



WESTINGHOUSE ELECTRIC SPAIN ENGINEERING SUPPORT FOR NEW BUILDS

This Article describes the involvement and participation of Westinghouse Electric Spain in the AP1000 design since the very beginning of the project, even from the preliminary and conceptual design of its parent project AP600 which eventually turned into the premier Gen III+ nuclear power plant, the AP1000 whose main characteristics are the modular construction and the passive safety features. Past, Present and Future of WES' participation in the AP1000 Architectural Engineering design are described in this article. It includes the support provided to the Engineering and Construction of 4 units in China (two at Sanmen site and two at Haiyang site) and 4 units in USA (two at Vogtle site and two at VC Summer site, whose construction was recently discontinued).

INTRODUCTION

Westinghouse Electric Spain (WES) has been deeply involved in the AP1000 Engineering development since the very first steps. Six AP1000 units are currently under construction, four in China and two in US (construction of 2 AP1000 units has been recently stopped). WES AP1000 team is providing Engineering support to them all.

As indicated above, WES AP1000 team has been involved in the project for almost a decade, performing activities related to Architectural-Engineering for several disciplines. Systems have been typically kept under our US colleagues' umbrella. The work WES AP1000 team has performed during these years has been focused on the Nuclear Island (Containment Building and Auxiliary Building).

Some of the disciplines WES AP1000 team has been involved in are:

- Civil/Structural (Structural Modules, Concrete Walls, Floors, Structural Steel, Shield Building).
- HVAC Layout (Ductwork and Equipment Layout).
- Raceway Layout (Cable Trays and Conduits routing).
- Piping.
- I&C.
- Supports (Electrical, HVAC, Piping, Instrumentation Racks).

- Attachment Plates (Embedded and Post Installed).
- Penetrations (Mechanical and Electrical).

Within the Architectural-Engineering branch, the scope WES AP1000 team has developed has included:

- PDS modeling.
- Drafting of 2D drawings for Construction.
- Structural Design and Qualification
- Stress analysis.

The current WES AP1000 team is made up of around 150 individuals. The team is composed by a multidisciplinary crew combining Engineers, Designers, and Drafters (Figure 1).

PAST

Before starting with the AP1000 project, the team was actively involved in its parent design AP600 as an I+D+I process, providing the start point to a new generation of Nuclear Power Plants. After that, due to economic reasons, it was decided to increase the energy production capacity. The AP1000 Nuclear Power Plant aims to be a standard design, so a big portion of the effort was focused on providing support to the development of the Engineering Design for the fleet/standard design. However, particular requests from the local regulator, client, etc, meant that the design



ALBERTO MARTÍNEZ MASEDO

Mechanical Engineer

WES AP1000 Engineering Support Manager. Mechanical, Electrical, and Optimization.



FRANCISCO P. QUINTERO CASTRO

Civil Engineer

WES AP1000 Engineering Support Manager. Civil, Structural, and Construction Support.



Figure 1.



Figure 2.



Figure 3.

needs to be adjusted at each location. As a result of this, most of past effort was focused on the plants under construction in China. Such support was provided from both Madrid office (all disciplines) and at the Sites through

rotational 6-month assignments (Figure 2).

Among other important tasks, it must be highlighted the participation of the team in the design of one of the main structural modules of the plant,

the 1,100 tons CA20 module, which contains the spent fuel pool (Figure 3).

During the last two years it has also been remarkable the support WES AP1000 team has provided to the US Projects at their early Construction stages. For such engineering support, in addition to the team settled in Madrid, several Engineers have provided first hand support at Vogtle (Georgia) and VC Summer (South Carolina) Sites through a 2-years assignment and mid-term assignments at Module Fabrication Shops spread all over the globe (Florida (US), Oregon (US), Du-bose (US), Japan) (Figure 4).

It is also worth mentioning the involvement of the team in Spain in the Project for the evaluation of the potential impact that local UK Codes, Rules and Regulations may have on the current AP1000 design. This Project, in addition to the GDA process which was successfully finished, was planned as a key point for the decision to be made in regards to the construction of three AP1000 units in Moorside (Cumbria, UK).

The AP1000 project is being an international effort, it was encouraged the



Figure 4.



Figure 5.

ONE team around the globe, and the Spain office is a key player to reach the success.

PRESENT

Once the lead units in China are expected to load fuel during this summer, the Engineering support from WES to China projects has decreased in the last months, although the team has been involved in several critical modifications to achieve the fuel-load milestone whose need for resolution came up because of the results obtained during the Hot Functional Tests.

Most of them have been related to high temperatures detected at several sensitive areas. Modifications and additions to the HVAC system have been developed to reach the design conditions.

Most of the team is currently involved in the following main activities for US Domestic Projects:

- **Site Support:** The team is providing engineering support directly to all the sites and fabrication shops. This effort is a key activity to proceed with the construction, and many engineers participated in the rotational assignment effort to both sites in China as well as to the US ones. Additionally, many engineers from WES were assigned to some shops in order to assist. Right now, a multi-disciplinary team is providing Engineering support from Madrid Office, one to Vogtle US site. These teams report directly to the site Construction Management. Examples of the problems addressed by this team are site deviations, resolution of unknown clashes, preparation of missing documentation, acceptance of material not procured as designed, etc.

- **Design Engineering Completion:** In this effort the team is providing engineering support to accomplish the design as well as to assure the adherence with the regulatory/customer requirements. The Standard

design and US domestic design, although almost done, it is not totally completed due to particular features US domestic plants need to meet. A portion of the team is working on the Standard design completion as particular modifications are considered for the US domestic design.

- **Optimization:** Given the particularly difficult financial situation of the US domestic projects, saving money and shortening construction schedule without relaxing the quality and safety by searching for simpler and optimized solutions has become one of the main initiatives in the AP1000 project. Also the lessons learned from China projects are taken into account in the program. The success of this effort has been measured as follows: each Dollar invested at the Engineering side involves 20 Dollar saving at the Construction side thanks to the cost-effectiveness of the WES AP1000 team.

- **Engineering Drawings Clean Up:** In alignment with the previous point, the principal objective of this mixed Engineering-Drafting effort is the incorporation of all the change orders against each document into it through a new revision so that the craft and construction responsible at the sites just need to look at one document. This is translated into simplification for the craft, minimization of mistakes and time saving (Figure 5).

FUTURE

The future of the AP1000 project and the team in Madrid will be focused on helping to the completion of the US domestic Units. The change to the situation at these sites where the Construction Management has been taken over by the owners of the plants (in Vogtle), opens new scenarios in which WES AP1000 team expects to play a key role in keeping on being one of the key members in the project at the Architect-Engineering side. The support to Construction as well as Optimization program will be the main activities WES AP1000 will support in the following years. As soon as the construction of the two AP1000 Units finalizes, there will be a remaining activity in order to close the as-built project, incorporating all the modifications and the final design to each unit, this will represent the main activity downstream of the current status. ■