

**IEA - ECES
THE 49th EXCO MEETING IN TOKYO, NOVEMBER 2000**

November 2, 2000

**ANNEX 13
DESIGN, CONSTRUCTION AND MAINTENANCE
OF UTES WELLS AND BOREHOLES**

PROGRESS REPORT 6

1. General information

Annex 13 cover aspects of testdrilling, well and borehole design, construction and maintenance of wells and boreholes for UTES applications. The main target is set upon aquifer and borehole systems (ATES and BTES).

The final goal of the Annex is to work out a set of guidelines covering the following subtasks.

- How to gain information of the underground properties by testdrilling (Subtask A)
- How to design well or borehole systems properly (Subtask B)
- How to construct wells or boreholes cost effective, safe and properly (Subtask C)
- How to keep the storage systems functional during operation (Subtask D)

A second goal is to identify items or areas that need further research and development.

The annex was planned during 1997 and eventually approved by the 43rd EXCO Meeting in Paris 4-5 of December 1997.

Prior to the EXCO meeting there was an Annex Preparatory Workshop to review and correct the annex proposal.

The workplan takes into consideration that a number of participating countries will contribute to the further development of the annex following the task shearing principle. The target is set to finalise the work at the end of year 2001.

2. Previous events

The Annex started with a minor Workshop in Stockton, March 18, 1998 and continued with a first Expert Meeting in Giessen, June 15-16, 1998.

During these meetings the over all workplan was established and the project was consolidated in its working forms.

As was reported on the 44th EXCO Meeting in Chester, June 22-24 1998 most participating countries were still in a starting stage, trying to form national "working teams", and looking for financial resources for their work. Nether the less, a lot of valuable state of the art information was presented as the first input to the state of the art report.

The 2nd Expert Meeting took place in Malmö, Sweden, October 12-13 1998 and the results were reported to the 45th EXCO Meeting in Albuquerque, December 7-10. A general conclusion from this meeting was that there are still problems with organising and financing the work in several participating countries and that this will delay the progress of the work. However, a lot of useful information was presented for the benefit of the scope of the annex.

The 3rd Expert Meeting took place in Appenzell, Switzerland, March 17-19 1999 and the results were reported to the 46th EXCO Meeting in Luleå June 14-16. At this meeting it was stated that several countries have delays in forming national teams and to find financial support for the work. For this reason, it was concluded that the state-of-the-art stage would be delayed. It was also concluded that the most essential material have been obtained, to start the process of identifying areas or subjects for further research and development and to start preparing most of the state of art reports.

The 4th Expert Meeting took place in Westerville, Ohio, USA, October 6-8, 1999 and the results were reported to the 47th EXCO Meeting in Berlin, November 1-3, 1999. At this meeting it was stated that seven countries formally had joined the Annex, but there were still problems with fundings and forming of national teams. It was also found that recently activated countries must be given time to forward country specific information for the state of the art reports. To speed up the progress of work it was agreed to add simple questionnaire surveys to the input that is obtained by presentations.

The 5th Expert Meeting was held in Edmonton, Canada, April 10-11, 2000 and the results were reported to the 48th EXCO Meeting in Adana, Turkey, May 24-25, 2000. At this meeting it was approved to extend the time schedule to finalise the work at the end of year 2001. It was also announced that Germany

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would formally join the Annex and take over the subtask C leadership after the withdrawal of Switzerland. At the expert meeting it was concluded that the future work would be focused on finalising the state of the art reports and to screen the information with respect to guidelines and items that need further research and development.

3. Results from the 6th EM

3.1 General

The 5th Expert Meeting was held in Mol, Belgium, October 16-17 2000.

The proceedings were held at the VITO office in Mol, Paul Dirven, Bert Gysen and Hans Hoes as personal hosts.

The meeting was coordinated with the Annex 12 Expert Meeting (Oct 12-13) and a special workshop on Thermal Response Testing (Oct 14).

3.2 Participants and countries represented

The meeting was attended by 17 experts, representing nine different countries. These were, number each country in ()

- Belgium (3)
- Canada (1)
- Germany (2)
- Japan (2)
- Netherlands (1)
- Norway (1)
- Sweden (5)
- Turkey (1)
- USA (1)

Norway appeared for the first time represented by Norwegian Geological Survey and declared interest to join the Annex. At this point Norway is an observing country. However, by signing the ECES implementing agreement they were invited to be a formal member and share there experience preferably concerning BTES applications in Norway.

3.3 Current status each country

The current situation when it comes to forming national working teams, financial status and level of participation as expressed at the meeting is shown in table 1. Compared to the situation at the 5th meeting, Norway has joined as an observing country. Furthermore, the necessary funding and organisation issues seem to be firmly settled.

Table 1 Current country status

Country	Joinment	Financial support	Working team
Belgium	Formal	Limited	Develops
Canada	Formal	Limited	Develops
Germany	Formal	Fully	Develops
Japan	Formal	Fully	Formed
Netherlands	Formal	Fully	Formed
Norway	Observer	NA	NA
Sweden	Formal	Fully	Formed
Turkey	Formal	Fully	Formed
USA	Formal	Fully	Formed

3.4 Presentations

All together nine presentations were made. Three were general informations. These were

- Seed of ATES research in Japan, *Takao Yokoyama*
- Status of UTES in Norway, *Kirsti Midttömme*
- Measurement of Apparent Thermal Diffusivity and Recovery Factor in ATES, *Hiomishi Umemiya*

The other six presentations were linked to the subtasks. These were

SUBTASK A and B

- Thermal response test in Turkey-Future Work, *Bekir Turgut*
- Sampling Methods in Japan, *Hiomishi Umemiya*
- Status of the Subtask A survey, *Benjamin Andersson*
- Subtask B State-of-the Art report, *Göran Hellström*
- Status of the Subtask A and B State-of-the Art report, *Olof Andersson*

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Subtask B and C

- Subtask C State-of-the Art report, *Olof Andersson*
- Subtask D State-of-the Art report, *Guido Bakema*

3.5 Group work and discussions

Part of the meeting was scheduled for group work with the objective to screen the obtained information into

- Statements of knowledge that can be used for guidelines, manuals and equal
- Identification of technical items that can not be used to state guidelines and therefore need further consideration

The group work was performed in four groups covering the four subtasks. The results were presented and discussed at a final plenum.

