NUCLEAR REGULATION IN NEW JURISDICTIONS:
THE UNITED ARAB EMIRATES IN COMPARATIVE PERSPECTIVE

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ABSTRACT

This paper examines the creation of the United Arab Emirates Federal Authority for Nuclear Regulation (FANR). It highlights the role of foreign assistance from the International Atomic Energy Agency and other national nuclear regulators. But it also identifies the steps that FANR has taken to increase the nuclear expertise of native Emirati. FANR faces several challenges: maintaining its independence from nuclear industry and government, ensuring control of its budget, and blending multiple foreign and indigenous safety cultures and systems into one organization. Finally, this paper offers lessons from FANR that could be applied to other new entrants in nuclear energy.
Introduction

There are 31 countries that currently operate a nuclear power reactor around the world. The United Arab Emirates (UAE) will be number 32 as they are constructing four APR-1400 reactors at the Barakah site which is about 4 hours west of Abu Dhabi, close to the border with Saudi Arabia and is very isolated. These reactors, which cost a combined $20 billion, will have the first unit finished by 2017 and all units coming online by 2020. Even though the UAE has energy security with its large deposits of oil and natural gas, it still has a number of reasons to pursue nuclear energy. An obvious reason is the increased demand for electricity in the UAE. The UAE because of its harsh desert climate has high cooling demands throughout the year. This is combined with the fact that the UAE has a high living standard that results in an energy intensive lifestyle. The UAE also has a burgeoning aluminum industry which is very electricity-intensive. For these reasons, the UAE now has one of the highest per capita consumption of electricity in the world. The World Bank has calculated that in the 2011-2015 period the UAE’s per capita electricity consumption was 10,904 kWh, which was the 11th highest in the world. To handle this growth in electricity consumption, the UAE, despite its large natural gas deposits, has been importing gas for electricity since 2007. In addition, the UAE wants to stop using its oil and natural gas resources for generating electricity; it would rather export them to acquire foreign currency. The UAE also plans on exporting some of its surplus electricity to Saudi Arabia and the rest of the Gulf countries. A nuclear reactor can also be used for water desalination plants,

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which are critical in areas that lack freshwater resources such as the desert country of the UAE. The UAE already has 12% of the world’s desalination capacity, but will be using its new fleet of nuclear reactors to dramatically increase it. Finally, developing nuclear energy is a matter of national prestige for the Emirates.

Introducing nuclear energy into a new jurisdiction is a complex process. In the case of the UAE, they had begun to investigate the possibility of nuclear energy since the early 2000s. This involved numerous steps. In 2003, the UAE ratified a nuclear safeguards agreement with the International Atomic Energy Agency (IAEA). In 2006, the Gulf Cooperation Council (GCC) – an international organization that included Kuwait, Saudi Arabia, Bahrain, the UAE, Qatar, and Oman – commissioned a study on the peaceful uses of nuclear energy. In February 2007, the GCC agreed with the IAEA to cooperate on a feasibility study for a regional nuclear power and desalination program. In April 2008, the UAE produced a white paper announcing its intention to evaluate nuclear energy. In October 2009, it passed domestic legislation – required as part of

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its bilateral nuclear cooperation agreement with the United States\(^9\) - to permanently forego the acquisition of uranium enrichment and plutonium reprocessing capabilities.\(^10\) In 2009, the Federal Authority for Nuclear Regulation (FANR) was created. In that same year, the Emirates Nuclear Energy Corporation (ENEC), a state-owned entity, was formally established. The ENEC invited bids from nuclear vendors to build the UAE’s first set of nuclear reactors, ultimately choosing a consortium led by the Korea Electric Power Corporation (KEPCO) in December 2009. Construction began in 2012 making the UAE the first new country to build a nuclear power plant in 27 years.

