiency and renewables. In the hindsight, this change of focus may have been premature, given the nuclear industry’s continuing position, despite privatisation, as a “protected species”, subsidised by the taxpayer.<sup>24</sup> Devoid of its monopoly power, the nuclear industry nevertheless retained “a comfortable position in terms of insider contacts and access to public resources”. As part of its ‘adaptation and retreat’ strategy, the industry was prompted to sharpen its communication strategies, in an attempt to seize dominance in the ‘macro discursive spheres’ (Hendriks 2006). Its media offensive centred around attempts to create an image of a ‘green’ industry capable of “keeping the lights on”. In reorienting their campaigns away from nuclear risks, the NGOs hence let the nuclear industry reframe the debate in terms of climate change and energy security. (Tweena 2006)

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23 Statements by the Energy Secretary Patricia Hewitt during the announcement of the energy White Paper illustrate government’s official line of argument (sourced from Greenpeace website on 20 Feb 2009, <http://www.greenpeace.org.uk/media/press-releases/greenpeace-response-to-energy-white-paper-announcement?print>):

"If we achieve a step change in both energy efficiency and renewables we will be able beyond 2020 to move to 2050 without the need for a generation of nuclear power stations..."

"Energy efficiency is by far the cheapest and simplest way of meeting all our policy goals in this area."

"It would have been foolish to announce...that we would embark on a new generation of nuclear power stations because that would have guaranteed that we would not make the necessary investment in both energy efficiency and renewables. That is why we are not going to build a new generation of nuclear power stations now."

24 The BNFL and AEA remain in the hands of the DTI and provide advice to government; the bodies responsible for radioactive waste management – NDA and Nirex – are publicly owned and funded; and British Energy’s survival has depended on the government’s willingness to provide it with credit facility and underwrite its liabilities. (Tweena 2006).

## France

The 1990s had seen a mounting criticism against the secretive decision-making on risk-related issues, which now occupied a central place on the public agenda, thanks to the action by ‘counter-experts’ and ‘whistleblowers’ (e.g. Chateauraynaud and Torny 1999). The state-centrism of the French energy policy came under increasing pressure in the late 1990s, especially because of the creation of a common European electricity market (IEA, 2004, 7). The compatibility between nuclear energy and liberalisation, and the role of the state-owned EDF in the future electricity markets raised increasing discussion. Also the anti-nuclear critics increasingly used economic arguments in support of their case. The entry in power of the Greens as part of the socialist government in 1997 contributed to the final abandonment of the fast breeder reactor programme, ‘Superphénix’ in 1997.<sup>25</sup> This symbolically significant victory to the French anti-nuclear movement led to the creation of the anti-nuclear network “Réseau sortir du nucléaire” in December 1998. As part of this new activism, NGOs also increasingly brought in arguments by international experts to lend credibility for their case. Questions concerning radioactive waste management declined in importance on the national-level nuclear policy agenda, but conflicts persisted at the local level. For instance, strong local opposition postponed the selection of a second site for an underground research laboratory on geological disposal (IEA, 2004, 147).

Similar to the Sellafield leukaemia affair in the early 1980s, two studies, in 1995 and 1997, demonstrated an increased incidence of leukaemia among children living near the radioactive waste reprocessing plant in La Hague. To respond to local concern, an independent, pluralist expert group was set up to examine the issue. The ‘Groupe radioécologie Nord-Cotentin’ (GRNC), jointly governed by the ministries of health and the environment, brought together for the first time representatives from the nuclear power industry, institutionalised official expert organisations, ‘counter-experts’ from local and national NGOs (e.g. ACRO, CRIIRAD and GSIEN), and foreign experts (Gadbois *et al.*, 2007; Miserey, 2007, 108).<sup>26</sup>

New legislation both at the European level and in France continued to foster transparency, participation and deliberative democracy.<sup>27</sup> The CNDP’s role was

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25 The abandonment of Superphénix was part of the deal between the Greens and the socialists in the government-building process. Today, 857 organisations belong to the Réseau sortir du nucléaire (<http://www.sortirdunucleaire.org/>).

26 While being a major step forward in terms of transparency and pluralist expertise, the work of the GRNC has nevertheless suffered from the limited mandate of the group. Its task is only to assess the impact of nuclear installations, not to call into question the waste management options themselves. Hence, assessing issues such as the extent to which AREVA complies with its commitment to the reduction of waste generation, as stipulated under the OSPAR Convention, falls outside the remit of the GRNC. (Sugier, 2007)

27 The EU Aarhus Convention entered in force in 1998, providing for the right of public access to environmental information, public participation in those processes, and access to justice. In France, there were attempts to codify the modalities of participation, through the Charter of participation (Charte de la concertation) drafted by the Ministry of the Environment in 1996 (Blondiaux 2004, 12). Top-down participatory processes were tested, at experimental level, such as the ‘neighbourhood councils’, closely controlled by the municipal authorities, which became mandatory in towns with more than 80 000 inhabitants in 2002 (Blondiaux, 2004).

consolidated in 2002, when it was granted a status of an independent government institution.

The radicalisation of the anti-nuclear movement and the ensuing polarisation of the debate were part of the multiplication in the French society of new citizen movements engendered by the ever more frequent public controversies and ‘scandals’. To a greater degree than before, these movements built network across issue areas, both nationally and internationally.<sup>28</sup>

### *Finland*

While the UK had largely buried its plans for new nuclear build and France became critical of its existing fleet, Finland still wanted to go ahead with a 5th reactor. Finland had been planning to build a fifth nuclear plant since the late 1970s/early 1980s following the completion of the four existing plants. Decision for the fifth plant was almost made in 1986, but the issue did not proceed following the 1986 Chernobyl accident. New nuclear build was debated again in 1993 but the decision was turned down by the Finnish parliament. The general belief especially amongst those opposing nuclear power was that after the 1993 decision new nuclear plants in Finland were confined to history (Kojo, 2004b). However, at the end of 2000 TVO applied for a licence to build a new reactor which resulted in a public debate over the issue during 2001 and 2002, with opinion polls suggesting that a slight majority of the Finnish population were against a fifth plant. The Finnish Energy Attitudes survey from 2001 showed that 36.8 % supported the building of a 5th reactor, while 44% were against (Energia-asennetutkimus, 2001). The debate surrounding the 5<sup>th</sup> reactor was also largely affected by Finland’s policy on nuclear waste. Several MPs considered that the waste issue was “solved”, given that the government had made a decision in principle in 2000 to allow research in waste disposal at Olkiluoto, even though this was only a decision to start research in to the possibility of final disposal (Kojo, 2004b).

