

ENERGY POLICY after Fukushima

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Introduction

The nuclear accident in Fukushima on March 11, 2011 has had a profound and visible impact on energy policies worldwide. Japan, one of the countries most dependent on nuclear energy as well as one of the most advanced technological civilisations, failed to prevent and manage the severe melt-down in several reactors. Hundreds of thousands of people were exposed to elevated radiation; large, once densely populated areas have become uninhabitable for decades; and important marine ecosystems have been contaminated severely. Millions have been exposed to fear and a considerable risk of a more severe disaster during the weeks ahead. Despite attempts to play down the dimensions of the catastrophe, electronic media has spread the news on the Fukushima accident worldwide in an unprecedented way. This has undermined trust in the manageability and viability of nuclear technology also in countries where opposition against it has been weak until now.

Four months after the accident it is still difficult to assess the full dimension of the impact on energy policies worldwide. As an immediate reaction, some countries have changed their plans while in other countries the dramatic decline in public support for nuclear power has slowly paved the way for changes in government priorities. As the economics of nuclear power strongly depend on a supportive legal

framework, major shifts in many countries may only become evident after some time.

Global Scenario

In Japan, power shortages are hindering industry to get back to the pre-earthquake production levels. Only 19 of the 54 reactors that were in service before March 2011 are now working – mainly because of local opposition. More are scheduled to be switched off for inspection in coming months - providing an opportunity for local authorities to deny the permits. Estimations of the financial damage caused by the nuclear disaster have not yet been published; however, it is believed to be much higher than the non-nuclear damages caused by the earthquake and the tsunami, the loss from which has been estimated at \$147 billion.

A Swiss government agency had estimated that a Chernobyl-style disaster in Switzerland might cost more than \$4 trillion. These costs will never be covered by the operating company or its insurers. In a dramatic twist of events the Japanese government announced plans in May to pursue renewable energy without giving up on nuclear energy. Meanwhile, a more profound change in Japanese energy policy seems underway: On July 13, Japanese Prime Minister Naoto Kan called for a step-wise phase-out of nuclear power at a press conference on a TV news channel. Before the accident, the

authorities had planned to raise the share of nuclear power in electricity production to 53 per cent by 2030. On the other hand, large Japanese companies have already announced plans to invest heavily in wind and photovoltaic power generation segment.

The Nuclear Power Community was Hoping for a Revival

In the last few years, the nuclear power business community had hoped for a revival of the technology. Not only had Japan developed ambitious plans, but after 30 years of decline, the need to address the issue of climate change was viewed as an opportunity by nuclear power business community worldwide to convince the public to accept and finance a technology which had been the big hope for progress and prosperity in the 1960s. In the aftermath of the nuclear accidents of Three Mile Island in 1979 and Chernobyl in 1986, building new nuclear power plants had become unattractive and expensive: In 1979, 233 nuclear power reactors, totalling over 200 GW, were under construction worldwide – nearly 50 of them were subsequently cancelled. In 2004, the number of reactors under construction had fallen to 26 units. However in recent years, a number of emerging economies started to consider nuclear power as an option: The International Atomic Energy Agency (IAEA) lists 64 reactors “under

construction” as of April 1st, 2011 – twelve of them are on this list since more than 20 years.

Three quarters of the nuclear power reactors under construction are located in just 4 countries: China, India, Russia and South Korea. The countries which already depend strongly on nuclear power seem less keen to remain so, especially in Europe: 12 of the 18 countries meeting 20 per cent or more of their electricity consumption from nuclear power are part of the EU, however only four of them are constructing new nuclear power plants. In the current global scenario, becoming a nuclear specialist has become unattractive to a point that European operators fear serious problems in finding appropriately qualified personnel for dealing with the dangerous remainders of an industry without future.

With 13 reactors in operation and 27 units under construction, **China** has the most ambitious programme. Though after the Fukushima disaster permits for new plants have been halted for a thorough safety check, it seems that this pause might be over soon. However, critical voices have grown louder, expressing concern about safety and the high speed of the nuclear programme. In any case, China has awakened to the concept of green energy and seems determined to further speed up its plans for large-scale deployment of renewable energies. While the goal of 100 nuclear reactors in 2020 seems extremely ambitious, China’s rapidly growing wind energy industry last year installed 16 GW - this equals electricity production from seven large nuclear power plants. Chinese wind and photovoltaics companies hope to take advantage from the worldwide tendency to slow down nuclear plans in the aftermath of Fukushima.

With 104 units, the **United States** is running more nuclear power reactors

than any other single country. The reactors contribute 20 per cent of the electricity production. Though no new nuclear power plant has been built since the accident in Three Mile Island in 1979, President Obama, who has been praised for his efforts to push forward renewable energies, is also promoting nuclear power in order to contain climate change. A monetary allocation of \$50 bn has been earmarked for nuclear loan guarantees. However, industry is not queuing up for getting them. After Fukushima supplementary safety controls have been initiated, new risks have been discovered and publicly discussed. In the given situation an overall picture of the consequences is difficult to be drawn yet as US energy and climate policy is ensnared in a series of parallel debates (offshore drilling, shale gas risks, nuclear waste, smart grids, interstate connections, biofuel, coal & climate change etc.) and heavy controversies in the Congress.