Of all of these steps, the most critical one was, as noted in the UAE’s nuclear policy, “the establishment of an independent, vigilant and effective regulatory authority is a cornerstone for any stable, credible, safe and secure nuclear program.”\(^11\) A robust nuclear regulator is necessary to ensure the safety of nuclear energy, the physical security of reactors, preventing possible proliferation to nuclear weapons, and implementing a country’s international commitments. A properly functioning nuclear regulatory body also helps build and maintain a safety culture within a country. This is why, in a special edited volume on new entrants and nuclear energy, Steven Miller and Scott Sagan emphasized that “for nuclear energy programs to be developed and managed safely and securely” there needs to be “a strong degree of regulatory competence.”\(^12\)

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9 UAE has nine bilateral nuclear cooperation agreements: France (2008), United States (2009), South Korea (2009), United Kingdom (2010), Australia (2012), Canada (2012), Russia (2012), Argentina (2013), and Japan (2013).
10 United Arab Emirates, *Concerning the Peaceful Uses of Nuclear Energy.* A federal law by decree No. 6 of 2009 (2009), Article 2.
12 Steven E. Miller and Scott D. Sagan, “Nuclear power without nuclear proliferation?” *Daedalus* 138/4 (Fall 2009), 7-18.
The UAE is seen by many observers as “the model for nuclear newcomers.” Therefore, this paper conducts a case study of FANR. The first part is a description of FANR’s creation. This is followed by an analysis of the challenges facing FANR. The final section is a determination of the lessons that FANR provides for countries that are thinking of creating their own nuclear regulatory body.

Creation of FANR

The roles, responsibilities, and enforcement powers that FANR was granted are very similar to more established nuclear regulatory agencies such as the Canadian Nuclear Safety Commission (CNSC) and the U.S. Nuclear Regulatory Commission (NRC). FANR “shall determine all matters relating to the control and supervision of the Nuclear Sector in the State, particularly those related to Safety, Nuclear Safety, Nuclear Security, Radiation Protection, Safeguards and implement any obligations under the relevant international treaties, conventions or agreements entered into by the State” (Article 5). FANR licenses all nuclear facilities across the entire lifecycle: site selection, site preparation, facility construction, facility commission, facility operation, facility closure, and facility decommissioning (Article 25). As a quasi-judicial body, FANR has punishments at its disposal for non-compliance with its regulations and nuclear accidents. For example, FANR can issue fines (and even prison terms), suspend or even revoke licenses. FANR must also publicize all of its licensing decisions in order to be transparent to the

public (Article 9). Licensees that produce nuclear waste are also required to contribute to trust funds for a waste management facility and decommissioning of the plant (Article 42).  

As a brand new organization, FANR relies heavily on foreigners who have substantial nuclear regulatory experience. For example, FANR’s Director General is Christer Viktorsson who was Deputy Director at the Swedish Nuclear Safety Authority for over a decade. Other senior managers have experience at the CNSC, NRC, Australian Radiation Protection and Nuclear Safety Agency, and the Czech State Office for Nuclear Safety. FANR has also signed nine bilateral arrangements with foreign regulators.

This foreign flavour is not just at the top, but permeates the entire FANR workforce. FANR has over 180 employees from 23 countries (including the UAE) with prior experience in nuclear regulation. 57% of FANR’s workforce are Emirati, but too many of them are in the non-technical areas such as communications and finance. In contrast, FANR employs just 34 Emirati engineers and health physicists. In total, there are 26 Emirati staff members who hold graduate degrees in the nuclear field. Viktorsson wants FANR to get Emiratis “trained to take on key positions” in “all areas of operation.” This objective has led FANR to work in conjunction with ENEC on a national human resource development strategy in the nuclear field. FANR, in particular, has developed a three-pronged integrated approach to workforce development:

- In the longer term, the Regulator aims to have its workforce consisting predominantly of UAE professionals, with support from international experts;

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16 UAE, Concerning the Peaceful Uses of Nuclear Energy.
19 “Nine Emirati graduates to join nuclear training programme,” The National (10 January 2016).
Capacity building framework is based on four technical areas for training the regulatory staff: security, safeguards, radiation safety and nuclear safety. They are classified into three knowledge levels: basic level, specialized level and advanced level; Bilateral cooperation and partnerships for Education and Training Programme in collaboration with domestic and international partners.21

