



That happened in November:

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# Seven Keys to Success

In 2013, China and France will complete their first thirty years of cooperation in the use of nuclear power. This anniversary follows the signature of the tripartite cooperation agreement on a mid-size Gen 3 reactor between Areva, EDF and CGNPC on October 19.

These thirty years of cooperation relied on strong support from the French government, its utility (EDF), its manufacturing companies (Areva, Alstom) and the French industry in general symbolized by the France-China Electricity Partnership (PFCE).

During the thirty years following the first cooperation agreement, French industry has established a strong localization with solid partners in China, both countries organized numerous technical seminars, shared laboratories, and finally both countries will soon promote a common technology and investment abroad. In December 2009, Chinese Vice Premier Li Keqiang and French Prime Minister, François Fillon, discussed future cooperation between the two countries, on nuclear fuel reprocessing, personnel training and research on Gen 4. A few weeks ago, Premier Wen Jiabao restated to President François Hollande the importance of this strategic partnership between the countries.

We will describe seven keys of this success in China.

## November 22, 1982, the first milestone

In 1982, the CEA signed a cooperation framework with the Chinese Ministry of Nuclear. One year later, EDF, China Light and Power, and Guangdong Nuclear Power Joint Venture Company started the Daya Bay project, and in 1994 Premier Li Peng inaugurated Daya Bay NPP.

At that time, China was not the market we see today, and France was the only country that took the risk to share a sensitive technology with China. This strategy to import the French expertise in the long term is tangible and can be perceived today in various fields of the nuclear market. Let's just name a few examples:

- **Daya Bay:** Construction of the first 900 MW nuclear power plant.
- **Areva--Dongfang:** The first Joint Venture for the primary pump with DEC.
- **AFCE:** Regular seminars on Nuclear Safety, standards, codes and qualification.
- **EDF:** The first western Investor in a nuclear power plant as an operator.
- **IFCE:** Set up of the first Sino-foreign nuclear engineering institute in Zhuhai.
- **ACPP:** The first nuclear company localized in Taishan Green Area.
- **WECAN:** The first engineering company involving Areva and CGNPC.

- **CANBERRA:** The first company to provide equipment and service of nuclear detection, radiation measurement and nuclear security with the China Institute of Atomic Energy.

- **Onet Technologies:** The first company to sign an agreement with CNPEC that covered Europe and China, for the decommissioning of nuclear installations, decontamination and nuclear waste treatment.

**Key 1:** Due to the sensitive nature of nuclear power, the government directly encourages its nuclear industry to lead the path in the cooperation in various fields.

## Daya Bay: a mutual benefit for the French and Chinese industries

The training of engineers at EDF for the Daya Bay project and the transfer of expertise to CGNPC reinforced the expansion of the French codes, qualification and standards in China as well as the promotion of the French safety and operation references.

The involvement of the French industry in China is firstly measured by the number of HAF 604 certifications (33%) granted by the safety authority (against 20% to US companies and 17% for German companies). Most of the nuclear power plants being built in China, including the AP1000 and VVER, import French equipment and components.

In that regard, the PFCE is very active in the promotion of codes, standards, and qualification. For example, in March this year, the China Nuclear Energy Association and EDF hosted the Sino-French Seminar on Nuclear Equipment Manufacturing Quality Surveillance in Beijing (1) with the participation of AREVA and PFCE.

PFCE members localized their equipment to support the Chinese Nuclear Program. In 2009, the delegations of PFCE and GIIN (French Nuclear Industry Association) visited Haiyan (Zhejiang Province), where the biggest nuclear industrial park in China was being built. The delegation signed a Letter of Intent for promoting cooperation in nuclear related industries with the local government. In 2011 PFCE signed a tripartite agreement with Taishan Municipality and CGNPC.

**Key 2:** Various industry associations exist, including: Nuclear Suppliers Group (USA), the Nuclear Industry Association (UK), Organization of Canadian Nuclear Industry (OCI), Spanish Nuclear Group (Spain), and Finnuclear (Finland). None of these signed a strategic agreement or had partnership with the industrial parks, therefore cannot understand the local demand. Their members will rely on their sales forces or international biddings.

The foundation of a dedicated association to the Chinese market will generate synergies between the members and the domestic industry. Upstream, the training on Codes, Qualification and Standards is essential to promote the industry.

## EDF in China: committed to partnership

Mr. Jean-Claude Prenez will explain in this edition the involvement of PFCE and EDF in China, from Daya Bay to Taishan.

Beside its investments in Taishan, EDF's work is reviewing the qualification of local suppliers. In parallel EDF is supporting the PFCE (Partenariat France Chine Electricité).

Furthermore, EDF twins its plants with the Chinese counterparts, such as CGNPC Hongyanhe and CIVAUX, to strengthen international cooperation and improve the management capacity for its units operations effectively.

## Areva in China: a technology provider and major fuel supplier

The relations between Framatome, (later Areva) and China illustrate the industrial success. Areva is involved in China in the fuel cycle, reactor design, key element manufacturing and supply chain assessment.

