

**THE INTERNATIONAL ADVISORY COMMITTEE
ON THE J-PARC PROJECT
REPORT**

Meeting held March 4-5, 2024

Contents

THE INTERNATIONAL ADVISORY COMMITTEE	1
EXECUTIVE SUMMARY	3
MEXT view of J-PARC	4
JAEA view of J-PARC	4
KEK view of J-PARC	4
GENERAL STATUS OF THE PROJECT	5
SAFETY	9
PUBLIC AFFAIRS AND COMMUNICATION	11
RADIOACTIVE WASTE MANAGEMENT	12
ACCELERATOR SYSTEMS	13
PARTICLE AND NUCLEAR PHYSICS	15
MATERIALS AND LIFE SCIENCE - NEUTRONS	17
MATERIALS AND LIFE SCIENCE – MUSE	19
ADS	21
Appendix I	22
Appendix II	24
Appendix III	25

EXECUTIVE SUMMARY

The International Advisory Committee (IAC) on J-PARC met at J-PARC to review the progress and prospects since the last meeting in February 2023.

The presentations were made available ahead of time. Overall, the committee was able to fulfill its mandate as set by the director (see Appendix III). The IAC thanks J-PARC staff for the considerable efforts put into the preparation of the material, the efficient running of the meetings, and their hospitality.

The committee particularly expresses appreciation for the presentations of selected results by young scientists, engineers and technicians.

The IAC thanks JPARC for addressing many of the recommendations in their 2023 report.

MEXT view of J-PARC

- MEXT supports four National Large Scale Facilities in Quantum Beam Science: Spring-8, SACLA, J-PARC MLF and NanoTerasu (under construction).
- Upgrade of Spring-8 is under discussion as the next major investment.
- The MEXT 5-year review of J-PARC made the following recommendations:
 - Successive and scheduled recruitment to pass down techniques
 - Safety and stable facility operation: Acquisition of techniques for volume reduction of highly radioactive waste; Ageing-management such as planned replacement of old equipment
 - Concretely proceeding towards the achievement of future plans (e.g. MLF-TS2)
 - Presentation of an attractive vision and career path for younger people
 - Balance between increased convenience for users and cybersecurity measures
 - Improvement of proposal types
 - Broadening of J-JOIN to synchrotron radiation
 - Effective publicity for people and international cooperation
 - Consideration of data policy, spreading industrial use and implementing product creation
 - Self-financing through fee income

JAEA view of J-PARC

- JAEA has a new vision with three priority directions of R&D: pursuing nuclear-renewable synergy; making nuclear energy sustainable; making nuclear energy ubiquitous.
- J-PARC will play an important role in supporting these R&D directions.

KEK view of J-PARC

- KEK supports a wide range of accelerator based research at the Tsukuba and Tokai campuses.
- Budgets have been flat for several years. Discussions with MEXT on future funding have started based on the KEK-PIP 2022. Funding for the muon g-2/EDM experiment is starting, as recommended in the 2016 PIP.
- An Instrumentation Technology Development Centre has been set up to develop core technologies for next generation projects.

GENERAL STATUS OF THE PROJECT

Findings:

- The IAC congratulates J-PARC on the many significant achievements of the past year, for example 760 kW to MR/FX, 100 kW to MR/SX, MLF, stable operations at 830 kW to MLF, progress towards 1.3 MW, beam to COMET, high profile experiments in MLF, funding for T μ M, and progress on the access road, user transportation and the SOKENDAI Joint Research Center / J-PARC Experimental Equipment Development Building.
- There have been two equipment fires with unrelated causes – one due to new equipment, the other due to old. The immediate response to both incidents was excellent, though they did then lead to significant lost operating time due to the process for obtaining permission to restart. General safety performance is excellent.
- Difficult choices regarding the operation schedule were avoided through a supplementary budget, but also due to the fact that some amount of operation was lost due to the fires (though this has some benefit for operations in 2024 because budget can be transferred). The IAC is pleased to see that the operating budget allocation will not be reduced in FY2024. However the IAC has concerns that this budget has remained relatively flat for a number of years despite the increasing costs of operations. A further reduction in electricity prices or a special additional budget would be needed to ensure that J-PARC can operate the full planned schedule, or savings would have to be found elsewhere – which increases risks to future operation. External income, e.g. from industry use, can now be retained. This is a welcome bonus, but not sufficient to solve the problem.
- Staffing is a continuing concern. Overall numbers (~600 staff + ~150 contractors) are low to support a scientific infrastructure of the scale and sophistication of J-PARC. There has been some discussion of converting contractors to staff. The staff age distribution is a major concern - the JAEA average age has increased by more than a year within a year.
- MEXT has conducted a 5 year review with a number of important recommendations (see page 4).
- JAEA has a new vision with three priority directions of R&D (see page 4).
- National radioactive waste disposal policy is mentioned in both MEXT and JAEA strategies, but it is not clear if/how ADS is part of this.

