DRAFT

NKS(16)3
2016-05-23

Agenda for the board meeting in Copenhagen 22 June 2016

Place:
Park Inn by Radisson Copenhagen Airport, Engvej 171, DK-2300 København S

Time: 10:00 to 15:00

1 Opening

2 Practical remarks
- Meeting secretary.
- Information from chairman and host.

3 Approval of the agenda

4 Minutes of the last board meeting (Stockholm 14 January 2016)
- See draft minutes NKS(16)1 dated 2016-02-09.
- Review, discussion and decision.

5 Accounts 2015
- See distributed material: Financial Statements 2015, NKS(16)2 and Long-Form Audit Report, both dated 2016-04-04.
- Presentation by the auditor and the secretariat, discussion and decision.

6 Financial status for the current year
- See distributed material: Financial status report and financial programme specification, both dated 2016-06-03.
- Presentation, discussion.

7 News since last board meeting

- Report from the owners' group.
- News from the board members' organisations.
- Administrative news.

8 R-part: status

- See material from Emma Palm: status report June 2016.
- Presentation by the programme manager.
- Discussion.

9 B-part: status

- See material from Kasper Andersson: status report June 2016.
- Presentation by the programme manager.
- Discussion.

10 NKS seminar on current trends in nuclear and radiological safety 2016

- Introduction by the programme managers.
- Seminar survey.
- Discussion.

11 Information activities

- The website, NewsLetters, NewsFlashes etc.
- New pamphlet.
- Discussion.

12 Research activities in 2017

- Call for Proposals.
- Preliminary budget 2017.
- Funding 2017.
- Discussion, decision.

13 Other issues

- Any other business.

14 Next meeting

- Next meeting will be in Oslo January, 2017.

15 End of meeting

DRAFT
NKS(16)1
2016-02-09

Minutes of the board meeting in Stockholm 14 January 2016

Present: Sigurður M. Magnússon (Chair), Eva Simic, Jorma Aurela, Ole Harbitz, Steen Hoe, Annelie Bergman, Nici Bergroth, Olga German, Tarja Ikäheimonen, Astrid Liland, Jens-Peter Lynov, Timo Vanttola, Mette Øhlenschlæger, Karin Andgren, Emma Palm, Kasper Andersson and Finn Physant (meeting secretary).
Apologies:. Atle Valseth

1 Opening

The Chair opened the meeting and welcomed the participants. Regrets had been received from Atle Valseth. The Chair expressed many thanks to the hosts Eva Simic and Strålsäkerhetsmyndigheten. A special welcome was given to the new board member Astrid Liland, Strålevernet, and thanks were given to her predecessor Eldri Holo. Special welcome was also given to the new R-part programme manager Emma Palm, Strålsäkerhetsmyndigheten (action A).

2 Practical remarks

Practical remarks about the meeting were given by the Chair and the host. Finn Physant was appointed meeting secretary.

3 Approval of the agenda

The agenda was approved.

4 Minutes of last board meeting (Copenhagen, 12 June 2015)

The minutes were approved. Actions A to H noted in the appendix of the minutes of the last board meeting will be noted in parenthesis in these minutes except from action G as there have been no news concerning NKS-EURATOM alignment.

5 News since last board meeting

a. Report from the owners' group meeting
There has been no owners' group meeting since the last board meeting.
b. News from board members' organisations

The members informed each other about relevant news.
c. Administrative news
Finn Physant informed the board that the policy document ”This is NKS” had been updated by exchanging ”2014” with ”2015” concerning the size of the annual contributions to NKS. A new folder will be published in 2016. Proposals for revision of the ”Handbook for NKS applicants and activity leaders” will be presented by Karin Andgren under meeting item 13 (action B). The revision concerns the Young Scientists’ Travel Support and the definition of evaluation criteria for young scientists (action H). Finn Physant noted that the ”NKS Administrative Handbook” is still valid and updated. The handbook will be updated if needed.

6 Financial status

Finn Physant presented the distributed material: Financial status report and financial programme specification, both dated 14 December 2015. At this date the reserve was estimated to approximately 1,1 MDKK, which is according to the recommendation given by the auditor. – The board took note of the financial situation.

7 Agreements

The following four agreements were prepared for the board’s decision:
-R-part programme manager 2016 with Strålsäkerhetsmyndigheten
-B-part programme manager 2016 with DTU Nutech
-secretariat until 30 June 2017 with FRIT and
-auditing for the accounts of 2015 with Dansk Revision.
All these agreements were approved.
In connection with the start-up of the new PC-R it was concluded that it is the board’s intention that the duration of programme manager periods should be at least 3 years for the individual manager.

8 R-part: status and new activities

Karin Andgren presented the status of the ongoing activities. The work under NKS-R is progressing according to plan. Since the last status report 9 final reports have been published on the website. There are none delayed activities from before 2014. From the activities commencing in 2014 all final reports have been completed. Concerning activities commencing in 2015: all contracts have been signed and work is developing on schedule. Seminars from CfP 2015: workshop 1 and 2 under ADdGROUND and PLANS have been carried out in 2015 including a joint PLANS and MODIG seminar. The final seminar of L3PSA will be carried out in January 2016. The LESUN dissemination seminar with stakeholders may be postponed depending on schedule for the staff at the NPPs. Young scientist travel assistance has been granted to 4 scientists.
Annelie Bergman expressed concerns regarding the schedule of the activity reporting compared to what is stated in the contracts, the feedback in due time from the activities in connection with possible continuation of activities and the possibility of keeping track of the status of the activities. It was agreed that Annelie Bergman and Emma Palm will look into this for the next coordination meeting and a proposal for change be presented for the next board meeting if needed.
Emma Palm presented the evaluation results and funding recommendation for CfP 2016 -

a total of 20 proposals (7 continued and 13 new) were received. The proposals were in total asking for approximately 8500 kDKK in funding. After some discussion, the board agreed to fund the following activities in 2016 (all amounts in kDKK):

BREDA_RPV	400
COPSAR	500
SPARC	600
SC_AIM	410
ADdGROUND	500
HYBRID	500
FIREBAN	450
L3PSA	140

The total budget for these 8 activities is 3500 kDKK.

9 B-part: status and new activities

Kasper Andersson presented a status report for ongoing activities. In an overall view the activities are progressing well. There are no delayed activities started before 2014. The activities from 2015 are being carried out on schedule. Young scientist travel assistance has been granted to 3 scientists. All 4 NKS-B seminars planned in 2015 have been carried out: IDEA, FAUNA (workshop), NUFORNOR and NORDCOP-COAST.
Kasper Andersson presented the evaluation results and funding recommendation for CfP 2016 – a total of 19 (of them only 1 is continued) proposals were received. After some discussion the board agreed to fund the following activities in 2016 (all amounts in kDKK):

MOMORC	525
NISI	225
GAMMASPEC	395
MESO	375
NORCO	435
NORDIC ICP	420
EFMARE	395
COASTEX	330
NORDUM	400

The total budget for these 9 activities is 3500 kDKK.

10 Budget for 2016

Finn Physant presented the distributed budget proposal of 4 January 2016. Only two revisions had been made. The contribution from Fennovoima had been raised to 9,000 EUR according to the confirmation from Nici Bergroth and the contribution from IFE had been raised to 12,360 EUR according to the confirmation from Atle Valseth (action D). - The budget approved by the board is attached to these minutes in appendix A.

11 NKS seminar on current trends in nuclear and radiological safety 2016

The seminar carried out 12-13 January (action C) was commented by the Chair, who found it successful. The Chair thanked Vattenfall represented by Olga German and Karin Andgren for providing great facilities for the seminar. Both organizers Karin Andgren and Kasper

Andersson were happy with the result. The seminar was commented and discussed by the board. The Chair noted that a seminar survey addressing all participants will be carried out by the PC's quite soon. As a first conclusion the Chair stated that maybe a new seminar should be organized and carried out in 3 years time.

12 Information activities

Finn Physant informed the board about the status of the website, NewsLetters etc. User statistics of the present generation of website software have now been obtained for more than 3 years and were presented. There is a clear occurence, that for instance electronic news in September and October 2015 about specific events like the CfP 2016 and the upcoming January seminar attracted more website users. 7 NewsFlashes and one NewsLetter have been distributed since the last board meeting including news on the last board meeting, CfP 2016, the upcoming January seminar, other seminars, reports etc. Extra seminar news were also distributed. There is now a list of more than 500 e-mail adresses, to which the electronic letters are sent. A new and updated version of the pamphlet "Nordic Nuclear Safety Research" will be published in 2016. Furthermore a recent article in "Radiation Regulator" and 3 presentations from the NSFS conference have been uploaded to the website. All products of the coordination group.

13 Other issues

a. Waste activity based on request from the Nordic Council of Ministers (NCM)

Kasper Andersson informed the board that the activity had been successfully carried out and reported in the report "An overview of current non-nuclear radioactive waste management in the Nordic countries and considerations on possible needs for enhanced inter-Nordic cooperation", NKS-351 (action E). NCM will decide on funding a possible new NKS activity later in January 2016. Kasper Andersson has handed in a proposal from the CfP 2016 that NKS can not fund and he will report back to the board on the outcome.

The board supported the contacts taken to NCM regarding a possible funding for a new NKS activity in 2016.

b. NSFS Conference 2015

Finn Physant made a short resumé of the NKS participation in the NSFS Conference 2015. It started excellently by Mette Øhlenschlæger, as the President of NSFS, awarding Sigurður Magnússon the Bo Lindell Award. Kasper Andersson made the exhibitor talk. Oral presentations were given by Karin Andgren, Kasper Andersson and 4 activity leaders. These were supported by 2 poster presentations (action F). NKS sponsered the conference participants' bags and name tags with a very visible NKS logo. Mette Øhlenschlæger commented that the conference had been a fine experience to NSFS and had made NKS quite visible.

The board took note of the NKS participation in the NSFS Conference 2015.

c. Young Scientists' Travel Support

Karin Andgren presented a proposal for new requirements (action H): Young scientist travel assistance. The board approved the proposal, which will be uploaded to the website both to the R- and the B-part.

d. Definition of evaluation criteria for young scientists

Karin Andgren presented a proposal for new evaluation criteria (action H): "Participation of young scientists" as a change in the „Handbook for NKS applicants and activity leaders"

section 1.5 and in the proposal form. The board approved the proposal with one adjustment: “4“ instead of “2“ years in the following text:

Participation of young scientists
Will the proposed activity involve young scientists in the proposed work programme and if so, how? In this context, those studying towards a masters degree or a PhD and those in their first 4 years of their professional career after obtaining an academic degree would be considered as ‘young scientists’
The handbook and the proposal form will be revised accordingly.
e. Any other business
None.

14 Next meeting

Next meeting will be in Copenhagen 22 June 2016.

15 End of meeting

Many thanks for a good meeting were expressed by the chairman – especially to the organizers at Strålsäkerhetsmyndigheten. Many thanks were given to Karin Andgren for her valuable contributions to NKS as R-part programme manager.

Sigurður M. Magnússon
Chairman

Finn Physant
Meeting secretary

Appendices:
A: Budget decision for 2016
B: Actions from the board meeting

Appendix A - NKS budget decision for 2016 - 14 January 2016

Budgets	**Budget for 2016**	**Budget for 2016**	**Budget for 2015**
	EUR	**DKK**	**DKK**
R-part			
Activities	469.012	3.500.000	3.400.000
Fee PC	72.585	541.667	490.000
Travels PC	6.700	50.000	50.000
Coordination	6.700	50.000	50.000
Young scientists' travel	6.700	50.000	50.000
R total	**561.697**	**4.191.667**	**4.040.000**
B-part			
Activities	469.012	3.500.000	3.500.000
Fee PC	67.002	500.000	490.000
Travels PC	6.700	50.000	50.000
Coordination	6.700	50.000	50.000
Young scientists' travel	6.700	50.000	50.000
B total	**556.114**	**4.150.000**	**4.140.000**
Seminar 2016			
Seminar 2016	13.400	100.000	100.000
Seminar 2016 total	**13.400**	**100.000**	**100.000**
Common			
Common various according to specification	33.501	250.000	250.000
Common total	**33.501**	**250.000**	**250.000**
Others			
Fee Secretariat	88.442	660.000	645.000
Fee Chairman incl. travels	62.982	470.000	460.000
Travels Secretariat	1.340	10.000	10.000
Others total	**152.764**	**1.140.000**	**1.115.000**
TOTAL	**1.317.476**	**9.831.667**	**9.645.000**
Expected incomes according to app. 1	**1.161.291**	**8.666.132**	**8.663.585**
Surplus	**-156.186**	**-1.165.535**	**-981.415**

Any deficits to be covered by the reserve available for the board, which according to the financial status report of 14 December 2015 is ca.:	1.101.259,00
Proposed budget for 2016	-1.165.535,00
Present reserve and surplus	-64.276,00
Funding reserved for use in 2015, but not used, will amount to ca.:	300.000,00
Gain/Loss due to the development in exchange rates 2015-2016 ca.:	80.000,00
Old reservations from before 2013, not used, amount to:	658.608,00
Total reserve end of January 2016: ca. DKK:	**974.332,00**
Total reserve end of January 2016: ca. EUR:	**130.563,75**

Specification of ”Common" for 2016

	2016 EUR	2016 DKK	2015 DKK
Common			
Reports, materials etc.	3.518	26.250	27.500
Postage, fees	1.005	7.500	7.500
Equipment	2.010	15.000	15.000
Internet	12.060	90.000	90.000
Auditing, consulting	8.208	61.250	60.000
Information material	4.020	30.000	30.000
Various expenses	2.680	20.000	20.000
Common total	**33.501**	**250.000**	**250.000**

Appendix 1 for budget proposal for 2016

Pledge for funding in 2016 - Incomes

	Proposal for 2016 EUR	Proposal for 2016 DKK	Actual for 2015 DKK
SSM	495.211	3.695.510	3.574.480
TEM	340.000	2.537.250	2.530.824
BRS	57.400	428.348	427.263
GR	24.000	179.100	178.646
NRPA	132.600	989.528	1.049.580
Total EUR / DKK	**1.049.211**	**7.829.735**	**7.760.793**

SSM contribution SEK	4.550.000
NRPA contribution NOK	1.275.000

	EUR	DKK	DKK
Fortum	26.250	195.891	187.951
TVO	26.250	195.891	187.951
Fennovoima	9.000	67.163	57.688
IFE	12.360	92.237	89.323
Forsmark	13.150	98.132	97.883
Ringhals	12.000	89.550	89.323
OKG	13.070	97.535	92.673
NCM	0	0	100.000
Total EUR / DKK	**112.080**	**836.397**	**902.792**
Complete EUR / DKK	**1.161.291**	**8.666.132**	**8.663.585**

Exchange rates 2015/16:

NKS 2016:	
DKK	100,0000
EUR	7,4625
NOK	0,7761
SEK	0,8122
NKS 2015:	
SEK 2015	0,7856
EUR 2015	7,4436
NOK 2015	0,8232

Appendix B

Actions from the board meeting
(if nothing else is mentioned to be taken by the coordination group):

A. Ref. item 5: A new folder (pamphlet) will be published in 2016.
B. Ref. item 8: Annelie Bergman expressed concerns regarding the schedule of the activity reporting compared to what is stated in the contracts, the feedback in due time from the activities in connection with possible continuation of activities and the possibility of keeping track of the status of the activities. It was agreed that Annelie Bergman and Emma Palm will look into this for the next coordination meeting and a proposal for change be presented for the next board meeting if needed.
C. Ref. item 13: NCM will decide on funding a possible new NKS activity later in January 2016. Kasper Andersson has handed in a proposal from the CfP 2016 that NKS can not fund and he will report back to the board on the outcome.
D. Ref. Item 13: Karin Andgren presented a proposal for new requirements: Young scientist travel assistance. The board approved the proposal, which will be uploaded to the website both to the R- and the B-part.
E. Ref. Item 13: Karin Andgren presented a proposal for new evaluation criteria: "Participation of young scientists" as a change in the „Handbook for NKS applicants and activity leaders" section 1.5 and in the proposal form. The board approved the proposal with one adjustment: "4" instead of "2" years in the following text:
Participation of young scientists
Will the proposed activity involve young scientists in the proposed work programme and if so, how? In this context, those studying towards a masters degree or a PhD and those in their first 4 years of their professional career after obtaining an academic degree would be considered as 'young scientists'
The handbook and the proposal form will be revised accordingly.

The Secretariat

2016-04-04
NKS(16)2

nks
Nordic nuclear safety research

Financial statements

for

The Nordic Nuclear Safety Research Programme
NKS Secretariat

2015

4. april 2016
Finn Physant
FRIT

Statement by Management

The NKS Secretariat and Group of Owners have discussed and approved the annual report of The Nordic Nuclear Safety Research Programme (in the following referred to as 'NKS') for the financial year 1 January 2015 - 31 December 2015.

In our opinion, the financial statements provide a true and accurate picture of the organisation's assets, liabilities and equity, financial position as at 31 December 2015 and the results of the organisation's activities for the financial year 1 January 2015 - 31 December 2015.

In our opinion, the management's review includes a fair review of the matters dealt with in the management review.

We recommend the financial statement for approval by the Group of Owners.

Roskilde, 4 April 2016

NKS Secretariat:

Finn Physant

Copenhagen, 22 June 2016

Group of Owners:

Sigurður M. Magnússon
Chairman

Steen Cordt Hoe

Jorma Aurela

Ole Harbitz

Eva Simic

Independent Auditors' Report

To the group of owners of NKS

Report on the Financial Statements

We have audited the financial statements of NKS for the financial year 1 January to 31 December 2015, which comprises accounting policies, income statement, balance sheet and notes, including Financial Programme Specifikation. The financial statements are presented in accordance with the agreements and the accounting policies, which is decided by the Management, and which is described at page 5.

Management's responsibility for the financial statements

The Management is responsible for the preparation of financial statements that give a true and fair view in accordance with the agreements and the accounting policies, which is decided by the Management. The Management is also responsible for such internal control as the Management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In addition, Management is responsible for the transactions covered by the financial statements are consistant with the contribution, laws and other regulations, agreements and generally accepted practices.

Auditor's responsibility and basis of opinion

Our responsibility is to express an opinion on the financial statements based on our audit. We conducted our audit in accordance with International Standards on Auditing and additional requirements under Danish Audit regulation as well as the public accepted auditing standards. This requires that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatements of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to NKS's preparation of financial statements that give a true and fair view. In order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of NKS's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the Management, as well as the overall presentation of the financial statements.

The audit also involves an evaluation whether there are established procedures and internal controls that support the transactions, covered by the financial statements, which are consistant with the contribution, laws and other regulations, agreements and the accounting policies, which is decided by the Management.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

The audit has not resulted in any qualification.

Independent Auditors' Report

Opinion

In our opinion, the financial statements give a true and fair view of NKS's financial position at 31 December 2015 and of the results of NKS's operations for the financial year 1 January to 31 December 2015 in accordance with the agreements and the accounting policies, which are decided by the Management.

It is also our opinion that there are established procedures and internal controls that supports that the transactions are subject to the financial statements are consistent with the contributions, laws and other regulations, agreements and the accounting policies, which is decided by the Management.

Statement on the management's review

We have read the Management's review. We have not performed any further procedures in addition to the audit of the financial statements. On this basis, it is our opinion that the information provided in the Management's review is consistent with the financial statements.

Roskilde, 4 April 2016

Dansk Revision Roskilde
Godkendt revisionsaktieselskab, CVR-nr. 14 67 80 93

Palle Sundstrøm
Partner, State-Authorised Public Accountant

Statement by Management

2015 has been characterised by planned work/operation of the R (Reactor)-part and the B (Emergency Preparedness)-part.

In the course of 2015, the currency market for the Swedish currency has developed in a positive direction, while the Norwegian currency has developed in a negative direction, in comparison with the Danish currency and the EURO. The total foreign exchange gain at the end of the year is at DKK 78,517 / EUR 10,522 / 7,4625.

The financial statements are presented in DKK, but the amounts are also stated in EUR in a separate column.

The financial statements show a profit of DKK 240,435 / EUR 32,219, which is consistent with decisions taken by the Board.

Subsequently, the equity as at 31 December 2015 constitutes DKK 8,221,115 / EUR 1,101,657.

In assessing the year's profit and equity as at 31 December 2015, consideration must be made of the contracts for the R and B parts of DKK 6,666,674 / EUR 893,357,which is calculated at 31 December 2015, where invoices have not yet been received or where the work has not yet been completed.

It may also be indicated that NKS in accordance with programme managers' statements has received external funding of around DKK 13,9 mio. / EUR 1,86 mio. in the form of un-charged contributions. The external funding is the work performed in connection with the implementation of activities for which invoices will not be sent.

Unused activity, coordination and travel funds for programmes for the year 2014 are returned to the reserve as are unused common programme costs for a total of DKK 1,235,082 / EUR 165,505.

Sigurður M. Magnússon
Chairman

Accounting policies

The financial statements are presented in accordance with the agreements and the accounting policies, which is decided by the Management.

The financial statements are presented in accordance with the same accounting policies as last year.

Recognition and measurement
The association uses the "open post"-principle, which means, that all expenses, which is paid in the period 1/2-2015 - 31/1-2016, are included in the financial statements.

Conversion of foreign currencies
Transactions in foreign currencies are in the course of the year translated to the exchange rate at the beginning of the financial year. Giro and bank accounts, receivables and payables in foreign currencies, are translated at the exchange rates at the balance sheet date.

Realised and unrealised exchange differences are recognised in the income statement as financial income or financial expenses.

The income statement

Revenue recognitions
Income include grants for the financial year from the owners and the additional funding.

Expenses
Expenses include paid expenses for the financial year's approved projects for respectively the R- and the B-part, including common program expenses and travels, activity supports and fees. The association is not taxable for VAT and therefore the expenses of the association are recognized including VAT.

Interest income
Interest income include interest income.

Income taxes
The association is not liable to pay tax.

Balance sheet

Cash and cash equivalents
Cash and cash equivalents include bankdeposit in giro and bank accounts in Denmark, Finland, Norway and Sweden.

Received prepayments
Received prepayments are measured at the exchange rates at the balance sheet date.

Income statement 2015

Grants and interest income				Kurs 7,4625
Beredskabsstyrelsen DK	DKK	427.262,64	EUR	57.254,63
Arbets- och näringsministeriet FI	DKK	2.530.824,00	EUR	339.138,89
Geislavarnir ríkisins IS	DKK	178.646,40	EUR	23.939,22
Statens strålevern NO	DKK	1.049.580,00	EUR	140.647,24
Strålsäkerhetsmyndigheten SE	DKK	3.574.480,00	EUR	478.992,29
Additional funding	DKK	906.514,66	EUR	121.476,00
Interest income	DKK	17.750,48	EUR	2.378,62
Exchange adjustments	DKK	78.516,86	EUR	10.521,52
Total grants and interest income	**DKK**	**8.763.575,04**	**EUR**	**1.174.348,41**
Expenses				
R-Part	DKK	4.202.069,20	EUR	563.091,35
B-Part	DKK	2.949.861,26	EUR	395.291,29
Activity support	DKK	71.048,60	EUR	9.520,75
Fees	DKK	1.097.500,00	EUR	147.068,68
Common program expenses	DKK	193.110,04	EUR	25.877,39
Travels	DKK	9.551,02	EUR	1.279,87
Total expenses for the NKS programme	**DKK**	**8.523.140,12**	EUR	**1.142.129,33**
Income - Expenses	**DKK**	**240.434,92**	**EUR**	**32.219,08**

Balance sheet 2015

Assets:				**Rate 7,4625**
Giro and bank accounts converted to DKK, Note 1				
DK/IS-giro 918-9297	DKK	1.058.765,58	EUR	141.878,13
FI-giro 800015-70837915	DKK	2.197.403,87	EUR	294.459,48
NO-giro 7874.07.06976	DKK	943.922,79	EUR	126.488,82
SE-giro 6 64 63-1	DKK	6.457.622,92	EUR	865.343,10
Giro and bank accounts total	DKK	10.657.715,16	EUR	1.428.169,53
Total Assets	**DKK**	**10.657.715,16**	**EUR**	**1.428.169,53**

Liabilities:				
Equity:				
Retained from previous years	DKK	7.980.680,24	EUR	1.069.437,89
Result of this year	DKK	240.434,92	EUR	32.219,08
Total equity	**DKK**	**8.221.115,16**	**EUR**	**1.101.656,97**
Statement for new financial year, Note 2	DKK	2.436.600,00	EUR	326.512,56
Total Liabilities	**DKK**	**10.657.715,16**	**EUR**	**1.428.169,53**

Notes

Note 1: Giro and bank accounts:		Currency	DKK	EUR
DK/IS-giro 918-9297:				
Holdning 31.01.2016	**DKK**	1.058.765,58	1.058.765,58	141.878,13
FI-giro 800015-70837915				
Holdning 31.01.2016	**EUR**	94.053,73	701.875,96	94.053,73
Giro deposits 31.01.2016	**EUR**	200.405,75	1.495.527,91	200.405,75
NO-giro 7874.07.06976				
Holdning 31.01.2016	**NOK**	378.024,20	293.384,58	39.314,52
Giro deposits 31.01.2016	**NOK**	838.214,42	650.538,21	87.174,30
SE-giro 6 64 63-1:				
Holdning 31.01.2016	**SEK**	7.950.779,27	6.457.622,92	865.343,10
I alt			**10.657.715,16**	**1.428.169,53**

Exchange rates pr. 31.12.2015	**DKK**
EUR	**746,25**
NOK	**77,61**
SEK	**81,22**

Note 2:

Payment regarding the new financial year from Strålsäkerhetsmyndigheten, SE:

Owner contribution for 2016 - Paid 30.12.2015

Notes

Financial programme specification
31 January 2016

	DKK							EUR	7,4625	
Total	Budget from 2014	Returned 2014	Budget 2015	Total budget 2015	Payments made	Contracts signed, but not paid	Rest budget	Payments made	Contracts signed, but not paid	Rest budget
R-Part	2.485.421	-136.385	4.041.000	6.390.036	4.202.069	2.092.036	95.931	563.091	280.340	12.855
B-Part	4.512.489	-1.001.081	4.140.000	7.651.408	2.949.861	4.574.638	126.909	395.291	613.017	17.006
2016 seminar	0		100.000	100.000	47.775	0	52.225	6.402	0	6.998
NSFS 2015	0	0	37.500	37.500	23.274	0	14.226	3.119	0	1.906
Fees	7.500	-7.500	1.105.000	1.105.000	1.097.500	0	7.500	147.069	0	1.005
Common programme exp.	83.262	-83.262	250.000	250.000	193.111	0	56.889	25.878	0	7.623
Travels	6.854	-6.854	10.000	10.000	9.551	0	449	1.280	0	60
I alt	7.095.526	-1.235.082	9.683.500	15.543.944	8.523.141	6.666.674	354.129	1.142.129	893.357	47.454
	F_1	F_2	F_3	F	G	H_1	H_2	G	H_1	H_2

$F_1 + F_2 + F3 = F$
$F - G = H = H_1 + H_2$

Notes

Detailed financial programme specification - 31 January 2016

	DKK							EUR	7,4625	
Specifikation:	Budget from 2014	Returned 2014	Budget 2015	Total budget 2015	Payments made	Contracts signed, but not paid	Rest budget	Payments made	Contracts signed, but not paid	Rest budget
R-Part: Common program.	300.786	-60.786	590.000	830.000	509.324	245.000	75.676	68.251	32.831	10.141
Activities	2.145.286	-36.250	3.401.000	5.510.036	3.663.000	1.847.036	0	490.854	247.509	0
Travel young scientists	39.349	-39.349	50.000	50.000	29.745	0	20.255	3.986	0	2.714
B-Part: Common program.	340.000	-100.000	590.000	830.000	494.048	245.000	90.952	66.204	32.831	12.188
Preparedness	1.577.323	-250.000	1.215.000	2.542.323	1.102.458	1.439.865	0	147.733	192.947	0
Measurement	1.837.876	-489.604	1.777.000	3.125.272	890.738	2.234.534	0	119.362	299.435	0
Radioecology	595.813	0	408.000	1.003.813	433.574	570.239	0	58.100	76.414	0
Waste	120.000	-120.000	100.000	100.000	15.000	85.000	0	2.010	11.390	0
Travel young scientists	41.477	-41.477	50.000	50.000	14.043	0	35.957	1.882	0	4.818
2016 seminar	0	0	100.000	100.000	47.775	0	52.225	6.402	0	6.998
NSFS 2015	0	0	37.500	37.500	23.274	0	14.226	3.119	0	1.906
Fee Secretariat	7.500	-7.500	645.000	645.000	637.500	0	7.500	85.427	0	1.005
Fee Chairman incl. travels	0	0	460.000	460.000	460.000	0	0	61.642	0	0
Reports etc.	16.015	-16.015	27.500	27.500	12.531	0	14.969	1.679	0	2.006
Postage etc.	144	-144	7.500	7.500	7.848	0	-348	1.052	0	-47
Equipment	14.401	-14.401	15.000	15.000	12.775	0	2.225	1.712	0	298
Internet	30.466	-30.466	90.000	90.000	57.700	0	32.300	7.732	0	4.328

Notes

Detailed financial programme specification - 31 January 2016

	DKK							EUR	7,4625	
Specifikation:	Budget from 2014	Returned 2014	Budget 2015	Total budget 2015	Payments made	Contracts signed, but not paid	Rest budget	Payments made	Contracts signed, but not paid	Rest budget
Auditing	0	0	60.000	60.000	63.125	0	-3.125	8.459	0	-419
Information material	9.402	-9.402	30.000	30.000	30.711	0	-711	4.115	0	-95
Various	12.834	-12.834	20.000	20.000	8.421	0	11.579	1.128	0	1.552
Travels Secretariat	6.854	-6.854	10.000	10.000	9.551	0	449	1.280	0	60
Diff.	0	0	0	0	0	0	0	0	0	1
Total	7.095.526	-1.235.082	9.683.500	15.543.944	8.523.141	6.666.674	354.129	1.142.129	893.357	47.454
	F_1	F_2	F_3	F	G	H_1	H_2	G	H_1	H_2

$F_1 + F_2 + F3 = F$

$F - G = H = H_1 + H_2$

Dansk Revision Roskilde
Godkendt revisionsaktieselskab
Køgevej 46A
DK-4000 Roskilde
roskilde@danskrevision.dk
www.danskrevision.dk
Telefon: +45 44 53 77 44
Telefax: +45 44 53 77 04
CVR: DK 14 67 80 93
Bank: 9173 4783 428768

The Nordic Nuclear Safety Research Programme (NKS)

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

Contents

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

1 Audit of the financial statements

1.1 Introduction

As the appointed auditors for The Nordic Nuclear Safety Research Programme (NKS), we have audited the financial statements for the financial year 1 January 2015 - 31 December 2015 prepared by the NKS Secretariat.

