

## **NUMO International Technical Advisory Committee**

### **Short Record of the ITAC-3 Meeting Tokyo, 16- 19 July 2002**

#### **Introduction**

This 3<sup>rd</sup> meeting of the NUMO International Technical Advisory Committee (ITAC) was notable for the addition of an eighth member (Bernard Faucher of ANDRA, France) and the inclusion of a first joint session with the Domestic Technical Advisory Committee (DTAC). The ITAC meeting itself consisted of two days of presentations by NUMO staff, followed by extensive discussions and a third day of closed session during which ITAC formulated its conclusions and recommendations. The ITAC welcomed the joint meeting with DTAC on the fourth day and found it valuable: subsequent meetings might be useful to allow focused evaluation of critical issues and development of an ITAC-DTAC consensus.

This short record focuses on documenting the ITAC, but includes also an Appendix (I) containing a summary of key points arising from the joint meeting with DTAC. The ITAC record is an expanded version of the series of overheads prepared in the closed session and presented in the 19<sup>th</sup> July joint session; the summary of this joint session is based on overheads prepared at the session and agreed by the ITAC and DTAC chairmen. The ITAC record is structured as following:

- General comments
- QA
- Volunteering process
  - ◆ General
  - ◆ Level 1 document
- Repository concepts
  - ◆ Level 2 document
  - ◆ Level 3 document
  - ◆ RC workshop
- Siting factors
  - ◆ Level 2 document
  - ◆ The PIA problem
  - ◆ The fault issue
  - ◆ Level 3 document
- Future ITAC activities

## **1 General comments**

ITAC observed that NUMO staff are working more and more as a team and is greatly encouraged by this trend, which will help them in their extremely ambitious and challenging programme. It was also noticed that some restructuring and expansion has occurred at NUMO, and thus ITAC appreciated receiving a new organigram with all key staff listed (Appendix II).

It was also seen as positive that an implementer side committee on R&D co-ordination has been formed in Japan. Nevertheless, questions remain on how overall R&D strategy will be set, on the documentation of committee conclusions (without some kind of documentation, the impact of such committees can be greatly reduced) and on the interface with regulatory R&D.

Given the complex network of bodies involved, it was recommended that NUMO should consider explicitly allocating to one or more of its staff members responsibility for tracking output from, and co-ordinating liaison with, government strategy committees. This person would also be responsible for ensuring that all relevant NUMO staff are informed.

More specifically, NUMO documentation and presentations at the third ITAC meeting were again of a high standard. The extensive documentation provided before ITAC-3 was timely. However, significantly more than one day from each ITAC member was needed in order to prepare suitable responses; this fact was acknowledged by NUMO and an extra day of preparation was agreed. ITAC is very gratified that so many of its recommendations prepared before and during the meeting are being taken on board by NUMO, since this indicates that the work is judged as being of value to the Japanese HLW programme.

Overall, the structure of documentation, with three main levels, is now good. Timing is, however, looking tight for all preparations for the open solicitation strategy and, specifically, for production of high quality documentation. In this regard, it was certainly a good decision to use professional writers and graphic artists. Improving quality by extensive use of external reviewers is also very sensible, but NUMO might consider seeking more input on its solicitation documents from reviewers representing a broader range of social and geographic groups. Given the large work load, it may need to be accepted that level 3 documents may not be completed by the end of the year.

ITAC believes that there is an increasingly urgent need to establish NUMO positions on many issues that could be problematic or controversial (e.g. withdrawal from the volunteering process, retrievability, monitoring, etc.). Ideally the NUMO positions would be noted in appropriate documents but, in any case, they should be agreed before public presentation, in order to respond coherently and consistently to probable questions from key stakeholders.

Finally, it was noted that English translations of key documents, or summary chapters, could be useful to NUMO, although these are not urgent. In general, a policy on translations needs to be developed.

## **2 QA**

Quality management issues were raised on a number of different occasions during ITAC-3, and some of the key conclusions / suggestions are brought together in this section. At the top level, it should be recognised that QA should be established for the entire organisation (to track corporate processes, especially decisions), not just considered for specific projects, outside contractors, and data. Even for the latter, staff commitment should be recognised to be more important than computer tools to aid QA procedures.

In the short term, a NUMO organigram should be produced with clear identification of a Quality System manager. Steps should be taken to initiate a formal QA scheme, since an early start can help prevent a large backlog of QA activities and since it is important to signal to the public and the regulators that QA measures are being undertaken. Any QA procedures introduced should be checked by internal and external audits. In addition, as NUMO will bear ultimate responsibility for contractor QA, the requirement for also auditing such work should be borne in mind. Finally NUMO should think early about if/when/how to introduce the thinking behind ISO 9000/14000 – and should consider formal certification; this is increasingly becoming the industry norm and may well be required by regulators, as well as assisting NUMO in attaining its goals for transparency and traceability.

