NUMO International Technical Advisory Committee

Short Record of the ITAC-10 Meeting
Tokyo, 14-16 November 2006

General Remarks

Vice-president Kawaguchi summarised some of the key developments since the last ITAC meeting; of these progress in attracting volunteers, the potential expansion of the NUMO remit to include TRU and movement towards defining HLW regulations were particularly notable.

Considerable technical progress has been noted since the last ITAC meeting. Siting is still a critical issue, but recent movements look promising. If NUMO takes over responsibility for TRU, this will result in a need for major additional efforts, requiring expansion of resources (experienced manpower and funding). Such a development would also have a significant impact on the siting process. In any case, this expanded responsibility stresses again the need for an integrated national inventory.

More generally, ITAC sees a need for even closer integration of the PA, siting and design groups. In addition, the long lead time associated with development of understanding of some of the complex scientific issues involved in geological disposal, as successfully illustrated by the ITM, could indicate that focused studies like this could be applied to other critical areas (e.g. EBS development).

There appears to be more interaction of NUMO with the regulator and direct input to the development of new regulations. This is strongly supported by ITAC, as such early interactions can have a major positive impact on the boundary conditions for NUMO's programme.

Block 1: Highlights of NUMO activities since ITAC 9

Siting and public information activities (M. Futakuchi)

The presentation gave a general update in progress in this area, with a focus on activities since 2005. Continued efforts to establish NUMO in the public vision involve an information campaign involving the media (TV, newspapers, magazine) and direct contacts (public fora & panel discussions). For print & electronic media, a unified theme has been developed including a catch phrase, a cartoon mole character "Moguru" and a well-known actress (An Suzuki) who represents the public. Compared to last year, there is more focus on specific regions which have shown interest in NUMO (e.g. in terms of newspaper adverts).

In general, ITAC considers that the outreach programme is impressive, with good responses to feedback to adapt the programme (e.g. increasing benefits and ensuring early NUMO local representation). Assessing feedback via the internet has shown an

impressive growth of awareness, but the key stakeholders in typical volunteers (local government officials, older people) might be targeted by alternative approaches. In any case, it has been seen internationally that the volunteering approaches similar to that adopted by NUMO are now being adopted by other countries. In countries where acceptance is developing, this is often in communities which host other nuclear facilities. Nevertheless, there are cases where communities concerned with assuring future economic opportunities can also be willing hosts (e.g. WIPP).

Current status of NUMO R&D (K. Kitayama)

This presentation included the midterm R&D plan, developments in regulations and highlights of the work carried out by the technical groups. A key aspect of R&D planning is the NUMO structured approach (NSA), which has – as previously requested by ITAC – been documented in a technical report. ITAC thinks that the NSA could be very important for ensuring the flexibility and practicality of design and site characterisation, given the wide range of sites that may come forward. Illustration of the basic practical application of this approach has been provided, but future work might need to be more realistic and detailed (involving specific RC development for representative sites).

ITAC noted that the timing and scheduling of R&D is important; NUMO must ensure that key output is produced at appropriate stages of the site selection process. Although the presentation emphasised a 4-year R&D plan, a 10-year plan was shown which explicitly considers such linkages. Practically, this involves close coupling of the work (PA, siting, design, …), which ITAC believes to be extremely important. It is also important that R&D plans are revised regularly, to account for new issues and factors that may arise during the siting process.

Safety case development (K. Ishiguro)

This presentation outlined NUMO's thinking on the strategy for Safety Case development. This is strongly constrained by the particular boundary conditions of the NUMO programme – particularly as a result of the volunteering strategy and stepwise programme development as outlined in the NSA. ITAC considers it positive that such considerations are a focus for NUMO, but this initial work might be usefully extended with input from national experience. Although there is no international consensus on the exact definition of a safety case, there is agreement on some of the critical components that should be included. A future ITAC focused on the safety case might be useful.