The financial statements show the following results, assets and equity:

DKK / EUR	Current year	Last year
Result for the year	240,435 / 32,219	-1,233,162 / -165,667
Equity	8,221,115 / 1,101,657	7,980,680 / 1,072,153

1.2 Conclusion on the executed audit - auditor's report

The audit performed has not given rise to significant remarks to the financial statements.

If the financial statements are carried in the existing form and if further, significant information does not appear during management's processing, we will provide the financial statements for 2015 with an unmodified audit opinion.

The audit has not included the management's review, but we have read through the management's review. This has not given rise to remarks. On this background, it is our opinion that the information in the management's review is in accordance with the financial statements.

1.3 Scope and execution of the audit

The purpose, planning and execution of the audit, the auditor's responsibility and reporting as well as the board's responsibility have remained unchanged, which is why we refer to our letter of engagement dated 30 March 2011.

As preparation for the audit of the financial statements for 2015, we have discussed the expectations to the financial development for 2015 with the Secretariat, including risks related to the association's activities. We have, furthermore, discussed risks connected to the presentation of accounts and the initiatives the board has initiated for the management hereof.

On this background, we have prepared our auditing strategy with a view to targeting our work at significant and areas of risk. We have identified the following items and areas to which, according to our opinion, special risks of significant errors and insufficiencies in the financial statements are associated:

- Grants
- Project expenses
- Equity

On other areas, the risk of error in the financial statements is assessed as normal and the execution of the audit has therefore had a lesser scope.

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

The audit was executed with a view to verifying whether the information and amount specifications in the financial statements are correct. Analyses, review and assessment of administrative procedures, internal control systems and control procedures have been performed as well as a review and assessment of bookkeeping items and documentation for this.

The audit has also included an assessment of whether the prepared financial statements fulfil the auditing regulations of legislation and articles of association. In this regard, we have assessed the selected accounting policy, the board's accounting opinion as well as, moreover, the information submitted by the board.

Furthermore, the audit has been planned and executed in accordance with the international auditing standards as well as generally accepted government auditing standards and, in addition to the financial audit, it also includes a review and assessment of whether due financial considerations have been taken with the administration of the funds covered by the accounts.

During the execution of the financial audit, we have checked whether the accounts are without significant errors and insufficiencies. We have also checked the financial statements' agreement with the underlying bookkeeping records as well as the financial statements' concordance with laws and regulations as well as with commenced agreements and the accounting policies, which is decided by the Management.

The performance audit has been executed as an integrated and parallel part of the financial audit and, among other things, has included random reviews of agreements and contracts, reports, analyses of expense and income items as well as an analysis of budget deviations.

The audit has been executed in connection with the preparation of the financial statements.

2 The executed audit

2.1 Administration

Similar to last year, The NKS Secretariat is managed by FRIT ApS.

Agreement has been entered into on an extension of the agreement until 30 June 2017.

It must be noted that the Board has chosen to extend the agreement with Chairman of the Board, Sigurður M. Magnússon, up to and including 2018.

2.2 Attestation procedures

We have performed a follow-up on NKS Secretariat's procedures and internal controls regarding attestation procedures and have found reason to state the following:

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

Project expenses

We checked on a sample basis whether the supporting documentation is duly approved by the programme manager or by chairman, Sigurður M. Magnússon. This review has not given rise to any comments.

In addition, we have established that the Secretariat regularly sends programme status to the programme managers. The programme status is forwarded approximately every second month and at the latest on 31 January 2016. The programme status includes, for example, a ledger card for project expenses so that the programme manager can see the individual payments on the project for the current year.

Secretariat expenses

Remuneration for the Secretariat is controlled as per agreement and to the minutes of the board meeting. We checked on a sample basis whether the invoices has been approved by Sigurður M. Magnússon. This review has not given rise to remarks.

2.3 Authorisation to sign

The accounts manager, Finn Physant, owner of FRIT ApS, and chairman, Sigurður M. Magnússon, have authority to make withdrawals on NKS' giro and bank accounts jointly or individually together with Claus Rubin, who is a consultant for FRIT ApS.

Our assessment is that the above terms and conditions for authorisation to sign, in consideration of the few staff members, is appropriately organised.

2.4 Use of IT

In connection with our audit, we have performed a general review and assessment of the association's administrative use of IT, including of system, data and operation security.

Our assessment is that the association is dependent on IT in the daily business processes. However, the association's use of IT is not assessed as being a risk.

2.5 Non-corrected misstatements

Pursuant to the international auditing standards, we must account for non-corrected misstatements that are not insignificant, to the association's senior management.

We can inform, that we have asked the NKS Secretariat to make one single correction to the draft for the financial statements. The correction was related to an exchange rate adjustment at DKK 171.

So all amount errors and insufficiencies in the financial statements are corrected in cooperation with the NKS Secretariat.

2.6 Discussions with management on fraud

During the audit we have enquired the Secretariat about the risk of fraud and the Secretariat has informed us that according to their assessment, there is no particular risk that the financial statements can contain significant erroneous information as a result of fraud.

The Secretariat has, furthermore, reported that they do not have knowledge of fraud or investigations in progress for assumed fraud.

During our audit we have not established conditions that could indicate or arouse suspicion of fraud of significance to the information in the financial statements.

3 Comments to the audit and financial statements 2015

For the individual items in the income statement and balance sheet we can supplement the presented financial statements for the year 2015 with the following:

3.1 Additional financiers

The additional financiers stated in the income statement may be analysed as follows in DKK:

	2015	2014	2013
Fortum Power and Heat Oy, Finland	189.812	182.777	175,319
TVO, Finland / Teollisuuden Voima Oyj, TVO	189.812	182.777	175,319
Fennovoima Oy, Finland	57.688	55.952	52,223
Forsmarks Kraftgrupp AB, Sweden	97.883	95.268	95,269
Kärnkraftsäkerhet och utbildning (KSU), Sweden	0	0	90,868
OKG Aktiebolag, Sweden	92.673	90.158	86,690
Ringhals AB, Sweden	89.323	89.524	89,525
IFE, Norway	89.323	85.794	85,795
Nordisk Ministerråd, NCM	100.000	0	0
Total financiers	906.514	782.250	851,008

The additional financiers are in accordance with the supporting documentation.

We have found that in 2015, there has been added a new additional financier, Nordisk Ministerråd (NCM) and that Kärnkraftsäkerhet och utbilning (KSU), Sweden from the year 2014 has stopped as additional financier.

3.2 Exchange rate adjustments

The exchange rate adjustments are mainly the result of foreign currency amounts being registered at the rate on 31 December 2014 throughout 2015. This gives deviations between the utilised rate and the actual rate.

We can report that the principle used does not affect the overall results, but just the allocation of the individual items in the income statement.

3.3 Budget balances brought forward from one year to the next

In the financial survey for 2015, budget figures for all expenses are specified. In addition, an amount transferred from 2013 of, in total, DKK 5,860,444 - cf. the accounts pages 10 to 11, first two columns.

We draw attention to the fact that the remaining budget for joint programme expenses, joint trips and fees similar to previously, have not been transferred from 2014 to 2015 and are thus transferred to NKS' equity (reserve).

It is furthermore noted that the coordination and travel expenses as well as activity expenses granted to the programme managers for the year 2015 that are not used/allocated similar to previous year will be transferred to equity. Thus, only the allocated activity expenses for R Part and B Part and the balance of Seminar 2016, DKK 52,225, will be transferred from the one year to the next.

4 Performance audit

In accordance with generally accepted government auditing standards, we checked, for a number of selected areas, whether NKS has established business processes to ensure appropriate management of allocated funds. We performed our audit procedures to obtain limited assurance as to whether the management is conducted in a financially appropriate manner and whether the performance numbers disclosed are documented and adequate to cover NKS' operations in 2015.

According to our information, the grants (except for the grants contributed by Fortum Power and Heat Oy and TVO) are not earmarked for specific projects but for NKS' programmes as such. Based on this information, our audit was conducted on the basis of NKS' activities as a whole. During our audit, we checked that the grants from Fortum Power and Heat Oy and TVO have been employed as intended.

During our audit, we established that expenses incurred relate to individual projects and that the supporting documentation is duly approved. We noted that the programme and Secretariat budgets are kept. Finally, we checked on a sample basis whether reports have been prepared for completed projects.

As part of the performance audit, we must check whether the individual projects could be carried out in a more economical manner / efficiency. During our audit, no matters have come to our attention that cause us to believe that this is the case. However, we must state that our lack of technical expertise within nuclear safety means that we do not have the possibility to comment on this.

4.1 Agreement between bookkeeping records and financial statements

We noted that there is agreement between the performed bookkeeping and the prepared financial statements for the year 2015.

Similar to previous years, all deposits and payments in January 2016 have been included in the accounts as if they were settled before 31 December 2015. This utilised accounting policy does not affect the accounting result. Only the size of the cash available, receivables and debt are affected.

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

5 Statutory information, etc.

We have ascertained that on all essential areas, the association complies with the Danish Bookkeeping Act, including regulations on the storage of accounting records.

It is our opinion that the requirements of legislation on bookkeeping and storage of accounting records have been complied with. We have furthermore agreed that our archive material will be stored for 10 years after the expiry of the relevant financial year.

6 Economic crime

In accordance with the Danish Act on Approved Auditors and Audit Firms, we are obliged to check whether any management member has committed significant economic crime and under certain circumstances we must report our findings to legislative and enforcing authorities (primarily the Serious Economic Crime Squad and International Crime).

During our audit we have not come across conditions or indications that any management member have committed economic crimes.

7 Other tasks

In this financial year we have provided the following other services to NKS:

- Assistance with the preparation of the financial statements

A fee for the audit of the financial statements has been agreed on, including assistance with the preparation of the financial statements, participation in accounting meetings and in board meetings as well as the translation to English of the accounts and long-form audit report, in the amount of DKK 49,000 excl. VAT. The amount has not been allocated as debt in the presented accounts.

Long-form audit report of 4 April 2016 regarding Financial Statements for 2015

8 Statements in connection with the audit
8.1 The managements representation letter

As part of the audit of the financial statements, we have obtained confirmation from management of the financial statements' completeness, including that they contain all information on mortgages, guarantees, related parties, court cases, events after the balance sheet date as well as other complex auditable areas.

Management has further declared that all errors that have been presented to management are rectified in the financial statements. We have ascertained that the rectifications are included.

8.2 Auditor's statement

In compliance with the law regarding the approved auditors and audit firms, we state that:

- We comply with the statutory requirements for independence, and
- during the audit carried out, we have received all the information we have requested.

Roskilde, 4 April 2016

Dansk Revision Roskilde
Godkendt revisionsaktieselskab

Palle Sundstrøm
Partner, state-authorised Public Accountant

Presented at the board meeting on 22 June 2016

Sigurður M. Magnússon
Chairman

Steen Cordt Hoe

Jorma Aurela

Ole Harbitz

Eva Simic

Financial status - 03 June 2016

Incomes

DKK

Expected incomes this year	8.666.133	A = B + C
Received until now	7.015.441	B
Additional payments	1.650.692	C
Cash balance	9.769.549	D
Available funds	11.420.241	E = C + D

Budget and expenses

DKK

Total budget incl. transfer from earlier years	15.892.768	F = G + H
Paid until now	5.380.935	G
Rest budget incl. contracts signed, but not paid	10.511.833	H

Available

DKK

Reserve available for the board	908.408	I = E - H

Financial programme specification - 03 June 2016

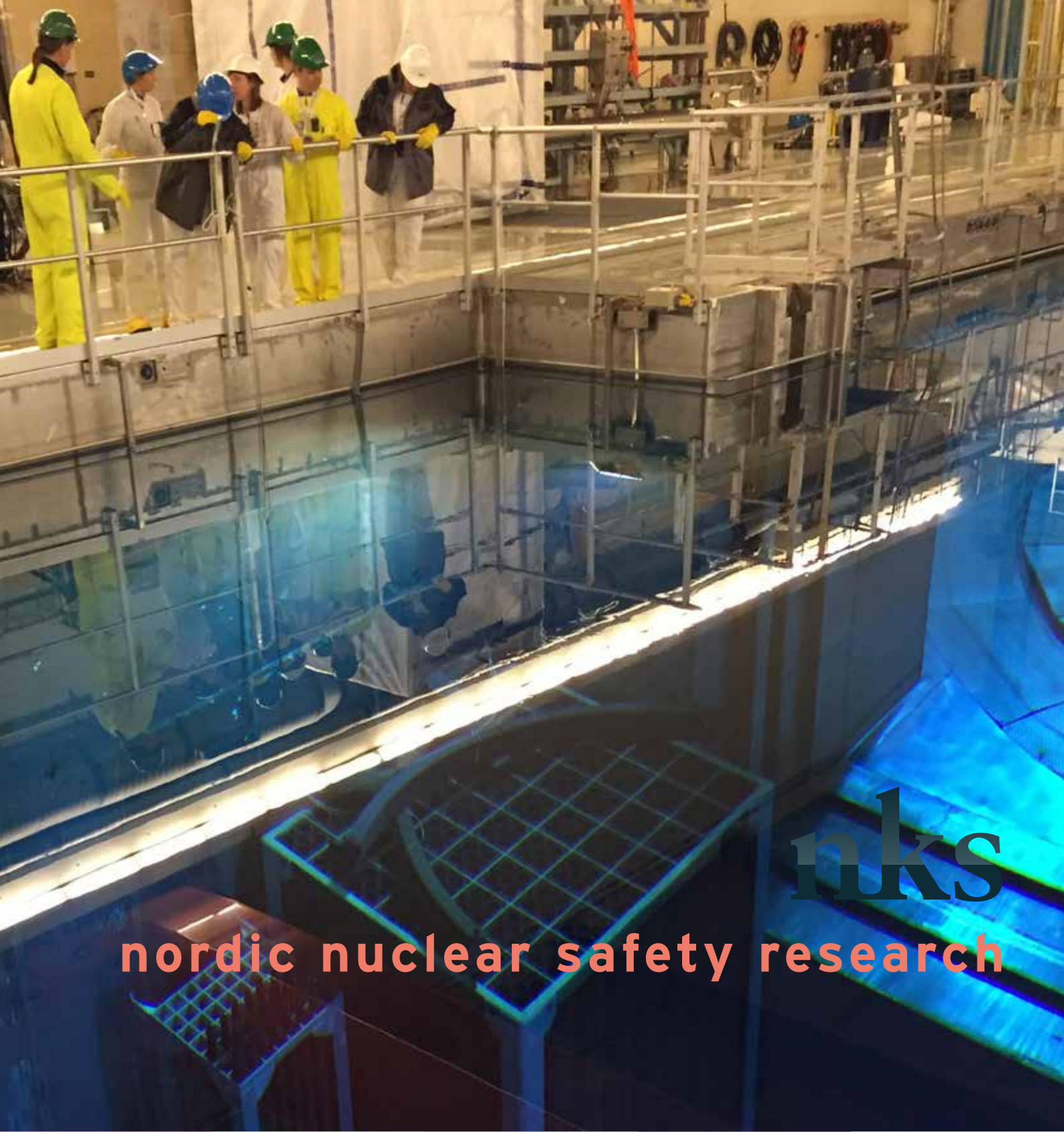
	DKK							EURO	7,4625	
Total	Budget from 15	Returned 15	Budget 16	Total budget 16	Payments made	Contracts signed, but not paid	Rest budget	Payments made	Contracts signed, but not paid	Rest budget
R-Part	2.187.967	-117.172	4.191.467	6.262.262	1.498.792	4.616.170	147.300	200.843	618.582	19.739
B-Part	4.701.547	-764.276	4.151.010	8.088.281	2.838.443	5.108.956	140.882	380.361	684.617	18.879
2016 seminar	52.225	0	100.000	152.225	151.590	0	635	20.314	0	85
NSFS 2015	14.226	-14.226	0	0	0	0	0	0	0	0
Fees	7.500	-7.500	1.130.000	1.130.000	792.500	337.500	0	106.198	45.226	0
Common programme exp.	56.889	-56.889	250.000	250.000	93.810	0	156.190	12.571	0	20.930
Travels	449	-449	10.000	10.000	5.800	0	4.200	777	0	563
I alt	7.020.803	-960.512	9.832.477	15.892.768	5.380.935	10.062.626	449.207	721.063	1.348.426	60.195
	F_1	F_2	F_3	F	G	H_1	H_2	G	H_1	H_2

$F_1 + F_2 + F3 = F$
$F - G = H = H_1 + H_2$

Detailed financial programme specification - 03 June 2016

	DKK							EURO	7,4625	
Specifikation:	Budget from 15	Returned 15	Budget 16	Total budget 16	Payments made	Contracts signed, but not paid	Rest budget	Payments made	Contracts signed, but not paid	Rest budget
R-Part: Common program.	320.676	-75.676	641.667	886.667	539.367	250.000	97.300	72.277	33.501	13.039
Activities	1.847.036	-21.241	3.499.800	5.325.595	959.425	4.366.170	0	128.566	585.081	0
Travel young scientists	20.255	-20.255	50.000	50.000	0	0	50.000	0	0	6.700
B-Part: Common program.	335.952	-90.952	600.000	845.000	245.000	500.000	100.000	32.831	67.002	13.400
Preparedness	1.439.865	-543.967	2.250.010	3.145.908	845.187	2.300.721	0	113.258	308.304	0
Measurement	2.234.534	-93.400	815.000	2.956.134	1.319.013	1.637.121	0	176.752	219.380	0
Radioecology	570.239	0	436.000	1.006.239	420.125	586.114	0	56.298	78.541	0
Waste	85.000	0	0	85.000	0	85.000	0	0	11.390	0
Travel young scientists	35.957	-35.957	50.000	50.000	9.118	0	40.882	1.222	0	5.478
2016 seminar	52.225	0	100.000	152.225	151.590	0	635	20.314	0	85
NSFS 2015	14.226	-14.226	0	0	0	0	0	0	0	0
Fee Secretariat	7.500	-7.500	660.000	660.000	322.500	337.500	0	43.216	45.226	0
Fee Chairman incl. travels	0	0	470.000	470.000	470.000	0	0	62.982	0	0
Reports etc.	14.969	-14.969	26.250	26.250	8.594	0	17.656	1.152	0	2.366
Postage etc.	-348	348	7.500	7.500	3.141	0	4.359	421	0	584
Equipment	2.225	-2.225	15.000	15.000	0	0	15.000	0	0	2.010
Internet	32.300	-32.300	90.000	90.000	32.075	0	57.925	4.298	0	7.762
Auditing	-3.125	3.125	61.250	61.250	50.000	0	11.250	6.700	0	1.508
Information material	-711	711	30.000	30.000	0	0	30.000	0	0	4.020
Various	11.579	-11.579	20.000	20.000	0	0	20.000	0	0	2.680
Travels Secretariat	449	-449	10.000	10.000	5.800	0	4.200	777	0	563
Diff.	0	0	0	0	0	0	0	0	0	2
Total	7.020.803	-960.512	9.832.477	15.892.768	5.380.935	10.062.626	449.207	721.063	1.348.426	60.197
	F_1	F_2	F_3	F	G	H_1	H_2	G	H_1	H_2

$F_1 + F_2 + F3 = F$ $F - G = H = H_1 + H_2$



nks

nordic nuclear safety research

DENMARK FINLAND ICELAND NORWAY SWEDEN

A common Nordic view

Nordic problems need Nordic solutions. NKS aims to facilitate a common Nordic view on nuclear safety and radiation protection including emergency preparedness. This requires common understanding of rules, practice and measures, which may vary between countries, as well as with time. The work builds on a foundation of over sixty years of Nordic collaboration on related issues. Non-Nordic participation may be allowed under certain circumstances.

Securing Nordic competence and knowledge building

Through collaborative NKS activities, Nordic competence and capabilities are maintained and strengthened, and solutions to Nordic problems are disseminated through a sustained informal network. NKS publications are available cost-free on the internet. A special effort is made to engage young scientists and students, to ensure knowledge and expertise for the future.

Strengthening response capacities

By maintaining vital informal networks between Nordic authorities, nuclear power companies, scientists and other stakeholders, the region's potential for a fast, coordinated and targeted response to urgent issues is strengthened. Thereby, problems can be tackled quicker, more efficiently and consistently and at lower cost than if they needed to be addressed on a national scale.

Addressing current societal questions

NKS keeps an open eye to societal changes and events that might influence requirements and perception of nuclear safety, radiation protection and emergency preparedness in the Nordic countries. For instance the Fukushima accident prompted the arrangement of an NKS joint reactor safety and emergency preparedness seminar on lessons learned and future implications for Nordic society.

NKS activities

These can take the form of research activities, test exercises or information collation/review exercises. Alternatively they can aim to harmonize approaches to common problems or spread and distribute knowledge and results through seminars, workshops and educational/training courses. Common to all NKS activities is that the results should be beneficial and made available to concerned end users in all Nordic countries. Aspects of nuclear safety, radiation protection and emergency preparedness may be combined in one activity.

Research areas

Areas of interest covered by NKS activities fall under two main programmes, NKS-R and NKS-B, which cover the following specified research areas.

NKS-R programme:

- Reactor safety
- Nuclear power plant life management and extension
- Decommissioning and handling of generated waste
- Organizational issues

NKS-B programme:

- Emergency preparedness
- Measurement strategy, technology and quality assurance
- Radioecological assessments
- Wastes and discharges

nks

Nordic nuclear safety research

Some recent examples of NKS activities

Learning from successes in nuclear power plant operation

In the nuclear industry, licensees are required to collect lessons from unwanted events in order to prevent the recurrence of similar events. This implies a focus on learning from failures, which may limit the opportunities of the organization to develop. Instead, the NKS-R LESUN activity investigated the concept of learning from success. LESUN noted that success is a complex and multidimensional concept. LESUN formulated a framework for capturing success which can be used to identify successful situations for learning purposes.

Planning safety demonstration

The NKS-R activity PLANS addresses some of the challenges of safety demonstrations, e.g. the knowledge gap on what a safety demonstration is and how it should be performed, by providing detailed guidance on how to plan for safety demonstration. PLANS organized an industry expert workshop to better understand the practices and challenges related to performing safety demonstration, and based on the outcome further developed a guide for planning safety demonstrations.

Advanced in-situ gamma spectrometry field activity in a Chernobyl contaminated area

The NKS-B GAMFAC activity provided an opportunity for testing of equipment, procedures and personnel in conducting in-situ measurements in areas in Belarus of high contamination with complex confounding factors. It was noted that the ability of a team to successfully conduct such measurements is largely related to the amount of work and preparation invested in calibration and procedure development prior to the actual exercise.

Internal dosimetry exercise for enhanced estimation ability

The NKS-B IDEA activity was initiated to enhance the ability to make correct calculations of internal dose following a release of radionuclides. A seminar/course about internal dosimetry calculations with state-of-the-art software was held. An intercomparison exercise showed that there is still a need for training, further experience and quality control in the Nordic region.

How to apply

Nordic companies, authorities, organizations and researchers can submit proposals for NKS activities under the NKS-R and NKS-B programmes. Usually at least three of the five Nordic countries should participate in an activity. Activities submitted under annual calls for proposals are assessed according to criteria important to the objectives of NKS, with final funding decisions made by the NKS board.