## **3 Volunteering process**

### **3.1 General**

The NUMO siting process is unique and corresponds to modern ethical principles. It would be good for NUMO to highlight this in level 1 and 2 documents, and explain why this approach was chosen and take credit due. However, the level of "commitment" of the partners is a key issue – the ability of both the municipality and of NUMO to withdraw at different stages needs to be defined.

It is noticeable that the law and official interpretations of it are ambiguous in many respects. It is not clear if this ambiguity is real or an artefact of English translations. NUMO should document its own interpretation clearly in order to reach a common position – both internally and with the volunteers. It may be useful to explain that the need for clarification has arisen from the volunteering process itself, as the law was designed for a nomination process (even if this is nowhere explicitly stated). Most particularly, this concerns Preliminary Investigation Area (PIA) (and Detailed Investigation Area (DIA)) definition and treatment of "active faults".

The overall concept of level 1 – 3 structure of documentation is fine, but NUMO should intensify preparations for presenting its work (core messages, internal position statements, FAQs, media training, etc.).

### 3.2 Level 1 document

ITAC considers that the length, format (in form of Tomon-san's letter) and messages are good. The tone of document could, however, be more co-operative (with more emphasis on municipality involvement). Some general recommendations / points are:

- Clearly state at beginning that the approach is about radwaste disposal!!
- Note that "Japan" chose geological disposal, the law mandates NUMO to carry out siting, and NUMO chose volunteerism for moral and ethical reasons and to ensure transparency and respect the independence of municipalities.
- ITAC thinks that NUMO should be looking for a volunteer area that is anything from 10 km<sup>2</sup> up to whole municipalities (or groups thereof, see also 2 scenarios considered in the PIA discussion below). Thus, avoid giving the impression that it is only about volunteering a small, specific site that has to be identified from the start – this is the least flexible option.
- Make clear that this is the start of a long process of dialogue between NUMO and municipalities with stepwise development of commitment from both sides (especially withdrawal from process – if, in fact, this is really the case )
- ITAC recommends that benefits to municipalities (not only cash compensation) are emphasised and some examples given
- Justification for geological disposal should be more general (safety / security / stability / isolation) with reference to feasibility studies which have shown that Japan has suitable environments for disposal. Should certainly be much less technical (remove references to volcanoes, groundwater, etc.)
- Box on the first page might usefully have a short description of content and purpose of document (like an abstract): not just a review of the legal basis of the document
- NUMO should point out that it has developed an approach using siting factors that are more detailed or more specific than the qualification factors described in the law (including social, economic and environmental issues) and that NUMO wants municipalities to be involved also in the process of evaluating the application of these factors
- Appendices are appropriate but could be simpler / clearer: 1) selection procedure; Figure 1 should have first and last steps added (Volunteering, Implementation), 2) reference materials: illustrate with concept picture and an example of an "exclusion map", 3) process of application; greatly simplify figure or replace with some simple text emphasising dialogue and 4) names, e-mail and phone number for points of contact and how to get copies of cited references.

In addition, ITAC written comments before this meeting have suggested ways of polishing the existing English text of Tomon-san's letter and improving logical development of the key messages. This could aid discussions with the "professional writer" used for text polishing and also could produce text for use in the NUMO English home page (which is rather limited at present).

## 4 Repository Concepts documents

### 4.1 Level 2

This document has improved (Japanese version amendments already proposed are generally even better) and is close to finalisation, but still has too much content. A page-by-page summary of key comments is included as Appendix 3 and a marked-up text with linguistic comments will be provided (**Action: Ian to give to Umeki-san**). In particular, suggestions are made for sections to be dropped or transferred to the level 2 SF document. This might best be implemented in collaboration with the qualified writer and illustrator. Two very general points in this regard:

- Try to emphasise security (fences, etc) in illustrations (concern about terrorism)
- Add more people in illustrations wherever relevant to provide scale and atmosphere of safety.

### 4.2 Level 3

The contents list looks fine, but it is still too early to say anything detailed about technical content. However, some points noted were:

- How convinced is NUMO that they have noted all key scientific and technical design factors ("concerning issues")? At least, the full list should be carefully reviewed
- There is a clear need to examine the socio-political factors further as these can play a critical role in defining the acceptability of a project
- ITAC cannot comment on supplementary PA report (no detail yet available and may not be available in English) – but, as the message it gives could be critical, NUMO should specify how it will be reviewed as part of the documentation QA
- ITAC recommends an English summary. This could be useful as the basis of conference papers, a glossy hand-out, web-page (which needs to be reinforced at present), etc.

