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NUCLEAR AUSTRALIA

**QUARTERLY NEWSLETTER OF THE
AUSTRALIAN NUCLEAR ASSOCIATION**

EDITORIAL

Good news and disappointing news continued from 2009 – The reports from recent World Nuclear Association's Weekly Digests contain the good news that the US government has approved substantial loan guarantees to assist in the financing of two new nuclear power stations in the USA. Guarantees have been given totaling over US\$8 Billion to three organisations financing the construction of the Vogtle 3 & 4 units in Georgia. These will have a total capacity of 2,234 MWe and a total cost of US\$14 B including financing costs. These guarantees will give a much needed boost to the US nuclear industry, while President Obama is reported as saying "This is just the beginning".

Recent disappointing news is that the Pebble Bed Modular Reactor planned in South Africa has been postponed indefinitely due to financial constraints but there are recent US initiatives to get a high temperature reactor program moving forward as part of the Generation IV initiative (to be reviewed in the next issue).

New Edition of Nuclear Energy for the 21st Century

The second edition of "Nuclear Energy for the 21st Century" by Ian Hore-Lacy (ISBN: 978-0-9550784-1-5) has been published by the World Nuclear University as its primer. It is effectively the 9th edition of what was originally "Nuclear Electricity" by Ian Hore-Lacy. The 140 pages of the new edition have been updated and copies can be obtained through the WNU website (www.world-nuclear-university.org) at £20 plus £8.50 standard delivery to Australia (Note - £28.50 is equivalent to A\$47.50 delivered to Australia, which makes it a little expensive). Your editor has only just received a copy and his first impression is that it is an excellent textbook on nuclear energy and eminently suitable for use by students and teachers in schools and universities as well as by the general public.

The 17th Pacific Basin Nuclear Conference, Mexico, 2010

Papers were invited on all aspects of nuclear science and technology for the 17th Pacific Basin Nuclear Conference to be held from 24-30 October 2010 and hosted by the Mexican Nuclear Society in Cancun, Mexico. Four papers have so far been accepted from Australia: An invited Plenary Paper by Dr Adi Paterson, CEO, ANSTO, on "Growing the Contribution of Nuclear Science & Technology Organisations", a paper by Dr Clarence Hardy, ANA, on "Australia's Uranium Resources & Production in a World Context", a paper by Drs Kath Smith and Gregory Lumpkin, ANSTO, on "Radiation Damage Response of Ceramics in Extreme Environments", and a paper by Dr Don Higson, ANA, on "A Perspective on Risks from Radon". Please contact Dr Clarence Hardy, ANA Secretary, email: hardycj@ozemail.com.au, if you are interested in submitting a late paper or attending. The ANA has strongly supported PBNCS in past years and held the 9th PBNC in Sydney in 1994 and the 16th PBNC in 2008.

ANA SUBMISSION TO SENATE INQUIRY

The ANA Committee has sent a submission to the Senate Legal and Constitutional Affairs Committee recommending that Parliament pass the Commonwealth Radioactive Waste Management Bill 2010. This Bill repeals the Commonwealth Radioactive Waste Management Act 2005, puts in place transition arrangements to ensure that the existing volunteer site at Muckaty Station (NT) remains an approved site and establishes a nationwide volunteer site nomination process should the Muckaty Station site (or other volunteered site on Aboriginal land) be considered unlikely to be constructed and operated. The ANA supports this process which will facilitate the siting, construction and operation of a facility for the management of radioactive waste and disposal of low level waste. For too long the process of establishing a national radioactive waste facility has been beset by emotive arguments and exaggeration of risks posed by radioactive waste and a waste facility.

AUSTRALIAN AND WORLD NEWS ITEMS

ANSTO News: ANSTO has signed two new agreements for research collaboration, one with the French Atomic Energy Commission (CEA) and one with Curtin University of Technology. ANSTO and the CEA first joined forces in 1992 with a cooperation agreement on the peaceful uses of advanced nuclear technology. The new agreement signed in Paris last week by ANSTO CEO Dr Adi Paterson and CEA Head Prof. Bernard Bigot at the International Conference on Access to Civil Nuclear Energy attended by 1400 delegates will enable closer collaboration in areas such as nuclear medicine, life sciences, radiation therapy, safety and radiological protection. The agreement signed by ANSTO and the Curtin University of Technology last week is for a four-year \$1.2M study into the storage of nuclear waste. The study will particularly involve researchers at Curtin's Nanochemistry Research Institute and ANSTO's Institute of Materials Engineering. Source: ANSTO website at www.ansto.gov.au

