RECENT EXPERIENCES OF INTERNATIONAL SERVICES PERFORMED BY AREVA NP SPAIN

AREVA NP worldwide presence in almost every nuclear technology and country has allowed the establishment of a Spanish specialized team within AREVA NP Spain that has been trained and qualified in multiple nuclear-related services in Spain and abroad. This article will briefly describe some of the activities and references of such services provided in some of the countries where AREVA NP has a consolidated presence.

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AREVA NP is currently the OEM of more than 92 operating nuclear power plants (NPPs) worldwide (heritage of former Framatome, Babcock & Wilcox, Siemens KWU, etc.) and provides services at over 250 NPPs all over the world. Moreover, AREVA NP owns 7 new build projects of three new generation of nuclear reactor technologies (EPR, ATMEA and KWU) in different countries (Brazil, China, UK, Finland, France, India and Turkey).

This consolidated presence worldwide in almost every technology and country has allowed the creation of a qualified team within AREVA NP Spain trained to perform a variety of services and projects in Nuclear Power Plants worldwide. This team has been integrated in an international and multidisciplinary environment within AREVA NP which validates their references and experience in different kind of services and almost every plant design (PWR-KWU, PWR-Framatome, PWR-Westinghouse, BWR-GE, etc.).

Among the different typology of projects and services in which the AREVA NP Spain team has participated worldwide, some of the most representative services will be described in the following lines, i.e. the Steam Generator (SG) Sludge Lancing, SG tube plugging, Incore system maintenance, NSSS services and other valve related services.

STEAM GENERATOR SLUDGE LANCING

The Steam Generator Sludge Lancing consists in the mechanical cleaning of the tube-sheet area of the secondary side of steam generators. The purpose is to remove the deposits accumulated during and at the end of the cycle in order to contribute to the good preservation of the components.

The process consits of the removal of the deposits accumulated by high pressure water spray (standard lancing) from the center line (no tube lane) or by high pressure water jet (inner Bundle lancing) on the accumulation areas and the cycling and filtering of the water with the deposit by a filtration unit that retains the deposits removed and allows the water to go back to complete the closed circuit. The AREVA NP system allows to remove soft sludge as well as hard sludge by means of application of the latest own developed qualified technologies.

Part of the project was to perform visual inspections of the complete tube sheet before and after the application of the process to state the as found and as left conditions of the component.

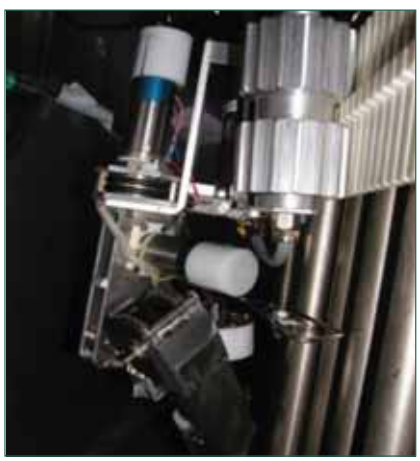

Figure 1. FOSAR tool.

Figure 2. AREVA SG services team at Beznau NPP.

Additionally, AREVA NP provided the FOSAR (Foreign Object Search and Removal) capabilities with a very high degree of efficiency.

The Sludge Lancing of the Steam Generator tubes has been performed at Beznau NPP for many years by the specialized team within AREVA NP Spain. In particular, during the outages of 2007 (Unit 2), 2008 (Unit 1), 2011 (Unit 2) and 2012 (Unit 1) this project was executed at Beznau NPP (Switzerland), being the last reference in 2015 at Unit 1.

Other references of sludge lancing projects were performed by the Spanish crew within AREVA NP at Krsko NPP in Slovenia (2006,2007,2009,2010 and 2012), Angra 1&2 NPP (2006), Doel 4 NPP in Belgium (2006), Isar 2 NPP (2009) and Phillipsburg NPP (2009) in Germany. Thanks to the big accumulation of experience and lessons learnt from similar projects worldwide, the Spanish team was able to provide high technically qualified services.

