MEETING REPORT

the Third Meeting International Nuclear Desalination Advisory Group

held at the VIC, Vienna from 21 to 25 June 1999

List of Participants

Name	Country/Organization
Mr. N. Masriera	Argentina/INVAP SE
Mr. J.R. Humphries	Canada/Candesal Ent. Ltd
Mr. Zong Xin Wu	China/INET
Mr. S.B. Abdel Hamid	Egypt/NPPA
Mr. S. Nisan	France/CEA
Mr. B.M. Misra	India/BARC
Mr. A. Barak	Israel/AEC
Mr. A. Minato	Japan/CRIEPI
Mr. Si-Hwan Kim	Korea Rep. of/KAERI
Mr. S.B. Ghurbal	Libya/TNRC
Mr. M. Righi	Morocco/ONE
Mr. Y.D. Baranaev	Russian Federation/IPPE
Mr. K.V. Zverev	Russian Federation/Minatom
Mr. I.S. Al-Mutaz	Saudi Arabia/KSU
Mr. H. Ben Kraiem	Tunisia/CNSTN
Mr. J.P. Colton	United Stares/USDOS
Mr. M.F. Barakat	AAEA

TABLE OF CONTENTS

1. General

The third meeting of the International Nuclear Desalination Advisory Group (INDAG) was held from 21 to 25 June 1999 at the VIC, Vienna. The meeting was attended by 15 members and two observers from Russian Federation and the Arab Atomic Energy Agency (AAEA). Mr. S.H. Kim of the Republic of Korea served as the Chairperson.

Mr. Juhn, Director of the Division of Nuclear Power, opened the meeting by welcoming three new members (France, Saudi Arabia and the United States), and briefing on the relevant progress and development in the Agency's activities in the field of nuclear desalination. He also briefed on the summary of the review of the programme by the Programme Performance Assessment System (PPAS), which was done in March 1999.

Regarding the mission of the third meeting, Mr. Juhn stressed his strong hope to receive recommendations, particularly regarding the interregional TC project (INT/4/134) on "Integrated Nuclear Power and Desalination System Design," and future major meetings.

The Group reviewed proposed meeting agenda and adopted the agenda ***as given in Attachment 1.***

The report of the previous meeting was approved without change.

The Group reviewed and assessed ongoing IAEA activities in the relevant field. The Group also discussed future tasks being planned by the Secretariat for the year of 2000 and beyond 2001.

The recommendations agreed upon are ***provided in Attachment 2***. Related discussions are summarized below.

2. Report by Members on National Programs.

Three new members briefed on national programs on nuclear desalination in respective countries and Dr. Barakat reported AAEA's activities on nuclear desalination. ***Summaries of reports by members are as follow.***

(**France**) From 1974 to 1987 France was actively involved in the development of SMRs for Desalination and other non-electrical applications. Two concepts were proposed for exportation: The 300 MW(e), NP-300 and the 100-200 MW(e) Heat only reactor, Thermos. New reactor projects are now under study in the context of CEA's innovative program for SMRs and in the context of an EU Project.

Mr. Nisan further elaborated on the recent activity "EURODESAL" project, which is being initiated by 12 industrial organisations in Europe as an off shoot of the "Michelangelo Initiative Concerted Action (MICA)." The project is being proposed for EU's 5th framework Programme. The project has three major elements: "short-term", "medium-term" and long-term "innovative concepts". In its current five-year plan, a detailed feasibility report on nuclear desalination will be documented using reactors of up to 600 MW (e). They include a couple of PWR concepts (a low pressure PWR and an integral PWR) and HTRs. Technical and

economical assessments will be made using the RO and the MED processes and compared with several fossil energy options and renewables.

