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Nuclear Desalination Newsletter

News from the Technical Working Group on Nuclear Desalination
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Division of Nuclear Power
Department of Nuclear Energy
IAEA

P.O. Box 100
Wagramer Strasse 5,
A-1400 Vienna, Austria
Tel : +43 1 2600 22751
Fax: +43 1 2600 29598
Email: *I.Khamis@iaea.org*.

Environmental Impact assessment for Nuclear Desalination

This document aims at improving the understanding of new aspects of nuclear desalination, addressing the environmental and socio-economic impacts, and opportunities and challenges associated with using nuclear power as the source of heat and/or electricity for a seawater or brackish water desalination facility.

The public perceived risks which are associated with nuclear power especially when used for seawater desalination is highlighted. The most obvious one is the assumption that the desalinated water might be contaminated with radioactive nuclides produced in the nuclear power plant. Therefore, this document is intended not only to present some experimental data and experiences of operating nuclear desalination projects, but also to highlight important issues such as the environmental impact of desalination and discuss challenges of nuclear desalination.

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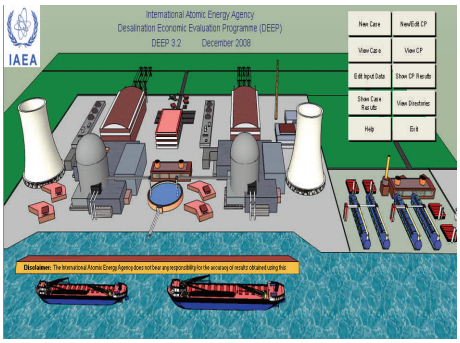
The Release of DEEP 3.2

The IAEA DEEP software has been under continuing improvements to respond to the need of making scoping analysis and economic comparisons of various envisioned desalination systems using nuclear and conventional energy sources. DEEP3.2 is now capable of performing: economic comparison between various options of energy sources and desalination processes, and technical and economic evaluation and assessment of product water transport analysis.



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Commissioning the 2nd Part of the Nuclear Desalination Demonstration Project in India

Early this year, India commissioned the MSF plant which is coupled to the Madras Atomic Power Station at Kalpakkam. This demonstration plant is designed for higher top brine temperature and utilizes less pumping power. The desalination plant can meet the fresh water needs of around 45,000 persons (at 140 liter per capita per day). The nominal capacity of the plant is 4500 m^3/day.

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A Word from the Deputy Director General

The reliable supply of water and energy is an important prerequisite for sustainable development. As a global issue, water scarcity is affecting more countries every year. The contracted capacity of desalination plants is reported to have reached recently an almost 50 million m^3/d worldwide. Desalination, and nuclear seawater desalination in particular, provides hope to the world community that water, can be provided at reasonable costs.

Nuclear desalination is considered one of the viable sources of producing fresh water needed in the arid areas. Nowadays, several countries have shown interest in the utilization of the nuclear energy for seawater desalination not only because recent studies have demonstrated that nuclear desalination is feasible, but also economical and has been already demonstrated in several countries. The future may require an effective integration of energy resources to produce power and desalinated water economically with proper consideration for the environment.

Through its programme on nuclear seawater desalination, the IAEA is contributing to the solution of the global water scarcity problems. The IAEA programme on nuclear desalination includes the establishment of a technical working group on nuclear desalination TWG-ND; the launching of coordinated research programmes including the newly approved one on new technologies for seawater desalination using nuclear energy; the continuing maintenance and updating of the IAEA DEEP software (the latest release is DEEP3.2); the development of a toolkit on nuclear desalination (the beta version will be released by September 2009); and the support to Member States through various forums of information exchange, technical cooperation projects, and publications.

During the TWG-ND meeting held in June 2009, information was exchanged on the progress of national and interregional activities on nuclear desalination, and a review of the IAEA activities on nuclear desalination was reviewed.

I am pleased to know that the TWG-ND highly appreciates past, present and future IAEA activities on nuclear desalination. I am also pleased with the release of this issue of the TWG-ND Newsletter highlighting the current activities of the Agency and from the Member States.

Y.A. Sokolov

IAEA, Deputy Director General

A Word from the Chairman of TWG-ND

The International Nuclear Desalination Advisory Group (INDAG) was established by the IAEA in 1996. It played an important role in the past years, contributed to promotion and stimulation of nuclear desalination activities, and provided a forum for Member States to exchange information on the technological developments and demonstration of integrated nuclear desalination systems. To enhance its functions, the IAEA reformed INDAG into a Technical Working Group on Nuclear Desalination (TWG-ND) in 2008. The first meeting of TWG-ND was held during June 08-10, 2009 in Vienna for exchange of information on nuclear desalination activities in Member States to review the progress and provide guidance to IAEA activities in this field. The objective of the meeting was to:

