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# PERSPECTIVES

Political analysis and commentary from the Middle East



## AMBITION AND PERIL

### NUCLEAR ENERGY AND THE ARAB WORLD

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## Heinrich Böll Foundation – Middle East

The Heinrich Böll Foundation, associated with the German Green Party, is a legally autonomous and intellectually open political foundation.

Our foremost task is civic education in Germany and abroad with the aim of promoting informed democratic opinion, socio-political commitment and mutual understanding. In addition the Heinrich Böll Foundation supports artistic and cultural as well as scholarly projects, and co-operation in the development field. The political values of ecology, democracy, gender democracy, solidarity and non-violence are our chief points of reference. Heinrich Böll's belief in and promotion of citizen participation in politics is the model for the foundation's work.

Our programme areas in the Middle East are:

- Statehood & Participation
- Conflict & International Politics
- Environmental Justice
- Culture & Dialogue

# Editorial - Nuclear Energy and the Arab Spring

After decades of relative quiet, popular discontent erupted massively in Arab streets. Starting with the protests in Tunisia, and across social, political and demographic boundaries, Arab populations are openly challenging those tenets of power that oppressed them for decades. Aged dictators are forced into exile. In some countries, authoritarian rule, hereditary presidencies and exclusive decision-making by isolated elites seem patterns of the past. Dignity is the word of the day. Arab societies long portrayed as conglomerates of tribal confederations and clan-based clienteles rediscover in their revolts collective responsibility and sense of belonging. Identical slogans and political demands are reverberating in the main squares of Tunis, Cairo, Sanaa and many other cities. The collective movements that proved so powerful, mature and disciplined in overthrowing the top brass of oppressive structures in Tunisia and Egypt are now facing the massive task to transform ailing political institutions, to reform security apparatuses, to combat corrupt structures, and to increase opportunities for social, economic and political participation. In Libya, the country's leadership is waging outright war against the uprising of its people. And in again other countries, such as Algeria, Bahrain, Syria, Saudi-Arabia and the Gulf in general, authoritarian rule seems deeply entrenched and quite resilient.

Despite all uncertainties, one factor is clear: there is an element of irreversible change and open debate in the Arab World, and a sense that democratic participation is not limited to forming political parties and competing in elections. Today, Arab citizens claim their right to be informed and to have a word when decisions are being taken by governments that may affect the very future of their societies.

The transfer and use of modern technologies requires such decisions. Among the most controversial of all, the civilian use of nuclear energy ranks high on the list. The nuclear disaster in the Japanese city of Fukushima on 11 March 2011 has brought the destructive potential of this technology to the forefront again. A leading industrial nation, Japan was not able to prevent the exposure of its citizens to massive hazards and risks as a result of the nuclear meltdown. Should Arab countries with less advanced technological capacities invest in nuclear energy production that proved uncontrollable in Japan? Why do Arab decision-makers perceive nuclear energy as bridge to the solar age and potential to decrease the dependency of external resources? Why is nuclear power so popular, despite its negative reputation in reliability, security and sustainability? What are the viewpoints of civil society?

These and other questions will be discussed in the first edition of Perspectives Middle East - Political Analysis and Commentary, of the Heinrich Böll Stiftung. Analysts, activists and decision-makers in the region and Europe take a critical look at the emergence of nuclear energy programs in the Arab world. The eight articles and interviews of this e-publication will be followed by a special issue of Perspectives Middle East in April 2011, with an in-depth focus on the extraordinary developments of the Arab revolutions.

Perspectives Middle East is a publication series of the Heinrich Böll Stiftung's offices in Beirut and Ramallah that seeks to provide a platform for presenting analysis and viewpoints primarily of experts from the region.

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# The Arab Region as Part of a Nuclear Renaissance: Outlooks and Alternatives

## Dawn or Twilight:

### Nuclear Ambitions in the MENA Region

A considerable amount has been written about a global nuclear renaissance. Some new plants are in the construction stage, e.g. one reactor in Finland and several in China. Other countries are considering introducing, extending or prolonging nuclear programs. The Middle East and North Africa (MENA) region has long been a hotspot of discussions and announcements in favour of using nuclear energy. Most MENA states have expressed a strong interest in civil nuclear energy and, at the time of writing, the UAE has signed a contract with a South Korean consortium to start constructing the first nuclear reactor in 2012.



Dennis Kumetat

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Renewable electricity projects (even large-scale ones) have considerably shorter lead times and can thus contribute to the supply of national power demands significantly faster.

Energy demand in the MENA countries is rising fast and steadily. This often brings about increasing instability of electricity grids, supply deficits and decreasing energy security. Additionally, the energy sectors in MENA countries are facing other major problems:

- high energy subsidies paid by governments
- a lack of incentives to use energy efficiently
- the absence of sustainable long-term and environmental policies
- limited potential to further increase the production of crude oil (valid for oil

exporters only)

In the current political environments, nuclear ambitions are manifold. In general, supporters of nuclear energy in the MENA region present the following arguments for the construction of nuclear power plants:

- the creation of high-level jobs for economic growth
- ensuring a secure energy supply for the rapidly increasing demand for power
- reducing energy import dependence in the non-OPEC countries
- supplying environmentally friendly energy with containable risks
- reducing domestic fossil fuel consumption and keeping export levels high
- achieving technological leadership in the region and beyond
- acquiring prestige for internal and external political agendas

In the following article, we aim to analyse some of the main arguments and conclude that nuclear energy is not a preferable energy option for the MENA states.

### Nuclear Energy for the Middle East: The Major Obstacles and Pitfalls

**The contribution of a secure and stable electricity supply:** it is doubtful that nuclear energy will guarantee a stable and secure electricity supply in all MENA countries, as nuclear power is not the appropriate solution to the current level of average growth in electricity demand. Lead times for nuclear power plants are usually around about 8-12 years (and by experience they can stretch out even further). Therefore nuclear power cannot fill the demand

gap in a timely manner. Contrary to this, renewable electricity projects (even large-scale ones) have considerably shorter lead times and can thus contribute to the supply of national power demands significantly faster. Evidently, the fastest way to tackle pressing supply issues is the utilisation of energy efficiency potentials

It could become impossible to introduce both renewable and nuclear power due to the different nature of both approaches.

that are significant in all states of the region.

**System stability** is closely linked to technical characteristics. The size of an electricity system is most relevant in this regard because the relation of absolute size and the single largest power generation unit is crucial for factors such as backup-capabilities. The Algerian energy system, for instance, is probably too small to be able to integrate nuclear power (nuclear energy was originally projected to contribute around 10% to domestic electricity production by 2020 with probably only one reactor in operation), however the integration of a large generation unit is technically complex in the small electricity system in Algeria and requires very large reserve capacities, given that power plants have regular maintenance cycles. Unforeseen shut-downs would also cause blackouts. Detailed assessments of systems sizes were conducted

in a research project by the Wuppertal Institute and Adelphi Consult (Energy Systems in OPEC Countries of the Middle East and North Africa - System Analytic Comparison of Nuclear Power, Renewable Energies and Energy Efficiency).

The consideration of system size reveals another dimension: many MENA countries also try to use renewable energy for electricity production. However, depending on the absolute amount of intermittent renewable energy capacity installed, it could become impossible to introduce both renewable and nuclear power due to the different nature of both approaches. While renewable energies are mostly intermittent (except concentrating solar power plants with large heat storage systems), nuclear power is supposed to operate on a 24/7 basis. Furthermore, an energy-efficient energy system runs counter to the introduction of nuclear power because in an energy system that is more efficient, total generation capacity would be lower and this would make it even more difficult to integrate large nuclear power units.

Looking at the construction **costs of nuclear power plants**, investment costs for nuclear power were historically characterised by strong cost overruns. Indeed, after going on-grid, total construction costs were often more than twice as high as initially projected (see table 1). This makes it very difficult to reliably calculate the total costs of nuclear power.

Investment costs for **renewable energy technologies** are also higher than those of natural gas-based combined cycle plants.



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Table 1: cost estimations and real costs of nuclear power plants

Nuclear Plant (Start of building)	Original Cost Estimation	Actual Cost	Cost Escalation
75 operational reactors in USA	US \$ 45 billion	US \$145 billion <sup>1</sup>	+ 324%
Tarapur III and IV, India (implementing 2006)	Rs Crores 2,428	Rs Crores 6,200 <sup>2</sup>	+ 255%
Temelin, Czech Republic (2007)	CZK 20 billion	CZK 99 billion <sup>3</sup>	+ 495%
Sizewell B, UK (1987)	GBP £1.691 million	GBP £3.7 million <sup>4</sup>	+ 219%
EPR OL 3 Olkiluoto, Finland (2003)	Euro €3.2 billion	Euro €4.5 billion <sup>5</sup>	Min. + 41%

<sup>1</sup> Thomas, Bradford, Froggatt, Milborrow (2007). <sup>2</sup> Ramana et al. (2005). <sup>3</sup> IEA 2001 (for 1998). <sup>4</sup> House of Commons (1990). <sup>5</sup> Alich/Hopfner (2008)

Accordingly, total investments will be considerably higher. However, the situation of an energy exporter is very different from that of energy importers. By sparing natural gas in the domestic electricity sector, more gas could be exported thus generating foreign currency. This effect is larger than the cumulative differential costs of renewable and natural

It is improbable that MENA states will be able to establish a strong domestic nuclear engineering industry that will be able to supply all the essential technological components of a nuclear power plant in the foreseeable future.

gas technologies. By including natural gas price curves in the calculation, there is a very strong indication that Iran would economically benefit from such a substitution strategy, even at natural gas prices that are considerably lower than current prices in Europe.

Another argument commonly employed by proponents of a nuclear future is the enhanced **independence from energy imports**. This argument has to be put into perspective: no MENA country has enough uranium ore reserves to sustain a domestic nuclear fuel supply. Consequently, nuclear fuels will have to be imported during the full lifetime of the power plant. At the same time, it is improbable that MENA states will be able to establish a strong domestic nuclear engineering industry that will be able to supply all the essential technological components of a nuclear power plant in the foreseeable future. Therefore, import dependencies will not be avoidable for MENA countries on these two levels (fuels and technologies). This problem has been addressed only by the UAE so far. Its government officially stated that it intends to import fuel rods only and will then export

them directly after their depletion to guarantee maximum transparency of all nuclear material.

It should be noted that for an oil-exporting country like the UAE, relying on nuclear fuel imports will mean a certain **loss of energy autonomy**. Even if a country is endowed with uranium ore (like Algeria and to some extent Iran), the processing stages for ore mining to the production of yellow cake to fuel rod production are very complex and require wide-ranging technological and engineering expertise that is currently not available in MENA countries. Thus, building up domestic uranium mining industries does not make countries independent from nuclear fuel imports. This is different for the use of renewable energies. Although import dependence on technologies will be an issue for the first few years of a large-scale deployment of renewable energy capacities, it is much easier to establish domestic renewable energy industry structures.

