

**The IAEA's Programme on
Environmental Modelling for Radiation Safety
(EMRAS II)**

**EMRAS II
Approaches for Assessing Emergency Situations
Working Group 7
"Tritium" Accidents
MINUTES
of the 2nd Working Group Meeting held at
EDF/R&D, Chatou, France
28–29 September 2009**

IAEA Scientific Secretary	Working Group Leader
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Background

The EMRAS II Working Group 7 (WG7) "Tritium Accidents" includes certain areas of interest in connection with accidental releases of tritium in the environment, i.e.:

- develop a standard conceptual dynamic model for tritium dose assessment for acute releases to the atmosphere and water bodies;
- drive the new model with given air or water concentrations (HT or HTO) and the duration of the exposure. These concentrations will be obtained by each major user from the best available atmospheric and aquatic transport models for the site in question. The question of tritium washout, which is not specifically addressed in atmospheric dispersion models, needs to be further investigated;
- agree on common sub-models for specific transfers or processes, based on an interdisciplinary approach involving the understanding of the processes and key parameters, based on recent findings in all Life Sciences;
- define the framework for an operational model (requirements for meteorological data, atmospheric transport, site specific data);
- obtain or develop quality assured sub-models that will result in predictions with a moderate degree of conservatism; and
- have the capability to assimilate real measured data into the models.

Working Group Attendance

The meeting was hosted by the Electricité de France (EDF) at their Headquarters in Chatou, France. Sixteen participants from 6 countries attended this second Working Group Meeting of WG7. The sessions were moderated by Mr Dan Galeriu, Romania (WGL), and Mr Volodymyr Berkovskyy who

is the IAEA's Scientific Secretary for WG7. A list of the attending participants is provided at the end of these Minutes.

Scope and Objectives of the Meeting

The main objectives of the meeting were to:

- discuss and harmonize the views of participants concerning the approaches for developing the conceptual model for tritium accidents (atmospheric and aquatic);
- agree on the structure and scope of the conceptual model;
- identify potential gaps in knowledge and expertise, which should be addressed during the model development;
- define the structure of the technical document and share tasks according to the expertise of each participant and the interests of his/her organization or institute;
- elaborate the work plan for developing the conceptual model; and
- distribute specific tasks to be accomplished and reported during the next (Second) EMRAS II Technical Meeting, being held at IAEA Headquarters in Vienna 25–29 January 2010.

Work performed

The meeting began with a summary of past achievements and conclusions of recent international conferences concerning the modelling of accidental tritium releases in the environment. The importance of uncertainty and sensitivity analysis was highlighted and a general list of processes involved in tritium transfer in the environment was presented. The participants provided presentations summarizing their activities, their models or modelling approaches, or experimental work of interest to the group. The presentations include: site-specific requirements for modelling purposes, description of simple or process level approaches, and revision of a few key aspects. During the discussions participants were asked to contribute with specific tasks for the next meeting. Details of these tasks are provided below. It was agreed that before the next meeting, the WGL will collate suggestions from the WG members in order to establish the final content of the next document which must be agreed upon before the next meeting. In order to compare various approaches in modelling, two exercises will be distributed between the participants concerning accidental contamination with tritium in fish and grass.

Next Meeting

The next Working Group Meeting of WG7 is scheduled to take place during the next (Second) EMRAS II Technical Meeting, being held at IAEA Headquarters in Vienna, 25–29 January 2010.

Future Work Programme		
Action	Participant(s)	Date
Draft on uncertainty and sensibility needed in the quality assurance of the models	J. Duran	25–29 January 2010
Potential improvements of plant sub-model in OURSON code: detailed sub-model description and sensitivity tests	F. Siclet	1 January 2010*
Potential improvements of plant sub-model in OURSON code: analysis and discussion for potential improvements	All WG members	25–29 January 2010
Detailed description of expanded MAGENTC for animals and sensitivity analysis	A. Melintescu	25–29 January 2010
Full expanded interaction matrix for terrestrial pathways of tritium transfer	S. Le Dizès-Maurel	25–29 January 2010
Availability of soil-water revision done Ph. Ciffroy and dissemination between WG members	L. Marang	20 December 2009
Submission for publication of updated AQUATRIT model	D. Galeriu, A. Melintescu	15 December 2009
OBT formation versus available energy in plants	L. Vichot	25–29 January 2010
Review of tritium washout	L. Patryl, A. Melintescu, D. Galeriu	25–29 January 2010