Do you have suggestions for a nuclear safety or radiation protection related activity? Contact us via www.nks.org

Financing of NKS activities

NKS is mainly financed by Nordic authorities, with additional contributions from Nordic organizations that have an interest in nuclear safety. The budget for NKS in 2016: about 9 million Danish kroner (€ 1.2 million). In addition to the funding sought from NKS, participating organizations are asked to provide a similar amount of in-kind contributions. This may take the form of working hours, travel expenses or laboratory resources. Without these in-kind contributions it would not be possible to carry out NKS activities.

Main financiers

- Danish Emergency Management Agency
- Ministry of Employment and the Economy, Finland
- Icelandic Radiation Safety Authority
- Norwegian Radiation Protection Authority
- Swedish Radiation Safety Authority

Co-financiers

- Fennovoima Oy, Finland
- Fortum Power and Heat Ltd, Finland
- TVO, Finland
- Institute for Energy Technology (IFE), Norway
- Forsmark Kraftgrupp AB, Sweden
- OKG AB, Sweden
- Ringhals AB, Sweden

The NKS website

On the NKS website (www.nks.org) information is available on funding opportunities, travel support for young scientists, current activities and upcoming seminars. Presentations from seminars held are available for download as are reports from all completed NKS activities. It is also possible to discover more information on NKS and the history of Nordic co-operation in nuclear safety. You can also reach the NKS website using the QR code.

How to apply for NKS funding

NKS email list

NKS sends out newsflashes and newsletters throughout the year providing information on call for proposals, upcoming seminars and published reports. If you wish to join the NKS email list please sign up at www.nks.org or scan the QR code.

NKS mobile reports

All NKS reports from all completed activities can be reached conveniently also with your mobile devices at mobile.nks.org or simply by scanning the QR code.

Contact

If you wish to learn more about NKS and NKS activities visit our website or contact the NKS secretariat.

nks@nks.org

Telephone +45 4677 4041

NKS Secretariat

P.O. Box 49

DK-4000 Roskilde, Denmark

nks

Nordic nuclear safety research

Emma Palm, NKS-R programme manager

Kasper Grann Andersson, NKS-B programme manager

Sigurður M Magnússon, NKS chairman

Finn Physant, NKS secretariat

In the reactor hall at Barsebäck unit 1, Sweden
Photo: Anders Wiebert

This is NKS

Nordic Cooperation Forum

NKS (Nordic Nuclear Safety Research) is a forum for Nordic cooperation and competence in nuclear safety, including emergency preparedness, serving as an umbrella for Nordic initiatives and interests. It runs joint activities of interest to financing organisations and other end users producing seminars, exercises, scientific articles, technical reports and other types of reference material. The work is financed and supported by Nordic authorities, companies and other organisations. The results which should be practical and directly applicable are used by participating organisations in their decision making processes and information activities.

The Nordic Approach

The Nordic region comprises five countries, i.e., Denmark (including the Faroe Islands and Greenland), Finland, Iceland, Norway and Sweden. Building on the foundation of a common cultural and historical heritage and a long tradition of collaboration, NKS aims to facilitate a common Nordic view on nuclear and radiation safety. A common understanding of rules, practice and measures, and national differences in this context, is an essential requirement. Through collaborative efforts problems may be tackled quicker, more efficiently, more consistently, and at a lower cost.

Why Nordic Cooperation on Nuclear and Radiological issues?

One reason to maintain this collaboration between the Nordic countries is the common challenges in relation to nuclear installations. While nuclear power plants are in operation in Finland and Sweden, research reactors have been operated in Denmark, Finland, Norway and Sweden. Clearly, exchange of operational expertise and new ideas can be beneficial. Some of the Nordic research reactors have been closed down and the experience gained in subsequent decommissioning may be useful in connection with the planned decommissioning of Swedish nuclear power reactors. Also knowledge exchange between Sweden's nuclear fuel production plant and other Nordic nuclear installations may be beneficial. The Fukushima accident highlighted the need for an effective operational emergency preparedness for accidents at nuclear installations. By continuously improving detection, response and decision aiding tools while maintaining an informal collaborative network between relevant stakeholders in the Nordic countries, the capacity and capability to respond optimally to an emergency is enhanced. Experience has shown that nuclear and radiological challenges to society are far from static, and the response systems require continuous development. Radiological issues need to be addressed coherently and effectively in the Nordic countries, and some of these are on the NKS agenda. They range from exposure to naturally occurring radioactive material in the environment to the threat of malicious use of radioactive material. In addition to the NKS cooperation there is an extensive co-operation between the Nordic radiation safety authorities regarding general radiation safety issues.

Nordic and International Benefits

NKS with its program for nuclear safety including emergency preparedness is of common benefit for all five Nordic countries. The hallmark of NKS is a spirit of sharing – all results are available free of charge on the NKS web site (www.nks.org), not only to the NKS family but also worldwide providing an international benefit of the NKS work. When quoting NKS material, a reference to the source will be appreciated.

Two Program Areas

NKS activities are divided into two program areas:
NKS-R: Reactor safety; Nuclear power plant life management and extension; Decommissioning and handling of generated waste; Organisational issues.
NKS-B: Nuclear and radiological emergency preparedness; Measurement strategy, technology and quality assurance; Radioecology and environmental assessments; Management of radioactive waste and discharges.

Owners and Financiers of NKS

The owners and main financiers are:
Danish Emergency Management Agency (DEMA, Denmark)
Ministry of Employment and the Economy (TEM, Finland)
Icelandic Radiation Safety Authority (GR, Iceland)
Norwegian Radiation Protection Authority (NRPA, Norway)
Swedish Radiation Safety Authority (SSM, Sweden)

The co-financiers are:
Fennovoima Oy (Finland)
Fortum Power and Heat Ltd. (Finland)
TVO (Finland)
Institute for Energy Technology (IFE, Norway)
Forsmark Kraftgrupp AB (Sweden)
OKG AB (Sweden)
Ringhals AB (Sweden)

Financial Contribution

In 2015 the contributions of the owners and additional financiers were about 9 million Danish crowns (1.2 million euros). To this should be added contributions in kind by participating organizations, worth approximately the same amount, without which this program would not be possible.

NKS(16)4
2016-04-19

HANDBOOK FOR NKS APPLICANTS AND ACTIVITY LEADERS

April 2016

TABLE OF CONTENTS

1 INFORMATION FOR APPLICANTS

1.1 Subscribe to NKS News

Ensure that you will not miss any important information (regarding e.g. call for proposals) by subscribing to NKS News at: www.nks.org.

1.2 Who can apply?

Organisations such as universities, research centres, institutes and companies in the Nordic countries can apply for NKS funding for research activities. The activity budget should distribute the NKS funding between participant organisations from at least 3 Nordic countries (in some special cases, involvement of only 2 Nordic countries has been accepted in the NKS-R programme). Non-Nordic participation in NKS activities is possible, but NKS funding of Non-Nordic organisations is not possible. The activity leader must come from a Nordic country (i.e. work for a Nordic organisation).

1.3 What kind of work would be funded?

NKS funds work related to nuclear safety, including emergency preparedness, radioecology, measurement strategies and waste management, considered to be of importance to the Nordic community. The work should be of interest to the owners and financing organisations of NKS. The results must be of relevance, e.g., practical and directly applicable. The work can be in the form of scientific research, including experimental work, or joint activities producing seminars, workshops, courses, exercises, scientific articles, technical reports and other type of reference material. Examples of research topics can be found in the framework documents for NKS-R (http://www.nks.org/en/nksr/call_for_proposals/nks-r_framework_2015.htm) and NKS-B http://www.nks.org/en/nksb/call_for_proposals/nks-b_framework_2014.htm.

1.4 Requirements for NKS activities

The proposal shall fulfil the following requirements:

- Demonstrated compatibility with the current framework program
- NKS funded participation of organisations in at least three Nordic countries in all major activities (occasionally, two countries may be acceptable)
- Results of NKS activities are publicly available for free
- 50 % of the funding from own contribution

1.5 Criteria for NKS activities

The entire NKS program as well as the various activities is evaluated against the following criteria:

1. *Added Nordic value*
   Will the proposed activity lead to an increase in Nordic competence and/or building of informal networks within a relevant NKS-R framework area and how will this be achieved?
2. *Technical and/or scientific standard*
   How does the proposed activity demonstrate a suitable technical and/or scientific standard?
3. *Distinct and measurable goals*

What will the proposed activity deliver as a result of the proposed work programme in the year for which funding is applied for? It is important to ensure that it is clear to the evaluators what the proposed activity will set out to achieve.

4. *Relevance to NKS end-users*
   Is the proposed activity relevant to NKS end-users and which NKS end-users is the proposed activity targeting? It will strengthen the proposal if the interest of relevant end users is clearly demonstrated and not only assumed.
5. *Participation of young scientists*
   Will the proposed activity involve young scientists in the proposed work programme and if so, how? In this context, those studying towards a masters degree or a PhD and those in their first 4 years of their professional career after obtaining an academic degree would be considered as 'young scientists'
6. *Links to other national/international programmes*
   Does the proposed activity have a link to ongoing or past research programmes or activities? In particular, it should be clear where a proposed activity builds upon previously funded NKS activities.

1.6 What do I have to do in return for the money

The activity partners are expected to report the work carried out each year. The most common type of output is a scientific report at the end of the year. A report with clear results is requested even if the activity continues the next year. Other forms of reporting can be for example presentations and proceedings from a seminar. All material produced must be available for publishing on the NKS webpage, where they are free to be downloaded by anyone.

1.7 NKS financing

The NKS funding is granted for one year at a time. Generally, an activity will not receive more than 600 kDKK per year from NKS. The first 50% of the contribution is paid when an activity is started and the rest 50% when the final results of one year's work are available. The first part of the funding can be invoiced when a contract has been made between NKS and the activity leader.

1.8 Working language

The main working language in NKS is English. Applications for NKS funding as well as final reports and other material should be submitted in English. However, each working group determines its own language for meetings.

1.9 How do I apply?

It is up to the applicants themselves to find collaboration partners in the Nordic countries. The programme managers can help with getting into contact with Nordic organisations. NKS seminars are good places for networking. More information on ongoing research and all the published reports are available on the NKS website.

NKS funding is announced in the annual Call for Proposals. It is usually organised in September - October. All the necessary information, material and instructions are distributed on the NKS website. The Call for Proposals is also announced in the NKS electronic newsletter. The applicant is requested to fill in an application form. A voluntary annexe with further details about the proposal

may also be handed in. Detailed instructions on how to fill in the application form will be available when the Call for Proposal opens. The applicant is encouraged to read these instructions carefully. The applicants are expected to demonstrate that at least half of the necessary funding of the activity in question will be supplied by the participating organisations. In other words, the participants are expected to put in the same amount of money in the project as they are applying from NKS. These contributions may be work hours, travel expenses, etc. and should be clearly specified in the proposal form.

Please note that all funding by NKS includes possible VAT

1.12 What happens next

Proposals received before deadline are evaluated against the requirements by the NKS programme managers. Projects fulfilling these requirements are then evaluated against the criteria in section 1.5by the NKS board members. The board members have the right to use the help of external experts in the evaluation process if needed. Each proposal will be given marks based on how well the proposal fulfils the NKS criteria. Based on the evaluation results and the available budget, the programme managers make a suggestion for the next year's NKS-R and NKS-B programme. The suggestions are discussed at the January board meeting and the final decision of successful applicants is made by the board. The programme managers inform the applicants of the outcome as soon as possible after the board meeting.

1.13 Useful links for applicants

NKS webpage
Information about NKS
Owners and supporting financiers of NKS
The NKS-B programme
The NKS-R programme
Information about the Call for Proposals, NKS-B programme
Information about the Call for Proposals, NKS-R programme
NKS Seminars
NKS Reports
Travel support for young scientists: NKS-B, NKS-R

2 INFORMATION FOR ACTIVITY LEADERS

2.1 Contract

The Activity Leader will shortly after the Board's grant decision receive a contract template from the manager of the relevant NKS Programme, which is to be filled in with information on the activity deliverables or stages of work to be done, *always* including the submission of a final activity report (normally by the end of the funding year). In the contract template, the Activity Leader must also include a budget for each of the various activity partners, in line with the Board's decision. The contract is valid when signed by an authorised representative of the Activity Leader's organisation and by the Programme Manager. The NKS Programme Manager will have provided the contract template with a reference number (format: AFT/{R or B}({year}) {serial number}). This reference number is the identifier of the activity, and must be stated in all official management documents concerning the project (contracts, invoices, etc.). Contracts are generally for one year's work, and further continuation of activities is subject to submission and approval of a new proposal.

2.2 Invoices

When the contract is duly signed by both parties, the Activity Leader should inform the participants that they can invoice NKS for 50 % of their total contractual amount. When the work has been completed and the final report of the activity has been approved by the Programme Manager, the Activity Leader should inform the participants that NKS can be invoiced for the remaining 50 % of the amount. All invoices are to be addressed to the NKS Secretariat, but mailed to the relevant Programme Manager (NKS-R or NKS-B).

2.3 Activity progress reporting and communication

If deviations are foreseen from the agreed activity work schedule, the Activity Leader must immediately notify the Programme Manager so that any problems may be solved and contingency plans implemented if necessary. On request, the Activity Leader is also obliged to inform the Programme Manager of the state of progress at various stages of the activity.

2.4 Progress documentation if applying for continued funding

If participants in an activity wish to apply for funding for continuation of the activity, they need to document significant progress with the ongoing work (e.g., in relation to declared milestones and deliverables) in connection with the application for continuation.

2.5 Advertisement of dissemination activities

Events like seminars, workshops, courses and exercises connected to NKS activities need to be advertised timely and efficiently to be successful. NKS Programme Managers can help Activity Leaders in advertising these, e.g., through NewsFlashes sent to subscriber lists and posted on the NKS internet site http://www.nks.org/en/news/subscribe_to_our_newsletter/. It is however the responsibility of the Activity Leader and partners to plan and execute all aspects of the activities. Seminars should generally be open and not held exclusively for a closed circle of participants.

2.6 Travel support for dissemination activities

NKS particularly encourages participation of young scientists in NKS events to maintain a high level of competence in the longer perspective, and can offer travel support for this purpose

(http://www.nks.org/en/nksr/travel_assistance/). All other costs for NKS in connection with NKS activities are to be covered by the amount approved in the contract.

2.7 Final reporting of the activity

All NKS activities, regardless of their nature, must produce a final report that should be in the standardised NKS report format (see template/instructions: report template). **Please note**, that where an activity is anticipated to continue for more than one year, a final report is expected to be delivered after each year of the activity as funding cannot be guaranteed for continuing activities. Note that Activity Leaders must also supply a filled-in bibliographic datasheet (http://www.nks.org/en/this_is_nks/administration/) together with the final report.

Final reports from research activities or exercises aimed at filling knowledge gaps or developing methodologies should be in line with standards expected for scientific publications. Final reports from exercise activities in the form of intercomparisons or proficiency tests should seek to address any discrepancies or problems highlighted by the exercise, to increase knowledge and competencies where necessary. Final reports from seminar or workshop activities should contain extended abstracts from each presenter as well as a final overview of any discussions and conclusions. Presentation slides should not be presented in final reports. Final reports for educational and training courses should contain all course documents presented as well as feedback from participants. The conclusion of any NKS activity (and thus the final payment) is subject to the approval of the final report by the Programme Manager. In addition to the final report, activity participants are urged to disseminate activity results (with due credit to NKS) in scientific journal articles as well as at conferences, seminars and workshops. The Programme Manager in charge of the activity should be notified of any dissemination efforts.

The final report can be a paper and electronic report, or only an electronic one, but in both cases the report will be formally registered at the NKS and through the international library network. Printing costs of modest paper reports can be covered centrally by NKS (there is no need to use the activity funding for this), but printing of more sophisticated reports (e.g. thick reports using colour figures) may need to be included in the budget of the activity. Information about possible printing costs can be obtained from the NKS Secretariat.

2.8 Internet hosting of NKS activity material

All final reports of NKS activities are hosted on the NKS internet site (http://www.nks.org/en/nks_reports/). In connection with NKS events like seminars and workshops it is encouraged that the Activity Leader seeks the permission of the participants to publish presentations (slides) on the NKS internet site (http://www.nks.org/en/seminars/presentations/presentations.htm). Also information on other available software (e.g., as downloads) or hardware generated by NKS activities can be hosted on the NKS internet site (http://www.nks.org/en/nksb/supporting_material/). For further information contact the relevant Programme Manager.

Travel assistance

NKS Young Scientist Travel Assistance

NKS would like to announce travel assistance for 'Young Scientists' wishing to:

- Attend NKS-B/R events as well as related non-NKS events that are held within the Nordic countries. An event is typically a seminar, conference, workshop, course or an excercise. Project Work or participation in project meetings is normally not funded. Priority will be given to 'Young Scientists' making oral and/or poster presentations.
- Attend a seminar, conference or a workshop held outside the Nordic countries. The additional criteria that then must be fulfilled is that the applicant gives an oral presentation of their Work within an NKS activity. The NKS logo has to be present on each side of the presentation.

Those wishing to claim travel assistance (for travelling to a Nordic country or to another country) must fulfill the following criteria:

- Applicants must be affiliated to an institution/organisation/university within a Nordic Country.
- Applications will only be considered for 'Young Scientists'. In this context, those studying towards a masters degree or a PhD and those in their first 4 years of their professional career after obtaining an academic degree would be considered as ‘young scientists’. A priority will be given to those below the age of 35.

Priority will be given to 'Young Scientists' making oral and/or poster presentations. Applications should be in line with appropriate travel costs (maximum award per claim of 10 000 DKK; total claims for one calendar year should not exceed 12 000 DKK). Travel assistance claims may only cover actual travelling costs (i.e. flights, trains, buses or taxis), hotel accommodation and conference fees. The number of hotel days should be related to the length of the event. It is a prerequisite that the expenses are not reimbursed to the person in question or their employer through other financing sources. Please note that daily allowance rates will not be covered by NKS. 'Young Scientists' wishing to apply for travel assistance should first contact the NKS-R Programme Manager to determine their eligibility. Only after approval from the NKS-R Programme Manager will claims for travel assistance be accepted. All applicants for travel assistance will be asked to submit a form with their claim giving details of the seminar or meeting and travel costs along with receipts for all expenses incurred.

NKS-B/R Programme Manager

nks
Nordic nuclear safety research

NKS-R STATUS REPORT

Emma Palm
NKS-R Program Manager
May 2016

Table of contents

1 Overall status summary

This report provides a short overview of the current status of the NKS-R programme. Since the last NKS board meeting in January, final reports for four of the eight NKS-R activities started in 2015 have been published on the NKS website. Contracts have been agreed and signed for seven out of eight activities started in 2016. For all activities initiated earlier than 2015, final reports have been received.

1.1 Seminars and publications

Project	Seminar date
L3PSA	Final seminar, L3PSA 2015, was held 28th of January 2016. Final seminar for L3PSA 2016 is planned for Q4 2016 or Q1 2017.
SC_AIM	Internal seminar:16 June 2016, International seminar 27-28 September 2016.

Project	Publications
ADdGROUND	*Opportunities for Source Modelling to Support the Seismic Hazard Estimation for Nuclear Power Plants", V. Jussila, L. Fülöp* has been submitted to the Nuclear Science and Technology Symposium - ST2016, in Helsinki, 2-3 November 2016 (not yet accepted).
FIREBAN	A Master thesis has been completed: Reliability of fire barriers, Erasmus Mundus Master in Fire Safety Engineering
SPARC	Takasuo, E. An experimental study of the coolability of debris beds with geometry variations. Annals of Nuclear Energy 92, 2016. pp. 251-261
	Konovalenko A., Basso S., Kudinov P., Yakush S. E., "Experimental Investigation of Particulate Debris Spreading in a Pool", Nuclear Engineering and Design, Volume 297, pp208-219, 2016
	Basso, S., Konovalenko, A., Kudinov, P. "Empirical Closures for Particulate Debris Bed Spreading Induced by Gas-Liquid Flow", Nuclear Engineering and Design, 297, 19-25, (2016)

1.2 Young scientist travel support

No requests have been received.

1.3 Published reports

The following reports have been published within the NKS reports series since the last board meeting in January:

NKS-354	2015-12-21	Learning from Successes in Nuclear Power Plant Operation to Enhance Organisational Resilience	LESUN
NKS-357	2016-01-28	Planning Safety Demonstration	PLANS
NKS-361	2016-03-15	Modelling of Digital I&C	MODIG
NKS-363	2016-04-22	Modelling as a tool to augment ground motion data in regions of diffuse seismicity	ADdGROUND

The reports listed above are all final reports for work done in 2015 within the respective activities.

2 Summary for activities initiated in 2015

Eight activities were initiated in 2015. Three of the activities were continuing activities and five were new. Four final reports are still missing.
An overview of the status of 2015 NKS-R activities is presented below in table 1.

Table 1. NKS-R 2015 activities

Activity	Description	First invoice	Report	Second invoice	Report number
ADdGROUND	Modelling as a tool to augment ground motion data in regions of diffuse seismicity	4/6	x	2/6	NKS-363
ATR-2015	Impact of Aerosols on the Transport of Ruthenium in the primary circuit of nuclear power plant	x	-	-	-
COPSAR	Containment Pressure Suppression Systems Analysis for Boiling Water Reactors	x	-	-	-
DECOSE	Debris coolability and steam explosion	x	-	-	-
L3PSA	Addressing off-site consequence criteria using level 3 PSA	x			-
LESUN	Learning from Successes in Nuclear Power Plant Operation to Enhance Organisational Resilience	2/3	x	2/3	NKS-354
MODIG	Modelling of Digital I&C	x	x	1/2	NKS-361
PLANS	Planning Safety Demonstration	3/4	x	3/4	NKS-357

ATR-2015 In April, they stated that the final report would be submitted in June 2016, and have not responded to later requests for status updates (deadline in contract is the 31 of January 2016).
COPSAR states that the work with the final report is ongoing and will be submitted in June 2016 (deadline in contract is the 31 of January 2016).
DECOSE states that the final reports will be submitted in the end of June 2016 (deadline in contract is the 31 of January 2016).
L3PSA a final report has been circulated among the project partners and their comments have been included in the report. A completing conclusions chapter for a guidance document is being finalized, and it will be sent to stakeholders for comments before publication. The final report will be submitted within June 2016 (deadline in contract is the 31 of January 2016).

For further information regarding the not finalised 2015 NKS-R projects, please see **chapter 5.**

3 Summary for activities initiated in 2016

Eight activities were started in 2016. Three of these are continuing activities and five are new. Contracts have been signed for seven of the eight activities. The contract for BREDA is missing due to the delayed start of the project and some internal work at KTH. The BREDA contract is expected to arrive in June 2016. In this chapter short descriptions are given for the activities. For more detailed status reports see **chapter 6**.

3.1 ADdGROUND

Modelling as a tool to augment ground motion data in regions of diffuse seismicity

Summary

After the Fukushima accident, seismic safety of nuclear power plants and other nuclear installations has become an increasingly important topic also in regions with low seismic activity, including the Nordic nuclear sites. The technical aim of the AddGROUND project is to build new capabilities in earthquake source modelling for ground motion simulations. The scarcity of empirical observations of near-field ground motions from large magnitude earthquakes in Fennoscandia has been an impediment for deeper understanding of the possible earthquake loading scenarios on nuclear installations, even if empirical data has been exhaustively analysed. With recent advances in computational methods, the opportunity exists for numerical models to give realistic estimates of earthquake loads. In addition to the technical outcome, the AddGROUND project also aims to establish and maintain a network of experts focused on diffuse seismicity areas of the Nordic Countries, and further enhance the cooperation between VTT and Uppsala University in the area of earthquake source modelling. A longer term aim would be to extend the cooperation to the Baltic countries. The project outcomes will support STUK and SSM, providing background information for the safety assessments of nuclear plants, but are also relevant for nuclear repositories.
For 2016 we propose moving the focus of the activity from networking and data collection to model building, testing and outputs calibration using the real measurement from seismic events. 2016 will be dedicated to model building, calibration, and outputs calibrated using the real measurement from seismic events or from artificial earthquake produced by explosions. We return to collecting additional model inputs - fault measurement, bedrock properties for building a model for estimating ground motion need to be studied only if/when modeling requirements make it unavoidable.

Activity leader

Ludovic Fülöp, VTT Technical Research Centre of Finland.

Funding

500 kDKK

Milestones

M.1. Input variable ranges for selected modelling cases.	02.2016
D.1. Conference/Magazine article on NPP seismic design in the Nordic context	03.2016
D.2. Conference paper on benchmark modelling	09.2016 / Paper submitted for review 31.05.2016

Status
Progress according to plan.
The paper *"Opportunities for Source Modelling to Support the Seismic Hazard Estimation for Nuclear Power Plants", V. Jussila, L. Fülöp* has been submitted to the Nuclear Science and Technology Symposium - ST2016, in Helsinki, 2-3 November 2016. This is an important forum for popularizing the research activity to interested stakeholders in the nuclear field (http://www.ats-fns.fi/en/nst2016). If accepted, the paper would count towards Deliverable D.2. The consortium is considering several forums for Deliverable D.2.1, ranging from more scientific ones to more "commercial" ones. It is early to decide where the results will fit, and we are also considering the expected impact/readership carefully.

3.2 BREDA_RPV

Studies of mechanical and microstructural properties of Irradiated Low Alloy Steel trepan samples from the RPV wall of Barsebäck 2

Since submitting the proposal (October 2015) for the project BREDA_RPV and the NKS board decision to fund the proposal (January 2016), BREDA has been informed that it will not be possible to reach the reactor pressure vessel in Barsebäck 2 during 2016. This prevents them from obtaining the samples from the reactor pressure vessel, which was a large part of the work planned for 2016. An updated proposal was requested from the activity leader, which was sent to the NKS-R evaluators. The four of the six NKS-R evaluators responded. Three evaluators saw no need to change their evaluation, and thought the project was still very relevant. One evaluator thought the project had a lower merit now. The coordination group discussed the evaluations at the coordination meeting in Risö 25-26 april 2016. The coordination group found, based on the overall evaluation of the NKS-R evaluators, that the BREDA project still holds merit and should be funded. Contracts have been sent out but are not yet signed.

Summary
Irradiation induced ageing of the reactor pressure vessel steel is an issue that has been closely monitored though specified ageing management programs called surveillance program. These consists of a number of capsules or container chains that are fitted onto the reactor internals of the nuclear power plant to allow for accelerated irradiation of the pressure vessel material to predict the evolution of the mechanical properties of the material as a function of the neutron dose. A number of issues remains as open, or partially closed, knowledge gaps with respect to the irradiation induced ageing of low alloy steels and the effect on the reactor pressure vessel and their fitness for long term operation. Among these issues are representativeness of the production weld test blocks that make up the surveillance programs to the actual pressure vessel welds, the effect of weld material inhomogeneity on mechanical behaviour measured as either fracture toughness or impact toughness and the attenuation, i.e. the damping of the irradiation induced defect number with increasing depth from the media touched surface of the RPV. The weld material in the Swedish reactor program contains high levels of nickel and manganese. The material has been shown to exhibit large shifts in the DBTT caused by the formation of copper-nickel-manganese-silicon agglomerates. By the closure of the nuclear units at the Barsebäck site, an opportunity has opened up to harvest samples from the reactor pressure vessels.