- MUSE has made good progress but has many challenging projects, e.g. laser, microscope; staffing and funding will limit the ability to fully deliver everything. There is particular concern around laser development as this impacts several experiments.
- Progress is being made towards a 2 year target replacement schedule for MLF.
- There is coordination of MLF neutrons/muons and JRR-3 through J-JOIN, though this is not yet a 'common programme'. The decrease in Japanese user numbers for MLF is a concern, though international use is increasing.
- The Open House attracted over 1000 visitors.
- The 4th J-PARC international symposium 'Futures of J-PARC, Futures by J-PARC' is planned for October 14-17 2024 in Mito. This is a key opportunity to present past achievements and future plans.

Recommendations:

- The recommendations from the MEXT review are clearly important for J-PARC and are very consistent with the recommendations of the IAC. However, the IAC would suggest that, while increased collaboration with synchrotrons is an appropriate goal, it needs to be approached carefully because (a) J-JOIN itself is only recently established and (b) the synchrotron community is much larger and has only partial overlap with the neutron community. Discussions with known neutron users who are also significant synchrotron users might be an advisable first step.
- J-PARC should identify its potential contributions to the new JAEA vision and then put in place actions to deliver them.
- J-PARC has been doing all the right things with regard to the recent fires. Procedures were in place that identified issues early and dealt with them before they became serious problems. For such a facility these incidents will happen, it is not possible to entirely avoid them, but it is important to minimise the risks and then minimise the impact of the facility not operating. However, the IAC recognises the process of obtaining permission to restart operation is not under J-PARC control.
- J-PARC needs to develop both a short term and a long term strategy regarding electricity costs. If the cost stabilises there will still be increasing pressure to use less energy. Investment in solar energy cannot be a total solution, even if government investment was available, because the space requirement is simply too great. And if this were implemented through a public/private partnership it probably doesn't save money. IAC recommends that J-PARC

develops a cost-benefit analysis concerning investment to enable enhanced use of the facility while it is operating, e.g. through more or improved experiments (hadron hall extension, MLF Double, increased staffing), compared to the cost of operating the existing facility for more years to deliver the same science output.

- The J-PARC 10 year plan is very ambitious. However, the total scope of JPARC activities is continually increasing, and this has to be supported from operational budgets that have been real terms flat for several years (i.e. effectively decreasing). This is not sustainable without additional funding. One year supplementary budgets, or specific project budgets, are helpful but not a long term solution. The Hadron Hall extension project is ranked as the top priority in the PIP 2022 plan but is being delayed. J-PARC should be careful that other shorter/easier projects do not continually delay it.
- Despite the challenges in being able to fulfil it, J-PARC nevertheless needs to develop a long term plan for staffing and skills. This is also highlighted in the MEXT review. However, the IAC recognises that the constraints on staff numbers and budget make this difficult.
- From this point on J-PARC will need a continuous programme to replace ageing equipment. A risk assessment activity should be pursued to identify potential safety issues, vulnerabilities in single-point failures, high-value spares, and asset management of the existing facility. J -PARC should consider structuring equipment replacement as a single rolling programme with a ten year (time priority) plan, rather than a set of separate smaller scale projects. The programme should emphasise the performance improvements that could be achieved, including energy saving, not just the replacement need. If the programme of work is not implemented soon it will become too late to ever fully recover.
- Hadron hall experiments are accumulating due to the missed operating time. If there is not a reduction in the backlog in the coming year J-PARC may need to reconsider experiments that are too delayed.
- The muon microscope project has a funded feasibility study but the laser development seems a weak point (for this and other muon projects). If additional resources cannot be found (possibly through collaborations?) then J-PARC will need to carefully prioritise activities.
- The decrease in Japanese users of MLF is concerning and this requires action. Doing this through J-JOIN would be appropriate since the size of the user community is important for both MLF and JRR-3. It is hard to see how TS2 would be motivated if the trend is not reversed. In addition, if TS2 is to become a reality then MLF needs to further develop the concept, with an indicative timescale, and engage the user community.
- The integrated neutron/muon target for TS2 is an ambitious concept and could benefit from an external review when the design is suitably developed. Experience gained when ESS starts operating its rotating tungsten target will obviously be important.

