Report of the Ninth International Symposium on Symbiotic Nuclear Power Plant Systems for 21st century (ISSNP2018)

ZHANG Zhigang[1], GAO Puzhen[1], WANG Jianjun[1], ZHANG Zhijian[1], and YOSHIKAWA Hidekazu[1, 2]

1. *Fundamental Science on Nuclear Safety and Simulation Technology Laboratory, Harbin Engineering University, No. 145, Nantong Street, Harbin 150001, China (zg_zhang@hrbeu.edu.cn)*
2. *Symbio Community Forum, C/o RIAS, Tanaka-Ohi-Cho 49, Sakyo-ku, Kyoto 606-8202, Japan (yosikawa@kib.biglobe.ne.jp)*

Abstract: The 9th International Symposium on Symbiotic Nuclear Power Systems for 21st Century (ISSNP2018) was held in Harbin, China in July9-11, 2018. At the ISSNP2018, nine invited lectures with total 63 technical papers were presented at the technical sessions and a unique workshop on Quality, Competence and Education of Nuclear Engineer was also conducted by inviting many international experts. The research subjects presented at the technical sessions of ISSNP2018 are related with the seven areas: (1) Modeling and simulation for digital numerical reactors, (2) Diagnosis,(3) Severe accident and other coupled complex phenomena, (4) Risk and safety analysis, (5) I&C and human factors, (6) Thermal-hydraulics, and (7) Integrated aspect of nuclear system.. The overview of the ISSNP2018 was given in this report, and the condensed summaries of major keynote presentations by international experts were included.

Keywords: virtual numerical simulator; thermal hydraulic; I&C+HMIT; risk analysis; severe accident; nuclear engineer education

1 Introduction

In the 21st century with high demands for securing energy resource for the economic development in developing countries with the growth of human population while worsening of environmental pollution as well as global climate change, the motivation of more utilization of nuclear energy is developing especially in Middle Eastern and African countries. The International Symposium of Symbiotic Nuclear Power Systems for 21st Century (ISSNP) is focused on nuclear power in harmony with human, society, and environment by exploring advanced nuclear technologies for attaining higher safety in nuclear power operation. The ISSNP first held in 2007 in Tsuruga, Japan, and then in 2008 and 2010 both in Harbin, China, and in 2011 in Taejon, Korea, and in 2013 in Beijing, China, and in 2014 in Jeju, Korea, and in 2015 in Kyoto, Japan, and in 2016 in Chengdu, China has become a unique and meaningful international conference by the researchers, engineers and industrial practitioners in nuclear developing countries.

The 9th ISSNP was held in Harbin, China in July9-11, 2018. The ISSNP2016 is organized to promote academic exchanges of symbiosis of technology in nuclear industries. It was hosted by Harbin Engineering University, being cooperated by China Nuclear Society, Korea Nuclear Society, Atomic Energy Society of Japan, Japan Society of Maintenology, Human Interface of Japan and Symbio Community Forum.

In ISSNP2018 with the main theme of symbiotic nuclear power systems, there were two important subjects being added to the conventional subjects of ISSNP conference series in the past. The both are virtual numerical reactor project and international Workshop on Quality, Competence and Education of Nuclear Engineer. There were nine keynote presentations and one workshop discussions by about 100 participants from different countries (China, USA, Japan, Korea, Outer Mongolia, Finland, Switzerland, Slovenia and UK) in the technical areas of reactor physics, safety analysis, I&C, equipment, nuclear safety, nuclear fuel, thermal hydraulic, advanced reactor, simulation and modeling, experiment and severe accident as well as the discussion on the

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education and training of nuclear engineer. This report gives the overview and summaries of the presentations and the discussions at the ISSNP2018, as described in the subsequent parts of this report.

2 Overview of conference program

The conference program of ISSNP2018 is as shown in Table 1. The conference was initiated by the opening ceremony chaired by Prof. Xia Hong, Dean of College of Nuclear Science and Technology (CNST), Harbin Engineering University (HEU) at 8:30 am of July 9 at the Academic Lecture Hall of Qihang Activity Center of HEU in Harbin, China. (See Fig.1)

The General Chair of ISSNP2018, Prof. Zhang Zhijian, Vice President of HEU, delivered his opening address. Then Mr. Jianfu Yu delivered the cerebrating address of Chinese Nuclear Society as the co-organizing society in China. Prof. Hidekazu Yoshikawa, Symbio Community Forum, made his thanks message to Prof. Zhang Zhijian for the successive continuation of ISSNP conference series by representing three academic societies in Japan (AESJ, Human Interface Society and Japan Society of Maintenology) and Korean Nuclear Society who had cooperatively started the first ISSNP conference in 2007 in Tsuruga, Japan. Lastly, Prof. Phillip Beeley delivered the welcome message by representing International Academic Council for CNST/HEU. The group photo of all participants at ISSNP2018 is shown in Fig. 2.