(**Saudi Arabia**) Saudi Arabia is the world's largest producer of desalted water. The total production of desalted water will be 811 mgd (3.07 Mm3/d) with a power production of 5200 MW. Water desalination accounted for about 20% of the country water demand. It is planned to supply fresh water from seawater desalination with ground water as back up. Most of the Saudi desalination plants are of multistage flash (MSF) type. Reverse osmosis (RO) has less share in the capacity although large numbers of RO plants were in operation. Hybrid RO/MSF plants is considered as an attractive option from economical and operational viewpoints. The implementation of nuclear desalination in Saudi Arabia is essential, where large requirements of water exist. Electric power is also needed. The long experience of Saudi Arabia in desalination field together with the massive desalination capacities nominated Saudi Arabia to introduce nuclear desalination.

(**US**) Mr. Colton reported on the nuclear and desalination technologies available from the US. Recent membrane technologies have reduced significantly the water cost in the RO process. Technological developments in materials mainly account for the cost reduction.

(**AAEA**) In the framework of the cooperation agreement with IAEA, AAEA is interacting with IAEA in many activities and particularly is supporting the ongoing activities of IAEA in nuclear desalination. IAEA representatives participated in almost all AAEA activities conducted in the field of nuclear desalination. AAEA participated in IAEA activities to prepare "A Guidebook on Introduction of Nuclear Desalination" and also a "User Requirement in SMR and its Applications in Developing Countries". It is expected that further cooperation with IAEA would be continued along the line developed in the IAEA for the formulation of a CRP. In this context AAEA is prepared to cooperate with IAEA's nuclear desalination activities as is necessary by assisting in training courses, expert meetings or missions, translation of documents or any other subject that is deemed necessary to serve the common interests of IAEA and AAEA. Along this line AAEA is ready to implement any activities that both organizations feel necessary: a training activity about user requirements documents preparation: to support participants of IAEA Technical Cooperation Programmes on economic assessment of nuclear desalination using the DEEP code; and nuclear desalination project planning and implementation.

In UN and LAS meeting that was held last year a resolution was taken that UN organizations should cooperate with the equivalent LAS organization in the activities performed in the Arab region. This has been adopted afterwards as a UN General Assembly Resolution. The next meeting of UN-LAS organizations scheduled for the 5th of July 1999 in Vienna.

All other members updated the nuclear desalination programs in respective countries ***and summaries are as follow.***

(**Argentina**) Mr. Masriera updated the CAREM project in the country. The project structure has been reorganized. CNEA has stepped in the project management and has involved its own technical teams in most of the project areas. Key effort is now placed on preparing construction as early as the next year."

(**Canada**) Mr. Humphries reported that as of 1 June 1999 CANDESAL has undertaken, with funding assistance from the Industrial Research Assistance Program (an arm of Canada's

National Research Council), a three-year project (entitled *Advanced Reverse Osmosis Desalination System*) to validate its innovative RO system design concepts. The key project activities consist of final development of the theoretical design concepts, experimental validation of the predicted membrane and system performance characteristics, and development of a conceptual RO system module design based on the validated design approach. Economics modeling to include RO feedwater preheating effects and system design optimization will also be carried out during the project. Mr. Humphries indicated that international cooperation/participation in their project was welcomed.

(**China**) Several cities located at the coast of China are very interested in thinking about the seawater desalination using nuclear energy. Some draft and conceptual designs are underway. Mainly they are concerning economic and safety aspects of the nuclear desalination. A MOU has been signed between China and Morocco government to establish a demonstration nuclear desalination plant with 8,000 m^3/day in city of Tan-Tan, using an INET 10 MW(t) nuclear heating reactor. More detail aspects will be discussed between two governments in 1999.

(**Egypt**) Nuclear Power Plant Authority (NPPA) is carrying out a feasibility study of Nuclear Power and Desalination at El-Dabaa Site (EGY/4/140). It will be completed in 2000. Also in 1999, NPPA will construct a test facility to study the effect of pre-heating RO at El-Dabaa, to investigate the feasibility of this technology for that site.

(**India**) Mr. Misra updated the demonstration plant construction at Kalpakkam. The commissioning is foreseen for 2001/2002. He restressed Indian readiness to welcome international participation in the project and share experience and information on operation and maintenance in nuclear desalination.

