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The Winning Strategy of the Late-Comer: How Korea Was Awarded the UAE Nuclear Power Contract

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This case study examines the successful winning strategy of the Korean KEPCO consortium against the French AREVA consortium on the $20 billion nuclear power plant contract with the United Arab Emirates. Applying the 'Ser-M' paradigm, the two consortia were subjected to a detailed comparative analysis in terms of cost and lead time of construction, core technology, major actors' leadership, and collaborative efforts of consortium members. This case analysis revealed that the relatively lower price, shorter lead-time, and above all the 'animal spirited' leadership appeared to be the most significant strengths that drove the success of the Korean consortium in winning this historical contract.

Field of Research: Business Strategy, Human Resource Management

1. Introduction

A Korean consortium led by the Korea Electric Power Corporation (KEPCO) has won a $20 billion contract to develop civilian nuclear power plants (NPP) for the United Arab Emirates (UAE), beating French, US and Japanese rivals to win one of the world's largest nuclear tenders on offer. *"How could the Korean consortium, as a late-comer, be awarded the historical contract?"* The answer could be derived from the anatomy of each consortium's competences and its operating mechanism in a form of case analysis. The world's NPP technology was previously vested in only five countries: the United States, France, Japan, Russia and Canada. The deal is worth 40 billion US$, inclusive of future operating costs. Construction of the reactors alone will cost $20 billion, which is equivalent to exporting 1 million mid-sized passenger cars or 180 oil tankers capable of transporting 300,000 tons of crude oil. The deal is expected to create 110,000 jobs over the next 10 years (MKE, 2010). It is also expected to lead to contracts for Korean companies to the tune of another $20 billion for the operation, maintenance and fuel supply of the reactors during their 60-year lifespan.

Actually, nuclear company market share is distributed among Westinghouse (US) around 28%, AREVA (France) at 24%, GE (US) with 20%, AEP (Russia) with 10%, and AECL (Canada) with 5% (Daishin Securities, 2009a). The UAE order places South Korea among the leaders with good prospects for future growth. There are 432 nuclear plants operating in the world; however, the World Nuclear Association (WNA) predicts substantial growth, forecasting that 430 additional nuclear plants will be built by 2030, and 1,400 by 2050 (WNA, 2010b). Nuclear power, despite the enormous capital cost of a nuclear generating facility, has attracted attention largely due to spreading concerns over greenhouse gas emissions, the growing expense of fossil fuels, and a growing desire to move away from coal and gas-fired energy sources.[i]

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Our interest is laid upon that even though the Korean consortium has newly appeared in the global NPP arena, we suspect that there will be no 'free lunch' for the Korean consortium, and this winning 'David' strategy might be successful only in winning the present 'battle', but not the expanding future 'war' in nuclear power contracts.

2. Methodology and Analysis Design

This case study focuses on using the Ser-M paradigm to analyze Korea's competitiveness in NPP technology, and how it won a mega-order. The respective model is conceived from the Diamond Model of Michael Porter (1990). *'Ser-M paradigm'* and '*mechanism-based view'* (MBV), suggested by professor Dong-Sung Cho of Seoul National University, are focused on the interactions among the Subject (S), environment (e), and resources (r) and their integration into a dynamic mechanism (M). The central concept of this paradigm is the mechanism, which is composed of three attributes - *coordinating, learning and selecting mechanism* (Cho, 2006; Park, 2010). We know that the success of a company could be explained with a single factor at a given time, but that particular factor will not be enough to describe the total context or the long-term success of the company. Even the individual success factors such as the subject, the environment and the resource are such important to analyze, what is far more important is the process, the structure or the system in which the individual factors interact with one another to create the success (Cho, 2004). Applying the MBV and the Ser-M paradigm, we firstly analyzed each of the three factors 'S', 'e', and 'r', followed by the dynamic context of 'M (mechanism)' of this NPP export business process. Besides the press release or internet sources, working as a special consultant for KEPCO (Park) and for AREVA (Chevalier), and various information and supports from each consortium were available for this case analysis.

3. Subject: Leadership and Strategy

Here, the 'subject' factors, we will firstly look at which companies performed the leading roles in this success story. *KEPCO & KHNP:* Korea Hydro & Nuclear Power (KHNP) is the largest among the six power generating subsidiaries being led by CEO Jong-shin Kim who interestingly was awarded the *Légion d'honneur* from the French government in 2008. KHNP was separated from KEPCO in April 2001, accounting for approximately 25% of electricity producing facilities, hydro and nuclear combined. KHNP also operates NPPs in *Kori, Yonggwang, Ulchin* and *Wolsong,* and several hydroelectric power generation facilities in the *Hangang* system, providing approximately 40% of the national power supply.

