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PUBLICATION

LEADING THE NUCLEAR CHARGE – VIETNAM’S QUEST TO DEVELOP NUCLEAR POWER

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Malaysia announced in December 2010 that it intends to build two nuclear power plants by 2022 and Indonesia has also indicated its intention to explore nuclear energy as a means of addressing its energy shortfall. However, it is Vietnam which, in a number of ways, is leading the pack in the South East Asia region in its drive to develop nuclear power plants.

Introduction

The Vietnamese government has been working for a number of years now towards achieving its stated desire to develop nuclear power for peaceful purposes based on modern, verified technology. The race to generate nuclear energy is driven largely by the country’s growing energy demand which, according to government projections, is expected to increase by 16 per cent per year until 2015.

One of the key challenges which Vietnam faces is that currently at least a third of its energy is generated by hydropower plants but there are two key issues which threaten the viability of hydropower as a long term solution to Vietnam’s energy needs.

Firstly, hydropower projects depend on favourable weather conditions and in recent periods of drought, the existing hydropower projects have struggled to generate sufficient output to meet peak demand and this situation will only worsen as the demand increases. Secondly, other than the major new plant at Son La, very few sites have been identified as being suitable for additional large scale hydropower projects.

Therefore, Vietnam has had to look to an alternative renewable source to meet its growing demand. Vietnam has announced its intention to construct at least 13 nuclear power turbine units in Vietnam in the next 20 years with the aim that, by 2030 these nuclear power units will provide 15,000-16,000MW of power representing 10 per cent of the total installed capacity in Vietnam.

Creating a legal and regulatory framework

Vietnam has been developing its policy on nuclear power generation for

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many years, demonstrated by the establishment of the Vietnam Atomic Energy Commission (now the Vietnam Atomic Energy Institute) in 1976 and more recently, the issuance by the Prime Minister in January 2006 of the Strategy for Peaceful Use of Atomic Energy up to 2020 and the corresponding Master Plan issued in 2007.

However, only in the last couple of years has the government started to build a legislative framework for the implementation of nuclear power projects from design to decommissioning and fuel supply to storage and ultimately, the safe disposal of nuclear waste.

However, given the rigorous nature of international regulation and the policy considerations surrounding the implementation of nuclear power projects, it has yet to be seen whether the existing and currently anticipated legislation will go far enough in order to enable Vietnam to fulfil its nuclear vision on schedule.

The main piece of legislation which underpins Vietnam's framework of atomic energy regulation is the Law on Atomic Energy which was promulgated on 3 June 2008 and came into effect on 1 January 2009. This law sets out comprehensive high level principles which govern Vietnam's pursuit of nuclear power and the focus is, unsurprisingly, on ensuring safety of persons and the environment and the need to utilize modern proven technology, together with emphasizing non-proliferation.

The Law on Atomic Energy has since been followed by three Decrees and a number of Decisions of the Prime Minister which start to elaborate on some of the detail as to how Vietnam intends to address the various complex issues which surround the implementation of its atomic energy strategy.

Ambitious timetable for implementation

The roadmap for the future development of nuclear energy in Vietnam over the next twenty years is set out in the Prime Minister's Decision 906 dated 17 June 2010. According to Decision 906, the first nuclear plant, Ninh Thuan 1, with a capacity of approximately 2000MW, is scheduled to commence construction in 2015 subject to the requisite regulatory consents and frameworks being in place and necessary feasibility studies having been carried out. It is anticipated that commercial operation will commence in 2020 with further capacity scheduled to come on line in 2021.

The project is to be located in the Phuoc Dinh commune, Thuan Nam district of the Ninh Thuan province.

A second nuclear power plant (Ninh Thuan 2) comprising a further 2 x

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1,000 MW turbines is then also slated for development in Ninh Thuan province but in the Vinh Hai commune, Ninh Hai district with construction due to commence by 2020.

EVN, the state electricity utility in Vietnam, will invest in and ultimately be the operator of the initial two projects. Subsequently, it is envisaged that domestic economic joint ventures may be allowed to develop the remaining nuclear power plants provided they have the requisite capabilities, skill and experience to be awarded a nuclear operating licence.

It is not clear from Decision 906 whether there will be opportunities for foreign investors to be involved in these future plants in joint venture with a local partner but the Decision does not preclude the possibility. Therefore, Vietnam has elucidated an ambitious plan to develop nuclear power over the couple of decades but there are a number of factors which may yet hinder Vietnam’s progress in achieving its stated goals.

