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Professor Shoji Nagamiya
Director J-PARC Project
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Dear Professor Nagamiya,

In submitting this report of the International Advisory Committee from its March 2004 meeting we would, above all, like to thank you and all of the people working for the J-PARC project for the quality of the preparation of our meeting and the openness to our questions and needs as we wrote this report. The Committee is very impressed with the progress being made on J-PARC and this covering letter is merely to draw your attention to key points in our report which follows. The key points as required by the Committee are:

- **Maintaining a budget stability across the defined time frame of the project** into the operating phase. The IAC strongly believes that the next two or three years of funding will be important for the highest success of the J-PARC project.

- **Ensuring "balance"** across the broad J-PARK program. To achieve these priorities will have to be set in the current budgetary profile to allow essential "underlying" work to be best done to the benefit of condensed matter and life sciences, transmutation science and technology and hadron physics.

Site Wide Organisational, User, Interface And Operating Issues
There are overarching matters relevant to the subprograms of J-PARC whose early consideration and resolution will help the project:

- The IAC advises that it would be prudent to create as soon as possible a proposal for coordination, collecting and overviewing the requests from the users or user communities at all beam facilities.

- **A clear access strategy to J-PARC should be set as soon as possible.** This should ensure as wide as possible national and international participation in the construction and eventual operation phases of J-PARC.

- **Outline decisions should be made on governance and operation** of J-PARC as an operating facility, by the partner organisations to further clarify the arrangements for participation in the project at all stages.

The Executive Summary enlarges slightly on these points which are fully developed in the sections relevant to the parts of the whole project for which we would hope a ‘balance’ of funding and participation will be achieved in a projected time scale we see as particularly important maintenance of the budget profile for the next three years.

Yours sincerely

John White
Chairman, International Advisory Committee

THE INTERNATIONAL ADVISORY COMMITTEE

ON THE J-PARC PROJECT

REPORT MARCH 2004

Meeting March 8-9 2004

Tokai, Japan

CONTENTS

EXECUTIVE SUMMARY

The International Advisory Committee, (IAC), to the Director of the J-PARC joint project of the Japanese Atomic Energy Research Institute (JAERI) and the High Energy Accelerator Research Organisation (KEK) met on March 8-9, 2004 at JAERI, Tokai and inspected the construction site at Tokai.

In November 2003 the committee held an “out of sequence” meeting by e-mail correspondence, at the request of the Director, Professor Nagamiya. The neutrino program had been assigned a rating of C (poor) by the Japanese Coordinating Committee for Science and Technology - meaning that it might be lost from the program. This “out of sequence” meeting, after broad consultation, formulated an interim advice on 13 November and then a final advice (on 2 December 2003) assigning relative priorities (in Phase I of the project). Neutrino science was given first priority and the accelerator energy recovery project to 400MeV injection energy second priority. Subsequent to these meetings the Japanese Government decided to bring forward the funding of the neutrino program from Phase II to Phase I.

The Accelerator Technical Advisory Committee (A-TAC) met in March 2004 just before the IAC. Its interim report covering both the effects on performance of the whole accelerator system, with 181 MeV injection, and the steps needed to achieve recovery as soon as possible to 400MeV injection, was available to the IAC. The Neutron Technical Advisory Committee met in October 2003 and the Muon Science Experimental Facilities Advisory Committee (MUSAC) in February 2004. Reports from these committees and the Nuclear and Particle Physics Advisory Committee were presented at the 9 March IAC. The agenda of this meeting is attached at Appendix I.

The IAC thanks the Director and the project team for the detailed information and discussion provided at the IAC meeting about these developments. The distribution of papers before the meeting was of great help to the meeting and the Director and his colleagues are thanked for this innovation.

At its 2002 meeting the IAC said of the project;

> ***“The Committee advises that with this project Japan has the opportunity to be a world leader in a number of fields. The committee furthermore recommends a policy of "world class standard" in the quality of the construction of the accelerators and the initial suite of supporting instruments even if the number of instruments or experiments has to be limited. Our advice to the Director is that he ensure that from day one of the facility's operation the most novel aspects of the programme attract the world's attention to and involvement in the project from the importance of the results produced”.***

These comments remain true in 2004 and the IAC re-endorses the recommendations to this effect made in 2002 and 2003. Bringing forward the neutrino program should give new insights into fundamental physics through fullest possible support to current Japanese excellence in this area. The challenge is for a "leap forward" unsurpassed elsewhere in the world.