(**Israel**) On the national scale, the government recently decided officially to start preparations for deployment of a series of large seawater desalination plants. The first units will have each a capacity of 50 Mm3 per year. The initial steps are preparing bid documents and identifying priorities for suitable sites for these plants. Technologies will be for the bidders to offer (although RO seems more promising). In addition, a national R&D program is being initiated. On the local scale, the largest existing SWRO unit in Israel at Eilat (the Red Sea) has been upgraded from the original production rate of 8000 to 10.000 m3/day with specific energy of less than 4 kWhe/m3. An additional similar unit at the same plant is about to be installed shortly. Export of desalination plants continues.

(**Japan**) A special advisory body to the Ministry of Education has been established to assess and make recommendations on R&D activities in seawater desalination for industrial use including application of nuclear energy. Japan sent an expert to the kick off meeting of the interregional TC Project (INT/4/134) in May 1999 and presented willingness to provide expertise upon request. An expert can be also sent upon request to the countries, which want to be informed on the operation and maintenance experience.

(**Korea**) The conceptual design of SMART with desalination system for co-generation of water and electricity was completed by March 31, 1999. The basic design for the integrated nuclear desalination system is currently underway and will be continued until 2002. In the basic design phase, industries including KHIC and KOPEC are being participated. The licensing application for design certification is planned after the completion of the basic design phase.
(**Libya**) Libya is a very arid country with very limited surface water. It relies only on groundwater and seawater desalination for the provision of water supply. Several solutions have

been considered, to solve the problem of severe water shortage. Among the solutions are

- launching the Man Made River project
- increase the Capacity of Desalted Seawater

With regard to nuclear seawater desalination, Libya has shown seriousness in this programme since its initiation in 1989 and supported the activities related to the feasibility study, which was carried out for the five North African countries (Libya, Algeria, Tunisia, Morocco, and Egypt). A working group has been assigned to deal with coupling studies and perform economic evaluation using DEEP. For solving the problem of water shortage, Libya is very interested in participating in the interregional project. A site that was qualified for a nuclear power plant could be offered for performing feasibility study on the use of nuclear reactors for seawater desalination.

(**Morocco**) As planned in the final report of the pre-project study of a nuclear demonstration desalination plant of TAN-TAN beach, Morocco, a construction of this unit is expected to start by 2001-2002. This is consisting of the 10 MW(t) heating reactor (NHR10) from china coupled to a Multi-Effect Distillation process (MED) and producing 8000 m^3/d of potable water. The decision by the government on proceeding with the project is foreseen.

(**Russia**) The design and licensing activities for a nuclear floating co-generation plant intended for implementation in the Russian Arctic Sea coast area are to be finished later this year. Construction is expected to commence in the year 2000. Concept of a nuclear floating desalination plant based on this project has been developing. The integrated nuclear desalination plant concept under consideration comprises nuclear floating power units with KLT-40C reactors coupled to either MED or RO desalination facilities. This project has been proposed for international cooperation as a demonstration project.

(**Tunisia**) The deficit in potable water in the southern Tunisia is enlarging and will reach 80,000 to 100,000 m3/day in 2010. This deficit can only be filled by desalination of seawater. At present more than about 50.000 m3/d of potable water is supplied by desalination using reverse osmosis process powered by electrical energy. Efforts are done for studying several methods for desalination suitable to the country including an option of using nuclear energy. Tunisia is being involved in IAEA nuclear desalination activities through technical and economical studies, a CRP for optimization, and other subjects. Two sites, Skhirat and Zarat located in the southern area of the country, could be offered for such studies.

3. Progress Review and Future Plan (1999-2000) of Nuclear Desalination Activities

Based upon detailed report made by the Agency on each major item, the Group reviewed and assessed ongoing IAEA activities in the relevant field. It was noted that The Agency made a significant progress on it's ongoing programmes related to nuclear desalination. The Group also reviewed the tasks proposed by the Agency for the years 7/1999-2000 and comments are given in Attachment ***3***.