The weld materials are the limiting materials from a Long term operation, LTO, perspective of the pressure vessels. One issue to verify is for example if the (often separately performed) heat treatment of the surveillance samples gives representative values as compared to the real RPV wall heat treatment. Secondly, the analysis of the material degradation gradient through the depth of the RPV thickness due to irradiation would be of importance, as the embrittlement properties at a ¼ of the wall thickness is used in the reporting to the radiation safety authority (SSM). A possibility to acquire for example three or four trepan samples from locations at different axial positions, would make it possible to study the metallurgic variability as well as the different ageing phenomena from thermal and radiation induced degradation: the core region has substantial neutron flux, while the RPV top lid has a substantial thermal component while the neutron flux is orders of magnitude lower.

During 2016, base line testing will be performed at KTH and VTT on un-irradiated material retrieved from the original testing of the reactor pressure vessel. In addition, a feasibility study on harvesting of material from the reactor pressure vessel at Barsebäck will be conducted to lay the foundation for testing on irradiated material. A minimum of two trepan samples (cut-out of RPV wall) will be withdrawn from Barsebäck 2 for further transport to VTT. The deliverable for 2016 include reconstitution of the un-irradiated test samples (charpy specimen) to fracture mechanical samples for continued testing. Due to other activities at the Barsebäck plant, there is no availability of the reactor hall for trepan cutting until late 2017. A feasibility study for the extraction will lay the foundation for a timely extraction of material, given that funding can be achived for this collaborative project. The proposal is planned over 5 years, and the main deliverables, including test results from the irradiated material are to expected by 2019-2020.

Activity leader
Pål Efsing, Royal Institute of Technology (KTH)

Funding
400 kDKK

Milestones
Baseline testing on un-irradiated material.
Feasibility study on harvesting material from the reactor pressure vessel at Barsebäck.

Status
The first project phase which includes the pre-project planning and mechanical testing of unirradiated material can start at latest July 1st 2016 given that the project is funded, and that fracture mechanical specimens from base line testing are retrieved. Testing of surveillance capsules and material from the Barsebäck RPV will be dependent on the possibility that these are harvested in due time.

3.3 COPSAR

Containment Pressure Suppression Systems Analysis for Boiling Water Reactors

Since submitting the proposal (October 2015) to NKS and the evaluation of the board members and the subsequent decision to fund the COPSAR project (January 2016), the funding situation

changed dramatically for COPSAR. SAFIR reduced its overall funding which affected COPSAR and NORTHNET decided to not fund COPSAR at all. This affected the COPSAR proposal, as submitted to NKS. An updated project proposal was requested from the activity leader by the NKS-R program manager. The received updated proposal was discussed at the coordination meeting in Risö, 25-26 of April 2016. The altered funding situation affected the quantity of experiment which can be performed at the Lappeenranta university of technology, which in turn affects the available data for VTT Technical Research Centre of Finland and the Royal Institute of Technology to simulate. The quality of the project was decided by the coordination group as still being very high. Contracts have been signed.

Summary

The details of the work are described in the proposal submitted by the Contractor in the NKS-R Call for Proposals 2016.

LUT participates in the COPSAR project by carrying out thermal hydraulic experiments on the behaviour of a safety relief valve (SRV) sparger and residual hear removal (RHR) system nozzle in the PPOOLEX facility. The effectiveness of mixing a thermally stratified water pool due to injection through a sparger and RHR nozzle is studied.

In 2016, a SRV sparger test with combined steam injection through the sparger head and load reduction ring (LRR) will be carried out to provide closures for the EMS model development for spargers by KTH. Integral effects with simultaneous activation of the head and LRR can be validated against the test results.

Experiments on mixing efficiency due to water injection through a RHR nozzle will be also done in 2016. Single phase water injection through the RHR nozzle is used to mix the pool. The effect of flow rate and water temperature on mixing efficiency will be studied. The experiment data will be used by KTH to further extend and validate the concepts of the EHS and EMS models.

Milestones in October 2016:

1. Mixing tests with a RHR nozzle in PPOOLEX have been done.
2. Specifications for the combined sparger head and LRR test have been determined.

In 2016, KTH will perform pre-test analysis and simulations for selection of operational regimes and test procedures, and post-test analysis and validation with EHS/EMS models implemented in GOTHIC against PPOOLEX tests with (i) RHR nozzles, (ii) combined sparger head and LRR injection. Further development of the EHS/EMS models for spargers and RHR nozzles will be pursued to simulate dynamics of the pool mixing and stratification. The models will be validated against respective separate effect tests.

In 2016, CFD simulations of PPOOLEX experiments on SRV spargers and RHR nozzles are performed by the Contractor. Detailed model of the sparger geometry is constructed in the CFD model. A sub-model for the condensation of clouds of small vapour bubbles is used in the ANSYS Fluent code. The thermal stratification of the pressure suppression pool during steam injection into the pool is studied with CFD calculations. Suitable time interval of stratification and mixing experiment of PPOOLEX is calculated. The CFD model provides detailed information of the energy and momentum sources in the vicinity of the sparger, which can be used in the development of the EMS/EHS model for the GOTHIC code at KTH. The CFD calculations provide information on the mass and heat sources from the pool surface to the gas space of the wet well that can be used in the modelling of wet well spray experiments. The results are compared to the results obtained in the PPOOLEX experiments and to the results of GOTHIC calculations performed at KTH.

Activity leader
Markku Puustinen, Lappeenranta University of Technology.

Funding
500 kDKK

Milestones
Lappeenranta University of Technology

Deliverables of LUT in 2016:

1. A SRV sparger test with combined steam injection through the sparger head and LRR
2. Mixing tests with a RHR nozzle
3. Delivery of relevant experiment data to the simulation partners

Royal Institute of Technology:

In 2016, KTH will perform pre-test analysis and simulations for selection of operational regimes and test procedures, and post-test analysis and validation with EHS/EMS models implemented in GOTHIC against PPOOLEX tests with (i) RHR nozzles, (ii) combined sparger head and LRR injection. Further development of the EHS/EMS models for spargers and RHR nozzles will be pursued to simulate dynamics of the pool mixing and stratification. The models will be validated against respective separate effect tests.

Deliverables of KTH in 2016:

1. Pre-test analysis for selection of operational regimes and test procedures.
2. Development of the EHS/EMS models.
3. Post-test analysis and validation with GOTHIC code.
4. Reporting.

VTT Technical Research Centre of Finland

Milestone in the end of October 2016:

1. CFD model of the PPOOLEX wet well is constructed. Calculation of stratification transient is in progress.

Deliverables of VTT in the end of December 2016:

1. CFD model for the wetwell
2. Report on the calculation of a time interval of stratification and mixing experiment in PPOOLEX.

Status
Work progressing according to updated plan.

3.4 FIREBAN

Determination of fire barriers's reliability for fire risk assessment in NPP

Summary
The scope of the project is to investigate and assess the reliability of fire barriers in NPP during realistic fire scenarios to support the plant-scale risk assessment.
The objective is to establish data and methods to determine the conditional probabilities for failure of fire barrier. The Methods used will be statistics, literature review, calculation and specific unique designed fire tests.

Activity leader
Patrick van Hees, Lund University

Funding
450 kDKK

Milestones
MS1: Risk-based acceptance criteria, June 2016
MS2: Current state of the art for determination of reliability of fire barriers
First year report

Status
Work is progressing according to plan. A first Master thesis has been produced at LTH and the first action will be finished during June.

3.5 HYBRID

Development of hybrid neutron transport methods and data visualization tools

Summary
The modelling of neutron transport typically relies on two rather opposite approaches: the probabilistic approach, and the deterministic approach. The probabilistic approach or Monte

Carlo approach relies on tracking the individual lives of neutrons, and requires a large computing power for nuclear reactors. The deterministic approach, on the other hand, is based upon fast running algorithms, that solve the problem at hand in only an approximate manner. The purpose of HYBRID is to combine both approaches in order to obtain fast running methods (thanks to the deterministic route) and accurate results (thanks to the probabilistic route). One promising hybrid method is the so-called response matrix method. This method was originally derived in the early seventies in a pure deterministic sense. In the proposed project, the computation of the collision probabilities required for applying the method will be carried out using a probabilistic solver. Due to the level of details of the simulations to be performed, the development of enhanced visualization tools will be necessary as an aid to development. This will require the construction of an adequate data management system and results visualization capabilities.
In the projects initial phase, the project will aim at investigating the feasibility of the proposed hybrid method, and at demonstrating the usefulness of the fine-scale results obtained, compared to traditional coarse-mesh approaches. The project will also result in the specification of a system architecture description for visualizing the results of the hybrid calculations. Examples of implementations will also be given.

Activity leader
Christophe Demazière, Chalmers University of Technology

Funding
500 kDKK

Milestones

Tasks	*Milestones*	*Deliverables*
Determination using the Serpent Monte Carlo code of the required collision probabilities for the response matrix method	Evaluation of which collision probabilities are necessary for the required accuracy of the system Examples of simulation results obtained for small enough systems Description of the computer resources required for a full scale version of the system	Progress report summarizing the work performed and the achieved milestones to be ready by November 30, 2016
Development of a Matlab-based software for testing the response matrix method using Serpent-generated collision probabilities		
Development of data storage, transfer strategies and visualization methods to facilitate development team.	Interviewed Chalmers and VTT team participants to determine data storage, transfer and visualization requirements. Reviewed possible data	Progress report summarizing the work performed and the achieved milestones to be ready by November 30, 2016

	solutions and evaluated against requirements.	
Study with the developed test software of the dependence of the deterministic solution onto the boundary conditions applied with respect to the spatial, angular, and energy dependence	Assessment of the dependence of the Monte Carlo solution onto the types of boundary conditions applied with respect to the spatial, angular, and energy dependence	Progress report summarizing the work performed and the achieved milestones to be ready by December 31, 2016
		Final report to be ready my January 31, 2017

Status

Chalmers :

- The project formally started on week 15 with an MSc student working 50% of his time on the project as part of his MSc thesis work. The student will work 100% on the project from the summer.
- Contacts have been taken with VTT in order to discuss how to estimate the probabilities necessary for the application of the response matrix method.

IFE:

- Interviews of MSc thesis students will take place on week 21. The selected MSc thesis student will start working this summer on the project.

VTT:

- Discussions with Chalmers are on-going in order to provide the probabilities required for the application of the response matrix method.

3.6 L3PSA

Addressing off-site consequence criteria using Level 3 PSA

Summary

Level 3 PSA provides a tool to assess the risks to society posed by a nuclear plant, and could be useful in making objective decisions related to the off-site risks of nuclear facilities. The intention of this study was to further Nordic understanding of the potential of Level 3 PSA to determine the influences and impacts of off-site consequences, the effectiveness of off-site emergency response, and the potential contributions of improved upstream Level 1 and Level 2 PSAs. Many activities will be completing in 2015 or and continuing during 2016

- During 2016 further IAEA work will be performed which the Level 3 PSA project's working group has worked within during the duration of the project.
- The ANS/ASME standard has cleared passed the necessary voting measures and after updates should be available for trial use within the year.
- The possibility to new recommendations from the Swedish Radiation Safety Authority may also come in the next year.

The proposed work for 2016 is a minor addition and will provide resources for the following:

- The continuation of the international cooperation that started during the first 3 years
- Articulate updates and provide interpretation to the many changes in the field
- 1-day workshop involving all stakeholder and working group members.

Activity leader
Andrew Wallin-Caldwell Lloyd's Register Consulting

Funding
140 kDKK

Milestones
1-day seminar Q4 2016 or Q1 2017.
2016 report provided in Q1 of 2017.

Status
There are several ongoing activities which the working group is monitoring while the 2015 activities are being finalized:

- No planned IAEA activities are made for 2016 due to agency budget constraints.
- Some exploratory work is being made at the OECD NEA WGRISK group regarding Level 3 PSA.
- The USNRC project on Level 3 PSA is being finalized, but NRC review usually takes some time, so it is not expected that significant documentation will be made available for some time.
- The ANS/ASME Level 3 PSA standard has been balloted an additional time. Minor changes have been made and it appears that the standard will be published in the "near future", something that did not seem likely even recently.

The project has interfaced extensively with the parallel NKS project NORCON, which has been very beneficial to the project. This has included meetings between working group members for each of the projects discussing in particular the NORCON study and Swedish Level 3 PSA Pilot Study.

3.7 SC_AIM

Safety culture assurance and improvement methods in complex projects

Summary
The concept of Safety Culture was first coined to explain the Chernobyl nuclear accident in the late 1980s. From the very beginning, the concept aimed at highlighting and illustrating that safety cannot ever be guaranteed by technical means alone, but rather safety

depends heavily on management, leadership, and so called human and organizational factors. Culture is repeatedly created and recreated as members behave and communicate in ways that seem natural, obvious, and unquestionable to them (Reiman & Rollenhagen, forthcoming). Despite a long research tradition, there is a large variance in conceptualisations of safety culture, ranging from descriptive studies on the social construction of safety to normative models of ideal safety culture/climate dimensions. Empirical studies of culture improvement in the safety field are scarce (Hale et al. 2010), especially in comparison to the amount of research on identifying the elements of safety culture or evaluation of safety culture. Major projects in the nuclear industry are typically carried out by networks of companies. Current safety culture and safety management models and practices are largely focused on single organisations and it is far from clear how to apply them in the dynamically changing project networks. Traditional cultural approaches emphasize that it takes time and certain amount of continuity to create a culture, both of which are in short supply in projects with short time frames, diversity in both personnel and companies involved, and often a high personnel turnover. Antonsen (2009) highlighted that safety culture studies seem to embody a harmonious view of the organization to be analyzed. Several issues remain unanswered, e.g., what should a safety culture improvement or assurance program be like in an "organization", which is actually a dynamic network of actors from different companies? How to utilize the concept of safety culture in network and project settings?

A basic premise of the project is that so far there has been a lot of attention on how to diagnose and evaluate safety culture, but not so much on how to actually improve the safety culture. A second premise is that improvement of safety culture in projects sets some unique requirements due to e.g. multiple organizations interacting, diverse background of personnel, schedules and contract issues etc. The same methods may not work that have been applied in operating power plants. Further, the long supply chains and the licensee's responsibility to oversee the safety culture of the entire network put more demands on safety culture assurance methods.

The project is planned as s two years' effort (2016-2017) and has two aims:
1. To identify and specify methods to improve and facilitate safety culture in complex projects
2. To identify and specify methods to assure safety culture in complex projects

The different ways of improving / facilitating safety culture can be for example the use of safety culture ambassadors, learning from experience, tool box talks, pre and post job briefs, cross-organizational working groups, and training.
Assurance methods can include auditing, self-assessment and independent assessment as well as questionnaires.

Activity leader
Elina Pietikäinen, VTT Technical Research Centre of Finland.

Funding
410 kDKK

Milestones

Milestone / deliverable	Planned completion date	Status
Workshop on safety culture methods	June 2016	Preliminary agenda has been drafted, invitations sent for relevant parties and practicalities handled. The workshop will be held in Stockholm on 16.6.
International workshop	October 2016	Preparations are on-going, the workshop is planned to be held at the same time as HUSC seminar (27.-28.9.) in Finland
Conference paper or article	November 2016	Not yet started, the content of the scientific publication will be internally discussed in project workshop and other meetings.
Intermediate report	December 2016	Literature review has been nearly completed and will be integrated into the intermediate report.

Status

Overall, the project is progressing according to plan. In February and March 2016, VTT carried out interviews in the Finnish case study at Fennovoima (10 interviews in total). The data has been summarized and is being analysed. In parallel to the empirical studies, a literature review has been carried out (VTT and Vattenfall jointly). Another primary source of empirical data comes from a seminar organized by Carl Rollenhagen (Vattenfall) with a topic of project management and safety culture, which is being prepared for. Furthermore, we have been in close contact with representatives from two Swedish nuclear organizations (SKB and Forsmark) that will function as information exchange partners. In addition, an information exchange partnership with Fortum is planned and currently under discussion. Currently we are preparing for the internal project workshop to be held in 16.6.

3.8 SPARC

Scenarios and Phenomena Affecting Risk of Containment Failure and Release Characteristics

Summary

A robust severe accident management strategy is paramount for minimizing the environmental impact in the case of a severe accident involving melting of a reactor core. Both physical phenomena (deterministic) and accident scenarios (stochastic) are sources of uncertainties in the assessment of effectiveness of the accident mitigation. Adequate approaches are necessary in order to address both deterministic (epistemic) and stochastic (aleatory) sources of uncertainty in a consistent manner.

KTH, VTT and LRC have been active in addressing phenomenological and scenario uncertainties in severe accidents in the framework of national programs such as APRI-MSWI, SAFIR, NPSAG, NKS-DECOSE and NKS-DPSA, European FP7 and Horizon2020 projects SARNET, SAFEST, CESAM, IVMR and in direct collaboration with nuclear power utilities and regulators.

WP1: Development and application of risk oriented accident analysis framework (ROAAM+) for prediction of conditional containment failure probability for a Nordic type BWR. (KTH)

WP2: Development of the methods for coupling of Integrated Deterministic Probabilistic Safety Analysis tools such as ROAAM+ developed by KTH with PSA in general and PSA-L2 in particular. (LRC).

WP3: Deterministic modelling of core degradation, melt relocation, vessel failure, debris spreading and coolability. (VTT).
WP4: Analysis of the factors that affect the energy (temperature), altitude and probability of the release in PSA-L2. The input is from KTH, LRC and VTT analysis in WP1, WP2 and WP3. (VTT).

Activity leader
Pavel Kudinov, Royal Institute of Technology.

Funding
600 kDKK

Milestones
KTH

In 2016 *KTH* work will be focused in WP1 on Tasks 1, 2 and 3 with the following deliverables:

1. Development and validation of detailed (full) deterministic models for analysis of severe accident phenomena in Nordic BWRs.
2. Development and application of computationally efficient surrogate models for uncertainty and risk analysis.
3. Collaboration with VTT and LRC on cross code comparison, code validation, and development of approaches to informing PSA with the ROAAM+ framework results.
4. Reporting of the results.

VTT

In 2016 in WP3 VTT will focus on Task 3 and 4 with the following deliverables:

1. Analyses of debris bed temperature in post-dryout conditions (for developing temperature-based coolability criterion).
2. Exploring accident scenarios that may lead to hydrogen explosions with MELCOR.
3. Comparison of obtained results with KTH and LRC data.
4. Reporting of the results (Milestone 1).

In WP4 VTT will focus on Task 1 and 2 with the following deliverables:

1. PSA-L2 analysis results addressing important factors for release characteristics.
2. Consideration of at least one relevant phenomenon, e.g. steam or hydrogen explosions.
3. Reporting of the results (Milestone 2).

Lloyd's Register Consulting

In 2016 *LRC in* WP2 will be focused on Task 1 and 2 with the following deliverables:

1. PSA-L2 analysis results addressing important factors for the release characteristics.
2. Consideration of the relevant phenomena, namely steam and hydrogen explosions.
3. Reporting of the results.

Status
Overall the project is work is going according to plan.

4 Overview of all NKS-R activities 2010-2015

It is seen from the table below that all activities started in 2014 and earlier have been finalised. An activity is considered to be started at the January board meeting, and ended when the final report has been delivered.

Activity	NKS number	Started	Ended
Decom-sem	NKS_R_2010_83	01/2010	12/2010
DIGREL	NKS_R_2010_86	01/2010	12/2010
IACIP	NKS_R_2008_61	01/2010	12/2010
INCOSE	NKS_R_2009_75	01/2010	05/2011
MOSACA10	NKS_R_2008_69	01/2010	01/2011
NROI	NKS_R_2008_70	01/2010	04/2011
POOL VTT	NKS_R_2007_58	01/2010	05/2011
POOL KTH	NKS_R_2007_58	01/2010	06/2011
POOL LUT	NKS_R_2007_58	01/2010	03/2011
AIAS	NKS_R_2011_98	01/2011	12/2012
DIGREL	NKS_R_2010_86	01/2011	01/2012
ENPOOL	NKS_R_2011_90	01/2011	03/2012
ENPOOL	NKS_R_2011_90	01/2011	05/2012
ENPOOL	NKS_R_2011_90	01/2011	05/2012
MoReMO	NKS_R_2011_95	01/2011	02/2012
NOMAGE4	NKS_R_2008_63	01/2011	11/2011
POOLFIRE	NKS_R_2011_96	01/2011	02/2012
SADE	NKS_R_2011_97	01/2011	03/2012
RASTEP	NKS_R_2010_87	06/2011	09/2012
AIAS	NKS_R_2011_98	01/2012	06/2013
DECOSE	NKS_R_2012_100	01/2012	07/2013
DIGREL	NKS_R_2010_86	01/2012	02/2013
ENPOOL VTT	NKS_R_2011_90	01/2012	04/2013

ENPOOL LUT	NKS_R_2011_90	01/2012	03/2013
ENPOOL KTH	NKS_R_2011_90	01/2012	05/2013
MoReMO	NKS_R_2011_95	01/2012	03/2013
Nordic-Gen4	NKS_R_2012_103	01/2012	11/2012
POOLFIRE	NKS_R_2011_96	01/2012	02/2013
RASTEP	NKS_R_2010_87	01/2012	10/2013
SADE	NKS_R_2011_97	01/2012	03/2013
Decom-sem	NKS_R_2013_106	01/2013	02/2014
DECOSE	NKS_R_2012_100	01/2013	10/2014
DIGREL	NKS_R_2010_86	01/2013	03/2014
DPSA	NKS_R_2013_107	01/2013	07/2014
ENPOOL	NKS_R_2011_90	01/2013	10/2014
Exam HRA	NKS_R_2013_110	01/2013	03/2014
HUMAX	NKS_R_2013_108	01/2013	02/2014
L3PSA	NKS_R_2013_109	01/2013	03/2014
POOLFIRE	NKS_R_2011_96	01/2013	12/2014
SADE	NKS_R_2011_97	01/2013	02/2014
ATR	NKS_R_2014_111	01/2014	06/2015
DECOSE	NKS_R_2012_100	01/2014	07/2015
DIGREL	NKS_R_2010_86	01/2014	02/2015
DPSA	NKS_R_2013_107	01/2014	08/2015
ENPOOL	NKS_R_2011_90	01/2014	07/2015
HUMAX	NKS_R_2013_108	01/2014	01/2015
L3PSA	NKS_R_2013_109	01/2014	04/2015
Nordic-Gen4	NKS_R_2012_103	01/2014	02/2015
ProCom	NKS_R_2014_112	01/2014	03/2015
ADdGROUND	NKS_R_2015_113	01/2015	04/2016
ATR-2015	NKS_R_2014_111	01/2015	Unfinished
COPSAR	NKS_R_2015_114	01/2015	Unfinished
DECOSE	NKS_R_2012_100	01/2015	Unfinished
L3PSA	NKS_R_2013_109	01/2015	Unfinished
LESUN	NKS_R_2015_115	01/2015	12/2015
MODIG	NKS_R_2015_116	01/2015	03/2016
PLANS	NKS_R_2015_117	01/2015	01/2016

5 Status 2015 activities

5.1 ATR-2015

Status as of the 22nd of April, activity leader has not responded to request for updated status.

Description of the work done during the work period (16.11.2015 – 22.4.2016)

The aim in NKS-R ATR activity during 2015 was to study the effect of representative air radiolysis products (N2O, NO2, HNO3) and aerosols (CsI; Ag was studied in 2014) on the transport of gaseous and particulate ruthenium through a model primary circuit. The experiments were performed at VTT Technical Research Centre of Finland Ltd by PhD students Teemu Kärkelä (VTT) and Ivan Kajan (Chalmers University of Technology). Ivan Kajan visited at VTT, when the experimental phase of the project was ongoing.

VTT's Ru transport facility was modified for the experiments in order to be able to feed gaseous additives after the vaporisation crucible filled with RuO2 powder. The experiments were performed at 1300K, 1500K and 1700K oxidation temperatures. After the release of ruthenium oxides from the crucible, the additional air radiolysis products and aerosols reacted with the vaporised Ru species. The reaction products were transported through the facility by the carrier gas flow of air and nitrogen. Aerosols were collected on a plane filter and gaseous products were trapped in NaOH solutions. Aerosols were also analysed with online devices, such as TEOM, ELPI and SMPS. The devices gave information on the number/mass concentration of particles, as well as, on the variation of the total mass concentration of particles in the experiments.

In total eleven experiments were performed. The most interesting result was the effect of oxidising NO2 on the transport of Ru. It seemed that NO2 was able to oxidise RuO3 within the facility to RuO4. And thus a significant concentration of gaseous RuO4 was observed at the outlet of the facility simulating containment atmosphere conditions. Similar outcome was also observed when CsI particles were fed into the flow of vaporised Ru oxides. The effect of other additives was not as prominent.

Deviations from set objectives:

There is no deviations to the project plan. Two extra tests were completed in addition to the experimental plan.

Results produced during the performance period
As result of 2015 experiments, two journal publications are prepared. The first one is dedicated on the study of N2O, NO2, HNO3 effects on rutheniu transport and the topic of the second one is the influence of CsI on Ru chemistry.

The results have been presented in the NKS seminar in Denmark during August 2015. An abstract has also been submitted to NENE2016 conference, but there is no information on the approval yet.

The results from ATR project has received internationally attention and the current OECD/NEA STEM-2 program has updated their experimental plan due to the outcomes of

ATR activity. In STEM-2 the plan is to perform similar experiments, e.g. they will study the effect of NO2 on the transport of Ru.

ATR activity under NKS-R programme has produced new information on the behaviour of Ru. The results have pointed out that the transport of radiotoxic gaseous Ru to the containment atmosphere can be significantly higher than what has been expected based on the thermodynamical equilibrium calculations. Especially the effect of air radiolysis products on Ru chemistry has been a crucial piece of information when considering a severe accident. This information has stirred up renewed discussion on the importance of Ru when considering source term. New experiments on the chemistry of Ru are being planned by other organisations as well.

Scheduling situation
The final results will be reported to NKS latest in June 2016.

5.2 COPSAR

Work at LUT

Deliverable 1: Experiments with a SRV sparger and RHR nozzles
Two SRV sparger tests, SPA-T1 and SPA-T7, were carried out in the PPOOLEX facility. Test specifications were decided together with KTH on the basis of earlier tests and pre-test simulations. In SPA-T1 part of the injection holes at the sparger head were blocked and in SPA-T7 all the holes at the sparger head were blocked but the injection holes of the load reduction ring (LRR) were open. Steam injection directed downwards from the LRR effectively mixed the pool even with quite a small flow rate. The report on the experiments was delivered on April 21st, 2016.