## **Period V: The revival of nuclear (FRA 2003-; UK 2005-; FIN 2000-)**

### *UK*

The transparency and the cautious attitude towards nuclear energy turned out to be but a short interlude in UK energy policies, as the style and the substance of the policy changed again, only a couple of years after the publication of the 2003 White Paper. Nuclear power was this time portrayed as a solution to climate change and energy security problems. Security of supply had received increasing attention by the government energy policymakers and policy insiders already in the late 1990s, as demonstrated for instance by the creation of the government Joint Energy Security of Supply Working Group (JESS) in 2001. Around 2005, security of supply seemed to

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28 An emblematic example of this new era of contestation was the creation, in 1997, of ATTAC – an anti- (or alter-) globalisation movement active at local, regional, national and international levels.

regain its position as the first energy policy objective, which it had temporarily lost to climate change mitigation. Also the policy style seemed to revert back to the previous opaqueness, exemplified by the more or less overt attempts by the government to legitimise its pro-nuclear position (Lovell *et al.* 2009; MacKerron 2009).

In November 2005, Prime Minister Blair announced that a new major energy policy review would be needed urgently. Official reasons were the instability of world energy markets (price increases) and UK's increasing dependence on gas imports, especially from Russia (DTI 2006), yet the alleged hidden agenda was to launch a new nuclear programme (Adams 2007 (FoE 2007; Lovell *et al.* 2009).<sup>29</sup>

The new energy review, launched in January 2006, reflected the policy changes. Stakeholders were allowed only twelve weeks to produce written responses concerning the hastily put-together consultation document, and neither wide-ranging stakeholder engagement nor any direct public involvement were organised. Soon after the closing of the consultation, without waiting for the analysis of consultation responses from DTI, Blair announced that nuclear power was “back on the agenda with a vengeance”. (MacKerron 2009; Scrase and Ockwell 2009).

The publication of the final Energy White Paper was postponed until May 2007, as a result of a successful court appeal by Greenpeace, accusing the government of having failed to provide the promised ‘fullest consultation’ before any new decision on nuclear new-build. The findings of the High Court deeming the consultation the ‘misleading’, ‘seriously flawed’, and ‘manifestly inadequate and unfair’ were echoed by a broad range of commentators,<sup>30</sup> who suggested that the process had been a mere smokescreen to decisions that had already been taken.<sup>31</sup>

This rapid change in policy represented a challenge also for the CoRWM. Government now openly flagging for nuclear new-build, it was difficult to justify that the committee should adhere to its original mandate of only analysing UK legacy radioactive waste. Despite CoRWM's clear statement that its conclusions should not be taken as either green or red light to new-build, the alleged ‘solution’ to the waste issue provided by CoRWM was used by the government in its argumentation for new nuclear power.

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29 Indirectly, the rise of energy security on the policy agenda also fostered the change in policy approach, as many energy sector insiders now identified an aggravating and quantifiable, ‘objective’ problem, whose solution would be a task for experts – no further consultation would therefore be needed (Interviewee 2).

30 These included the chairman of the Trade and Industry Committee, the Sustainable Development Commission, as well as two House of Commons committees: the one on the environment and the other on trade and industry. Dorfman (2008, 10) notes that the consultation process “was ill-conceived, carried out over too short a timescale, and did not involve the public in any meaningful way.” Also the methods used by the stakeholder engagement consultant hired by the government were criticised for misleadingly portraying nuclear new-build as a solution to climate change. (Greenpeace 2007)(Dorfman, 16).

31 Indeed, Prime Minister Tony Blair famously noted, following the judicial review ruling, “this will change the consultation, this won’t affect the policy at all”.

Some observers have seen the change in the policy style and substance between 2003 and 2007 as not surprising, but rather as a return to normal and an expected outcome from a consultation process designed primarily to put off difficult yet important decisions. Once the discussion would start on the means to achieve the objectives laid out in the White Paper 2003, and especially if renewables and climate policies were to head into trouble, the old debates, including those on the role of nuclear power, would unavoidably reappear, and the pro-nuclear groups within the DTI would gather force. Another way to put the issue was that the 2003 White Paper was a victory of the environment department (Defra) over the energy department (DTI), and represented as such an anomaly (Mather 2008).<sup>32</sup> This return to the normal was clearly facilitated by the lobbying in the media and behind the scenes by nuclear industry and pro-nuclear DTI officials, which had began soon after the publication of the White Paper 2003 (Tweena 2006, 19). Finally, the role of the Prime Minister Blair was primordial. Arguably, Blair set up of the PIU in order to bring back the control of energy policy to the Cabinet, away from the energy ministry officials, but did foresee the full consequences such a shift.<sup>33</sup>

Two framings were characteristic to the pro-nuclear arguments. On the one hand, the risks of an uncontrolled climate change were contrasted with those of the highly improbable nuclear accidents and radiation effects.<sup>34</sup> On the other hand, a science-based, rational approach was portrayed in opposition to ‘irrational fear’. The Energy Minister Malcolm Wicks hence proclaimed that “now is the right time for a cool-headed, evidence based assessment of the options open to us... I want to sweep away historic prejudice and put in its place evidence and science” (Wicks 2005), followed by the Government Chief Scientist’s assertion that “we have no alternative to nuclear power” (King 2006).

### *France*

In France, the nuclear revival was less drastic and started slightly earlier than in the UK, not least because nuclear never disappeared from the French policy agenda in the same way as it had in the UK. The high dependence on nuclear electricity and the late and far less radical liberalisation of electricity markets had certainly contributed to this stability. In 2003, nuclear accounted for 77.6% of the total electricity generated in

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32 Mather (2008, 14) mentions how the concerns for security of supply and ability of other energy sources than nuclear to achieve the needed GHG emission cuts expressed during PIU work did not feed into the final reports of either PIU or the White Paper 2003: “although the ministerial team at the Department of Trade and Industry was positive towards nuclear renewal and in particular Brian Wilson the Minister for Energy was enthusiastic about the possibility, more powerful figures at the Department for Environment, Food and Rural Affairs, including the Secretary of State Margaret Beckett MP, the Minister of State Michael Meacher MP and the Junior Minister Elliot Morley MP, all firmly from the Labour left, were strongly opposed.”

33 According to this line of argument, the PIU review was simply too radical for its time, and it was foreseeable that the PIU recommendations would be subsequently watered-down in the White Paper 2003. Likewise, while Blair had his strong policy convictions and objectives, in order to achieve those objectives, he actually had to start manipulating the evidence. (19)

34 For instance the Nuclear Industry Association (NIA), which retains strong links with public bodies such as BNFL re-branded in 2003 its website, which now runs under the banner heading “Nuclear: Climate Friendly Energy” (Tweena 2006, 25).

the country. Including nuclear electricity for exports, the French nuclear plants generated an equivalent of 92% of the country's domestic electricity needs. (IEA, 2004, 141)

Between March and May 2003, the government organised a “national debate on energy”, in preparation of a major new energy law (*Loi d'orientation sur l'énergie*), which would set the general course of energy strategy for the next thirty years. The debate took place when a consortium constituted by Areva and Siemens was bidding for the contract to construct the new EPR plant in Finland, to become the first nuclear reactor built in a Western country since Chernobyl. A wise-men's committee of three was constituted to ensure the “balance, pluralism and pedagogical value of the debate”. These debates were widely regarded as a poorly disguised attempt by the government to legitimise decisions already made.<sup>35</sup> However, the debate was groundbreaking in that it for the first time in history gave the citizens a say, even if only symbolically, in the French energy policy. Moreover, even the critical NGOs valued the opportunity to discuss the future of renewable energy (Gueorguieva-Faye 2006).

