

Talk on “Nuclear Power Generation - Myths and Facts”

ENGINEERING EDUCATION TECHNICAL DIVISION



reported by
Ir. Chew Weng Yuen

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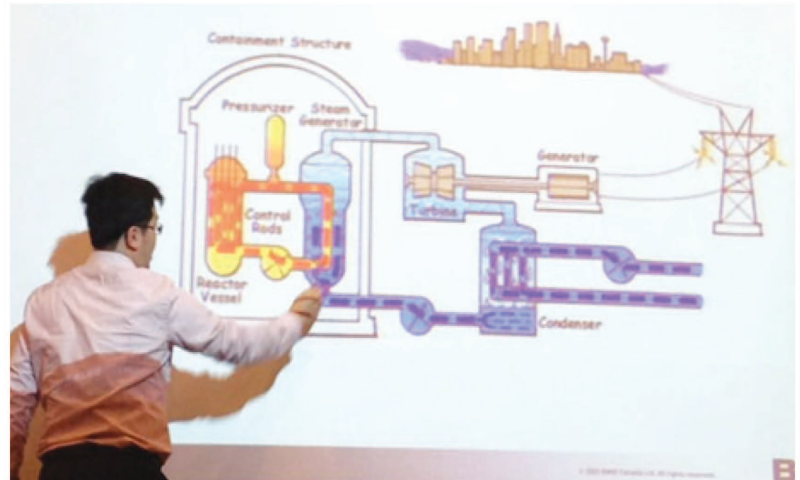
The Engineering Education Technical Division co-organised a talk entitled “Nuclear Power Generation – Myths and Facts” with the Consulting Special Interest Group of IEM, Engineers Australia Malaysia Chapter, and the Institution of Mechanical Engineers Malaysia Branch, on 23 March 2016, at Wisma IEM in Petaling Jaya, Selangor.

The talk, attended by 42 participants, was delivered by Mr. Wayne Soong, a licensed professional engineer from the nuclear engineering department of BWXT Canada Ltd. in Ontario, Canada.

Mr. Soong started by reviewing the nuclear fission process and the mechanism of how a large nucleus splits into smaller nuclei with the release of energy. The most common nuclear fuel is uranium and Mr. Soong highlighted two uranium isotopes namely U^{238} which is non fissile (99.7% natural abundance), and U^{235} which is fissile (0.3%). It is the fissile isotope that can sustain a chain reaction since it can be broken apart by thermal neutrons and so, is important for both nuclear reactors and nuclear weapons.

He explained the uranium enrichment process whereby the percentage composition of U^{235} is enriched through isotope separation for both reactor grade uranium (3-4% U^{235}), or the highly enriched weapon grade uranium (90% U^{235}).

He then elaborated on the process of turning uranium ore into nuclei fuel in what is called the Nuclear Fuel Cycle. He started with the mining of uranium ore and extracting uranium from the ore to subsequently getting uranium oxide concentrate which is



Mr. Wayne Soong explaining how the Pressurised Water Reactor works

sealed in drums. Then he moved on to the enrichment process where the uranium oxide (U_3O_8) is transformed into gaseous uranium hexafluoride (UF_6). The enriched UF_6 is then converted into uranium dioxide powder at the fuel fabrication plant. The uranium dioxide powder is subsequently pressed to form small fuel pellets, which are then heated to make a hard ceramic material. The pellets are then inserted into thin tubes of zirconium alloy to form fuel rods which are then grouped together to form fuel assemblies measuring several metres in length. These fuel assemblies are then used to build up the nuclear fuel core of a nuclear power reactor.

The functions of the nuclear reactor are mainly to shield radiation, extract heat energy and control fission rate. The two most common nuclear reactor designs are Pressurised Water Reactor (PWR) and Boiling Water Reactor (BWR).

Mr. Soong discussed the advantages and disadvantages of both types of designs and said that currently, 70% of all the nuclear reactors in the world are PWRs.