- provide a forum for the exchange of information on nuclear desalination activities in Member States
- review the progress of and provide advice and guidance on the IAEA's activities in nuclear desalination.
- provide advice on preparatory action by Member States for implementing nuclear desalination demonstration projects;

Fifteen (15) members participated in the meeting. Status of national and international programs were deliberated by representatives from Algeria, Argentina, China, Cuba, France, Germany, India, Indonesia, Kuwait, Libyan Arab Jamahiriya, Saudi Arabia, South Africa, Spain and United States of America. Nuclear desalination is gaining increased importance for Member States that are experiencing widespread water and power shortages. Discussions were held on future activities such as CRPs, DEEP, tool kit and technical meetings on nuclear desalination. It was recommended to carry out studies on economically and technically viable cogeneration options using nuclear power, online nuclear desalination toolkit for wide use by Member States and organizing regional workshops on nuclear desalination-related topics as per request from Member States. The Newsletter gives the full insight of TWG-ND activities highlighting the current as well as future activities of the Agency and the Member States.

P. K. Tewari

Chairman, TWG-ND

Recent Activities on Nuclear Desalination in Member States

Algeria: the authorities are investigating the option of nuclear desalination through a feasibility study. The study, a technical cooperation project with the IAEA, began in 2007 with an objective to elaborate a document which will be used to support the government's decision to introduce the nuclear energy in the country.

Hamma seawater desalination plant

China: The China's nuclear power development goal is to have an installed capacity of nuclear power plants in operation achieves of 40 million kilowatts by 2020. By the end of 2008, China has nine nuclear power plants with 11 units in operatio having total capacities of 9.068 million kilowatts. In addition, 22 units (Lingao II, Qinshan II expansion, Hongyanhe I, Ningde I, Fuqing I, Yangjiang I, Fangjiashan) totalling of 22.1 million kilowatts are under construction.

The rapid development of nuclear power, the lack of water resources, as well as the development of desalination technology is expected to be the drivers for the development of nuclear desalination. Nuclear desalination is considered as an option for some NPPs to support the electricity generation and for the plant's residential use.. For example, in Hongyanhe NPP, the capacity of the desalination plant during phase I is about 17,000 m^3/d, and to be expanded 100,000 m^3/d later in future. The capacity of seawater desalination system in Ningde nuclear power plant is 11,000 m^3/d, and the desalination water will be used for the nuclear power plant make-up water.

Cuba: has already completed a feasibility study on desalination of seawater. As presented, nuclear desalination was not considered an option in the study.

France: the Commission of Atomic Energy CEA is developing engineering support systems for nuclear desalination studies, and actively collaborating with India and the Libyan Arab Jamahiriya.

Germany : As the world population increases, more and more people will live in areas with freshwater scarcity. Hence, necessary technical means to reduce this scarcity has to be made, where freshwater has to be made available at socially acceptable cost. This could only be achieved if improved desalination processes with sustainable cost efficient energies were realized.

India: has an emphasis on the role of nuclear desalination programme which has already been demonstrated and achieved several milestones such as:

- Indigenous capability in design, fabrication and operation of nuclear desalination plant has been demonstrated by its successful construction and commissioning. Product water quality has been achieved.
- Distilled quality water from seawater was produced from MSF.
- Drinking quality water from seawater was produced from RO.
- Under the Agency's Technical Cooperation Program, a group of three (3) engineers from Algeria have undergone fellowship training in the field of nuclear desalination including NDDP, Kalpakkam. A two weeks scientific visit for a senior official from Algeria was also organised. More fellowship training and scientific visit may be organised in future as and when such requests are received from IAEA.

Kalpakkam Nuclear Desalination Demonstration Plant

It is utmost important that IAEA should continue to play the positive role as facilitating agency. Nuclear desalination demonstration projects, cost reduction strategies through technological innovations and environmental considerations may be taken up more vigorously. Seawater intake and outfall, coupling aspects, pre- and post-treatment, energy recovery and reduction, recovery of valuables from brine, hybrid concepts, waste heat utilization may be further explored based on site specific and technology specific requirements.

Indonesia: is planning to utilize nuclear power for not only electricity but also for co-generation purposes. Several studies have been made in Indonesia looking at feasibility of nuclear desalination. These studies include: a pre-Feasibility Study on Nuclear Desalination in Madura Island, BATAN, 2003, study on techno-economics of HTGR co-generation in BATAM Island, BATAN, 2009, and a study on economy of PWR co-generation in Muria Peninsula: Desalination, BATAN, 2009.

Kuwait: has had its eyes on nuclear energy for power/water cogeneration since early seventies of the Twentieth century. The cogeneration option is favoured where power/water cogeneration schemes using thermal distillation or reverse osmosis membrane processes is used. It was envisaged that a nuclear power/water cogeneration plants include light water-pressurized water reactor and multiple effect distillation plants such as 1000 MW/140,000 m^3/d or 600 MW/48,000 m^3/d could be utilized. Kuwait is revisiting the nuclear power and desalination option in the country as a national program as well as joining efforts with other Arab Gulf Cooperation Council Countries (GCC) in developing a nuclear energy program for electrical power generation and water desalination.