This special relationship is directly marked at the top management of CNNC and CGNPC:

1. In the nineties Jean-Claude Leny, former president of Framatome, kept strong relations with Wu Yi and Jiang Zemin.

2. In 2011, the meeting in Hong Kong between He Yu and Luc Oursel illustrated the scope of cooperation such as in uranium exploration, promotion of the phase two of Taishan nuclear power project and research on new nuclear reactors.

3. In February this year Mr. Lv Huaxiang, Deputy General Manager of China National Nuclear Corporation (CNNC), met Senior Executive Vice-President of Areva, Mr. Philippe Samama, to consider other fields of interest such as DCS cooperation, and talked with Mr. Yang Changli, Vice General Manager of CNNC, and Mr. Rémy Autebert, Vice President of Areva in June.

## Ambitious transfers of technology: The construction of the heavy component facility of Nansha.

The objective of Nansha facility is to build heavy components from the main primary system of a nuclear steam supply system. The facility, based on the standards of the facility of Chalon/Saint-Marcel is designed to manufacture two complete nuclear steam supply system per year during its first years of operation.

Nansha is a symbol of successful localization because since 1978 many Chinese leaders visited the Chalon/Saint-Marcel plant such as Ku Ming (Vice Minister in Charge of the Plan), Wang Quanguo (President of GNPJVC), and Zhu Rongji. This facility was targeted as a key project in the Chinese market.

In terms of technical support, we can refer to two cases, in Nuclear Safety and Fuel Technology.

Mr. Dai Zhonghua, Assistant to the General Manager of Daya Bay Nuclear Power Operations and Management Co., Ltd. (DNMC), was invited to Munich a few months ago to attend the "Safety Alliance" program, developed by Areva after the Fukushima disaster to help utilities demonstrate and upgrade the safety of their nuclear plant fleets.

And in July 2012, CGNPC Uranium Resources Co., Ltd. signed a Nuclear Fuel Technology Support Agreement with Areva to

provide technology support for nuclear fuel for CGNPC's NPPs.

**Key 3:** A strong engineering and technology provider must maintain a persistent relationship with the leaders of CNNC, CGNPC and SNPTC to define and monitor a common strategy.

**Key 4:** The technology provider must accept the transfer of one of its proven technologies in order to sustain its business in China.

**Key 5:** The engineering company must enhance the scope of cooperation and involve its Chinese partners in overseas projects.

## Alstom: Partnership and Localization

Alstom sets a high standard for sourcing and logistics processes as well as strong project and quality management.

Alstom is renowned in China for three major sets of equipment: its 1,750 MW Arabelle turbine, the Emergency Diesel Generator (EDG), and the Liquid Purification Equipment.

Alstom is part of a consortium comprising two subsidiaries of CGNPC: China Nuclear Power Engineering Co., Ltd. (CNPEC), and China Nuclear Power Design Co., Ltd (CNPDC). On Alstom's side, most projects are led by Alstom Turbo machines group (TMG) business, including its local engineering office Alstom Wuhan Engineering and Technology Co (AWEC).

The localization of the speed rotor 1100MW generator was transferred to China National Erzhong Group in August 2009, and continues to follow Alstom's technical standards.

Since 2010, the 6300 kilowatts 1E emergency diesel generator has been designed and developed by a consortium of Alstom, AWEC, MAN Diesel and Shaanxi Diesel Heavy Industry Company. Alstom supplies the EDG to almost all the major NPPs in China, such as Tianwan, Ningde, Fangchenggang, Yangjiang, and Fuqing.

**Key 6:** The equipment manufacturer should create a consortium to share the responsibility and limit the risks of being copied. The transfer of standards requires great effort but guarantees the safety of the equipment manufactured.

**Key 7:** Strong local engineering (such as AWEC) is required to keep the edge and continue to provide upgraded technology.

More can be written about the scope of the cooperation, but our editorial team has chosen to interview the main stakeholders involved in the birthplace of the first Sino-French major project: Daya Bay. Sir Michael Kadoorie, Son of Lord Kadoorie has kindly accepted to give us his insight and the involvement of China Light and Power in this first project.

Mr. Jean-Claude Prenez, the president of the Sino-French Electricity Partnership explains the overall relation of PFCE and EDF from Daya Bay to Taishan.

Mr. Pierre-Yves Cordier, Nuclear Counselor at the French Embassy in Beijing, gives us an overview of the relationship between the CEA and the Chinese counterparts.

Areva gives us an overview of its activities in China.

Note: (1) 140 representatives from 56 enterprises attended the meeting. Nine companies, including National Nuclear Safety Administration, China Nuclear Power Engineering Co. Ltd (CNPEC), China Nuclear power Engineering Co. Ltd (CNPE), Dongfang Electric Corporation, Electricité De France (EDF), Areva, VELAN, SGS Industrial Service, Bureau Veritas, made reports involving Sino-French surveillance requirements in nuclear equipment manufacturing, company owners' practice, etc.