KEPCO-KPS: KEPCO-Korea Plant Service & Engineering (KEPCO-KPS) started to provide maintenance services to overseas NPPs in April 1993, when technological support was given to change fuel for No.1 nuclear reactor in the *Angra* NPP, Brazil. At present, KEPCO-KPS is providing maintenance services in nine core fields for the maintenance of overseas NPPs, including changes in fuels for NPPs. The company is responsible for the management of maintenance services for the UAE project. *KOPEC:* Korea Power Engineering Company Inc. (KOPEC) is firmly committed to

continuously improving the safety and economical viability of nuclear power based on technical know-how and manpower resources developed through designing every single NPP in Korea. The company is responsible for designing NPPs for the UAE project.

Hyundai E&C: The Hyundai Engineering & Construction participated in the construction of NPP in the early 1970s. Since then, it has developed into a leading company in the construction of Korean NPPs with Samsung C&T.

Samsung C&T: Samsung Construction & Trading Corporation plans to use the Engineering Procurement Construction (EPC) turnkey method for engineering, construction, maintenance and repairs during project life cycles. The EPC method is especially effective for building projects in the energy and petrochemical industries.

Doosan Heavy Industries & Construction Co. Ltd.: Doosan Heavy Industries & Construction Co., being a unique Korean company that specializes in power plants, is equipped with the highest level of technology, especially in the area of nuclear power generation. With its turnkey production lines and management systems for materials, design, construction, testing and services, maintenance and repair, Doosan is strengthening its position as a leading provider of nuclear power systems in both Korean and international markets.

Toshiba and Westinghouse: Toshiba has balance-of-plant and major component capabilities that Westinghouse did not have before. Toshiba's size and financial strength give Westinghouse even greater ability to compete in the new plant business. Toshiba has constructed 17 NPPs in Japan. Most were turnkey contracts that included the balance of the plant. This experience, combined with the existing supply chain, is of great benefit in the construction of new plants. Clearly, Toshiba is committed to providing full support to Westinghouse's activities in the new-build market, not only in U.S. but around the world. KEPCO formed a consortium with Westinghouse of US and Toshiba Power Systems of Japan because there are still areas that require various technologies patented by those companies. But experts say it is only a matter of time before Korea finds a cost-efficient way to replicate them and become completely self-sufficient in terms of nuclear power technology (KEPCO, 2010).

AREVA: Ranked first in the global nuclear power industry, AREVA's unique integrated offering covers every stage of the fuel cycle, reactor design and construction, and related services. In addition, the group is expanding its operations in renewable energies. AREVA is also a global leader in electricity transmission and distribution and offers its customers a complete range of solutions for greater grid stability and energy efficiency. Sustainable development is a core component of the group's industrial strategy. AREVA's activities are organized into six business groups. Mines groups the uranium mines exploration and operation activities. The front-end converts and enriches the uranium and designs the fuel for the nuclear reactors. Reactors and services groups the activities of design and construction of nuclear reactors and propulsion and research reactors, and the activities of maintenance of the NPPs. The back-end recycles the spent fuel and provides

transport, clean-up and dismantling services. Renewable energy develops wind energy, bio energy, solar power and hydrogen power solutions and transmission and distribution (AREVA, 2009b). All over the world, AREVA supplies its customers with solutions for carbon-free power generation, electricity transmission and distribution. With its knowledge and expertise, AREVA plays a leading role in meeting the world's energy needs (AREVA, 2009a; AREVA's web site).

3.1 Leading Characters of Winning the Deal

Each company of the Korean consortium has advantages over the strong competitors such as the French nuclear group AREVA, and a consortium of General Electric of the US and Hitachi of Japan. However, technology alone does not determine success or failure in business (Barney, 1991; BBC, 2009; Park, 2010). In particular the diplomatic skills of the exporting country must complement it (MK, 2009). The US and France, which competed with the KEPCO consortium in this bid, have close ties with the UAE, even operating military bases there. French President Nicolas Sarkozy visited the UAE just after the NPP bid was announced, to support his country, offering to deploy more soldiers to the UAE, replace its fighter jets and even open a branch of the Louvre in the desert. Korea seemed to face insurmountable odds competing with such heavyweights in the NPP industry (MK, 2009; Daishin Security, 2009a). But it was able to catch up because it showcased the world's best operation rate for NPP and the least plant stoppages, while the Korean government provided *'behind-the-scenes'* support. President Lee, who had been commanding the negotiations, flew to the UAE in the final phase to provide the push needed to seal the deal. The success of such major deals depends on the diplomatic skills of a country's leader. President Sarkozy aggressively pitches French NPPs, fighter planes and submarines, just as the Russian Prime Minister Vladimir Putin played a key role in the success of winning the 2014 Winter Olympics bid.

3.2 Leadership of Kim Ssang-Soo: Innovative Management Mindset

The CEO of KEPCO, Mr. Kim Ssang-soo, said *"This project will be remembered as a surprising event which had not been expected. It couldn't have been achieved without President Lee's active salesmanship and the strong support of the government. Through this, Korea's new reactor APR 1400 has been recognized as the top NPP by experts around the world."*

- *'Report 123':* After Kim Ssang-Soo was appointed as CEO of KEPCO every report within the company was limited to three pages, following '*the principle of report 123'*, including all required information. This innovative principle halved a bit the company's paper expenses, but the potential savings of this scheme have got nothing to do with saving paper; that's not the purpose. The purpose is better, more succinct reports, written quicker with a focus only on essential facts, easier flow of information and ultimately faster decision-making. He prefers to improve things from the beginning, even though it looks like a trivial detail. The principle of management is the first innovative code of CEO Kim (KEPCO, 2010).