The Libyan Arab Jamahiriya.: has retained the desalination of seawater to be one of the major options to augment national efforts for the supply of potable water and decided to conduct certain activities toward capacity building and cost optimization in this field. A brief summary of some activities were highlighted.

Morocco: has reiterated its commitments to promote further the introduction of nuclear power for electricity production and desalination.

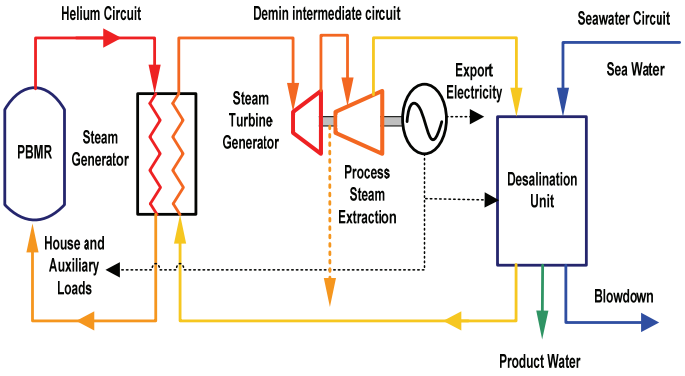
Saudi Arabia: is very much interested in nuclear desalination and joining efforts with other Arab Gulf Cooperation Council Countries (GCC) in developing a nuclear energy program for electrical power generation and water desalination.

Spain: having approximately 40 years of experience on desalination in the Canary Islands, desalination provide approximately 150 cubic hectometres per year in 2001 and 425 cubic hectometres per year in 2008. A number of very attractive R&D projects on desalination geared towards efficiency and sustainability are currently underway.

No national nuclear desalination initiatives have been undertaken in Spain in the past. However, since RO desalination plant processes are electrical energy intensive, a sustainable long-term electric supply service will be considered. For that reason, some Spanish institutes and companies have been participating in international nuclear desalination R&D programmes.

Seawater desalination at the Canary Islands (40 years of operation) and Mediterranean coast

South Africa: Currently most desalination systems use fossil fuels as their energy source. As the Pebble Bed Modular Reactor (PBMR), a helium-cooled graphite moderated high-temperature gas-cooled nuclear reactor, is under development in South Africa, nuclear desalination system using the PBMR is considered as an option.