Besides the proliferation risks, other **non-technological aspects of nuclear power** have to be taken into consideration. Since the earliest days of the nuclear industry, its supporters have promoted the allegedly clean and environmentally friendly aspects of this technology, particularly in comparison to conventional power plants. This argument has recently been fuelled by the climate change discourse and the admittedly low carbon emissions of a nuclear power plant. Nonetheless, other burdens are heavy and should not be readily dismissed. Apart from the risk of accidents in nuclear power plants, the entire life cycle of nuclear power generation is highly wasteful and environmentally costly. Uranium mining leaves behind a contaminated soil and the issue of the disposal of nuclear waste is still far from being solved on a global level.

In contrast to that, the life cycle analysis of all modes of renewable electricity production looks far better in all respects. As mentioned above, the UAE found an elegant solution to these problems on a national level. By importing fuel rods and exporting depleted ones

as part of a leasing scheme, the UAE would fully externalise the environmental burden and human health risks of the nuclear fuel cycle to foreign countries. However, problems of mining and the disposal of depleted rods do not disappear on a global scale; they are simply shifted from one country to another.

It has been argued that the construction of nuclear power plants in the region would have **benefits for the local job market** and this argument deserves further scrutiny as well. As previously stated, it is highly unlikely that a full-fledged nuclear industry will be established in

It seems the system-wide benefits of energy efficiency are underestimated in the region in general.

the MENA region in due course. Even if this happens though, the potential for domestic jobs will be limited to a few nuclear engineers, traders and power plant construction and maintenance workers. In the case of a strong renewable energy commitment, they would easily be outnumbered by the large job creation such a program would trigger, not only in the highly-skilled labour market but also in the application, installation and maintenance sector, where a high number of low-skills jobs could be created as well. In all likelihood, this would have a lasting effect on the strained domestic labour market. Energy efficiency measures could also create numerous jobs in the retrofitting and maintenance sector.

#### Coping with Rising Electricity Demand in the MENA Region

The traditional approach to rising demand has been to increase the supply base by working on the supply side. However, this approach seems to be more and more outdated and close attention should instead be given to the demand side: how can energy demand be curbed? Is ever-increasing energy consumption

the fate of developing economies? (It most certainly is not). However, most Middle Eastern energy policy frameworks are not suited to tackle this problem as the key demand driver in the region can be seen in the omnipresent, high electricity subsidies that are paid to electricity customers of all income groups in the same manner. Far-reaching reforms of MENA energy price regimes seem inevitable to guarantee a long-term, stable and secure energy supply. This includes the introduction of energy saving incentives such as the reduction of subsidies to make consumers pay real prices.

In general, the demand side has to be emphasised when it comes to sustainable energy solutions. This includes mainly energy efficiency measures and incentive schemes. Various studies show that by fostering energy efficiency measures, there would be no intrinsic necessity for high demand growth in MENA countries. It seems that the system-wide benefits of energy efficiency are underestimated in the region in general. Some of the most important benefits could be the reduction of external costs of energy consumption, large net benefits in economic and trade balance terms (e.g. via an increase in oil and gas exports), as well as enhanced energy security. All of these approaches would make nuclear power in MENA countries dispensable, simply from the perspective of energy demand.

#### Alternatives for Power Production

To consider the **supply side**, what direct alternatives exist to nuclear power? Once again, analysis shows that renewable energies would be the preferable option. The key reasons for this are the following:

- Natural potentials are very large to satisfy future energy demand in MENA countries.
- The ecological burden is by several orders of magnitude lower than for nuclear power.
- Although renewable energy technologies are significantly more expensive than those for fossil fuels, their large-scale deployment generates enormous economical benefits especially for energy exporting countries:

using renewable energies domestically allows increased exports of crude oil and natural gas.

- Technologies for renewable energies would have to be imported in the first few years, but compared to nuclear energy technologies it would be easier to establish domestic production facilities.
- By using renewable energies and energy efficiency measures MENA countries could also create a win-win situation in the climate change regime. As potential frontrunners of climate protection they could strongly benefit from international technological transfer and act as a group to foster the change to sustainable energy systems on a global scale.
- Scenarios show that renewable energies and energy efficiency would generate very high export revenues for Iran and other hydrocarbon-exporting MENA countries. Due to various energy indicators that are identical for all OPEC members, the results can be generalised for OPEC as a whole: countries would benefit from a high renewable electricity share in their domestic energy systems and from domestic energy efficiency measures. Taking the current situation of OPEC in the climate regime into consideration, efficiency and renewable energy could be a powerful means to convince these countries to take a sustainable development path as well as overcome their previous tactics of thwarting the climate negotiations.

In conclusion, nuclear energy is neither inevitable nor the most desirable option for energy supply and the future energy policy dimensions of the MENA countries. Renewable energies and energy efficiency measures are alternatives that show significantly greater benefits. Regional stakeholders can (and must) choose how they want to shape domestic and regional energy futures. They can opt for the sustainable development of energy systems or

for the opposite effect; for flexible and partly decentralised forms of power production or for

In conclusion, nuclear energy is neither inevitable nor the most desirable option for energy supply and the future energy policy dimensions of the MENA countries.

the inflexible alternative of big industry. They can foster large-scale job creation and become leaders of renewable energy (and energy efficiency) innovation - or continue pursuing an outdated form of energy policy that is fixated on demand growth, short-term solutions and long-term costs, coupled with unforeseeable externalities.



## Web Guide: the Myths of Nuclear Power

The recent earthquake damage to at least one reactor in Japan has again highlighted the potential hazards of nuclear power in a dramatic way. The description of nuclear power as reliable, secure, and a source of unbeatable energy has turned out to be a myth. The nuclear power industry has struggled to make a comeback for decades. Now a revival is more unlikely than ever before. The catastrophe in Japan puts new focus on the operation of existing plants.

To address the myths of nuclear power, the Heinrich Böll Foundation has commissioned renowned international nuclear experts to deliver reports that provide the public with an overview of current, facts rich, and nuclear-critical know-how. The complete guide is available online on the foundation's webpage.

[www.boell.de](http://www.boell.de)

With Contributions by Gerd Rosenkranz, Steve Thomas, Henry Sokolski, Antony Froggat, Mycle Schneider and Otfried Nassauer.

# Nuclear Reactors or Hernia Surgery?

The debate on the use of nuclear power in Europe inspired an Italian cinema company, MOROL Productions, to produce a documentary entitled 'The Nuclear Question'. This documentary was shown at the Rome Film Festival in October 2009 and received awards for presenting the

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nuclear question from ethical, environmental and economical perspectives.

A quarter of a century after the Chernobyl disaster and its repercussions, and three decades after the Three Miles Island nuclear accident in the US, the film poses several questions: is there a moral justification for accepting the potentially disastrous results of nuclear accidents in order to meet raising energy demands? Is the nuclear energy option inevitable? Or was Italy's 1987 decision to ban nuclear reactors (based on a referendum held after the Chernobyl disaster) a wise decision?

When MOROL recently approached me to request an interview for another documentary on nuclear energy in the Arab region, I welcomed the idea and found it useful to contribute to a serious discussion on the subject in the Arab region.

I was asked, "Are you afraid of the devastating effects of nuclear radiation in the Arab region, given the possibility of an accident similar to Chernobyl at an Iranian nuclear reactor?" This opening question surprised me because before the Lebanese should fear the effects of an accident 2,000 km away in Iran, they should fear a nuclear accident in the Israeli Dimona reactor, which is only 200 km away. This also assumes that we limit fears to a mere accident. The Dimona reactor produces fuel for nuclear warheads and is located in a country which is at war with its neighbours and which refuses to sign the Treaty of Non-Proliferation of Nuclear Weapons. Iran has signed that treaty but is still suspected of pursuing its nuclear program for military ends. What guarantees can the Lebanese and the Arabs have against an intentionally triggered nuclear apocalyptic attack, especially from a country with which they are officially considered to be in a state of war with?

Furthermore, at the opposite end of the Mediterranean, dozens of nuclear reactors exist in France and it is sufficient for just one accident to occur for radiation to reach Arab countries across the Mediterranean. Moreover, Turkey is preparing to construct nuclear reactors on the Akoya coast close to Cyprus, only 300 km away from Beirut.

"These reactors are all closer to us," I pointed out to my interviewer. He commented that in spite of this, many Arab countries have begun to build nuclear power stations. "This is true," I told him, "and Arab countries have multiple motives. Some suffer from a deficit in energy resources yet possess stocks of uranium, plan to extract it and use it to produce

electricity from nuclear energy, as is the case in Jordan." Feasibility studies often ignore the cost of dismantling nuclear reactors and dealing with the waste which, apart from the environmental risks, would increase the liabilities and outweigh potential economic benefits in any case.

Moreover, other Arab countries are rich in conventional energy resources and still want to 'purchase' nuclear technology under the banner of diversifying energy resources and accelerating development. The danger lies in luring some countries into buying ready-made nuclear technology and equipment, under the pretext of a regional balance of power, which may lead to wasting national wealth in an absurd race. This race is not based on developing and owning technology but on buying ready-made equipment from 'international sales representatives', including heads of state, who offer both nuclear reactors and military equipment on the same plate, sometimes as part of so-called 'peace initiatives'.

It seems my answer provoked my interviewer, so he asked, "Are you against Arabs acquiring advanced technology, including nuclear?" Of course I want Arabs to develop and own all technologies and invest in science, literature and art. But what does buying nuclear reactors mean, when Arab citizens still have to travel to hospitals in Europe and America for treatment of the simplest injuries or diseases?

Before we talk of nuclear reactors, what have we achieved in the field of scientific research, whether in medicine, engineering, physics, economics or sociology? The Arab region still ranks amongst the lowest in the world in terms of budget allocation to scientific research. A stark manifestation of this is that while Arab countries produce 60 per cent of desalinated sea water in the world, they continue to import desalination technology, equipment, spare parts and in most cases foreign scientists, managers, technicians and workers. So we have to ask whether the construction of nuclear reactors should be accorded a priority over building a factory to produce membranes for water desalination, let alone complete

desalination plants? Is a nuclear reactor more important than developing medical services so

Ultimately, is it not more useful to invest in renewable energies, especially sun and wind, which are free, clean, safe and abundantly available in the Arab region, before seeking to produce nuclear electricity?

that citizens are not forced to travel to foreign hospitals, like the Mayo Clinic, for surgery as simple as removing a hernia or a gallbladder?