- The ADS programme is sub-critical. The 5 year JAEA strategy does not appear prioritising this. So J-PARC needs to focus on activities that have a cross-benefit for other areas, e.g. accelerator reliability. The proposed diversification of T-TEF has to be developed and justified on its own merits, not be a 'support' mechanism for ADS.
- J-PARC needs to continue working on the long term plan for dealing with all radioactive waste, coherently with national policy. It is not clear to the IAC that moving some waste to the KEK Tsukuba campus is a practical or cost effective solution.
- J-PARC should develop a high level a communications and stakeholder strategy, which is then formulated as a plan, particularly if funding for developments like TS2 is to be motivated. As major stakeholders, this strategy should clearly link to MEXT, JAEA and KEK strategies.
- The 4th J-PARC symposium should be used as an opportunity to develop and present the long term vision for J-PARC.

SAFETY

Findings:

- During 2023 there were two equipment fires with unrelated causes – one related to a design fault in new equipment, the other related to ageing of old equipment. The response to both incidents was rapid and effective, though there was then significant lost operating time due to the process of getting permission to restart from the local government. Lessons learned and other appropriate actions have been carried out following these incidents.
- Otherwise safety performance has been excellent, with a very low number of incidents. The number of reports of potential incidents has increased over the last 3 years.
- The safety survey of all staff recommended by IAC 2023 has been carried out and the results are being analysed.

Recommendations:

- In a large and complex facility like J-PARC accidents such as fires will occur. However, measures can be implemented to reduce the likelihood including preventative maintenance, inspections, thermal imaging etc. Other actions to reduce the impact can also be implemented such as fire detection systems, automatic extinguishers and rapid response. Implementing learnings from past incidents is also important to prevent future recurrence. These things J-PARC has in place or has done, so the IAC recommends that J-PARC clearly communicates this to its stakeholders - that the systems and processes are in place to minimise the risk (likelihood & impact).
- J-PARC has learned two lessons from the fire incidents – one related to replacement of ageing equipment and the other to design faults in new equipment. With regard to the latter, the IAC recommends implementing a standard practice of cross-facility reviews. For example, those designing power supplies in one part of the facility would review the designs or specifications of another part before they are sent out for procurement. Such reviews should have the intention of being helpful, not critical, and could be applied to all sorts of equipment. In this way good design practice and expertise would be regularly shared through the organisation. (Note that this recommendation is not only related to safety. It might also decrease cost, increase performance etc.)
- The IAC supports the positive message regarding safety that comes from the annual safety day. However, the IAC would suggest that this is now moved to a different date, rather than continuing to commemorate a past safety failure.

- A high ratio of potential incidents to actual incidents is an indicator of a good safety culture, so the rising number of potential incidents should not be a concern provided that it is due to improved reporting. The IAC would recommend that attention is paid to possible trends in the types of potential incidents, e.g. electrical safety given the two recent fires.
- The IAC will be interested to see the analysis of the 2023 staff safety survey at its next meeting, and recommends that the survey is carried out every year in order to track changes.

PUBLIC AFFAIRS AND COMMUNICATION

Findings:

- The IAC highly values J-PARC's sincere response based on the recommendations of IAC2023. The activities in communicating the importance of basic science to society have been excellent, and recommends that these continue. However, for J-PARC's sustainable development, it is necessary to formulate a more detailed and broader strategy.
- J-PARC is jointly managed by KEK and JAEA, but from the user's perspective, this bureaucratic structure is not relevant. The IAC requests that J-PARC's overall strategy and role division be clarified.