Future Work Programme		
Action	Participant(s)	Date
Correlation between air and rain HTO concentration (experimental data)	P. Guetat	25–29 January 2010
Comparison between UFOTRI and CERES models for 1 g of HTO and 1 g of HT	P. Cortes	25–29 January 2010
OBT formation in night experiments and modelling trials	S.B. Kim	25–29 January 2010
HTO dynamics using SOLVEG (plants and soil) after an accidental tritium release	H. Nagai	25–29 January 2010
Modelling exercise 1: HTO and OBT in fish.	D. Galeriu	1 November 2009*
Modelling exercise 2: Dynamic of tritium in grass following 1 hour air contamination	D. Galeriu	1 November 2009*
Results for both modelling exercises	All WG members	1 January 2010
Upload on the WG7 EMRAS 2 web page of a list of existed documents/papers in each laboratory/site to be circulated between WG members	All WG members	15 November 2009
Proposals for the content of final document to be transmitted to WG Leader	All WG members	1 December 2009

* To disseminate to all WG7 members.

List of Participants	
Name / Email	Organization / Country
Mr Franz Baumgärtner (franz.baumgaertner@radiochemie.de / bgtbgt@web.de)	Technische Universität München, Germany
Mr Pierre Cortes (pierre.cortes@iter.org)	ITER Organization, France
Mr Juraj Duran (duran@vuje.sk / juraj.duran@ttonline.sk)	VÚJE Inc. - Engineering, Design & Research Organization, Slovakia
Mr Philippe Guetat (philippe.guetat@cea.fr)	Commissariat à l'Energie Atomique (CEA) – Valduc, France
Mr Sang Bog Kim (kimsb@aecl.ca)	Atomic Energy of Canada Limited (AECL), Canada
Ms Séverine Le Dizès-Maurel (severine.ledizes@irsn.fr)	Institut de Radioprotection et de Sûreté Nucléaire (IRSN), France
Ms Laura Marang (laura.marang@edf.fr)	Electricité de France (EDF) - Département Environnement (R&D), France
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Mr Luc Patryl (luc.patryl@cea.fr / luc.patryl@free.fr)	Commissariat à l'Energie Atomique (CEA), France
Mrs Françoise Siclet (francoise.siclet@edf.fr)	Electricité de France (EDF) - Département Environnement (R&D), France
Mr Shinji Sugihara (sugirad@mbox.nc.kyushu-u.ac.jp / mercy9day@hotmail.com)	Kyushu University, Japan
Mr Tomoyuki Takahashi (tomoyuki@rri.kyoto-u.ac.jp)	Kyoto University Research Reactor Institute (KURRI), Japan
Mr Toshiyuki Umata (umata@med.uoeh-u.ac.jp)	University of Occupational & Environmental Health (UOEH), Japan
Mr Laurent Vichot (laurent.vichot@cea.fr)	Commissariat à l'Energie Atomique (CEA) – Valduc, France

**2nd Meeting of the EMRAS II Working Group 7
“Tritium”**

**Electricité de France (EDF), Research and Development (R&D)
Chatou Site, 6, Quai Watier, B.P. 49, 78 400 Chatou Cédex, France
Building H, Room H025
28–29 September 2009**

PROVISIONAL AGENDA

WG7 focuses on the development of approaches for the reliable assessment of doses to members of the public in a case of accidental releases of tritium to the environment. The major goal of WG7 is the reduction of uncertainties and variabilities in the estimations of doses to the representative person in the case of accident. The processes involved in the transfer of tritium in the environment will be analyzed with dependence on the environmental conditions, season and time of the day.