Fig. 1 ISSNP2018 opening ceremony chaired by Prof. Xia Hong, Dean of CNST, HEU.

As shown in Table 1, the main body of the ISSNP2018 conference program was composed by 9 invited plenary speeches, three parallel technical sessions (TSs) of 63 technical paper presentations and a new meaningful international workshop on Quality, Competence and Education of Nuclear Engineer in the first two days of July 9 and 10, and a technical tour to a newly built research accelerator facility of HEU/HEU in the vicinity of Harbin International Airport in the morning of July 11.

Table 1. Time table of ISSNP2016 conference

Day and time	Items	Notes
July 9, Monday Morning	Opening Ceremony Plenary presentation Ⅰ	Chaired by Prof. Xia Hong Five invited speeches
July 9, Monday Afternoon	Plenary presentation II Three technical sessions (TS11, TS12, TS13) Workshop on Quality, Competence and Education of Nuclear Engineer	Two invited speeches TS11: Modeling and simulation for digital numerical reactors TS12: Diagnosis TS13: Severe accident and other coupled complex phenomena
July 10, Tuesday Morning	Plenary presentation III Three technical sessions (TS21, TS22, TS23)	Two invited speeches TS21: Risk and safety analysis TS22: I&C and human factors TS23: Thermal-hydraulics
July 10, Tuesday Afternoon	Two technical sessions (TS31, TS32)	TS31: Thermal-hydraulics TS32: Integrated aspect of nuclear system
July11,Wednesday Morning	Technical tour	Accelerator facility

Fig. 2 The group photo of all participants at ISSNP2018.

Also as seen in Table 1, the nine invited speeches were divided into three plenary presentations I, II, and III, and the synopsis of those invited speeches will be given in 3.

Concerning the technical paper presentations, the condensed summaries of the individual eight technical sessions of TS11 until TS32 in Table 1 will be given in 5.

Concerning the workshop on Quality, Competence and Education of Nuclear Engineer, it was conducted at VIP meeting room, Qi Hang Activity Center, in 14:50-18:00, July 9, 2018 by inviting several experts from China, Korea, Japan, and Europe. The workshop lectures were chaired by Prof. H.L. Doods of University of Tennessee and Prof. Gao Puzhen of HEU/CNST. The workshop agenda and the participants are listed in Table 2, and the summary of the panelists presentation at the workshop is given in 4. The succeeding panel guided by Prof. H.L Dodds had proceeded on active discussions by all participants on selected topics such as career development, training, international recognition, what is competence, assessment of competence, standard setup, nuclear discipline classification, *etc*. A snap photo during the panel discussion is shown in Fig.3.

Table 2. Time table of the workshop on Quality, Competence and Education of Nuclear Engineer.

Time	Topics	Presentors/Panelists(Affiliation)
14:50-16:30	Part 1: Lectures (Chaired by Prof. H.L. Doods and Prof. Gao Puzhen)	
	1. Education of Nuclear Engineers from Industry point of view	Jong Tae SEO (Korea Electric Power Corporation)
	2. Talented Nuclear Engineers - Training for non-technical skills at emergency	Akihide KUGO (Japan Nuclear Safety Institute)
	3. Current Situation of Chinese Engineers	Xian Feng ZHU (Tianjin University)
	4. The system of "transferable nuclear competences" – nuclear passport ?	Leon CIZELJ (European Nuclear Education Network)
	5. Global Nuclear Human Resource Development in Tokyo Institute of Technology	Hideharu TAKAHASHI (Tokyo Institute of Technology)
16:30-16:40	Coffee break	
14:40-18:00	Panel discussion	
	1. Self-introduction of panelists	<u>International panelists:</u>
	2. Mutual discussion on selected topics such as career development, training, international recognition, what is competence, assessment	H.L. Dodds (USA) Phillip Beeley(UK) Leon Cizelj (EU)

	of competence, standard setup, nuclear discipline classification, *etc*.	Xianfeng ZHU (China) Jong Tae SEO (Korea) Akihide KUGO(Japan) Audiences: International advisory council members ISSNPC members Members from CNS, KNS, and AESJ
	3. Discussion including audience	

Fig.3 Panelists discussion at the workshop on Quality, Competence and Education of Nuclear Engineer.

