

THE NEW APPEAL OF NUCLEAR ENERGY AND THE DANGERS OF PROLIFERATION

The peaceful use of nuclear energy is becoming more attractive. Access to such technology is guaranteed under the terms of the Nuclear Non-Proliferation Treaty (NPT) as long as the related projects are not misused for military purposes. In the past, however, states have repeatedly succeeded in initiating nuclear weapons projects under the guise of civilian nuclear energy programs. Furthermore, the spread of atomic energy increases the risk of nuclear terrorism. International efforts should aim at a clear distinction between peaceful and military use of nuclear power.



The attractiveness of nuclear energy is on the rise – as is the danger of proliferation: An Official of the Iranian nuclear energy organization in front of a model of the Bushehr reactor, April 2009. Reuters/Caren Firouz

An ever increasing number of countries are aiming to construct nuclear power plants. The member states of the NPT not only have a right to maintain peaceful nuclear projects; they are even asked to provide mutual support. However, in the past, civilian programs have repeatedly been used to disguise the advancement of military efforts. The example of India in the 1970s was particularly striking. Delhi purchased a heavy water reactor from Canada. Ottawa was unaware that it was to be used for the production of weapons-grade plutonium. In the 1980s, Saddam Hussein attempted to persuade the international community that Iraq's nuclear program, which was actually aimed at building a bomb, was a peaceful project. Today, Iran claims that its nuclear program is exclusively intended for peaceful purposes; but the International Atomic Energy Agency (IAEA), due to a number of

outstanding issues that give rise to concern, is not in a position to exclude the existence of a possible military dimension to Iran's nuclear program.

Indeed, it is indisputable that nuclear energy programs entail proliferation dangers. As long as a country only operates nuclear reactors, these dangers may not be dramatic. But when uranium enrichment and nuclear reprocessing are added to the equation, the problems increase drastically. Both of these technologies are well suited for producing weapons-grade fissile material. This is the main obstacle to be overcome by any country that wants to build nuclear bombs. At the same time, the spread of nuclear energy tends to increase the danger of nuclear terrorism. In the interest of continued guaranteed access to the unequivocally peaceful use of

atomic power, international efforts will be required to exclude misuse for military purposes as far as possible. A debate on these issues, for instance on the internationalization of the nuclear fuel cycle, is already underway, but no comprehensive solutions are on the horizon yet.

The Spread of Nuclear Energy

There are currently 436 operational nuclear power plants in 31 countries. About half of these are located in only three countries: The US (104), France (59), and Japan (53). Seven current operators of nuclear plants can be considered threshold or developing countries: China, India, Pakistan, Argentina, Brazil, South Africa, and Taiwan. Nuclear energy only accounts for 15 per cent of global energy production.

Nevertheless, the idea of a "renaissance of nuclear energy" is gaining traction. Indeed, Russia, China, and also South Korea have decided to engage in comprehensive nuclear energy programs. In the US, too, the number of planned nuclear power plants has increased drastically. France and Finland are already constructing newly designed "European Pressure Reactors". Nuclear energy optimists expect the generation of power from nuclear sources to double or even triple by 2050.

The share of nuclear power in worldwide electricity production will, however, remain constant at best, and in all likelihood even sink to 10 per cent by 2030, despite the construction of new reactors. The main reason is the expected huge increase of energy demand. Thus, many more new

The spread of civilian nuclear energy in the Middle East						
	Operational civilian power plants	Civilian power plants under construction	Interest in starting nuclear energy program	NPT member	Signed IAEA Additional Protocol	Implemented IAEA Additional Protocol
Afghanistan				x	x	x
Bahrain			x	x		
Egypt			x	x		
Iraq				x	x	
Iran		x	x	x	x	
Israel						
Jordan			x	x	x	x
Kuwait			x	x	x	x
Lebanon				x		
Oman			x	x		
Pakistan	x	x				
Qatar			x	x		
Saudi Arabia			x	x		
Syria			x	x		
Turkey			x	x	x	x
UAE			x	x	x	
Yemen			x	x		

Sources: IAEA; Carnegie Endowment for International Peace

reactors would have to be constructed in order to increase their share in overall electricity generation. That is not realistic, however, considering the long planning and construction periods of up to 20 years for nuclear reactors and against the background of the current lack of construction capacities and skilled personnel. Irrespective of these considerations, more than 100 older nuclear plants are expected to be taken off the grid in the coming years.