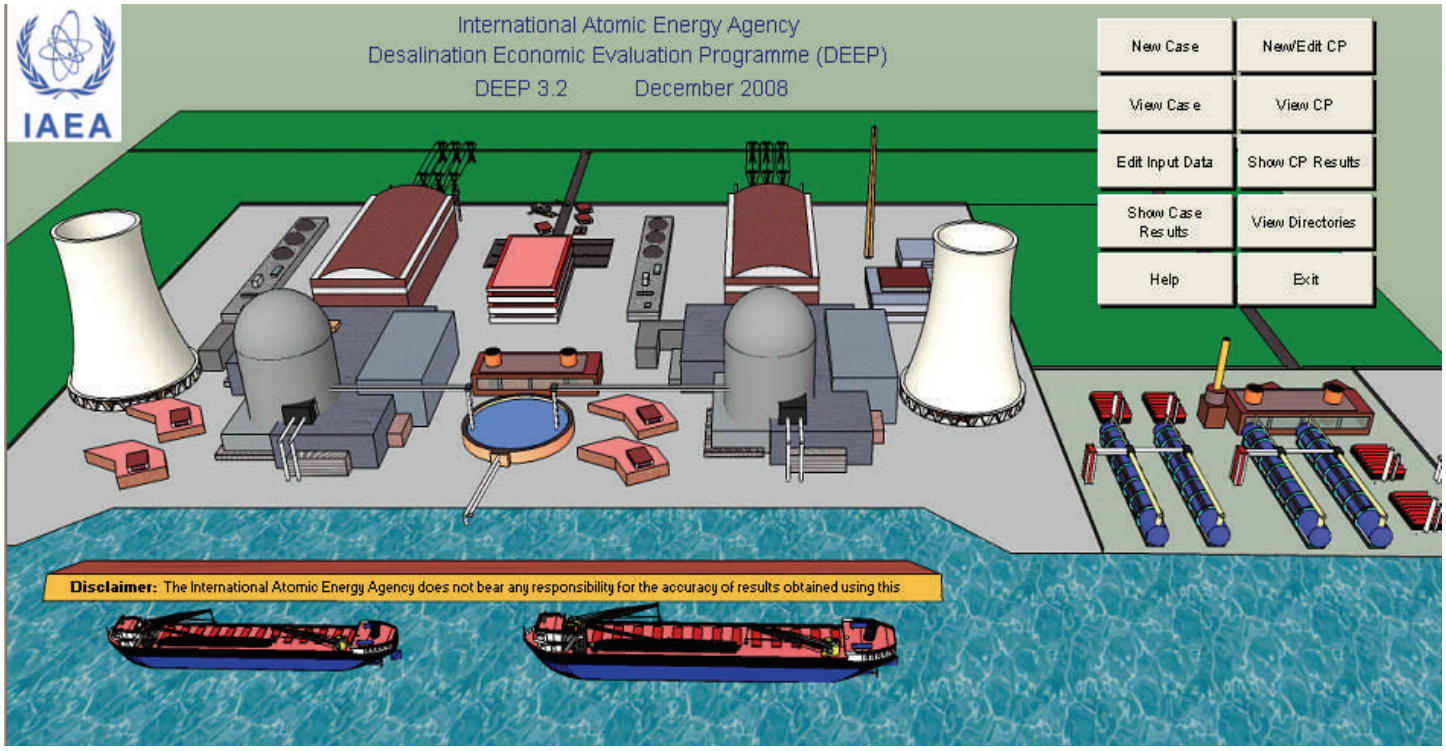


PBMR cogeneration configuration

USA: is reiterating its position to continue its involvement in the TWG-ND activities and meetings to the extent possible. The USA, via Argonne National Laboratory (ANL), has been actively engaged in various techno-economic analyses of possible deployment of nuclear power plants for the cogeneration of power and water. These studies clearly demonstrated the need for making a sound financial case to support the economic feasibility of such projects. ANL in support of GNEP completed early 2009 an economic assessment for a GNEP Partner country in which it was found that not only was cogeneration for electricity and freshwater using a pressurized water reactor-type plant found to be a viable reason for nuclear energy development, but also that it could provide a very lucrative revenue generation advantage.

The Release of DEEP 3.2

DEEP has been increasingly used among scholars from member states to carry out feasibility studies of desalination systems (nuclear or non-nuclear-based systems). Currently, several versions of DEEP (with salient modifications to each version) are being utilized among users. This has resulted in high demand from scholars to have only one common version of DEEP with protection from unauthorised modifications and that includes all prior modifications made in recent years. Due to compatibility issues and software structure, an increasing number of users are encountering difficulties during the installation of new downloaded versions of DEEP. This new version of DEEP 3.2 has been released aiming at making the IAEA DEEP software more user friendly with an updated information to help making feasibility studies more reliable.



New features of DEEP 3.2 :

- **New outlook with security on non-input cells.** In addition to the new outlook of DEEP main page, many bugs within the VB coding of DEEP have now been eliminated and a new security features were added. These features will limit access to the needed-cells only while protecting the actual programming of DEEP and its calculations procedures.
- **The use of Rankine cycle is introduced, instead of Carnot's, in four selected templates.** The idea is to allow the user to test-run the templates while the Carnot-based templates are still available for comparison.
- **Detailed water cost transport model**, which is now implemented within all of DEEP's templates.

As DEEP is still under development, various related documentations are in need to be updated. In addition, a quality assurance manual to the user is being prepared to be released in the near future. In summery, the areas under development, (to be included in the next release of DEEP) are as follows:

- **Update of documentations**
- **Revision of DEEP models**
- **Update of the economic data carbon foot print model**
- **Model for renewable energies**
- **Update of benchmarking.**

Release of Newly Developed Toolkit on Nuclear Desalination

Based on previous recommendation made by the International Nuclear Desalination Advisory Group INDAG, the beta-version of the toolkit on nuclear desalination was just released. The aim of the toolkit is to help Member States considering nuclear power for seawater desalination.

The toolkit is structured using Microsoft publisher and consisting of live pages related to:

- Evaluating options for seawater desalination using nuclear energy.
- DEEP Home Page.
- IAEA Publications on Nuclear Desalination.
- IAEA Activities on Nuclear Desalination.
- Technical Working Group on Nuclear Desalination (TWG-ND, *previously INDAG*).
- Newsletter on Nuclear Desalination.
- Launching nuclear desalination programme.