Deviation from the plan: The sparger test SPA-T7 replaced the single phase water injection test originally planned for 2015. Additional data on the behavior of the sparger with injection through the LRR was considered more useful for the development of the EMS model than the single phase water injection data. The change in the plan was discussed and agreed in the SAFIR2018 Reference Group 4 meeting. RG4 supervises the work done in the SAFIR2018/INSTAB project.

Deliverable 2: Designing spray injection systems for the PPOOLEX facility
Information on different spray systems in Nordic power plants was gathered. A preliminary design of the spray system to be installed to the PPOOLEX facility was drawn. *Note: Studies on the operation of a spray system in PPOOLEX were postponed in 2016 to later years due to unavailability of NORTHNET funding for 2016.*

Deliverable 3: Single spray nozzle experiments in a separate test facility
Droplet size measurements of a single spray nozzle with the help of the shadowgraphy application (light diffuser and software upgrade) of the PIV system in different flow conditions in an open test environment (no walls) were done. Some preliminary tests in a steam environment were done, too. The test environment was then developed to better suit for spray nozzles with a larger injection capacity and some additional tests were carried out. Five

different measurement positions underneath the spray jet were used. The majority of the droplets were in the size range of 0.2-0.8 mm in the centerline positions whereas the droplet distribution was broader in the two other positions, which were 300 mm away of the centerline axis. The report on the tests was delivered on April 21st, 2016.

Deliverable 4: Delivery of relevant experiment data to the simulation partners.
Measurement data and video clips of the SPA-T1 and SPA-T7 tests with a SRV sparger have been delivered to KTH and data of the shadowgraphy measurements of the first single spray nozzle injection tests have been delivered to VTT.

Work at VTT

Deliverable 1: Improved condensation model for vapour on spray droplets
The submodel developed earlier for the evaporation and condensation model for spray droplets has been transferred to new version of ANSYS Fluent. Since no experiments with spray and steam were performed during 2015 at LUT and no experiments will be performed in 2016. Therefore, much smaller amount of work than was originally planned was done on this topic. The resources were transferred to modelling of the single spray nozzle experiments (Deliverable 2).

Deliverable 2: CFD calculation of the single spray nozzle experiment performed at LUT
Modelling of single spray nozzle experiments has been performed. CFD models for two experimental configurations have been constructed. CFD calculations for two spray nozzles have been performed by using available information on the properties of the nozzles. Model for the size distribution of the spray droplets has been constructed based on the preliminary information from the LUT experiments and literature data. Report has been written on the simulations performed for two spray nozzles in two different test configurations.

Deliverable 3: CFD model for the PPOOLEX facility with spray systems and pre-calculation of experiments
Four spray nozzles have been included in the wetwell compartment of the CFD model of the PPOOLEX facility. The properties of the nozzles and droplets have been chosen based on the simulations of separate effect tests for the spray nozzles. Pre-calculation of PPOOLEX spray experiments has been performed, where the effect of the sprays on the thermal stratification of the wetwell water pool was studied. Report on the calculation has been written.

Deliverable 4: Reports on the single spray nozzle calculations and PPOOLEX pre-test calculations
Report on the single spray nozzle experiments and report on the pre-calculations of the PPOOLEX spray experiments have been written. They will be submitted to NKS on 6th of June, 2016.

Work at Royal Institute of Technology (KTH)

Deliverable 1: Contribution to selection of the design of the spray injection systems for the drywell and wetwell of the PPOOLEX facility

Information on spray nozzle models, nozzle diameters, droplet diameters, droplet distributions, mass flow rates, and jet expansion angles that has been obtained from literature. Discussion with LUT on the selection of the design has been carried out.

Deliverable 2: Pre-test analysis for selection of operational regimes and test procedures
Scaling and pre-test analysis for tests with pool mixing by RHR nozzles has been performed. A preliminary test matrix has been proposed to LUT.

Deliverable 3: Post-test analysis and validation with GOTHIC code on spray
No progress.

Deliverable 4: Post-test analysis and validation of EHS/EMS on spargers and RHR nozzles
Post-test analysis and preliminary validation of the EHS/EMS models for spargers has been carried out against the PPOOLEX SPA-T3, T4, T1 and T7 tests. Further development of the EMS model for spargers is ongoing as well as the validation of the EHS/EMS models against the remaining SPA tests.

Preparation of the report is ongoing and will be submitted by June 2016.

5.3 DECOSE

Work at Royal Institute of Technology (KTH)

1. Joint analytical activity on debris bed coolability which will include: code–to–code comparison, development of recommendations and best practice guidelines for simulations, defining reference cases for coolability analysis in plant accident conditions, post-test analysis and code validation against COOLOCE data and pre-test analysis to determine conditions for the future COOLOCE experiments (Tasks 7). Validation of the DECOSIM code against existing COOLOCE data with different configurations of debris bed has been carried out. The simulations showed that dryout conditions are very sensitive to particle diameter and porosity of the bed. Generally, reasonable agreement between simulations and experiments was achieved. DECOSIM analysis of debris bed coolability were carried for different ranges of debris bed configurations in pre and post-dryout conditions. The function describing the dependence of dryout heat flux on the width-to-height ratio was found for each shape. A surrogate model for 2D debris bed coolability is developed applicable to wide range of debris bed shapes, properties, and system conditions. The dependence of dry zone size and maximum temperature on problem parameters was obtained. It was shown that temperature can be stabilized by vapor cooling, provided that the size of dry zone is limited. It was shown that the relative size of dry zone is a linear function of relative heat flux excess above the dryout heat flux, and various geometric configurations can be described in a unified manner. On the basis of these findings, a surrogate model for post-dryout debris beds is suggested.
Reporting of the work and code–to–code comparison for the selected cases and development of recommendations and best practice guidelines for simulations is ongoing.

2. Investigation of particulate debris spreading, PDS-C tests and PDS-P (pool) tests on particulate debris spreading in a pool (Task 4).

Extensive series of PDS-C (Particulate Debris Spreading – Closures) tests on self-levelling of the debris bed provided data for development of scaling approaches and empirical closures that have been implemented in a model for particle mass flow rate. The model has been implemented in the DECOSIM code. Analysis has been carried out for selected severe accident conditions of the Nordic-type BWR. A series of tests on the debris spreading driven by large turbulent flows in the pool (PSD-P) has been carried out. Further experimental work is required in order to cover wider ranges of pool configuration, particle properties and debris release conditions. The preliminary work on validation of the DECOSIM code against PDS-P experimental has been performed. Generally, good agreement between the simulated and measured data is observed for both steel and glass particles. Parity plots (experimental vs simulated results) show that DECOSIM predicts the mean spreading distance within 20% accuracy on average. Reporting of the work is ongoing.

3. Investigation of the effect of the particle size on the DHF in POMECO-HT and POMECO-FL (Task 1d).
Small particle beads used in COOLOCE facility to clarify the effect of the particle size and morphology on the DHF were delivered to KTH. A confirmatory test in POMECO-HT facility is planned. Reporting of the work is ongoing.

4. DEFOR-A series of tests with corium simulant material on debris bed formation (Task 2).
New DEFOR-A tests are under preparations. Reporting of the work is ongoing.

5. Application of MC3D and TEXAS-V to analysis of steam explosion in a BWR containment (Task 8).
TEXAS-V model complemented with an impulse propagation approach to estimate explosion loads at the pedestal wall and on the containment floor has been developed and used for generation of the database of steam explosion solutions for different combinations of the input parameters. In order to address significant variability of explosion impulse with respect to the triggering time a statistical characterization of the explosion energetics for a single melt release scenario was introduced. The non-influential input parameters of the Full Model were screened out based on detailed sensitivity study with the Morris method. A large database of FM solutions was then generated and used for the development of a Surrogate Model (SM). The Surrogate Model reproduces with sufficient accuracy statistical characteristics of the Full Model solutions, providing much higher numerical efficiency. This SM has been implemented in the latest version of ROAAM+ and used for failure domain analysis for Nordic BWRs. Reporting of the work is ongoing.

6. Reporting of the POMECO-FL, POMECO-HT and PDS experiments and code development results.
Reporting of the work is ongoing.

Work at VTT Technical Research Centre of Finland Ltd DECOSE-NKS and SAFIR2018:

1. Joint analytical activity on debris bed coolability (Task 7).
Simulations of the debris bed geometry variations were continued using MEWA, including sensitivity studies of the unheated layer in the case of the side-only flooded cylinder and a BWR case with a heapshaped bed. The sensitivity study showed somewhat similar behaviour

as DECOSIM, i.e. the dryout power depends on the presence or thickness of the unheated layer. The large-scale BWR simulation showed similar dryout characteristics as the small-scale simulation of the conical bed experiment, also in post-dryout conditions. These results have been described in a doctoral thesis published in October 2015. Guidelines and details helpful for the validation of simulation codes using the COOLOCE experiments were given in the thesis. The main results of the doctoral thesis were: 1) the coolability of the debris bed depends on both the flooding mode and the height of the bed; 2) multi-dimensional flooding increases the dryout heat flux and coolability in a heap-shaped debris bed by 47–58% compared to the dryout heat flux of a classical, top-flooded bed of the same height; 3) heap-like beds are higher than flat, top-flooded beds, which results in the formation of larger steam flux at the top of the bed, this counteracts the effect of the multi-dimensional flooding; 4) the maximum height of a heap-like bed can only be about 1.5 times the height of a top-flooded, cylindrical bed in order to preserve the direct benefit from the multi-dimensional flooding.

2. Steam explosion analysis using the MC3D code to analyze steam explosion in a BWR containment (Task 8).
The objective was to evaluate the effect of some key input variables to the pressure loads induced by steam explosions. Simple MELCOR calculations have been made in order to find realistic boundary condition limits for the sensitivity analysis in the reactor application. However, melt temperature in the lower plenum according to MELCOR results was considered too low (2250K–2300K). This is because part of the melt was assumed to be debris. Temperatures more close to oxide melting temperatures were used in the analyses. In the MC3D simulations, three different breaking locations were evaluated starting from central break continuing sideways. The selected parameters for the sensitivity analysis were drop size (1 mm, 2.5 mm, 3 mm, 4 mm, 6 mm, 8 mm), water level in drywell (6 m, 8m and 12 m), melt temperature (2900K, 2950K 3000K, 3050K and 3100K) and coolant temperature (subcooling of 0K and 50K) In each case for the comparison was selected the triggering time yielding the strongest explosion. What comes to the maximum pressures on wall, it was difficult to observe consistent behaviour when changing an input parameter. However, when analysing maximum impulses it was possible to make some conclusions. Maximum impulses were always located to the bottom corner of the drywell and explosions became weaker with decreasing water level as well as with decreasing melt temperature. The results are collected to a master's thesis that is currently under review.

Status of all tasks from previous years
Task 1. Investigation of the effect of the bed geometry and particle size on coolability in 2D debris bed
Synthesis of the COOLOCE experiments performed 2011-2014 is being prepared to combine the results from all six debris shape variations: conical, truncated cone, cylindrical with top flooding, cylindrical with lateral flooding, cylindrical with an agglomerate simulant and cone on a cylindrical base. The geometries which allow multi-dimensional flooding generally have greater dryout power compared to geometries in which the water infiltration into the debris bed is limited by closed walls. On the other hand, it is emphasised that the coolability is strongly dependent on the height of the debris bed and, according to the experiments and the simulations; the effect of the bed height is often greater than the effect of the flooding mode.

Task 2. Investigation of the effect of debris agglomeration on coolability

The effect of agglomerate was studied in the COOLOCE-11 experiments performed in 2013. When comparing the results to previous experiments it was found out that the bed with both top and lateral flooding had the best coolability: the measured dryout heat flux (DHF) was 50-70% greater than the DHF of the test bed with top flooding only. Also, the test bed with the agglomerate simulant had better coolability than the top-flooded test bed, with 10-40% greater DHF. These results are also discussed in the synthesis performed in the frame of Task 1.
Task 3. Investigation of the effect of initial pool subcooling on coolability. The effect of initially subcooled water pool was analysed in the COOLOCE-9 experiments. The experiments suggest that the subcooling may increase dryout heat flux and increase coolability. A synthesis of the results is included in the 2014 report.

Task 4. Investigation of particulate debris spreading
No planned activities due to reductions in funding for SAFIR2018.

Task 5. Investigation of the effect of the heaters' geometry on the DHF
The effect of heater´s geometry will be assessed performing experiments in the POMECO-HT facility with the same ceramic beads as used in the COOLOCE experiments. The debris bed material has been received by KTH.

Task 6. Development of advanced instrumentation
No planned activities due to reductions in funding for SAFIR2018.

Task 7. Joint analytical activity on debris bed coolability
The experimental results, particularly the comparisons of dryout heat fluxes in all six geometries, were collected in a manuscript which has been submitted to Annals of Nuclear Energy.

Task 8. Analysis of steam explosion in a Nordic BWR containment
MC3D and TEXAS have been applied to analysis of steam explosion in Nordic BWR conditions. Results are summarised in the reports.

Overall Project Summary
Comparison between plans and results with explanation of any deviations:
There are no major deviations between plans and results except for:
- Additional experiments with COOLOCE facility at VTT (Task 2, Task 3, and Task 4) will not be performed due to the reduction of funding in SAFIR2018. Instead the focus will be on analytical activities and application of the validated codes to prototypic plant conditions.
- New experiment in DEFOR-A and POMECO are delayed and will be carried out during July – September 2016 due to current lack of manpower.
- Expected date for submitting the reports for 2015 is in the end of June 2016.

5.4 L3PSA

Over the course of the project many activities were undertaken and completed. The first activities in the project (starting in 2013), were mostly exploratory in nature and included an industrial survey, an investigation of appropriate risk metrics, and participation in the development of guidelines and standards. The later stages of the 3-year project focused on application through two concurrent pilot studies, and the development of a guidance document.

The 3rd year project seminar was held on January 28th 2016. The pilot project was split amongst a Finnish Project, and a Swedish Project. The Finnish project had been underway since 2013, while the Swedish project started in earnest during the second year of the project (2014). The Finnish project was completed during 2014, and the Swedish pilot was completed in January 2016.
A completed draft of the guidance document was provided to stakeholders on the 15th of December, one month prior to the 3rd year seminar. This draft did not, however, include a draft conclusion section. Report comments were received from Ringhals Nuclear Power Plant and the Swedish Radiation Safety Authority, by mid-March 2016. The working group has incorporate comments, and is currently completing the conclusions for the guidance document, where stakeholders will provide final comments to the conclusions before the first publication.

6 Status 2016 activities

6.1 ADdGROUND

Modelling as a tool to augment ground motion data in regions of diffuse seismicity
Activity leader: Ludovic Fülöp (VTT), May 31th, 2016

Introduction/Scope
After the Fukushima accident, seismic safety of nuclear power plants and other nuclear installations has become an increasingly important topic also in regions with low seismic activity, including the Nordic nuclear sites.
The technical aim of the AddGROUND project is to build new capabilities in earthquake source modelling for ground motion simulations. The scarcity of empirical observations of near-field ground motions from large magnitude earthquakes in Fennoscandia has been an impediment for deeper understanding of the possible earthquake loading scenarios on nuclear installations, even if empirical data has been exhaustively analysed. With recent advances in computational methods, the opportunity exists for numerical models to give realistic estimates of earthquake loads. In addition to the technical outcome, the AddGROUND project also aims to establish and maintain a network of experts focused on diffuse seismicity areas of the Nordic Countries, and further enhance the cooperation between VTT and Uppsala University in the area of earthquake source modelling.
A longer term aim would be to extend the cooperation to the Baltic countries. The project outcomes will support STUK and SSM, providing background information for the safety assessments of nuclear plants, but are also relevant for nuclear repositories.

Foreseen milestones and deliverables

	Date
M.1. Input variable ranges for selected modelling cases.	02.2016
D.1. Conference/Magazine article on NPP seismic design in the Nordic context	03.2016
D.2. Conference paper on benchmark modelling	09.2016 / Paper submitted for review 31.05.2016
Final report	

Technical progress
The main progress item in AddGROUND is the realization of M1 and the submission of a conference paper, which is accepted, can count towards fulfilling D2. After the calibration work with measured data in 2015, the consortium agreed to move to hybrid modelling of earthquake scenarios deemed to be possible in the Fennoscandian context. The following variable ranges were decided (**Deliverable M.1**):

Hybrid means that slip on the seismic fault is modelled by dynamic modelling. Hence, the fault and its immediate vicinity are modelled in software respecting mechanical (i.e. stress strain) compatibility on the fault. The target is to develop this model to cover the frequency range up to 20Hz and so the fault has to be modelled with very good resolution, leading to very large models. Due to the very large models only the immediate vicinity of the fault can be discretised, and the vibration propagation cannot be modelled. 3DEC is the software of choice for the dynamic part of the model.

We extract the displacement/fault-slip data from the dynamic model and use it as an input in a kinematic model. This model is used to predict the vibration propagation away from the fault. The Compsyn software and capabilities developed in AddGROUND-2015 are used for this section. Since the modelling here is not FEM or FDM based, there is no problem with the discretization of large area around the epicentre leading to huge numerical models. We can extend observations to 10, 20, 40 even 80km distance range.

Hence this hybrid modelling technique overcomes to computational limitations related to this complex problem. Both the fault movement and the vibration propagation can be modelled realistically.

The method is being benchmarked on a calculation case. Later, a couple of magnitude 5.2+ earthquake fault scenarios will be chosen. This corresponds to a fault size in the range of 4x4km, 5x5km. Strike-slips and reverse faults will be studied, without the faults rupturing the ground surface. The fault types will be selected compatible with the stress state in the crust in Fennoscandian.

Some variation of the scenarios using the faults will be parametrically studied (e.g. varying depth of the fault, dip orientation, rake-direction, discontinuities on the fault, etc.). But, since there is still a step of "manual" data transfer between 3DEC and Compsyn we cannot carry out a very large parametric study.

Progress towards deliverables
The paper *"Opportunities for Source Modelling to Support the Seismic Hazard Estimation for Nuclear Power Plants", V. Jussila, L. Fülöp* has been submitted to the Nuclear Science and Technology Symposium - ST2016, in Helsinki, 2-3 November 2016. This is an important forum for popularizing the research activity to interested stakeholders in the nuclear field (http://www.ats-fns.fi/en/nst2016). If accepted, the paper would count towards Deliverable D.2. The consortium is considering several forums for Deliverable D.2.1, ranging from more scientific ones to more "commercial" ones. It is early to decide where the results will fit, and we are also considering the expected impact/readership carefully.

6.2 BREDA_RPV

Studies of mechanical and microstructural properties of Irradiated Low Alloy Steel trepan samples from the RPV wall of Barsebäck 2

Due to the time schedule and the changes of the activities during 2016, the project is not scheduled to start up until 1st of July 2016. Thus no firm activities apart from project planning and discussion regarding the test material and test matrix for the fracture mechanical testing of un-irradiated material has been undertaken. Material to test in the baseline experiments, utilizing specimens from the original baseline impact tests during the manufacturing of the reactor pressure vessel of Barsebäck 2, has been identified and collected. The signing of the contract is currently held up by the internal process at KTH, but is expected to be conducted with-in the first half of June. A start-up meeting regarding the fracture mechanical testing will be held at VTTs offices in Esbo, Finland at the 13th of June involving the partners from VTT/Aalto University and KTH.

6.3 COPSAR

Containment Pressure Suppression Systems Analysis for Boiling Water Reactors

Work at LUT
Deliverable 1: A SRV sparger test with combined steam injection through the sparger head and LRR
The test, where the effect of combined injection of steam through the sparger head and load reduction ring is studied, will be carried out in autumn after the RHR nozzle tests have been finished. Expected submit date of the report is December 31st, 2016.

Deliverable 2: Mixing tests with a RHR nozzle
Three RHR nozzle tests have been carried out in the PPOOLEX facility. Test specifications were decided together with KTH on the basis of earlier tests and pre-test simulations. Both vertical (pointing downwards) and horizontal orientation of the RHR nozzle have been used. Mixing succeeded when the nozzle was in the vertical position. The effect of nozzle flow rate and temperature was visible. Mixing was incomplete with the horizontal orientation of the nozzle if the used flow rate was small but successful with a clearly larger flow rate. One more test could be carried out in August. Expected submit date of the report is November 30th, 2016.

Deliverable 3: Delivery of relevant experiment data to the simulation partners
Measurement data of the three RHR nozzle tests (NZL-T0V, NZL-T1V and NZL-T1H) have been delivered to KTH.

Note: Deviation from the original NKS-COPSAR plan: Studies on the operation of a spray system in PPOOLEX have been postponed due to unavailability of NORTHNET funding for 2016. The smaller than applied SAFIR2018 funding has also reduced the number of the SRV sparger and RHR nozzle tests that can be performed. The changes to the original plan have been discussed and agreed in the SAFIR2018 Reference Group 4 and in the NKS coordination group meetings. RG4 supervises the work done in the SAFIR2018/INSTAB project.

Work at VTT
Deliverable 1: CFD model for the wetwell

CFD model for the sparger has been constructed for the studies of condensation of bubble clouds in the pressure suppression pool. Test calculations have been performed for the condensation of the bubble clouds injected from the sparger to the water pool. Vapor temperature was 110 °C, and the pool temperature was 50 °C. In the CFD calculations, penetration of vapor into the water pool was smaller than expected. The behavior of the condensation model is examined and improved.

Deliverable 2: Report on the calculation of a time interval of stratification and mixing experiment in PPOOLEX

The starting of the stratification and mixing have been delayed by three months. The calculations will be started in the beginning of August, when the condensation model for the bubble clouds has been validated.

Work at Royal Institute of Technology (KTH)
Deliverable 1: Pre-test analysis for selection of operational regimes and test procedures
Scaling and pre-test analysis of the sparger and RHR nozzle tests have been performed and used in the design and test matrix of the PPOOLEX and PANDA experiments.

Deliverable 2: Development of the EHS/EMS models
A preliminary validation of the current EHS/EMS models for spargers has been done against the PANDA HP5 tests. Validation against the PPOOLEX tests is on-going. EHS/EMS models for coarse mesh containment simulations have also been developed based on the Richardson scaling of the PPOOLEX and PANDA data.

For blowdown pipes, a containment model integrating the EHS/EMS models has been implemented in GOTHIC. The model allows (i) imposing the effective heat and momentum based on the condensation regime and (ii) time-average the numerical oscillations at the blowdown pipe outlet.

Deliverable 3: Post-test analysis and validation with GOTHIC code on spray
The work is postponed due to the changes in LUT work-plan.

Deliverable 4: Reporting
NKS-2016 report will be provided in June 2017.

6.4 FIREBAN

Determination of fire barriers's reliability for fire risk assessment in NPP

Status
A first Master thesis has been produced at LTH and the first action will be finished during June.

Any major deviations between the original plan and the progress of your activity,

No deviations at the moment. We are aware that we started a bit later due to confirmation of the project being earlier this year.

Performed or upcoming seminars (if any), publications etc,
One master thesis, Jonathan Valee, Reliability of fire barriers, Erasmus Mundus Master in Fire Safety Engineering
http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8876398&fileOId=8876406

Any other issues or highlights you would like the NKS board to be informed about regarding your project?
No specific items.

6.5 HYBRID

Development of hybrid neutron transport methods and data visualization tools

Status of the activity
On the Chalmers side:
- The project formally started on week 15 with an MSc student working 50% of his time on the project as part of his MSc thesis work. The student will work 100% on the project from the summer.
- Since then, the student got acquainted with the computing environment and started to use the tools to be used within the project (Matlab and Serpent).
- Contacts have been taken with VTT in order to discuss how to estimate the probabilities necessary for the application of the response matrix method.

On the IFE side:
- Interviews of MSc thesis students will take place on week 21. The selected MSc thesis student will start working this summer on the project.

On the VTT side:
- Discussions with Chalmers are on-going in order to provide the probabilities required for the application of the response matrix method.

Major deviations between the original plan and the progress of the activity
None

Performed or upcoming seminars, publications, etc.
None

Other issue to be brought to the attention of the NKS board
Although the researcher originally planned to be involved at VTT has left, the project can still be carried out as planned.

6.6 L3PSA

Memo

NPSAG / NKS-R L3PSA - Addressing off-site consequence criteria using Level 3 PSA: Spring 2016 status report

To:	NPSAG / NKS-R	Cc:	
From:	Level 3 PSA working group	Date:	03 June 2015
Project no:	211975		

1 Summary

Purpose of Project

Level 3 PSA provides a tool to assess the risks to society posed by a nuclear plant, and could be useful in making objective decisions related to the off-site risks of nuclear facilities. The intention of this study was to further Nordic understanding of the potential of Level 3 PSA to determine the influences and impacts of off-site consequences, the effectiveness of off-site emergency response, and the potential contributions of improved upstream Level 1 and Level 2 PSAs.

Progress of the activity 2015 activities

Over the course of the project many activities were undertaken and completed. The first activities in the project (starting in 2013), were mostly exploratory in nature and included an industrial survey, an investigation of appropriate risk metrics, and participation in the development of guidelines and standards. The later stages of the 3-year project focused on application through two concurrent pilot studies, and the development of a guidance document. The 3rd year project seminar was held on January 28th 2016.

The pilot project was split amongst a Finnish Project, and a Swedish Project. The Finnish project had been underway since 2013, while the Swedish project started in earnest during the second year of the project (2014). The Finnish project was completed during 2014, and the Swedish pilot was completed in January 2016.

A completed draft of the guidance document was provided to stakeholders on the 15th of December, one month prior to the 3rd year seminar. This draft did not, however, include a draft conclusion section.

Report comments were received from Ringhals Nuclear Power Plant and the Swedish Radiation Safety Authority, by mid-March 2016. The working group has incorporate comments, and is currently completing the conclusions for the guidance document, where stakeholders will provide final comments to the conclusions before the first publication.

Progress of 2016 activities

There are several ongoing activities which the working group is monitoring while the 2015 activities are being finalized:

- No planned IAEA activities are made for 2016 due to agency budget constraints.
- Some exploratory work is being made at the OECD NEA WGRISK group regarding Level 3 PSA.

Table 1. List of project deliverables.

Deliverable	Date
Detailed project plan	May 2013 (complete)
Reference group meeting	May. 2013 (complete)
Project seminar 1	Jan. 2014 (complete)
First year report	Jan. 2014 (complete)
Major Sub-report Survey of Level 3 PSA Industrial Purpose/Application Status of Task 1 - Risk Metrics (complete) Status of Task 2 - Regulation & Standards (complete) Status of Pilot Application (SAFIR/PRADA – VTT)	
Project seminar 2	Jan. 2015 (complete)
Second year report	Jan. 2015 (complete)
Major Sub-sections Level 3 PSA Regulation, Guides and Standards Report Status of Pilot Application (33%)	
Final report (Following year 3) (ongoing)	Jan. 2016 (seminar complete, report ongoing)
Major Sub-report Level 3 PSA Guidance document (ongoing) Input from previous tasks including pilot application (complete)	

6.7 SC_AIM

Project: Safety culture assurance and improvement methods in complex projects (SC_AIM)

Description: The SC AIM project aims to increase understanding on how to improve nuclear safety culture in complex project settings (e.g. in the presence of multiple organizations interacting, diverse background of personnel, etc.). The practical goals of the projects are to identify and specify methods to improve and facilitate safety culture in complex projects and to identify and specify methods to assure safety culture in complex projects.

