

**Thematic session: Supply chain in the fabrication of welded structures and NDT servicing during building of the first Polish NPP” and IAEA workshop,
Sosnowiec, 16-17 October 2018**

Thematic session and the IAEA workshop (IAEA – International Atomic Energy Agency) on the issues connected with the supply chain in the fabrication of nuclear power plant took place in Sosnowiec, Poland, at Expo Silesia exhibition centre, during the 60th International Scientific Welding Conference “Welding Engineering in the Age of Industry 4.0” and international welding fair ExpoWelding 2018, on 16 - 17 October 2018. The session was organised by Instytut Spawalnictwa (Institute of Welding) with the support and patronage of Ministry of Energy and IAEA. The session was also attended by the representatives of potential vendors of nuclear technologies for Polish NPP, i.e.: CGN, EDF/FRAMATOME, HITACHI-GE and KHNP/KEPCO.

The aim of the session was the presentation of the requirements and procedures for home enterprises, willing to participate in supply chain of the potential suppliers of nuclear technologies as well as information about potential collaboration between the vendor of the nuclear technology and Polish industry.

The session was opened on 17th October 2018 by Prof. Jerzy Niagaj, the Manager for Nuclear Energy Issues of Instytut Spawalnictwa. The participants were welcomed by Mr. Zbigniew Kubacki, Deputy Director of the Department of Nuclear Energy of the Ministry of Energy and dr. Adam Pietras, Director of Instytut Spawalnictwa.



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Large group of participants listened to the lectures of the following titles:

- IAEA Milestones Approach and Industrial Involvement in the Building of New Nuclear Power Programme – Satoru YASURAOKA, Nuclear Infrastructure Development Section, IAEA, Wien;
- CGN Comprehensive Cooperation Proposal on Nuclear Power Plant Construction in Poland (HPR1000) – Kuang Yanjun, Fan Shubin, Vice Chief Engineer, Equipment Procurement and Supply Division, China General Nuclear Power Corporation (CGN), China;
- Pre-service and In-service Inspections of Welds of the EPR Reactor – Etienne Martin, Associate Manager NDE Senior Specialist, EDF, France;
- Welding Technology for Advanced BWR (Potential Cooperation with Polish Companies for First NPP in Poland) – Yu Kuwada, Staff Engineer, Second Manufacturing Sec., Nuclear Equipment Manufacturing Dept., Hitachi-GE Nuclear Energy, Ltd., Japan;
- KHNP Supply Chain Management for Polish Suppliers – Victor Kum, Senior Manager, Europe Business Development Team, Korea Hydro & Nuclear Power (KHNP), Korea;
- Introduction to Welding Implementation System in BOP Items – Gye-seog Jeong, Material Engineering Group Supervisor, Material Engineering Department, KEPCO E&C, Korea;
- Prospect for the Home Welding Industry for the Participation in Supply Chain during the Construction of the First Nuclear Plant in Poland – Jerzy Niagaj, Associate Professor, PhD, Nuclear Engineering Chief Manager, Instytut Spawalnictwa, Gliwice, Poland.

The representative of the International Atomic Energy Agency (IAEA) Mr. Satoru Yasuraoka in his presentation emphasized that IAEA notices the importance of the organisation of the proper supply chain in the countries willing to build nuclear power plant, however not having or having little an experience in nuclear energy production. To this end IAEA has developed and published several documents, including IAEA Nuclear Energy Series. No. NG-G-3.1 (Rev. 1) Milestones in the Development of a National Infrastructure for Nuclear Power (2015), among other things describing the role, rules and stages of the construction of supply chain, where the principle “safety above all” is respected. Mr. Satoru YASURAOKA mentioned that the vendor of the nuclear technology (EPC contractor) in the collaboration with the owner/operator of the newly constructed nuclear plant is in the first place responsible for the organisation of the chain of the qualified and reliable suppliers.

In the next lectures the speakers representing the vendors of nuclear technologies, i.e.: CGN, EDF/FRAMATOME, HITACHI-GE and KHNP/KEPCO in a very professional way presented the issues on both their own nuclear technologies and supply chains and pointed out what are the conditions for Polish companies to be entered in the list of the qualified suppliers. The lecturers also described the areas (prefabrication, production, assembly, service) in which their companies could collaborate with Polish companies while construction of the first power plant in Poland.

Mr. Kuang Yanjun representing the Chinese concern China General Nuclear Power Corporation (CGN) was the first to take the floor. In his presentation the reactor HPR-1000 (Hualong One), entirely developed by

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Chinese engineers, was described for the first time in Poland. It is the Pressurized Water Reactor (PWR), which was developed basing on the contemporary French solutions. Several HPR-1000 reactors are being built in China at the moment, next two power units are to be built in Pakistan and after completing the licence process which started in the autumn last year, i.e. exactly a year ago, it is planned to be built in Great Britain. Mr. Kuang Yanjun presented the regulations and standards applied while the production of HPR-1000 reactor. It appears that for the nuclear part the French code RCC-M and ISO (EN ISO) standards were applied, however some ASME regulations and standards were also used. The turbine island is being manufactured now basing on the Chinese regulations and standards, but CGN assures that in Europe the construction of the HPR-1000 reactor all devices and systems of the turbine island will be produced basing on the PED and EN and EN ISO standards. It was interesting the fact that in the case of the building of HPR-1000 reactor in Poland the concern CGN is going to locate supplies (participation of Polish industry) up to 40% of the project value.