The focus of attention of the IAC's attention in 2004 was drawn to four important issues which should be resolved, at least in part, during the next year. These are:

• **Maintaining a budget stability across the defined time frame of the project** into the operating phase. The IAC strongly believes that the next two or three years of funding will be important for the highest success of the J-PARC project.

> ***Recommendation 1: The IAC recommends that Phase I of the project be finished as quickly as possible taking into account the priorities set out below. To this end it is imperative that the most recent budget profile does not change appreciably. Certainty about the project profile, in the project team and the scientific community is now very important.***

• **Ensuring "balance" and budget stability** across the broad J-PARK program. To achieve these priorities will have to be set in the current budgetary profile to allow essential "underlying" work to be best done to the benefit of condensed matter and life sciences, transmutation science and technology and hadron physics.

> ***Recommendation 2: The IAC reaffirms its advice the neutrino program be a leading feature of Phase I of J-PARC.***

> ***Recommendation 3: We couple this with a call now for prioritization of " balance" in the wider program. Only this will ensure the success of the broad aims above. Although noting some excellent initiatives by JAERI and KEK we call for measures to attract more funding to the wider program.***

Recovery of the injection energy to 400MeV will be the most important step to support these programs but assured staffing levels and instrument construction funding are also essential.:

> ***Recommendation 4: The potential negative impact on J-PARC performance from the lower Linac energy is still a risk for the J-PARC program. The IAC recommends that the 400 MeV linac capability be restored by JFY 2010 at the latest and that plans are made to continue Linac development towards 600 MeV.***

> ***Recommendation 5: J-PARC Management develop a plan for assuring that sufficient manpower is assigned to the accelerator project to support successful completion. In developing such a plan, the management should consider the size of the staff that will be required to complete construction,***

to commission the accelerator complex, and to support the accelerator facility during its operational phase, including associated R&D. Management may also consider the opportunities presented to train new people in the technologies of accelerators.

Recommendation 6: The IAC reiterates its recommendation from last year that availability/reliability criteria be developed and formally communicated to the accelerator and target teams. Many existing neutron and light sources have demonstrated facilitating availability better than 95% - a feature very important for use by a large number of users.

Site Wide Organisational, User, Interface And Operating Issues

Here we draw together overarching recommendations relevant to the subprograms of J-PARC. The IAC advises that it would be prudent to create as soon as possible a proposal for coordination, collecting and overviewing the requests from the users or user communities at all beam facilities. This will allow a "proton economics" (proton beam distribution) plan to be proposed and identify areas of potential conflict. The IAC will be prepared to comment on the Director's coordination proposals especially in regard to balance between various facilities of J-PARC.

• **A clear access strategy to J-PARC should be set as soon as possible.** This should ensure as wide as possible national and international participation in the construction and eventual operation phases of J-PARC. The strategy should be available within the year, on an attractive and maintained web site. The IAC suggests that the advisory structures be integrated into this strategy. For example, the IAC notes the encouragement to the neutron science component of J-PARC from the creation of the Neutron Scattering Centre and the substantial start on instrument construction through additional funding by JAERI and the Ibaraki Prefecture. The possible additions of more funding and in kind contributions from KEK should be quickly settled.

Recommendation 7: The IAC recommends that the Director of J-PARC develop proposals for central coordination of all aspects of the program at the project level. These proposals might include the operational requests from future users or user communities, the oversight on all beam facilities and have a scope such that potential conflicts can be identified and a balanced proton economics proposed which could then be reviewed from time to time as part of the IAC process.

Recommendation 8: The IAC recommends that the Director of J-PARC develop with the partners JAERI and KEK a draft operational structure and a user access plan for J-PARC. This is to ensure attraction of the best scientists in Japan and world wide to J-PARC. This is a top priority for Japan's national interest.
The elements of this operational structure and a user access plan should be made available as soon as possible on an up to date and attractive web site.

Recommendation 9: The IAC recommends that J-PARC management develop a site wide policy for establishing such Partnership Research Initiatives Agreements which will bring new resources to the J-PARC experimental program.

- **Outline decisions should be made on governance and operation** of J-PARC as an operating facility, by the partner organisations to further clarify the arrangements for participation in the project at all stages.