Related discussions are summarized below for selected items to supplement the attachment ***3***. Recommendations to the ongoing tasks in the programme on "Co-generation and heat applications (A2.06)" are summarized in **Attachment 3**.

3.1 Co-ordinated Research Project on "Optimisation of the Coupling of Nuclear Reactors and desalination Systems" (Task 2)

The progress of the CRP on "Optimisation of the coupling of Nuclear Reactors and Desalination Systems" up until the first RCM in November 1998 was reported and reviewed. Thirteen institutes from nine countries are participating in the CRP. It was noted that good progress had been made and continuation of the CRP activities as they are planned, was supported. Most of the Research Projects within the CRP deal with demonstration projects or preparation for demonstration projects as it has been recommended by the INDAG last year.

However it is recommended that the national efforts in economics of nuclear desalination need enhancement and this could be done through the use of CRPs. A second CRP focusing on economics could be considered either as a continuation or a spin-off of the ongoing CRP on optimization. The progress up until the second Research Coordination Meeting, which will be convened in February 2000 in Mumbai, India, as planned, should be evaluated and analyzed for judgment. Extension of the CRP beyond three years will be assessed at the second RCM and be reviewed by INDAG next year.

3.2. Guidebook on "Introduction of Nuclear Desalination" (Task 3)

The draft of the Guidebook on " Introduction of Nuclear Desalination" was presented and reviewed by the group. It was recommended that the draft should be submitted for publication as a guidebook after incorporating the following specific comments.

① Executive summary (~5 pages) is recommended.
② The draft looks much better in its new version, but some lengthy descriptions and duplications are still there and should be reviewed.
③ Units should be the same all over the text.
④ The frequent restatement of apparent benefits of nuclear desalination should be avoided. The first part establishes the basis for consideration of nuclear desalination and need not to have frequent restatement in following chapters.

3.3 Economic *Assessment* (Task 4)

Mr. Gowin presented a summary of activities over the past year in the area of economics. Effort has progressed in two basic areas: development of economic evaluation tools and economic assessment of energy/desalination options.

The initial stages of development of DEEP (Desalination Economic Evaluation Program) have been completed and a draft user's manual has been prepared. The code and draft manual has been used to give a DEEP training workshop, and additional workshops are planned for the balance of 1999 and 2000. Additional development of the DEEP code to modularize it and enhance the ability to add additional cases and system models is planned for the year 2000.

A consultant's meeting was held in December 1999 to establish the input parameters and conditions for an updated economic assessment of seawater desalination including a variety of nuclear and fossil fueled energy sources and desalination technologies. The economic assessment was carried out at INET and the results have been reviewed by an AGM held in June 1999. Preparation of a TECDOC describing the economic assessment is planned for autumn 1999. A final consultant's meeting is planned to review the draft TECDOC prior to its intended

publication before the end of the year. No further work on economic assessment is planned for the year 2000.

3.4. Interregional Cooperation in "Integrated Nuclear ***Power*** and Desalination System Design" (Interregional TC Project (INT/4/134))

With participation of Mr. Razley (TCPA) and Mr. Juhn, the outcome of the kick-off meeting of the newly launched interregional TC project on “Integrated nuclear and desalination system design (INT/4/134)” was reviewed. The meeting took place in May 1999 in Taejon, Republic of Korea. The group analysed the status and recommended revising the projected plan for the first two years (Phase 1) of the TC project, as attached (**Attachment 4**). The first phase of the project should be devoted to finalize the preparing and planning. In order to reconfirm the “national commitments” of participating countries, a second Questionnaire was reviewed and redrafted for complementing the first Questionnaire (**Attachment 5**). It was agreed to recommend the Agency to send the second Questionnaire, upon finalization, officially to these member-states, which have expressed indications of “interest”. The Questionnaire should be responded by October 1999 for timely evaluation and analyses for budget planning for 2000 onward. The meeting in Bombay in February 2000 will be the follow-up meeting. The meeting, which was originally proposed for November 1999 in Cairo was recommended to reschedule for a later date in 2000. A work plan for the subsequent two years (Phase 2) should be well defined during Phase 1. IAEA will report to the next INDAG meeting.