Overall evaluation: The project is progressing according to plan.

Project group: Kaupo Viitanen (VTT, coordinator), Carl Rollenhagen (Vattenfall), Nadezhda Gotcheva (VTT), Mika Kari (VTT)

Milestones and deliverables for 2016

Milestone / deliverable	Planned completion date	Status
Workshop on safety culture methods	June 2016	Preliminary agenda has been drafted, invitations sent for relevant parties and practicalities handled. The workshop will be held in Stockholm on 16.6.
International workshop	October 2016	Preparations are on-going, the workshop is planned to be held at the same time as HUSC seminar (27.-28.9.) in Finland
Conference paper or article	November 2016	Not yet started, the content of the scientific publication will be internally discussed in project workshop and other meetings.
Intermediate report	December 2016	Literature review has been nearly completed and will be integrated into the intermediate report.

Overall status

Overall, the project is progressing according to plan. In February and March 2016, VTT carried out interviews in the Finnish case study at Fennovoima (10 interviews in total). The data has been summarized and is being analyzed. In parallel to the empirical studies, a literature review has been carried out (VTT and Vattenfall jointly). Another primary source of empirical data comes from a seminar organized by Carl Rollenhagen (Vattenfall) with a topic of project management and safety culture, which is being prepared for. Furthermore, we have been in close contact with representatives from two Swedish nuclear organizations (SKB and Forsmark) that will function as information exchange partners. In addition, an information exchange partnership with Fortum is planned and currently under discussion. Currently we are preparing for the internal project workshop to be held in 16.6.

Task description	Estimated completion %	Progress by end of May 2016
1) Identification of the currently used and potentially useful methods to improve, facilitate and assure safety culture in complex projects from literature	80 %	• Essential literature has been identified and reviewed • Text is being drafted
2) Identification of the currently used methods to improve, facilitate and assure safety culture in the selected case studies	50 %	• Fennovoima case study interviews are completed, all interviews have been summarized and data analysis is ongoing • Seminar on project management and safety culture (to be held in 20.6.) organized by C. Rollenhagen • Forsmark is an information exchange partner and provides additional data for the study through interviews • SKB is an information exchange partner – a tele-interview has been completed • Collaboration with Fortum is under discussion
3) Identification of the safety culture challenges and method development needs in the case organizations	50 %	• This work is done within case studies and in collaboration with representatives from the case study organizations in regular meetings and in internal workshop
4) Evaluation of the pros and cons of the identified methods by expert judgment and workshop with the case organizations as well as international partners	20 %	• This work is done in the internal project workshop with contact persons from VTT, Vattenfall, SKB, and Fennovoima
5) Specification of the identified best practices (tentatively at least the following will be specified: definition of practice, do's and don'ts of the practice, field of application, necessary background knowledge of the user, and contextual issues to consider)	20 %	• To be carried out partially in the project internal workshop and as a result of the project's activities this year.
6) Arranging an international workshop for presenting, clarifying and discussing the identified best practices (October 2016)	5 %	• Agenda will be drafted based on the insights from our internal workshop, empirical case studies and literature review.
7) Intermediate report and dissemination of the existing best practices, including a networked safety culture questionnaire (December 2016)	10 %	• Preliminary report structure has been constructed • Literature review will be integrated to intermediate report as one of the chapters
8) Scientific publishing (2016-2017)	0 %	• A conference paper or journal article manuscript is planned to be written in autumn 2016
9) Administration	50 %	• Ongoing

6.8 SPARC

Scenarios and Phenomena Affecting Risk of Containment Failure and Release Characteristics
May 31, 2016

Work at Royal Institute of Technology (KTH)
WP1: Development and application of risk oriented accident analysis framework (ROAAM+) for prediction of conditional containment failure probability for a Nordic type BWR.
In 2016 *KTH* work will be focused in WP1 on

Task 1: Development and validation of detailed (full) deterministic models for analysis of severe accident phenomena in Nordic BWRs including.
Task 2: Development of computationally efficient (surrogate) models for approximation of the full model response parameters.
Task 3: Coupling of the surrogate models into ROAAM+ framework.
with the following goals:

1. Development and validation of detailed (full) deterministic models for analysis of severe accident phenomena in Nordic BWRs.

2. Development and application of computationally efficient surrogate models for uncertainty and risk analysis.

3. Collaboration with VTT and LRC on cross code comparison, code validation, and development of approaches to informing PSA with the ROAAM+ framework results.

4. Reporting of the results.

1.1 Core degradation and relocation to the lower head (using MELCOR code). Obtained results will be compared with VTT analysis for Station Blackout (SBO) with delayed power recovery and other scenarios of risk importance.

MELCOR model of Nordic BWR has been used to evaluate the effect of severe accident scenario (timing of activation of safety systems) on the resultant properties of relocated debris in LP. The analysis of the effect of severe accident scenario and possible recovery actions showed that:
i) the whole scenario domain can be represented by four groups, namely: small relocation domain; transition domain; large relocation domain with significant debris oxidation; large relocation domain with small debris oxidation;
ii) the major part of the core relocates to LP within ~30-60min after onset of core support plate failure;
iii) ECCS is effective in preventing massive core relocation only within relatively small time window after activation of ADS; delay in activation of ADS can significantly delay massive core relocation to LP, however it results in greater extent of core materials oxidation;
iv) debris composition (i.e. metallic/oxidic debris fraction) in different layers are highly influenced by severe accident scenario and can be classified in a limited number of groups.

Sensitivity analysis has been performed to evaluate the effect of modelling options in MELCOR on the resultant properties of relocated debris in LP. The most influential parameters for determining debris mass in LP and time of core support plate failure are: oxidized fuel rod collapse temperature and particulate debris porosity. Hydrogen generation and metallic debris fraction in the first axial level are mostly affected by: velocity of falling debris and particulate

debris porosity. Complex non-linear interactions between physical models in MELCOR make results sensitive to selection of numerical parameters and achieving numerical convergence. Currently it is planned to develop further MELCOR model of Nordic BWR; in particular, it is planned to:
i) Refine lower plenum nodalization for spatial distribution of the debris properties in LP.
ii) Perform sensitivity analysis with updated model, to identify the most influential parameters.
iii) Generate a new data base of MELCOR solutions, taking into account the effect of modelling options.

The new data base will be used to develop computationally efficient Core Relocation Surrogate Model, to predict the properties of relocated debris in LP for the analysis of in-vessel debris coolability, debris remelting, melt pool formation and vessel failure in ROAAM+ framework.

1.2 In-vessel debris coolability (using DECOSIM code).
Coolability of a porous heat-releasing debris bed in a water pool was studied in the case where some zone within the bed is impermeable (a "cake"). Such a zone can develop in the process of debris bed formation from fragmented melt jet if agglomeration role is significant due to insufficient water pool depth. Numerical simulations were performed by DECOSIM code in axisymmetric framework. A mound-shaped debris bed having an impermeable "cake" in its top part was considered; the debris bed was placed on the bottom surface of a deep water pool, simulations were started from the initially quenched state. It is shown that while a dry and hot zone almost certainly develops in the debris bed with a "cake", there exist conditions under which the dry zone temperature rises only to some level where it is stabilized by steam cooling. The influence of particle diameter, decay heat power and "cake" size on the maximum temperature and possibility of material remelting were considered.

1.3 Debris remelting, melt pool formation and vessel failure (using PECM model).
The PECM model has been developed and validated for prediction of debris bed heatup, remelting, melt pool formation and thermal load on the vessel wall. The PECM calculations are computationally expensive. The computational cost has been significantly reduced in the order of hours when 3D slice model for the debris bed heat transfer and 2D slice for the structural analysis are used. We are implementing corrections in the slice models (to address the effect of the differences in surface to volume ratios and the effect of penetrations) in order to obtain the same results as in the 3D quadrant models in terms of debris bed melt characteristics and timing of the vessel wall failure, while keeping the same computational efficiency of the original slice models. The resulting approach is useful for further sensitivity and uncertainty analysis.
To generate the output for the melt release and vessel ablation model (discussed below), we are in the process of generating a database of solutions using PECM. From this, we can characterize the data according to: Failure mode; Failure timing; Melt mass available for release; Melt superheat; and Initial break size as functions of initial debris properties.

1.4 Experiments on multi-component debris remelting will be carried out to understand basic physical phenomena.
The process of preparation for the construction and commissioning of the experimental setup is ongoing.
The necessity of commissioning tests is dictated by possible complexity of the exploratory facility which is envisaged as an intermediate step towards development of experimental platform for investigation of the debris bed remelting phenomena under different conditions. Three series of commissioning tests are planned. In the first series of commissioning tests the temperature profile in the debris bed as a function of

debris bed heat up rate and absolute temperature will be investigated. Tests with different size particles of (i) tungsten carbide, (ii) metal, and (iii) mixtures of tungsten carbide and metal particles will be performed.
Recommendations concerning experimental procedure (heat up rate and power distribution between the heaters) allowing establishment of uniform temperature profile within the test section for different debris materials will be developed and adjusted in the commissioning tests based on the obtained experience.
The second series of commissioning tests will evaluate the effect of specific interfacial area (determined by the particle size) of non-wettable solid debris on retention of liquid metal in the bed under uniform heating conditions. The materials of the debris chosen for the second series of commissioning tests is tungsten carbide (for high-melting temperature debris simulant) and tin (for low melting temperature simulant). The test with this combination of materials do not require application of inert atmosphere. The test series will be performed with two different sizes of tungsten carbide particles: 3 and 8 mm.
The third series of commissioning tests will be performed using copper as high melting temperature debris simulant and tin as low melting temperature material simulant. Debris bed behavior in this group of tests is expected to be sensitive to the oxygen potential in the atmosphere. Therefore, the objectives of these tests will be devoted to the investigation of different approaches and design solutions for providing inert atmosphere.

1.5 Melt release and vessel ablation model and experiments for validation of the model.
Melt release and vessel ablation model is currently based on the simplified modelling approach that allows prediction of the ablation rate of a breach given conditions of melt release: melt properties, transient release velocity and vessel wall conditions. Melt plugging is not modelled.
The preliminary analysis using the model has demonstrated that melt release velocity (availability of melt for release) is the key parameter defining the ablation rate, final jet diameter and respective risks of containment failure due to steam explosion or debris bed coolability.
Currently a simplified modelling approached are introduced into the model to provide insight into the importance of different phenomena of melt relocation that may delay, limit or enhance melt release from the vessel. The respective parametric study is ongoing.
Experimental program and experimental setup for the investigation of wall ablation under impinging jet and breach ablation under flowing through it melt is currently under development.

1.6 Ex-vessel debris bed formation, agglomeration, spreading and coolability (using DECOSIM and Agglomeration models). The focus is on the mechanisms of the debris spreading that can help to reach a coolable state. Particulate Debris Spreading (PDS) experiments on debris spreading in the pool and after settlement will be carried out using different particles. Collaboration with VTT will be established for validation of the models.
The shape, and therefore, coolability of the debris bed is affected by debris particle spreading (i) after settlement on the debris bed; (ii) in the water pool above the bed. The fist phenomenon has been intensively investigated experimentally (in PDS-C or Particulate Debris Spreading – Closures test series) and analytically using scaling approach and empirical closures. The model has been used to carry out sensitivity analysis and quantify the uncertainty in the efficacy of the particulate debris spreading in prototypic accident conditions. The modeling of the debris bed coolability with DECOSIM code taking into account debris bed self-leveling has been performed for selected severe accident conditions of the Nordic-type BWR. For extensive sensitivity analysis computationally efficient surrogate model (SM) using artificial neural network (ANN) has been developed and validated against results for the full model (DECOSIM). The preliminary uncertainty quantification and sensitivity analysis of the debris coolability SM coupled to particle spreading (bed self-leveling) model is ongoing.

The work on the debris spreading driven by large turbulent flows in the pool (PSD-P) is ongoing. Further experimental work is required in order to develop a database on particle spreading in the pool with wider ranges of pool configuration, particle properties and debris release conditions. The work on validation of the DECOSIM code against PDS-P experimental has been started. Particle mass distributions over the pool bottom were determined obtained for each pool geometry, injection rate, and particle properties. These mass distributions were compared with the experimental results, in terms of local distribution functions, and integral quantities characterizing particle spreading: the mean spreading distance defined by the horizontal coordinate of the center of mass of collected particles, and the tangent of the spreading angle. Generally, good agreement between the simulated and measured data is observed for both steel and glass particles. Further work on improvement of the code is ongoing.

1.7 Steam explosion analyses (using TEXAS code) will be carried out with quantification of different sources of uncertainty.

The Full Model (FM) for analysis of steam explosion in Nordic BWR was implemented in TEXAS-V. The effect of the triggering time on energetics of steam explosion was investigated. In order to address significant variability of explosion impulse with respect to the triggering time a statistical characterization of the possible explosion energetics for a single melt release scenario was introduced. A large database of FM solutions is generated and is used for the development of a computationally efficient Surrogate Model (SM) that reproduces statistical characteristics of the Full Model solution. The SM was trained to predict 50, 65, 78, 95, 99 and 100% percentiles of the cumulative distribution faction for the explosion impulse. This SM has been implemented in the latest version of ROAAM+ and used for (i) failure domain analysis for Nordic BWRs and (ii) example calculation of the risk of containment failure in melt release scenario similar to SERENA-2 BWR benchmark exercise.

The results of the failure domain analysis suggest for Nordic BWR the impulse will be higher than ~6kPa s in most of the possible met release scenarios if jet diameters is larger than Ø26 cm (independently on the other parameters) or if jet diameters >Ø10 cm in case if melt release velocity is high (>7 m/s) and water pool depth is large (>9m). If jet diameters are limited to 30 cm the probability of exceeding 50 kPa s impulse is less than 10^{-3} for the most of the possible combinations of eth distributions of the uncertain parameters.

Work on Tasks 4-6 is postponed due to reduction of the project budget:

Task 4: Connection of the framework to PSA-L1 and different plant damage states will be carried out in collaboration with LRC and VTT.

Task 5: Development and implementation of the methods for quantification of uncertainty, identification of failure domains and prediction of the conditional failure probabilities using ROAAM+ framework will be carried out.

Task 6: Development of data clustering techniques for coupling of ROAAM+ frameworks with PSA-L2, source term prediction tools and PSA-L3 will be done in collaboration with LRC and VTT.

Work at LRC Loyd's Register Consulting – Energy AB

LRC is responsible for WP2: Development of the methods for coupling of Integrated Deterministic Probabilistic Safety Analysis tools such as ROAAM+ developed by KTH with PSA in general and PSA-L2 in particular.

In 2016 LRC work will be focused in WP2 on Task 1 and 2 (see detailed status of each task below) with the following goals:

1. Development of demonstration case for integration of the IDPSA generated data into PSA.

2. Defining requirements on dynamic cut sets and success and failure paths for dynamic events.

3. Reporting of the results.

Task 1: Development of IDPSA generated data processing techniques for informing PSA about importance of (i) timing of events and (ii) epistemic uncertainty.
Status. No activities has been performed during this phase.

Task 2: Different approaches will be considered in collaboration with KTH and VTT to addressing of dynamic events and physical phenomena in (i) cut sets; (ii) success and failure paths; (iii) connections to PSA-L3.
Status. No activities has been performed during this phase.

Task 3: Cross code comparison for modelling of key phenomena of different accident progression scenarios (in collaboration with WP1 and WP3).
Status. No activities has been performed during this phase.

Work at VTT Technical Research Centre of Finland Ltd

VTT is responsible for WP3 and WP4 of the SPARC project:

WP3: Deterministic modelling of core degradation, melt relocation, vessel failure, debris spreading and coolability. (VTT)
In 2016 VTT work in WP3 will be focused on Task 3 and 4 (see detailed status of each task below) with the following goals:
1. Analyses of debris bed temperature in post-dryout conditions (for developing temperature-based coolability criterion).

2. Exploring accident scenarios that may lead to hydrogen explosions with MELCOR.

3. Comparison of obtained results with KTH and LRC data.

4. Reporting of the results.

Work on Tasks 1-2 is postponed due to reduction of the project budget:

Task 1: Development and verification of modelling approaches to core degradation, melt relocation and vessel failure. Comparison of MELCOR and ASTEC results for SBO with delayed power recovery and other scenarios of risk importance in collaboration with KTH.

Task 2: Implementation and validation of debris bed spreading models (e.g. Lagrangian particle tracking model in CFD) against PDS-P data in collaboration with KTH.

Task 3: Analytical investigation of the effect of debris bed multidimensionality on coolability (using the CFD approach developed at VTT and the MEWA code). This consist of refining the temperature-based coolability criteria for heap-like debris beds, which is a main unresolved question in the coolability of realistic debris beds. Collaboration with KTH on comparison of results obtained with DECOSIM code analysis.

The task includes advanced investigations of the debris bed coolability of multi-dimensionally flooded beds, review of the simulation models and comparisons of the results to the results by KTH. The focus

of the simulations is on the long-term post-dryout behaviour, and the possibility of establishing a temperature-based dryout criterion, which is more realistic but less conservative than the void fraction based coolability criterion (dryout heat flux). The effects of available heat transfer models on the post-dryout behavior of reactor application debris bed have been studied by MEWA simulations. The variation between the results obtained with the models which can be considered as the best is small.

Task 4: MELCOR analyses of hydrogen explosions in order to address the interactions between deterministic phenomena, stochastic events and operator actions (in collaboration with WP1 and WP4).
The existing MELCOR input deck for Nordic BWR plant will be converted for the latest MELCOR version, i.e. from MELCOR 1.8.6 to MELCOR 2.1. Accident scenarios that may lead to bypassing the filtered containment venting and to hydrogen explosions in the Nordic BWR reactor hall will be examined. Planning of the accident scenarios to be analyzed has been started.

Task 5: Consideration of the implications of the analysis results for source term characteristics in collaboration with KTH, LRC and WP4.
The effect of obtained results especially on source term will be summarized in the reports following discussions with other project partners.
Ilkka Karanta, Tero Tyrvainen

WP4: Analysis of the factors that affect the energy (temperature), altitude and probability of the release in PSA-L2.

In 2016 VTT *in* WP4 will be focused on Task 1 and 2 (see detailed status of each task below) with the following goals:
1. PSA-L2 analysis results addressing important factors for the release characteristics.

2. Consideration of the relevant phenomena, namely steam and hydrogen explosions.

3. Reporting of the results.

Task 1: PSA-L2 analysis with the focus on the factors affecting source term characteristics, i.e. release energy (temperature), altitude, and probability. The factors to be considered are: (i) plant damage states (from PSA level 1), (ii) plant design and (iii) accident progression phenomena.
Release height and temperature have been considered tentatively for different accident scenarios based on general knowledge, literature and discussions with deterministic safety analysis experts. Roughly speaking, there are three different cases with regard to the release height:
- The release height is the height of the place where the containment fails.
- The release height is the height of the stack if filtered venting is performed.
- An explosion throws the releases in the air above/surrounding the containment.

Literature search gives very little about the release heights directly. Some papers where release heights for Fukushima accident were given were found. Concerning release altitude when the containment fails, construction of a list of possible containment failure modes for generic BWR's and PWR's is being considered; the list is based on international guidance (IAEA, Asampsa), and will contain the failure modes, prerequisites of failure in a particular mode, and some major possible causes of a failure in a particular mode.
Also release energy has not received much attention in the scientific literature. Release temperatures are in most cases close to 100°C because steam is expected to be a dominant constituent of the release. Some scenarios where the release energy might differ significantly from that temperature have been tentatively identified, but more work is needed on this. It is possible to calculate accurate temperatures

using deterministic severe accident analysis software such as MELCOR. An explosion can be a special case with regard to release temperature too. Fire in reactor building can also potentially increase the temperature of a radioactive release.
The plan is to develop old BWR containment event tree model (see VTT-R-05974-13) further by including release heights and energies, improving hydrogen explosion modelling and implementing uncertainty analysis for probabilities. A tentative uncertainty analysis implementation has already been done, and release height and temperature variables have been added to the model.

Task 2: Consideration of the factors affecting the probability and magnitude of relevant phenomena such as (i) hydrogen explosions (in collaboration with WP3), (ii) steam explosions (in collaboration with WP1); (iii) non-coolable debris bed formation and core-concrete interaction (in collaboration with WP1 and WP3).
This year, the plan is to improve hydrogen explosion modelling in the BWR containment event tree model. The subject has been discussed with deterministic safety analysis experts (WP3). The results of forthcoming MELCOR analyses will be utilised in this task.

Overall Project Summary

Comparison between plans and results with explanation of any deviations:
Active work on the project at LRC is planned for the second half of the year.
There are no major deviations between plans and results so far.

Expected submit date of the final report
- Expected date for submitting the reports for 2016 is mid of June 2017.

Any issues you would like the board to know
- No.

Publications:

1. Takasuo, E. An experimental study of the coolability of debris beds with geometry variations. Annals of Nuclear Energy 92, 2016. pp. 251-261.
2. Konovalenko A., Basso S., Kudinov P., Yakush S. E., “Experimental Investigation of Particulate Debris Spreading in a Pool”, Nuclear Engineering and Design, Volume 297, pp208-219, 2016.
3. Basso, S., Konovalenko, A., Kudinov, P. “Empirical Closures for Particulate Debris Bed Spreading Induced by Gas-Liquid Flow”, Nuclear Engineering and Design, 297, 19-25, (2016).

NKS-R Status

June 2016

Emma Palm
NKS-R Program Manager

Board meeting,
Copenhagen, 22 June 2016

Summary

Overall the work in NKS-R is progressing according to plan.

- Since last NKS-R status report
  - *4 final reports published on website (ADdGROUND, LESUN, MODIG, PLANS)*
- Delayed activities (from before 2015)
  - *None*
- Activities commencing in 2015
  - *4 (of 8) completed, final reports missing for ATR-2015, COPSAR, DECOSE, and L3PSA*
- Activities commencing in 2016
  - *7 out of 8 contracts signed, work proceeding according to plan*
  - *Fortum & TVO support agreement drafts have not yet been sent*

Status NKS-R 2015 projects

Activity	Final report	Cont. 2016	Comments
ADdGROUND	Yes	Yes	Finished
ATR-2015	No	No	Final report expected in June 2016 (budget 300)
COPSAR	No	Yes	Final report submitted but not approved by VTT and LUT, nothing from KTH (budget 500)
DECOSE	No	No	Final report expected in June 2016 (budget 460)
L3PSA	No	Yes	Final report expected in June 2016 (budget 340)
LESUN	Yes	No	Finished
MODIG	Yes	No	Finished
PLANS	Yes	No	Finished

Deadline according to contract is the 31st of January 2016 for all activities.

Emma Palm
NKS-R Programme Manager

Status NKS-R 2016 projects

Activity	Contract signed	Comments
ADdGROUND	Yes	No deviations, project going well.
BREDA	No	Project started with delay due to altered circumstances for the project (see next slides).
COPSAR	Yes	Project started with delay due to funding changes (see next slides).
FIREBAN	Yes	No deviations, project going well.
HYBRID	Yes	No deviations, project going well.
L3PSA	Yes	No deviations, project going well.
SC_AIM	Yes	No deviations, project going well.
SPARC	Yes	No deviations, project going well.

Effects of budget cuts CfP 2016

- Many of the activities are used to receiving less than the sum they applied for.
- Adjustments to the original plan also depends on the funding from additional financiers
  - How handle funding not coming though as expected from other sources?
- In general, the deliverables will not change. Instead the hours allocated to performing a certain task has been reduced.

BREDA–RPV – renewed evaluation (400 kDKK)

- Background: could not retrieve samples from RPV @ BKAB => large change in work stated for 2016.

- Discussed in coordination group => let NKS-R evaluations evaluate the project again based on updated work proposal from activity leader

- Result from renewed evaluation: (see next page)
  - 4 out of 6 NKS-R evaluators have responded

  - 3 out of the 4 see no need to change their evaluation => the overall score of BREDA – RPV is virtually unchanged =>
  - **Funding recommended by NKS-R programme manager & coordination group.**

BREDA –RPV – renewed evaluation

Name	Evaluation	Impact	Comments
Nici Bergroth	No change	None	The pre-study could even make the project better.
Tiimo Vanttola	No change	None	Just a change in the order of work.
Olga German	Renewed evaluation	Lowers score	The relevancy and the value of the first year project is low in itself for the industry and end users. It is expected that the project will deliver more applicable results in upcoming years, but it will need to be re-evaluated accordingly.
Annelie Bergman	No change	None	Good to make use of Barsebäck before it's too late. I see no reason to change my evaluation, since the only thing that's changed is the timing of actions. It is true that the RPV samples will be delayed, but there is a lot to do before and for the PhD student to get started. My evaluation is colored by the whole project rather than the deliveries for 2016, but I see this as a necessity if NKS shall co-finance any PhD projects at all. As for the other funders, SSM hs not changed its decision to co-finance the PhD student.
Atle Valseth	No respons	-	
Tarja Ikaheimonen	No respons	-	

COPSAR – altered funding situation (500 kDKK)

COPSAR – COntainment Pressure Suppression Systems Analysis for BWR

- Proposal stated project had funding from SAFIR2018 and NORTHNET, however;
  - SAFIR reduced funding => reduced funding for COPSAR too
  - NORTHNET – no funding for COPSAR

- Activity leader expressed interest in waiting to se if SSM would cover the lost funding from NORTHNET. However, 20th April: SSM still undecided =>
  - wrote to activity leader with request for clarification of
    - funding situation
    - possible impact of altered funding situation

- Review of changes (affects quantity but not quality) => **NKS-R program manager and coordination group recommend funding**

NKS-R seminars 2016

Activity	Seminars
ADdGROUND	---
BREDA	---
COPSAR	---
FIREBAN	---
HYBRID	---
L3PSA	Final seminar 28th of January 2016 performed. Final seminar planned for Q4 2016 or Q1 2017
SC_AIM	Internal workshop: 16/6, International workshop 27-28 September, Finland.
SPARC	--

NKS-R publications 2015-2016

Activity	Publications (submitted and approved)
ADdGROUND	The paper *"Opportunities for Source Modelling to Support the Seismic Hazard Estimation for Nuclear Power Plants", V. Jussila, L. Fülöp* has been submitted to the Nuclear Science and Technology Symposium - ST2016, in Helsinki, 2-3 November 2016.
BREDA	---
COPSAR	---
FIREBAN	One MSc produced within project: "Reliability of fire barriers"
HYBRID	---
L3PSA	---
SC_AIM	Planning for scientific publication or conference proceeding
SPARC	3 scientific papers published

Annelie's comments

Nordic nuclear safety research

Background (from board meeting notes):

- Annelie Bergman expressed concerns regarding the schedule of the activity reporting compared to what is stated in the contracts, the feedback in due time from the activities in connection with possible continuation of activities and the possibility of keeping track of the status of the activities.

- It was agreed that Annelie Bergman and Emma Palm will look into this for the next Board meeting and a proposal for change be presented for the next board meeting if needed.