Recommendation 10: Part of the attractiveness of J-PARC for international investors will be assurance that the operating budget will be satisfactory. The IAC recommends that discussions to provide sufficient budget for the facility begin forthwith.

Recommendation 11: The IAC reaffirms the importance of J-PARC transmutation technology development. The other facilities at J-PARC and the nuclear site offer unique possibilities for understanding nuclear energy technology particularly in materials science. We reiterate the recommendation that this program should occur in an international context and in the context of a clear understanding of the ADS system role in the larger P/T and nuclear fuel cycle context.

The basis of these recommendations is developed in the report sections related to the components of the J-PARC project. Further detailed recommendations on the components themselves are given in the text.

ACCELERATOR PROGRAM

The J-PARC Project encompasses the construction of a state-of-the-art proton accelerator complex consisting of a 400 MeV linac, a 3 GeV rapid cycling synchrotron (RCS), and a 50 GeV "Main Ring" (MR) synchrotron. The two synchrotrons are designed to deliver extremely high average power: 1 MW from the 3 GeV RCS and 0.75W from the MR (operating at 40 GeV in Phase 1 of the project). Since last year's IAC meeting the linac energy goal for Phase 1 of the project has been formally reduced to 181 MeV to accommodate incorporation of the neutrino facility originally foreseen in Phase 2. In association with this scope change, established performance goals in Phase 1 have been lowered to 0.6 MW from the 3 GeV RCS and 0.72 MW from the MR. These capabilities remain beyond those of any other accelerators operating elsewhere in the world today. Nonetheless, it is the IAC's judgement that the J-PARC complex is highly unlikely to achieve its original performance goals with the linac energy limited to 181 MeV. Thus, restoration of the linac energy to 400 MeV remains a priority for immediate implementation following Phase 1.

The status of the design and construction activities related to the accelerator complex was reviewed by the Accelerator Technical Advisory Committee (ATAC) at a meeting held on March 5-6, 2004, immediately in advance of the IAC meeting. A summary of the findings of that review was reported to the IAC during its meeting. Significant progress has been made on the project over the last year. The most relevant points are:

Performance criteria are established and designs are now complete for all accelerators in the complex based on the new Phase 1 linac energy of 181 MeV. Performance criteria are lower than the original project goals.
The funding profile has been delayed by one year. Completion of Phase 1, exclusive of the neutrino facility, now extends through JFY2007.
A sensible linac energy restoration plan has been established, but funding has not yet been committed to execute this plan.
Nearly all components have moved beyond the design stage and are in fabrication. Procurements have been initiated and approximately 80% of the technical components are now on order.
Civil construction is proceeding rapidly on the Tokai site.
The staffing level on the accelerator team has remained approximately fixed over the last year.

Projected Performance with a 181 MeV Linac
The adopted change in the initial operating energy of the linac is the most critical new development. The J-PARC project team estimates the impact on performance is a reduction of beam power delivered from the 3 GeV RCS to 0.6 MW when not supporting simultaneous MR operations, and 0.5 MW when simultaneous fast spill (neutrino) operations are required. A modified MR operating scheme is designed to recover nearly all of the lost performance, 0.72 MW, but uncertainties exist in this projection related to the strong space-charge forces at injection over the extended injection time. The best-case scenario for the recovery plan is initiation of 400 MeV linac operations in 2011.

Linac Energy Recovery Plan

A strategy for recovering the 400 MeV linac energy has been formulated. This strategy is based on fabrication of annular coupled structures (ACS) over the period JFY2008-2010, i.e. following completion of Phase 1, with installation, commissioning, and initiation of operations in the first half of JFY2011. It is the view of the ATAC that the proposed energy restoration plan would restore full capability of J-PARC with minimal compromise in the scientific goals. However, the IAC notes that the funding required to support the recovery plan (85 Oku yen) is not yet committed.

It is the IAC's judgment that the J-PARC complex is unlikely to achieve the performance goals for which it was designed with the linac energy limited to 181 MeV. Therefore the committee recommends that the 400 MeV linac capability be restored by JFY2011 at the latest and that plans be made to continue Linac development towards 600 MeV.

Human Resources

A staff of approximately 130 people is working on the accelerator facilities within the J-PARC project. While this staff is extremely dedicated and skilled, the IAC feels, as it did last year, that the overall staffing level is modest for such an ambitious and complex facility. The committee is gratified to hear that increased staff have been pledged by laboratory management, however we feel that there may exist additional experienced accelerator expertise within the laboratories that could be brought to bear on the J-PARC project as other programs wind down.