### 4.3 RC workshop

The working method developed at the Baden workshop was considered to be valuable, broadening horizons beyond the very generic H12 work. This approach serves as an aid to develop flexibility and also helps NUMO to integrate its siting and repository design work. It was noted that a complementary approach would be a top-down model although this would probably be practicable only when the general characteristics of individual PIAs are known. It might be useful to clearly explain the justifications for looking at a wide spectrum of site characteristics / design options at the present time (saving time and costs later, giving a perspective on key R&D needs, providing the basis for future optimisation, as a learning process, etc.). While this analysis of the impact of siting factors on repository design concepts may be of secondary importance until the time of open solicitation, the insights from this analysis will likely be of key importance at very early stages of the PIA process (e.g., Step 4 of PIA Case 1 cited below). Such analyses also affirms NUMO's stated willingness to examine design concepts outside of the current H12 reference, which could have significant problems based on international experience.

As minor points, it was noted that nomenclature needs tidying (e.g. design goals rather than factors) and it needs to be emphasised that the system characteristics used are just a sample – not in any way comprehensive. Obviously, keeping as many options open as possible at early stages gives maximum flexibility, but eliminating impractical designs as soon as specific site data are available is important to focus and cost-optimize the programme. In any case, final reports of workshops could usefully be reviewed by ITAC and DTAC.

## 5 Siting Factors documents

### 5.1 Level 2

The purpose and style of this document is necessarily different from the level 2 RC; this is an operational document but it should still be in easy to understand language and contain clear and useful illustrations.

It may be useful to emphasise that Evaluation Factors for Qualification (EFQs) are being used only as first screening discriminators and to explicitly state that the way they will be applied will be more restrictive at the later, Favourable Factors (FF) stage. Also, if factors are called "qualification factors" then requirements should be negatively stated ("site should NOT have certain characteristics....").

Some further specific points noted were:

- It would be sensible to make maximum use of language and concepts / justifications in NSC document on "The policy for environmental requirements on the PIA
- It will soon be crucial to have level 3 justifications for SF to support level 2 statements, thus it is extremely important do this part of the level 3 document **now** to ensure consistency later
- Critical issues are:
  - ◆ Definitions of volunteer areas, PIA, DIA, complementary investigation area (needs illustrations: see following section)
  - ◆ Definition of faults, classes, respect distances (needs illustrations: see following section)
  - ◆ Clear formulation of resource issue: emphasising that presently worked resources just for screening – abandoned mines and distribution of mineral resources will be considered at FF stage
- Recommend publication of SFs in open literature (e.g. 2003 Sapporo IUGG meeting) to bring to the notice of, and gain feedback from, the wider technical community
- The list of FFs is **still** incomplete or not sufficiently discretised: especially environmental, social, conflicting land use, etc. (but probably best to remove "low price": emphasise alternative feature such as land availability)

- Maybe add a box describing impact of all non-nuclear (i.e. planning) legal requirements on acceptability of a volunteer Figure 1 appears too complex and should better show how NUMO will offer **help** to municipalities, not just offer to provide "details"
- ITAC agree with idea of a glossary, but note also that general terminology needs tidying up.

A particular issue causing much discussion was the justification used for an implied uplift cut-off (300 m during the past hundred thousand years)) which gives a bad impression that anything short of repository exposure at surface is acceptable. Particular related points were:

- There should be clear recognition of other adverse effects on repository performance and safety occur before exposure
- Emphasise that regions with less uplift will be evaluated in FFs
- Note explicitly that any cut-off is only relevant if associated with comparable amounts of erosion.

ITAC suggested a different, more general "uplift" formulation:

The NUMO objective could be that the repository should not reach depths less than 300 m in ~100 ka (as ITAC recommended last time). In this respect, site suitability cannot be determined until the site, the host formation and consequent degree of flexibility in depth of the repository, and the local erosion rates are all known or can be estimated.

## 5.2 The PIA problem

### Background

The characteristics of a PIA as defined in the law are really those of a **potential siting area**, rather than an investigation area (which might be more suitable terminology in the case on a strictly technical, nomination approach to siting). For example, it is stated that a PIA may not contain an active fault – but this is a siting area restriction and investigations may well have to cover areas with such faults. NUMO appears to have defined the **minimum** acceptable area for a "volunteer area" to be around 10 km<sup>2</sup>. The maximum is a whole municipality or a group of municipalities who volunteer together. It must be accepted that the area that must finally be investigated by field operations such as seismics, boreholes, surface mapping / trenching, etc. will be site dependent and may be bigger (maybe much bigger) than the official PIA or the volunteer area. NUMO should clarify these issues as soon as possible; if municipalities adjacent to a volunteer area do not accept field investigations, it may be difficult or impossible to implement a scientifically defensible site characterisation programme. This issue may become more sensitive due to the fact that compensation for co-operating with NUMO is foreseen only for the municipality containing the volunteered area.

NUMO should sketch how official "PIA's" can be arrived at starting from each of these extremes – we provide below an illustration of two Cases to show the kind of information (both text and graphics!) that the SF level 2 document should contain (or, at least, summarise with reference to more explanation at level 3).