Annelie's comments cont.

- Emma & Annelie had a meeting discussing Annelie's comment.

- Results:
  - Complications:
    - funding from many sources, NKS may only contribute a small part and the project has a "natural" timeline.
    - Cant control when report writing is performed and for which money the writing is actually done.
  - Solution: "Positive reinforcement" i.e.:
    - Clarify / make a point of addressing the importance of submitting the final report in time, as "un-submitted" reports can influence
      - the evaluations and their ability to make a good evaluation when previous work is not reported

Additional item - # NKS-R evaluators

NKS-B (8)	NKS-R (6)	Unassigned (2)
Ole Harbitz	Nici Bergroth	
Astrid Liland	Timo Vanttola	
Mette Øhlenschlæger	Atle Valseth	
Steen Cordt Hoe	Annelie Bergman	
Eva Simic		
Sigurður M. Magnússon		
Tarja K. Ikäheimonen	Tarja K. Ikäheimonen	
Olga German	Olga German	
		Jorma Aurela
		Jens-Peter Lynov

Extra slides

COPSAR – unclear funding situation (500 kDKK)

- Got response 22 April (Largest impact on experimental work (LUT), Less impact on theoretical work (VTT & KTH)

For LUT proposal (30k€)	For LUT updated (22 k$)	For VTT & KTH
SRV sparger tests with combined steam injection through the sparger head and load reduction ring (LRR) in PPOOLEX	Only one test (instead of 2-3 planned originally) can be carried out. Extensive varying of steam injection mass flow rates and pool water temperatures is therefore impossible.	
Mixing tests with residual heat removal (RHR) system nozzles in PPOOLEX	The number of the tests needs to be reduced (from 6-7 to 3-4).	
Installation of a spray injection system to the PPOOLEX facility	Spray injection system cannot be manufactured and installed	No data from spray injection to simulate
Preliminary spray injection tests in PPOOLEX	Spray tests cannot be done.	No data from spray injection to simulate
Delivery of relevant experiment data to the simulation partners		No data from spray injection to simulate, rest of data OK

NKS-R SPARC publications

Takasuo, E. An experimental study of the coolability of debris beds with geometry variations. Annals of Nuclear Energy 92, 2016. pp. 251-261

Konovalenko A., Basso S., Kudinov P., Yakush S. E., "Experimental Investigation of Particulate Debris Spreading in a Pool", Nuclear Engineering and Design, Volume 297, pp208-219, 2016

Basso, S., Konovalenko, A., Kudinov, P. "Empirical Closures for Particulate Debris Bed Spreading Induced by Gas-Liquid Flow", Nuclear Engineering and Design, 297, 19-25, (2016)

Nordisk kernesikkerhedsforskning
Norrœnar kjarnöryggisrannsóknir
Pohjoismainen ydinturvallisuustutkimus
Nordisk kjernesikkerhetsforskning
Nordisk kärnsäkerhetsforskning
Nordic nuclear safety research

NKS-B Status Report

Kasper G. Andersson
NKS-B Programme Manager
June 2016
Technical University of Denmark

Status summary

Overall the work in NKS-B is progressing well. Since the last NKS-B status report was made to the NKS-Board in January 2016, 6 new final reports from completed NKS-B activities have been published on the NKS website. All NKS-B activities that commenced prior to 2015 are completed. Of the 10 activities starting in 2015, 8 have been completed, and 2 are expected to be nearing completion. Of the 9 NKS-B activities that started in 2016, contracts have been agreed and signed with all. Activities that started in 2016 are all currently on schedule.

NKS-B reports

The following NKS-B reports have been published on the NKS website since the last NKS-Board meeting.

EFMARE
M. Iosjpe et al.
Effects of dynamic behaviour of Nordic marine environment to radioecological assessments

FAUNA
J. Havskov Sørensen et al.
Fukushima accident: Uncertainty of atmospheric dispersion modelling (FAUNA)

IDEA
B.B. Árnason et al.
Internal Dosimetry Exercise for enhanced Ability

NORCOP-COAST
A. Nalbandyan et al.
Nuclear icebreaker traffic and transport of radioactive materials along the Nordic coastline: response systems and cooperation to handle accidents (NORCOP-COAST): Final report

NUFORNOR
O.C. Lind et al.
Nuclear forensics within a Nordic context

STANDMETHOD
X. Hou et al.
Standardization of Radioanalytical Methods for Determination of 63Ni and 55Fe in Waste and Environmental Samples

NKS-B activities from 2015 (January)

CONCORE
Characterisation of NORM contaminated objects: reliable & efficient
Activity leader: Charlotte Nielsen (NIRP/SIS)

NKS-B funding: **363 kDKK**

Milestones defined in contract:

1. Third project meeting
2. All samples retrieved.
3. Analytical start-up.
4. Fourth project meeting: presentation and discussion of results
5. Dissemination at international meeting.
6. Guideline for characterisation of NORM and NORM contaminated equipment for operators and competent authorities
7. Final report

Status
Contract signed. More time was granted on request in December, since the group wanted to include extra experimental work. The above milestones have been covered, except final reporting, which is imminent (expected before 22nd of June 2016). Dissemination took place at the NSFS conference in Roskilde in 2015, and an additional paper is planned.

RAPID-TECH
Application of rapid and automated techniques in radiochemical analysis
Activity leader: Jixin Qiao (DTU)

NKS-B funding: **317 kDKK**

Milestones defined in contract:
1. Meetings and planning
2. Sample preparation and distribution for inter-comparison
3. Performance of inter-comparison and inter-exchange exercises
4. Results evaluation and summary
5. Final report

Status
Contract signed. Report was contractually due by 1st of April 2016. Milestones 1-4 achieved, and report writing is ongoing. The activity has on request been granted a little more time since the laboratory work took a little longer than anticipated at some of the partner organisations. Final reporting is imminent and expected before 22nd of June 2016.

NKS-B activities from 2015 (January)

MOMORC
Mobile search of material outside of regulatory control (MORC) – Detection limits assessed by field experiments
Activity leader: Christopher L. Rääf (Lund University)

NKS-B funding: **525 kDKK**

Milestones defined in contract:
1. Joint meeting of participants (31 March)
2. Description of field experiment for testing of detection limit of various vehicle borne systems and a template for data reporting (31 May)
3. Field experiment conducted by the participants using the agreed definitions of detection limit (15 September)

4. Data report compiled in a pre-determined format (31 October)
5. Follow-up meeting discussing the reported data (15 November)
6. Full report to NKS Board (31 December)

Status
Contract signed. Progress on schedule. Comprehensive meeting minutes, experiment description and template received on 4th of May.

NISI
Nordic in situ gamma intercomparison
Activity leader: Alexander Mauring / Torbjörn Gäfvert (NRPA)

NKS-B funding: **225 kDKK**

Milestones defined in contract:

1. Intercomparison site and dates selected (01-04-16)
2. All necessary information sent to participants (15-05-16)
3. Final list of participants, preparatory work complete (30-06-16)
4. Intercomparison and seminar completed (30-09-16)
5. Final report (15-12-16)

Status
Contract signed. Progress on schedule. Only few participants can be accommodated, so the intercomparison and seminar will not be announced publicly. NRPA, IRSA, SSM, STUK and DEMA will nominate participants. Event to be held in Norway (Ås). Alexander Mauring will leave NRPA, and has been replaced (information given 12-05-16) as NISI coordinator by Torbjörn Gäfvert (NRPA).

GAMMASPEC
Seminars for users of gamma spectrometry
Activity leader: Sven P. Nielsen (DTU)

NKS-B funding: **395 kDKK**

Milestones defined in contract:

1. Planning meeting, Spring 2016
2. Announcement of intercomparisons and seminar, Spring 2016
3. Seminar, autumn 2016
4. Final report, December 2016

Status
Contract signed. Planning meeting held, seminar announced in NewsFlash and on NKS website as well as on GammaWiki website. Event to be held near Oslo on 13-14 September 2016. Progress on schedule.

MESO
Meteorological uncertainty of short-range dispersion
Activity leader: Jens Havskov Sørensen (DMI)

NKS-B funding: **375 kDKK**

Milestones defined in contract:

1. Kick-off meeting
2. RIMPUFF short-range atmospheric dispersion model implemented at the DMI supercomputer
3. Case studies selected, corresponding NWP model ensembles generated, and data derived for RIMPUFF
4. Short-range atmospheric dispersion model applied to the case studies and atmospheric dispersion model ensembles generated
5. Uncertainties related with the use of weather radar data described
6. Meeting
7. Methods developed and described for computation of meteorological uncertaintyof the atmospheric short-range dispersion of radioactivity from accidental releases.
8. Methods applied to the atmospheric short-range dispersion model ensembles corresponding to the case studies
9. Presentation of the uncertainties to decision makers described and applied to the case studies selected.
10. Final report

Status
Contract signed. Kick-off meeting held. Progress on schedule.

NORCO
Nordic cosm pilot study
Activity leader: Tanya Helena Hevrøy (NRPA)

NKS-B funding: **435 kDKK**

Milestones defined in contract:

1. Construction of cosms and dosimetric calculations (30-06-16)
2. Midterm report (01-08-16)
3. Exposure to radiation (30-10-16)
4. Data analyses (30-11-16)
5. Draft of scientific papers (16-12-16)
6. Final report (16-12-16)

Status
Contract signed. Progress on schedule.

NORDIC ICP
Nordic development and exploration of inductively coupled plasma spectrometry
Activity leader: Jixin Qiao (DTU)

NKS-B funding: **420 kDKK**

Milestones defined in contract:

1. Kick-off meeting and planning
2. Experimental material purchase and sample preparation
3. Execution of inter-comparison exercise
4. Summarise results and output
5. Final report of 1st year

Status
Contract signed. Progress on schedule.

EFMARE
Effects of dynamic behaviour of Nordic marine environment to radioecological assessments
Activity leader: Per Roos (DTU)

NKS-B funding: **395 kDKK**

Milestones defined in contract:
1. Kick-off meeting
2. Report on available biokinetic models for fish
3. Final report

Status
Contract signed. The work group meet to discuss progress at Hotel Hilton, Copenhagen airport, on 14-06-16. Progress on schedule.

COASTEX
Scenarios and table top exercise concept on events related to traffic of nuclear-powered vessels and transportation of spent nuclear fuel along the Nordic coastline
Activity leader: Inger Margrethe Eikelmann / Anna Nalbandyan (NRPA)

NKS-B funding: **330 kDKK**

Milestones defined in contract:
1. Planning meeting/s: MAR-MAY 2016. Each partner will contribute and participate at the planning meeting (incl. electronic communication). NRPA will be coordinating the whole activity, communication with partners and organisation of meetings.
2. Development of scenarios: MAR-SEPT 2016. Each partner will contribute to the development of scenarios related to the maritime transport of radioactive materials and traffic of nuclear-powered vessels. NRPA will combine all inputs and summarize.
3. Development of the table top exercise concept: MAR-OCT 2016. Each partner will contribute to the development of the table-top concept. NRPA will combine all inputs and summarize.
4. 2-days Workshop in Reykjavik, Iceland: AUG-OCT 2016. NRPA and GR will organize the workshop where all partners will attend and work together.
5. Preparation of the scenario and table-top exercise report: by DEC 31 2016. All partners will contribute to the draft report. NRPA will compile inputs and write the report.
6. Preparation of the final project report: by DEC 31 2016. All partners will contribute to the final project report. NRPA will compile inputs and write the report.

Status
Contract signed. Progress on schedule. Note that instead of the planned 1 project workshop there will be 2 workshops for better implementation of the project and interaction between

countries. The 1st workshop is to be held on 30-31 May in Tromsø and the 2nd is to be on 11-14 October in Reykjavik. Participation will be only by invitation.

NORDUM
Intercomparison of Nordic unmanned aerial monitoring platforms
Activity leader: Kasra Tazmini (NRPA)

NKS-B funding: **400 kDKK**

Milestones defined in contract:

1. Selection of site for exercise (01-03-16)
2. Obtaining of all necessary permits/permissions (01-05-16).
3. Notification of all teams, production of necessary materials, information (01-06-16)
4. NORDUM activity (09-16)
5. Final report (19-12-16)

Status
Contract signed. Progress on schedule. Required permissions obtained. There will be a 1 day workshop for participants plus a few observers. Will be held near Oslo probably 5-9 September, the day after the activity field work. First announcement has been made in NKS NewsFlash and on NKS website.

NKS R and B Seminars 2016 and 2013 Survey Comparison

Report based on the answers following the questionnaire sent 26 January 2016 with follow-up reminder 9 February 2016 and similar questionnaire of 2013. - Both questionnaires were anonymous.

NKS R and B Seminar 2016 - Survey

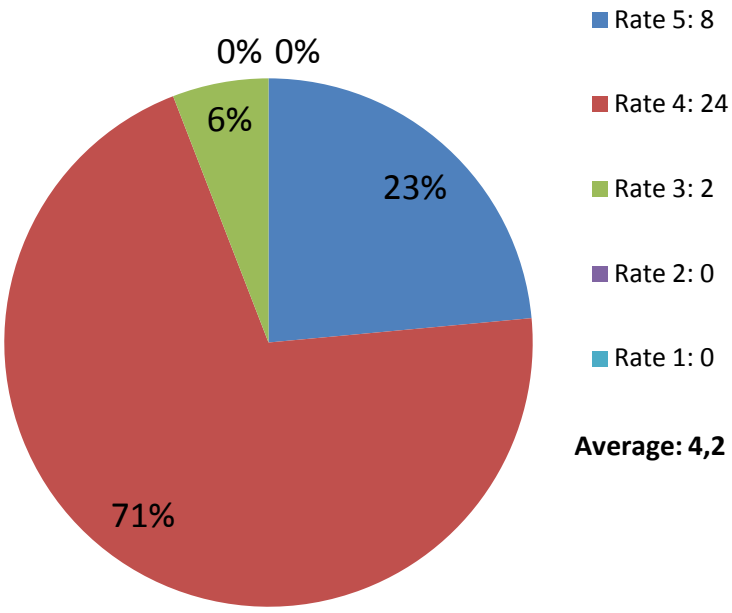
- The questionnaire was sent to all 101 registered participants
- Maximum number of possible responses was 97, as the 4 coordination group members were not expected to answer
- We received 34 responses – meaning a response percentage of 35

NKS R and B Seminar 2013 - Survey

- The questionnaire was sent to all 158 registered participants
- Maximum number of possible responses was 136, as 140 attended the seminar and the 4 coordination group members were not expected to answer
- We received 60 responses – meaning a response percentage of 44

Overall rate of the seminar 2016/2013

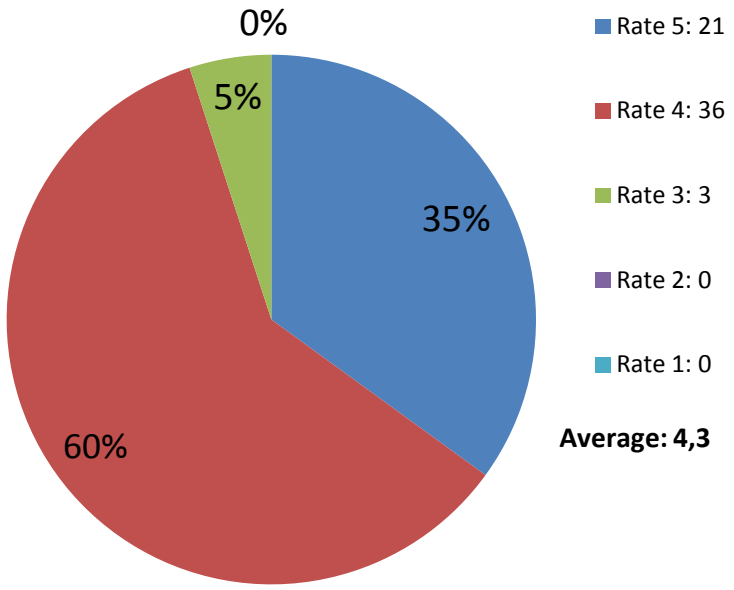
2016: 34 responses



Average: 4,2

Rate 5: excellent and rate 1: not good

2013: 60 responses

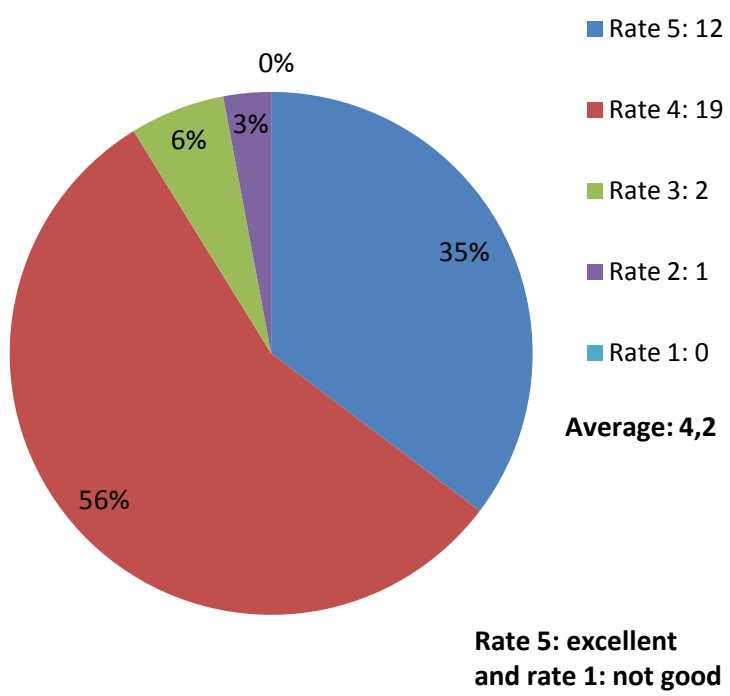


Average: 4,3

Rate 5: excellent and rate 1: not good

Relevance of the seminar topic 2016/2013

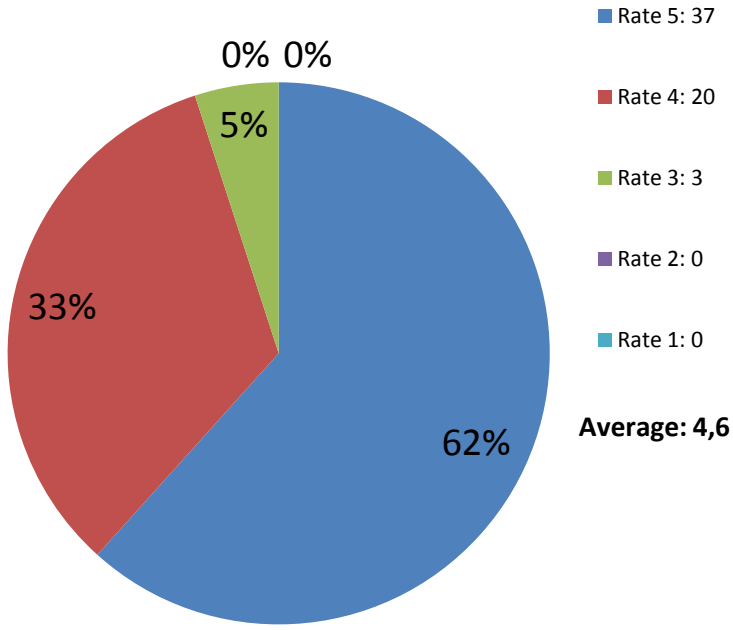
2016: 34 responses



Average: 4,2

Rate 5: excellent and rate 1: not good

2013: 60 responses

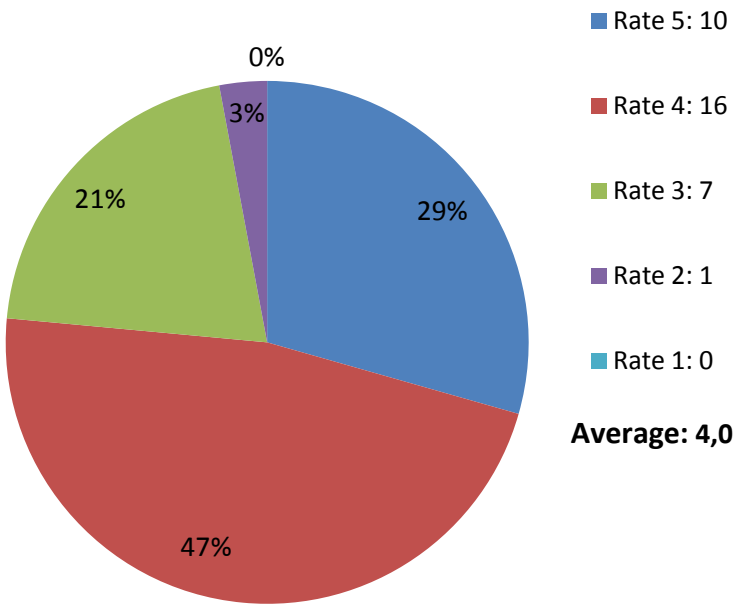


Average: 4,6

Rate 5: excellent and rate 1: not good

Usefulness of information presented 2016/2013

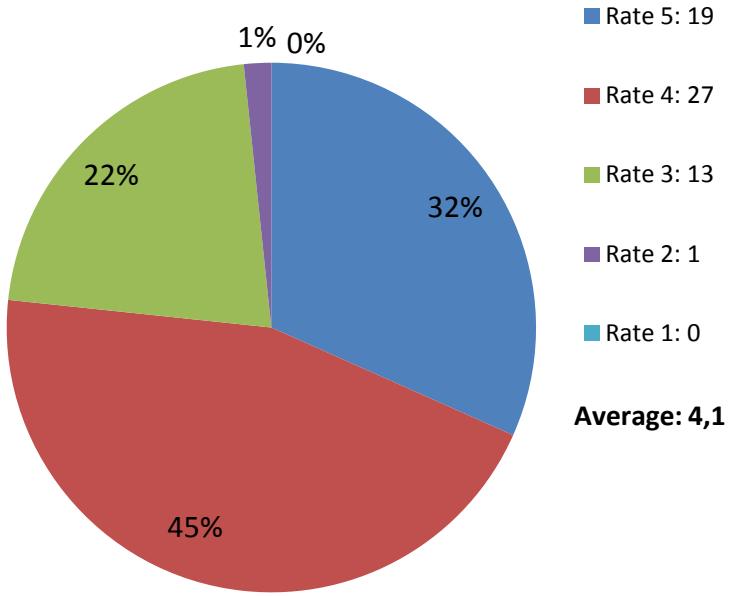
2016: 34 responses



Average: 4,0

Rate 5: excellent and rate 1: not good

2013: 60 responses

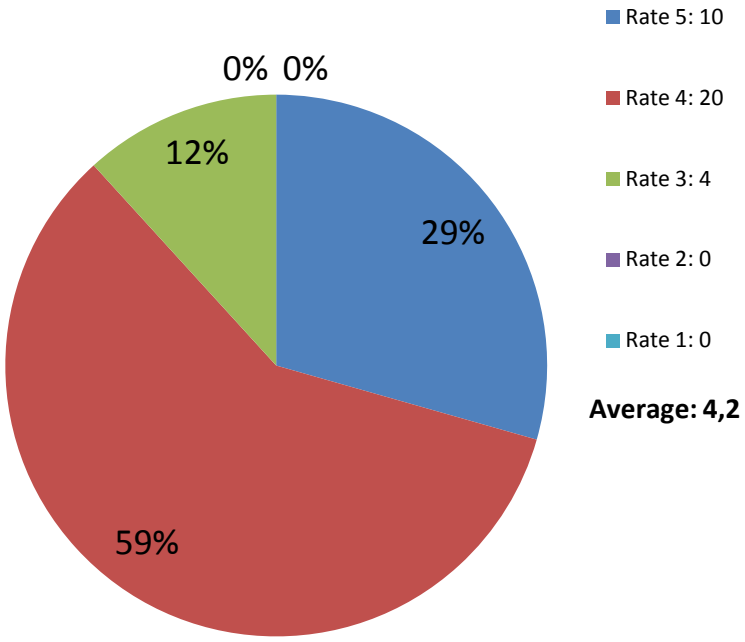


Average: 4,1

Rate 5: excellent and rate 1: not good

Quality of presentations 2016/2013

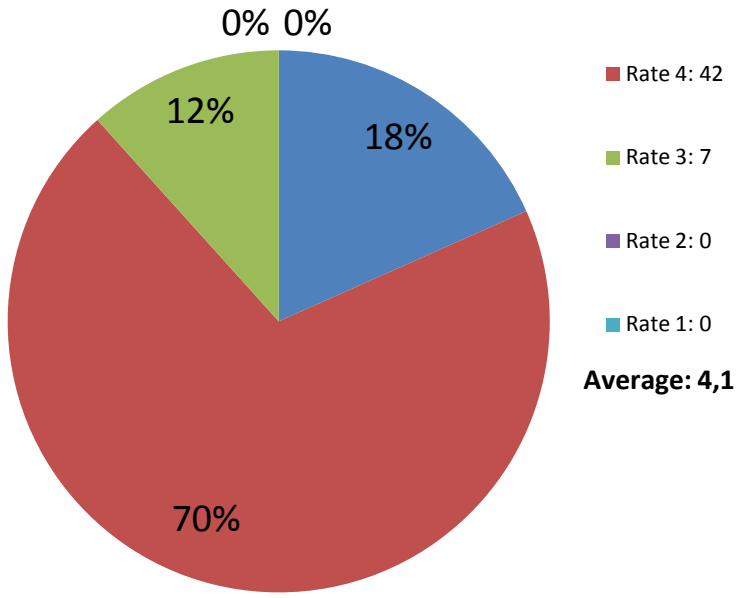
2016: 34 responses



Average: 4,2

Rate 5: excellent and rate 1: not good

2013: 60 responses

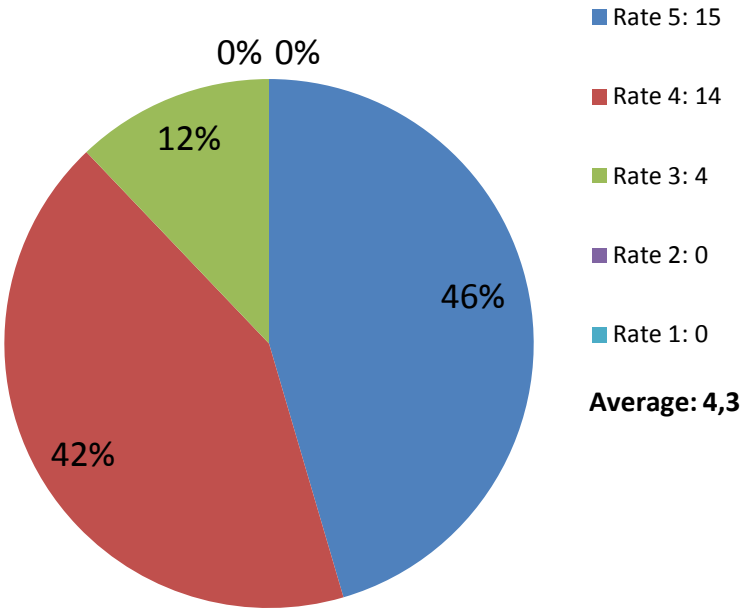


Average: 4,1

Rate 5: excellent and rate 1: not good

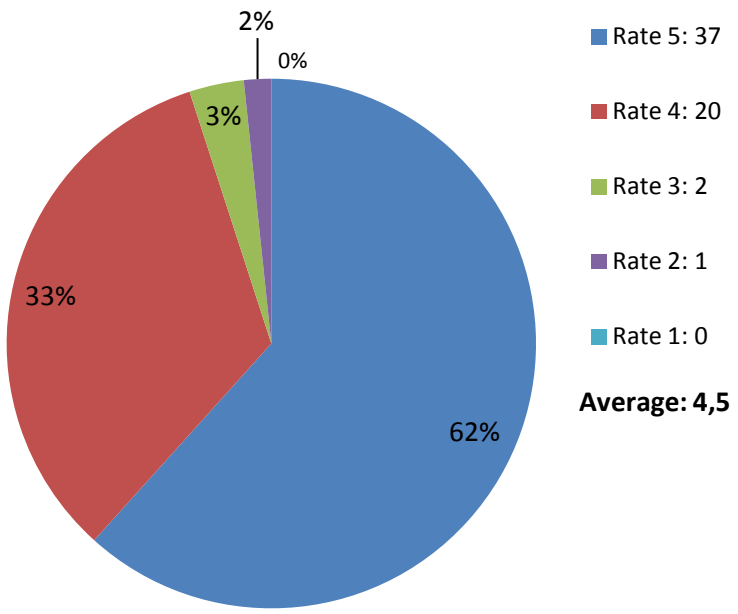
Seminar organization: scheduling and timing 2016/2013

