

Inrate view

The Nuclear Industry: Fukushima or the End of a Renaissance

6 April, 2011

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A natural disaster caused a huge “tsunami” that has subsequently resulted in a grave nuclear fallout at the Fukushima Dai-Ichi plant. There have been explosions, fires and releases of radiation that will make the world think very carefully about its reaction to the renaissance of nuclear power generation. The full extent of the human tragedy will only unfold over the next few weeks but the longer-lasting impact on the soil, sea and air around Fukushima will not be known for many months, if not years.

For many years Inrate has considered nuclear power as unsustainable. Our research shows that nuclear power is not desirable, necessary or attractive from an economic standpoint. Indeed practically all of our clients have benefited by avoiding investments in the nuclear power industry. We do believe that there are some positive indicators for investors to focus on: for example, our close look on the electricity industry clearly highlights the winners and losers as the world shifts towards a more sustainable future.

Operators of nuclear power plants emphasise that they can control the risks of nuclear power production. Cost considerations, incomplete information on risks and technical (and human) limitations, however, are the reasons why nuclear energy will always have residual risks. Moreover, every incident changes previous risk calculations.

The current events indicate that the nuclear power renaissance is over. In most democratic societies improved safety systems and re-fitting will be required, and external costs of nuclear power generation carried by general public will be more and more internalized. Thus the costs of nuclear power will rise in the future. At the same time, competitiveness of alternative power generation will increase significantly.

The post-nuclear age is imminent. It is called Clean-Tech and will bring energy efficiency and renewable energy sources. The necessary technologies are already in place or currently being developed. Energy scenarios display the measures that can be taken on a political and private level to ensure that the development will actually occur. These would direct investments into the reconstruction of the energy and transport infrastructure and simultaneously accelerate the renewal of existing buildings and production structures.

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Fukushima – Nuclear disaster in the high-tech country of Japan

At the Fukushima nuclear power plant several unlikely events led to a nuclear disaster with high amounts of radioactive radiation being emitted into air, soil and water. The consequences are dramatic: plant workers have been contaminated, the population in the periphery of Fukushima had to be evacuated and the scarceness of electrical power has led to a shortfall in productivity across the country. An area of unknown size will be contaminated by radiation, and production sites are destroyed. Surveillance of the area and its decontamination will take decades and will cost enormous sums of money. The exact long-term effects of the accident are neither foreseeable nor calculable. The health of an unknown number of people is at stake and the economic costs are hardly predictable.

The risk of a worst-case nuclear disaster, a nuclear fusion because of chain reactions that cannot be stopped, is still very real. In such case enormous amounts of radioactive material would be released. The potential harm for humans and the environment as well as resulting economic costs would be many times higher than they are already.

Fukushima, nuclear technology and investors

How do the structural changes and trends in energy systems influence businesses and investors? Which chances and risks does it carry?

The stock price of Tepco has rapidly declined after the incident and the equity prices of energy producers worldwide have performed similarly to the reoccurring global decline in the stock market.

This poses the question if financial markets are able to correctly assess “pathological risks” like those of nuclear power, or if they are in fact blinded by microeconomic returns and, thus, underestimate certain risks (and opportunities). Sustainability analysis can help to point on those risks and related opportunities.

When social costs are taken into account, it becomes clear that nuclear power is quite expensive, even if this is not currently evident on the energy bill. At the moment, society ultimately pays the costs. In the future, further internalizations of these costs will lead to rising costs for companies involved in nuclear energy.

In this context, the existing mega trend towards clean-tech, i.e. towards energy-efficient processes and products as well as renewable energies, will be accelerated significantly.