STEAM GENERATORS TUBE PLUGGING

Another international project that has been recently executed by the Spanish specialized team was the Steam Generator tube plugging. The plugging service consist in the installation of expanded rolled plugs on steam generators tubes at both ends when they are designated to be plugged by different reasons as a consequence of the Non Destructive Examination (NDE) results. The plugging tool performs the installation of plugs by roll expansion of mechanical alloy metallic coated plugs. The AREVA NP steam generators plugging system consists of a plug installation tool that can be delivered manually or by means of a robot depending on the ALARA study results by estimation of what would be the method which requires less dose to be absorbed by the activity players.

The Spanish team started to perform this activity in 2008 at Angra 2 NPP, followed by another execution in 2010 at Angra 1. Moreover, in 2016, AREVA NP Spain won a contract to perform these activities in Angra 1&2 NPP (Brazil) during their Refueling outages until 2019. The first execution within this project was performed in November 2016 at the Unit 2.

INCORE SYSTEM MAINTENANCE

Another of the services provided along the last years by the AREVA NP Spain team was the Maintenance of the Incore instrumentation system. The services consisted in the routine maintenance activities of Incore system and thermocouples, including repair works of thermocouple columns among other special services related to the system, such as thimble replacement and guide tube cleaning. The most recent experiences were during the first half of 2017 at Cattenom 2 NPP and Paluel 2&3 NPP, and during 2016 at Blayais 3 NPP. Before that, in 2015, the same service was delivered to Paluel NPP (France), and in 2014 to other French plants (Chinon 2 NPP, Penly NPP, Golfech NPP, Gravelines 5 NPP, Blayais 3 NPP and Dampierre 4 NPP).

Figure 3. AREVA plug installation tool.

NSSS SERVICES

As part of the NSSS activities, on the other hand, AREVA NP Spain also cooperates internationally in the reactor-related services provided by the group AREVA NP as open-close of RPVH, maintenance and repair of reactor internals and fuel activities in France, Spain and Brazil. Some examples of such activities are the reactor floor activities at Angra 1 NPP from 2005 to 2013 and at Angra 2 NPP from 2009 to the present. In addition, the split pin replacement and guide tube replacement of reactor internals has been executed at some plants of the French fleet from 2008 until today.

Moreover, the AREVA NP Spain personnel has been involved in Steam Generator replacement within the handling and rigging team at Gravelines 3 NPP and Civaux NPP in 2012, Blayais 2&4 NPP in 2013, Blayais 3 NPP and Cruas 4 NPP in 2014.

Another significant contribution of the Spanish team lately has been the Maintenance of the Reactor Cooling

Figure 4. AREVA inspector working on a RCP seal.

Pumps (RCP). This work was performed during the first half of 2017 at Flamanville 2 NPP and Chooz NPP. It has also been performed since 2012 in most of the French nuclear power plants supporting the RCP manufacturer Jeumont-AREVA within the AREVA group, among the maintenance works at the AREVA NP facility of SOMANU where the refurbishment and tests of the RCPs is performed.

Finally, the international new build projects together with the huge modernization projects running out in Europe, such as the "Grand Carénage", new perspectives are open for AREVA NP Spain as international supplier of qualified services and projects. Following this motivation, AREVA NP Spain has developed a re-training plan, professional training and development of own and new competencies focused on the new projects of modernization and new build in France, Finland, UK, China, USA, etc. In fact, new build projects such as Olkiluoto 3 NPP (OL3) in Finland, Flamamville NPP in France or Taishan 1&2 NPP in China, under commissioning phase nowadays, are demanding qualified resources within the AREVA NP group for services such as fuel handling for their first outages, which will start in 2018.

OTHER VALVE RELATED SERVICES

For mechanical activities on valves there is a large tradition on supporting the group internationally at sites as Angra 1&2 NPP and Sizewell B NPP. In 2015 the Spanish crew performed jointly with some local crew the diagnostic of the Motor Operated Valves at Koeberg NPP (South Africa). In addition, in 2016 AREVA NP Spain was awarded to performed the maintenance of Sempell valves at Angra 2 NPP during all their refueling outages until 2020.

CONCLUSION

All in all, since AREVA NP Spain was born, special focus has been taken in continuous training and qualification of their internal professionals with international experience and references. As a consequence, this qualified crew is integrated with the rest of the group and able to deliver services to Nuclear Power Plants worldwide, but always prioritizing the service of the Spanish NPPs.