As such, the talk of a “renaissance of nuclear power” is due not so much to any expected growth of its share in overall electric power generation, but to the fact that more and more countries that do not yet operate nuclear plants are beginning to show an interest in the civilian use of nuclear energy. Indeed, more than 60 countries have expressed their interest in the peaceful use of atomic energy to the IAEA. Most of these are developing countries. In the Near and Middle East in particular, nearly all countries intend to engage in nuclear power generation.

There is a whole range of different motives for the recent development concerning the peaceful use of nuclear energy. These include the temporarily high prices of oil and gas, which triggered a debate on energy security in resource-poor countries in view of their excessive dependency on a few supplier states. But the debate on climate change and the necessity to reduce greenhouse gases have also played a significant role. Many believe nuclear power plants to be a sensible solution, as their level of emissions is low. However, this does not apply to the mining and processing of ura-

nium, which is indispensable for the operation of reactors. Moreover, wealthy Middle Eastern countries such as Saudi Arabia already today want to prepare against the day when their oil wells will begin to dry up. Others such as Egypt wish to continue to cover their own energy requirements using nuclear power in order to be able to sell as much of their oil as possible on the international market. Lack of water is also an important factor in this region. Some countries are flirting with the idea of alleviating this shortage by building nuclear-operated desalination plants. Another important factor is the prestige to be derived from mastering what is regarded as a modern technology. Neither should the competition among purveyors of nuclear power be underestimated; after all, the construction of a nuclear plant involves high investments of over US\$5 billion. This is why solvent customers, including many of the Gulf states, are heavily courted by the three suppliers that almost completely dominate the world market – Westinghouse/Toshiba (US/Japan), Areva (France), and Atomenergoprom (Russia). Finally, in the Middle Eastern region in particular, security-policy motivations may also help to explain the interest of many countries in nuclear energy. It is believed that in view of a potential Iranian nuclear threat, they wish to maintain the option of developing nuclear weapons of their own.

Dangers

In the course of a peaceful nuclear energy program, scientists, engineers, and technicians gain skills that may also be useful in the context of a weapons program. This constitutes a certain proliferation risk.

However, it is important to emphasize that the path from peaceful to military use of nuclear power is a very long one.

Around 90 per cent of the power plants currently in use are light water reactors. This type was developed specifically to reduce the risk of proliferation as far as possible. Whether or not the plutonium accumulated in the course of their operation can be used to build weapons is a controversial issue. Over extended periods of reactor operation, they generate plutonium isotopes that would interfere with the detonation of a plutonium bomb. In order to extract plutonium that could be easily used for military purposes from a light water reactor, the latter would have to be frequently shut down for removal of fuel rods. This would be quite laborious and would certainly raise questions as long as the reactor was monitored by the IAEA.

Light water reactors use low enriched uranium. Therefore, natural uranium must first be processed in several steps. Currently, only a few countries have such technology. Four suppliers share about 95 per cent of the global market for enriched uranium: The British-German-Dutch URENCO consortium; France's EURODIF; the US Enrichment Corporation; and Russia's TENEX. Japan also enriches uranium; Brazil and Iran are in the process of building up such a capacity. China, India, and Pakistan operate enrichment plants for military purposes.

This brings us to the main problem: In uranium enrichment plants, operations can be switched without major structural changes from the production of low enriched uranium, for fuel rods to be used in light water reactors, to the production of highly enriched uranium that can be used to build nuclear bombs. Thus, it has long been feared that states might build light water reactors so as to legitimize a uranium enrichment program, which would provide them with the opportunity to produce weapons-grade fissile material. This is precisely what has now happened in the case of the Iranian nuclear program.

The technology for reprocessing fuel rods is similarly problematic. Such installations are currently in place in France, the UK, Japan, Russia, and India. The US has a small plant for enriching fuel from research reactors, but has consciously refrained from large-scale reprocessing since the 1970s. Furthermore, North Korea maintains a reprocessing plant for military purposes. This already

highlights the danger of proliferation emanating from reprocessing technology. On the one hand, this technology may help to reduce the quantity of nuclear waste, which is not unimportant in view of the still unresolved issue of final storage. At the same time, however, plutonium is separated in a way that allows it to be weaponized.

An expansion of peaceful nuclear energy use also raises the risk of nuclear terrorism. While non-state actors will probably remain incapable of building nuclear weapons independently for some time, they might well acquire the ability to build so-called “dirty bombs”. This would not set off a nuclear chain reaction, meaning that the damage would be limited. However, should such “dirty bombs” involve the use of reactor fuel rods the wide dispersal of large amounts of radioactivity would significantly increase the contamination.