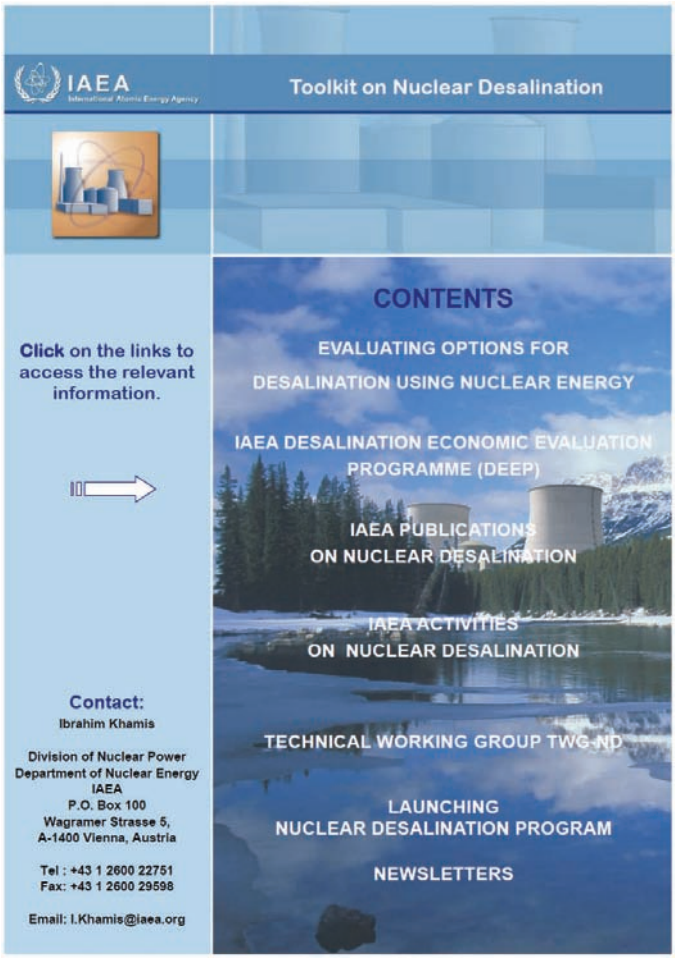
Each page of the toolkit contains hypelinks to all relevant documents. These documents are either available on the IAEA official website or from the toolkit directory prepared by the subscriber with consultation with the IAEA representative.

Once officially released, the toolkit can either be downloaded directly from the IAEA website or distributed as a stand alone compact disc or other sorts of data storage.

As recommended by INDAG, the toolkit requires continuous update to include new developments and reports as well as to implement any feedback from users after release. Indeed, future plan may include having within this toolkit a sensitivity analysis software, for example, the development of financial analysis tool with bankable model to evaluate the financial viability of nuclear desalination projects to take into account site specific cost and tariff inputs.

In addition, the toolkit may include another important tool for capacity building such as an integrated nuclear desalination simulation package which will be able to perform optimization of different desalination schemes, investigate operational and transient events experienced by the desalination system, and address some safety issues resulting from the coupling of desalination systems to the nuclear power plant.

Most of these future activities will be implemented once financial support is made available.



The front page of the new IAEA ToolKit on Nuclear Desalination

Highlights of Ongoing and Future Activities at the IAEA

Nuclear desalination as an integral part of Non Electrical Applications of Nuclear Power

Non electric applications could make nuclear energy more viable, this is one of the conclusions made by twenty two experts from eleven Member States attended the technical meeting on non electric applications held in Daejeon, Rep. of Korea during 3-6 March 2009. Another important conclusion was the need for an Active international collaboration could help accelerate progress on high cost R&D in non electric applications such as development of nuclear technology and pilot plant for nuclear hydrogen production. Some interesting recommendations of the meeting include the need of the IAEA to emphasize the energy security aspect of non electric application in view of the

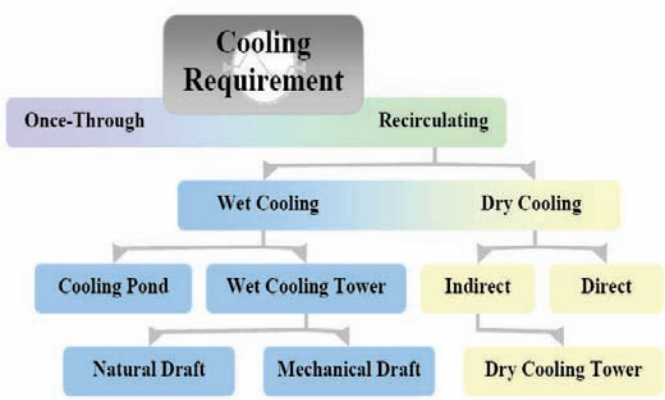
increasing volatility on the fossil fuel price and the environmental security aspect in view of the acceleration of the global warming by heavy dependency on fossil fuel, and that existing nuclear facilities should be made available to international cooperation.

Joint ICTP/IAEA Training Workshop on Technology and Performance of Desalination Systems

In co-operation with the International Center for Theoretical Physics, the IAEA organized a training workshop on Technology and Performance of Desalination Systems, held at ICTP, Trieste, from 11 to 15 May 2009. 21 participants from 18 countries were trained on technology and performance evaluation of energy sources and water desalination systems, including coupling of various sources of energy such as combined cycles, gas turbines, fossil, and nuclear reactors with different desalination processes using the IAEA DEEP software for economic evaluation methods of nuclear desalination.