Ultimately, is it not more useful to invest in renewable energies, especially sun and wind, which are free, clean, safe and abundantly available in the Arab region, before seeking to produce nuclear electricity?

Arabs have the right to develop and own technology, including nuclear, on condition that they identify priorities and uses according to real needs and in compliance with safety and security considerations. We should be aware, however, of falling victim to an artificial nuclear race that only serves international salesmen.

**This commentary has been re-written by the author for 'Perspectives Middle East', based on his monthly editorial published in September 2010. Translated from Arabic by Doreen Khoury.**



Najib Saab

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# Going Nuclear: An Arab Oppenheimer?

## An Arab Response to Iranian Nuclear Energy Ambitions Should be Dictated by Wisdom and Not by Emotion

The response of Arab states to Iran's bid to join the nuclear club can be best described as reactionary. Perhaps such rejoinders divulge fear - or perhaps they smack of envy. Whatever the case, Arabs are ill-advised to apply emotion where wisdom is needed.

Unrelated developments throughout history have often diverged to create circumstances

The pursuit of nuclear power may spur on other developments, which could take the region into a new age defined by innovation.

that breed human creativity, whether through necessity or an enhanced environment. Without falling into the Orientalist trap of banding the Arab Middle East (AME) into a monolithic mass of homogeneity, I sincerely believe developments in the region are creating the necessity for a new progressive approach. There is a need to contend with traumas domestically and from within the International system: the AME is crying out for its own Oppenheimer.

### Solar Revolution and Scientific Attainment

Now, this isn't a call to produce an assembly line of nuclear physicists or develop a stockpile of nuclear weapons. Indeed, the Oppenheimer metaphor refers to stimulation and pursuit of scientific knowledge, to revisit a past cultural tradition where the reverence of higher learning was deeply enshrined.

The age of oil will be increasingly passing.

Arab states, along with Iran and other nations, are correct to be seeking preparation for a post-oil age. The Arabian Peninsula may be the prime setting for a solar revolution: there is an abundance of financial and physical resources. Many pro-environment consultants complain about the lack of political will both in Europe and the United States to undertake such projects en masse. However, rentier economies in the Gulf are hardly overflowing with big energy lobbyists preventing pro-environment legislation from being established - one has to look no further than Abu Dhabi's Masdar City. Yet it must also be stated that most forms of scientific endeavour produce unforeseen positive offshoots.

No matter how alarming the expenditure on researching and developing military hardware, many functional externalities have been produced. I am not advocating such a dehumanising use of capital! Pursuing nuclear power may seem contradictory to the pursuit of solar power, but the region must primarily focus its 'energy' on scientific advancement. The pursuit of nuclear power may spur on other developments, which could take the region into a new age defined by innovation.

### Arab Reactions & Reactors

Going nuclear may be more burdensome than rewarding. From the Atlantic Ocean to the Gulf, both rich and poor Arab governments have placed orders for nuclear reactors. Each nation - rightly or wrongly - is scrambling to catch up to the Iranians by going nuclear.

Gamal Mubarak<sup>1</sup> is promoting the revival

<sup>1</sup> At the time of writing Hosni Mubarak was still president of the Egyptian Republic.

of Egypt's nuclear programme; Shaykh Sayyid Hassan Nasrallah sees (in emulation of Iran) a solution to power shortage in Lebanon. The Saudis have their own plans for purchasing reactors, and may even insist on uranium enrichment since Iran is already on the case.

The rush for nuclear reactors may be

Oil spills may be cleaned and controlled before they spread further afield - radiation leaks cannot.

ill-thought. Nuclear programmes demand scientific, political, moral and environmental responsibilities. They come with hefty costs and benefits, but also liabilities, and these must be accounted for. The small geography and proximity of tiny states with dozens of reactors may prove more calamitous than Iran seeking to acquire nuclear capability. Also, the serious liabilities of incidents (as in Chernobyl) within such small surface areas render national borders meaningless: nuclear radiation travels in all directions. Oil spills may be cleaned and controlled before they spread further afield - radiation leaks cannot.

Accidents such as those on Egyptian rails and ferries are reminders of the lag in high standards of health and safety across the Arab geography. Egypt is planning the construction of eight reactors over the next 20 years in order to add up to 60,000 megawatts to its current electric generation capacity, but there are questions about the suitability of the chosen site. Despite endorsement from the country's National Power Plants Authority, its potential impact on tourism, (the site is near Alexandria) along with the potential danger to neighbouring populations, warrants further debate.

### Investment in Indigenous Intelligence

Of the tiny Gulf Co-operation Council states, only Saudi Arabia has the surface area necessary for having such installations. Plus,

if the GCC is serious about going nuclear, isn't this an opportunity for collective ownership, management, and benefit from nuclear research and energy? This is a time when the utility and viability of a sustainable community of interests is put to the test!

Other questions beg answers. Could a GCC nuclear future be realised without the necessary human resources and scientific know-how? Most fundamentally, all Arab states must not ask why Iran is going nuclear. More appropriately - and I say this with the following paragraph in mind - they should be asking themselves why they don't have the ability to go nuclear.

The answer lies in education and scientific attainment. Where is the equivalent pool of Arab scientists that Iran possesses today? The way forward is more universities and research for the purpose of delivering a more creative Arab future. Emphasis on science and technology will lead to the peaceful, safe and environmentally sound development of alternative sources of energy.

Hints at this future lie in the kinds of universities in Qatar (Education City) and Saudi Arabia (King Abdullah University of Science and Technology) that have opened up. Arabs cannot afford to lag behind by simply remaining consumers of technology. Nuclear energy must not be treated like a weapons system that is bought whole and transplanted with foreign know-how. It requires ongoing indigenous creativity and research.

### Interdependence not War

Iran going nuclear must not alarm the Arab world. Israel has a bomb. So what?

Nuclear weapons are an unrealistic option - suicide - whether committed by Israelis, Iranians or anyone else.

Arab Gulf states, in particular, must heed history by not rushing into a conflictual solution against Iran as they did when they supported Saddam. That war was executed with their money and threatened their own sovereignty and security. Hasn't the Prophet of Islam said



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that the faithful is never bitten from the same 'hole' (or snake) twice?!

Ideally, Arabs and Iranians would cooperate in peaceful nuclear research so that the region may use local resources and indigenous know-how for joint development. Iranian and Arab knowledge once founded a brilliant synthesis in Sibawayh or Avicenna; Russians and Americans, former adversaries, today cooperate in space research and development.

For the Western world, if non-proliferation matters, then de-nuclearization should be made universally applicable and mandatory.

Thus, a regime for peaceful interdependence can potentially unhinge the realist war-mongering 'paradigm' coming from within and without the region.

Arabs can design their own projects, and the US, EU, Russia, China and India can then add technological value, diplomatic good will and overall guidance. Such initiatives may constitute the basis for a pluralist and liberal vision for refashioning the region's international relations. This, in turn, will lead to a shifting of emphasis from selfish statism and conflict to communal interests and co-operation.

#### Postscript: Going Nuclear-free

Ideally, the whole world goes nuclear-free, and people do not have to live with the scenarios of 'what if'. For the Western world, if non-proliferation matters, then de-nuclearization should be made universally applicable and mandatory. Unfortunately, the persistence of real-politik makes this nothing more than a pipe dream. With the push towards nuclear energy in the region, my hope among all hopes is that a new dawn of ethical innovation is borne out of this precarious pursuit.

Morality and wisdom must bond with science. As Oppenheimer discovered after the

first Atomic bomb test, quoting the Hinduism's sacred text: "If the radiance of a thousand suns were to burst at once into the sky, that would be like the splendour of the mighty one... Now I am become Death, the destroyer of worlds."

That is an evil not worth a million 'Islamic', 'Hindu', 'Jewish', 'Christian' or 'secular' bombs'.

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## Women and Nuclear Energy

We are approaching the end of the energy era, during which oil had been considered "cheap", and are now transitioning to an era that will be characterized by the increasing exhaustion of non-renewable energy resources. The potential scenarios are alarming. They include oil wars, competition for the production of nuclear

Solar thermal energy could satisfy all the energy needs of the Arab world in a clean and safe manner.

energy, and a rush towards hoarding land for the plantation of bio-fuels. The debate on the replacement of fossil sources by other energies, including renewable as well as nuclear energy, is hence of fundamental importance.

In the Arab world, solar thermal energy could satisfy all the energy needs of the Arab world in a clean and safe manner.<sup>1</sup> But the current trend in the Arab world is leaning towards adopting the nuclear option, albeit with different approaches. There is a general tendency among the major oil-producing countries to refute the fact that their energy sources are not infinite. Although some countries like Morocco or the United Arab Emirates (particularly with the Masdar project), and also to a lesser extent Egypt, Jordan and Syria, are involved in renewable energy projects, this effort remains modest, also due to technical reasons of supply and efficiency.



Leila Ghanem

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<sup>1</sup> I am emphasising solar thermal energy, in contrast to solar photovoltaic energy, the efficiency of which drops with heat.

Unlike Saudi Arabia, which opted exclusively for nuclear energy, there are countries like Tunisia and Egypt that are getting involved in renewable energy projects - certainly under the pressure from civil society organizations - but at the same time believe that the nuclear option remains the most reliable one in the medium term.

European discourse, interest and expertise play an important role. French President Nicholas Sarkozy lately explained his policy in the Mediterranean region: "If we don't give the future energy to Southern Mediterranean countries, how will they develop? And if they don't develop, how are we going to fight terrorism and fanaticism?" It is no coincidence that France created an International Institute of Nuclear Energy. In 2009, the French Atomic Energy Authority - henceforth the Alternative Energies Commission - welcomed 1000 foreign doctoral and postdoctoral students, 14 % of whom come from the Maghreb." The president of the French Society of Engineers and Technicians stated that France, apart from Tunisian and Algerian students, will also especially welcome students from Jordan and the United Arab Emirates. The representative of the French Atomic Energy Authority, Jean Cazalet demanded that "those who express doubts towards nuclear energy, should at least mention the risk of the lack of energy and, above all, the lack of water". Accordingly, Tunisia is hoping to acquire a light production unit of 600 MW which would ensure coverage of 15 % of the country's needs, and Egypt is planning to launch a nuclear power station before 2020.<sup>2</sup>

<sup>2</sup> See the proceedings of a conference held in 2010 at the Institute du Monde Arabe in Paris on nuclear energy, and of a

Germany by contrast has a different, more responsible attitude and a stronger commitment to sustainable development. With the Desertec Initiative, it is working on establishing renewable energy supply with electricity from desert regions both to the Near and Middle

**Women account for only a tiny section of the energy production sector and they are hardly represented in the executive boards of relevant energy bodies.**

East and North Africa, and Europe. Its goal is to intensify economic interdependence through cooperation in the renewable energy sector, also through seawater desalination projects that create conditions favorable to agricultural production growth, and via knowledge transfer. Initially designed with a strong peace-building component, the project also conceives intercontinental collaboration on energy issues as a contribution to inhibit the potentials for economic and political conflicts.