**Case 1: Municipality (or group) volunteer its whole land area**

In this case, in '**Step 1**', the municipality may be aware that an active fault runs through the region, but they are not sure exactly where. The volunteer may also specify conditions, e.g. area under a city is excluded.

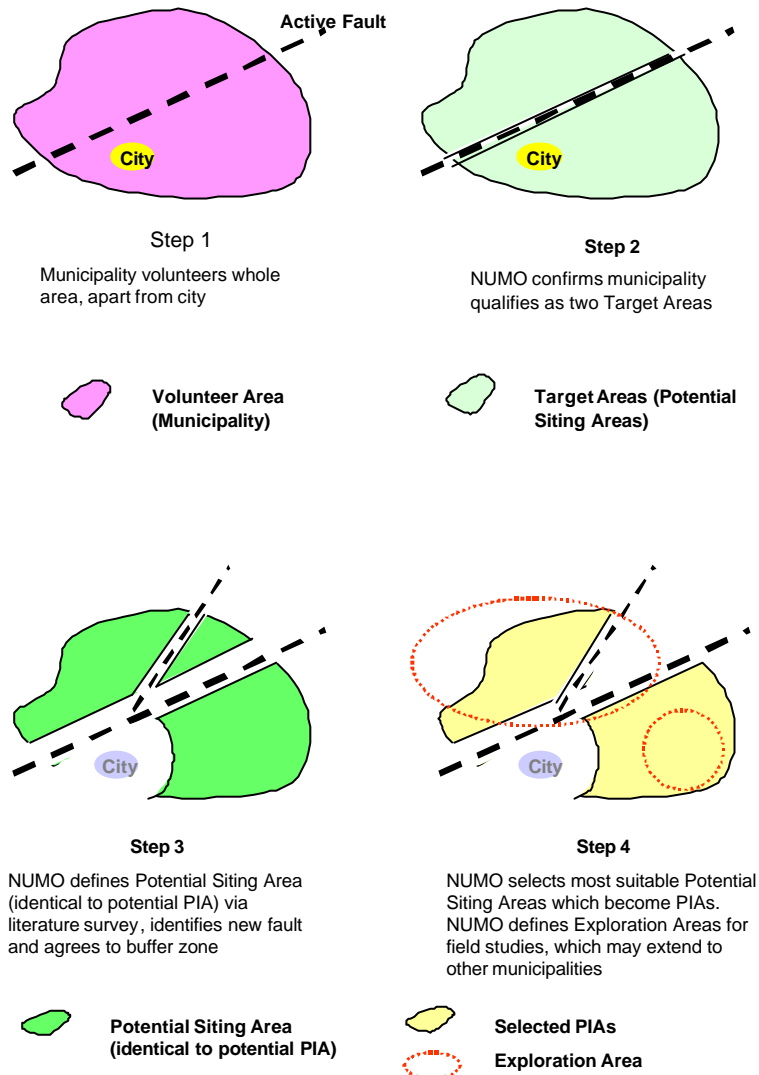
In **Step 2**, NUMO works together with the volunteer municipality to identify 2 potential target areas on either side of the fault which are not excluded by other criteria (e.g. volcanism, uplift) and hence will form the focus for the detailed literature study.

**Step 3:** the detailed literature survey identifies another smaller active fault in the area and allows respect distances to be specified for it and the major fault. Discussion with the local municipality also allows the exclusion zone around the city to be defined.

**Step 4:** based on further discussions with the municipality, the two larger areas are agreed as potential PIAs and the smaller one dropped (although it is not technically excluded and could, in principle, be considered a reserve). Based on these PIAs, an understanding of the siting environment involved and appropriate repository concepts leads to specification of a potential siting region and the required surface characterisation studies within a specific exploration area. This exploration area may, if one is lucky, lie inside the volunteer municipality and be remote from the fault. It is implicitly assumed here that surface exploration does not need to include the entire PIA if it is very large. More likely, however, is that it would include active faults and extend beyond the PIA, and perhaps beyond the municipality. This also raises the issue whether the planned exploration programme must be agreed with (and permits obtained from) the volunteer municipality, as well as others impacted (possibly municipalities opposing the project).