FAST REACTORS: The Japanese government has selected **Mitsubishi Heavy Industries (MHI)** as the core company to develop the new generation of fast breeder reactors. Japan has had experience with the Joyo prototype fast reactor since 1977 and the Monju prototype FBR which started up in 1994 but was off line with a sodium leak in 1995 and is expected to restart shortly. There has been good progress with the **Chinese Experimental Fast Reactor (CEFR)** which is nearing commissioning. This reactor has a thermal power of 65MW connected to a 25MWe turbine and it contains a load of 260 te sodium. The uranium/plutonium mixed oxide fuel has been supplied by the Russian company TVEL. A new joint venture company has been set up in Russia to develop and commercialise **small lead-cooled fast reactors**. A 100MWe reactor design based on long-established fast reactor technology used in Russian submarines will be ready by 2019. An **Integral Fast Reactor (IFR)** is one of the preferred designs in the international Generation IV program and GE-Hitachi has designed a potential commercial modular 311MWe version (PRISM). Source: World Nuclear News. **Dr Hardy will be discussing the IFR developments in a talk to the Engineers Australia Southern Highlands Branch in Mittagong on 29 April (see page 4 for details).**

UAE/KOREA: The Korea Electric Power Company (Kepco) and Korea Hydro and Nuclear Power (KHNP) will have a major role in a \$20B order for four Korean-designed APR1400 pressurised water reactors by the United Arab Emirates. No sites have yet been announced but the reactors are planned to come on line from 2017-2020. UAE power demand is expected to increase from under 16 GWe now to 40 GWe by 2020 and the four reactors will add 5600 MWe. This order demonstrates the emergence of the mature Korean nuclear industry as a major new exporter of nuclear plants. Korea currently has 17.5GWe of nuclear capacity representing 28.5% of total electrical capacity but 45% of total electrical generation at a capacity factor of 95%. Korea plans to add ten more NPPs totalling over 10GWe to come on line before 2020. Sources: World Nuclear News and others.

ANA NEWS

PROVISIONAL TECHNICAL PROGRAM FOR 2010

The details of most of the technical talks in the combined program of the ANA and the Nuclear Panel of the Sydney Branch of Engineers Australia for 2010 have been finalised. Information on speakers still to be confirmed in Sept, Oct & Nov. will be provided in the next Newsletter.

24 March (Wednesday) Host: Nuclear Panel at 5.30 for 6.00pm, Engineers Australia Lecture Theatre, 8 Thomas St, Chatswood, NSW.
“The Revival of British Nuclear Power”
by Mr Ian Hore-Lacy, WNA

Britain’s nuclear power industry initially focussed on gas-graphite technology (Mgnox reactors) with natural uranium fuel capable of producing plutonium. These were superseded by advanced gas-cooled reactors (AGRs) using slightly enriched fuel operating at higher temperature. These lacked standardisation and had operational problems. Britain’s first light water reactor (a 1200MWe Westinghouse LWR) started up in 1995 and was to be the first of four, but the industry stagnated. The government’s Energy White Paper in 2003 concentrated on renewable sources and gave nuclear a low priority. However, a political U-turn led to a 2008 White Paper on Nuclear Power, which gave new importance to nuclear power. Two reactor designs are being considered, Areva’s PWR and Westinghouse’s AP1000. Mr Hore-Lacy will discuss these new initiatives not only in nuclear power but also in the UK fuel cycle including enrichment, fuel fabrication, reprocessing and waste disposal.

Ian Hore-Lacy is Director of Public Communications with the World Nuclear Association in London, and a consultant to the Australian Uranium Association based in Melbourne (the predecessor of which he headed in 1995). He is a former biology teacher and then worked as an environmental scientist with CRA (now Rio Tinto) & has published several books, including Nuclear Electricity (7 editions) now Nuclear Energy in the 21st Century (2 editions).

22 April (Thursday) Host: ANA at the AINSE Theatre, Lucas Heights, at 1.00pm.
“A Perspective on Risks from Radon”
by Dr Don Higson, ANA

26 May (Wednesday) Host: Nuclear Panel at 5.30 for 6.00pm at Engineers Australia Lecture Theatre, 8 Thomas St, Chatswood, NSW.
“Nuclear Power Developments in the Middle East” by Dr Clarence Hardy, ANA

24 June (Thursday) Host: ANA at the AINSE Theatre, Lucas Heights, at 1.00 pm.
“Progress Report on Gamma Sterilisation”
by Mr Murray Lynch, CEO, Steritech

28 July (Wednesday) Host: Nuclear Panel at 5.30 for 6.00pm at Engineers Australia Lecture Theatre, 8 Thomas St, Chatswood, NSW.