Wider public opinion, particularly in Europe, remains skeptical of nuclear energy. This is especially true for women. Opinion polls that the European Commission conducted in 2005 reveal that only 27% of European women, compared to 47% of men, believe that nuclear energy provides an alternative solution to replace polluting fossil energy<sup>3</sup>. However, Greenpeace pointed out that the same poll showed that 77% of all European citizens generally consider themselves poorly informed about radioactive waste.<sup>4</sup>

One of the Millennium Development Goals

conference held in the same venue in June 2006 on renewable energy.

<sup>3</sup> Opinion poll carried out in 2005 by the European Commission with 24708 citizens from Europe of 25 on the matter of nuclear energy. This poll was included in a survey called Special Euro barometer 227 – radioactive waste.

<sup>4</sup> Greenpeace / France commented widely on the European poll by emphasizing on the fact that citizens are not well-informed about nuclear energy and that the poll should have kept count of that.

addressing gender and energy sets the task of securing durable energy and environmental policies, including the nuclear option. Arguments presented include the fact that women in developing countries are highly dependent on natural resources for their subsistence. Droughts, floods and extreme meteorological phenomena due to growing greenhouse gas emissions are severely affecting developing countries, where women are struggling to provide their families and themselves with food in an increasingly deteriorating environment. Therefore technological innovation should be employed to make their daily lives easier. By putting at their disposal, for instance, nuclear fuels capable of replacing wood, their health and the environment would significantly improve. The time saved would allow women to devote themselves to education and to take part in income-generating activities. The argument in favor of nuclear energy in this context is thus build on the assumption that it helps breaking the vicious circle through which solid fuels impede economic development, whereas poverty limits the ability to adopt cleaner fuels.

The formulation of the Millennium Development Goals is based on accurate and well-founded research, but the resulting recommendations and deductions can be used wisely or less wisely. Environmentalists and feminists should use them for promoting alternatives in the range of sustainable practices, in particular renewable energies. One can also observe that these development directives of the MDGs do not necessarily take into account women's views on energy strategies.

The problem of women's access to natural resources is well recognized. Social and cultural reasons lead to marginalization in the economy and democratic decision-making when it comes to the management and governance of natural resources. Most women only have usage rights of natural resources, such as land, water and forests, while they for instance have no say in the industrial exploitation of these resources. The fact that women have less access to

productive resources has an impact on their living conditions and strategies, and potentially contributes to their vulnerability.

In the Arab world, women account for only a tiny section of the energy production sector and they are hardly represented in the executive boards of relevant energy bodies. It is therefore not surprising that in energy and nuclear energy policies, they are almost completely marginalized. There is also hardly any women's voice in the Arab debate on nuclear energy. This is not exclusively due to the paternalistic prism but also due to the fact that the general public is hardly informed on such matters and an Arab expert debate on nuclear energy has just started. However, Arab women are at the heart of civil society, fighting for the environmental cause and against climate change. Women also play a significant role in scientific research in universities in Egypt, Jordan, Morocco, Tunisia and Iraq. Not by coincidence, these are also the countries where we are witnessing a significant increase in environmental civil society activity.

A symposium titled "Women and Renewable Energy: Various Future Options", held in Abu Dhabi in 2006, represented a new debate. It

**As the Arab region's resources are limited, women's interest in sustainable development is a very fundamental one.**

asserted that renewable energy development concerns Arab women strongly as it is them who mostly care for their children's future. It affirmed that Arab women have a fundamental interest in peace, access to quality medical care, education, satisfactory living conditions, fundamental human rights, and the respect for human dignity. As the Arab region's resources are limited, women's interest in sustainable development is a very fundamental one. Women are often more affected than men by environmental crises such as the depletion of natural resources caused by drought, deforestation or overexploitation of land, as it

directly affects their sustenance labor. When the collection of water, wood and animal fertilizers is becoming more energy- and time-intensive, it also prevents them at least from partly investing in education or other activities. Promoters of nuclear energy claim that the influence of technology has a positive role in enhancing women's access to education, while women are excluded from deciding and choosing the kind of energy and environmental policies they want.

Nuclear proliferation constitutes one of the major threats on the international level, and the dangers of nuclear energy in conflict regions are especially prevalent among women. The use of "peaceful nuclear energy" in the Arab world is clearly interrelated to the nuclear arms issue in terms of the proliferation risk. The mining, transportation and use of uranium and other substances used for or in the process nuclear energy production poses an imminent threat. In Iraq, studies point to the severe impact of the US and Britain's use of depleted uranium weapons and ammunition on the health of the local population. Associations such as Arab Women Solidarity provide on women's cancer symptoms and congenital defects as well as the increase of cancer, particularly leukemia, among Iraqi children.

Some environmental associations are demanding nuclear disarmament, but still do not oppose the use of nuclear energy. Environmentalists and feminists should stress that these are interconnected. Energy issues are inseparable from those of human welfare and economic development in general. In order to form a stronger opinion among Arab women, NGOs should raise awareness of the risks that concern women especially, such as thyroid cancer caused by radioactive radiations, which are all the more dangerous as our senses cannot detect them. The development of the Arab debate on future energy will depend on whether the public will be engaged in it, and this will be a crucial part of the wider debate on democratization in the region.

**Translated from French by Layla Al-Zubaidi.**

# United Arab Emirates (UAE): The Nuclear Program and Renewable Energy Alternatives

There is no doubt that energy security is one of the most crucial problems in the world today. Energy is the backbone of modern developed societies worldwide and, as a consequence, energy supply is a global problem. One third of greenhouse gases

The Gulf region's view on the issue of fossil fuel energy resources, renewable energy and climate change has changed significantly in the last few years.

are caused by the use of fossil fuels and the global economic crisis is linked to fluctuating energy prices. Water desalination, cooling and air conditioning all expend high levels of energy. In fact, achieving sustainable development depends on overcoming energy shortages and on using energy in a more efficient way and with a smaller carbon footprint.

The Gulf region's view on the issue of fossil fuel energy resources, renewable energy and climate change has changed significantly in the last few years. There has been a dramatic shift towards energy diversification with a new resolve to fight climate change and play a vital role in the emissions-trading market. This argument is used by advocates of nuclear energy as well as by those who want to invest in renewable energy research and initiatives. The following article tries to look at the discussion in the UAE and Gulf region.

## The UAE Nuclear Program

The UAE government decided to pursue the peaceful use of nuclear energy. In December 2009, a US\$20.4 billion nuclear development contract with the Korea Electric Power Corporation (KEPCO) was signed. It came less than two years after the government declared its intention to pursue nuclear energy. KEPCO leads a consortium of companies including Samsung, Hyundai, Doosan Heavy Industries, Westinghouse and Toshiba. The construction of four nuclear plants in the UAE, designed on KEPCO's third-generation pressurised water reactor, is planned.

A tight construction schedule for the four-reactor complex has been announced. The first construction work at the site will start in February 2012, the first fuel delivery is planned for 2016 and the first of four 1,400 MW plants should be ready to deliver electricity to the grid as early as May 2017. The entire complex is scheduled to begin generating power by 2020 and the UAE's reported aim is to generate up to 25% of its power from nuclear energy by 2020.

## Official Energy Needs Assessment

The development of a nuclear energy program was based on an in-depth evaluation of the UAE's future energy needs. An initial study determined that national annual peak demand for electricity is likely to rise to more than 40,000 MW by 2020, reflecting a cumulative annual growth rate of about 9% from 2007. The UAE then studied options to meet this demand and came to the following conclusions: -

- Natural gas reserves will only be able to satisfy 50% of UAE electricity demands by 2020.

- The burning of liquids (crude oil and/or diesel) would be logistically viable but costly and environmentally harmful.
- Coal-fired power generation, whilst potentially cheaper, would be environmentally unacceptable and potentially vulnerable from a 'security of supply' standpoint.
- In 2006 the UAE produced 66.8 billion kWh of energy (gross), 98% of it from gas and it has a capacity of around 18 GWe. Electricity demand is growing by 9% per year and is expected to require 40 GWe by 2020.
- And finally, whilst the deployment of renewable and other alternative energy supplies would be desirable, they would only be able to supply 6 - 7 % of the required electricity generation capacity by 2020.

## Nuclear Energy as a Sheet Anchor for the Post-oil Era?

Oil export revenues facilitated the transformation of the UAE into a booming economy. The UAE is an OPEC member and the third largest oil exporter in the world, after Saudi Arabia and

The nuclear transformation will further increase the power of the central government and also enhance security and intelligence measures to protect nuclear installations. In the worst case scenario, such security measures could be used against society as a whole as well.

Russia. To maintain the high standard of living and to cope with the expected population increase, the UAE has looked into ways of guaranteeing its energy security for the post-oil era. Thus, in the UAE's view, nuclear power

became an option to secure its energy needs. The main motives were as follows: -

- Growing electricity demand versus insufficient gas resources has resulted in electricity cuts in Sharjah and the northern emirates, especially during high peak season in summer.
- The availability of necessary funds for the immensely high investment costs of nuclear technology due to high oil revenues and the wealth of sovereign funds.
- The aim to reduce the carbon footprint and improve its bad image as a climate killer. The UAE had the highest amount of carbon emissions in the WWF and World footprint network reports of 2006 and 2008.
- Strategic strengthening of the role of the central government and its continued control and legitimacy in the post oil era with a centralised nuclear program.
- The creation of a highly skilled economic sector that diversifies its economy away from hydrocarbons. Authorities view this sector as a major avenue for the transfer of technology as well as a new jobs arena for unemployed UAE nationals. The KEPCO contract provides training for Emiratis to enable them to take most of the 2,300 nuclear sector jobs by 2030.

## The Key Entities Implementing the Program

1. Federal Authority for Nuclear Regulation (FANR): The FANR is responsible for the regulation and licensing of all nuclear energy activities in the UAE.
2. Emirates Nuclear Energy Corporation (ENEC): The ENEC is an Abu Dhabi state-owned corporation. Its task is to develop nuclear plants in the UAE.
3. International Advisory Board: This advisory body will include former heads of national regulatory bodies, nuclear industry leaders and recognised academic authorities. It is supposed to report directly to the



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Ministry of Presidential Affairs and provide independent assessments of the status and performance of the various entities. It is responsible for the observation of areas of potential concern.