- *'Ssang-Kal' management:* His nickname '*Ssang-Kal* (dual-knives)' came from his name Ssang-Su in Korean and his firm character. He got this nickname from his CEO era of LG Electronics. As a CEO he disposed matters intelligently, definitely and quickly. When he was nominated as CEO of KEPCO, he started a sweeping organizational reform to completely replace its current structure based on hierarchy of rank and seniority with a team-based system combined with assigning personnel to positions according to their ability. He always stressed that *"Our aim is not only to become No. 1 in the local industry, but to compete with global leading players such as GE, Samsung Electronics and POSCO".*

- *Tear-down and redesign – "5% of minor changes are impossible but 30% of innovative changes are not impossible":* TDR is the trade mark of President Kim with his management innovation. *"If we try to improve 5% things of the company's efficiency, we only attempt to raise the efficiency within the manner that we are doing. However in terms of increasing 30% efficiency, things should be changed from the beginning to solve the fundamental problems".*

- *CEO at the forefront:* He is too active to remain idle. He believes that his decisions and efforts can influence everything for the future of company and his staffs in the company. He runs the company with the belief about the important role of CEO in terms of business innovation, and should contribute to the society where they belong. He emphasized that the innovation of management needs to be processed by a CEO who knows well about the whole context of the operation. He called it *'strategic top-down management'*. As the commander taking care of the project for bidding, he made desperate efforts, being a model leader, to win the deal. He was deployed to the front lines with his staff as well as with other companies.

3.3 'War Room': The Symbol of Crisis Management

KEPCO formed a 'War Room' in the second basement of its Seoul headquarters for 75-80 executives from the companies to coordinate the proposal and sales push. Huge signs around the room bore slogans such as *"UAE Nuclear Exports, We Must Do It!"* and "*Go UAE, Yes We Can!"* His innovative management style and type of character contributed to take on the position of a leader in charge of the project. Early in the UAE bidding process, many observers expected that it would mainly be a contest between the French AREVA consortium and the US-Japanese consortium that included General Electric and Hitachi. He devoted himself to winning the bid for building NPPs in the UAE even under the worst of conditions, by organizing a project team in the basement at KEPCO to seek cooperation with other businesses and concentrate on the goal for 7 months. With his passion for winning the bid, the Korean consortium was able to achieve another milestone for Korea, which has also emerged over the last four decades from being a recipient of international aid to an economic powerhouse that now helps other countries grow. Finally, President Kim of KEPCO has succeeded in the remarkable achievement of winning one of the world's largest NPP deals (KEPCO, 2010; SERI, 2009). *"How can it be possible?"*

The reasons come firstly from AREVA: *'Lack of being closely united in France', 'Loss*

of cost competitiveness and lead time', 'Underestimation about Korean consortium', and 'Failure to provide the UAE with anything other than its technical proposal'. On the other hand, Korea is an emerging powerhouse to be reckoned with in the global market for NPP. Although it had not yet exported any NPP, Korea still held advantages over its rivals as the sixth-largest nuclear power generator in the world (KEPCO, 2010). With 20 nuclear reactors in operation, Korea is renowned for the lowest shut-down time in the world. Moreover, it is highly efficient in constructing NPP within 48 months which the French takes 58 months on average. Also of great help in winning the contract were the close relations Korea has cultivated with the UAE, particularly in trade and construction. The UAE is the second-largest oil and natural gas exporter to Korea. In addition, Korean construction companies have been playing a leading role in the building of infrastructure in the Arab countries. Moreover, Korea recently concluded a nuclear cooperation agreement with the UAE, under which it is set to extend assistance in building the Middle East, the Muslim country's nuclear program by providing nuclear technology, equipment and supplies for a 20-year period (MKE, 2010).

4. Environment: Competence and Opportunity

Here we applied the traditional SWOT analysis to investigate the strategy taken by the Korean consortium against the French group AREVA.

4.1 Nuclear Civil Energy Market - With What Korea Dealt?

The nuclear industry is completely different from other industries such as automobiles or electronics. An overview of the NPP market is presented to define its specific characteristics. The first commercial NPPs started operation in the 1950s. There are now some 436 commercial nuclear power reactors operating in 30 countries, with 372,000 MWe of total capacity. They provide about 15% of the world's electricity as continuous, reliable base-load power, and their efficiency is increasing. Fifty-six countries operate a total of about 250 research reactors and a further 220 nuclear reactors power ships and submarines (IEA, 2007; SERI, 2010).