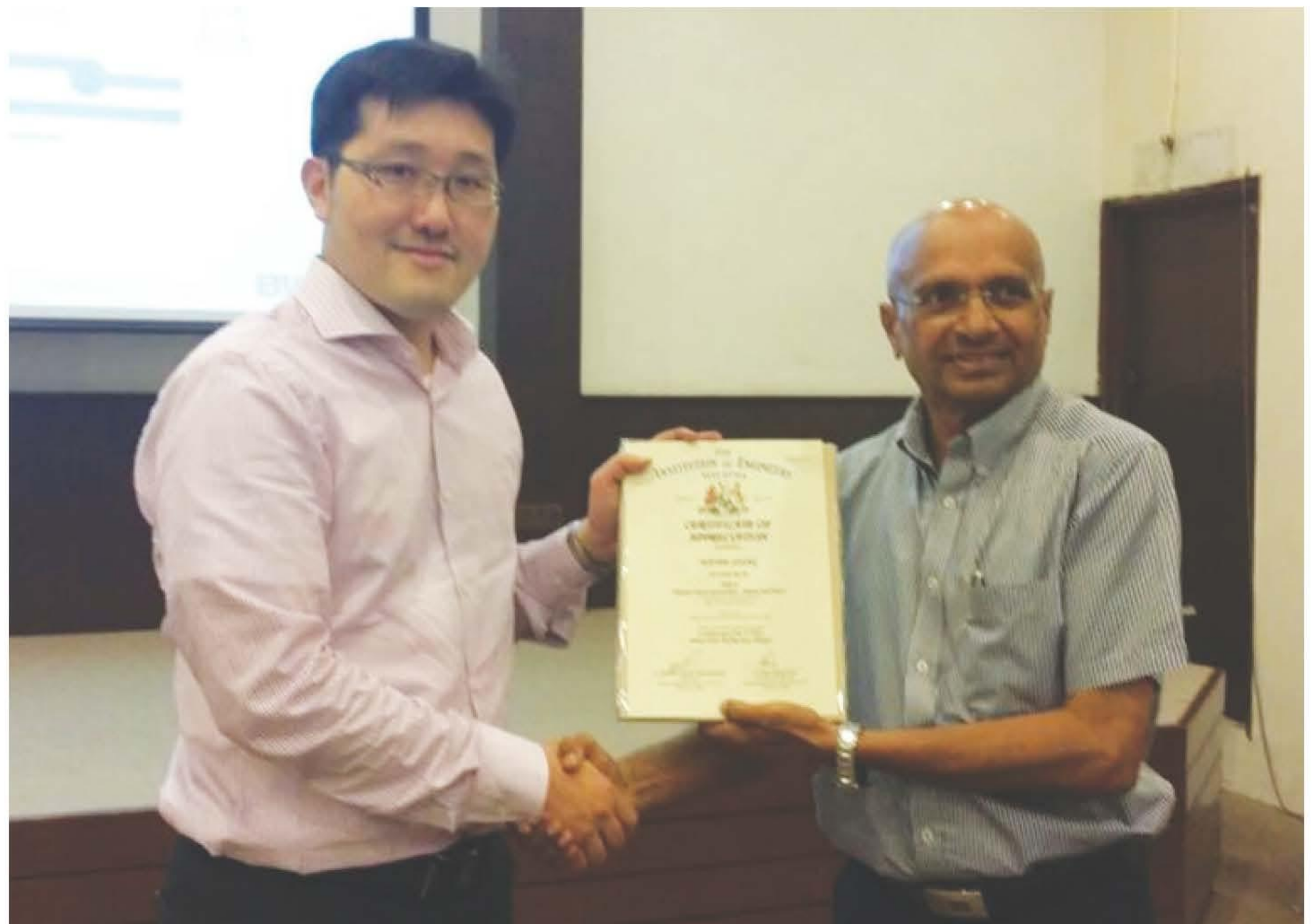
He said that currently USA and France were the top 2 leading nuclear generating countries, followed by Russia, South Korea,

China, Canada and other countries in Europe. Japan was also a leading nuclear power generating country prior to the unfortunate incident involving the Fukushima Daiichi Nuclear Power Plant. It is now in the process of shutting down most of its nuclear power plants.

The future of the nuclear power market, especially in developing countries, was also discussed. Mr. Soong said Vietnam could be the first ASEAN country to embrace nuclear power generation as the ground work, in terms of nuclear policy, implementation and the design and construction safety was in a very advanced stage.

He also discussed the roles played by the various engineering disciplines in the construction of a nuclear power plant and elaborated on the roles played by nuclear, mechanical, civil/structural, electrical, material and chemical engineers. He said it can take 6-7 years to build a nuclear power plant (i.e. from conceptual design to operational stage).

Despite the unfortunate incidents involving Fukushima Daiichi and Chernobyl Nuclear Power Plant in former Soviet Union, and the high construction costs, Mr. Soong believes that nuclear power generation is still a viable source of energy. ■



Ir. Mathew Thomas of the Engineering Education Technical Division presenting a memento to Mr. Wayne Soong

IEM DIARY OF EVENTS

Title: 1-Day Course on Enterprise Risk Management and Business Continuity Management

15 June 2016

Organised by : Building Services Technical Division
Time : 9.00 a.m. – 5.00 p.m.
CPD/PDP : 7

Title: 1-Day Workshop On 'Mind Mapping for Creative Problem Solving and Decision Making'

16 June 2016

Organised by : IEM Women Engineer Section
Time : 9.00 a.m. – 5.30 p.m.
CPD/PDP : 7

Kindly note that the scheduled events below are subject to change. Please visit the IEM website at www.myiem.org.my for more information on the upcoming events.