INDAG discussed the status of the project and they commend the cooperation between the Departments of Technical Cooperation and Nuclear Power to implement the project. It recommended that the sharing of information and coordination of efforts continue under the regular budget and that direct assistance to Member States, on a needs be basis, be given through the TC Programme. The Agency is encouraged to continue identifying the needs of Member States and support the project by upgrading the project to a "hard-core" from a "footnote-A" project. It took note of the extra-budgetary contribution of the Republic of Korea of US$60K.

< deleted one pp>

3.5 Preparation of international co-operation in nuclear desalination demonstration projects (Task 7)

In view of the status and plan of the above-mentioned newly launched interregional TC project on “Integrated Nuclear and Desalination System Design,” INDAG recommends to give specific objectives to the subject task planned for 1999-2000 as follows. AGM for 1999 should be planned for information exchange on technical and non-technical items, which complement and facilitate the interregional TC project. Suggested topics for consideration could be: Lectures on “Introduction of nuclear desalination”; Lectures on “Economic assessment of nuclear desalination”; Identification of R&D needs; Proliferation-resistant technologies for nuclear desalination; Application of innovative reactors for nuclear desalination; Public awareness and socio-economic impacts of introducing nuclear desalination. AGM for 2000 could function as a TCM for “Design concept review for integrated nuclear desalination plants.” Progress in various demonstration projects and new developments could be timely updated after the first meeting of INT/4/134.

3.6 Non-electrical Applications of Nuclear Energy and Database Development for Non-

electrical Applications (Tasks 5 and 6)

Seawater desalination is one of the main non-electric applications of nuclear energy. The steam from nuclear reactors could be used for thermal desalination namely in MSF and MED. Hot seawater from the condenser could be as preheated feed for an RO process since high temperature increase membrane heat flux and hence throughout at a reduced specific energy consumption.

The TCM on "Prospects of non-electrical application of nuclear energy" in April 1999 provided a forum of exchanging among experts, information on the prospect, design, safety and licensing aspects, and development of non-electrical applications of nuclear heat for industrial use. The participants showed their keen interest in the ongoing projects, such as a nuclear heating reactor coupled with the MED desalination process as a demonstration plant of Morocco, a hybrid MSF-RO nuclear desalination demonstration project of India as well as R&Ds on coupling of nuclear heating desalination technology. Also Russia is carrying out designs on the nuclear floating reactor coupled with desalination technology based on RO and MED processes. Indonesia has undertaken a feasibility study for a plant using HTGR coupled with desalination units. A technical document on prospects of non-electrical application of nuclear energy will be published as the proceedings.

The activities of the non-electrical application of nuclear energy should be coordinated with the activities of nuclear desalination. The data collection and evaluation of non-electrical applications are crucial to the economic evaluation of nuclear desalination. The activity of data collection, compilation and evaluation of non-electrical application of nuclear reactors will continue into 1999-2000. Upon completing of the data collection and dissemination mechanism, the database could be handed over to NPES for unified supervision by the PRIS personnel.

3.7 User Requirements for Nuclear Desalination Plants

The TECDOC has been finalized for publication. The document provides guidance to developing countries on the preparation of their requirement to use nuclear energy to desalinate seawater. MS are encouraged to consider this document when they will draft their requirement document.

4. Other Activities Related to Nuclear Desalination

4.1 SMR Programme

Mr. Kendall presented the outline of the activities of Small and Medium sized Reactors Development in IAEA, which included, among others, Power generation unit market history, issues and opportunities of SMR development, IAEA current activities and IAEA major future activities.The market history shows that many SMRs were constructed until around 1980. However, the size of nuclear power plants was shifted to a larger size since then. The maximum size at the present is 1450 MW(e) N4 type reactors in France.

