

## **UAE leading way in peaceful use of civilian nuclear energy**

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The Middle East is turning to nuclear power as the only way to provide enough energy to handle the growth that all Arab states will go through over the next 40 years.

Almost incredibly, the huge oil and gas reserves in the GCC states (and Iraq once it comes back on stream fully) will start not being able to cope within the next 20 to 25 years with both supplying domestic power while at the same time fulfilling the long contracts the GCC states have exporting to their international customers, which bring in vital state revenues.

This looming and unavoidable shortfall is because the population of the Arab world is about to increase substantially. For example, the Arab Peninsula (GCC and Yemen) is expected to double from its present 59 million people in 2007 to 124 million by 2050, according to the UN Population Reference Bureau's 2007 estimates, and these added numbers will have substantial requirements for water and power.

All the Arab states are already short of water, and the only real answer to that desperate deficiency is desalination, since rivers in the Arab world are few and far between, and what aquifers there are have been badly over-used. However, desalination requires substantial power to boil the sea water and distill it into fresh water, and that power can only come from gas.

In addition, all the millions of the new populations will expect domestic supplies of power for air conditioning and lighting, which will require more gas to generate that electricity. And the industries that they will be working in will also require power, which will again have to come from gas.

The hydrocarbon and gas reserves which are in the Gulf simply will not cope with this planned expansion, and in the very long term, after 100 years or slightly less, they will run out anyway, so the Gulf states along with all the other Arab states will need to find alternative sources of energy.

Of course, solar power is one obvious way to find new and sustainable energy, and avoid the dwindling supply of gas being the sole supplier of energy. But there is no technology for solar power to work at the scale of production that is required, and that is not yet even being developed. Several GCC states are developing solar power projects, like the Masdar project in Abu Dhabi, and in time they may turn it into a valid back-up alternative to other sources of power, but that is still many decades in the future.

### **Arab plans**

Therefore more than a dozen Arab states have announced plans to build nuclear reactors as part of developing peaceful nuclear power programmes. As Oxford Analytica summarised in March 2008, more than a dozen Arab states have set themselves to pursue nuclear power programmes.

Egypt has been specific about its plans, and is the most advanced in moving towards

construction. Jordan has said it wants a reactor by 2015. The six GCC members as a group have stated they will look at nuclear power, of which the UAE has gone furthest in developing feasibility plans, and has agreements with the United States, France and Britain to work on nuclear programmes.

Yemen, Algeria, Morocco and Tunisia have all said that they need to look at nuclear power, and Libya has been reported as buying a reactor from France to handle desalination.

Yet, the volume of nuclear activity on the Middle East is minimal compared to what is happening elsewhere. There is only one power reactor under construction in the region (in Iran) and eight other power reactors are planned or proposed (in Egypt, Iran, Israel and Turkey). These nine are a very small fraction of the total 439 power reactors already working around the world, and a further 349 due to be built in the future.

Despite being such a small fraction of the world's nuclear plans, the various announcements of Arab nuclear programmes have caused considerable interest or alarm in other parts, with fears raised that the peaceful plans might lead to military plans, eventually to Arab states acquiring nuclear bombs.

Clearly there is a proliferation risk once a country starts a nuclear programme, since it has the technology and expertise to develop weapons. But it is still a big technical jump to go from a civil power reactor to nuclear weapons, never mind the political problems that owning nuclear weapons would bring.

### **Transparency**

The key to calming international fears that a civil programme might become military is for the Arab states to be completely transparent in how they operate their reactors, and to avoid the first steps that lead to weapons.

Using light-water reactors offers less chance of developing fuel for nuclear weapons than a heavy-water reactor. Getting international support to enrich the fuel is another way, since the process of enriching the fuel for civilian use can easily be extended to military use. Nuclear fuel can be bought and the waste can be returned, and this open process does not allow the fuel to be converted into military source material.

Signing up in full to the international treaties and being ready to implement them also makes a big difference. Full membership of the Non-Proliferation Treaty (NPT), which allows inspection by the International Atomic Energy Agency (IAEA), and signing the Additional Protocol which allows intrusive inspections at short notice, both ease international fears of duplicity.

Egypt has signed the NPT, but has not agreed to sign the Additional Protocol, whereas Jordan and the GCC states have all signed the NPT and said they would sign the Additional Protocol. In addition, the UAE has made clear it will also import all its fuel, working with international partners to handle that requirement.

The UAE and Saudi Arabia have both spoken of working within a multilateral fuel

mechanism. Such a thing is being encouraged by the IAEA, so as to bring sensitive aspects of the fuel cycle under multinational control, "so that no one country has the exclusive capability to produce the material for nuclear weapons" as IAEA Director General Mohammad Al Baradei said in his in-house report to the IAEA in March 2008.