### Strategic Goals

On the whole, Abu Dhabi has directed the process in a transparent way whilst bypassing external and internal opposition. It has minimised external opposition by signing a number of relevant treaties, by avoiding enrichment activities and reprocessing (associated with nuclear weapons), and by agreeing to the International Atomic Energy Authority's enhanced counter-proliferation measures. Such arrangements will secure the supply of nuclear fuel as well as safe and secure transportation.

On a political level, the UAE would like to diversify its foreign policy to allow cooperation with Far Eastern countries, due to discontent with US policies in the region. However, it intends to keep a balance by strengthening relations with Western countries such as the USA and France, with whom the UAE has also signed memorandums of understandings (MOUs) for nuclear power cooperation.

Internal opposition was diminished with a

**The UAE could face threats to its nuclear infrastructure that are much larger than those to other countries.**

quick and centralised decision process. Today, nuclear power can hardly be seen as a future technology. Nowadays one would expect that a major decision in favour of nuclear power would require heated debates and protests amongst parties, NGOs, think tanks and individuals. However, civil society and anti-nuclear groups in the country are weak. The nuclear transformation will further increase the power of the central government and also enhance security and intelligence measures to protect nuclear installations. In the worst case

scenario, such security measures could be used against society as a whole as well.

### Environmental Problems and Risks

From an environmental perspective, nuclear energy is clearly not the best solution, even though a Strategic Environmental Assessment (SEA) has been carried out by the Environmental Agency - Abu Dhabi (EAD). The SEA is a Master Plan level document that addresses the environmental impacts of the project and includes information on mitigation measures and monitoring programs. The study also addresses the construction activities on the site.

However, there are several serious environmental concerns and threats:

- In the event of a man-made / natural accident or catastrophe there is a high risk of grave and irreversible consequences. Even with all necessary safety and environmental measures taken, the fundamental risk remains – even more so in a society which is still developing its capacities in all fields.
- In the event of any leakage into the Arabian Gulf water, this will have grave environmental consequences and will lead to the closure of some, and possibly all, of the desalination plants that dot the shores of the Eastern coast of the Arabian Peninsula. If such an accident occurred, the health of millions of people and their access to water could be affected.
- Until now, there has been no technical solution to safely get rid of or treat nuclear waste. It is more than likely that UAE nuclear program waste will be disposed of locally within the UAE borders. The arrangements relating to the disposal of used nuclear fuel remain unclear.
- The investment in the nuclear program will slow down investment into environment friendly renewable energy and the solar sector. The announced target of 7 % solar power by 2020 is already quite small in this regard.

- Uranium mining is a grave environmental and social concern in all uranium producing countries; uranium resources are not endless and will end in approximately fifty years.

### Threats

The UAE could face threats to its nuclear infrastructure that are much larger than those to other countries. The UAE lies in a volatile region: wars and insurgencies are still a reality in Iraq and Afghanistan, along with anti-government insurgencies in Yemen and, until recently, in neighbouring Saudi Arabia. Al-Qaida has threatened strikes on Gulf energy infrastructure and the UAE's nuclear installations could be a target. In the event of an attack on Iran by the US and/or Israel, the UAE could be a target for Iranian retaliation as it is a close target and hosts many western businesses.

### Renewable Energy Alternatives for the Gulf

Almost all types of renewable energy (geothermal, wind, solar and biofuels) can be

**Masdar has all the elements needed for success, such as a research institute, highly qualified personnel, finances and access to international expertise and experience.**

utilised in the Gulf region and the UAE. One of the main sources of renewable energy for the UAE could be solar energy. The average direct natural exposure to sunlight is about 1,800 kilowatt/hours per square metre. This is the basis for using solar energy in the region in a technically and economically feasible way. One would think that in a country abundant with solar radiation and hosting IRENA (The International Renewable Energy Agency), the utilisation of solar power would be a priority. However, the announced target of 7% solar power by 2020 is quite small.

In the last few years, many projects to explore renewable energy sources have been undertaken in the Gulf region, such as using wind power at the Trade Centre Building in Bahrain and sunlight to power some reverse osmosis units in Bahrain and Oman. The latter use a photovoltaic system in combination with wind energy to pump water and generate electricity. In the UAE, solar energy is used to power parking metres and offshore buoys as well as water heaters and air conditioners in hotels. The wind is harnessed on Sir Bani Yas Island in Abu Dhabi and in Fujairah.

It is worth mentioning that although the UAE is one of the major hydrocarbon producers and has thus managed to achieve creditable economic growth (an average annual growth rate of 5% for 1980-2008, with GDP per capita amongst the highest globally), it has taken a crucial step towards diversifying energy resources and moved in the direction of clean renewable energy, especially solar, with the Masdar initiative. In fact, Masdar has all the elements needed for success, such as a research institute, highly qualified personnel, finances and access to international expertise and experience.

### The UAE and the Regional Outlook

Since February 2006, at least thirteen countries in the Middle East have announced their intentions to develop their nuclear abilities due to increased energy needs and higher oil prices. In late 2006, the Gulf Cooperation Council (GCC) announced that it would undertake a study for a collective nuclear energy program. It completed a preliminary feasibility study with

#### THE MASDAR INITIATIVE

Masdar is the title of an ambitious UAE renewable energy project. At the centre stands the construction of Masdar City, a completely energy efficient city that is entirely powered by renewable energy and is thus envisioned to become the first emission-free city. Masdar was chosen to be the future location for the International Renewable Energy Agency (IRENA) and construction started in February 2008. Critics of the project warn that Masdar City could become a socially segregated refuge for the élite.<sup>3</sup>

the International Atomic Energy Agency (IAEA) in November 2007.

During the 1970s, high oil prices encouraged several Gulf countries to consider introducing nuclear power, with Kuwait going as far as inviting bids for a small reactor. However, the subsequent fall in oil prices, the disaster in Chernobyl and the vast costs associated with

Cairo sees itself as a natural leader in the Arab World, and with Iran being perceived as a hegemonic threat and other regional players such as KSA, Qatar, and Turkey being more self-confident, the nuclear option remains on the table.

introducing nuclear power to countries with little or no relevant infrastructure deterred most countries from proceeding further.

In 2009 the Prime Minister of **Bahrain** Sheikh Khalifa bin Salman al-Khalifa ordered the formation of a national nuclear energy committee. Bahrain signed MOUs with the United States and Russia in 2008 but neither of these resulted in a solid nuclear-cooperation agreement. In November 2009 the IAEA board approved a comprehensive safeguarding agreement and Additional Protocol for Bahrain, which have yet to be signed and implemented.

**Saudi Arabia** also signed a memorandum of understanding with the US in 2008 and has been offered assistance with nuclear energy by France and Russia. However, in late 2009 Saudi officials denied press reports that the kingdom had decided to proceed with nuclear power reactors, making it clear that a nuclear program could not proceed until major infrastructural problems had been overcome and that such a decision was not anticipated in the short term.

**Qatar** has investigated developing nuclear power and signed a memorandum of understanding with the French company

EDF in January 2008 that referred to future discussion of nuclear-power cooperation. But by late 2008 it had assessed that economic and infrastructural factors precluded the imminent procurement of a reactor.

While some countries like the UAE, Saudi-Arabia and Bahrain voluntarily agree not to enrich uranium, others like Egypt, Syria and Algeria might not follow suit. However, due to economic conditions and political reasons, it is unlikely that they will manage to do so, at least not in the next 10 years or so unless there is regional cooperation between Middle Eastern countries to speed up the nuclear programs.

**Egypt's** program is the oldest one in the region. After the Chernobyl accident, and due to economic and political conditions, Egypt chose not to continue its nuclear program. However, Egypt recently announced that it will resume the peaceful nuclear program as a result of declining petroleum resources and increased electricity demand. Egypt witnessed frequent electricity cuts in 2010 during the month of Ramadan. In 2007, Egypt announced plans to meet its growing energy shortages (7% annually) with the construction of 10 nuclear powered electric stations.

Although Egypt has longstanding nuclear experience, the main difficulty seems to be the lack of funds. Egypt has two research reactors: the Inchas reactor would even be capable of producing plutonium for military purposes. In addition, Egypt has some uranium resources. President Mubarak had not publicly dismissed the option of nuclear militarisation. Cairo sees itself as a natural leader in the Arab World, and with Iran being perceived as a hegemonic threat and other regional players such as KSA, Qatar, and Turkey being more self-confident, the nuclear option remains on the table.

A study by the Strategic Research Foundation in Paris 2008 tried to identify which Middle Eastern countries presented the greatest risk regarding military use by assessing a number of motives, such as risk realisation, political incentives, human resources in the nuclear field, current nuclear projects, financial

abilities and monitoring by the IAEA. The highest-ranking countries in the Middle East were Egypt followed by Syria, Algeria and KSA.

Finally, political reasons and the Iranian nuclear program in particular will remain a major motivation for the utilisation of nuclear energy in the region in the coming years. Only the future will determine whether these are serious initiatives or just a timely reaction towards Iran, and if renewable energy options such as solar power will be made accessible and economically feasible instead.

## A View from Germany

# Energy of the Future Instead of Technology From the Past

In recent years in particular, there has once again been increasing talk of building new nuclear power plants. Whilst nuclear power plants were expected to provide cheap

The fundamental risks of nuclear technology, together with the unresolved question of the final disposal of nuclear waste and growing public opposition to nuclear energy, led to a lively debate in Germany that contributed to the establishment of the Green party in 1980 and their first election to Parliament in 1983.



Jürgen Trittin

Jürgen Trittin has been Chairman of the Parliamentary Group Alliance 90/The Greens (Bündnis 90/Die Grünen) in the German Parliament since 2009. Until 2009 he was vice-chairman of the Parliamentary Group Alliance 90/The Greens in the German Parliament, in charge of Foreign, Security and European Policy. From 1998 to 2005 he was Federal Minister for the Environment, Nature Conservation and Nuclear Safety. In 1998, Trittin was elected as a Member of the German Parliament.

and inexhaustible energy until the 1970s, in the 1980s we were forced to face up to the myriad unsolved problems. The construction of new nuclear power plants ties up high levels of funding over a long period of time. Their operation has been characterised by unforeseen incidents and expensive upgrades (including in Germany), resulting in downtime lasting for months at a time. New incidents continue to occur and have shown that the technology is neither as safe nor as reliable as plant operators have insisted. Numerous upgrades corrected some defects but the technology's fundamental risks could not be eliminated. In the late 1980s, the re-processing strategy also failed and there was still no final disposal site for nuclear waste in sight. A final disposal site would have to allow

nuclear waste to be stored safely for a million years. To date, no such site exists anywhere in the world.