“Engineering Challenges of Small Modular Power Reactors”
by Mr Martin Thomas, AO, Engineers Australia

26 August (Thursday) Host: ANA at the AINSE Theatre, Lucas Heights, at 12.30pm.

ANNUAL GENERAL MEETING
followed at 1.00pm by
“ANSTO’s Involvement in Regional Programs: RCA and FNCA”
by Mr Peter McGlynn, ANSTO

22 September (Wednesday) Host: Nuclear Panel at 5.30 for 6.00pm at Chatswood, NSW.
Topic and speaker to be confirmed

28 October (Thursday) Host: ANA at the AINSE Theatre, Lucas Heights, at 1.00pm.
“Developments in Uranium-Molybdenum Research Reactor Fuel”
by Mr Ross Finlay, ANSTO

24 November (Wednesday) Host: Nuclear Panel at 5.30 for 6.00pm at Chatswood, NSW.
Topic and speaker to be confirmed

ANA ANNUAL LUNCH still to be confirmed

REPORT AND NOTICE OF MEETINGS

**Report on the Four Societies' Meeting
6.00pm, 17 February 2010, Engineers Australia
Theatre, 8 Thomas St, Chatswood.**

“The Current State of Development of Electricity Producing Technologies” by Dr Christopher Dey and Professor Manfred Lenzen, Integrated Sustainability Analysis Centre, University of Sydney

The talk was presented by Dr Christopher Dey and based upon a report commissioned by the Australian Uranium Association to provide an analysis and overview of the range of electricity producing technologies in 361 references in the international literature in recent years. The report included eight technologies, seven of which are generating technologies: hydro, nuclear, wind, photovoltaic, concentrating solar, geothermal and biomass power. The other technology is carbon capture and storage because of its perceived importance in making the use of fossil fuels more acceptable environmentally.

Dr Dey reviewed each of the technologies and concluded that all of these technologies have their advantages and drawbacks. Attempts to quantify the varied aspects in one end-point indicator are fraught with problems.

This lecture was the best attended of any Four Societies lecture that the reviewer can remember with over 100 present and standing room only in the lecture theatre. There were inevitably a large number of questions which Dr Dey answered admirably. Any attendees or members who could not attend, can download the full detailed report from the Australian Uranium Association's website at: www.aua.org

Dr Dey is a Senior Research Fellow in the ISA Centre with interests in renewable energy, sustainability analysis and social indicators.

Prof. Lenzen is Professor of Sustainability Research and an international leader in economic input-output analysis and life cycle assessment. Both speakers contributed to the UMPNER study commissioned by the previous government and published in 2006.

Review by Dr Clarence Hardy, Hon. Secretary, ANA

**Notice of Dinner Meeting of the
Southern Highlands Branch of Engineers
Australia, RSL Club, Mittagong, Old Hume
Highway, 6.00pm, 29 April 2010**

“The Integral Fast Reactor”
by Dr Clarence Hardy, ANA

Dr Hardy will present the case for developing the Integral Fast Reactor (IFR) which is a liquid metal-cooled fast reactor using metal fuel and integrated with an on-site fuel recycling plant. The basic design was developed in the 1980s at the Argonne National Laboratory in the USA.

The IFR was chosen in a US Dept of Energy study in 2002 by a large group of consultants as No. 1 of the large number (19) of advanced types put forward as Generation IV reactors for future development. It is claimed to have advantages over current or future Light Water Reactors of (a) high efficiency in its use of uranium, (b) a high level of passive safety, (c) the ability to breed more fissile material than it consumes, or burn up excess plutonium, and (d) lower proliferation risks. In addition, when the reactor is integrated with pyro-processing of the spent fuel in an on-site plant, it can recycle and burn up trans-uranium isotopes, thus giving much less final high level waste of lower potential toxicity than a conventional LWR/conventional reprocessing plant. This means that less waste with lower toxicity has to be disposed of in an underground repository.

A potentially commercial version of the IFR known as the S-PRISM, has been designed by GE-Hitachi as a 311MWe module to be built in a factory and transported to a site. There are no IFRs currently constructed but 20 more-conventional fast reactors have had 390 reactor-years of operation since the 1950s. A number of developmental fast reactors are being constructed in several countries and Dr Hardy will also review their progress. The IFR is one of the most promising designs of Generation IV reactors and is likely to be developed by one of the major countries in the next few years.

Contact Dr Hardy: hardycj@ozemail.com.au