FANR’s relationship with the IAEA has also been indispensable. This is because the IAEA has “a central role with respect to nuclear safety and security.”22 Yet “when the UAE went to us [IAEA] in the early days of its desire for nuclear energy, they asked for the model for a new entrant. We [IAEA] replied that we did not have a model for a successful new entrant into nuclear energy. The UAE, therefore, became the world’s test case. A test that, so far, they have passed.”23 Due to the pressure from the UAE, the IAEA eventually created its “Integrated Strategy for Assisting Member States in Establishing/Strengthening Their Nuclear Safety Infrastructure.”24 The UAE signed an Integrated Work Plan with the IAEA for the implementation of its national nuclear program.25 There have already been two sustained IAEA review missions to the UAE to inspect its regulatory framework. The most recent in February 2015, found that FANR had “strengthened its regulatory oversight and made significant progress” since the initial review in 2011.26 A former IAEA official says that the technical support that the agency provided to FANR was “very critical.” He adds that he expects even

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23 Confidential in-person interview with IAEA official (Dubai, 18 January 2016).
more cooperation once the Barakah facility is completed. He said that “IAEA safety inspections of the Barakah facility could occur by request from the UAE. It is likely that the UAE will pursue this option to reassure its public and its neighbours about the reactor’s safety.”

As a new entrant into the world of nuclear energy, FANR obviously relied heavily on foreign assistance in getting off the ground. However, the sustainability of the organization – and the UAE’s nuclear sector as a whole – can only be achieved though developing an indigenous nuclear capacity. To this end, “FANR has recruited a core team of experienced international personnel with sound training and mentoring backgrounds to work closely with the skilled cadre of Emirati personnel.” For example, part of KEPCO’s contract is to operate the reactors for 60 years and provide training for Emiratis. FANR has also established links with its universities to train more nuclear engineers. Khalifa University, the UAE’s flagship school, has recently started a number of nuclear educational programs: MSc in Nuclear Engineering (2010), Nuclear Engineering Minor within the BSc Mechanical Engineering (2011), and a PhD Engineering Programme which includes nuclear (2013). FANR also has established internship programs with both Khalifa University and Sharjah University and is partnering with Abu Dhabi University’s new engineering college. The UAE and the US established the Gulf Nuclear Energy Infrastructure Institute (GNEII) at Khalifa University’s Abu Dhabi campus. The GNEII focuses on the peaceful uses of nuclear energy and has already held symposiums on nuclear safety, safeguards, and security. At the IAEA’s 2014 General Conference, John Loy, FANR’s Deputy Director, discussed how the culture of the nuclear industry needed to change with regards to knowledge management. FANR’s challenge

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27 Confidential skype interview with former IAEA official (15 April 2016).
has been to transfer knowledge from “experienced and skilled expats to a young generation of Emiratis.”

**FANR Challenges**

Despite a “rollout that has gone very smoothly,” FANR faces several potential challenges. Most importantly, it needs to establish and maintain its independence from both government and nuclear industry. As the revelations about the collusion between Japanese regulators and industry which were exposed in the aftermath of the Fukushima nuclear accident have shown, this can be difficult even within mature liberal democracies. But the challenge is even tougher in a nondemocratic country such as the UAE.

FANR did make independence one of its core values. It emphasized the independence was “fundamental to achieve and maintain public and international acceptance of a civilian nuclear power program.” It operationalized this through an appointments process that included “clear and limited removal criteria,” budgets that would “not be subject to undue control by external bodies,” and a government reporting structure that avoided “direct Ministerial control over nuclear safety regulation.” One way that FANR is already independent from the nuclear industry is that FANR and ENEC were created separately. In many countries, there is often a

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cross-over in personnel between the nuclear industry and the regulator due to similarity in technical knowledge. But, so far, this has not been the case in the UAE. A FANR official has also maintained that “it will never happen.” In a comparative study of nuclear regulators, Matthews and Park determined that there was a “practical level of independence” between FANR and ENEC, and that the two entities “frequently declare efforts to maintain transparency and independence from one another.”