[Tab. 1] Changes of international market for nuclear reactors (IAEA, 2008)

Before market restructuring (1995)		After market restructuring (2005)	
Industrial group	Nature of group	Industrial group	Nature of group
General Electric (US)	Conglomerate/Electrical Manufacturer & Constructor	General Electric	Conglomerate/ Electric Constructor (Private)
Westinghouse (US)	Conglomerate/Electrical Manufacturer & Constructor	BNFL-Westinghouse (include CE and ABB Nuclear)	Nuclear Corporation Integrated (Semi-public)
Combustion Engineering (US)	Construction Mechanical/Boilers		
ABB (US)	Electrical Manufacturer & Constructor		
Minatom (USSR)	Company nuclear integrate	Rosatom (ex-Minatom)	Integrated Nuclear Corporation (Public)
Framatome (France)	Constructor nuclear specialize	AREVA (Framatome ANP; 33% Siemens)	Integrated Nuclear Corporation (Public)
Siemens-KWU (Germany)	Electrical Manufacturer & Constructor		
AECL (Canada)	Nuclear Engineering (Public)	AECL (Canada)	Nuclear Engineering (Public)

The nuclear market is characterized by the growth in demand substituting the fossil fuel, and the lower cost of nuclear fuel with relatively cheap to operate. Also it is not an open market (few suppliers representing the traditional circle of the developed countries) which is gathering technological and political lobbies and economic and strategic alliances (MK, 2009; MKE, 2010). The International Atomic Energy Agency (IAEA) controls this market very strictly with heavy rules on operation. Competition in it is fierce and ruthless and competitive advantages include industry benchmark (industrial reference), conditions of sale (price, support on export credit by one government bank and insurance), political support, and agreement of a gradual transfer of technology (IAEA, 2008; WNA, 2010b).

[Tab. 2] Distribution of NPP export market (NEI, 2010)

	AREVA	BNFL/Westinghouse	GE	Minatom	Others *
Market Share	20% (2.6G$)	20% (2.6G$)	15% (2G$)	15% (2G$)	30% (4G$)
*AECL Canada, Japanese manufacturers subcontract mining companies (Cameco, RTZ, BHP, etc.)					

4.2 United Arab Emirates – What Are Their Real Needs?

Clear identification of the customer is really important and helps to overcome the generic weaknesses and highlight the strengths in bidding competition. Then, *"what are their real needs as a customer?"* The customer, the UAE represented by the Emirate Nuclear Energy Corporation (ENEC), is located in a conflict region - *Persian Gulf* - at some 40 nautical miles from Iran. All this suggests that the UAE has a great need for military protection (Al-Ahram Weekly, 2009; SERI, 2009). Historically, the UAE had been a British protectorate (from treaty signing in 1892 till 1968), so it should be considered as an Arab-Muslim country with an anti-imperialist culture. This country has been the fastest growing in the global economy and is now preparing for

the post-oil era. All these factors made the UAE a new and very promising market of nuclear energy plant (Al-Ahram Weekly, 2009; WNA, 2010a). Regarding diplomatic relations and foreign policy, this country has had a close and deep relation with France for over a century. But the Republic of Korea established 'Korea-UAE' diplomatic relations only 30 years ago on June 18, 1980.

4.3 French Group - Who Is the Real Competitor?

For the Korean part, the strongest competitor in this deal has been the French consortium, headed and led by AREVA. It is a top class company which has credibility and a high reputation in the nuclear industry field. It also has great experiences and masters the whole chain of processes which commenced by mining, construction and operating NPPs, and finished by the treatment and the recycling of radioactive wastes (AREVA, 2009; WNA, 2009b). From 1975 to 2005, its international market share amounted 20% and its 15 atomic reactors represented really good industrial references for this group (IAEA, 2008; SERI, 2006). AREVA possesses the highest and newest technologic designs with the higher standard of safety. The 3rd generation European pressurized reactor (EPR) withstands or resists air attacks by missile or aircraft. As the nuclear power industry represents a sensitive point for the French economy, AREVA benefits from the full support of the French government (MKE, 2009; SERI, 2010; Thomas, 2005). Nevertheless, the AREVA group is actually not as strong as it appears due to the following *Achilles heels*:

- Lack of coordination between AREVA and EDF (Pilot project leadership conflict)
- High cost of the 3rd generation EPR technology
- Delay on the completion dates of the two latest projects to build EPRs

Construction of the most powerful NPP in the world began in 2005 at Olkiluoto, Finland but the project did not progress as originally planned, with the delay currently being at least two years. The construction site of the future EPR nuclear reactor EDF in Flamanville, France is also delayed by at least two years to 2014 at the earliest compared to the original plan of 2012. And AREVA has outsourced some parts of the NPP construction. As a result, the costs, quality and lead times are often out of its control in a similar case to that presently suffering by Toyota will its brake recalls (MKE, 2010).

4.4 SWOT Analysis - Korean versus French Consortium

The SWOT analysis highlighted the strengths, weaknesses, opportunities and threats of the Korean consortium KEPCO versus the AREVA group, as shown in [Tab. 3]. As the consequences of SWOT analysis, KEPCO was requested to develop and maintain its strengths and opportunities (S-O) strategies by cutting down the prices even by having dumping sales, shortening the lead time to complete the construction of NPP, and above all satisfying the real needs of the customers by juxtaposing the entrepreneurship of the CEO.