3 Synopsis of plenary presentations

As was already said on Table 1, the nine invited speeches were divided into three plenary presentations I, II, and III. In July 9, there were five lectures in the plenary presentation I (chaired by Prof. Hidekazu Yoshikawa and Prof. Gao Puzhen) and two lectures in the plenary presentation II (chaired by Prof. Hidekazu Yoshikawa and Prof. Poong Hyun Seong), while in July 10, two lectures in the plenary presentation III (chaired by Prof. Won Sik Yang and Prof. Yunlin XU). In the subsequent part of this chapter, all of the nine lectures will be briefly summarized with the order of their presentation at the ISSNP2018.

3.1 Pipe wall thinning measurement technique with electromagnetic acoustic resonance method and its application to nuclear power plants

Prof. Takayuki Takagi of Tohoku University presented his lecture on the basic principle of the electromagnetic acoustic resonance method and the merit of its application for nuclear power plants as the non-destructive examination for the intactness of piping wall. Please see the detail of his presentation in his paper of this issue. [1]

3.2 Progress of AP1000 and CAP1400

Dr. Mingguang Zheng of Shanghai Nuclear Engineering Research and Design Institute presented his lecture on the recent progress of the construction of AP1000 plants in China and the design features of CAP1400, based on the Chinese experiences of construction of AP1000 in China.

3.3 Attracting, retaining and developing new nuclear talents for long term success of nuclear technologies

Dr. Leon Cizelj of European Nuclear Education Network (ENEN) his lecture on the joint effort made by nuclear industries in European Union to enhance the nuclear engineers' performance for the sustainable development of nuclear business. His talk is related with the European activity by ENEN for the system of "transferable nuclear competences" presented at the educational workshop. Please see in 4.4 of this paper.

3.4 Development of Pro-SCHEME: probabilistic safety culture healthiness evaluation method for an operation team in nuclear power plant

Prof. Poong Hyun Seong of Korea Advanced Institute of Science and Technology (KAIST) presented his lecture on his laboratory's work on developing a new evaluation method of safety culture healthiness of the operator team in nuclear power control room. Please see the detail of his presentation in his paper of this issue. [2]

3.5 Licensees activities or nuclear safety: organizational culture and leadership

Dr. Akihide Kugo of Japan Nuclear Safety Institute (JANSI) presented his lecture on the recent activities of Japanese Nuclear Industries to promote organizational culture and the enhancement of leadership of nuclear staffs by reflecting the mishaps of Fukushima Daiichi accident in Tokyo Electric Power Co. ltd. His talk is related with the JANSI's activity presented at the educational workshop. Please see in 4.2 of this paper and also the detail of his presentation in his paper of this issue. [3]

3.6 Research development of numerical reactor technology

Dr. Lei Li of Harbin Engineering University presented his lecture on the progress of Harbin Engineering University of aggressive project on Numerical Virtual Reactor (NVR) with the collaboration of University of Michigan in U.S.A. Concerning the overall scope of HEU's NVR project, please see his paper already published in this IJNS journal.[4] The collaborative activities by University of Michigan to help HEU for NVR project are also presented at ISSNP2018 by the subsequent invited speakers, Prof. Fei Gao in 3.7 and Prof. Won Sik Yang in 3.8, respectively.

3.7 Recent development of multi-scale simulation for studying nuclear materials

Prof. Fei Gao of University of Michigan presented his lecture on the methodological development of multi-scale simulation in nuclear materials which has been conducted with the collaboration of HEU/CNST's researches on virtual numerical reactor project.

3.8 Overview of Nuclear Energy Advanced Modeling and Simulation (NEAMS) program

Prof. Won Sik Yang of University of Michigan also presented his lecture on advanced modeling and simulation program called NEAMS at his university which has been conducted with the collaboration of HEU/CNST's researches on virtual numerical reactor project. Please see the detail of his presentation in his paper of this issue. [5]

3.9 Introduction and engineering progress of hualong one (HPR1000) nuclear power plant

Dr. Feng Wei of China Nuclear Power Engineering Co. presented his lecture on the recent status of Chinese 3.5+ Generation PWR development HPR1000 which has been expanded the Chinese PWR technology based on the domestication of Western PWR technology.