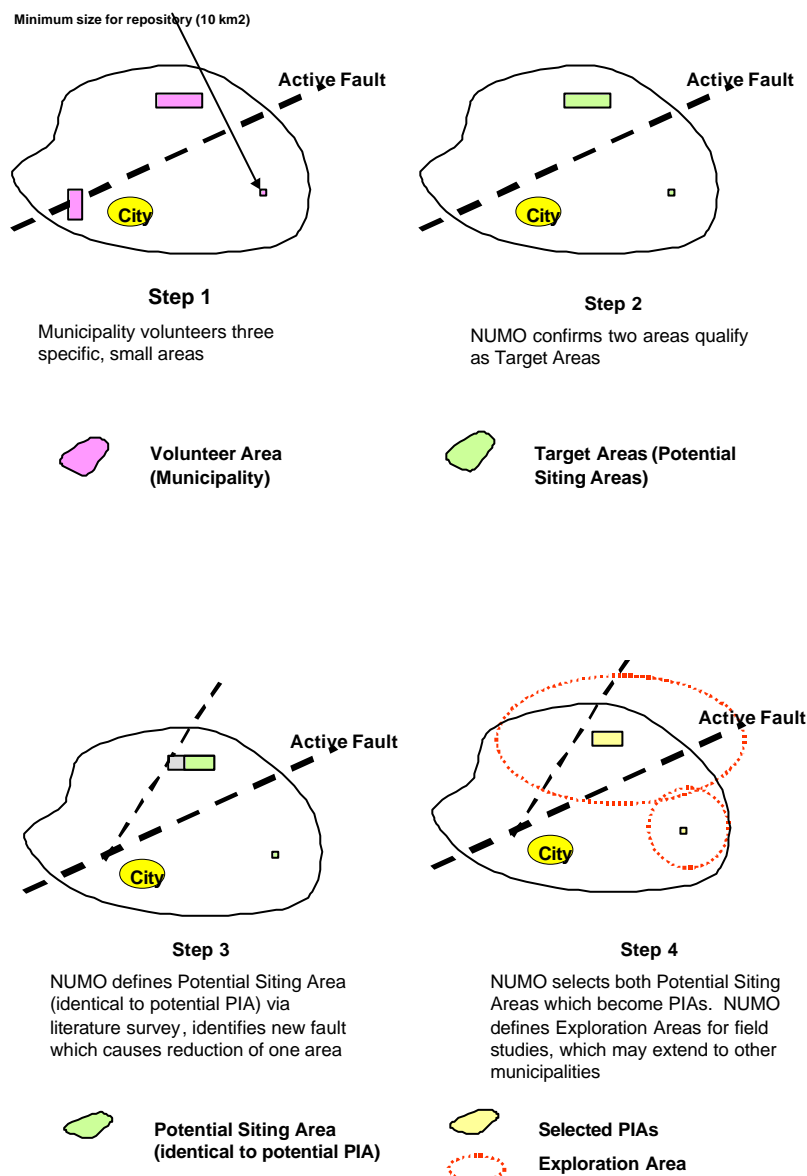
As ITAC understands the situation, a somewhat different scenario is also possible.

**Figure 1: Case 1: Municipality volunteers its whole land area**



**Case 2: Municipality (or group) volunteer specific, small areas**

**Figure 2: Case 2: Municipality volunteers specific, small areas**



In this case, in **'Step 1'**, the municipalities may again be aware that an active fault runs through the region, but they are not sure exactly where. The volunteer municipality specifies exact areas for consideration (e.g. industrial areas, derelict land, etc.) and all other areas are excluded.

In **Step 2**, NUMO works together with the volunteer municipality to show that one of the areas is excluded by the active fault but that the other 2 potential target areas are not excluded by other criteria (e.g. vulcanism, uplift) and hence will form the focus for the detailed literature study.

**Step 3:** the detailed literature survey identifies another smaller active fault in the area and allows respect distances to be specified for it and the major fault. Although the larger of the target areas is intercepted by this fault, discussion with the local community allows a reduced size target area to be defined.

**Step 4:** based on further discussions with the municipality, both areas are agreed as potential PIAs. Based on these PIAs, an understanding of the siting environment involved and appropriate repository concepts leads to specification of a potential siting region and the required surface characterisation studies within a specific exploration area – which could include active faults and will certainly extend well beyond the boundaries of both these small PIAs. This also raises the issue whether the planned exploration programme must be agreed with (and permits obtained from) the volunteer municipality, as well as others impacted (possibly municipalities opposing the project).

Note that, for both the Cases illustrated, the PIA terminology is not very useful (at least in English) as it seems to refer more to a potential (or preliminary) siting area – the investigation area would generally be much larger, as well as the issue of when exactly during the process does a site qualify as a "PIA". As some of these points may be rather subtle, it may be best for NUMO and DTAC to review this section of the record with some care and provide some feedback to ITAC in case they have missed some important considerations. Also note that other, alternative Cases could also be identified that may raise issues (e.g., how municipalities volunteer off-shore regions, and how such regions will be evaluated, or PIAs that might straddle two volunteer municipalities, or whether and how revised boundaries to initially volunteered areas might be negotiated).