Planned future documentation was discussed. The key reports are already defined (in Japanese) by NUMO, and these will be supported by further technical documents. The reports listed - and their contents - include (but are not restricted to) those required by NISA. The explicit identification of open issues in a safety case report may need special consideration as, in principle, these should not detract from the final conclusion that the repository is safe. An option is to consider "provisional" safety cases, where the open issues are identified as project assumptions. It was also noted that there are

inconsistencies in the NEA safety case definition and that this definition is likely to develop with time.

Recent regulatory framework development (M. Takeuchi)

This presentation outlined some developments from AEC and METI on the disposal of TRU and from NISA and NSA on safety regulations. ITAC considers it appropriate that NUMO is focusing on such issues and found the information useful. The positive interaction of NUMO in the development of such regulations is consistent with earlier ITAC recommendations.

The NISA report on the regulatory framework expands on NSC's first 2000 report and will apply to both HLW and TRU. It considers approval and licensing during various stages of siting and implementation. It also comments on the development of a safety case, along with associated safety review and confirmation (e.g. via monitoring). Although such reviews are common around the world, a key question is how often they are carried out. Closure processes are considered, noting that retrievability after closure is not required and outlining concepts for subsequent institutional control.

The consideration of a demonstration waste emplacement phase, as part of the licensing process, was based on a comparison with the Swedish case. It was noted by ITAC that this concept was not accepted by the Swedish regulators and is no longer considered. Phased licensing is, however, still being discussed in some countries - but there seems to be little support by most regulators of proposals for initial licensing of a repository for emplacement of only a small test inventory.

The NSC considerations for safety regulations include support of staged siting, the process of license application and specification of a special review board. The draft report on LLW safety regulations includes distinction between different probabilities of scenarios, but the numerical values for such probabilities are not yet defined. So far, it seems that the probabilities may be considered qualitatively – rather than in a rigorous quantitative assessment. Nevertheless, probability is directly implied for each of the dose levels mentioned.

Working standards (T. Kato)

This presentation outlined progress in the definition of NUMO's internal standards, which are particularly critical in the Japanese case, where regulations have not yet been specified. The hierarchical structure of such standards allows them to evolve in a top-down manner, becoming more detailed as the overall programme advances. Examples illustrating this process were presented for TP1 (Protection of human health) and TP3 (Avoiding undue burdens on current and future generations).

ITAC comments on particular open issues were requested:

- How long must be considered for assessing post-closure safety?
- How can BAT (best available technology) be considered?
- How can "future generations" be defined?

In terms of BAT, the question is whether further improvement is required in cases where, already, regulatory limits are met. It was noted by ITAC that the term "best" is dangerous as many different criteria can be applied to a technology, so that there is normally a balance between various pros and cons. Comparison with ALARA is useful, which comes with the rider that socio-economic factors need to be taken into account – which ITAC considers to be extremely important. However, BAT is sometimes incorporated into ALARA or vice versa - which complicates things. A term used in the UK is BAT-NEEC (-not entailing excess cost). NUMO concerns are based on IAEA reports, which emphasise BAT over optimisation – maybe the BAT-NEEC term might be more usefully used in Japan.

Block 2: Related meetings and R&D

Staged design / PA (H. Hyodo)

This presentation reports on a case study to examine the stepwise development of design and some associated PA. The data used corresponded to that expected at LS, PI and DI stages. In terms of design modifications, variations of layout were considered. ITAC considered that this was useful as a first trial, bringing the siting and PA groups together, but it would be worth expanding dry runs to look at more practical designs.

Output was given in terms of layout characteristics (depth and footprint) and ability to meet dose targets. It was noted by ITAC that an important role of PA at the LS (and PI) stages is to guide subsequent field studies. More realistic PA models than H12 would also be much more useful, as they can better represent the safety-relevant features of the system and more realistic designs. These will be considered for subsequent analysis. It may also be worth considering qualitative assessment of safety-relevant features in addition to PA (see also comments below).