Potential challenges which face the development of nuclear power in Vietnam

- Lack of a centralised Nuclear Energy Programme Implementation Organisation

The Government of Vietnam opted not to form a separate Nuclear Energy Programme Implementation Organisation (NEPIO) and empower the NEPIO to formulate all the required strategic and regulatory requirements to progress implementation of its nuclear power programme. Instead, each relevant government ministry, including the Ministry of Industry and Trade, the Ministry of Natural Resources and Environment, the Ministry of Construction, the Ministry of Health, the Ministry of Agriculture and Rural Development and the Ministry of Science and Technology, remains responsible for duties assigned to it under the Law on Atomic Energy.

In addition, there are a number of different agencies and taskforces charged by the ministries to prepare plans and strategies in connection with the promulgation of nuclear power such as the Vietnam Atomic Energy Agency (formed by the Ministry of Science and Technology through its regulation dated 31 August 2010), the Vietnam Atomic Energy Institute and the Vietnam Agency for Radiation and Nuclear Safety & Control (established by the Ministry of Science and Technology in 2004).

IAEA recommends that a NEPIO which reports directly to government oversees the implementation of a national nuclear programme for a variety

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of reasons. The disadvantage of splitting the function across a number of ministries and agencies is that there may be a lack of coordination between each of the various agencies and ministries and insufficient knowledge at all levels of each ministry or agency regarding the international norms and political and socio-economic issues that surround the development of nuclear policy to enable a cohesive and consistent approach.

- Liability for Nuclear Damage

Vietnam has not signed the Vienna Convention on Civil Liability for Nuclear Damage 1963 (the Vienna Convention). The Vienna Convention channels liability for third party personal injury and death and third party property damage caused by a nuclear incident to the operator of a nuclear facility. The operator is obliged to maintain insurance or some other financial security to meet this liability. The importance of these channelling provisions should not be underestimated in terms of the ability of the party to the Vienna Convention to access the nuclear insurance market.

As an alternative, some countries such as the United-States have in place domestic legislation which channels liability in the same way, such as the United-States' Price Anderson Act (Atomic Energy Act 1954) which also enables access to the insurance market.

The Vienna Convention sets a minimum level of limit of liability on the operator in respect of nuclear damage - under the original convention the limit cannot be less than US\$ 5 million but in 1997, an amending protocol to Vienna Convention extended liability of the operator to matters such as environmental damage and increased the minimum limit of liability of the operator to 300 million SDR (roughly equivalent to US\$ 400 million).

However, the actual limit of liability is set by the domestic legislation which implements the convention. The limit on liability of 150 million SDR under the Law on Atomic Energy (Article 88) falls short of the Vienna Convention. Vietnam may gain more acceptance of its nuclear ambitions in the international market if it increases these limits to comply with the Vienna Convention.

- Prohibitive cost and limited financing options

On a short term view, one of the major disadvantages of atomic energy is the huge upfront investment required to put in place the necessary regulatory framework and build the necessary resources and knowledge pool to sustain a nuclear power industry.

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In addition, the lengthy construction period associated with a nuclear power plant and need to import sophisticated modern nuclear technology is prohibitively expensive compared with the cost of procuring a traditional coal fired plant, even though the costs of operating a nuclear plant are low, by comparison with other technologies. The cost of developing the first nuclear power plant in Vietnam is considered to be at least US\$ 10 billion - significantly more than the cost of developing a coal fired plant.

As a result, Vietnam will almost certainly be heavily reliant on export credit agencies and commercial debt to provide financial support to its early nuclear projects. As yet, no nuclear project has secured financing in the international commercial debt market on a project finance basis. Vietnam's ultimate goal is to foster the expertise and experience to potentially develop its own technology and build its nuclear operating and fuel processing capability within Vietnam to reduce cost in the long term but this will take a number of years to achieve.

- Security of Fuel Supply

Vietnam will need to import uranium to process into fuel assemblies for use in its nuclear power plants. However, this leaves Vietnam somewhat at the mercy of the uranium import price which can be unpredictable. It is thought that Vietnam may have its own reserves of uranium ore but there is a question mark as to whether the quality of its reserves are sufficient for the purpose of nuclear fuel. Vietnam has reportedly signed an agreement with a Canadian mining company to carry out an assessment of Vietnam's potential for mining uranium ore, including the economic and technical feasibility of any reserves found.

It remains to be seen whether Vietnam can defray the cost of operating its nuclear power plants by utilizing its own uranium reserves or whether it will continue to need to rely on importing uranium from other countries at potentially considerable cost.