### 5.3 The fault issue

As was the case with H12, the terminology associated with active / inactive faults and other repository-relevant geological discontinuities seems to cause confusion between Japanese and external reviewers. Without again going into extensive discussion of the problems, some recommendations from ITAC are that NUMO should:

- Clearly define, reference and illustrate what they mean by "active faults" and whether their clear definition (in terms of a specific map) changes after the EFQ stage
- Describe A, B, C (and lower?) classification, and if and how it will be used in the EFQ and later stages

- Clearly explain why no respect zone is used at EFQ stage (i.e. large local and regional variability) and how such zones will be defined at later stages
- Be clear that subsequent discovery of a small active fault during PIA or DIA investigations will not necessarily lead to rejection of site
- Explain how small active and all non-active faults will be incorporated into site evaluation and repository layout designs
- Consider extending remit and outside contacts of the International Tectonics Meeting (ITM) to focus on this topic and then publishing findings, in order to establish consensus and build up scientific credibility of the approach finally adopted.

## 5.4 Level 3

Basically, the structure seems fine although it is important to ensure that it is consistent with level 2 (see earlier comment). A few more technical points / questions:

- "Comparative assessment" of sites is easily over-interpreted – do not promise too much at the present stage when it is unclear to what extent such ranking will be needed (e.g. if there are only 3 volunteers, it might be sensible to carry all on to the surface characterisation phase regardless of what comparison based on Favourable Factors (FFs) indicates
- Section 3.3 should more emphasise working together with municipality
- Definitions of terms should be documented here (extension of level 2 glossary)
- Core messages should reflect text phrasing suggestions of ITM and other peer review groups
- Where are geothermal constraints considered?

## 6 Future ITAC activities

The date for ITAC-4 has been moved slightly (now 25 – 27 November 2002) and the date for ITAC-5 set as 21 – 23 January 2003. Although extensive iteration with NUMO will be required to fix programmes for these meetings, some topics that might be included could be:

### ITAC – 4: 25 – 27 November 2002

- Level 3 penultimate review
- Review output from RC-2 workshop and MAA project
- Level "2.5" PA work: first review
- Review NUMO positions on critical issues (e.g. inventory, retrievability.....).

### **ITAC – 5: 21 – 23 January 2003**

- Last look at level 3 (??)
- Status of open solicitation process (number / characteristics of volunteers)
- Review NUMO positions on critical issues
- First look at forward R&D programme.

It may also be valuable to plan future joint sessions with DTAC (e.g. 24 January 2004), but these need to be planned well in advance. In future NUMO might also consider if anything could be gained by joint sessions with other important groups in Japan or key decision-makers (e.g. METI groups, professional groups, ...).

Finally, ITAC prepared a list of potential topics for discussion with DTAC (or other relevant groups):

- Terminology of geological discontinuities on all scales
- Feasibility of site characterisation work for PIAs
- Evaluation of geothermal water and other indirect indicators of igneous activity
- Human intrusion: mineral resources
- Long-term geological stability in a PA timeframe
- Alternatives to H12 repository concept
- Establishment of experienced staff
- NUMO co-ordination of R&D
- Implementing QA.

Although some of these were discussed on the 19<sup>th</sup>, this may be a useful checklist for future assessment of consensus between ITAC and DTAC.

## *Appendix I*

### **Short Report**

#### **DTAC / ITAC Joint Meeting 19 July 2002**

##### **A-I.1 Overview**

The DTAC / ITAC Joint Meeting, was attended by all 8 ITAC members and by 8 DTAC members; NUMO staff also participated and President Tomon attended the Summary Session. After a welcome and introduction of participants, the meeting comprised 4 main blocks:

- Summary of ITAC-3, with particular focus on the process of PIA definition (see main text). This did not cause much discussion (possibly helped by the fact that Ohnishi-sensei attended the ITAC closed session as an observer) and hence is not further documented here
- Reviews of the current status of HLW programmes in the USA, Finland, Sweden, Switzerland and France and international / regional disposal options. These reviews focused on siting procedures, repository concept / safety case and plans for implementation. Again they are not further documented here; overheads were distributed at the meeting.
- Clarification of potential ITAC / DTAC differences in opinion. Due to constraints of time, only 4 issues could be covered:
  - ◆ Terminology; particularly of faults and discontinuities
  - ◆ Human intrusion / resources
  - ◆ Predictability of geological stability
  - ◆ Alternative concepts to H12
- Wrap-up synthesis of agreements and disagreements.

In this short note, the last 2 blocks will be integrated and summarised by topical area.

##### **A-I.2 Terminology**

Discussion focused entirely on faults and respect distances as used during the early stages of siting. Based on DTAC response to ITAC outlines, it appears that:

- There is **consensus** on the use of the active fault map without consideration of respect distances for the purpose of screening at a national level
- At the level of local literature studies, emphasis is still on major active faults (A, B, ...maybe also C?) – **consensus**. It seems possible that some kind of minimum respect distance might also be required to be defined at this stage, but this was not discussed in detail (see PIA discussion in main text)

- After such screening, all identified major discontinuities (active or non-active) need to be examined as FF and site-specific respect distances more rigorously defined – **consensus**
- Despite early emphasis on active faults (as for reactor siting, for example), it should be emphasised that there are 4 major classes of properties of faults and other discontinuities which are relevant for repository siting / design:
  - ◆ Movement of the fault: i.e. direct displacements
  - ◆ Associated vibrations – earthquakes and related perturbations
  - ◆ Hydrogeology – local / regional; hydraulic cage or low K barrier, solute transport paths
  - ◆ Mechanical – influence on constructional and operational constraints, layout, etc.
- There was a diversity of opinion on the extent to which fault terminology needs to be harmonised at the present time – **possible future discussion topic**.