## **Iran**

Iran has taken a much more combative line. It has signed the NPT, but it also has a legacy of being unclear, slow to cooperate, and of failing to comply fully with the NPT's regime, a stance which has reduced Iran's international credibility, particularly with the politically-motivated Americans, who are anxious to find fault.

The IAEA learned in 2003 that Iran had been conducting undeclared nuclear experiments and activities for almost two decades, which "created a confidence deficit on the part of the international community", said Al Baradei, with understatement.

Nonetheless, for two years Iran applied the provisions of the Additional Protocol, which helped to provide clarity about some of its nuclear activities. It stopped this after Iran was referred to the Security Council, and although last August Iran agreed to a work plan with the IAEA to clarify all remaining outstanding issues, one remained unsettled over alleged plans to weaponise. Only in April has Iran apparently reached a way to sort this out with the IAEA.

In addition, Iran refused to suspend its enrichment-related activities and was continuing with R&D on more efficient centrifuges, and the IAEA was working to find a way for Iran to work with the Security Council to meet its requirements to build the necessary confidence about Iran's future nuclear activities.

## **GCC openness**

That is in stark contrast to how the Saudi Arabia and the UAE are leading the GCC into nuclear power. Both countries have made it very obvious that they are not looking to attract any suspicion.

Saudi Foreign Minister Prince Saud Al Faisal said at the December 2007 GCC summit, "We are doing this in the open. We want no bombs." In addition he has floated the idea of working with an international body to enrich uranium for Saudi reactors to use, suggesting that such a facility could be based in Europe, perhaps Switzerland.

Last month, UAE Foreign Minister Shaikh Abdullah Bin Zayed Al Nahyan said the UAE would set "a good example for the region" as he signed a nuclear cooperation agreement with the US. US Secretary of State Condoleezza Rice replied "The UAE is a very responsible partner."

In the nuclear world it is important to be completely clean, and to be seen to be completely clean.

## **OPTIONS: ENERGY GENERATION**

## **NUCLEAR**

### **Advantages**

- Fuel is inexpensive
- Energy generation is the most concentrated source
- Waste is more compact than any source
- Extensive scientific basis for the cycle
- Easy to transport as new fuel
- No greenhouse or acid rain effects

### **Disadvantages**

- Requires larger capital cost because of emergency, containment, radioactive waste and storage systems
- Requires resolution of the long-term high level waste storage issue in most countries
- Potential nuclear proliferation issue

## **COAL**

### **Advantages**

- Inexpensive
- Easy to recover (in US and Russia)

### **Disadvantages**

- Requires expensive air pollution controls (e.g. mercury, sulphur dioxide)
- Significant contributor to acid rain and global warming
- Requires extensive transportation system

## **HYDROELECTRIC**

### **Advantages**

- Very inexpensive once dam is built
- Governments across the world have invested heavily in building dams

### **Disadvantages**

- Very limited source since depends on water elevation
- Many dams available are currently exist (not much of a future source [depends on country])
- Dam collapse usually leads to loss of life
- Dams have affected fish (e.g. salmon runs)
- Environmental damage for areas flooded (backed up) and downstream

## **GAS/OIL**

### **Advantages**

- Good distribution system for current use levels
- Easy to obtain
- Better as space heating energy source

### **Disadvantages**

- Very limited availability as shown by shortages during winters several years ago

- Could be major contributor to global warming
- Expensive for energy generation
- Large price swings with supply and demand

## **WIND**

### **Advantages**

- Wind is free if available
- Good source for periodic water pumping demands of farms as used earlier in 1900's
- Generation and maintenance costs have decreased. Wind is proving to be a reasonable cost renewable source.
- Well suited to rural areas

### **Disadvantages**

- Limited to windy areas.
- Limited to small generator size; need many towers.
- Need expensive energy storage (e.g. batteries)
- Highly climate dependent — wind can damage equipment during windstorms or not turn during still summer days.
- Can affect endangered birds, however tower design can reduce impact.

## **SOLAR**

### **Advantages**

- Sunlight is free when available

### **Disadvantages**

- Limited to sunny areas throughout the world (demand can be highest when least available, e.g. winter solar heating)
- Does require special materials for mirrors/panels that can affect environment
- Current technology requires large amounts of land for small amounts of energy generation

## **FUSION**

### **Advantages**

- Hydrogen and tritium could be used as fuel source
- Higher energy output per unit mass than fission
- Low radiation levels associated with process than fission-based reactors

### **Disadvantages**

- Breakeven point has not been reached after 40 years of expensive research and commercially available plants not expected for at least 35 years