Monday, 28 September 2009

09:30–09:35	Opening of the Meeting	Volodymyr Berkovskyy, WG Scientific Secretary (IAEA)
09:35–09:45	Welcome by the meeting hosts	Francoise Siclet, EDF R&D, France
09:45–10:00	Self-introduction of participants	All participants
10:00–10:10	Introduction by the Working Group Leader and IAEA Scientific Secretary	Dan Galeriu, WG Leader (Romania) Volodymyr Berkovskyy, WGSS
10:10–10:30	Discussion of the meeting’s priorities and finalization of the Provisional Agenda	All participants (WGL in the capacity of moderator of the discussions)
10:30–11:00	Work in accordance with the agreed agenda: — 1–2 short presentations for identification of the direction for the further discussions	
	Preparatory discussion on Processes and Parameters of relevance for WG7	All participants (WGL in the capacity of moderator of the discussions)
	Uncertainty and WG7 – a personal view	Dan Galeriu, WGL
11:00–11:30	<i>C O F F E E B R E A K</i>	
11:30–13:00	Discussions and presentations on specific needs of selected sites, in order to better define the scope of the WG7, as well as the advantages and disadvantages of simple models	Presentations by Pierre Cortes, Philippe Guetat, Haruyasu Nagai & Dan Galeriu for specific sites and general discussion by all participants
13:00–14:00	<i>L U N C H B R E A K</i>	
14:00–16:30 (coffee break included)	Discussion and presentations on present knowledge (if following topics will be agreed by the group): — Overview of ETMOD and Environmental Tritium Research — Overview of past deuterium experiment in Japan — Key results and open problems from Valduc experiments — SOLVEG Co2 model and transition to tritium — UFOTRI model with focus on key processes — RODOS FDMH model and follow up with focus on processes	Cf. list of presentations attached
16:30–17:30	Discussion and presentations on the work plan of the group: — Structure and scope of the proposed model — Potential gaps in knowledge and expertise, which should be addressed during the model development	All participants (WGL in the capacity of moderator of the discussions)
17:30	<i>M E E T I N G C L O S E</i>	
19:30	<i>Dinner in Paris, La Rotonde restaurant, Bul. Montparnasse, offered by EDF</i>	

Tuesday, 29 September 2009

08:30–10:00	<p>Continuation of the work:</p> <ul style="list-style-type: none"> — Structure of the technical document; — Tasks of participants according to their respective expertise and the interests of his/her organization or institute. <p>Modelling dynamic tritium transfer to farm animal and birds, extension to wild mammals</p> <p>Task Group III</p> <ul style="list-style-type: none"> — Modelling tritium transfer in the aquatic food chain <p>“Review of aquatic tritium modeling and knowledge” Update of AQUATRIT The Cardiff case (bioaccumulation?)</p>	<p>All participants</p> <p>Anca Melintescu</p> <p>Francoise Siclet Anca Melintescu Dan Galeriu, IFIN</p>
10:30–10:45	<i>C O F F E E B R E A K</i>	
10:45–12:30	<p>Individual presentations of participants</p> <p>Task Group II</p> <ul style="list-style-type: none"> — Use of growth models - define the minimal needs <p>“Current and planned experiment in IRSN; need of considering photosynthesis and plant growth in TOCATA model”</p> <p>Role of photosynthesis, respiration, partition of new dry matter, role of reserves</p> <p>WOFOST model DEMO</p> <ul style="list-style-type: none"> — Translocation of OBT from leaves to edible plant parts, fruits and roots; — Adaptation to OBT of plant growth processes <p>OBT formation at night</p>	<p>All participants</p> <p>S�everine Le Diz�es-Maurel</p> <p>Introduction by WGL & contribution by all participants</p>
12:30–13:15	<i>L U N C H B R E A K</i>	
13:15–17:00 Including coffee break	<p>Individual presentations of participants and discussions</p> <p>Task Group I</p> <ul style="list-style-type: none"> — Tritium washout — HT/HTO deposition-reemission: Initial profile of HTO and discussion — Actual evaporation and transpiration and related HTO concentration dynamics — HTO uptake and retention in plant in rainy condition — Plant uptake under rain, soil contribution — Movement of HTO to deeper soil layers — Soil type and climate roll — Winter case (particularly deposition on snow and how to deal with snow) 	<p>All participants Cf. attached list</p>
17:00	<i>M E E T I N G C L O S E</i>	