The resulting ‘Besson report’ on the national energy strategy, released on 8 October 2003, underlined energy independence, combat against climate change and ensuring competitive prices as the key objectives of energy policy. As key measures to achieve these objectives, it highlighted demand management in France and low-carbon electricity sources especially in the developing countries, as well as the need for dialogue with citizens to gain acceptance especially for waste management solutions. A relaunch of nuclear power was portrayed as a necessary, especially at the global level, to avert harmful climate change. Despite some disagreement within the group of wise men, the report ended up recommending the construction of a pilot EPR plant.

The Besson report illustrated a number of key framings characteristic to subsequent French debate on nuclear energy. Firstly, the emphasis on “pedagogy”, the need to educate citizens, demonstrates the persistence of the old ‘deficit model’ of public communication. Second, nuclear energy is explicitly portrayed as indispensable to avert climate change and secure the country's energy independence. Third, the stress on the international nature of the challenges gives the French nuclear exports the noble task of solving problems of global nature. Fourthly, the economics of nuclear power, especially the price per kWh in the liberalised markets, became a key topic in the debate. Finally, the report's emphasis on the need to gain social acceptance, and the parallel debate organised by the NGOs, illustrate the prevailing atmosphere of mistrust and polarisation of views.

In this atmosphere of general scepticism created by the energy debate, the National Commission of Public Debate (CNDP) organised three nuclear-related public debates in 2005-2006. One was designed to inform parliamentary debate on a draft bill on nuclear waste management, another concerned the construction of a new European

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35 Daniel Boy, personal communication, 17 March 2008.

Pressurised Reactor (EPR) plant in Flamanville, and a third one the high-voltage transmission line designed to link the EPR to the national grid.

The scepticism regarding the EPR debate was not eased by the fact that the government already seemed to have made up its mind well in advance. At the release of the “Besson report”, the industry minister Nicole Fontaine had openly flagged in favour of the construction of an EPR reactor, prompting criticism from Greenpeace, the Greens, associations and a number of prominent individuals.<sup>36</sup> In December 2003, the EDF presented the EPR project to its personnel, and parliament endorsed the project in April 2004. Flamanville was chosen as the site for the new reactor in October 2004 – primarily for reasons related to regional economic interests and anticipation of local opposition, rather than to ‘objective’ technical criteria. The debate on the EPR was due to start in October 2005, a few months after the EDF had started construction (in April 2005). The scene was therefore set for a politically highly explosive debate, which many suspected would simply serve to legitimise a decision already made. The CNDP decided to give the debate a national focus, to cover not only the localisation of the plant, but the entire programme of construction of EPRs (Chateauraynaud *et al.*, 2005).

In September 2005, the government demanded the removal of a statement that had appeared in the pre-submission to the CNDP debate on the EPR reactor by the anti-nuclear network “Réseau sortir du nucléaire”, on the grounds that the statement contained information classified as confidential under the defence secrecy legislation. After a failed compromise solution by CNDP, rejected by the industry minister, and less than a week before the debate was scheduled to begin, all national anti-nuclear NGOs withdrew their participation, and declared they would instead conduct their protests ‘from the outside’.

In view of the difficult circumstances, the CPDP set up for the task managed relatively well, partly thanks to improvisation and creativity<sup>37</sup> (Chateauraynaud *et al.* 2005). While far from ideal, the debate was nevertheless generally considered as a step towards improved democracy. With the ‘defence secrecy affair’, transparency and access to information were firmly on the nuclear policy agenda. The debate was probably more important for the future of the CNDP and the French democracy than for nuclear policy as such. Indeed, the main concrete outcome of the debate was the commitment of the EDF to improve access to information by certain associations and academics. Discussions about the future of nuclear power in France was postponed until 2015-2020 – a period when the need to replace the existing nuclear capacity was forecast to arise (Ballan *et al.*, 2007). More important was that the debate seemed to have improved the authority and status of the CNDP in the eyes of the anti-nuclear

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36 Such as the former environment minister from the Juppé government Corinne Lepage, a widely respected environmentalist Nicolas Hulot, and the economist Benjamin Dessus.

37 For instance, it organised thematic preparatory workshops led by a journalist, in order to put forward and highlight some of the existing controversies around the project. (Chateauraynaud *et al.* 2005)

critics, and that the innovations that the CPDP was forced to come up with would serve as examples for similar future debates. (e.g. Zonabend 2007; GC 2006)

The national debate on radioactive waste management had a better starting point than the one on the EPR, since it was specifically designed to inform parliamentary debate on a draft bill on nuclear waste management. The law, adopted in 2006, stipulated on the continuation of research into different management options, reversibility of the management options, and on the organisation by ANDRA of a national debate prior to final decisions on radioactive waste management in 2015 (CNDP, 2006a). The Law forced a considerable change in ANDRA's operating philosophy, prompting it to develop its capacities of citizen participation and consultation, and making reversibility a key topic of ANDRA's research.<sup>38</sup> Nevertheless, long-term geological disposal still remains, implicitly or explicitly, the preferred option by the French nuclear industry (Gilbert and Bourdeaux, 2006, 17-24) (ANDRA 2008, 16).

The waste debate drew from the anti-nuclear groups criticism similar to that against the EPR debate; the debate was called 'bogus', conducted under completely unequal premises (e.g. L'Homme, 2006). Others lamented the unclear objectives and rules of the debate, its failure to genuinely engage the public and go beyond mere provision of information, and the excessively rigid and formal rules, which tended to increase rather than reduce the existing asymmetries of power between the participants (Ballan *et al*, 2007). Some blamed the anti-nuclear groups, in turn, for having spread misleading propaganda (Nifenecker, 2006).