But there are some signs of a lack of budgetary independence. Budgetary independence was identified by Matthews and Park as one of their main criteria for nuclear regulatory independence. FANR’s initial budget was solely dependent on the UAE government. But in 2014, the UAE passed a new decree that mandated that 90% of FANR’s budget would come from licensing fees and the remaining 10% from government grants. The decree included a basic schedule of fees, which ranged from AED1500 (approximately $500) for a dental x-ray machine to AED50,000 (approximately $18,000) for more than 20 kilograms of nuclear materials as defined in the safeguards agreement. With the first Barakah unit almost 85% built, FANR is facing some budget pressures from the UAE government. This at a time when it should be adding staff. As a UAE newspaper reported, “FANR executives said privately that budget cuts would slow down the programme at some point.”

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34 Confidential in-person interview with FANR official (Abu Dhabi, 24 January 2016).
Other potential tests of FANR’s independence will occur in the future. For example, if a dispute emerges between FANR and ENEC and/or the government over the safety of the Barakah reactors. Already, there are questions being asked about the safety of some valves that caused an explosion at a Korean nuclear plant. These same valves are to be deployed at the Barakah site.\textsuperscript{39} Another test will be when (or if) anti-nuclear organizations start to take shape among the UAE public. How will FANR address their concerns?

While maintaining FANR’s independence is a challenge, many observers are optimistic about the future. A current FANR member maintains that he has seen no evidence of government or industry interference in FANR.\textsuperscript{40} A former IAEA official echoed that sentiment and stated that since its creation the IAEA has been “independent. There has been very good management by the UAE government. They have provided the resources, but has let the experts make the decisions. If there was any government interference it would likely lead to resignations by senior FANR officials.”\textsuperscript{41}

A final challenge is how FANR handles its unique blend of different safety cultures and systems that it has compiled from around the world. Bringing in foreign expertise is, at once, FANR’s greatest strength and potentially a liability. However, as Richard Meserve reminds us, a new entrant’s nuclear safety system “must operate within each nation’s legal, economic, and social culture; adaptations of regulatory systems to fit local conditions are probably necessary in any event.”\textsuperscript{42}

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\textsuperscript{39} McAuley, “UAE nuclear project enters critical phase.”
\textsuperscript{40} Confidential in-person interview with FANR official (Abu Dhabi, 24 January 2016).
\textsuperscript{41} Confidential skype interview with former IAEA official (15 April 2016).
\textsuperscript{42} Richard A. Meserve, “The global nuclear safety regime,” \textit{Daedalus} 138/4 (Fall 2009), 100-111.
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FANR, as a former ENEC executive stated, “is a blend of US and western European philosophies in terms of the plant safety and emergency response procedures.”\(^4\)\(^3\) For example, FANR is training its regulators at British universities.\(^4\)\(^4\) Add to that is the fact that “you are going to operate the plant with systems and processes that were developed in Korea” and with operators who are being trained in Korea. Clearly, “having a multinational, multicultural and multilingual workforce certainly adds a layer of complexity to the UAE project. A great deal of effort has been placed on trying to address potential issues in this area, and it will have to continue to be an area of emphasis for the foreseeable future.”\(^4\)\(^5\)

A final challenge for FANR is in its ultimate goal of indigenizing its workforce. This process, as a former IAEA official reminds us, will be a long-range project. He believes that “it will take between a decade and a generation to indigenize FANR.” He emphasizes that human resource development is much more important than technical knowledge. “You can import technology, but it is more difficult to sustain importing people.” He warns that “how long will foreigners stay in the UAE. Will they work for a couple of years, make some serious coin, and then move back home. Will foreigners stay for 10, 20, 30 years? The culture of the UAE may not encourage Westerners to permanently move there. This means that there could be a possibility of high turnover of people working for FANR.”\(^4\)\(^6\) Moreover, there are silent fears within the UAE government that when the UAE removes its foreign workers (regulators as well as operators) whether the nuclear reactors will still be safe?\(^4\)\(^7\)

\(^4\)\(^3\) McAuley, “UAE nuclear project enters critical phase.”
\(^4\)\(^4\) Confidential in-person interview with FANR official (Abu Dhabi, 24 January 2016).
\(^4\)\(^5\) McAuley, “UAE nuclear project enters critical phase.”
\(^4\)\(^6\) Confidential skype interview with former IAEA official (15 April 2016).
\(^4\)\(^7\) Confidential in-person interview with UAE government official (Dubai, 18 January 2016).
**FANR’s Lessons**

