

The new face of nuclear energy

Alex Forbes



Mohamed Al Hammadi (credit: ENEC)

The United Arab Emirates will be the first of the Gulf Co-operation Council nations to develop nuclear power – and only the second in the Middle East after Iran. In this exclusive interview, the CEO of the Emirates Nuclear Energy Corporation (ENEC), Mohamed Al Hammadi, explains why the UAE has chosen to develop nuclear energy, why he is confident the new reactors will come on stream on time and within budget, and why the nation sees itself as a model of how nuclear power can be developed cost-effectively and safely.

Q: The United Arab Emirates has taken a leading role in the Middle East and North Africa with its future energy initiatives, as embodied by Masdar, and is also rich in oil and natural gas. Why the need for nuclear power?

A: We expect an average annual growth of 9% in electricity demand and the forecast is that by 2020 it will reach around 40GW. It's a challenge to meet that demand for electricity, so in 2006 and 2007 we carried out a very comprehensive energy study. We looked at all of the options to generate electricity and we tried to create a diversified portfolio of energies that would supply the needs of the nation, to become developed and to become sustainable.

We looked at coal and at renewables and at nuclear. We also have gas and diesel to make electricity. And with all that stacked up, economically and environmentally nuclear came out as one of the viable options. So did renewables and that's why Masdar was initiated. The more we scrutinised nuclear, the more it looked a viable option – in that it is safe, clean and environmentally friendly, and also very economical compared to other options.

Q: How will the start-up of the four proposed nuclear reactors of 1400 MW each between 2017 and 2020 affect the UAE's energy mix and its emissions of carbon dioxide? And what will be the impact on the consumption of natural gas?

A: The four plants we are building will cater for around a quarter of the electricity generation for the nation – and will contribute a saving of around 12 million tonnes of CO2 emissions annually. Gas will not be impacted. Even with the gas and oil currently available in the country, plus nuclear, plus renewables, we are still also buying LNG from outside.

Q: Your nuclear programme is being implemented under a US\$20 billion contract agreed with Korea Electric Power Company. Why did you choose to award that contract to KEPCO?

A: We did a very comprehensive study for almost a year to analyse the different parameters. Our key was choosing somebody who has done it before and succeeded in doing it in a systematic manner – and managed to build the human capacity, one of the most important factors. The Koreans have a third-generation reactor – the AP 1400 – and they offered us a comprehensive deal that was commercially viable. They met all our pre-conditions to sign the contract, to be able to deliver on time, on budget, safely. Today we are executing the project with them and we are seeing that the choice we made in 2009 was the right one.

Q: Nuclear programmes in some countries have suffered severe cost over-runs and construction delays. How confident are you that your reactors will come on stream on time and within budget?

A: When we selected the Koreans we were very blunt and very thorough in our review. We had guys from the international nuclear community, with experience in building nuclear power plants, who went to Korea. They sat with the engineering companies, with the utilities, with the suppliers, with the manufacturers, and questioned and tested them on their quality standards, their management and their methodologies. Everything the Koreans promised, they've been delivering to us.

Also, the UAE has been very successful in major project developments in oil and gas and other major infrastructures in the country. We have the confidence and expertise to tackle major project challenges.



Unit one is now 55% complete, and the whole project more than 35% complete. The aim is to commission the first reactor in 2017 with three more plants coming online each year to 2020. (credit: ENEC)

Q: The Fukushima event in Japan in 2011 led to some countries deciding to phase out nuclear power. Japan itself is torn over the role that nuclear should play in its future energy supply. What impact did Fukushima and its aftermath have on the thinking of the UAE government and ENEC?

A: We did our design and technology selection in 2008 and signed a contract in 2009. Fukushima was designed in the 1960s and commissioned in 1971, so the engineering was done more than 40 years ago. The revolutionary design that the Koreans have used, and offered us, has the privilege of

incorporating lessons learned throughout 40 years of improvements to nuclear power plants.

Looking at other countries, Japan's new energy plan has nuclear as one of the options. Looking at Germany, it's a very expensive bill that they're paying – by having to build coal or other not very environmentally friendly plants and having to buy expensive energy from France and other neighbouring countries.