The polarisation of the debate, which began in the late 1990s, has continued during the present period of 'nuclear renaissance'. However, parallel with the polarisation was the process of blurring the lines between the pro- and anti-nuclear groups, in a manner similar to the one observed in the UK. On the one hand, moderate anti-nuclear organisations (e.g. Global Change) have also emerged, and on the other hand, the NGOs themselves are torn between the nuclear critics and advocates. In the same way as in the UK, some prominent French environmentalists have recently joined the pro-nuclear camp.<sup>39</sup> Finally, the social base of the protest has changed: unlike in the 1970s, when anti-nuclear criticism came from Parisian intellectuals, today's radical contestation movements have their roots at the local level.<sup>40</sup>

### *Finland*

The Finnish nuclear industry's hopes for a 5<sup>th</sup> reactor were never completely buried despite the effects of Chernobyl in 1986 and the government's negative decision on a new reactor in 1993. At the turn of the millennium, TVO's application for a new reactor was possible again amidst discourses of energy security and climate change.

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38 Personal communication, Luis Aparicio, ANDRA, 16 September 2008.

39 Among the most famous, Nicolas Hulot, presidential adviser during both Chirac's and Sarkozy's mandate; the ex-environment minister Brice Lalonde; and the energy and climate expert Jean-Marc Jancovici.

40 Personal communication, Francis Chateauraynaud, 17 September 2008.

When decision to build new nuclear was debated in the government in 2002, the government's Finance Committee argued that in order to maintain Finland's competitiveness there was a need to secure competitive electricity prices for Finland's energy intensive main industries, as well as secure long term energy supply (Finnish Government, 2002). This, it was argued, could be best secured by electricity generation which was based in Finland, rather than relying on imports from other countries such as importing natural gas from Russia. The Finance Committee also stated that Finland was likely to be hit by large natural gas price increases after 2010 when the country was due to negotiate new long-term gas contracts. Another key issue was climate change and nuclear power was now portrayed as the cheapest low carbon option (Kyllönen, 2004).

The Finnish Nuclear Energy Act requires that any decision on new nuclear build has to be made by government - a decision-in-principle which agrees that the project is in line with the overall good of society - this decision-in-principle is then brought to Parliament for examination. Before government makes its decision-in-principle, the Ministry of Trade and Industry must obtain a preliminary safety assessment from the Radiation and Nuclear Safety Authority (STUK), and statements from the Ministry of the Environment, the nuclear site's municipal council and its neighbouring municipalities. The decision-in-principle also requires a public hearing to be held for residents and neighbouring municipalities of the nuclear site, as well as relevant local authorities. Once built, the nuclear plant also requires an operation licence from the government. In May 2002 the Finnish parliament voted on the 5<sup>th</sup> reactor and decided in favour of it, becoming the first OECD country to decide to build a new nuclear reactor for several years. The vote was very close, with 107 votes for and 92 against. In December 2003 TVO and Framatome ANP (consortium of Areva and Siemens) signed a turn-key contract for a 1,600 MW Pressurised Water Reactor, with an estimated cost of around 3,2 billion euros. TVO applied for a construction licence at the beginning of 2004, which was granted by the government in February 2005. The full licensing process for the Olkiluoto 3 site is expected to take over a decade. The timeline for the licensing process can be seen from Table 1 below. However, note that due to delays, construction of Olkiluoto 3 is not expected to be finished until at least 2011.

**Table 1: Timeline for a new nuclear decision in Finland**

**New nuclear - 20 years in the making**

March 1986	TVO and Imatran Voima (state owned power company) apply for a licence for a 5th plant
April 1986	Application withdrawn following Chernobyl accident
May 1991	TVO and IVO make another application for 5th plant
September 1993	Parliament votes 90-107 against new nuclear (despite Government's positive decision-in-principle)
November 2000	TVO submits an application for 5th plant to Government
May 2001	Parliament approves the final disposal of all Finnish spent nuclear fuel into the bedrock of Olkiluoto
January 2002	Government makes a positive decision-in-principle on TVO's application

May 2002	Parliament votes 107-92 in favour of and approves the decision-in-principle
December 2003	TVO signs contracts with ANP - Siemens consortium
February 2005	Government grants construction licence for Olkiluoto 3 and construction works begin

Source: Länsimies, (2006)

During the lobbying period for the new reactor, the Finnish electricity industry had four key messages in support of new nuclear (Länsimies, 2007; Sund, 2009):

1. energy security - new nuclear reduces dependence on imported electricity
2. climate change - nuclear is low carbon and helps Finland to fulfil its Kyoto commitments
3. guaranteed production - new nuclear covers partly additional electricity demand and replaces old power plants
4. economics - new nuclear secures stable and predictable electricity price to the owners and stabilizes the electricity price in the Nordic market area

These issues were high in the agenda in the public debate in the early 2000s. Energy security and climate change were two important themes; the nuclear industry wanted to secure Finnish jobs by providing Finnish industries with “cheap” and low carbon electricity without having to rely on Russian exports. Those supporting nuclear power argued that the country was in need of new generating capacity to meet increasing demand, while those opposing new nuclear power argued that more ought to be invested in energy efficiency and renewables, and that climate change was used only as an excuse to build a new nuclear reactor. The Finnish environmental movement largely felt that they failed in their task of preventing the nuclear decision, especially in their arguments regarding the economics of new nuclear build (Kojo, 2004b).

## **Reframing and the (in)stability of public opinion**

In all the three countries of France, the UK and Finland, public opinion surveys have demonstrated increasing support for nuclear new-build at least to replace the existing plants as they approach the end of their life-time. In all three countries, nuclear is increasingly perceived as the lesser risk when weighed against the impending problems of energy security and climate change. Lesourne (2008) reports on surveys conducted in the UK in 2005 (by Deloitte Touche) and 2006 by (YouGov), in which 35% and 40% of the respondents, respectively, were in favour of nuclear. The share rose to 62% and 68%, if nuclear new-build was coupled with a concerted policy of promotion of renewables. According to surveys conducted by IPSOS-MORI and Deloitte Touche in 2006, 40% and 45% were for the replacement of existing reactors. In Finland, support for nuclear power varies from one to another, and the results therefore must

be interpreted with caution.<sup>41</sup> In 2008, 43% of Finns supported new nuclear build, while 25% wanted to phase out nuclear (Kiljunen, 2009).

Bickerstaff et al. (2008) describe the British public attitude as ‘reluctant acceptance’, i.e. when presented against the impending danger of climate change, the risks of nuclear power seem acceptable even to people *a priori* hostile to nuclear power. However, Bickerstaff et al. (2008) argue that the reframing may well remain an unstable one, in the light of the ‘institutionalised scepticism’ that has come to characterise UK public’s views concerning public governance of science, resulting “in part, to the problematic experience of science and technological decision-making in the UK over the past two decades.” Vested interests, hidden agendas and the short-termism inherent to UK politics are seen to compromise policy processes and undermine political rhetoric, and lead to secretive processes and attempts by nuclear industry to cover-up the safety problems. While science itself is trusted, the government institutions are seen as “unreliable, secretive and failing to execute their proper duties (or functions) to serve the public interest”. Chilvers and Burgess (2008) similarly estimate that the use by the government’s use of CoRWM conclusions as an argument in favour of new-build may well undermine a lot of the trust, goodwill and confidence built during the CoRWM process, while Dorfman (2008) draws similar conclusions on the negative impact of the ‘nuclear consultation’ on public trust in the government.