D&V of PI technology (T. Miwa & H. Okada)

This collaboration with CRIEPI is carried out at their Yokosuka laboratory. In the first stage, the LS is used to develop a PI plan. Key output is the production of a site descriptive model (SDM).

ITAC considered this work to be valuable and appropriate to the current stage of NUMO's programme

The plan for a first deep borehole was presented in detail, as this will be a key part of PI. At present, the first phase of drilling and testing has been successfully completed. The logging and testing results were summarised. A question was how such new data would be used to update the SDM: it will be interesting to see how much the model will change.

Manuals for PI (A. Deguchi)

The planning (PIPM) and management (PIMM) manuals for PI have been recently produced by the ITC. This approach fits in well with past ITAC recommendations.

The manuals have been tested by trial application to 3 hypothetical sites. One of three was summarised; all 6 steps in the PIPM have actually been carried out for this site to plan an integrated, staged investigation programme including 2 deep boreholes and a seismic survey. A question was if these are expected to be typical for most PI sites; in response, it was noted that boreholes and seismics would be expected at all sites, but numbers, locations and sequences may be very different. It was also noted that the plans of idealised characterisation may be constrained by the practicality of application in a particular location.

Management structures (evaluation and investigation teams) will be considered for adoption by NUMO in the future – the GET and FIT separation was considered by ITAC to be sensible and efficient, but it is important that these groups work closely together. They also need to have in-house expertise available in order to ensure programmes are consistent and well focused, and that problems are effectively resolved (e.g. conflicts between scientific data requirements and technological complexity). Some specific improvements of manuals are planned – ITAC recommends to specifically consider the number of PIAs running in parallel and direct interactions between PIAs. This was noted to be critical because of NUMO's expected number of volunteers and the possible political coupling of site characterisation work – it is important to avoid an expectation or demand that all sites are investigated with the same intensity.

Update on ITM and R&D activities (J. Goto)

Information was provided on studies on the assessment of volcanism and active faults based on the ITM and associated R&D work. ITAC recognises that these topics are clearly of great relevance for NUMO, given the tectonic situation in Japan, and will provide important input for PI planning. It would be valuable to see how this is integrated with any other relevant work on volcanism and rock deformation and ITAC would like to know more about this.

It was noted that extensive publication of such work in the open literature is planned, which ITAC considers to be important in order to increase the credibility of NUMO's programme for both domestic and international experts. A feature of this work is the use of expert elicitation workshops, which seem to work well in promoting involvement of a broad cross-section of Japanese geoscientists in NUMO's programme.

In the future, results will be integrated to help siting decision-making and site investigation planning. In addition, there will be effort focused on evaluation of the consequences of such processes on repository design and performance. ITAC will be interested to see how this is actually carried out in practice.

Operational phase logistics and project management (H. Hyodo)

This work includes both evaluation of practical constraints on repository implementation (construction and operation) during expected conditions and a special analysis of the consequences of potential disturbances, particularly due to encountering poor-quality rock. This was considered by ITAC to be especially important as it might involve feedback to PI / DI programmes and, possibly, selection decisions. To be useful in such applications, however, the level of treatment needs to be improved and the assumed boundary conditions should be reconsidered. At the present stage, great care should be taken with interpretation of output.

This entire topic of operational phase analysis is very important and something not really examined in H12. The simplified studies done to date, with particular boundary conditions imposed, should not be used to derive premature conclusions. Hence the key issues involved (NOT fine details) might be a good focus for a more intensive ITAC working session.

Operational safety (Y. Sugita)

The assessment of repository operational safety is considered to be critical for NUMO due to the high sensitivity of such projects (which is confirmed by international experience). This is also an aspect not covered by H12. Background studies have considered “analogous” industries, looking at disaster statistics, security measures and associated laws and regulations. This work will lead onto the derivation of security measures for a repository – both for the expected case and in case of emergencies. For the special case of a repository, additionally radiation protection measures need to be included. All this will result in specification of operational safety requirements.