Recommendation: J-PARC Management develop a plan for assuring that sufficient manpower is assigned to the accelerator project to support successful completion. In developing such a plan, the management should consider the size of the staff that will be required to complete construction, to commission the accelerator complex, and to support the accelerator facility during its operational phase, including associated R&D. Management may also consider the opportunities presented to train new people in the technologies of accelerators.

Availability Criteria

Based on achieved availability (defined as actual/scheduled operational time) in existing neutron and light source facilities, the IAC believes that the users of the J-PARC facility will expect an extremely reliable operation, approaching 95%. However, it still does not appear that availability/reliability criteria have been relayed to the accelerator group nor are formally reflected in their planning. The availability of a facility includes not only "mean-time between failures" but also includes "the time required to repair or replace" failed hardware. Therefore depending on the facility availability goals, it is customary to build in spares parts and/or redundancies in hardware system in order to minimize repair time during the design period of the project. Such design activities would have impact on the project budget. The IAC reiterates its recommendation from last year that availability/reliability criteria be developed and formally communicated to the accelerated and target teams. Many existing neutron and light sources have demonstrated facility availability better than 95% - a feature very important when there is a large number of users.

Recommendation: The IAC reiterates its recommendation from last year that availability/reliability criteria be developed and formally communicated to the accelerator and target teams. Many existing neutron and light sources have demonstrated facilitating availability better than 95% - a feature very important for use by a large number of users.

NUCLEAR AND PARTICLE PHYSICS

The IAC heard a complete presentation of the intended Nuclear and Particle Physics Program by the J-PARC project managers and a report from the Nuclear and Particle Physics Committee chaired by Prof. T. Yamanaka of Osaka University. Below, we report the content of these presentations and the associated issues raised in the presentations. Here, we note the emergence of an important issue that affects all program users other than those in the neutrino program. This issue can be epitomized by the observation that looming budgetary difficulties for the overall J-PARC Project, especially the portion provided by JAERI in JFY 2005, may put into jeopardy, many parts of the program of nuclear and particle physics. This potential funding problem may be exacerbated by the fact that support of the nuclear and particle physics experimental detectors is to be provided outside the J-PARC project scope.

In this context, we note the recent one-year delay in the overall schedule for the experimental program that was driven by budgetary circumstances in the Japanese Government. We commend the Government for holding the funding-driven delay to a one-year period and emphasize the importance of making very strong efforts to prevent further slippage to reoccur in future years.

Hadron Beam Line

Major advances have been made during the past year in the preparation of the experimental program in nuclear and particle (NP) physics. This involves two aspects: i) technical layout and design of the general target area, of the beam lines, and of tentative experimental apparatus, and ii) the implementation of the first steps in the process to select and define the experimental program.

In the first area, the Committee heard a presentation detailing the status and plans for the NP Hall, which is the experimental hall for experiments with high-intensity (up to 15 micro-amperes), 50 GeV proton beams. Due to the lowered linac energy and the resulting consequences on overall accelerator performance in Phase I, the actual parameters for the NP program will initially be limited to 30 GeV for slow extracted beams (40 GeV for fast extraction), 9 micro-amperes, and total beam power of 270 kW. However, even under these conditions the accelerator capabilities will be unparalleled worldwide and will provide for a forefront research program.

In fact the beam parameters are such that they pose severe new challenges for radiation hardness in beam line and instrumentation design, and for power handling aspects in both

target and beam dump construction. Major effort was devoted during the past year towards design of the NP hall with regard to these aspects and to develop the Phase-I technical layout. Many of these design tasks are near completion and provide a solid basis for planning of the experimental program. Construction of the NP-Hall will be such that first beam can be accepted in 2008.

The Committee was impressed by the progress made and found the overall concept convincing. Of course, no detailed technical assessment was possible given the limited time available during this review. It is obvious that many detailed questions have to be discussed and determined in collaboration with the experimental groups and in view of the instrumentation to be placed into the NP Hall. In this context it seems to be prudent to find a good compromise between the need from civil construction to install permanent structures and shielding now, and the need from experiments for flexibility to optimize experimentation and science output. This is the one concern that the Committee would like to express.