The Chernobyl catastrophe in 1986 taught the German population that nuclear power plants are fundamentally unsafe, and that an accident can have catastrophic effects. These effects would not stop at national borders but could be felt even hundreds of kilometres away. A majority of the German population is opposed to nuclear energy. Serious accidents (such as the one in Chernobyl or on Three Mile Island in 1979), public opposition and high capital costs have resulted in a drastic fall in investment in nuclear energy. Since the late 1970s, not a single new nuclear power plant has been commissioned in the United States. In Europe, the number of nuclear power stations is declining. The construction of the only new nuclear power plant in the EU (in Finland) has been dogged by delays and costs have doubled; at the same time, a series of old plants are being decommissioned.

The fundamental risks of nuclear technology, together with the unresolved question of the final disposal of nuclear waste and growing public opposition to nuclear energy, led to a lively debate in Germany that contributed to the establishment of the Green party in 1980 and their first election to Parliament in 1983. From the early 1990s onwards, a discussion about ending the use of nuclear energy emerged. When the Social Democrats (SPD) – previously a nuclear-friendly party – passed a resolution in 1990 favouring a phase-out of nuclear energy within ten years, there were calls even from within the nuclear industry for a consensus to be reached on the details of such a phase-out.

When the SPD and the Greens came to power in 1998, they reached an agreement with the operators of nuclear power stations that nuclear power would be phased out and plants would be decommissioned after an operational lifespan of thirty two years. The strategy involved the gradual decommissioning of nuclear power stations, with the last expected to shut down in 2022. In addition, the construction of new nuclear power plants was prohibited. The Federal Government did not stop there and the phasing-out of this high-risk technology was coupled with a shift towards modern forms of energy generation. However, this progressive approach was recently overthrown by the current liberal-conservative government's decision to revoke the phase-out and prolong the use of nuclear energy.

The 'Renewable Energy Sources Act' ensures that operators of installations generating renewable electricity are paid a feed-in tariff, whose level is fixed for twenty years. In this way, we have created secure conditions for the investment needed to boost this new market. A new and unexpectedly dynamic industry has since emerged and for some years now, new firms have been springing up, old companies have been expanding into new fields and 300,000 new jobs have been created.

An initial target of increasing the proportion of renewable electricity from 4% to 12.5% within ten years was set. In fact, progress

We firmly believe that a switch to renewable energy is urgently needed to curb climate change.

has been far more rapid and today [2010], renewable energy already accounts for 17% of all electricity generated (more than a four-fold increase), and that at a time when demand for electricity is rising in absolute terms. Germany is a global market leader in renewable energy and is constantly continuing to develop these

technologies. The phase-out of nuclear power and a switch to electricity produced solely from renewable sources makes sense from an economic perspective too. A federal government study estimates that between 2010 and 2050 Germany could save more than 700 billion Euros by using renewable energy instead of using nuclear and importing coal, gas and oil for energy generation. The technology already exists today to fully meet German and European demand for electricity using only renewable sources. However, the recent decision to revoke this policy puts this progress at risk.

We firmly believe that a switch to renewable energy is urgently needed to curb climate change. Oil, gas, coal and uranium are growing ever scarcer and prices will continue to rise. The use of renewable energy therefore makes sense not only in terms of climate policy but also in economic terms. In addition, only a few major companies profit from large power stations. By contrast, it is predominantly small local companies which profit from an expansion in the use of renewable energy. This is another advantage from which Germany has also benefited. For these reasons, we believe it to be a fatal error that the current liberal-conservative government in Germany has prolonged the use of nuclear power. We will continue to fight for the phasing-out of nuclear energy and pursue the renewable energy path, in concurrence with the majority of Germans.

A number of countries, including some in the Arab world, are currently interested in building new nuclear power plants. However, the many arguments against this technology are often ignored. Only a few companies are capable of building nuclear power plants and they are based in France, the United States, Russia or Korea. Specialists and experts also usually come from these countries, resulting in an immense level of dependence on the states in question. In recent years, the construction of new nuclear power plants has not only involved immense cost overruns and delays, but also malfunctions and construction defects. In addition, nuclear power plants

need to be cooled at all times. In the summer, German and French plants regularly have to be shut down due to water shortages or if rivers exceed maximum temperatures. Nuclear power stations also require a well-developed grid because vast quantities of electricity are produced at a single location which must then be transmitted long distances. At the same time, a great deal of replacement capacity must be available as nuclear power plants need to be shut down very quickly if hazardous incidents occur. Moreover, the question of how to dispose of nuclear waste safely has still not been resolved anywhere in the world.

By contrast, in the case of renewable energy, electricity is generated where it will be used. It is particularly suitable for countries

In many regions, including those in the Arab world, there is far greater potential for renewable energy than in Germany; there is more solar and wind power available for example.

whose infrastructure is currently less well-developed. All countries which have made use of renewable energy have seen the creation of many local jobs and the establishment of new companies. In many regions, including those in the Arab world, there is far greater potential for renewable energy than in Germany; there is more solar and wind power available for example. It is therefore quick and simple to begin generating electricity from renewable sources – there is no need for high levels of investment or for years to be spent on the planning and construction stages. Many renewable energy installations in Germany are operated by individuals or cooperatives. They purchase the installations, arrange for them to be installed and profit from the feed-in tariffs, whose level is fixed for 20 years.

We should also not lose sight of the security implications. The greatest threat to peace is no longer other states, as it was during the Cold War

We believe that pressing at national and global levels for the phasing-out of the civilian use of nuclear energy and instead supporting renewable energy is the order of the day.

era, but rather nuclear terrorism. It is therefore important for nuclear security to be placed at the very top of the international agenda. If nuclear disarmament is to be achieved, the spread of the civilian use of nuclear technology must be curbed as the proliferation of fissile material and of enrichment and reprocessing technology is the gateway to nuclear weapons. The risk of dual-use goods being used for both civilian and military purposes must therefore be reduced. We believe that pressing at national and global levels for the phasing-out of the civilian use of nuclear energy and instead supporting renewable energy is the order of the day.



Ali Darwish

Ali Darwish is General Secretary of the Green Line Association in Lebanon which he co-founded. He helped to establish Greenpeace in Lebanon, is regional councilor for the International Union for the Conservation of Nature (IUCN) and the International NGO/CSO Planning Committee for Food Sovereignty. He is member of the Commission on Environmental, Economic and Social Policy (CEESP), and committee member of the Global Forum on Agricultural Research. Darwish earned his Ph.D. in Agriculture in Germany.

## We Need a Long Term Advocacy Strategy Towards a Nuclear Free Region

Interview with Ali Darwish

**PERSPECTIVES:** You are a founding member of Greenline, one of the few civil society organisations in Lebanon that follows a rights-based approach to environmental questions. How do you evaluate the discourse on a worldwide “nuclear renaissance”, especially in the MENA region, from a rights-based perspective? What is your assessment of the proliferation of nuclear energy in the region from a technical, environmental, societal and security policy perspective?

**DARWISH:** The world is currently witnessing a reincarnation of the “nuclear revolution” with either civil or military objectives, or both, depending on the region in question. Such revolutions are taking place in Europe, Central Asia (Iran, Pakistan and India) and North Africa (Egypt, Jordan, Syria and Saudi Arabia). In some European countries it can be linked to the return of conservative parties to power, i.e. those that have traditionally opposed a gradual transition to environmentally friendly technologies and the abandonment of the nuclear option. In Central Asia, the context is

Given the technological capacities available in these countries, it is quite evident that there is currently no ability to manage and maintain nuclear reactors, let alone handle and dispose of nuclear waste.

somewhat different as it relates to the ongoing silent conflict between India and Pakistan:

Pakistan sees nuclear power as the key to deter its much bigger and more powerful neighbour. As a former regional military super-power prior to the Islamic revolution, Iran is seeking to regain its earlier role. Nuclear power is regarded, just as elsewhere, as an essential deterrent to threats by other countries and a key to regional hegemony. In the case of Iran, a natural neighbour of China and Russia, currently feeling the increased military presence of the United States in Afghanistan and the Caucasus (not to mention the Israeli nuclear capacity), it is not too difficult to understand why the country wants to enter the nuclear age, even if its leadership claims it is for exclusively peaceful purposes.

In West Asia and North Africa a kind of political race is going on which sees the adoption of the nuclear option as a very efficient path to solve existing energy problems and deficits. Nuclear energy is being erroneously promoted as both a financially and environmentally efficient solution: this energy discourse is heading towards the wrong direction for several reasons. Given the technological capacities available in these countries, it is quite evident that there is currently no ability to manage and maintain nuclear reactors, let alone handle and dispose of nuclear waste. To build a technical and scientific base would require years, if not decades, of preparation. Thus the whole process will depend on the availability of experienced ‘backstopping’ being provided by the countries that are willing to supply the reactors.

There is serious doubt as to whether or not the proponents of nuclear energy in the region have thoroughly investigated these

issues. From a social point of view, “going nuclear” is regarded by many as an anchor of security during times of increased resource shortages and the potential of conflict over those resources. Yet in reality, and due to the prevailing instability of the political situation in the region, nuclear facilities, with their risk of intentional or non-intentional accidents, are an additional threat to the whole population in the region.

**PERSPECTIVES: In your opinion, what are the motives that drive numerous governments in the region to promote nuclear energy and invest in this sector?**

**DARWISH:** Whilst the feasibility and efficiency of nuclear energy is being promoted as the primary reason by Middle Eastern countries, the real reason lies closer to a competitive political discourse and climate. In general, entering the nuclear era is considered to be a sign of modernisation and power. The countries in question, with the exception of Jordan, are rich in fossil fuel resources including natural gas. Additionally, these countries enjoy an

We are lobbying the governments of the region to make a radical shift in their energy policies, which currently depend on fossil fuels, and instead give the lead to renewable energy.

abundance of renewable energy resources that could be tapped.

In my opinion, the acquisition of nuclear energy by Iran and the Israeli nuclear arsenal are the main factors triggering this interest in nuclear energy. Israel has developed military nuclear power since the 1950s and has accumulated a large stock of warheads, estimated to number more than 200. These are said to be the ultimate deterrent to any Arab country launching an attack. Iran, a regional

political and military player, has sought nuclear power since the days of the Shah but so far this has been in vain. The Iranian Islamic government has continued along this path with the same motives: to reinforce its strength and power in a region where political and military tensions are not decreasing.

Commercial interests and the fact that many Arab politicians are linked to the business sector also play a role. This opens the door for corruption, as we know from past scandals regarding arms deals between the US, France and some Arab countries. I would also not be surprised if we will soon find some of the old reactors that European countries want to get rid of for sale in Arab markets.