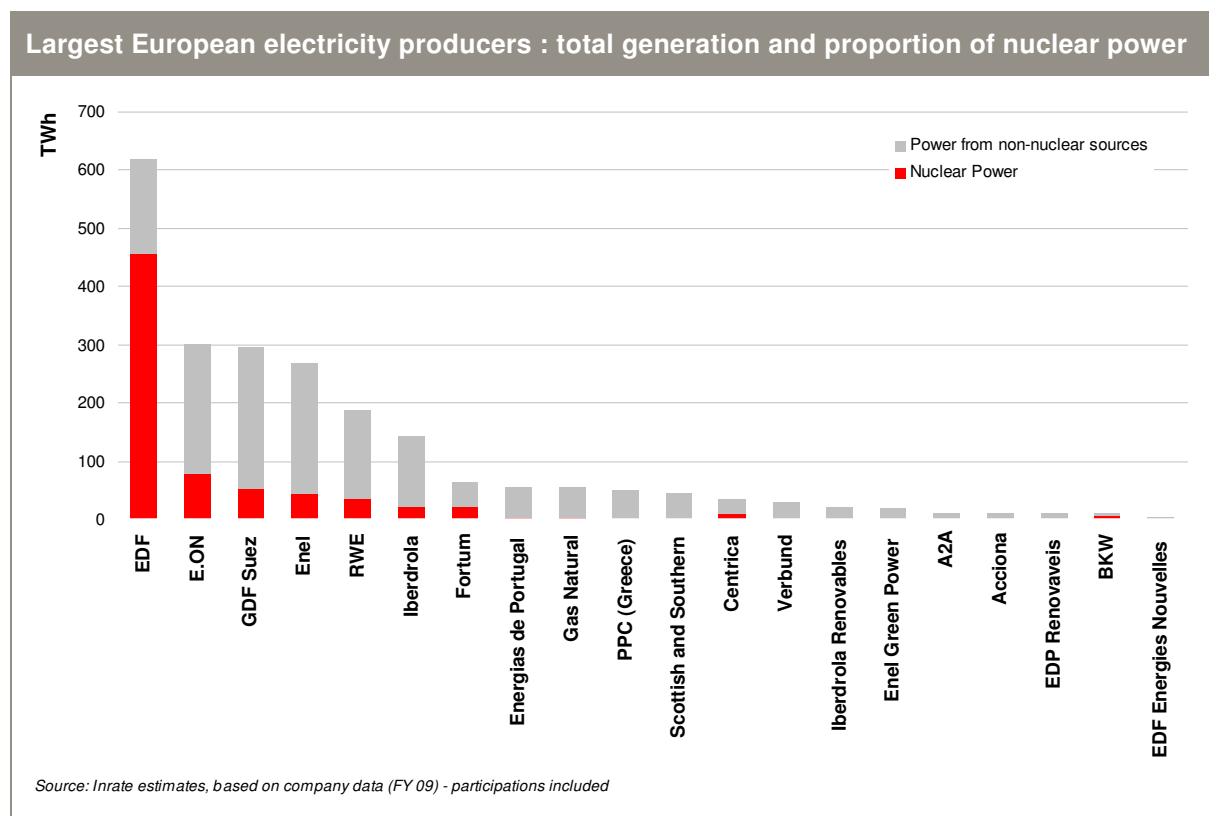
Investments in companies that anticipate the clean-tech trend are therefore promising for high return yields; companies that are involved with nuclear power in contrast bear investment risks.

As a matter of fact, the nuclear power industry will lose competitiveness as it will bear increasingly higher security-related costs.

Most exposed to this risk pricing process are obviously producers of nuclear energy as the high investments in nuclear power plants are sunk costs. Many of these plants could continue with their current safety standards. They have not yet been depreciated and get positive figures on the balance sheet. However, higher risk and liability standards (earthquake security, provisions against radiation damages and increasing provisions for disposal costs) will lead to higher overall costs.

Numerous large electric utilities supply nuclear power; the ones with a higher production share in nuclear power will be struck more than those with lower shares.

Other actors in the nuclear industry – constructors, suppliers of components and services – may suffer as well, but to a lesser extent as they have the possibility to switch to other markets.



Nuclear power contains residual risks

The example of Fukushima has proven to the world: nuclear power generation is associated with high risks. The term risk is defined by the expected amount of damages, multiplied by the likelihood that certain events can occur which would provoke these damages. Risks from nuclear power generation are extreme (“pathological”) risks, i.e. they inherit a “fundamental insecurity”: there is only a very small chance that the production of nuclear power will lead to an extremely large damage. For instance, seismologists in Japan ignored the possibility of an earthquake scoring a 9.0 on the Richter scale. Consequently, this case was not considered when safety systems were developed and applied. Moreover, only limited information is available when calculating the risks of nuclear power production: neither all possibly hazardous events can be known beforehand nor the exact likelihood of them to occur, nor is it possible to calculate the amount of damage it could result in. For this reason, “pathological” risks are hardly estimable and therefore not insurable by the private sector.