Overall though, the Committee feels that the steps taken towards the NP program in such a limited time are impressive. A process is in place to identify the program. Progress in the last year has been substantial. There is good international interest. This promises a forefront science utilization of the opportunities offered by the J-Parc facility.

In summary, the key issues to be addressed in the near future are the detailed matching of NP Hall layout and experimental requirements before irreversible civil construction is carried out, the establishment of the PAC and proposal review, an assessment of the 'proton economy' in defining the program, clarification of scenarios such as concurrent use of the same target by several experiments, and – most of all – addressing the funding (or lack thereof) for beam lines and experimental equipment.

Neutrino Beam Line

We heard a report on progress in the Neutrino Beam Program from Prof. T. Kobayashi, who reported the recent successful addition of the Neutrino Beam to the Phase I of the J-PARC Project. The beam will be constructed over the period JFY 2004- 2008 and operations are expected to commence in JFY 2009. The proposed neutrino physics program will provide an important next step in the understanding of neutrino mass and oscillation and, if the schedule is held as proposed and the requisite number of protons per year is supplied for the neutrino beam, this program will be the first in the world to provide these new results. There is also envisioned by the neutrino physics proponents, a follow-on neutrino physics program utilizing a larger version of the existing Super Kamiokande Detector, called Hyper Kamiokande, that envisions further advances in neutrino physics such as CP-violation in the neutrino sector that could be opened up by a larger detector in the 1-Megaton class. Such a detector will also have capability in further enabling a search for nucleon decay, a process that is also expected to occur at levels potentially reachable by the Hyper Kamiokande Detector program.

The IAC was very pleased by the funding and priority decisions made that allowed this important international particle physics experiment to proceed on a timely schedule.

CONDENSED MATTER AND LIFE SCIENCES

The condensed matter and life sciences program at J-PARC has equal importance to the neutrino and other programmes for adding renown to Japanese and international science. A major difference is that these programmes may attract, at fruition, thousands of visiting scientists from all over the world each year - who will bring to Japan novel ideas and new scientific perspectives. Japanese science, for example, using neutrons, is already of the highest repute. Its broad scope underpinning the understanding of technologically important materials such as those showing unusual magnetism and/or superconductivity, polymers, dielectrics, thin films are of importance to the economy. The novelty of the instruments proposed and the great intensity of the neutron beams also offer new opportunities in the life sciences. In particular diffraction from protein and other crystals of moderate complexity will be feasible and help to understand enzymes reactions. For biological materials in solution and biological assemblies both elastic and inelastic scattering methods could achieve new prominence. The early submission of letter of intent and the competitive process now in progress for the initial group of instruments as welcomed by the IAC.

J-PARC will realize the foreseen OECD megascience forum plan of one major neutron source in USA, Europe and the Asia- Pacific regions for the first decade of the 21 century. The intended 1MW operation will parallel that of the SNS in the USA and the possible European Spallation Source – still under discussion. The IAC has given much consideration about how to realise these benefits given budgetary constraints. The need to do so – as with other parts of the program is why we have called for prioritization in the next year and clarity as soon as possible on the access arrangements and operating proceedures. We see this as an essential step in attracting the extra finance and manpower needed at this time.

To achieve the goal of equal status with the other OECD spallation sources restoration of the accelerator energy with the least possible delay is essential, but so are other matters. These involve the major tasks of target design to eventually accept the 1MW beam, moderator design to convert the produced neutrons and the construction of beam instruments for neutron scattering and muon science, of such quality as to use the beams provided. The IAC heard excellent presentations from the neutron project teams who are facing these major challenges – but their resources appear to be stretched despite the strongest commitment from the teams. The substance of recommendations 1, 2, 3 and 4 relate to these matters.

The IAC was encouraged to hear of the extra funds for instrumentation and personnel to be provided by JAERI through the formation – with the JR-III reactor – of a Neutron Scattering Centre headed by Professor Fujii, on the Tokai site. Along with the extra funds from the Ibraki prefecture, the blockage in instrument construction, perceived last year, has been removed. The outline designs for the first nine instruments are interesting and the process for their selection from letters of intent to formation of construction teams is commendable. Within the funding profile it would be desirable to do more so

that even with the initial lower power operation in 2009 ground breaking science will be done from day 1.

The chief concerns of the IAC rest with the target, moderator and detector development as well as the means to attract additional funding from now on to operation. Despite much success, these technical programs need to maintain strong local momentum and international collaboration to achieve the projected performance. The N-TAC committee's report was available to the IAC and emphasizes these points.