**PERSPECTIVES: You are currently proposing a draft law to Lebanese decision-makers that would allow for the extensive use of renewable energies. You have also reviewed renewable energy policies in other countries of the region. What is your approach to nuclear energy in this context?**

**DARWISH:** As an environmental activist and a long-standing member of an environmental organisation, I am totally opposed to nuclear energy on the grounds of its excessive long-term costs, both on environmental and financial levels. In this framework, we are lobbying the governments of the region to make a radical shift in their energy policies, which currently depend on fossil fuels, and instead give the lead to renewable energy. This shift entails putting in place relevant legal regulations that would force energy providers to increase the share of renewable energy in their production by a certain annual percentage. It should also allow small and medium sized providers, including households, to feed in energy from renewable sources to the grid at preferential prices. Introducing levies on non-renewable energy sources to finance renewable energy generation could be used as a financing model.

Our opposition to nuclear energy is not restricted to those Arab countries that attempt to acquire nuclear energy for “peaceful purposes”,

but also to the military nuclear programme of the state of Israel which, as mentioned earlier, has a lethal arsenal of nuclear warheads and an outdated reactor only about 200 km from the Lebanese border. Any intentional or non-intentional use of these weapons could lead to massive human and environmental losses.

**PERSPECTIVES: How do you assess the widespread opinion, even among some civil society actors, that nuclear energy is a clean energy source that can help to mitigate climate change in the region?**

**DARWISH:** What I observe is that the geopolitical situation in the region, including both the non-military and military presence of Western powers and their influence on

A section of the media also plays an important role in the “greening” of the image of nuclear energy.

economic, social and even cultural aspects of life (in addition to politics), generates a negative attitude towards these powers. Whilst nuclear energy is considered to have been amongst the drivers of development and prosperity in the West and the North, some Arab civil society organisations and NGOs perceive the attempts of the international community and some Western powers to deny it to their countries as a continuation of hindering development. From the perspective that nuclear power generates much needed energy and provides more political weight, these actors thus adopt a supportive approach towards “going nuclear”.

Concerning the support of nuclear energy by some civil society actors, I also want to note that we need to question how we define “civil society”. So-called “governmental non-governmental” (GONGOs) and “governmental civil society organisations” are flourishing in the region. By that I mean those groups and organisations that have been created by politicians in order to serve their purposes by

providing public services, whether be it in the environmental, health or social fields. They are usually supported by abundant international and national funds, which are channelled through these politicians and their connections.

A section of the media also plays an important role in the “greening” of the image of nuclear energy through highlighting only its positive impacts on the economy and daily life, and its advantages for the generation of reliable and cheap energy. It is important to know that most regional media outlets belong to politicians and political circles, or businessmen and tycoons that are closely linked to them. These media instruments constitute a major part of the power-play in most of our countries. For example, it is not unusual to see politicians and industrialists, who act as environmental criminals, being praised and honoured by “environmentalists” in the media, including even by “environmental” magazines.

We can also assume that many politicians simply do not know the reality and are only informed about the short-term benefits of nuclear energy whilst remaining ignorant about the long-term costs that populations in Europe and elsewhere are suffering from. By that I mean the treatment and storage of nuclear waste which needs maximum security containment due to its radioactivity; not a single country in the world has a permanent and reliable solution for this. Even in many European countries with nuclear reactors these containment techniques and facilities are not available: some countries have to rely on others to perform this task for them at very high costs.

**PERSPECTIVES: The discussion on nuclear energy in the region should not be reduced to security matters but it clearly has a military dimension. How do you assess the use of nuclear energy in the region in the light of the Israeli-Palestinian conflict and the Iranian nuclear project? What kind of answers (or questions) would you like Arab civil societies to consider?**

**DARWISH:** The ecosystems of the West Asian

subcontinent are already threatened due to the absence of sound environmental policies governing major sectors such as waste, water, air, forests and others. A nuclear programme of any sort would put these ecosystems under even greater threat, including potential radiation and nuclear and radioactive waste. Beyond the questions of technical security, one should not deny the presence of an arms

**Nuclear countries of the West and North should practice a 'preaching by example' approach in order to convince other countries to stay nuclear-free.**

race in the region. This race between Iran and Syria versus Israel can have devastating effects on the socio-economic situation in the region, besides its direct hazards to human life.

Arab and West Asian civil society actors should join forces and develop a long term advocacy strategy towards a Nuclear Free Region. This advocacy strategy should be primarily directed towards Western powers, principally the USA, which continues to ignore the existence of an Israeli nuclear programme and thus undermines its own credibility in limiting the military use of nuclear power. A move to request Israel to sign, ratify and implement nuclear non-proliferation treaties and to dismantle its nuclear capacities under the supervision of the IAEA would make the task of national anti-nuclear lobbying in the Arab world, and anti-nuclear campaigning against Iran, much easier.

**PERSPECTIVES: Which priorities do you see to finally come to a sustainable, efficient and peaceful use of energy in the MENA region, and what role - if any - should international organisations and donors, governments and the EU play in this process?**

**DARWISH:** A more serious promotion of

renewable energy is required from governments in the region as well as from international organisations such as the Global Environment Facility, the World Bank, the European Investment Bank, and finally, powerful actors such as the US, the EU and others.

Nuclear countries of the West and North should practice a 'preaching by example' approach in order to convince other countries to stay nuclear-free. They should invest in renewable sources of energy instead of more nuclear power plants. The US, Russia and the EU need to continue to reduce their military nuclear capacity to lead to a future without nuclear weapons.

International agencies such as the UN and the IAEA that also avoid criticising Israel for known political reasons are requested to play a non-biased role, and not only to (legitimately) pressurise Iran but to also to pressurise Israel in a more serious manner. A political solution to the nuclear question in the region should therefore follow a more holistic approach than is currently the case.

**Interview by Layla Al-Zubaidi.**



**Hamed Beheshti**

Hamed Beheshti is a PhD fellow in Renewable Energy Policy Planning at the University of Osnabrück in Germany. He is also director of the international relations department of the Iran Renewable Energy Association, which he co-founded. He is specialized on renewable energy management and supportive policies, particularly "feed-in tariff". His most recent publication at the American University of Beirut is a feasibility study of feed-in tariff in Lebanon (2010). He is currently working on renewable energy policy scenarios for Iran.

## Nuclear vs. Renewables? Energy Options for Iran

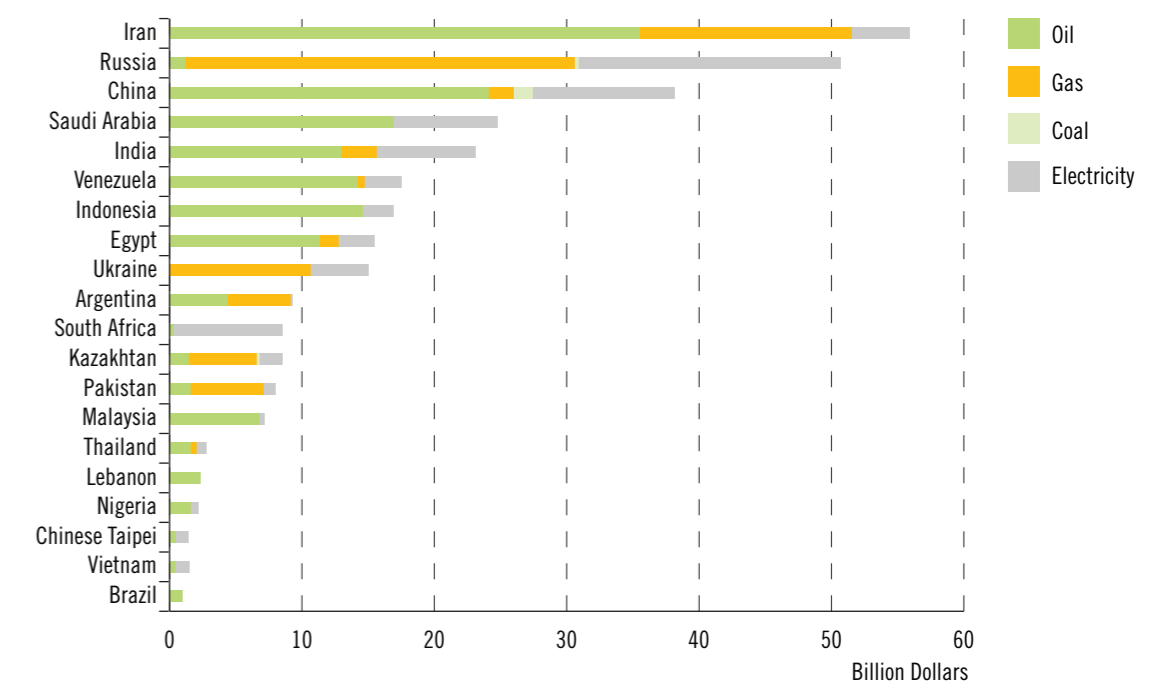
The Iranian nuclear program is almost exclusively discussed under the premise of proliferation risks, potential threats for Israel and/or Arab states and the standoff between the US and the Iranian government. Whilst the UN has repeatedly sanctioned Iran due to its suspicions of a secret military element, the Iranian government upholds its right to the peaceful use of nuclear energy as granted to all members of the Nuclear Non-Proliferation Treaty (NPT), and the Iranian population overwhelmingly supports this right. Whilst putting the eminent security discussion to one side, this article questions the feasibility of a nuclear program in a country which already subsidises its entire energy sector to a very high degree. A question to those defending the use of nuclear power for meeting Iran's energy means could therefore be: does it make

sense to add another highly subsidy-dependent energy source in Iran, while the option of extending renewable energy production might at the same time satisfy energy demands as well as create new economical opportunities and employment in the country?