[Tab. 3] SWOT analysis of the KEPCO Consortium

Opportunities & Threats / Strengths & Weaknesses		O Enter into the restricted circle of nuclear reactors providers Win its first reference to export Revenues by NPP in the UAE Gain market share in Jordan, Turkey, Asian & Arabic market Gain experiences in the field of NPP; negotiation, construction, technologies etc.	T Control of International atomic energy agency (IAEA) Lack of solution (nuclear waste) Influence of French diplomacy & probable Franco-American alliances (AREVA & GE) Experiences in technology & safety standard of French group Others: Clean energy market
S	Korea's images in the UAE (economic/industry) Lower selling price Relative short lead time Alliances Opportunities President Lee: former Hyundai-man Sharing the historical & cultural similarities	<u>S-O strategy</u> - Keep *LOW-COST advantage* (even with dumping strategy) - Push *LEAD-TIME advantage* (ever with 'can-do' spirits) - Find *CUSTOMERS-NEEDS* (even the hidden & real needs) - Show *TRUST-LEADERSHIP* (ever with 'top-down' models)	<u>S-T strategy</u> - Intensify and expand diplomatic supports for potential markets - Win-Win alliance with IAEA - Political support on R&D for NPP core technology
W	Lack in core-technology Weak diplomatic relations	<u>W-O strategy</u> - Making alliances to get win	<u>W-T strategy</u> - Diplomatic support

Also, the Korean consortium is required to intensify and strengthen its diplomatic relations by initiating visits of officials of both countries and regularly sitting on the table negotiations, to propose joint-offers or joint-value by providing the UAE with military cooperation (hi-tech weapons supply-military base, *i.e.,* aircraft & missiles), economic cooperation (Samsung and STX Shipbuilding) and diplomatic cooperation and supports, and also to establish win-win alliances with IAEA, diplomatic and political support, and R&D for nuclear wastes management.

The essence of those S-O strategies and other supplementary ones is based on choosing wiser and widely different activities than those of the competitors (Daishin Securities, 2009; SERI, 2010). Thus for this NPP contract bidding, the KEPCO consortium beat the AREVA consortium by differentiating the negotiation strategy through the virtue of its dramatically different goals. Now the remaining questions and future ones are *"What will and what should be the next strategy of KEPCO for the future demand of NPPs?"*

5. Resource: Qualification and Mobilization

Although Korea is a relative newcomer in the international market, it is recognized by the UAE for having cost-effectiveness and technological know-how. In the Ser-M model, 'resources' stand for fundamentals and objects which should be developed and utilized for competitive advantages. We will identify the competitive advantage of the Korean consortium over the French one, focusing on the following five aspects: capital, labor, ability, culture, and sustainable business environments (Park, 2010).

1) Capital

According to the data (KEPCO, 2009; AREVA, 2009b), the sales volume of KEPCO is bigger than AREVA. And the debt ratio of KEPCO (38.8% in 2008) is higher than that of AREVA (15.7% in 2008). But the debt-to-asset ratio of KEPCO is far lower than that of Korean private companies. The sales of both companies are increasing. However, net income is decreasing at these companies because of high fuel cost and unfavorable exchange rate.

2) Labor

KEPCO (Korea): KEPCO will supply the full scope of works and services for the UAE Civil Nuclear Power Program, including engineering, procurement, construction, nuclear fuel and operations and maintenance supports. KHNP plays a key role as the engineering, procurement and construction contractor and operator. KOPEC provides the NPP design and engineering service. Korea Nuclear Fuel Co., Ltd. (KNF) provides the nuclear fuel. KPS is involved in plant maintenance. Korea Atomic Energy Research Institute (KAERI) plays a role in R&D activities. The non-Korean companies involved in the KEPCO team include Westinghouse of the US, and Toshiba of Japan.[ii]

AREVA (France): AREVA is a public multinational industrial conglomerate that is mainly known for nuclear power. It is the only company with a presence in every industrial activity linked to nuclear energy: engineering, nuclear propulsion and reactors, treatment, recycling and stabilization. EDF is an integrated energy company in France with operations spanning electricity generation and electricity distribution. GDF is a French-based energy company active in the fields of electricity generation and distribution, natural gas and renewable energy. GDF Suez is the second-largest generator of electricity in France behind EDF. TOTAL is a French oil company and one of the six "Super major" oil companies in the world. Total does not currently have extensive involvement in nuclear power. However, in January 2008, Total announced that they were to sign an agreement with Suez and AREVA to submit an NPP project to the UAE. Meanwhile, the AREVA consortium does not have noticeable engineering and construction companies compared to the KEPCO consortium which includes Hyundai and Samsung C&T. Also KNF is in charge of providing nuclear power fuel. Furthermore, it has a more integrated industry portfolio which can induce nation-wide interest and economic effects (Lee, 2007; MKE, 2009). But the *'hidden'* competence for the KEPCO consortium is its human resources equipped with *'can-do-spirit', 'entrepreneurship' and 'company-oriented and animal spirit'.* Those things are related to KEPCO's firm-specific organizational culture.