Bickerstaff et al. (2008) suggest that under these conditions, citizens are unlikely to accept without contestation a frame resting exclusively on the risk-risk trade-off between nuclear and climate risks. Alternative framings from key environmental NGOs might gain popularity – for instance those stressing the poor case for new build on environmental (climate change) and economic grounds, furthermore arguing that renewable energy alone cannot deliver the necessary carbon emission reductions (Greenpeace 2005; Roche 2005; FoE 2004). The ultimate challenge to the dominant framings comes from the local level: the ‘reluctant acceptance’ is not manifest at the local level, since a vast majority (75-80%) would resist localisation of power plants in their proximity (Lesourne 2008).

In France, despite the overwhelming role of nuclear in the country’s electricity supply, the public opinions have evolved in ways very similar to those in Britain. Lesourne (2008) reports on recent opinion polls, which show slight support for the gradual phasing out or reduction of the share of nuclear electricity. In 2005, 54% supported a gradual phasing out of nuclear energy (43% were against).<sup>42</sup> These findings were confirmed in 2006: 50% of the surveyed were in favour of reducing the share of nuclear in electricity supply.<sup>43</sup> However, French parliamentarians are far more positive about nuclear: in a survey conducted among parliamentarians soon after

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41 For instance, the Finnish Energy Attitudes survey has measured opinion on different energy generation forms since 1983, though the questions have not necessarily stayed the same over the years. Results have also varied between different media and commentators have spoken about the significant influence of a pro-nuclear ‘media elite’ on the public opinion (Kojo, 2004b; Sund, 2009).

42 A survey conducted by IFOP for the Green Party.

43 A survey conducted in 2006 by the IFOP for the industry ministry.

the publication of the Besson report in 2003, more than three-quarters of the MPs supported the continuation of the nuclear programme and the replacement of the existing reactors, while only 15% called for a gradual phasing out of nuclear.<sup>44</sup> Furthermore, even the citizens changed their view when asked to weigh the pluses and minuses of nuclear energy: in 2006, a slight majority considered the benefits of nuclear greater than its disadvantages.<sup>45</sup> As the main benefits of nuclear, the citizens evoked the low price of nuclear electricity and the contribution of nuclear to energy independence and environmental protection. Radioactive waste was considered, in turn, as the main disadvantage associated with nuclear energy.

More recent surveys have confirmed a similar rapid recent change in public risk perceptions in France as the one reported in the UK.<sup>46</sup> Announcing the results under the headline “Nuclear perceived by the French as less risky than climate change”, IFOP reports that, when asked to rank a number of risks threatening the society, only 27% place nuclear risks first, whereas for 53% climate change represents the greatest threat. In 2002, the estimation was the inverse, 33% judging nuclear and only 20% climate change as the greatest risk (Lesourne 2008). As a further indication of the new framing of nuclear power as a contribution to climate change mitigation, the percentage of people wanting to reduce the share of nuclear in energy mix had declined from 47% in 2002 to 33% in 2008.

An analysis by d’Iribarne (2005) of the French attitudes towards radioactive waste suggests that also the French may have adopted an attitude of ‘reluctant acceptance’. Far from being ignorant about or incapable to assess the ‘real’ risks involved, the French citizens display significant lucidity in their attitude towards risks from nuclear waste. A widespread view is that since ‘zero risk’ is in any case unattainable, the solution must be to manage the inevitable risks as well as possible. In the same way as in the UK, the IFOP poll mentioned above<sup>47</sup> reveals significant mistrust in government institutions: 70% of the polled would “not trust much” the government as a source of reliable information in a case of a nuclear accident. The potential instability of the current framing of nuclear as a key solution to climate change and energy security may well hold for France as well. This is all the more so given that the dominance of nuclear in electricity supply is increasingly viewed as a threat, rather than a guarantee security of supply, and the need to diversify the supply sources is widely regarded as necessary. In a context of deep scepticism towards the government’s willingness and ability to protect the public interest and the existence of a radical minority of anti-nuclear opposition, framings imposed by the government will continue to be challenged and new framings developed. It is likely that a major nuclear accident could therefore switch the opinions and framings again.<sup>48</sup>

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44 [http://www.dissident-media.org/infonucleaire/deba\\_nat.html](http://www.dissident-media.org/infonucleaire/deba_nat.html)

45 In a survey conducted in 2006 by CREDOC for the energy and industry ministry.

46 <http://www.ifop.com/media/poll/energienucleaire.pdf>

47 <http://www.ifop.com/media/poll/energienucleaire.pdf>

48 The fact that the above-mentioned IPOF poll, showing reduced support to nuclear phase-out, was conducted after safety incidents at the Tricastin nuclear plant in summer 2008 demonstrates that minor safety problems are not sufficient to overturn the present trends in framings and opinions.

## Conclusions

The analysis of the evolution of debates and institutions in the area of nuclear energy in France, the UK and Finland has highlighted a number of similarities and key differences at critical turning points of policy. Civil nuclear energy emerged in France and the UK as an offshoot of the countries' military nuclear programmes and the early years were characterised by highly non-transparent decision-making, strong public trust in science, highly pro-nuclear media reporting, and the concentration of power into the hands of nuclear industry experts. This belief in the 'official experts' and the promise of nuclear power began to fade in the 1970s, with the rise of new, radical contestation movements, the gradual even though timid opening of the technocratic decision-making and the gradual separation of powers between the development, expertise, and regulation of nuclear power. The sometimes violent protest movements did not produce major policy changes, yet they were elemental in forcing the nuclear 'establishment' to gradually increase transparency and develop more participatory and inclusive planning and decision-making procedures, a process which would gather speed with the manipulative communication by the government on the Chernobyl accident.

In France, the protests of the 1970s laid the foundations for the emergence of 'counter-expertise' in the area of nuclear energy. Independent experts were elemental in both France and the UK in drawing attention to hitherto neglected social, ethical and safety issues related to nuclear energy was crucial in both countries since the mid-1970s throughout the 1980s, notably bringing radioactive waste management onto the table as a key concern. The chronic problems in gaining citizens' acceptance for waste management solutions, especially at the local level, were crucial in all three countries for the development of more open and communicative approaches to planning. Radioactive waste management is likely to persist as a key determinant of decisions concerning new-build, as demonstrated for instance by the ease at which the decision on the new reactor was achieved in Finland once the waste problem was perceived as 'solved', and by the UK discussions around the (ab)use of the waste management committee's conclusions to justify new-build.