ITAC considered that it may be useful to separate “safety measures” (general occupational safety measures including the radioprotection), distinguishing between those to reduce the risk of disturbances (prevention) and the actions taken to minimise consequences and remediate thereafter (so-called mitigation measures).

Output operational safety requirements will be formalised in a RMS. These are being listed in a hierarchical manner and some examples were given. It was recommended that terminology be improved – particularly in the radiation protection field.

Block 3: National HLW programme news

The international presentations, with some key points briefly summarised, are in the Addendum A.

Block 4: TRU

Status in Japan (S. Shimura)

TRU terminology is a clear problem. IAEA and EU revision of nomenclature is ongoing; no individual national classifications are completely consistent with either the IAEA or each other. For disposal, the classification in terms of repository type seems

more sensible. In Japan, wastes are defined in terms of disposal option, but there appears to be too much relation to simple concentration levels of alpha and beta / gamma nuclides.

It might be useful to consider adopting a better term for such long-lived low and intermediate level waste (LL-LILW), as it can be confusing for the general public to see that the highest predicted doses from TRU actually are not from transuranics. Also, the emphasis on the source from reprocessing involves a risk of ignoring some other toxic wastes (e.g. reactor internals), which should really be classed with TRU. Such waste should not go to L1, as it would clearly give problems there – especially for erosion scenarios. There are also potential problems with the TRU from medicine, industry and, especially research. Again this emphasises the critical need for a Japanese national inventory, with clearly identified responsibility for management. ITAC noted that there could be considerable advantages of having a single organisation responsible for geological disposal of all wastes (improving efficiency, ensuring consistency, making best use of limited resources); in any case all geological disposal needs to be well coordinated.

A change in law is needed if NUMO is to assume responsibility for TRU disposal (termed co-disposal at present). ITAC noted that general application of the term "co-disposal" should be used with care; there could be advantages of separating these wastes into a different repository (space limitations at particular sites, different technical requirements, undefined inventories, avoiding possible interactions of wastes, public acceptance). The last point is particularly important for NUMO, since it has already initiated the siting work, with specification of a repository for HLW only.

The repository concept under consideration by NUMO (cavern disposal in concrete-dominated EBS including a bentonite buffer) and associated PA is that presented in JNC's "2nd TRU report" (an English version is under preparation at present). The key output from this report was summarised along with a brief outline of possible TRU – HLW interactions in the case of co-disposal. In the future it is assumed NUMO will take the lead in site-specific concept development.

Compared to other countries, the doses reported in the 2nd progress report are very low. This is due to the very favourable, non-conservative conditions assumed for both the EBS and the geosphere. NUMO accepted the need for further detailed analysis, to make the results obtained realistic enough to apply to a real site. It would be useful to start off, however, by clearly identifying the required safety functions of both engineered and natural barriers in the case of TRU. In any case, it might be valuable for NUMO to organise a critical review of the 2nd progress report (which ITAC might undertake or contribute to).

The international presentations, with some key points relevant to TRU disposal in Japan briefly summarised, are in Addendum B.

Block 5: future activities of ITAC

Potential topics for future ITAC meetings include:

- R&D programme
- Application of the NSA to siting and RC development
- Development, structuring and documentation of a safety case
- Review of 2nd progress report on TRU waste disposal (when English version is available)
- PIA & DIA siting factors
- Site investigation, PA & designs – plans for linking
- Communicating with volunteer communities (at an appropriate time) and helping with visiting groups going abroad
- Special topics for TRU (technical) that may help to develop the programme and experience may be available abroad.
- Meeting with DTAC
- Enhanced engineered barrier concepts
- Variable geology – application of the NSA in a specific example (e.g. optimisation of RC for a real site)
- Practicality of EBS construction (to required Q levels) incl. plugs, seals, etc.
- Construction and logistics; engineering practicality of implementing idealised designs