2016: 33 responses



Rate 5: excellent and rate 1: not good

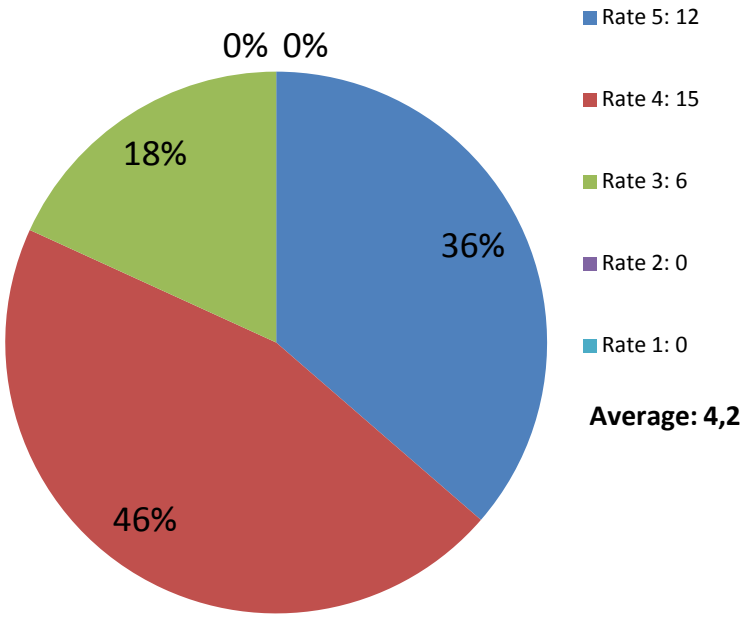
2013: 60 responses



Rate 5: excellent and rate 1: not good

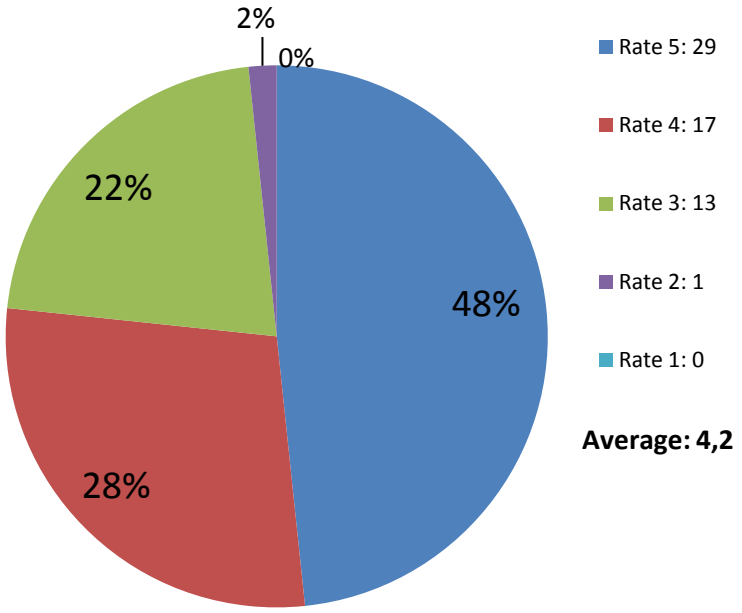
Seminar organization: facility / venue 2016/2013

2016: 33 responses



Rate 5: excellent and rate 1: not good

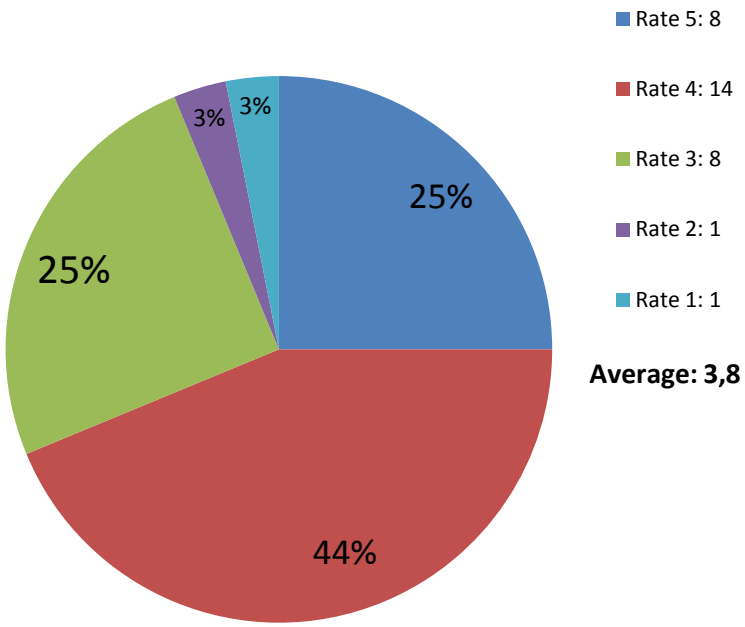
2013: 60 responses



Rate 5: excellent and rate 1: not good

Seminar organization: handouts during the seminar 2016/2013

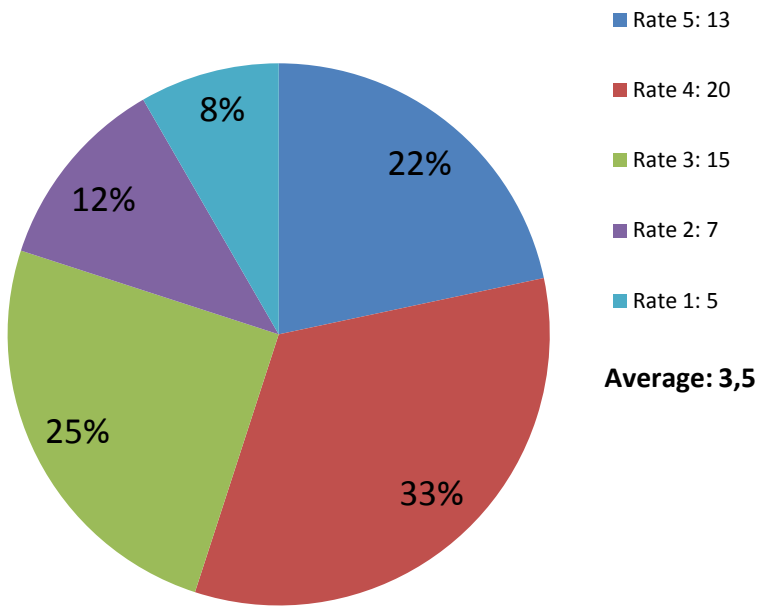
2016: 32 responses



Average: 3,8

Rate 5: excellent and rate 1: not good

2013: 60 responses

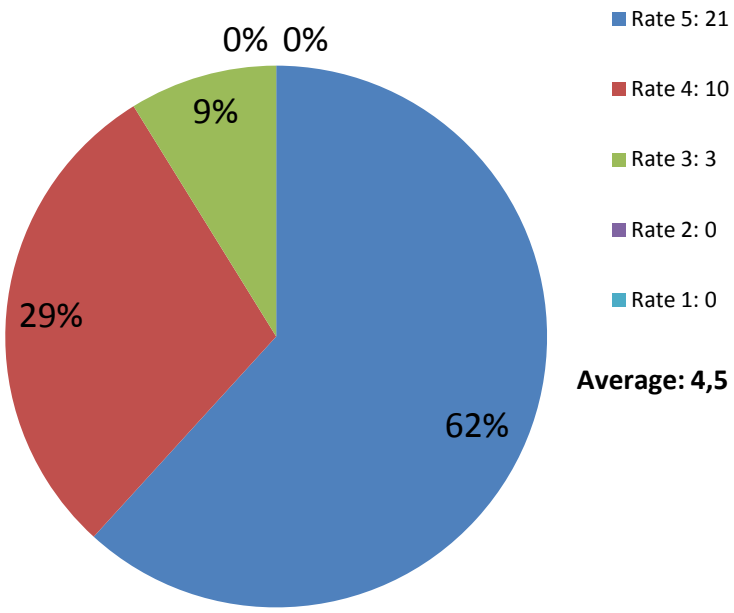


Average: 3,5

Rate 5: excellent and rate 1: not good

How likely are you to attend future NKS seminars 2016/2013

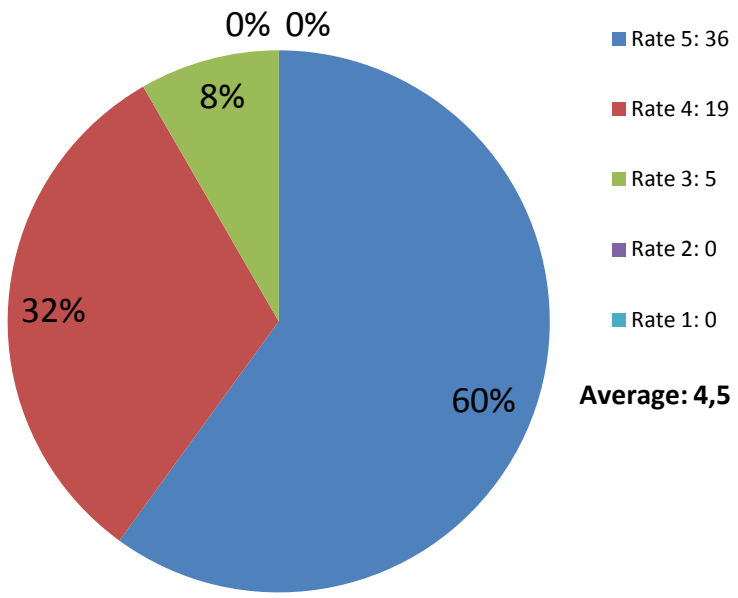
2016: 34 responses



Average: 4,5

Rate 5: very likely and rate 1: not likely

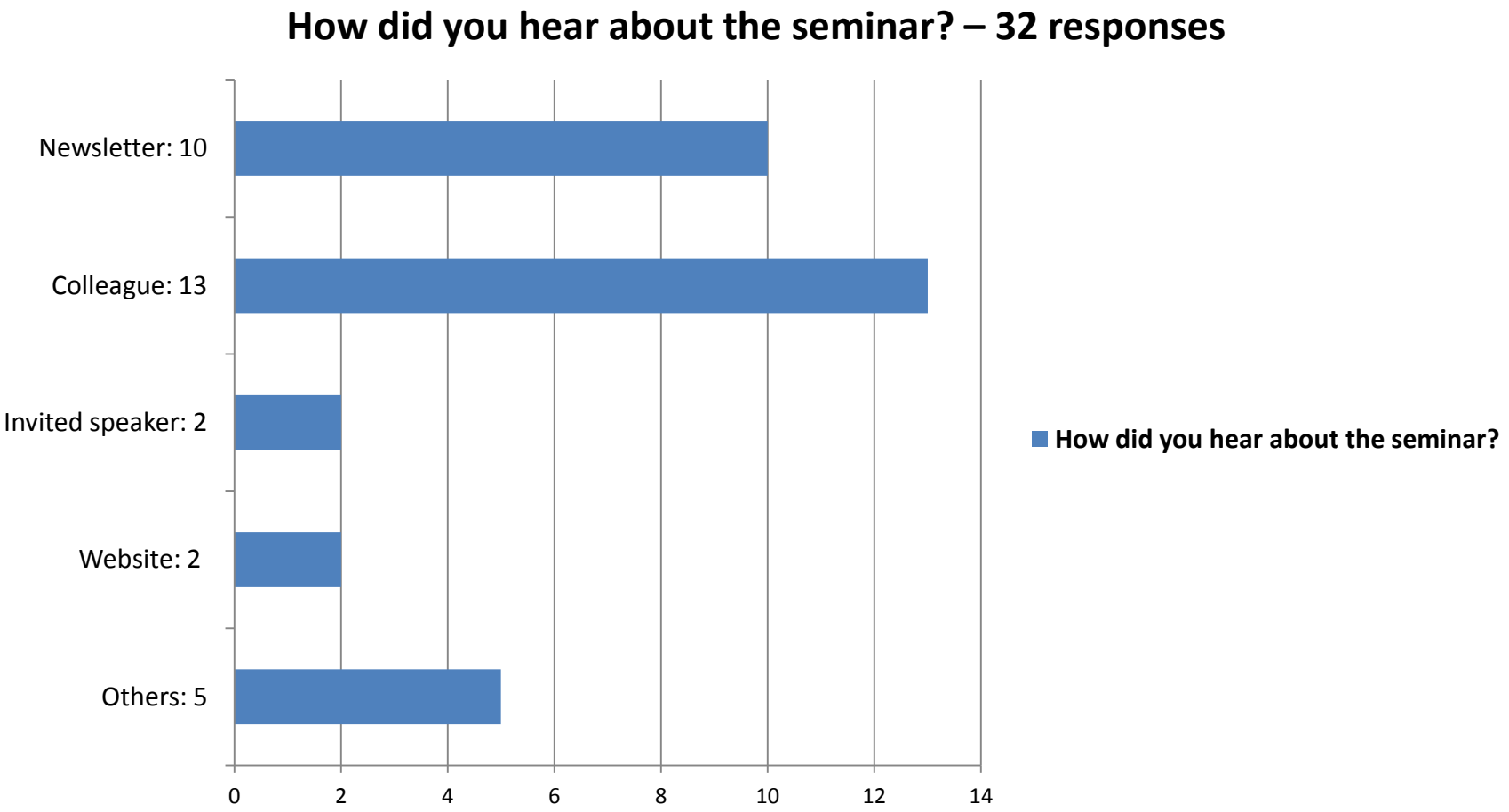
2013: 60 responses



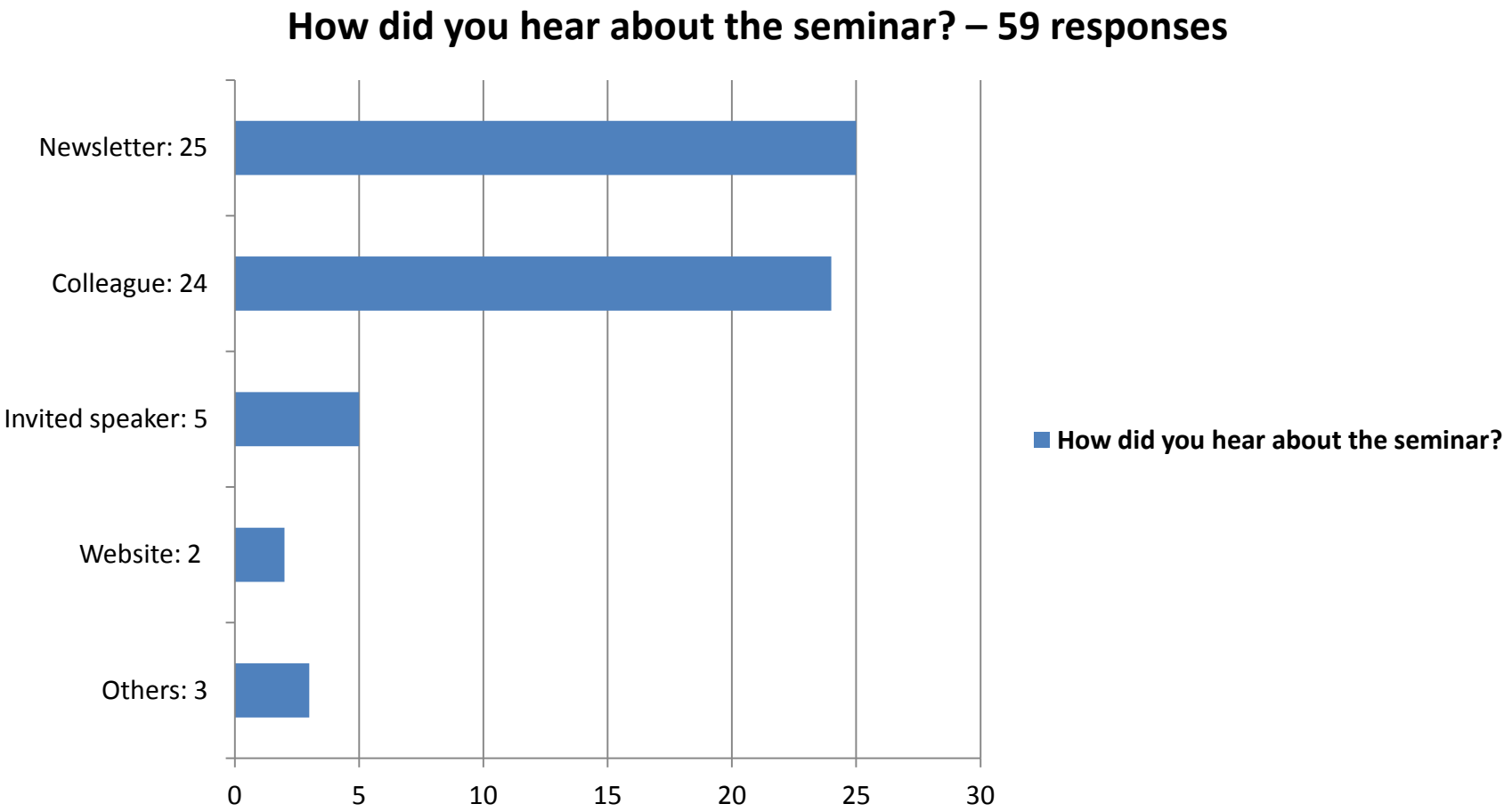
Average: 4,5

Rate 5: very likely and rate 1: not likely

NKS R and B Seminar 2016 - Survey



NKS R and B Seminar 2013 - Survey



NKS R and B Seminar 2016 - Survey

- ”Content could be more balanced between hazards, deference barriers and post-accident mitigation”.
- ”Give the invited speaker(s) more time. The first invited speaker had a very interesting presentation but rushed it through so fast that it was meaningless. I was dissappointed since the speech was the main reason for the trip. You could also say, of course, that he was unprepared, but still I would have appreciated if he had been given 60-90 minutes”.

NKS R and B Seminar 2016 - Survey

- ”Many of the talks were far too specialised in either theme or delivery. There was a mismatch between the audience and the nature of many of the talks. Future seminars should either decide to be “policy” type seminars with talks on less technical issues, or technical seminars with less focus on non-science themes such as communications. Joint R and B seminars have worked before but this Fukushima seminar was missing the target somewhat in that many of the talks were barely related to Fukushima”.
- ”Handouts were not provided. A possibility could be to make them available on the website already before the seminar, possibly replaced with final version if updated”.

NKS R and B Seminar 2016 - Survey

- ”Include more environmental questions in future seminars. Consider gender of presenters and aim for equal numbers male and female presenters”.

NKS R and B Seminar 2013 - Survey

- ”Provide more time for questions, please. What happened to the video recording? It would be nice to have this available. Thank you”.
- ”More time for discussion had been good, between the presentations”.
- ”On day 2, some more discussion time would have been good, and in particular a final questions and discussion session (preferably 30 minutes but even 15 minutes would have been very good)”.

NKS R and B Seminar 2013 - Survey

- ”Time keeping should be improved. Speakers should not be allowed to speak overtime, and enough time should be allocated for discussions in the agenda”.
- ”The sessions were quite heavy with several 2 hours sessions with 30 min long presentations. Specially the 30 min long presentations seemed too heavy (20 min would have been enough for most). I was hoping for more presentations on what is going to be done at Swedish NPPs as Fukushima actions. It was a bit disappointing that this side was not covered so much (I understand that it must have been difficult to contact companies on this topic, and the companies are not so open on this topic at this time when the plans are not totally fixed. But anyhow excellent seminar, thank you very much”!

NKS R and B Seminar 2013 - Survey

- ”Perhaps fewer and a bit longer presentations”?
- ”More time should be reserved for questions. Max length of presentations (30 min + 15 min for questions/discussion)”.
- ”Website with presentations could be made available already during the seminar”.
- ”Everybody should use a microphone, always”!
- ”Some minor problem with microphones and peoples willingness to use them”.

NKS R and B Seminar 2013 - Survey

- ”A few commentators gave surprisingly superficial answers”.
- ”There should have been something about the consequences outside the fence. We know from Tjernobyl that such consequences may be large and also require R&D in advance”.
- ”Naturally, the Seminar was too Nordic-oriented. Given the internationalization of nuclear safety, perhaps NKS could consider a better balance of Nordic vis-à-vis global interests”.

NKS R and B Seminar 2013 - Survey

- ”I think the bridging between R and B was fine. Maybe a little too much on Stress test? In general good presentations. The queing in breakes etc should have been avoided. Ok reception in the afternoon”.
- ”We will provide a proposal concerning a matter that is missing in NKS' list of issues, namely the risk of poorly performing repositories for disposal of radioactive waste”.
- ”It was an excellent seminar. I would love to join again next time. Thanks for organizing such a good seminar”.

NKS R and B Seminar 2013 - Survey

Conclusion from the survey – some lessons learned:

- Handouts must be improved – we should consider the logistics in connection with the seminar opening.
- We should make even more intensive use of newsletters before the registration deadline and the seminar itself.
- We should consider more time in the seminar program for questions and discussions.

NKS R and B Seminar 2016 - Survey

Conclusion from the survey – some lessons learned:

- Handouts / presentations must again be considered – a possibility could be to make them available on the website already before the seminar, possibly replaced with final version if updated
- We should make adequate use of newsletters before the registration deadline and the seminar itself.
- We should again focus on balancing scheduling/ timing, presentations, questions and discussions.
- Topic relevance, usefulness, quality etc. must be maintained.
- Consider gender of presenters and aim for equal numbers male and female presenters.

NKS R and B Seminars 2016 and 2013 Survey Comparison

Conclusion:

The 2016 seminar was a success. There is clearly a positive expectation that NKS continues organising seminars – like the 2013 and 2016 seminars. The coordination group therefore proposes to start working for a 2019 seminar.

Short note on status of the website, NewsLetters etc.

The Secretariat

Finn Physant

NKS Board Meeting, Copenhagen
22 June 2016

Website

- The present version of the website was opened in 2012 and still a state-of-the-art day-to-day website working tool.
- We have noted, that due to the development in website use of mobile devices, we need to check up on the responsiveness of the website. We will keep an eye with this and – if needed – come back to you with an update proposal.
- For the present sites we started obtaining statistics from a Google site in 2012. Here you have some main monthly figures for more than 3 years:

nks.org user statistics

Date	Dec 12	Jan 13	Feb 13	Mar 13	Apr 13	May 13	Jun 13	Jul 13	Aug 13	Sep 13	Oct 13	Nov 13	Dec 13
Visitors	771	2110	841	727	1030	815	623	577	643	1249	967	742	578
Unique visitors	562	1342	642	550	718	562	459	415	481	803	628	546	459
New visitors	536	1226	539	474	584	448	374	348	406	648	511	461	397
Return visitors	235	884	302	253	446	367	249	229	237	601	456	281	181
Av. visit time	2:54	2:36	2:25	2:32	2:40	3:20	2:50	2:32	2:26	3:33	3:20	2:49	3:35
Video 13 views					344	92	55	58	27	48	22	17	19

nks.org user statistics

Date	Jan 14	Feb 14	Mar 14	Apr 14	May 14	Jun 14	Jul 14	Aug 14	Sep 14	Oct 14	Nov 14	Dec 14
Visitors	878	1011	969	722	659	717	823	762	904	865	712	736
Unique visitors	672	763	771	581	471	499	696	620	680	625	536	578
New visitors	380	370	296	203	243	298	178	207	332	356	231	221
Return visitors	498	641	673	519	416	419	645	555	572	509	481	515
Av . visit time	2:36	2:09	2:11	2:31	4:27	3:17	2:35	2:28	2:58	3:40	4:01	3:18
Video 13 views	15	11	11	12	5							

nks.org user statistics

Date	Jan 15	Feb 15	Mar 15	Apr 15	May 15	Jun 15	Jul 15	Aug 15	Sep 15	Oct 15	Nov 15	Dec 15
Visitors	1067	723	1046	848	864	877	673	869	1207	1037	923	822
Unique visitors	751	547	857	648	670	642	524	627	818	665	568	571
New visitors	431	244	249	272	279	551	481	553	680	524	459	440
Return visitors	636	479	797	576	585	326	192	316	527	513	464	382
Av . visit time	3:40	3:05	2:17	2:55	2:37	2:30	2:29	2:20	3:00	3:03	2:46	2:45

nks.org user statistics

Date		Jan 16	Feb 16	Mar 16	Apr 16	May 16	Jun 16	Jul 16	Aug 16	Sep 16	Oct 16	Nov 16	Dec 16
Visitors		1523	730	724	792	845							
Unique visitors		903	522	536	579	670							
New visitors		684	403	448	511	583							
Return visitors		839	327	276	281	262							
Av. visit time		2:43	3:04	2:24	3:31	2:17							
Video 16 views		151	167	23	18	32							

NewsLetters and NewsFlashes

- Since the last board meeting four NewsFlashes have been distributed.
- January 19: summary report from the January board meeting including the result of the 2016 call for proposals.
- January 22: presentation of all the 2016 seminar presentations.
- January 29: presentation of the link to all 2016 seminar video presentations.
- May 4: including young scientist travel support, upcoming seminars and new reports.
- A NewsLetter was distributed a week before this meeting.
- There is a list of more than 500 e-mail addresses, to which our electronic letters are forwarded.
- A NewsFlash will be prepared for distribution a week after this meeting including a summary report from today's meeting.

Other kinds of info material –new pamphlet

- A new and updated version of the pamphlet "Nordic Nuclear Safety Research" has been published in 2016.