Management of Water Use and Consumption in Water Cooled Nuclear Power

Efficient water use/consumption is very important in several developing countries considering introduction of nuclear power, and in industrialized countries considering expansion of their nuclear power programme. In some countries, the lack of water has even resulted in shortages in electricity generation. Therefore, the efficient management of water use at new nuclear power plants is highly important. Gathering best practices followed on efficient water management and document the approaches. The IAEA is planning this consultant meeting in May 2009 with the objective to produce a draft document on efficient water use/consumption in water cooled reactors and to formulate a plan and schedule for the follow-up activities required to finalize the report.

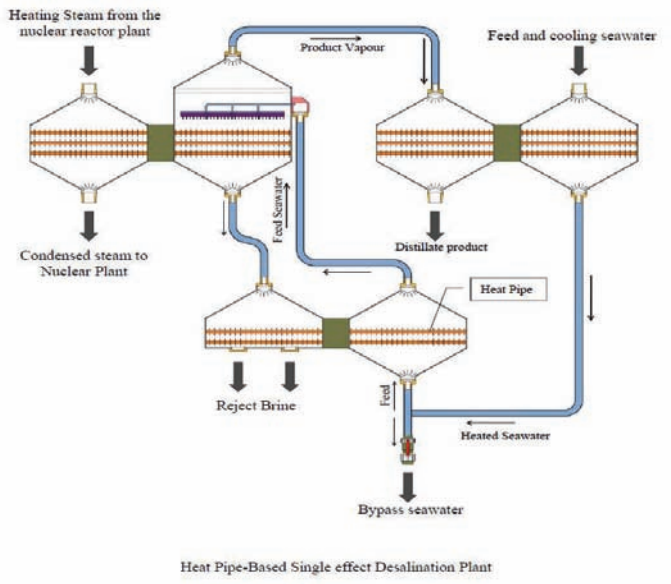


Advances in Nuclear Power for Process Heat Applications

Results of an on-going CRP on advances in nuclear power for process heat applications will be presented in 2009. In this CRP, the potential of using high temperature reactors (HTR) not only for electricity generation but also for hydrogen production together and desalination is being investigated. The safety of coupling of HTR to other systems, mainly hydrogen production facility, is also analyzed.

New Technologies for Seawater Desalination Using Nuclear Energy

The IAEA has launched a new Coordinated Research Programme (CRP) on new technologies for seawater desalination using nuclear energy. Among other prospects of innovative technologies, the CRP will investigate the potential of using new technologies aiming at harnessing waste heat in nuclear power plants using heat pipe technologies for various applications (see Fig. below). This CRP will help support R&D in nuclear desalination technologies with the aim of producing large amounts of desalted water at the lowest possible cost and in a sustainable manner, and assist developing countries interested in nuclear programmes to master applications of nuclear energy for seawater desalination and cogeneration option. So far, 15 Member States expressed interest in joining this CRP. The kick-off meeting is planned for 27-28 Oct 2009.



Heat Pipe-Based Single effect Desalination Plant (Jouhara, Khamis)

UPCOMING MEETINGS

- **Consultancy meeting on Efficient water use/consumption in new water cooled reactors, VIC, Vienna, 7-9 Dec 2009.**
- **1st Research Coordination Meeting RCM for the CRP on new technologies for seawater desalination using nuclear energy, 27-28 Oct, 2009**

Recent IAEA publications relevant to nuclear desalination

- **Proceedings of the International Conference on *Non Electric Applications of Nuclear Energy: Nuclear Desalination, Hydrogen Production, and other industrial Applications*.** Oarai, Japan 16-19 April 2007, under printing.
- **Ibrahim Khamis and Vladimir Anastasov, *" Nuclear desalination: environmental impacts and implications for planning and monitoring activities*"**, Journal of Environmental Monitoring, 2009.
- **Hussam Jouhara, Vladimir Anastasov, Ibrahim Khamis, *"Potential of heat pipe technology in nuclear seawater desalination*", Int. J. of Desalination, 2009.**
- **Ibrahim Khamis, *"A Global overview on nuclear desalination*", Int. J. of Nuclear Desalination, 2009.**
- **Ibrahim Khamis and Vladimir Anastasov, *"Environmental Aspects of Nuclear Desalination*", Cairo International conference on Energy & Environment, 2009.**
- **Ibrahim Khamis, Hussam Jouhara, Vladimir Anastasov, *"Heat pipes as an extra measure to eliminate radioactive contamination in nuclear seawater desalination*", Conf. on Desalination for the Environment Clean Water and Energy, Baden-Baden, Germany, 17-20 May 2009.**

IAEA presence at International Conferences

- ***Conf. on Desalination for the Environment Clean Water and Energy, Baden-Baden, Germany, 17-20 May 2009.***