### **A-I.3 Human Intrusion**

Discussion focused entirely on inadvertent human intrusion resulting from exploration or exploitation of natural resources. Although not discussed, it was noted that the general international consensus is that intrusion by drilling (e.g. in mineral exploration) is critical only if it causes disturbance of the repository; societies with the technology for deep drilling should be able to detect and respond to minimise direct consequences to the drilling team.

Some key conclusions of discussions were:

- The criterion of presently exploited mineral resources used for screening at a national level is now understood and agreed to be reasonable – **consensus**
- It is agreed that "low likelihood of future intrusion resulting from exploration or exploitation of natural resources" should be listed as an important FF for site-specific evaluations; institutional or legal controls cannot be relied upon to prevent intrusion at long times
- Although the present Japanese situation concerning utilisation of groundwater is recognised to be different from that in most national programmes, there remain differences in opinion on the treatment of groundwater as a resource (**possible future discussion topic**)
- On the other hand, geothermal waters are an important resource in Japan; a key problem is the assessment of possible future exploitation, even on a local level – **consensus**.

#### **A-I.4 Predictability of geological stability**

Within this general topic, a range of topics were considered. For all, however, it was agreed that, although assuring integrity of the EBS for around 1ka is important, the main concern was stability on a scale in the order of 100 ka or more – **consensus**. On specific processes:

- Vulcanism; agreement that there is no problem east of the Quaternary Volcanic Front (QVF) and that, to the west, a probabilistic approach is reasonable – **consensus**
- Faulting; major movements focused on A / B faults with low probability of C growing to A / B (although this low probability remains to be defined) – **consensus**
  - **Note:** during discussion a characterisation problem was identified, in that it was possible that an A could be mistakenly classified as a C – **something for NUMO to remember**
  - Uplift; technical understanding to support predictability and the geological evidence on which uplift rates are derived are both reasonable – **consensus**. Problems still arise with the way in which exclusion values are selected and presented (see main text – **90 % consensus**)
- Climate change – **consensus** that effects are predictable for any location even if the timing of such changes is not
- Mega-tsunamis; wild card which caused some discussion and maybe a little confusion. Probably not critical, but might be worth nailing down (**possible future discussion topic**).

#### **A-I.5 Alternative concepts**

It was recognised that the H12 designs were aimed for a feasibility demonstration and hence, like those in similar studies such as Project Gewähr, KBS-3, etc., may not be practical for full-scale implementation in a particular site / host rock. R&D carried out in Japan and elsewhere can allow evolution and optimisation of designs and NUMO is prepared to make use of such flexibility. Already in the RC documentation, an indication that different designs are possible is given. More could possibly be done in level 3 – **consensus**

Even though priority must now be on organising the solicitation process, there seem to be considerable advantages in thinking ahead to identify if H12 variants or novel designs would be particularly suitable for the geological and geographical settings of potential volunteers. Postponing this effort until PIAs are identified could greatly increase the risk of programme decisions with major cost and time implications being made on the basis of incomplete understanding of key design issues. Although DTAC is clearly "not responsible for H12", and seemed unsure of its role in project optimisation after the solicitation phase is complete, this is an important topic which might be examined further at a future joint meeting (**possible future discussion topic**)