3) Ability and Technology

ENEC has decided to build KEPCO's APR 1400, a Generation III, 1400 Megawatt NPP with evolutionary improvements in safety, performance, and environmental impact that meet the highest international standards for safety and performance. The APR 1400 design was developed by the Korean nuclear industry under the leadership of KEPCO over a 10-year period from 1992. The first NPP in the UAE will be the fifth unit of the APR 1400 plants, and the *'Shin-Kori'* plants in Korea will serve as the 'reference NPPs' for the UAE program.

KEPCO's APR1400: The APR 1400 has been designed to meet heightened safety

goals developed in accordance with the latest international safety standards, which aim to secure an additional margin of safety to protect the public health. Its design incorporates more than 30 years of operational learning and resulting enhancements to safety, reliability and efficiency. Also it was developed to keep up with the trend of the international nuclear power industry. Important achievements are increasing the capacity from 1,000 to 1,400 megawatts and advancing and experiences gained, in addition to meeting the licensing requirements needs by the US regulatory agency. It is a design with highly improved safety and cost competitiveness using the most advanced technology. By deploying only a third-generation design, the UAE's future fleet of nuclear reactors will boast safety levels significantly above those of existing nuclear fleets that are still dominated by second-generation designs.[iii]

AREVA's EPR (European Pressurized Reactor): The EPR is a 1,600 megawatt Generation III reactor designed for US by AREVA. It is a standardized, advanced design derived from the EPR currently being built in Europe. Olkiluoto, Finland but the project did not progress as originally planned, with the delay currently being at least two years. The construction site of the future EPR nuclear reactor EDF in Flamanville, France is also delayed by at least two years to 2014 at the earliest compared to the original plan of 2012.

① Cost advantage: Cost effectiveness is one of the biggest attractions of APR 1400 in this bidding. KEPCO suggested a construction cost/kW of 1,300U$, which is only 30% of that of the US-Japan consortium (http://www.chosun.com).

② Lead time advantage: The French consortium submitted designs for its 3rd generation EPR, and the US-Japanese consortium submitted designs for its Advanced Boiling Water Reactor (ABWR). All three plants are designed to operate for 60 years and require refueling after approximately 18 months of operation. While the French EPR will take 57 months to build, both ABWR and Korean APR1400 will take only 48 months. KEPCO's short construction period is definitely attractive to the UAE (http://nuclearstreet.com/blogs/nuclear_power_news).

③ Safety advantage: KEPCO has the lowest 'unplanned shutdown' rate in the world at only 0.5 times per month compared to 3.2 times per month in France, which is more than 6 times larger (Lee, 2007).

4) Culture

Cultural factors are one of the important keys in this bidding. Doing the business with French companies, we feel that they are politically neutral, culturally democratic and economically rational and character and rational (Chevalier, 1995). On the contrary, Korea business culture can be expressed as pro-government, paternalism and authoritarian (Cho, 2006; Park, 2010). From research and interviews with CEOs in Korean major companies, Park (2010) suggested a conceptual typology on organizational culture, which categorized Americans as *'know-how'* oriented, Japanese as *'know-what'* oriented, Koreans as *'know-whom' oriented* and French as *'know-why' oriented*. Both the French and Korean mechanisms are dynamically formulated and affected by the strategic behaviors of actors (Crozier & Friedberg, 1980; Park, 2010). *Then what are the differences between the French and Korean? And why did the Korean micro-culture appear more effective than the French in this*

bidding? We think that this Korean organizational culture contributed to the UAE's promotion because it often results in speedy and strategic top-down decision making and project processing. As aforementioned in the labor part, other Korean organizational characteristics are *'can-do-spirit'* and *'company (work) oriented spirit'* which have resulted in amazing economic growth since the late sixties. We cannot judge which organizational culture is better, but we can suggest which organizational culture is likely to be more competitive.

5) Sustainability

KEPCO: KEPCO has had a sustainability management framework since 2005 that focuses on the balanced consideration in four key areas; economy, environment, society and human resources. Accordingly, it has set 'KS-GT5' as its goal of sustainability management until 2015. KEPCO Sustainability (KS) stands for becoming the best institute of sustainability management in Korea, and Global Top 5 (GT5) for elevating the level of KEPCO's sustainability management to the level of the global top 5 energy companies. KEPCO has developed implementation strategies and identified 12 action items in 4 major areas of sustainability management to achieve the goal by 2015. The 12 action guidelines have been aligned with the 2015 mid-to-long term strategic business plan (KEPCO, 2009). The Korea Chamber of Commerce and Industry (KCCI) recently reported a continuing gap between Korean and global companies in sustainable management. Especially public utilities show a 10 % gap between Korean and global companies (KCCI, 2009).