Q: Several major concerns with nuclear power surround the nuclear fuel cycle. How will you be sourcing fuel? And what will you be doing to make spent fuel and other hazardous materials safe?

Currently we have a diversity of supply of the fuel, between countries and suppliers. We break the fuel supply chain into five phases, or cycles, all the way from mining to fuel assembly. In each one of those steps we have multiple suppliers. We have contracts signed with over six companies today to supply the first segments of the fuel.

For fuel storage, our policy paper talks about three options: the short, the medium and the long term. Medium term is the 160 or 200 years option. Short term is from 6 to 20 years.

The first option is either we keep the spent fuel inside spent fuel tanks which can hold the fuel for 20 years, Or after every six years we can transfer fuel from the short term to the medium term, which is the option used in a lot of developed nations. We put the nuclear fuel inside lead-shielded concrete dry casks that have very low maintenance. It's a very safe solution.

Longer term we have the option of re-processing fuel outside the country, with friendly nations like France and others who have the technology. But that will only be done when the re-processed fuel is cheaper than fresh fuel. The last resort will be to bury the used fuel underground.

Q: Nuclear technology requires specialist skills that are in short supply. What is ENEC doing to ensure the ready availability of trained people? And how many of them are likely to be UAE nationals?

The UAE has been very successful in infrastructure projects because we bring a lot of international expertise, people who come with their best practice and experience. Today I have over 1,100 people working in the ENEC organisation. That number is split roughly 50:50 between people managing the project's construction and operations people who will run the power plant. In 2008 it was myself and a couple of people.

Roughly 65% of them are Emiratis, who are rubbing shoulders with experts with more than 25 years of experience and learning from them. They will be leaders in this industry because as you know today we are building the biggest nuclear project in the world. Nobody else is building four units in one go, on one contract.

On the training of Emiratis we have four streams. Stream one is re-schooling qualified, experienced Emiratis from mechanical, electrical and other engineering fields to become acquainted with nuclear standards. Another is on the academic side, where we take people from mechanical, electrical and other majors and send them for a quick masters degree. The third is a longer process, a bachelors degree. And we have a fourth tranche: the technicians and technologists who will be operating the power plant and maintaining it.

Q: A concern with nuclear power is the non-proliferation of technology and materials that could be used to make weapons. What is the UAE's policy on non-proliferation?

A: The UAE has adopted very high standards when it comes to non-proliferation. By law we will never re-process fuel in the country. There are many other commitments. Our regulator is responsible, in coordination with the Ministry of Foreign Affairs and the IAEA, for having a comprehensive accounting system for all the fuel that comes on board – so that the IAEA and the countries who are selling us the fuel know where our fuel comes from, where it goes and where it is stored.

When it comes to operational transparency we have our international advisory board. They report directly to the President of the country and they publish reports on the progress of the nuclear programme on their website. It is a very transparent, very open critique.

Q: The UAE has said it wants to be a model of how nuclear power can be developed cost-effectively and safely. What practical steps are you taking to make this a reality?

A: We are working very hard. First of all, we have been blessed by starting a programme from a blank sheet of paper. That's where you can really learn from everybody globally, bringing the best ideas together and learning from the mistakes.

A key contributor to our success is the transparency of our nation vis-a-vis the international community, with friendly nations bringing their expertise and know-how to implement the nuclear programme to the highest standards of safety and security. We have achieved much more than we hoped for in the initial days.

Editor's Note

This interview was conducted by Alex Forbes for World Energy Focus, a new monthly digital magazine produced by Energy Post for the World Energy Council.

World Energy Focus can be downloaded for free here: <http://worldenergyfocus.org/>

World Energy Focus offers unique strategic insights from the global World Energy Council network. Formed in 1923, the [World Energy Council](#) is the UN-accredited global energy body, representing the entire energy spectrum, with more than 3000 member organisations located in over 90 countries and drawn from governments, private and state corporations, academia, NGOs and energy-related stakeholders.

Mohamed Al Hammadi chairs the World Energy Council's Knowledge Network and High-Level Advisory Board on Nuclear and Uranium. The group, to be launched later this year, will gather the knowledge of close to 20 nuclear energy chief executives and experts to look at the future of nuclear technology and resources. Their findings will contribute to the next edition of the WEC's World Energy Resources study.