#### **A-I.6 Conclusions**

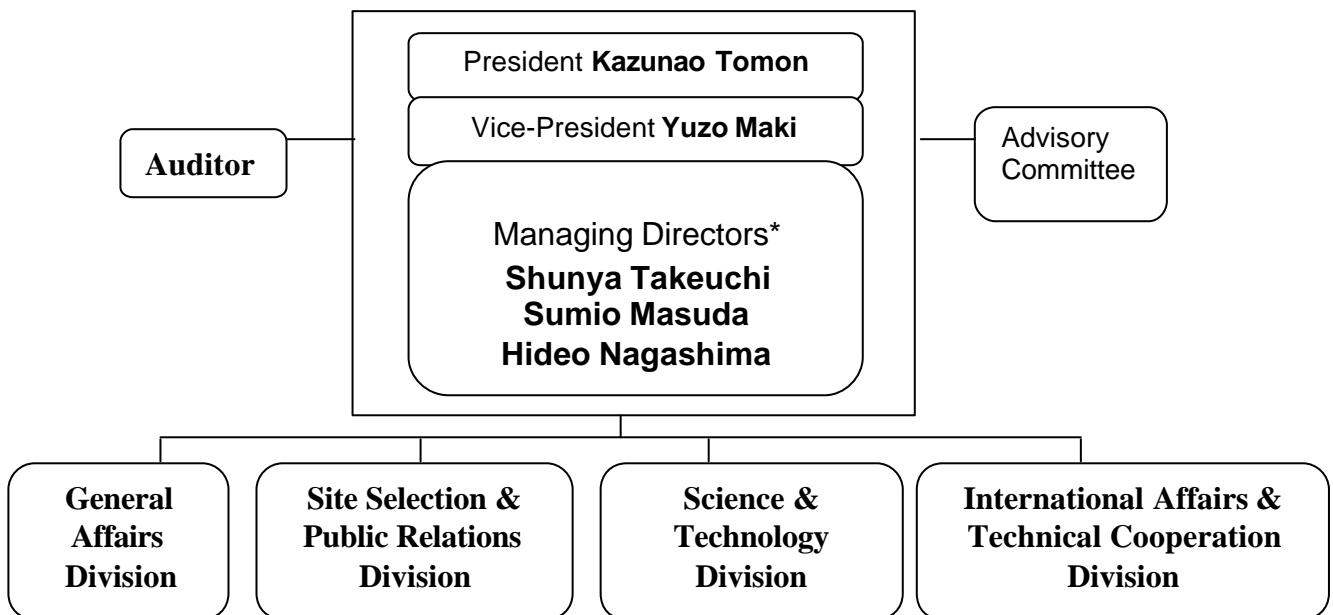
Overall, in conclusion, it appeared that there were certainly many more areas of consensus between DTAC and ITAC than there were areas of disagreement. Sorting out areas of confusion seemed to be helped by the excellent simultaneous translation service provided. NUMO may well benefit from holding some further joint meetings to extend discussions on some of the specific points identified above.

*Appendix 2*

## Organizational Chart of NUMO

Board of Directors

Aug 1, 2002



\* Shunya Takeuchi is responsible for General Affairs Division (except Public Information Section) and Site Selection & Public Relations Division

\* Sumio Masuda is responsible for Science and Technology Division

\* Hideo Nagashima is responsible for International Affairs & Technical Cooperation Division and Public Information Section in General Affairs Division

### **Appendix 3**

#### **RC Level 2: Page-by-page Comments**

- P 2 – 3: Spent fuel element should replace thing looking like cigarette or beer glass
- P 4 - 5: Have more explanation on geology, emphasising age and stability of deep formations and their ability to isolation (e.g. ores) rather than retardation properties; bring up EBS from page 23 to follow immediately
- P 6 –9: Remove contents of 6, 7, and 9 to SF document and review content. Simplify 8 (do not mention PIAs), emphasising what makes a *good* site, and attach original graphics of volcano, earthquake, etc.
- P 10 – 11: Reduce 10, 11 to one picture (based on 10, with repositories shown); remove "mountain": expand text range of environments in top bullets (e.g. coastal)
- P 12 – 15: Differentiate 12/13 more from 14/15: show dimensions, people  
P 16 – 19: Show some security system in 17: try to condense 16 – 19 (e.g. only give variant with everything underground)
- P 24-27: Should graphically show total work force and materials flow / transport volume to and from site at each stage (i.e. forget transfers from surface to depth): new diagrams better: leave harbour in at later stages?
- P 28 - 29: Remove black text and make all pictures (not diagrams of boreholes, etc); replace modelling with people at computer and in lab; change dark HRL pictures (bright Grimsel?): drop PIA/DIA, arrows
- P 30 – 31: Remove small figure with layout: mention licensing steps but not on barchart: do not duplicate images used elsewhere in RC
- P 32 - 33: Condense considerably: consider combining with 30 - 31: remove most pictures; replace with tunnel borer: N.B.: title question wrong – should be "how is a repository constructed?"  
P 34 - 35: Less stores, more transport, less ships
- P 36: Do not say encapsulation technology needs further development
- P 37 - 38: Check shielding on transport vehicle – is it shown? (May be OK, but worth checking)
- P 42 - 43: Better pictures (with nature and people): consider more positive wording (e.g. remove "burden", "traffic jams")
- P 44 - 45: Post-operational, pre-closure phase clashes with pp 26/27: needs clear message about what will be involved (e.g. monitored pilot facility?) or should omit EBS monitoring completely (too committing)

- P 46 – 47: Remove 46 – 47 but need position on retrievability on p 25: N.B.: retain top two bullets from 47 and move to 48P 48 – 49: Remove plume: clarify and crispen time sequenced "safety concept" messages shown on p 49: emphasise NO release for thousands of years and that any releases are only after tens of thousands and have no safety consequences
- P 50: Clarify what the doses come from: modify bullets to give clearer message (e.g. remove "several hundred thousandth" – say "tiny fraction" or something similar).

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