Thus, nuclear power production always contains residual risks. Existing safety systems cannot avoid those risks since their prevention is either considered too expensive for society or the risks are simply unknown. The possibility that safety systems do not work as expected or that workers make mistakes adds to the residual risks too. Currently, the residual risks of nuclear power production itself are mainly in the public focus. However, it is also important to consider the risks inherent to the extraction, transport, reprocessing and disposal of nuclear material.

The end of the nuclear power renaissance

The incidents in Fukushima demonstrate that the risks of nuclear power have been so far misjudged and that society (the population, investors etc.) was not fully aware of the associated residual risks. These very abstract factors have become once more reality – maybe more explicitly than ever. What has probably been downplayed by political and economic interests seems to have fatal consequences.

Fukushima will eventually provoke a new evaluation of the risks and costs of nuclear power and probably lead to societies tolerating less residual risks. In many countries, the population has either claimed a new evaluation of nuclear power and a reduction of risks or even a complete drawback of the involvement in nuclear energy – with the exception of

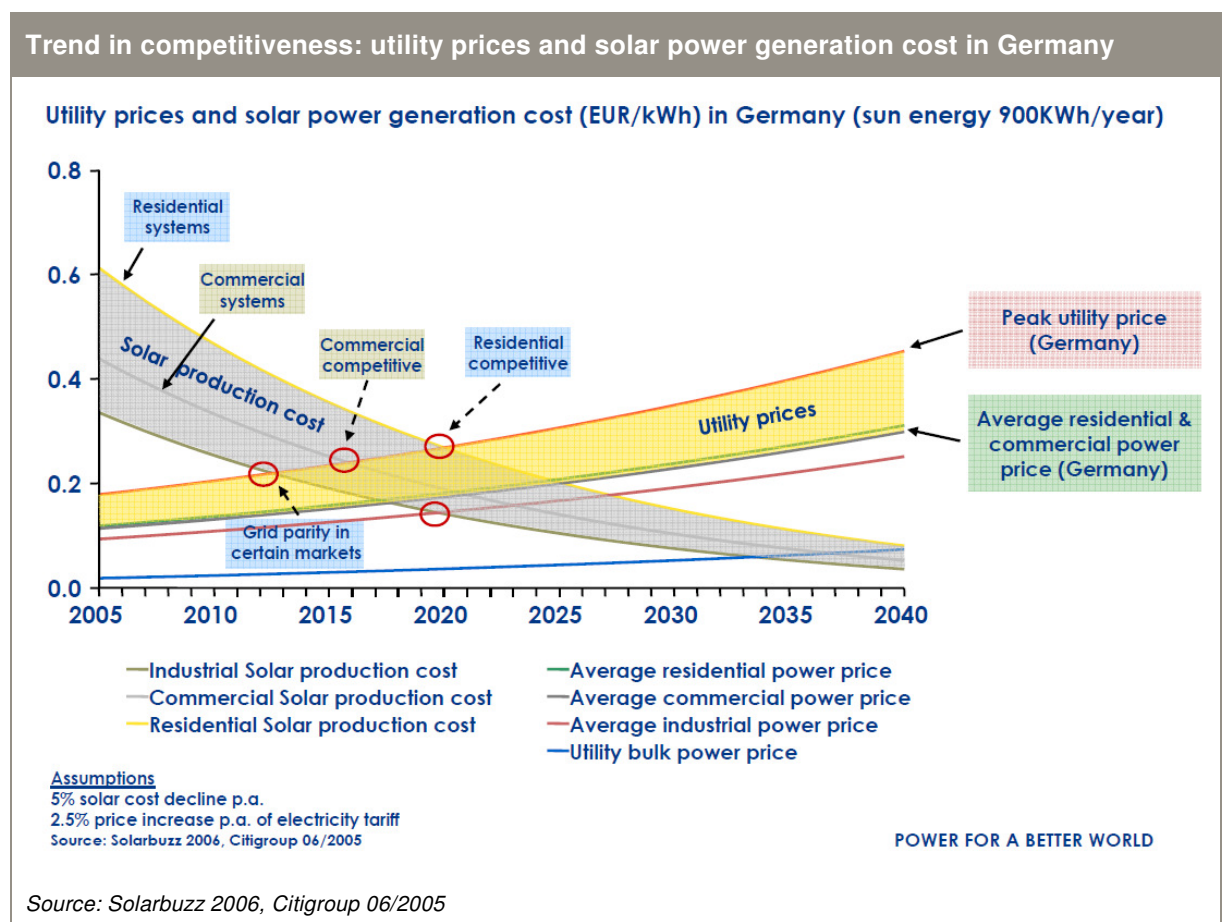
France and Great Britain where people's acceptance seems to have barely changed after the recent events. In any case, people are no longer willing to pay for the external costs of nuclear power.