The concepts for the Muon Science Laboratory (MSL) are now on a firm footing and many components are ready for tendering as soon as budgets will be released. The facility has been scaled down to one production target with a capability for four muon channels. Initially only two channels will be available. The production target module, proton beam transport and associated support services are at the detailing stage. The current plans are based on established technologies and are being reviewed for operational constraints (alignment, replacement, repairs, etc). The muon facilities are being integrated with the neutron source ones allowing more synergies between the two communities.
The muon user communities are starting to develop the new kind of spectrometers that could make full use of the intense pulsed muon beam intensities that will be available at J-PARC. An important development has been the recent creation of a new muon group which will be part of the Material Science effort of JAERI. The funding for instrumentation at the end of the muon beamlines is similarly problematic to that for the neutron instrument. Innovative schemes are proposed to attract external funding resources (see Partnership Research Initiatives below).

Site Wide Organisational, User, Interface and Operating Issues
Equally important as the technical matters (above), options for the governance of the facility should be worked out between the partners as soon as possible. This should be done in the context of decisions about the ongoing commitment of the partners to the "Operational Phase" of the project. The IAC considers that, for example, the operating conditions - at least for the neutron and muon sectors - should be the same as those at other "big science" facilities which attract a multitude of projects for "small science". These considerations involve zero cost for the provision of the neutron beams and the operation of the instruments and their ancillaries. An additional essential thing is to engage the broad scientific community as soon as possible through workshops in selected areas for current and potential users.

Recommendation : The IAC recommends that the Director of J-PARC develop with the partners JAERI and KEK an operational structure and a user access plan for J-PARC. This is to ensure attraction of the best scientists in Japan and world wide to J-PARC. This is a top priority for Japan's national interest

The elements of this operational structure and a user access plan should be made available as soon as possible on an up to date and attractive web site.

Suggested components of this include free beam time for non commercial users, collaborative access team benefits for groups establishing large instruments, a policy on visitors, and on Memoranda of Understanding with collaborating institutions nationally and internationally.

A general issue, obvious for the Nuclear and Particle Physics Program, relates to the process by which experiments are considered by the PAC and approved by the J-PARC management. We note that there are issues here, not only of funding adequacy, but also in the general area of the availability and allocation of primary beam protons, especially given the proton-hungry nature of the nuclear and particle physics program being contemplated for the J-PARC physics program. Before a workable plan can be arrived at a plan for the time evolution of available proton fluxes must be made and used by management to plan the macroscopic evolution of the nuclear and particle physics program. The **"proton economics"** issue is manifest in the prospective neutrino program but will no doubt emerge in many of the experiments, not least of which are the rare kaon and muon experiments. Towards this end, we offer the recommendations below. The response to the call for LoI's in Nuclear and Particle physics was quite good, with 30 letters submitted. Also, the range of programs proposed covers important areas of current research in this field.

Closely related is the issue of space planning. The proposed layout of the NP Hall is the basis of the technical design activities described above. This is a good process in the view of the IAC. But it was not completely clear to what extent and at what level the mentioned feedback with the LoI groups is indeed happening and at what technical detail this discussion is carried out. The IAC makes the rather obvious comment that this interaction be intensified in the next planning steps, involving the call for proposals and the formation of a Program Advisory Committee (PAC).

Recommendation: J-PARC management should seek to establish reliable pathways for approval, scheduling and funding of the highest-rated Nuclear and Particle Physics proposals at the earliest practical time following their approval by the PAC and Laboratory. In this program planning, it will be necessary for J-PARC management to have a global plan for the distribution of available primary beam protons ("proton ecomonics") for the approved experiments over the course of operating time.

In addition to the general user program, active participation of major research groupings (eg in polymer or life sciences, muon science) in Participating Research Initiative Agreements (PRIAs) as mentioned above for the nuclear and particle physics component program might be an option. The PRIA process is a mechanism to allow users to contribute equipment to J-PARC, based on external funding (external to J-PARC accessible funding sources) in exchange for some preferential access to beam time.

Conditions for considering such arrangements:

- It must enhance significantly the J-PARC scientific program.
- It must be based on excellence of scientific prospects from the proposed instrument.
- It must be consistent with J-PARC overall plan

- It must bring new resources in terms of capital, operating and staffing funding.
- It must be controlled very tightly by contractual commitments.