- Developing manpower and technology

The Government of Vietnam is acutely aware of the need to promote training of qualified persons to operate the plants and ultimately to take over the design, manufacture and construction of these plants instead of using foreign labour and equipment to drive down cost and boost the Vietnamese economy.

Decree 07 dated 25 January 2010 contains a number of measures to attract

people to work in the nuclear sector in Vietnam by offering preferential working conditions and an allowance of up to 70% of the rank or grade salaries. The Decree also targets the future workforce in Vietnam by offering scholarships and tuition paid for those studying atomic energy with additional incentives and possible support or overseas study.

More recently, the Prime Minister has also underlined the importance of training and resourcing in preparation for operation and maintenance of the Ninh Thuan nuclear power plant through Decision 1558 which was issued on 18 August 2010 and the allocation of a budget of around US\$ 154 million between now and 2020 for this purpose. The Decision again focuses on offering tertiary education on nuclear sciences at the major universities and training qualified persons overseas to ensure the requisite levels of expertise and experience.

Even with these measures in place, Vietnam is, to an extent, playing catch up with those countries with an established track record in nuclear power generation. The relevant authorities in Vietnam, including EVN as the proposed operator of the first two projects, will need to ramp up its efforts to be in a position to resource its nuclear activities on such a large scale in the next twenty years and in order to satisfy international requirements regarding operators of nuclear facilities to ensure safety and security.

- *International Co-operation and Assistance*

In the face of such challenges, however, Vietnam is not without support in seeking to further its nuclear power capability. Japan, the United-States, Russia and China, in particular, are all vying to export their technology and credentials to help Vietnam pursue its nuclear plants.

Vietnam is reported to have signed a formal accord with Russia for the development of the first nuclear power plant, Ninh Thuan 1, using 1200 MWe VVER pressurized water reactors and will supply nuclear fuel for the plant and then remove used fuel for reprocessing. Separately, the Vietnamese Prime Minister has been quoted as saying that Vietnam will partner with Japan to build a second nuclear plant and conduct rare-earth investigation, exploration and processing in Vietnam. China, meanwhile, has also signed a memorandum of understanding with the Vietnam Atomic Energy Commission for cooperation in the nuclear power sector.

In addition, the French Development Agency has pledged to support Vietnam's nuclear endeavours and Vietnam has met with senior representatives of AREVA to discuss its experiences in building and

operating nuclear power plants and AREVA's capability in providing fuel rods, converting and enriching uranium and reprocessing and handling nuclear waste. Vietnam is also reported to have entered into nuclear cooperation agreements with India, South Korea, Canada and Argentina.

Vietnam also signed a memorandum of understanding with the US government back in 2001 but talks have been accelerated in recent months possibly as a result of the advanced nature of discussions between Vietnam and Russia and China, resulting in a new memorandum of understanding between the US and Vietnam in March 2010.

This latest memorandum of understanding provides for broad co-operation between the countries on nuclear power including access to nuclear fuel with the ultimate aim of signing a Section 123 agreement to enable US entities like Westinghouse to export their technology.

However, the latest round of talks between the US and Vietnam have been surrounded in controversy on the basis that the deal struck between the countries allows Vietnam to produce its own nuclear fuel whereas recently in similar agreements with other nations, the US has insisted on including non-proliferation provisions restricting the right for that country to independently enrich uranium.

Conclusion

Given the finite nature of traditional energy sources such as coal and gas and the concerns regarding the viability of large scale hydropower projects to continue to meet Vietnam's ever-increasing demand for power, Vietnam may have little other option than to heavily invest now in a nuclear programme.

However, to implement a successful nuclear power industry in Vietnam going forward, the Vietnamese government will need to ensure that there is a sufficiently detailed and rigorous regulatory regime in place to provide adequate safeguards against the potentially devastating consequences of improper handling of nuclear materials or a nuclear incident which could jeopardize the future of nuclear power as an alternative energy source in Vietnam but also further afield.

This process is already under way with the recent Decrees and Decisions emanating from the National Assembly and the Prime Minister as well as the various ministries and agencies, but there is still more to do if Vietnam is to meet its challenging timetable of having a nuclear power plant

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operational by 2020.

Despite the challenges, there is little doubt that, where some of its rivals in the region are still grappling with the socio-economic, political and regulatory framework issues that surround the implementation of nuclear power as a viable alternative to traditional energy, Vietnam has embraced nuclear energy as an answer to its growing energy demands and is moving closer to realizing its nuclear ambitions.