Thus, Fukushima will most probably lead to further internalizations of external costs. Safety standards will be increased, which will be very costly for operating firms: existing nuclear power plants will have to be upgraded, building new plants will become more expensive and disposal of radioactive material will need a capital injection. Liability limits will also be increased as existing liability limits in many countries currently only cover a small part of the costs in case of a nuclear disaster. The damages of a worst case scenario in Germany, as calculated by the Prognos Institute in 1992 by order of the Federal Ministry of Economics, amounts to approx. 5 trillion EUR. By contrast to this, the German Nuclear Law regulates the liability limit to amount merely to 2.5 billion EUR. Austria is the only European country with unlimited liability. Other European countries have even lower liability limits than Germany: Switzerland around 1.4 billion EUR, Spain around 700 million EUR, Belgium and Sweden around 333 million EUR, the Netherlands 313, Great Britain, Poland and Slovenia around 165, France 84 and Italy 5.5 million EUR. The incidents in Fukushima show the consequences of insufficient liability regulations: Tepco, the operating company of the nuclear power plant in Fukushima, has called for a financial guarantee from the Japanese government to face the flood of liability consequences and to avoid bankruptcy. If operators of nuclear power plants have to cover the full external costs, especially those of nuclear disasters, the insurance premium will substantially increase the costs of nuclear power. Calculations of this cost increase, though, as the calculation of nuclear risks faces many uncertainties, vary considerably: from 0.1 Ct/kWh to 270 Ct/kWh, depending on the method used and system boundaries assumed. The German Aerospace Center for example estimated 7.9 Ct/kWh while a study by Meyer and KÜchler in 2010 on behalf on Greenpeace provides an estimation at a level of 270 Ct/kWh.

Through a wide internalisation of external costs, nuclear power will become economically less attractive compared to other energy sources. In addition to the current private costs that nuclear power producers already bear, social costs currently carried by society will have to be added. In Fukushima for instance, social costs include among others health care costs and the compensation for the threat to life and physical condition of today's and future generations. Not to mention the material damages (like contaminated soil) as well as the consequential losses like profit setbacks or the loss of income.

The following chart shows the effect on the competitiveness of renewable energies on the