4 Summary of panelist's presentation at the education workshop

As is seen in Table 2, there were five presentations by five invited international experts at the beginning of the workshop on Quality, Competence and Education of Nuclear Engineer. The titles, speakers, and the contents of the five lectures are summarized in this chapter.

4.1 Education of nuclear engineers from industry point of view

According to Dr. Jong Tae SEO of Korea Electric Power Corporation, major nuclear power industry ranges from operating company (utility) and service company (maintenance), to engineering company (NPP design and development), equipment supplier (manufacturer), nuclear fuel company, and construction company, and to regulatory body, research and development institute and federal and local government. Expectation on nuclear engineer from the need of nuclear industry are: (1) Comprehensive understanding on NPP design and its operation (nuclear reactor physics, radiation nuclear safety, system, structure and components of NPP), and principle of operation), and (2) Basic engineering knowledge such as wide spectrum of knowledge in related disciplines and capabilities of communication and cooperation with engineers from other disciplines.

He stressed that the nuclear engineers should be all-round player from the following four aspects:

(1) Unique characteristics of NPP such as (i)unique power generation (fission) and unique safety concern (radiation), and (ii)general plant engineering with extreme operating condition (high pressure, high temperature, severe accident conditions, and high safety requirement.),
(2) NPP related engineering disciplines such as (i)electrical and electronics engineering, (ii)mechanical engineering (fluid thermal dynamics and solid mechanics), (iii) material engineering, (iv) chemistry and chemical engineering, (v) computer engineering, (vi) architect engineering, and (vii) civil engineering,
(3) All-round player as well as key player so that (i) born to be a leader in nuclear industry and (ii) communicate and cooperate, and
(4) Educational institute has to train nuclear engineer with all-round player competence and build leadership in nuclear.

4.2 Talented nuclear engineers - training for non-technical skills at emergency

Dr. Akihide KUGO of Japan Nuclear Safety Institute (JANSI) started his lecture on JANSI's developed leadership training program which is intended to cover all classes of management of nuclear company in Japan,

that is, spanning from deputy section manager, section manager, chief reactor engineer, nuclear director, plant director, CNO, and CEO, although his presentation was limited on the part of crisis management.

He first pointed out that the specific characters of human organization in crisis management are (i) sense of isolation, (ii) uncontrollable situation, (iii) immediate decision making and trial, (iv)life threatening work, and (v)limited human resource and tools, and then he concluded that both the leadership command skill and communication skill are essential focal points of non-technical skills under unexpected severe situation.

He then introduced the concept of crisis management drill program which is composed by the three steps: (i) First integrate individual semantic memories to reproduce Fukushima accident-like condition, (ii) Second build up episodic memory by education program, and (iii) Third form workable procedural memory by group drill exercise. He stressed that the need of improving the conventional routine drill simply to follow the fixed scenario by replacing to the active drill with difficult mission under stressful environment.

Lastly he introduced the actual courses of 3-day program with some affirmative voices of trainees who took the course.

4.3 Progress of the professional engineer capability evaluation by China Association for Science and Technology (CAST)

Prof. Xian Feng ZHU of Tianjin University presented on the professional engineers' ability evaluation in China now being conducted by China Association for Science and Technology (CAST).

He first introduced the number of professional engineers in China. He said that according to Ministry of Science and Technology of China, human resource of science and technology has reached 80 million where more than 40 million are engineers. In 2018, more than 1.5 million engineering students have graduated from 16284 engineering departments from 1139 universities. There are 5.12 million engineering students studying in colleges, and 0.66 million post-graduated.

In 2016, China participated in Washington Accord and until the end of 2017, total 846 engineering departments in 198 universities have passed the Engineering Education certification by Washington Award.

He pointed out that the main problems being faced by Chinese Engineers is international recognition. That is to say,

(i) How can Chinese nuclear engineers get a job in Japan, Korea or Europe?
(ii) How to promote Chinese products from "made-in China" to "designed by China"?

He introduced a bit about international systems such as APEC, ASCAN, FEIAP, Washington Accord, Sydney Accord, Dublin Accord, and IPEA. He then proceeded to introduce the China Professional Title System the current titles of which are classified as Assistant Engineer, Engineer, Senior Engineer, and Engineering Technology Application Researcher. Such professional tiles are evaluated and only issued by the competent departments which authorized by Ministry of Human Resource and Social Security (MHR). He explained that the CAST is not governmental Ministry but it has many governmental resources to act as de-facto governmental ministry to supervise more than 210 technical societies which includes Chinese Nuclear Society (CNS).