Current Members of the TWG-ND

Algeria	***Mr. BELKAID Abderrahmane***	**Centre de recherche nucleaire de Birine** Email: abbelkaid@yahoo.fr
Argentina	***Ms. JAPAS Maria Laura***	**Comision Nacional de Energia Atomica** Email: mljapas@cnea.gov.ar
China	***Ms. WEIHUA Li***	**Institute of Nuclear and New Energy Technology** Email: liweihua@mail.tsinghua.edu.cn
Cuba	***Mr. ZUNIGA Santana Juan Francisco***	**Information Management and Energy Development Center** Email: jfz@cubaenergia.cu
Egypt	***Mr. YASSIN M. Ibrahim***	**Nuclear Power Plants Authority** Email: yassin_brhm@yahoo.co.uk
France	***Mr. DARDOUR Saied***	**CEA/Cadarache** Email: saied.dardour@cea.fr
Germany	***Mr. TUSEL Guenther***	**GFT Desalination GmbH** Email: g.tusel@gft-gmbh.com
India	***Mr. TEWARI Pradip K.***	**Atomic Research Centre (BARC)** Email: pktewari@barc.gov.in
Indonesia	***Mr. SUDI Ariyanto***	**National Nuclear Energy Agency (BATAN)** Email: asudi@batan.go.id
Kuwait	***Mr. AL-AWADI Nader Mohammed***	**Kuwait Institute for Scientific Research** Email: nawadi@safat.kisr.edu.kw
Libyan Arab Jamahiriya	***Mr. GHURBAL S.M.***	**Atomic Energy Establishment** Email: ghurbal55@yahoo.com
Morocco	***Mr. BOUABDELLAOUI Yahya***	**Institut Agronomique et Vétérinarire Hassan II** Email: y.bouabdellaoui@iav.ac.ma
Russian Federation	***Mr. BARANAEV Yuri D.***	**Institute of Physics and Power Engineering** Email: baranaev@ippe.ru
Pakistan	***Mr. BUTT Waqar M.***	**Pakistan Atomic Energy Commission** E mail: buttwmb@yahoo.com
Saudi Arabia	***Mr. AL-ARIFI A. Suliman***	**Saline Water Conversion Corp..** Email: ahmed_swcc@hotmail.com
South Africa	***Mr. VAN RAVENSWAAY Jan***	**M-Tech Industrial** Email: jvr@mtechindustrial.com
Spain	***Mr. ALONSO Felix***	**Empresarios Agrupados S.A.** Email: faz@empre.es
United States of America	***Mr. FAIBISH Ron***	**Argonne National Laboratory** Email: rfaibish@anl.gov
IAEA	***Mr. KHAMIS Ibrahim***	**Scientific Secretary** Email: I.Khamis@iaea.org

Technical Meeting of the Technical Working Group of the Nuclear Desalination Group (TWG-ND)

The International Nuclear Desalination Advisory Group (INDAG) was established by the IAEA in 1996. INDAG played an active role in the past years, contributed to promotion and stimulation of nuclear desalination activities, and provided a forum for Member States to exchange information on the technological developments, operations, and demonstration of integrated nuclear desalination systems. To enhance its functions, the IAEA has reformed INDAG into a Technical Working Group on Nuclear Desalination (TWG-ND) in 2008.

This meeting is the first meeting of the TWG-ND. The meeting was held from 8-10 June 2009 at the VIC, Vienna, and attended by 15 members.

The objectives of the meeting were to:

- Provide a forum for the exchange of information on nuclear desalination activities in Member States, identify important topics for discussion at SAGNE;
- Review the progress of and provide advice and guidance on the IAEA's activities in nuclear desalination.
- To provide advice on preparatory action by Member States for implementing nuclear desalination demonstration projects.

Conclusion of the TWG-ND

1. The TWG-ND highly appreciates past, present and future IAEA nuclear desalination activities.
2. Nuclear desalination is gaining increased importance for member states that are experiencing wide-spread water and power shortages. The goal of these activities is to produce fresh water at socially acceptable cost.
3. The TWG-ND members raised their concern regarding the severe budget cuts in support of nuclear desalination activities at the IAEA.
4. The TWG-ND strongly believes that past and any potential future budget cuts relating to IAEA's nuclear desalination activities is expected to seriously hinder implementation of future activities for the benefit of Member States.
5. The TWG-ND appreciates past extra budgetary contributions by Member States.

Recommendations of the TWG-ND

1. The TWG-ND endorses the IAEA plans (presented by the Scientific Secretary) on the issue of nuclear desalination. Activities of high priority include:

- Studies on economically and technically viable cogeneration options using nuclear power.
- Assembly and dissemination of an online nuclear desalination toolkit for wide use by Member States (currently under development).
- Regional workshops on nuclear desalination-related topics per request from Member States.

2. The TWG-ND members request IAEA's full support (including appropriate funding level and required manpower) for the proposed ND activities. It also recommends the increase of programmatic fund allocations to match or exceed levels of funding of previous P&B 2006/07 cycles.

3. The IAEA should address the efficient use of water in nuclear and related facilities which may involve the use of water desalination.

4. The IAEA should address the use of different qualities of water in other potential facilities which may involve the use of nuclear desalination.