Next lecture was done by Mr. Étienne Martin, Senior NDT Specialist representing EDF/FRAMATOME concern, who in the beginning reminded the advantages of the EPRTM reactor and functioning of the basic safety systems and then described the sequence of activities necessary for the determination of the list of the qualified suppliers. He emphasised that the same procedure applies to the companies in the whole world, including French enterprises. In the second part of the lecture Mr. Étienne Martin concentrated on the requirements of the regulations and NDT for the in-service inspection of the already functioning equipment and systems of nuclear island. From the data presented in the lecture it can be seen that the most important NDT method is ultrasonic testing (UT), which is used for testing of 55 out of 112 devices and systems. 23 systems undergo visual testing (VT), 15 – penetrant testing (PT) and 12 – radiographic testing (RT). Frequently for NDT examination of the same device or system not one but two methods are applied. The author also shared with the audience some interesting practical examples apart from technical information.

Next presentation was concerned with welding issues while manufacturing the devices of nuclear island of Advanced BWR (ABWR) reactor of Hitachi-GE. Ms. Yu Kuwada in a very detailed way presented the issues concerning welding of Reactor Internals as well as the quality control processes. Listeners could learn about numerous technical details of production of welding components, especially of narrow-gap welding, which was aimed at the reduction of strains arising during the production. Ms. Yu Kuwada emphasised that all processes are monitored and recorded. For instance during the welding of 50 000 welded joints in pipes 115 000 specifications, protocols and recordings are being created and registered currently in a special computer software programme. The regulations of ASME were also discussed. Hitachi-GE company has declared their willingness of undertaking a wide and advanced collaboration with companies in Poland within the range of the production of the selected group of devices and systems in the case of the selecting of ABWR reactor for the first nuclear power plant in Poland.

Next two lectures were presented by the lecturers from Korea representing companies Korea Hydro & Nuclear Power (KHNP) and KEPCO E&C. During the first presentation, Mr. Victor said that KHNP



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company intensively collaborates with over 900 qualified suppliers. Mr. Kum also described the procedure of a supplier qualification which may last up to 4 years from the moment of the application submitting. Prior to the qualification application submitting the company should conduct the internal audit aiming at analysing missing components and their correcting. The system of the quality assurance should satisfy the requirements of ASME NQA-1 standards. Technological criteria are based on the requirements of the specified ASME sections. The second lecture was presented by Mr. Gyue-seog Jeong of KEPCO E&C company, who in a detailed way described the regulations on welding and quality issues applied during the construction of the APR-1400 reactor. These are the ASME codes, however there are also the requirements of the US NCR regulations. KEPCO E&C company has announced their willingness to develop the Polish road map together with Polish partners in the field of localisations of orders connected with welding areas.

In the end of the Session Jerzy Niagaj, Associate Professor, PhD, Nuclear Engineering Chief Manager of Instytut Spawalnictwa gave a lecture presentation on prospect for the domestic welding industry for the participation in the supply chain during the construction of the first nuclear plant in Poland. It has been demonstrated that the participation of Polish companies in the supply chain for nuclear power engineering is possible after meeting of several conditions. First of all the products should meet the adequate “nuclear” regulations, which could be AFCEN French code or ASME code, as in Poland there are no regulations and standards in the range of nuclear industry. Polish companies should also meet the requirements of quality management systems in accordance with ASME NQA-1 or probably ISO 19443:2018 „Quality management systems – Specific requirements for the application of ISO 9001:2015 by organizations in the supply chain of the nuclear energy sector supplying products and services important to nuclear safety (ITNS)”. The usage of word „probably” is connected with the fact that ISO 19443:2018 standard has been published just several months ago (in May this year), and therefore there are no examples of its application in practice. The Polish companies should also employ welding and NDT personnel having the appropriate qualifications, i.e. IWE, IWT, etc. personnel. Meeting of the above mentioned requirements should make it possible to applying for the status of the qualified supplier.

Apart from the listening to the presentations during the Thematic Session, the participants could also participate in the IAEA Workshops that were carried out on 16th and 17th October at the premises of Expo Silesia in Sosnowiec. The workshops were conducted by the representatives of IAEA: already mentioned Mr. Satoru Yasuraoka and Mr. Jean-Marc de Guio from France and Mr. Humberto Werdine Viotti (Brasil/Spain). Polish side was represented by Andrzej Sidło from the Polish Ministry of Energy. The subject area of the workshops covered implementation of the international codes and standards concerning nuclear power plant to the Polish technical regulations and preparation of Polish enterprises for the collaboration in projects conducted in the nuclear industry. Unquestionably significant was the fact, that during the workshops lecturers shared the examples from their own many years’ professional practice.

Jerzy Niagaj, Associate Professor, PhD, Nuclear Engineering Chief Manager, Instytut Spawalnictwa, Gliwice, Poland.

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