### Background: Subsidising Conventional Energy

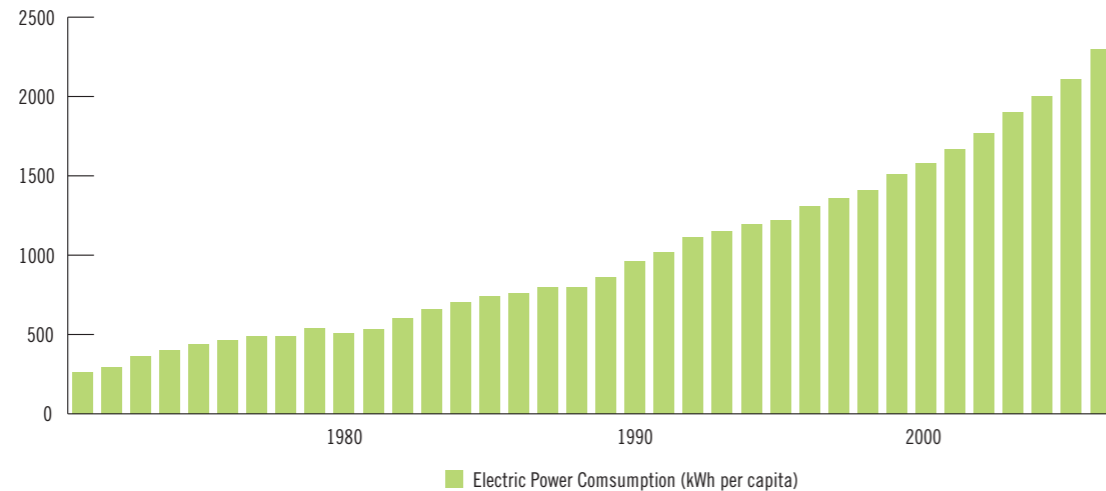
Iran possesses one of the world's largest supplies of oil and gas. The main investment of the country is allocated to expand its fossil fuel resources as well as its nuclear energy program. The economy of Iran is dominated by petroleum exports which constituted 50-70% of government revenue and 80% of export earnings between 2006 and 2008, according to the Energy Information Agency (EIA). Iran's total energy consumption of fossil fuels is as follows: 53% natural gas, 45% oil, 2% hydrocarbon and

**Figure 1: Energy subsidies in non-OECD Countries. Source: IEA 2008**



Source: IEA 2008

Figure 2: Electric Power Consumption in Iran



1% coal (EIA 2007). The World Bank estimates that in 2008 Iran paid 10% of its GDP (approx. US \$84 billion) to subsidise oil, gas and electricity (World Bank, 2010). It is unknown how much Iran is spending per year on its nuclear program but it is important to point out that any investment in this sector is also a form of subsidisation due to high construction and operational costs. For several decades, conventional energies have burdened Iran with heavy subsidies and subsidising conventional energies has not cultivated innovation but has instead increased dependency on financial assistance that is almost impossible to reduce. This is almost endemic amongst developing countries across the globe.

The International Energy Agency (IEA) estimates that developing countries, defined as those outside the Organization for Economic Cooperation and Development (OECD), spend \$310 billion a year (2008) on such subsidies (Figure 1). Developed countries also subsidise fossil fuels by some \$35 billion annually. The EIA calculated that eliminating fossil fuel subsidies would result in a 10% reduction in global greenhouse gas emissions by 2050 (EIA, 2008). Competing against such high subsidies is an insurmountable challenge for alternative sources of energy.

With strongly subsidised energy sources in Iran, energy consumption in the country is extraordinarily higher than international

standards; Iranian energy intensity is 3.5 times higher than the world average and much higher than most of the Persian Gulf countries. (Table 1)

Fossil fuels have the major share of this market. Electricity consumption has risen steadily in the past few decades (Figure 2) and it is expected to rise by about 6% per year in the coming decade.

Following approximately eighteen years of reliable electricity supply, the recent fast growth in electricity consumption in Iran caused electricity failures in the summer of 2008 and the country experienced power blackouts. The Iranian energy sector must therefore

Table 1: Energy intensity of Iran in comparison to some other OPEC members

Toe/ 1000 USD	TPED/GDP
Iran	1.13
Algeria	0.54
United Arab Emirates	0.50
Angola	0.83
Iraq	1.48
Qatar	0.74
Kuwait	0.57
Libya	0.46
Nigeria	2.01
Saudi Arabia	0.64
Venezuela	0.53
World	0.32

Source: Supersberger 2007

focus its efforts on meeting this continuing demand. Iran is already partially dependent on energy imports and if the 'business as usual' scenario continues, Iran will soon join the club of petroleum importers in the world. The need to cope with the rapid growth of electricity consumption is one of the main arguments used by the Iranian government to defend its

The United States, as part of its "Atoms for Peace Program" under President Dwight D. Eisenhower, started the transfer of technology and undertook the education of Iranian nuclear scientists.

controversial nuclear program – disregarding social, political and economic consequences for the country. The only nuclear power plant in Iran is the Busheer power plant, whose construction was started in 1975 and which was loaded with fuel in August 2010. The overall electricity generation of this power plant will reach 1,000 MW when it connects to the grid.

### The Nuclear Program, Privatisation and Subsidy Elimination

The history of the Iranian nuclear program shows that Iran has tried to rely on nuclear energy as an alternative source of energy since the early stages of its nuclear plan in the 1950s, with the aim of reducing the risk of its absolute dependency on the volatile market of fossil fuel resources. This aim was closely backed up by the Western allies of the last King of Iran, Mohammed Reza Shah. The United States, as part of its "Atoms for Peace Program" under President Dwight D. Eisenhower, started the transfer of technology and undertook the education of Iranian nuclear scientists. In 1975 the MIT (Massachusetts Institute of Technology) signed a contract with the Atomic

Energy Organisation of Iran to provide training for Iranian nuclear engineers.

The support and input of the United States and Western European governments in this program continued until the 1979 Iranian Revolution that toppled the Shah of Iran. After the 1979 revolution, the Iranian government temporarily disbanded elements of the program and then revived it with less Western assistance than during the pre-revolution era. Iran's nuclear program has included several research sites, two uranium mines, a research reactor and uranium processing facilities that include four known uranium enrichment plants.

Introducing nuclear energy as an alternative source of energy for Iran has been a controversial issue since the early stages of its appearance in the country. Iran is located in one of the most unstable regions in the world: an area with a high risk of regional tension and internal radicalism. Aside from security issues, the Iranian economy often struggles with extreme deficits and lacks harmony between the industrial capacities of the country and its financial power. Heavy investment in one specific area, such as the nuclear sector, could cause imbalanced development of the whole

The current nuclear program in Iran is a one hundred percent state-run industry, further increasing governmental control over the energy sector.

economy and impede the development of other sectors, such as agriculture. It also stands against the country's declared path towards privatisation and the elimination of energy subsidies.

The current nuclear program in Iran is a one hundred percent state-run industry, further increasing governmental control over the energy sector. This sector is already one where the state plays a monopolistic role and where the government directs investment, production

and even distribution; it also sets the production quantities (domestic, exports and imports) as well as prices for different energy carriers and products. Therefore there is no competition in production and distribution and in such a market, political factors, rather than economics or market conditions, affect energy policies and prices. This is one reason why nuclear energy is favoured over other, more feasible, sources of energy like renewable resources. Whilst there is no capacity for any sort of local private investment in nuclear energy in Iran, no

It is recognised that price reform is a key policy element for the promotion of energy conservation and fuel substitution for renewable energies.

foreign investments have been permitted due to international sanctions.

Iran is about to start a deep economical restructuring and has launched a governmental plan to accelerate privatisation on one hand and eliminate energy subsidies on the other. This privatisation plan is based on an amendment to Article 44 of the Iranian constitution, which originally referred to the economy of Iran and determined three sectors (state, cooperative and private) and their foundation, based on systematic and sound planning. In 2007 Supreme Leader Ali Khamenei requested that government officials speed up the implementation of further privatisation policies outlined in the amendment to Article 44. Khamenei also suggested that ownership rights should be protected in courts set up by the Justice Ministry: the hope was that this new protection would give an additional measure of security and encourage private investment. Despite these efforts, official backing for privatisation remains slow and the total value of privatisation transactions per capita during the past seven years has been less than \$11.10,

compared to Turkey and Egypt with more than \$79.10 of privatisation transactions per capita (World Bank 2010).

#### The Way Out? Renewable Energy Prospects for Iran

The Iranian Ministry of Power has proposed selling power plants on the Tehran stock market. However such privatisation proposals for conventional and nuclear power plants in Iran have not yet caught the eye of entrepreneurs, despite heavy pressure and incentives from the government. A series of requests for permission to establish renewable energy power plants with a total of 3,000 MW have been recorded by the Office of Renewable Energy in the Iranian Ministry of Power. Until 2009 a 700 MW share had been allowed and signed, whilst the rest remained on hold. The two major wind farms in Iran, Binalood and Manjil, with capacities of 28.3MW and 100 MW respectively, are about to be introduced to the stock market soon. In 2009 the Iranian government issued semi feed-in tariff regulation, which allowed individual electricity producers of renewable energy to sell their production to the grid. Although the regulation is not yet in force (and still to be legalised by parliament), it gives a positive signal to the market as a new place to invest. Ultimately, alternative sources of energy are clearly more in line with the declared strategic development approaches of the government than conventional and nuclear energy.

Energy market reform is also crucial to the elimination of subsidies. There is no way for the government to eliminate such subsidies whilst maintaining inefficient public management over the generation, transmission and distribution sectors. Subsidies and privatisation capacity always correlate and there should be a level of balance between these two in order to progress; low energy prices in Iran do not reflect the true economic costs. It is recognised that price reform is a key policy element for the promotion of energy conservation and fuel substitution for renewable energies.

The elimination of energy subsidies in

Iran would gradually offset a minimum of \$84 billion per year. It would finance the creation of approximately 5.25 million jobs for the controversial job market in Iran, thus opening the market up to new investments and new

Compared to nuclear energy, renewable energy has some of the greatest potential to create job opportunities for Iran.

capacities. Iran is struggling with a 13.2 % unemployment rate that is expected to reach 15.5% in the coming four years. Due to the variety of renewable energy sources, this sector has the potential to diversify itself and support other enterprises, from agriculture and animal husbandry to hydrogen refineries and photovoltaic cell laboratories. Compared to nuclear energy, renewable energy has some of the greatest potential to create job opportunities for Iran. In Germany, the nuclear energy sector generates 11.5% of primary energy and employs 40,000 people whilst renewable energy provides 8.2% of primary energy production yet employs 278,000 people. Renewable energy technologies are a lucrative economic alternative in Iran if the subsidies for fossil and nuclear energy are cut. Where fossil fuel resources in Iran become depleted and thus price rises occur, the economic profitability of renewable energy technologies increases, whilst nuclear energy would most likely remain the most expensive energy

Renewable energy is a potential “way out” for Iran.

generation technology. That is as a result of the sizeable capital requirements involved, the long planning and building times and the high external costs related to nuclear waste.

Renewable energy is a potential “way out”

for Iran: investments in renewable energy combined with a privatisation policy and a gradual elimination of energy subsidies could overcome many of the current economic, energy and political barriers. This would simultaneously diversify the Iranian economy and its energy supply. Feed-in tariff laws are a common tool to combine private sector investment, electricity tariffs and governmental subsidies. The current semi feed-in tariff policy in Iran favours renewable energy but needs to be extended and improved to become a working reform instrument for the Iranian energy sector. For a country like Iran, which has absolute dependency on oil revenues, the prices for renewable energy are constant (which is not true for uranium) and could help to stabilise Iran's economy. The development of a domestic renewable energy industry would attract private and foreign investors. In the beginning, state aid for fossil and nuclear energy could be redirected into the renewable sector but following this, by means of a well-designed plan, renewable energy could stand alone with no need for subsidies or state aid.

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