[Tab. 4] Sustainability of Korean industries

Industry	Global	Korean	Gap
Finance & Banking	44.9	24.1	-20.8
Automobile	49.7	35.2	-14.5
Petroleum & Gas	43.9	30.6	-13.3
Public Equipments	*52.9*	*42.1*	*-10.8*
Computer, Electronics, Communication	51.2	42.2	-9.5
Retailing	38.7	27.6	-11.1
Chemical, Material	39.6	48.8	+9.2

AREVA: AREVA's sustainable management policy is served by a commitment to ongoing improvement (AREVA, 2009a). It is implemented through a continuous improvement process that revolves around several commitments. It has led to the establishment of social and environmental performance indicators. It focused on four commitments: economic performance, environmental protection, community involvement and commitment to employees.

A comparison of the resource-based competence of KEPCO with that of AREVA shows that KEPCO has competitive resources in labor, ability and culture. On the contrary, we couldn't find specific competence in terms of capital or from the sustainable environment. We can conclude that, in the resource-based view (Barney, 1991; Cho, 2006), only the human resources, employees' ability, and culture-related factors showed their competitive advantages, as can be seen on [Tab. 5].

[Tab. 5] KEPCO's competitive resource and core competence

	Core Competences of the KEPCO consortium
Labor (HR)	Excellent industry portfolio lineup, company (work)-oriented actor's attitude
Ability	Low construction cost, safety in operation rate, short construction period
Culture	Strategic top-down project approach, aggressive (challenging) mentality

6. Mechanism: Culture and Operating Context

"Panta rhei *(all things are flowing)*". If we look at how someone has succeeded at something, we should analyze it at a strategic level in a holistic view. This is what Ser-M analysis is. As the Greek philosopher Herakleitos of Ephesus said, all things are flowing, corporate environment keeps changing, CEOs are replaced, and resources of corporations are transformed. KEPCO has operated and developed business with demanding Korean customers. As a public enterprise, it has provided reliable and high quality electricity to Korean customers. Due to its lack of natural resources, KEPCO tried to keep changing and innovating business and operations. Although the subjects, environments, and resources keep changing, the tangible or intangible systems and strategies, organizational culture, which have been built through all the changes, still remain and these sustainable factors represent the *'mechanism'* (Cho, 2006; Park, 2010). For the mechanism, we look into how these *subject-environment-and-resource* elements interacted with each other during the 3 stages of the bidding process: starting stage, bargaining stage and pay-off stage:

Starting stage: The UAE's evaluation of its energy needs was wide-ranging and concluded that the volume of natural gas would be insufficient to meet future demand and that the burning of liquid fuels would be both costly and negative for a green environment. Coal-fired power generation would be potentially cheaper but environmentally unacceptable, and potentially vulnerable from a security of supply standpoint. The deployment of renewable and other alternative energy supplies would only be able to supply approximately 6~7% of the required electricity generation capacity by 2020. These factors supported the decision to begin this bidding according to the five sectors below:

- *Economy:* Well run nuclear energy plant are among the most efficient producers of electricity
- *Safe supply of fuel:* NPPs have high availability factors (in excess of 90 %) and can operate for 18~24 months on a single fuel load
- *Environment:* Nuclear plants emit no greenhouse gases and represent an important tool for combating climate change
- *Industrial development:* Sustainable nuclear energy program will create new service industries and high-value jobs, while enhancing economic development throughout the UAE
- *Human resource development:* Essential for the success of NPP project in the UAE

Among the six consortia from four countries, three teams demonstrated that their technology and safety programs fully meet the latest international standards, so that these three teams were accepted as final candidates.

Bargaining stage: ENEC's year-long prime contractor selection process was designed to identify the best long-term partner for the UAE as it undertook its civil nuclear energy program. The process was guided by the policy of the UAE on the evaluation and potential development of peaceful nuclear energy, which set strict standards for safety and security, non proliferation and sustainability. ENEC focused on five core criteria in reaching its final decision: safety, deliverability, contract compliance, human resource development, and commercial competitiveness. KEPCO's team of 75 dedicated experts evaluated the bids. Collectively, the team boasted of directly relevant experiences in nuclear industry. The 'War room' was made up of experts in the following fields: NPP safety, design and construction; operations and maintenance; nuclear quality assurance, supply chain management and procurement; nuclear fuel procurement and management (including safeguards, non proliferation and spent fuel management); siting analysis (including environmental impact assessment, seismology, geology, meteorology and hydrology); finance (including generation cost modeling and project finance); legal and contracting; program management; utility operations; and communications and community relations.[iv] Finally, as we know, ENEC announced that the Korean KEPCO consortium had won the competition at the Emirates Palace Hotel, Abu Dhabi at 13:30 Dec. 27, 2009.