Regarding the issues and opportunities of SMR development, it was observed that a main issue of SMRs is its economy compared with large sized reactors, such as the trade-off between scale demerits and series production. On the other hand, SMRs have some advantages, too, such as less infrastructure requirements, low operating costs and applicability to small electrical grids. It is foreseen that the market of SMRs will grow in future because many developing countries

have a plan to introduce nuclear options for electricity production and also for seawater desalination.

In connection with current activities on SMRs, two TECDOCs will be published. One is on the "Guide for Preparing User Requirements Documents for SMRs and its Applications in Developing Countries", including specific aspects for nuclear desalination. The other is on the "Staffing Requirements and Ship Propulsion Reactors."

Among future activities on SMRs, the development plan of innovative nuclear cycles and power reactor is one of major tasks. Preliminary results in the joint (OECD/NEA and IEA, and IAEA) study on "Roadmap for future nuclear technologies" indicate that some reactors, which are considered as practical candidates for demonstration of nuclear desalination in the near term, may be categorized as "innovative reactors."

INDAG interprets the intent of the study as to trace possible reactor developments, which aim to improve level of safety, environmental performance and economic performance. In these regards, concern was expressed about the attempt to limit the number of reactors for this study. A comprehensive list (database) of current and planned reactor suppliers and their efforts for design modification to meet the improvements would be more helpful to Member States. This activity should be followed up.

4.2 Safety

Mr. Gasparini (NSNI) briefly reviewed the current safety related activities and the general safety approach of the IAEA Safety Standards for the Design. This approach has been now revised as a result of Member States suggestions and work of INSAG. Several different points are considered:

01. Reactors for Desalination would have the same general safety objectives and requirements such as those recently elaborated for innovative reactors. Reactor concepts may differ in the means that they would employ to achieve these objectives.
02. Current safety approach would employ the defense in depth principle at its fullest as underlined in INSAG-10 "Defense in Depth in Nuclear Safety". Particular emphasis would be placed on inherent safety characteristics of reactor concepts and, at least some, integration in the reactor design of consideration of severe accidents and mitigation of their impact on the public and the environment.
03. Systems should be designed to ensure the three fundamental safety functions, reactivity control, removal of residual heat, confinement of radioactive material, by a deterministic analysis. This deterministic approach will be complemented by probabilistic evaluations where possible.
04. The safety assessments should be made continuously as part of the design process.
05. The general document on the "Safety Standards for Design" will contain all the requirements formulated with "shall" statements. The Safety Guides will contain the interpretation of the Requirements and recommendations for their practical implementation.
06. Specific transients of coupled systems (Reactor-Desalination Plant) should be studied and analyzed.
07. The existing IAEA safety standards are currently under revision. The revised Requirements include a specific requirement to address the specific concerns raised by nuclear desalination plants and other heat utilization plants.
08. The existence of a positive safety culture is an essential condition to ensure safety .

INDAG noted the good cooperation and coordination between the Department of Nuclear Energy and the Department of Nuclear Safety in addressing the Safety Regulatory issues related to the desalination studies. It is recommended that these be continued, emphasizing on specific issues of coupled systems (reactor & desalination plants).

4.3 Isotope Hydrology Programme

Mr. Aggarwal (NAPC) briefed on the activities of the Agency. The department's programme covers five topics. US$2.5M per year plus US$10M for the Technical Cooperation finances it.

Movements of ground waters, surface waters and rains are investigated and measured by stable isotope ratios existing in nature such as C13/C12, D/H and O18/O16. Usually lighter isotopes evaporate faster and condense slower than the heavier ones. Mapping these isotopes densities allow following rains etc. Also artificial injection of isotopes is used, especially for groundwater dynamics, contamination of groundwater by seawater and leaks from dams and reservoirs. Leaks from nuclear installations can be identified and monitored by isotopes that originate in such installations. These activities enable following local water shortages, man-made and climate changes and their impacts on water availability and quality. The activities involve coordination by worldwide chain of laboratories' monitoring, among other things, GNIP (Global Network of Isotope Precipitation).