Nuclear power has throughout its lifetime been closely linked, not only to security of supply but also to national security and sovereignty. Each of the three countries has seen nuclear power as a means of generating 'truly domestic' electricity and as a source of national pride. This perception is probably the weakest in the UK, where the technical and safety problems in the 70s and the poor economics revealed in the 80s tarnished the image of the nuclear industry. Yet, the perception of nuclear as a 'national energy source' persists in all three countries, as for instance the latest EPR was 'sold' to the public as a 'Finnish nuclear power project', despite the fact that the supplier was French and only about a quarter of the workforce comes from Finland. Furthermore, nuclear has been closely associated with the issues of national security and sovereignty, as demonstrated by the use of the 'fear of Russia' as a key argument in the Finnish discussion, and by the 'defence secrecy affair' in the French debate on the Flamanville EPR.

The first oil crisis marked the first clear difference between the development trajectories of the two countries, as France launched its ambitious programme leading to a nearly all-nuclear electricity sector, while the nuclear protagonists in the UK failed to implement the nuclear programmes, despite the fact that these were far less ambitious than the French policy. Reasons for the divergence include the existence of alternatives in the UK (notably coal and later gas), strong position of the coal workers' unions, and – partly a result of the strength of the unions – the lack of cross-party consensus on nuclear policy. The pro-nuclear position of the trade unions and the strength of the 'Corps des mines' technocracy further help to explain the French success in implementing the nuclear programme. Indeed, while the CEA no longer held the same monopoly position in the 1970s as it did in the 50s and 60s, it had not yet lost its clout to the same extent as the UK AEA. The strong trust of the French in their engineering elites still remained largely throughout the 1970s and early 1980s. However, it is in Finland, where the trust in engineers seems the strongest and most stable.

Despite the recent seemingly successful reframing of nuclear energy as a solution to climate change and energy security concerns, nuclear protagonists and the governments in both countries face a formidable challenge in 'selling' further nuclear power to the populations highly sceptical about the elites' and governments' sincerity and trustworthiness notably concerning nuclear safety. This scepticism is particularly strong at the local level, especially against radioactive waste disposal repositories. These movements get support from the NGOs, which have gathered strength also in France, after a period of relative weakness in the 1980s and early 1990s. In the UK, the scepticism is unlikely to facilitate the government's current attempts to fast-track the construction of nuclear power plants through measures such as the 'streamlining' of planning regulations and procedures. The list of current issues challenging the credibility of the French nuclear industry is long including the radioactive leaks in the Tricastin plant in 2008; the safety control concerns, construction delays and budget overruns in the Finnish EPR plant under construction; the debates around radioactive waste exports to Russia and uranium mining in Africa; French setbacks competition in the world markets for nuclear technology (e.g. South Korea); and the disputes between the top-level managers of Areva and EDF.

Finally, while nuclear policymaking has, in all of the three countries, moved towards greater transparency and public engagement, the institutional solutions differ. The French system, founded on the exclusive monopoly of expertise and decision-making power held by the 'corps des mines', has taken longer to break than in the UK, yet transparency constitutes a key issue of debate, and the trend towards greater openness continues. One could even argue that the UK has recently taken long steps backwards, back towards technocracy and opacity, while the French have developed their own institutions of pluralist expertise and public debate (esp. CNDP). The paths of UK and France seem to converge also in the area of economics, which has traditionally had a far greater influence on UK than the French nuclear policy. At the time when France is in the gradual process of privatising its national energy industries, the UK is

seemingly giving up some of the ‘market dogmatism’ that has been the mainstay of its energy policy since the early 1980s. The analysis of the nuclear histories of the three countries suggests that the recent years’ convergence towards reframing of nuclear energy in terms of its contribution to climate change mitigation and greater energy security may not persist. Whether the new framings will result in a new convergence or distinct national trajectories remains a question for further research.

## References

1987/2004) Nuclear Energy Act. Unofficial translation by Ministry of Trade and Industry, Finland. 990/1987. 769/2004.

ANDRA. 2008. Réversibilité et sciences sociales – Actes de la Journée d'études du 2 octobre 2008. 143 p. <http://www.andra.fr/download/site-principal/document/editions/345.pdf>

Ballan, E., V. Baggioni, J. Métais and A. Le Guillou (2007). Anticipation et contrôle dans les débats publics: le cas des premiers débats "nucléaires". Le débat public: une expérience française de démocratie participative. M. Revel, C. Blatrix, L. Blondiaux et al. Paris, La Découverte: 123-133.

Barthe, Y. (2006). Le pouvoir d'indécision: La mise en politique des déchets nucléaires. Paris, Economica.

Bickerstaff, K, Lorenzoni, I., Pidgeon, N.F., Poortinga, W. and Simmons, P. 2008. Reframing nuclear power in the UK energy debate: nuclear power, climate change mitigation and radioactive waste. *Public Understanding of Science* 17(2): 145-169.

Blondiaux, L. (2004). L'idée de démocratie participative: enjeux, impensés et questions récurrentes. *Démocratie participative et gestion de proximité*. M. H. Bacqué and Y. Sintomer. Paris, La découverte.

Blowers, A. 1999. Nuclear Waste and Landscapes of Risk. *Landscape Research* 24(3): 241-264.

Brugidou, M. and C. Escoffier (2009). Le public de la controverse et le public du débat. Le débat public, un risque démocratique? L'exemple de la mobilisation autour d'une ligne à très haute tension. D. Boy and M. Brugidou. Paris, Lavoisier: 81-102.

Chateauraynaud F. 2009. Public controversies and the Pragmatics of Protest. Toward a Ballistics of collective action. Presentation at the Culture Workshop, Harvard University, February. 50p.

Chateauraynaud, F. and D. Torny (1999). Les sombres précurseurs: une sociologie pragmatique de l'alerte et du risque. Paris, EHESS.

Chateauraynaud, F., A. Bertrand and J.-M. Fourniau (2005). Nucléaire et démocratie délibérative: les technologies nucléaires à l'épreuve du débat public. Un projet d'observatoire des débats publics sur l'avenir du nucléaire civil. Document du GSPR. Paris, EHESS - Ecole des Hautes études en sciences sociales.

Chilton, P. (1987). Metaphor, Euphemism and the Militarization of Language. *Current Research on Peace and Violence* 10: 7-19.

Chilvers, J. and Burgess, J. 2008. Power relations: the politics of risk and procedure in nuclear waste governance. *Environment and Planning A* 40(8): 1881-1900.

CNDP. 2006a. Commission particulière du débat public Gestion des déchets radioactifs: Paris.

CoRWM. 2006. Managing our Radioactive Waste Safely - CoRWM's recommendations to Government. Committee on Radioactive Waste Management: London.

Dalquist, S. (2004), A Chronology of Public Opinion on Nuclear Power in the United States and the United Kingdom, 29<sup>th</sup> April, MIT.