What lessons from the FANR case could be used to help other new nuclear jurisdictions develop their own regulatory bodies? First, any new nuclear regulator should utilize the technical cooperation offices of the IAEA. Before FANR, new entrants were on their own to develop their regulatory capacity. But the challenge of the creation of FANR forced IAEA to develop a blueprint for technical cooperation for new regulatory bodies. This should make it easier for future new entrants. Second, they should recruit experienced regulators from countries with established nuclear regulatory regimes. This was something that FANR did very well. The UAE government personally recruited Christer Viktorsson and other key individuals, and then relied on their contacts to establish much of the rest of the team. Foreign assistance is a necessary first step, but it is insufficient in the long run. Therefore, the third lesson is to establish a comprehensive and well-funded domestic training programs for its own nationals. The UAE has done a lot of the right things in this regard through its own university programs and recruitment of promising Emiratis. Future new entrants needs to study this model.

A final lesson involves the expansion of the international regulation of nuclear safety. After all a nuclear accident anywhere in the world affects the entire nuclear sector. For example, Findlay has recommended that the world’s regulatory bodies and IAEA should create “a truly global body of regulators that would meet regularly.”\(^48\) This could be similar to how the World Association of Nuclear Operators was created in the aftermath of the Chernobyl accident. For his

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part, Meserve recommends strengthening the ability of the IAEA to conduct safety inspections of nuclear power plants, just like it does for non-proliferation purposes.49

There are those who wonder how applicable the FANR case is to future new entrants. Observers claim that “FANR was unique because it was completely out-sourced. There was no pre-existing nuclear literacy in the UAE.”50 For example, other potential new entrants, such as Australia or Egypt have had research reactors in place for decades and already have a cadre of nuclear experts inside of their country. Finally, FANR’s creation cannot be replicated to other countries, because they will lack the financial resources of the UAE.51 FANR was able to recruit top end foreign nuclear experts by dangling large salary increases to them. It is doubtful that other new entrants would have that type of financial resources. Even existing nuclear regulatory bodies would have trouble matching the resources that FANR has. A current FANR official, who was recruited from India, states that FANR is better than the old Atomic Energy Regulatory Board and likely even better than the forthcoming Indian Nuclear Safety Regulatory Authority. According to “I am very proud of FANR….it is less complex due to the political system, regional differences, role of the public, nature of the bureaucracy.” FANR also has substantially more money and better educated workers than what India had.52 The fact that it took India over six decades after the introduction of nuclear energy in the country to finally create a truly independent nuclear regulatory body speaks volumes.

49 Meserve, “The global nuclear safety regime.”
50 Confidential skype interview with former IAEA official (15 April 2016).
51 Confidential skype interview with former IAEA official (15 April 2016).
52 Confidential in-person interview with FANR official (Abu Dhabi, 24 January 2016).
Conclusion

This paper’s case study of FANR accomplished many tasks. It underscored the important need for nuclear energy in the UAE and traced the domestic and international processes by which the UAE gradually became a nuclear country. In particular, it highlighted the creation of FANR by describing its key legislation, recruitment of foreign regulators, and efforts at indigenizing its workforce. The assessment of FANR is still a work in progress; the first Barakah unit does not come online until 2017. But already it is possible to anticipate some future challenges facing FANR. These include maintaining independence from government and industry pressures, ensuring control of their budget, and blending multiple foreign and indigenous safety cultures and systems into one organization.

Is FANR a model for future new entrants? There remains a debate on this point. On the one hand, FANR has done a lot of good things and is rightly viewed as the model by the IAEA and other foreign observers. On the other hand, the combination of the UAE’s large financial resources and its lack of interest in developing a nuclear weapons option makes some wonder how replicable the UAE experience is to future new entrants. This debate can only be resolved when the full picture of the UAE nuclear experience becomes clear and whether future new entrants model their creation of a nuclear regulator on FANR.

Acknowledgments

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