He then went to somewhat details on Chinese professional engineers 'ability evaluation by CAST with respect to (1) organizational structure, and (2) engineers' capability evaluation criteria such as (i) educational experience requirement, (ii) professional working experience requirement, (iii) skills and competence requirement (professional ability, communication skill, management ability, and leadership), and (iv) professional ethics requirement.

He concluded is presentation by saying welcome comments by other countries' experts to CAST.

4.4 The system of "transferable nuclear competences" – nuclear passport?

Dr. Leon CIZELJ of European Nuclear Education Network (ENEN) started his presentation by saying that the transfer of nuclear competence has been

managed by ENEN's two systems, ECTS and ECVET, through different education and qualification frameworks in European Union. ECTS stands for European Credit Transfer and Accumulation System which is intended for high education (B.Sc, M.Sc, and Ph.D), while ECVET, European Credit System for Vocational Education and Training which is intended for vocational education and qualification up to B.Sc.

ECTS is the academic tool supporting student mobility based on transparency of learning, teaching and assessment process. It helps home university to recognize learning achievement, qualification and period of learning at other universities which usually involves in two different universities, where 60 ECTS corresponds to 1 academic year.

Concerning European MSc in nuclear engineering, it was established in the European Commission since 2005 in order to cope with qualifying and international mobility by common reference curriculum and mutual recognition among ENEN members. This is also to promote and facilitate the mobility of both the students and teachers internationally.

The requirements for European MCs in nuclear engineering are: (i)at least 5 years university education, (ii)master thesis, (iii)at least 60 ECTS must be "pure nuclear", (iv)20 ECTS must be obtained from a foreign institution member of the ENEN Association. Wherein the topics of "pure nuclear" are: (i)reactor engineering, (ii)reactor physics, (iii)nuclear thermal hydraulics, (iv)safety and reliability of nuclear facilities, (v)reactor engineering materials, (vi)radiology and radiation protection, and (vii)nuclear fuel cycle and applied radiochemistry.

As far as ECVET is concerned, it is the tool to support mobility for professional qualification, and it should transfer, recognize and accumulate learning outcomes to obtain a qualification. It also gives a methodological framework for describing qualification in terms of learning outcomes using units, and it could involve many stakeholders. This is similar to nuclear SAT 8systematic Approach to Training).

Lastly he introduced what is called "Nuclear Skills Passport2 which is maintained by Nuclear Skills Academy to prove individual's training, skills and qualification to be valid among EU and UK.

For further details of the both of ECTS and ECVET please visit their URL [6-7] respectively.

4.5 Global nuclear human resource development in Tokyo institute of technology

Dr. Hideharu TAKAHASHI of Tokyo Institute of Technology (TIT) presented TIT's on-going "Dojo" program for global Nuclear Human Resource Development for safety and security agent. The word "Dojo" is the old Japanese word for practicing Japanese traditional martial arts like "Judo", "Kendo", "Karate", Kyudo", *etc*.

Before his going to the details of TIT's Dojo program, he introduced the current state of Fukushima Daiichi plants under decommission work, decreased number of evacuees in Fukushima area, the current state of whole nuclear power stations in Japan. He also told the current trend of nuclear industry together with somewhat increase of nuclear students after sudden drop of Fukushima accident.

According to Dr. Takahashi, the start of developing global nuclear leaders by Dojo program at TIT is based on the four big events happened both in Japan and world: (i)World Trade Center terrorism on September 11, 2001 in US, (ii)G8 Hokkaido Toyako Summit in July 2008, (iii) Nuclear security summit in Washington DC in April 2010, and (iv) Fukushima Daiichi NPP accident in March 11, 2011.Thus the TIT's Dojo program was motivated to the necessity of raising global leaders to cope with bravely to manage successfully in the cases of various kinds of natural and human-originated nuclear disasters which may endanger human life and societal turmoil around the world.

According to Dr. Takahashi, the Dojo program is composed by the three step training courses: (i) Freshman course of systematic room study followed by rotational laboratory visit, (ii) Enter to Dojo of Global Nuclear Energy Safe/Security Training Center, and (3) Second selection of international students to enter MS.c and Ph. D courses for further investigation. He explained the structure of the Dojo program, and

various field studies by visiting international institutions by showing many slides for easy visualization of what the Dojo activity looks like.

5 Summary of technical session presentations

At the ISSNP2018, there were 63 technical papers presented in eight technical sessions with the contributions of five different countries and the individual paper numbers from China (54), Japan (3), Finland (2), Korea (2), and Outer Mongolia (2). The name, the session title, paper number and the subjects of presented papers are described in Table 3.