Proposed items for discussion

- Approaches to the minimization of uncertainties and variabilities in the estimations of doses to the public in the case of accidental releases of tritium;
- Advantages and disadvantages of simple models (all participants are asked to contribute);
- Structure and scope of the model;
- Potential gaps in knowledge and expertise, which should be addressed during the model development;
- Work plan of the Working Group;
- Structure of the technical document;
- Tasks of participants according to their respective expertise and the interests of his/her organization or institute.

Presentations (during the first and second days)

Tritium sites, specificity and requirements for WG7

~30 min	ITER (includes some model presentation)	Pierre Cortes, ITER Organization, France
~10 min (TBC)	VALDUC	Philippe Guetat, CEA France
~10 min	ROKKASHO	Haruyasu Nagai, JAEA, Japan
~5 min	Cernavoda	Dan Galeriu, IFIN, Romania

Review of present knowledge (experiments and modelling)

~30 min	Overview of ETMOD and Environmental Tritium Research	Sang Bog Kim, AECL, Canada
~20 min	Overview of past deuterium experiment in Japan	Noriyuki Momoshima, Kyushu Uni., Japan
~10 min	Study on behaviour of the environmental tritium and assessment of influence on environment	Shinji Sugihara, Kyushu Uni., Japan
~20 min	SOLVEG Co2 model and transition to tritium	Haruyasu Nagai, JAEA, Japan
~20 minutes (TBC)	Key results and open problems from Valduc experiments	Philippe Guetat, CEA France
~20 min	Current and planned experiment in IRSN; need of considering photosynthesis and plant growth in TOCATA model	S��verine Le Diz��s-Maurel, IRSN, France
~15 min	Tritium washout as modelled in CEA and discussions	Luc Patryl , CEA France
~25 min	UFOTRI model with focus on key processes (by Wolfgang Raskob, Institut f��r Kern und Energietechnik (IKET), Germany)	presented by Dan Galeriu
~25 min	RODOS FDMH model and follow up with focus on processes	D Galeriu, IFIN, Romania
~25 min	Modelling dynamic tritium transfer to farm animal and birds, extension to wild mammals	Anca Melintescu, IFIN, Romania
~20 min	Review of aquatic tritium modelling and knowledge	Francoise Siclet, EDF France
~15 min	Update of AQUATRIT	Anca Melintescu, IFIN Romania
~ 15 min	OBT, as seen from Munich	Franz Baumg��rtner, Technische Universit��t M��nchen, Germany

Tentative Tasks

<i>Task I</i>	
— Tritium washout	WGL (~5 min review)
— HT/HTO deposition/re-emission: Initial profile of HTO	WGL (~10 min) & discussions
— Actual evaporation and transpiration and related HTO concentration dynamics	Open to all
— HTO uptake and retention in plant in rainy condition Plant uptake under rain, soil contribution	Open to all
— Movement of HTO to deeper soil layers Soil type and climate roll	Open to all
— Winter case (particularly deposition on snow and how to deal with snow)	WGL (~10 min) & discussions
<i>Task II</i>	
— Use of growth models – define the minimal needs role of photosynthesis, respiration, partition of new dry matter, role of reserves	WGL (~10 min introduction) All participants
— WOFOST model DEMO	~10 min
— Translocation of OBT from leaves to edible plant parts, fruits and roots	
— Adaptation to OBT of plant growth processes	WGL (~10 min)
— OBT formation at night	Open to all
— biokinetic model- farm animal DEMO MAGENTC	~10 min
<i>Task III</i>	
— Modelling tritium transfer in the aquatic food chain	
— The Cardiff case (bioaccumulation?) DEMO AQUATRIT	~15 min