5. Workshops on nuclear desalination including related water management issues should be organized as needed for capacity building and information exchange.

6. The TWG-ND supports the IAEA future activities on upgrade (including the updating of economic data), maintenance, bench-marking and validation of DEEP as needed to ensure an up-to-date software package.

7. To compliment DEEP, the IAEA should consider the development of financial analysis tool with bankable model to evaluate the financial viability of nuclear desalination projects to take into account site specific cost and tariff inputs.

8. The TWG-ND supports the introduction and further study of improvement of existing and future technologies for nuclear desalination such as heat pipes as new and efficient heat exchangers and as an additional safety barrier.

9. The IAEA should explore the possibility of developing an integrated ND simulation (including optimization, design issues, …etc) tool so as to help in capacity building and addressing some of the safety issues.

10. The IAEA should update relevant documents on nuclear desalination such as the Guidebook on nuclear desalination TRS 400.

11. The TWG-ND endorses the completion of the IAEA Technical report addressing the environmental impact of nuclear desalination (under printing). The document should be updated to include results from new research and feedback of experience.

Environmental Impact Assessment of Nuclear Desalination

The scope of the report is limited mainly to operation related issues related to nuclear desalination and some commissioning issues. Decommissioning of a nuclear desalination plant is considered as an issue concerning more the nuclear power and covered in other publications. Life cycle analyses (LCA) have been limited to LCA values and externalities in order to provide a suitable perspective for the assessment of a nuclear desalination project.

The objectives set for this environmental impact assessment are to:

- Review the experiences with the environmental impacts of nuclear desalination so far
- Identify the possible impacts on the air, marine, coastal and socio-economic environment
- Present some of the impact mitigation measures available today
- Identify the challenges for nuclear desalination

In order to achieve the objectives, the research was conducted in the following manner:

- Review of IAEA material on the topic: proceedings, IAEA-TECDOCs, safety guides and studies.
- Use structured Questionnaires addressed to nuclear desalination facilities in Japan, India and Kazakhstan.
- Review the available data on desalination impacts, especially environmental impacts of co-located desalination and power plants.
- Review environmental experiences with nuclear power
- Synthesize possible combined impacts of desalination and nuclear power and compare against existing cases if possible.

Outline of the report

Chapter 1 of the report lays out background information on the experiences and rationale of nuclear desalination as well as the experiences and concerns with product water quality.

Chapter 2 provides an overview of possible environmental impacts through the marine, coastal and atmospheric perspective. In addition, environmental considerations with co-location and siting are presented.

Chapter 3 reflects on the socio-economic dimension of the possible environmental impacts from nuclear desalination including development issues and economic costs. The chapter also tries to assess the issue of public acceptance.

Chapter 4 discusses the challenges and issues of nuclear desalination.

The Annexes include related information on environmental impacts of nuclear desalination such as methodologies for assessing marine impacts, technical data on new small and medium size reactors suitable for desalination purposes and specifics of the desalination technologies used in nuclear desalination.

Vacancy Notices for Professional Posts

New vacancy notices will be available on the IAEA webpage addressing
https://personnel.iaea.org/apps/phflink/p_vacancies.asp.

Applications from qualified women and candidates from developing countries are encouraged.

List of IAEA Publications on Nuclear Desalination

Economics of Nuclear Desalination: New Developments and Site Specific Studies Final Report of a Coordinated Research Project 2002-2006
(IAEA-TECDOC No. 1561)

Advanced Applications of Water Cooled Nuclear Power Plants
(IAEA-TECDOC No. 1584)

Status of Nuclear Desalination in IAEA Member States
(IAEA-TECDOC No. 1524)

Optimization of the Coupling of Nuclear Reactors and Desalination Systems
(IAEA-TECDOC No. 1444)

Market Potential for Non-electric Applications of Nuclear Energy
(Technical Reports No. 410)

Design Concepts of Nuclear Desalination Plants
(IAEA-TECDOC No. 1326)

Safety Aspects of Nuclear Plants Coupled with Seawater Desalination Units
(IAEA-TECDOC No. 1235)

Introduction of Nuclear Desalination A Guidebook
(Technical Reports No. 400)

Examining the economics of seawater desalination using the DEEP code
(IAEA-ECDOC No. 1186)

Floating Nuclear Energy Plants for Seawater Desalination
(IAEA-TECDOC No. 940)

Potential for Nuclear Desalination as a Source of Low Cost Potable Water in North Africa
(IAEA-TECDOC No. 917)

Use of Nuclear Reactors for Seawater Desalination
(IAEA-TECDOC No. 574)

Guide to the Costing of Water from Nuclear Desalination Plants
(Technical Reports No. 151)

Storage and Transport of Water from Nuclear Desalination Plants
(IAEA-TECDOC No. 141)

Value to Agriculture of High-quality Water from Nuclear Desalination (Vienna, 30 Oct. - 3 Nov. 1967)
Panel Proceedings

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