Shifting Energy Priorities in Europe

As Europe has relied heavily on nuclear power, and has probably most intensely debated this technology since decades, it is not surprising that the reactions to the Fukushima accident have been most intense in this part of the world. On the other hand, in the last decades Europe has most effectively pushed renewable energies and energy efficiency, showing options for the transition towards a post-fossil fuel, post-nuclear energy era. Fukushima might convince Europe to take a leading role in this direction with more determination.

The most spectacular and widely discussed case of revised energy policies has occurred in **Germany**. Given the long record and strength of the anti-nuclear movement in the

country this was not astonishing. Already in 2001 a coalition of Social Democrats and Greens agreed with the utility industry on a nuclear phase-out by setting an upper limit for the overall electricity to be produced by nuclear power plants. In the autumn of last year, the centre-right government had extended the permitted lifetime of nuclear power plants, causing heavy criticism and large demonstrations. Public polls showed strong resistance by majority of population against this move, concerned over the security of ageing nuclear plants and increasing amounts of radioactive waste as well as the obstacle that inflexible base-load power plants were posing for a rapid growth of renewable power production.

After Fukushima, this critical majority became politically dangerous for Chancellor Angela Merkel. Facing several regional elections, she decided to take a U-turn by immediately shutting down seven old reactors, and pushed for a comprehensive package of energy legislation including a fix timetable for the phasing out of the remaining reactors. Nevertheless her Christian-Democratic party lost the elections in Baden-Württemberg, home to Bosch, Daimler-Benz, SAP and many medium-size high-tech industries. In power since 58 years, the Party had to hand over the role of head of the regional government to a competitor from the Green Party. The complex energy legislation package, rushed through parliament in a record time, was welcomed by the opposition only in the parts concerning the nuclear phase-out. Concerning renewables, it did not correspond to the public promises of speeding up the transition towards renewables in a determined way.

The most favoured technology in the country is large off-shore wind farms which would keep the power

structures in the utility industry rather unchanged. But this would require years of infrastructure development, including laying down of additional power lines. Only sharp public protests have prevented more damaging cuts to the support for onshore wind and photovoltaics. Despite the attempt of the government to put an end to the energy policy debate, further adjustments of the framework are inevitable. However, Germany has clearly embarked on the route for a non-nuclear low-carbon future. Dealing with growing shares of fluctuating wind and solar power production is the main challenge. Storage and control technologies are candidates for a next wave of innovation. The success story of pushing down the cost of wind and photovoltaic power by creating a large market has shown that Germany has a sufficient size for setting trends and unleashing creativity.

Switzerland, Germany's southern neighbour, is undertaking a similar fundamental revision of its policies. Almost 10 weeks after the Fukushima accident, the government decided a stepwise exit from nuclear power, which later was confirmed by the Parliament of the small alpine country with seven million inhabitants. Considering the high share of 39 per cent of electricity production coming from nuclear power plants, the firm decision to drop all plans for new reactors is a milestone for Switzerland although the last plant will be shut down only in 2034. Interestingly, all female cabinet members were in favour of the exit whereas all men, in minority among the seven federal councillors, were arguing against. Simultaneously, with the exit decision, plans for strengthening energy conservation and renewable energy have been decided, including the removal of the present cap on the feed-in-tariff, streamlined permitting procedures for wind and solar energy

as well as a commitment of public bodies to completely switch to energy from renewable sources. Wind and solar industry, until now hindered by restrictive permitting and limited public support, are now preparing for a boom. With companies such as ABB, Meyer Burger, Oerlikon and Solarmax, Switzerland is well positioned to take advantage from a worldwide change in energy policies.

Austria, the neighbouring alpine country with roughly the same size, had banned nuclear energy in a public vote in 1978, preventing a nearly completed nuclear power plant from going into operation. After Fukushima, it has taken the lead of a coalition of nuclear-free countries in the European Union calling for a more restrictive policy of the EU institutions. New efforts have been announced for extending hydropower and pumped storage power in the Alps for buffering fluctuating wind and solar power production in Europe. Wind power permitting will be facilitated.

Italy too banned nuclear power by a public vote in 1986 in the aftermath of Chernobyl and all four nuclear power plants were shut down by 1990. However, in the last years the Berlusconi government and the national power company ENEL had developed plans for new nuclear power plants. Supported by French President Nicholas Sarkozy, the nuclear industry in France had hoped that this could bring the long-awaited breakthrough for their new generation of reactors. However, the accident of Fukushima has led to an uprising against these plans: In a public vote with 57 per cent participation at the beginning of June, 94 per cent voted against nuclear power. As a consequence, support for solar and wind energy has increased, further confirming Italy's important role in the development of renewables in Europe. But with a shaky government



Italian politics remains confused.