Department of Energy (1988), Privatising Electricity, CM 322. London: HMSO.

d'Iribarne, P. 2005. Les Français et les déchets nucléaires. Rapport au Ministre délégué à l'industrie, 82 p.

Dorfman, P. (ed.) 2008. Nuclear consultation: public trust in government. Nuclear consultation working group: London.

DTI. 2006. The Energy Challenge: Energy Review Report 2006. Department of Trade and Industry: London.

DTI. 2007. Meeting the Energy Challenge: A White Paper on Energy. Department of Trade and Industry: London.

Duffy, K. and Hutchinson, J. 1997. Urban policy and the turn to community. *Town Planning Review* 68(3): 347-362.

Energia-asennetutkimus, (2001). Energia-asennetutkimus 2001. FSD2187, Version 1.0 (2006-06-07). Lempäälä: Yhdyskuntatutkimus, 2001. Fortum & Teollisuuden Voima. Tampere: Yhteiskuntatieteellinen tietoaarkisto, 2006. <http://www.fsd.uta.fi/aineistot/luettelo/FSD2187/meF2187.html>

Entman, R. M. (2002). Framing: towards clarification of a fractured paradigm. *McQuail's Reader in Mass Communication*. D. McQuail. London, Sage: 390-397.

Fagnani, J. and J.-P. Moatti (1984). "The Politics of French Nuclear Development " *Journal of Policy Analysis and Management* 3(2): 264-275.

Finnish Government, (2002). Valtiovarainvaliokunnan lausunto 12/2002 vp - Finance Committee Statement 12/2002 (on TVO's application to build a new nuclear plant). 26.04.2002.

Flood, M. and Grove-White, R. (1976) Nuclear Prospects: A Comment on the Individual, the State and Nuclear Power. London: FoE with CPRE and NCCL.

FOE. (1978) Nuclear power? No thanks! London: Friends of the Earth.

FoE. 2004. Briefing: Why Nuclear Power is not an Achievable and Safe Answer to Climate Change. Friends of the Earth. [http://www.foe.co.uk/resource/briefings/nuclear\\_power\\_answer\\_climate\\_change.pdf](http://www.foe.co.uk/resource/briefings/nuclear_power_answer_climate_change.pdf) (accessed 12 February 2010).

Foasso, C. (2003). Histoire de la sûreté de l'énergie nucléaire civile en France (1945-2000) - Technique d'ingénieur, processus d'expertise, question de société. Histoire moderne et contemporaine. Lyon, Université lumière - Lyon II. **Thèse de doctorat en histoire.**

Fontaine, N. (2006). Situation et perspectives de l'électricité nucléaire. La politique française de l'énergie. Paris, Regards sur l'actualité no 318. La documentation Française: 19-31.

Gadbois S, Heriard Dubreuil G, Vaillant L, Schneider T, Paterson J, Dawson M et al. 2007. European Commission Directorate General for Energy and Transport (EC DG TREN), Contract Number: TREN\_04\_NUCL\_S07-39556, p 33.

GC. 2006. Débattre publiquement du nucléaire ? Un premier bilan des deux débats EPR et déchets organisés par la Commission nationale du débat public. Les cahiers de Global Change, numéro 22, novembre 2006. Global Change: Paris.

Gilbert, C. and I. Bourdeaux, Eds. (2006). Recherche et déchets nucléaires: Une réflexion interdisciplinaire. Cahiers Risques Collectifs et Situations de Crise No 5. Grenoble, CNRS.

Greenaway, J., S. Smith and J. Street (1992), Deciding Factors in British Politics: A Case-Studies Approach. London: Routledge.

Greenpeace. 2005. Ditch the Dodgy Nukes! <http://www.greenpeace.org.uk/blog/nuclear/ditch-the-dodgy-nukes> (accessed 12 February 2010)

Greenpeace. 2007. Talking Nonsense – The 2007 Nuclear Consultation. September. <http://www.greenpeace.org.uk/files/pdfs/nuclear/2007-consultation-nuclear-dossier.pdf>

Gueorguieva-Faye, Diana. 2006. Le problème de l'acceptation des éoliennes dans les campagnes françaises : deux exemples de la proximité géographique. Développement durable & territoires. Dossier 7 : proximité et environnement. <http://developpementdurable.revues.org/index2705.html#bodyftn2>

Hadjilambrinos, C. 2000. Understanding technology choice in electricity industries: a comparative study of France and Denmark. *Energy Policy* 28, 1111-1126.

Hajer, M. and D. Laws (2006). *Ordering Through Discourse*. The Oxford Handbook of Public Policy. M. Moran, M. Rein and R. E. Goodin. Oxford, Oxford University Press: 251-268.

Hall, T. (1986). *Nuclear Politics. The history of nuclear power in Britain*. Harmondsworth, Penguin.

Hecht, G. (1998). *The Radiance of France: Nuclear Power and National Identity after World War II*. Cambridge, MA, MIT Press.

Hendriks CM 2006. *Integrated Deliberation: Reconciling Civil Society's Dual Role in Deliberative Democracy*. *Political Studies* 54(3): 486-508.

Hoikka, P., Kiljunen, P. and Pehkonen, J. (1983). *Energia-asennetutkimus 1983, FSD1062*. Version 1.1 (2003-12-02). Imatran Voima. Tampere: Yhteiskuntatieteellinen tietoaarkisto, 2003. <http://www.fsd.uta.fi/aineistot/luettelo/FSD1062/>

IEA (2004). *Energy Policies of IEA Countries: France 2004 Review*. Paris, IEA/OECD.

Jasanoff, S. (2005). *Designs on nature: science and democracy in Europe and the United States*. Princeton, N.J., Princeton University Press.

Kay, J. (2001), *Meeting of Closed Minds*, The Financial Times, 28th November.

Kiljunen, P. (1986). *Energia-asennetutkimus 1986, FSD1065*, Version 1.1 (2003-12-02). Imatran Voima. Tampere: Yhteiskuntatieteellinen tietoaarkisto, 2003. <http://www.fsd.uta.fi/aineistot/luettelo/FSD1065/>

Kiljunen, P. (2009), *Results of a follow-up study concerning Finnish attitudes towards energy issues 1983-2008*, Research report 15 June 2009, Yhdyskuntatutkimus Oy. [http://www.sci.fi/~yhdys/eas\\_08/english/eas-etied\\_08.htm](http://www.sci.fi/~yhdys/eas_08/english/eas-etied_08.htm).

King, D. 2006. *Why we have no alternative to nuclear power*. The Independent, 13 July.

Kantola, I. (2004). *Ydinvoimakeskustelun sähköinen kielipeli*. In Kojo, M. (Ed.) *Ydinvoima, valta ja vastarinta*. Keuruu, Finland: Like.