Mr. Kim raised a question about the use of these activities with regards nuclear desalination. Mr. Misra reminded that in the previous INDAG meeting the identification of a proper site for a nuclear power station considering other contamination sources has been presented as a possible application. Mr. Aggarwal responded that it is indeed possible to identify and trace contaminated water, depending on several existing models. Another application is detecting waste originated by nuclear desalination.

Mr. Baranaev asked about the minimum detectable contamination level for effective continuous monitoring. Mr. Aggarwal referred him to other experts in instrumentation. Mr. Barak presented a challenge to the department of isotope hydrology, asking to develop a methodology that will enable to locate such zones of aquifers, from which ground water with good quality could be over-pumped during a few years' water shortage without damaging the aquifer and be later recovered (e.g. by under-pumping or even recharging). That means the "loan" of ground-water will later directly or indirectly paid back by desalted water. This might help delay the more expensive desalination solution by a few years, which has meaningful economical advantages.

5. Plan for New Tasks beyond 2001

5.1 Symposium

In view of the successful Symposium in 1997 on "Desalination of Seawater with Nuclear Energy", the Group noticed it appropriate to plan another symposium on nuclear desalination in 2002. The Group understands that the Symposium be planned for the year when the IDA general congress does not take place.

5.2 Simulator Development

The Agency, according to the goal defined by INDAG in the 1998 meeting, briefed INDAG on the Options for the development of a simulator of Nuclear Desalination Plants, including existing SMR simulators as starting point, requirements, potential software suppliers and alternatives to proceed. The report was considered adequate in scope and completeness. After discussing the options surveyed and the costs they imply, INDAG considered that the need of this simulating tool as expressed by potential end-users ***at the very moment***, does not justify proceeding with further effort. If a clear request on this software tool appears, it could be considered in the next INDAG meeting.

5.3 Economics

For the 2001-2003 period, it was recommended that the economics activities be divided into two major task areas, representing the two major categories of activity that have been carried out to date under a single task area. The two tasks are (1) modeling tool development and validation and (2) economics evaluation. With respect to the latter, it was suggested that further detailed economic evaluation of various reactors and desalination coupling schemes be carried out as an extension, or second phase, of the currently ongoing CRP

.

5.4 Socio-economic Impacts (new)

INDAG recognizes this issue as relevant for decision-makers of potential user countries. Whether the issue is covered by existing publications on nuclear power plants and desalination plants is not completely clear for INDAG. Therefore it is recommended to compile and analyze information on the issue and to brief next INDAG on the analysis and options of how to proceed. Agency's staff could perform this task, by a Consultancy ***Meeting*** or by an external contract.

6. Co-operation with Other Organizations

The Group noticed the cooperation with other organizations, such as MEDRC, AAEA and IDA, is effective in collecting and disseminating relevant information. Considering recent activities in EU, ***it was suggested*** that cooperation with EU in the relevant field would be also worth in enhancing activities in nuclear desalination

7. Report to the Board and the GC (addendum to GOV/1999/1).

The Group reviewed the proposed draft and commented for finalization. The revised draft for submission is ***given in Attachment*** **6**.

8. Recommendations of INDAG to the Agency

The recommendations agreed upon are ***provided in Attachment 2.***

9. Date of Next Meeting

The next meeting would be ***held*** at the headquarters of IAEA in Vienna on 10-14 April 2000 starting 0930.

10. Closure of Meeting

In his closing remarks, Mr. Juhn appreciated the work by INDAG and confirmed due consideration to the INDAG recommendations in planning the regular programme for the next biennial period (2001-2002).

The chairman thanked all members for their active participation and co-operation, expressed great appreciation to Mr. Konishi, scientific secretary of INDAG for his great efforts to complete this meeting successfully, and closed the meeting.