With 17 per cent of the global nuclear power capacity in 58 reactors, **France** is the nuclear state par excellence, depending on nuclear power for 74 per cent of its electricity. This strategy had always been supported by a vast majority, although the costs were considerable. In the seventies and eighties, the nuclear sector absorbed a huge share of the industrial investments – even larger than in the US where nuclear investments for many years were five times higher than the investments in the car industry. The nuclear industry is considered to be the centrepiece of the French industrial policy. Left and Right parties have always promoted nuclear energy at home and abroad, and President Sarkozy has missed no occasion for helping to sell French reactors throughout the world – although with limited success.

The much praised new reactor generation EPR, developed by world nuclear technology leader Areva and Siemens, is facing problems: Cost overruns and missed deadlines are plaguing the first two projects in France and Finland. Moreover, two years ago Siemens had left the joint venture – first intending to team up with a Russian partner, now without any haste to dive into new nuclear adventures. Unhappy with the performance of Areva, Sarkozy eventually has sacked its decade-long CEO



French President Nicolas Sarkozy has pledged a monetary support of € 1.4 billion for renewable energy.

Anne Lauvergeon. Since Fukushima the Socialist Party, for which the State-controlled nuclear and electricity industry were a stronghold, has become more critical: An increasing number of leaders not only ask for more stringent security controls but also for a long-term step-wise phase-out.

Recently, President Sarkozy, in a generous gesture, promised €1 billion for strengthening the nuclear industry and at the same time pledged a monetary support of €1.4 billion for renewable energies. Surely, a rapid U-turn is not easy for a country with such a strong dependency on nuclear power, but it becomes more and more evident that France will considerably lower its nuclear share in electricity production. Not wanting to risk running into problems with costly requirements, the country vetoed attempts of the European Commission after Fukushima to harmonise nuclear safety standards at the EU level – despite a specialised European Treaty for Nuclear Energy and extensive common norms across nearly all industries, nuclear regulations in the EU are still a national affair.

Confronted with such resistance, the **European Union** initiatives to improve nuclear safety after Fukushima have had only a limited impact until now – but any harmonisation and ret-rofitting requirement will further decrease the competitiveness of

nuclear power. However, Energy Commissioner Oettinger, a former prime minister of Baden-Württemberg and reliable friend of the large utilities, seems to have been impressed by the Fukushima accident and the public response. He has intensified his efforts for strengthening European high-voltage grids and energy efficiency requirements in buildings. Other players at the European level, mainly the European Parliament, are pushing with more determination for a transition towards renewables.

Conclusion

Without question Fukushima has weakened the proponents of a centralised and to some extent nuclear approach and strengthened the advocates of a more decentralised, renewable energy supply. But the picture is complex. For different reasons the role of natural gas is rapidly increasing: For the electricity system it is the ideal complementary power source to fluctuating wind and solar power production – at least for a transition phase. Moreover, capacities can be built up quickly and compared to coal greenhouse gas emissions are much lower. However, in Europe the new technologies of producing shale gas by injecting large quantities of chemicals into the underground – which have led to falling natural gas prices in the US and elsewhere – are being eyed with scepticism. Another cause of concern is the growing influence of the Russian giant Gazprom. Weakened German utilities seem to be considering stronger co-operation with this potential partner.

As a consequence of this overview, one might draw two conclusions which at first sight seem to be in contradiction. On one hand, the number of countries which have openly and deliberately changed their

strategies after Fukushima is still very limited. The nuclear lobby has done a good job. On the other hand, the importance of these countries, the general shift in public opinion worldwide and the joint effect of supplementary appraisals, controls and safety measures will probably have more far-reaching consequences in the years to come. The revival of the old pro-nuclear / anti-nuclear debate on risks, ethics, waste and future generations has obfuscated the view on the fact that today nuclear power has far more attractive competitors than decades ago. Renewable energies are a viable, safe and competitive alternative.

In most countries, the Fukushima disaster of March 11th 2011 will mark the beginning of the end of nuclear power ambitions – except, perhaps, for some states which favour this technology for military reasons. At first Fukushima will have a similar effect as Three Mile Island and Chernobyl – in the sense that a new generation, that might have considered a revival of nuclear energy, has been reminded of the physical, technological and financial risks of nuclear power, a quarter of a century after the last severe accident. This will lead to hesitations in giving massive public support to a risky and very slowly developing technology. And that will broaden the opportunity for the final market breakthrough of renewable technologies which have much shorter innovation cycles and rapidly declining instead of rising cost curves. Since Fukushima, large multi-national companies have heavily invested in renewables and especially photovoltaics, i.e. distributed power generation: General Electric, Total, Siemens, Bosch.

It is no longer a David against Goliath game, but the emergence of a new concept of power generation with mass products for consumers.