Kojo, M. (2004a). *Eurajoki - ei paras mahdollinen, mutta poliittisesti sopiva*. In Kojo, M. (Ed.) *Ydinvoima, valta ja vastarinta*. Keuruu, Finland: Like.

- Kojo, M., Ed. (2004b). *Ydinvoima, Valta ja Vastarinta*. Keuruu, Finland: Like.
- Kyllönen, S. (2004). *Ydinvoiman ilmastonmuutos*. In Kojo, M. (Ed.) *Ydinvoima, valta ja vastarinta*. Keuruu, Finland: Like.
- Lesourne, Jacques (dir.). 2008. *L'énergie nucléaire et les opinions publiques européennes. Gouvernance européenne et géopolitique de l'énergie. Volume 2. L'institut français des relations internationales (Ifri)*.
- L'Homme, S. 2006. *Nucléaire: Débats bidons ?* In: Change G (ed) *Débatte publiquement du nucléaire ? Un premier bilan des deux débats EPR et déchets organisés par la Commission nationale du débat public*. Paris, pp. 66-67.
- Länsimies, A.-M. (2006). *Return of Nuclear Power. ERMIInE - Electricity Research Road Map In Europe Workshop 2 – Northern Europe*, Oslo, Norway.
- Länsimies, A.-M. (2007). *Interview with Anna-Maria Länsimies, Analyst, Finnish Energy Industries 24.07.2007, Helsinki, Finland*.
- Lovins, A. B. (1977) *Soft Energy Paths: towards a durable peace*. Harmondsworth: Penguin.
- MacKerron, G. 2009. *Lessons from the UK on Urgency and Legitimacy in Energy Policymaking*. In: Scrase I and MacKerron G (eds) *Energy for the Future. A New Agenda*. Basingstoke: Palgrave Macmillan.
- Mather, Graham. 2008. *Green light for nuclear – The transformation of UK policy to nuclear power*. European Policy Forum.
- Michelsen, K-E (2007). *Project Eastinghouse – teknologinen haaste Loviisassa. Ydintekniikka, 3/2007, vol. 36. Suomen Atomiteknillinen Seura (ATS)*.
- McAuslan, P. (1979) 'The Ideologies of Planning Law.' *Urban Law and Policy* 2 (2): 1-23.
- Miserey Y. 2007. *Contrôle: la revue de l'Autorité de sûreté nucléaire (ASN)*, p 107-110.
- Nelkin, D. and M. Pollak (1982). *The Atom Beseiged: Antinuclear Movements in France and Germany*. Cambridge, MA, MIT Press.
- Nifenecker, H. 2006. *Un débat introuvable et tronqué, une information trop tardive... Débatte publiquement du nucléaire? Un premier bilan des eux débats EPR et déchets organisés par la Commission nationale du débat public*. Paris. Vol. *Les cahiers de Global Change*, numéro 22, novembre 2006, pp. 68-69.

Nuttall, W. J. (2005) *Nuclear Renaissance: technologies and policies for the future of nuclear power*. Bristol: IOP.

Patterson, W. C. (1985) *Going Critical. An Unofficial History of Nuclear Power*. London: Paladin.

Rapport Besson. 2003. *Une stratégie énergétique pour la France*. Rapport de Jean Besson, Parlementaire en mission sur le Débat national sur les énergies, remis à Nicole Fontaine, ministre déléguée à l'Industrie. Paris. 8 Octobre. 62 p.

RCEP. 1976. *Nuclear Power and the Environment*. Royal Commission on Environmental Pollution, Sixth Report. HMSO, September.

Roche, P. 2005. *Is Nuclear Power a Solution to Climate Change?* [http://www.no2nuclearpower.org.uk/reports/Nuclear\\_Power\\_April\\_05v2.pdf](http://www.no2nuclearpower.org.uk/reports/Nuclear_Power_April_05v2.pdf) (accessed 12 February 2010).

Rough, E. (2009). "Critical Discourse Moments in the Framing of UK Nuclear Energy Policy, 1950-1990." Paper presented at the 4th International Conference in Interpretive Policy Analysis: Discourse, Power and Politics, University of Kassel, 25-27 June 2009.

Saward, M. (1992). *The Civil Nuclear Network in Britain. Policy Networks in British Governance*. D. Marsh and R. A. W. Rhodes. Oxford, Clarendon Press: 75-99.

Simmons, P. and Bickerstaff, K. (2006) 'The participatory turn in UK radioactive waste management policy'. In K. Andersson (ed.) *Proceedings of VALDOR-2006*. (Stockholm: Congrex Sweden, AB), pp. 529–536. ISBN 9163188767

Stenzel, T. (2003), *What Does it Mean to Keep the Nuclear Option Open in the UK?* Parliamentary Office of Science and Technology Report E-13.

Stott, M., Taylor, P. and the Town and Country Planning Association (1980) *The nuclear controversy: a guide to the issues of the Windscale Inquiry*. London: Town and Country Planning Association [for] the Political Ecology Research Group.

Sugier, A. (2007). *Le Groupe radioécologie Nord-Cotentin dix ans après (The Nord-Cotentin radioecology Group ten years on)*. *Contrôle: la revue de l'Autorité de sûreté nucléaire (ASN)*: 111-117.

Sund, 2009. Interview with Ralf Sund, Economist, Finnish Confederation of Professionals (STTK), 25.08.2009.

Sunell, M. (2004) *Suomalainen ydinvoimapoikkeus*. In Kojo, M. (Ed.) *Ydinvoima, valta ja vastarinta*. Keuruu, Finland: Like.

Topçu, S. (2006). "Nucléaire: de l'engagement "savant" aux contre-expertises associatives." *Natures Sciences Sociétés* **14**: 249-256.

Topçu, S. (2008). "Confronting Nuclear Risks: Counter-Expertise as Politics within the French Nuclear Energy Debate." *Nature and Culture* **3**(2): 225-245.

Tweena, M. (2006). *Nuclear Energy - Rise, Fall and Resurrection*. CICERO Working Paper 2006:01, CICERO - Center for International Climate and Environmental Research, Oslo, Norway.

Wakeham, J. (1989), Hansard, c.1178, 9<sup>th</sup> November.

Wicks, M. 2005. *Grasping the Nuclear Nettle*. *The Observer*, 4 December.

Williams, R. (1980) *The Nuclear Power Decisions: British Policies 1953-78*. London: Croom Helm.

Zonabend, F. (1993) *The Nuclear Peninsula* (Cambridge, Cambridge University Press).

Zonabend, F. (2007). *Un débat en débat. A propos du débat public sur le projet de centrale électronucléaire "EPR, tête de série", à Flamanville (Manche). Le débat public: une expérience française de démocratie participative*. M. Revel, C. Blatrix, L. Blondiaux et al. Paris, La Découverte: 134-141.