Pay-off stage: Despite the success of the Korean consortium in winning the contract, several negative effects appeared as many mass media and experts analyzed that this project will be unprofitable and that other countries will enjoy any real benefits. Nevertheless, we believe that the benefits for Korea will be immeasurable. When comparing the history of economics and technologies with advanced countries, it is clear that the winning of this project cannot be a disadvantage for Korea since it represents the first step to enter in the restricted NPP export market, and will enable Korea could develop and invest the fundamental sciences. But it will take time. The world economy is unstable. The financial crisis and recession are continuing. Some experts even forecast that it could worsen again in the near future. In this negative circumstance, Korea has picked up the business to enter and to invest. It can be a great turning point for Korea. The demand for NPPs will increase because they are environmentally friendly and efficient. In this growing industry with the tremendous first foot print made by Korea, the remaining question is how to win the next competition.

7. Conclusion

The Ser-M paradigm-based analysis of this case study requires a far more in-depth reflection to clearly determine the real mechanism of the bidding competition. Nevertheless, the results of our analysis can be summarized as follows [Tab. 6]. Based on the highlighted summary of each Ser-M factor, we could answer negatively to each of the following questions:

(S) Was the leadership of the President Kim the only factor to win the competition?
(E) Was the environment (political, economic, cultural) the only factor to win?
(R) Was the resource of KEPCO consortium the only factor to win?

(M) Korea will show a virtuous circle of actual mechanism in the next round?

[Tab. 6] Korea's bidding advantages on ser-M analysis

<table>
<tr><th colspan="2">SUBJECT
[Leadership & Participation]</th><th colspan="2">ENVIRONMENT
[The 1st Export of NPP]</th><th>RESOURCE
[Expertise in Operation]</th></tr>
<tr><td colspan="2">Quick reaction & decisions
Vision for long-term relations
Ready to export NPP
(by former CEO of KEPCO)
Can-do & challenging attitude
Aware of customer's culture</td><td colspan="2">1st Plant in Middle-East
Growing demand for NPP
Political gaming among exporters
The UAE's relation-oriented culture
Exchange rate: Euro↓/Won↑
Dubai's liability crisis</td><td>Low operating cost
APR1400: Gen III, 1400MW
Cost-effective plant design
Low rate of unplanned shutdown
Governmental supports</td></tr>
<tr><th colspan="5">MECHANISM</th></tr>
<tr><td rowspan="6">The Core Values of Korean KEPCO Team</td><td rowspan="4">Continuous Improvement</td><td rowspan="2">Respect to Customer</td><td>Government support: package deal</td><td rowspan="6">As a late-comer the Korean consortium was awarded contract</td></tr>
<tr><td>Leadership: President Lee & Kim</td></tr>
<tr><td rowspan="2">Profit Creation</td><td>Cooperation: related organizations</td></tr>
<tr><td>Low costs & shorter lead time</td></tr>
<tr><td rowspan="2">Challenging Vision</td><td rowspan="2">Change and Innovation</td><td>High safety in maintenance</td></tr>
<tr><td>Experienced human resources</td></tr>
</table>

"Let's do it!" This is what Mohamed Al Hammadi, CEO of ENEC said after the bidding competition. Many criticisms remain on the method of Korea's victory, but the high entry barrier to the nuclear energy market should be remembered. We should also remember the black and white TV sets made by Samsung in the past. No one could imagine that Samsung Electronics would become the strongest challenger against Sony (SERI, 2009; MKE, 2010). The Korean NPP consortium is now in the beginning stage just like when Samsung produced black & white TVs. It was a big event. But now, only months' later, Korean people no longer talk about the great success of the KEPCO consortium. Their interests have been distracted by the Winter Olympic Games, unemployment, and the gossip world of celebrities. If some remain interested, they only wait for the next competition to be won, rather than remaining as loyal supporters.

Then*, "What would be the right strategy for Korea to win in the next bidding?"* Obviously Korea needs to develop its own 5 % core technology, which presently depends totally on Westinghouse. This deficiency is the core issue in designing NPPs. Only two companies, AREVA and Westinghouse have the code. If Korea wants to be one of the strongest future candidates, it must attain this core technology as to be able to build the nuclear plant 100 % by itself. Fortunately, once more the Korean government declared its support in developing this core technology. President Lee announced that the government will provide any necessary support for this development and has set the goal of achieving it by 2014. Neither are the world's fastest rates of growth and democratization, Korea's image abroad has failed to keep up with these achievements, resulting in what is widely called the *'Korea Discount'* .

NOTE

* Major facts of this article is available on the web from a variety of sources, predominantly newspaper articles, such as the Korea Herald, JoongAng Daily and company marketing brochures from the likes of KEPCO, AREVA and Doosan. We have listed most of them throughout the paper, but of course actually there will be many others.

i. The original source of news topics can be found especially from the site: http://environmental-engineering.suite101.com/article.cfm/south_korea_exports_nuclear_power_to_uae, and http://joongangdaily.joins.com/article/view.asp?aid=2915051

ii. Cited directly from the following news: http://www.wam.org.ae/servlet/Satellite?c=WamLocEnews&cid=1261832658351&p=1135099400124&pagename=WAM%2FWamLocEnews%2FW-T-LEN-FullNews

iii. From the same source above

iv. Also mainly from the same source

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