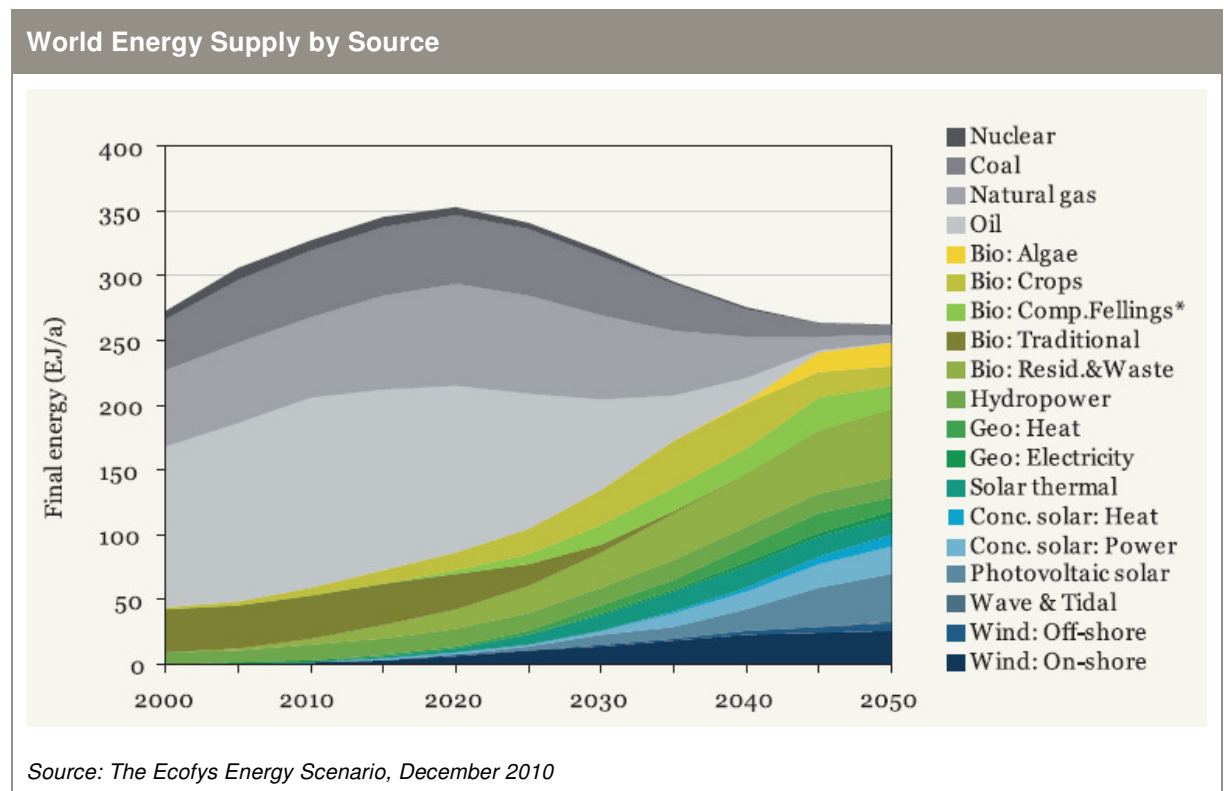
example of solar power. It compares the trend of solar power prices with the trend of utility prices (fossil and nuclear power) as estimated in 2005/6. It shows that generation costs of fossil and nuclear power have continuously risen in the past and that the costs for solar power in contrast have been falling. Solar power was (in a rather pessimistic estimation) predicted to become competitive in 2020. Now, with external costs not only of fossil power but also of nuclear power getting more and more internalized, solar power (as well as other renewable energy sources) will become competitive much sooner.



The post-nuclear age

There are signs that indicate an acceleration toward a post-nuclear age that emphasises energy efficiency and renewable energy. The process to get there, however, will be long and complex. After all, 30 countries currently operate a number of 212 nuclear power plants with 442 reactor blocks and an installed overall capacity of 374.682 Megawatt for the production of commercial power.

Yet, it is possible to satisfy the rising demands for quality of life – like for food in poorer countries, for living comfort and mobility – until 2050 with a reliable and stable energy provision almost without fossil or nuclear power energy sources. PricewaterhouseCoopers published in 2010 a roadmap to 2050 for Europe and North Africa based on renewable electricity exclusively. The German Advisory Council on Global Change 2003 judges that a full renewable energy provision is also possible on a global scale within the same time range. The “Energy Report” by Ecofys on behalf of the WWF shows how this can be achieved: it describes an ambitious global energy scenario which forecasts a decline of 15% of the energy use despite an increasing population and growing economy, enhanced individual mobility and freightage. All these demands can be managed by efficiency measures (e.g. through more efficient means of transportation or better insulations of buildings) and substitution measures (e.g. through substituting gasoline with renewable electricity or oil heating with solar heating). These measures are based either on already existing technologies or on technologies which are currently being developed and should not lead to a dramatic increase of everybody’s energy bill.



The reorganisation will save approximately 4 trillion EUR annually due to efficiency measures and energy costs savings. On the other hand, high investments will be necessary to rebuild energy infrastructure (e.g. “smart” grids), transport infrastructure (e.g. for more public transportation or power filling stations), buildings and production structures. In the long term (the scenario calculates the breakeven point for 2040), these investments will be economically and ecologically profitable. This turnaround, however, will not happen overnight and without joint societal action. On one side political decisions are needed to set the course towards the internalisation of external costs (i.e. eco taxes and emission certificates). On the other side, forward looking investors need to recognize those companies that facilitate this turnaround by providing economically, environmentally and socially advanced solutions to current energy issues.

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