Possible funds from the KEK to enhance the instrument program could be used to "leverage" contributions form national and international participants for example. The acceptance of PRIA operation would need a clear definition of their privileges and the duration of those privileges at the outset.

Recommendation: The IAC recommends that J-PARC management develop a site wide policy for establishing such Partnership Research Initiatives Agreements which will bring new resources to the J-PARC experimental program.

The IAC considers that such initiative could produce a win-win situation in the development of the J-PARC scientific program. The IAC would advise that significant open user access be preserved on such facilities and that some in-house group support be made an integral part of such agreements. The IAC warns against agreements that would create a strong in-house dominance or would carve out a "reserved" wide scientific territory by restricting access to resources. A peer evaluation process is proposed which should have a strong influence on the decision to create a new PRI or to extend an existing PRI.
From the above processes, the benefit to Japan of the inflow of ideas should be the same as that which has already been realized at major centres such as the Institut Laue Langevin at Grenoble, the ISIS spallation source (UK) and the SNS at Oak Ridge National Laboratory in the USA – where all of the above principles have been in action for years or will apply. From the point of view of terminology the J-PARC neutron, muon and life sciences program should be designated as a National Facility.

Coordination of the large and small bids for access to the facility and their cost to the proton economy might best be done through a project wide coordination process. This process should be outlined at the earliest possible time by the director and the partners to have maximum effect on access and a planned process of attracting additional funding. The involvement of the user advisory structure and specialist committees such as the Nuclear and Particle Physics advisory committees is desirable and the arrangements for achieving this should form part of the proposal from the director. The International Advisory Committee would be willing to comment on this.

Recommendation: The IAC recommends that the Director of J-PARC develop proposals for central coordination of all aspects of the program. These proposals might include the operational requests from future users or user communities, the oversight on all beam facilities and have a scope such that potential conflicts can be identified and a balanced proton economics proposed which could then be reviewed from time to time as part of the IAC process.

Recommendation : Part of the attractiveness of J-PARC for international investors will be assurance that the operating budget will be satisfactory. The IAC recommends that discussions to provide sufficient budget for the facility begin forthwith.

TRANSMUTATION/ADS

The IAC notes a major contradiction concerning the Transmutation/ADS component of JPARC — it has high visibility but little or no priority in planning and development of J-PARC. We base this observation on the following:

Visibility - Transmutation is presented as one of the three major focus areas of J-PARC. Its importance can be traced to initial JAERI goals concerning development and use of accelerator-based systems in the national OMEGA program.

Priority – At the same time, J-PARC major development activities associated with transmutation (the Transmutation Experimental Facility (TEF) and extension of the linac to 600 MEV (via use of superconducting technology)) were not included in Phase 1 but were assigned a Phase 2 priority. Furthermore, recent actions derived from overall J-PARC funding pressures have placed the Transmutation element of J-PARC in further danger – specifically the current linac energy of 180 MeV makes creation of a viable neutron source required for TEF unlikely since neutron production by spallation requires proton energies in the hundreds of MeV range. To reestablish the viability of the Transmutation program, timely restoration of the linac proton energy to 400 MeV is needed. Concrete planning and preparation to extend the linac to 600 MeV should also occur. Phase 2 program, to which transmutation/ADS is assigned, should be realized without delay. This is extremely important because transmutation/ADS is one of the major programs of J-PARC.

As described in the previous IAC recommendations, the Transmutation Experimental Facility in the J-PARC project should be discussed and developed in the context of the Japanese policy on nuclear fuel cycle, radioactive waste disposal and Partitioning/Transmutation (PT) technology. The unification of JAERI and JNC should be taken into consideration in such discussion. Considering the importance of high-level radioactive waste management, development of ADS technology is an important mission in the unified organization as a nuclear energy research institute. IAC would like to encourage discussion between JAERI and JNC about the role and the importance of the Transmutation Experimental Facility in their R&D roadmap of nuclear fuel cycle technology. Moreover, the IAC recognizes that the discussion to revise the long-term nuclear program in Japan, which has started since the beginning of this year, is a good opportunity to clearly define the role of the Transmutation Experimental Facility in the context of the Japanese policy on nuclear energy.