The results of group work pointed at a number of subjects that have to be discuss further. However, there were also consensus of some basic subjects that will be used as guidelines.

3.6 Conclusions and agreements

The current information status, survey material excluded, is shown in table 2. A general conclusion at the closing of the meeting was that the country specific state of the art material now should be completed. Missing information will be covered by additional inputs to the draft reports during the review stage.

Table 2 Current information obtained from different countries

Country	Number of presentations that cover			
	Subtask A	Subtask B	Subtask C	Subtask D
Belgium	1	-	-	1
Canada	3	3	3	1
Germany	2	-	-	1
(Denmark) ¹	-	1	-	-
Japan	2	1	2	2
Netherlands	1	1	1	6
Norway ²	1	-	-	-

Country	Number of presentations that cover			
	Subtask A	Subtask B	Subtask C	Subtask D
Sweden	6	9	7	7
(Switzerland) ¹	-	-	1	-
Turkey	2	1	2	-
USA	5	-	-	-
Total	23	16	17	18

1) Withdrawn from formal participation

2) Observing Country

The current status of the subtask reports is shown in table 3.

Table 3 Current status of state of the art reports

Subtask	Report title Subtitles if sections Author(-s)	Status
A	UTES Site Investigations by Testdrillings and Thermal Tests	
Section I	"Test drilling for UTES Applications", <i>F Michel, Canada</i>	Delayed
Section II	"Thermal Response Tests for BTES Applications. <i>J Spitler, USA</i>	Draft April 2000
B	UTES well and Borehole Design	
Section I	"ATES Well Specification and Design" <i>O Andersson, Sweden</i>	Draft Nov 2000
Section II	"Borehole Heat Exchangers. Configurations and Thermal Efficiency" <i>G Hellström, Sweden</i>	Draft Oct 2000
C	Drilling and Construction of UTES Wells and Boreholes, <i>O Andersson, Sweden and B Sanner, Germany</i>	Draft Dec 2000
D	Well and Borehole Failures and Cures in UTES Systems, <i>G Bakema, Netherlands</i>	Draft April 2000

The delay for part of the Subtask A report is due to a survey that has not yet been finalised. However, it's expected to have a first draft in February 2001.

It was proposed and agreed upon that a survey covering the drilling costs in different countries shall be made as a part of Subtask C.

Regarding Subtask D, there is still missing information's on failures with BTES applications.

The expert meeting agreed that – for the time being – all draft reports should be made generally available on the IEA-ECES homepage.

It was also agreed that these reports should be working documents until the next meeting on which the subtask leaders shall present the second drafts.

The expert meeting agreed that Norway might formally join the Annex, even at a late stage. However, this require that Norway sign the ECES implementing agreement.

It was finally concluded that on the next meeting the group work for screening guidelines and subjects for further research and development must be given the major part of the meeting time.

4. Workplan till next meeting

4.1 Subtask A

- All countries shall submit the test drilling survey answers to F Michel or B Andersson not later than December 15, 2000-11-02
- The subtask leader for “testdrilling” shall produce a first draft of the report not later than February 15,2000-11-02
- The subtask leaders and experts involved in the subtask shall prepare proposals for guidelines till the next meeting
- The subtask leader for TRT shall submit the second draft report not later than February 15, 2000

4.2 Subtask B

- The subtask leader for ATES Well Design shall submit the first draft report not later than November 30, 2000

- The subtask leader for Borehole Heat Exchanger shall submit the second draft report not later than February 15, 2000
- The subtask leaders and experts involved in the subtask shall prepare proposals for guidelines till the next meeting

4.3 Subtask C

- The current subtask leader (OA) shall submit a first draft not later than December 31, 2000
- He shall also distribute a survey to the coordinators of the participating countries concerning drilling costs. This format shall be distributed not later than January 30, 2001 and the countries shall have replied not later than March 31, 2001
- The subtask leadership shall formally be taken over by Germany at the next meeting
- The subtask leaders and experts involved in the subtask shall prepare proposals for guidelines regarding ATES well drilling and completion procedures till next meeting

4.4 Subtask D

- The subtask leader shall submit the second draft report not later than March 31, 2001
- Countries with experiences on BTES applications (preferably Germany, Sweden, USA) shall send information on BTES failures and cures to the subtask leader not later than February 15, 2001
- Germany shall think about how to detect failures in BTES systems to be presented at the next meeting (to be potentially used as guidelines and for maintenance programs)
- The OA shall review guidelines that were established in the former IEA-ECES Annex 6 and present these for discussions at the next meeting
- The subtask leader and experts involved in the subtask shall prepare proposals on "maintenance" guidelines till the next meeting

5. Next meeting

The 7th Expert Meeting will be hosted by IF Technology, Netherlands, April 26-27, 2001 (preliminary).

The meeting will be in conjunction with Annex 12, April 23-24, with a study tour in between.

Olof Andersson
Operating Agent