Solutions

A variety of efforts are required to exclude the abuse of civilian nuclear energy programs for military purposes. A debate is currently underway on various proposals to internationalize the fuel cycle. A successful resolution of this issue would be a giant step towards a world where more and more countries could choose nuclear power without their neighbors having to fear military threats as a result. It will be at least as important to negotiate with Iran to discard its current path towards an atomic weapons option, or some of its neighbors will also most likely strive to acquire nuclear arms. Other important steps would be to introduce improved safeguards standards for nuclear energy operators, more intensive IAEA monitoring options, and new types of power plants.

Internationalizing the fuel cycle: In February 2004, US President George W. Bush suggested that the multinational Nuclear Suppliers Group (NSG) should only export equipment for uranium enrichment and reprocessing to such countries that already have such facilities. This proposal was rejected by many countries both within and outside of the NSG that do not maintain capabilities for enriching or reprocessing uranium on the grounds that they are not willing to accept an additional discrimination between haves and have-nots. Currently, about a dozen proposals aimed at internationalizing such technologies are being discussed. At the same time, access to nuclear fuel is to be

assured; plans for establishing an IAEA fuel bank are seen as the most promising proposals in this respect, which is apparently favored both by US President Barack Obama and IAEA Director General Mohammed elBaradei. The IAEA has already secured commitments from various governments and NGOs to provide total funding of US\$150 million for such an endeavor. Nevertheless, such notions are frequently viewed with skepticism. Those countries that produce low enriched uranium for industrial purposes fear they might lose customers and profits. On the other hand, recipient states are suspicious of the fuel bank project, fearing that their rights under Article IV of the NPT (free access to peaceful use of nuclear energy) would be curtailed. Indeed, it remains unclear as yet which conditions a country would have to meet, particularly in terms of verification requirements, in order to gain legally guaranteed, secure access to fuel.

Iran: If Iran cannot be persuaded to abstain unequivocally from a nuclear weapons option, many believe this could trigger a nuclear arms race in the Middle East. Other countries in the region, such as Egypt, Saudi Arabia, or Turkey might use their civilian energy projects to engage in military options of their own. Currently, many hopes are being pinned to the new negotiation approach of the Obama administration. It remains to be seen, however, whether Iran is prepared to agree to a compromise that would allow Tehran to retain its civilian energy program, but would exclude military usage. If Iran were permitted to keep its national uranium enrichment program, it would subsequently be difficult, in the longer term, to convince other regional actors to forswear such technology in return for participation in international projects.

Verification: With the Additional Protocol to the IAEA's safeguards agreements, the Vienna-based agency has made significant progress in the field of nuclear verification. States that have implemented this protocol are subject to a more comprehensive notification requirement than was previously the case. For example, all elements of a nuclear energy program must be declared, including research and development projects. In particular, the IAEA now has the task of verifying the absence of undeclared nuclear material and activities. To that end, access rights for inspectors have been expanded. They can inspect installations at short notice and col-

lect environmental samples at any place of their choosing.

The Additional Protocol has been implemented by 91 states (as of May 2009). The IAEA as well as countries including the US, Russia, the EU, China, and Japan support the demand to make implementation of the Additional Protocol a standard prerequisite of fulfillment pursuant to Article III of the NPT. This proposal is, however, rejected by states such as Brazil, Argentina, or Egypt, primarily due to the inadequate status of nuclear disarmament to date.

Safeguards standards: The IAEA currently states that standards for nuclear security still vary considerably from country to country. The IAEA has its work cut out in helping countries to construct security architectures that are appropriate. This is necessary in order to prevent terrorists from gaining access to nuclear material.

Proliferation-resistant reactors: Intense research on proliferation-proof reactors is underway. In the US, the planning boils down to supplying customers with small reactors that would have a lifespan of 15 to 20 years and then be collected again. Thus, the recipients would only gain a minimum of their own nuclear know-how. In Russia, even more radical programs are being debated; under these plans, floating reactors would be rented out for a limited time. It is questionable, however, whether such projects can be reconciled with the spirit of the NPT's Article IV, which ensures that all signatories shall enjoy unlimited access to peaceful use of nuclear energy as long as it is not misused for military purposes. It is therefore difficult to imagine emerging and developing countries agreeing to such terms; not least because due to the risks involved with nuclear reactors, it seems inadvisable to commit oneself fully to the work of foreign operators.

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