The J-PARC Transmutation/ADS program is one of several international programs focused on development and demonstration of ADS technologies and systems in advanced nuclear fuel cycles. Such activities play a particularly strong role in European Union R and D plans, as evidenced by the MEGAPIE program at the Paul Scherer Institute, the TRADE project (Italy, Carlo Rubbia) and the MYRRAH project (Belgium). All these efforts envision ADS research, development, and demonstration activities on significant technical scales. The proposed J-PARC Transmutation/ADS program would compare favorably with such efforts if development time schedules can be met. Under

any circumstance, both the J-PARC ADS program and international ADS efforts would be strengthened by close coordination.

Finally J-PARC as a whole potentially represents a unique resource in R and D applicable to nuclear energy and advanced nuclear fuel cycle technology development. In addition to the role that the Transmutation program plays in such activities, J-PARC's neutron scattering capabilities could be important as well. Fundamental understanding of materials properties in radiation environments is an area where the experimental capabilities of JPARC could be effectively utilized. Materials performance, both in nuclear fuels and structural materials areas, is key to the successful development and operation of nuclear system technology. Participation of JPARC users from the university community in such research and development could also expand the pool of young researchers interested in nuclear energy and advanced nuclear fuel cycle technology development.

Based on these observations and discussion, the IAC reaffirms its position as to the importance of JPARC Transmutation and ADS program activities and recommends a series of actions to strengthen both the program and its priorities within JPARC and national nuclear development environments.

Recommendations: The Committee strongly endorses the need and role for P/T technologies in JPARC development and recommends the following actions to strengthen P/T efforts:

1) ***Define a clear JPARC strategy to utilize its R&D capabilities relevant to advanced nuclear technology development (neutron scattering, TEF, etc.).***
2) ***Develop efficient joint JAERI/JNC planning on P/T to define the JPARC-ADS role in P/T and to develop information for the AEC nuclear energy review.*** In particular, the IAC recommends that the Project team aggressively work with JNC researchers and management to establish the importance of JPARC R&D towards Transmutation/ADS and to promote collaborative research on this aspect of the program.
3) ***Develop major collaborations with EU and other ADS efforts to position JPARC-TEF in a worldwide ADS development.***
4) ***Develop strong support from university groups for future nuclear energy technology development with the goal of attracting young, innovative technologists.***
5) ***Integrate TEF into future reactor system R&D, (neutron kinetics, transmutation efficiency, materials performance).***
6) ***Develop a budget profile required for credible ADS/TEF program implementation.***

APPENDIX I

Agenda for the 3rd International Advisory Committee Meeting
J-PARC

Date: March 8 (Mon) and March 9 (Tue), 2004
Place: JAERI-Tokai

March 7 (Sun)

18:00 – 19:30	Informal Welcome Reception (place TBA)	

March 8 (Mon)

9:00 – 9:20	Executive Session (Committee + Nagamiya + Yokomizo) Change of comm. members, Points of advice, Agenda, etc.	
9:20 – 9:40	JAERI and J-PARC	S. Tanaka
9:40 – 10:00	KEK and J-PARC	Y. Totsuka
10:00 – 11:00	One year progress Budget, Interim Review, Construction, Schedule, Organization, Activities at Committees, Actions for the last year's recommendation items	S. Nagamiya/ H. Yokomizo
11:00 – 11:20	Coffee Break	
11:20 – 12:20	Accelerator	
	Progress, Status	Y. Yamazaki
	A-TAC report	S. Holmes
12:20 – 13:20	Lunch	
13:20 – 14:20	Neutron sciences	
	One-year progress +N-TAC	Y. Ikeda
	Committee report	Y. Fujii
14:20 – 14:50	Muon	
	One-year progress	Y. Miyake
	Committee report	J. –M. Poutissou

14:50 – 15:10	Coffee Break	
15:10 – 16:40	Nuclear and Particle Physics	
	One-year progress	J. Imazato
	Neutrino Program	T. Kobayashi
	Committee Report	T. Yamanaka
16:40 – 17:10	Nuclear Transmutation	H. Oigawa
17:10 – 18:00	Executive session	
18:00 –	Dinner Party	

March 9 (Tue)

9:00 – 10:00	Executive Session (Committee + Needed Persons)
10:00 – 12:00	Working hours
	Open Discussion, Report writing, Up to chairperson
12:00 – 12:30	Summary Session
12:30 – 13:30	Lunch
14:00 – 15:00	Tour of the Site (optional)

APPENDIX II

Committee Members
The members of the Committee were:

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