Table 3. Summary of technical paper presentations

Session name	Session title	Paper No.	Subject of presented papers
TS11	Modeling and simulation for digital numerical reactors	9	Sustainable digital twin platform for dynamic studies of thermal process; Voxel modeling algorithm for point kernel simulation; multi-physics object-oriented computational framework; Core design of annular prismatic HTGR: CDF analysis of two-phase natural circulation in heat exchanger; CDF simulation of coolant mixing in reactor vessel down comer; CDF simulation of GEMIX experiment; Nanoindentation of voids in ODS; Grid-to-rod fretting wear.
TS12	Diagnosis	9	Monitoring of MOV; Local wall thinning estimation based on low frequency electromagnetic monitoring; Regression model for crack severity estimation; Plant diagnosis with recurrent neural network; NDE based on multi-frequency ECT for thickness of SS cladding layer; Intelligent fault diagnosis based on deep belief network and SVM; Magnetic transmission eddy current array probe; Blind source separation for fault diagnosis; Pipe wall thinning diagnosis by LSTM network.
TS13	Severe accident and other coupled complex phenomena	9	Experimental design and analysis for eutectic reaction and molten fuel fragmentation; Design of reactor replenishing water system for Integrated PWR; Blind source separation algorithm; local FCI in molten fuel pool; direct contact condensation of steam jet; Monte Carlo simulation for characterizing nuclear materials; Simulated reactivity feedback experiment in natural circulation; pressure oscillation of submerged steam jet with non-condensable gas.
TS21	Risk and safety analysis	7	Integrated DiD risk analysis method; Dependency consideration of phenomenological reliability; Dynamic analysis of large leakage sodium-water accident; CCF analysis by Weibull shock model; Integral effect test of station blackout accident; Density wave oscillation in natural circulation; Thermal hydraulic phenomena during SBLOCA of AP1000.
TS22	I&C and human factors	6	Condition monitoring of reactor coolant pump by expert system; Load following control by H infinity LQR theory; Vibration signal denoising method; 3D virtual reality control room; Distance information display for supporting decommissioning work; Modeling of drop time for hydraulic suspended control rod.
TS23	Thermal-hydraulics I	7	Simulation of single bubble rise in water; computer code for helical coil once through steam generator; Pressure water level and false water level in ocean condition; Two-phase flow instability in low

			and fast flow rate condition; Transition point from single phase to two-phase flow instability in natural circulation; Numerical study of boiling by OpenFoam; Subcooled boiling heat transfer of pulsatile flow under low flow and low velocity.
TS31	Thermal-hydraulics II	8	Effect of ship motion in marine small modular reactors; Visualization of premature CHF during two-phase flow instability in narrow, vertical rectangular condition; Optimization of the geometrical factors of subsonic air-air ejectors; Design and experimental verification of condenser for water making plant; Dynamic simulation of OTSG of 600 MW sodium cooled fast reactor; Numerical simulation of single bubble rising in water.
TS32	Integrated aspect of nuclear system	8	Dose assessment method for virtual human; Point cloud method of radiation source for cutting operation in decommissioning work; Load following of SMR; Performance evaluation of PWR simulator; Neutronics analysis of VHTR; Sensitivity and uncertainty analysis of sodium-cooled fast reactor; Material region based 2D/1D transport method; Physical feasibility study of a small modular dual fluid reactor.

6 Conclusion

The 9th International Symposium on Symbiotic Nuclear Power Systems for 21st Century (ISSNP2018) was held in Harbin, China in July 9-11, 2018, with the main theme of symbiotic nuclear power systems. In ISSNP2018, two important subjects were added to the conventional subjects of ISSNP conference series in the past. The both are virtual numerical reactor project and international Workshop on Quality, Competence and Education of Nuclear Engineer.

There were nine invited presentations and sixty three technical papers at the ISSNP2016, the subject of which were mostly related with (1) Modeling and simulation for digital numerical reactors, (2) Diagnosis,(3) Severe accident and other coupled complex phenomena, (4) Risk and safety analysis, (5) I&C and human factors, (6) Thermal-hydraulics, and (7) Integrated aspect of nuclear system. The overview of the ISSNP2018 was given in this report, together with the condensed summaries of nine keynote presentations by international experts and the five expert presentations at the beginning of the workshop on Quality, Competence and Education of Nuclear Engineer.

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