Recommendations:

- J-PARC should develop a comprehensive communications strategy. First, the vision for J-PARC needs to be defined. Next, the strategy should consider how to communicate J-PARC to the various stakeholders, e.g. the government, our colleagues around the world, and society. All activities must be based on the strategy. Each activity should have a goal, and achievement of these goals should be assessed both quantitatively and qualitatively.
- Communications aimed at increasing the number of MLF users and TS2 construction, or for building trust (especially after fires), or for education, have different purposes and methods. However, they are all communication activities conducted by a single organization. The IAC recommends that J-PARC tries to link these aspects, especially in aligning the tone and manner, to ensure a unified communication approach.
- The IAC would like to receive an annual report on progress regarding diversity. J-PARC should set long-term goals and report each year on the progress made. Similar to communication, a vision and strategy are necessary. The IAC is aware of a recent strategy and actions at the US Spallation Neutron Source regarding diversity, and similarly within the League of European Neutron Sources, and suggests that J-PARC should look at these for possible suggestions as to how to approach this issue.
- It is a notable event for J-PARC that Professor Ichikawa, a former spokesperson for T2K, has been awarded the Nishina Prize. Such significant events should be reported to the IAC.

RADIOACTIVE WASTE MANAGEMENT

Findings:

- Development of the plan for radioactive waste management is continuing and progress is being made. The division of responsibilities remains complicated because of the number of different organisations involved. (However, this is also the case in many other countries.)
- Some example items (RCS RF cavity, MR magnet coils) have been moved through the waste handling process for the first time.
- Without a long term repository in Japan for high activity/long lifetime waste, storage space will continue to be a critical issue. The possibility of storing some waste on the KEK Tsukuba campus is being discussed.
- The definition of dose that can be considered non-radioactive (0.01 mSv/year) is extremely low and much smaller than the natural background in Japan (2.1 mSv/year). This can cause a serious problem where 'waste' still has to be stored even though it no longer presents any radiological risk and could be disposed of through standard mechanisms, or even recycled.

Recommendations:

- The IAC congratulates J-PARC on the serious efforts being made to deal with this difficult issue and encourages J-PARC to continue with this work.
- Some information on costs has been provided. For the next meeting the IAC would like to see information on the total planned expenditure per year in order to understand its impact on the overall J-PARC budget. This should be split into costs and investments (e.g. storage building(s), which might be separately funded).
- The IAC encourages J-PARC to engage with the NRA working group, if possible, to advocate for a more practical definition of 'non-radioactive'. However, the IAC recognises the difficulties in terms of public perception.

ACCELERATOR SYSTEMS

Findings:

- Since the IAC meeting in 2023, the J-PARC accelerator team has delivered high-quality beam to the MLF and re-commenced MR beam operations following the installation and commissioning of major power supply upgrades during JFY2022 to enable a 1.36 s acceleration cycle. A major milestone was achieved by exceeding 750 kW in the MR-FX to the neutrino experimental facility and beam was also delivered to the Hadron Facility for the COMET experimental beamline for the first time. Overall facility availability has been affected by two power supply fires.
 - The RCS remained in stable user operation, delivering 600 – 800 kW beam to the MLF during the periods January to March, April to June and November to December 2023. Availability for the RCS only was once again excellent, at 98.3%, the only significant downtime being caused by factors external to the RCS itself. At present there is insufficient cooling capacity to run the RCS above 800 kW beam power if the wet-bulb temperature is $> 24^{\circ}\text{C}$. As a result, beam power was reduced to 750 kW in June 2023.
 - During February 2024 RCS availability was compromised by failure of a pump in the cooling water system. The motor in the failed pump was replaced with a spare unit.
 - The MR experienced some power supply problems but is now running stably, and despite low overall MR availability of $\sim 42\%$ (37/88 days), the scheduled program was completed and successful continuous operation at 760 kW was demonstrated.
- During JFY2023 the J-PARC accelerator complex operated without reportable incidents on personnel safety or beam-induced machine protection. However, two incidents of equipment fire caused significant downtime to the user programs. As a result of the two fires, MLF operations were suspended for a significant period, even though there was no damage to any equipment in the RCS.
- The fires were dealt with very professionally – interlocks, alarm systems and the prompt fire response from KEK staff and the Fire Department ensured that the fires were caught early, put out efficiently and therefore that damage to adjacent equipment was avoided. The root causes of each fire have been clearly identified, and the mitigations that have been put in place are appropriate.
- The J-PARC complex consists of both accelerator equipment and infrastructure established about 20 years ago, and legacy experimental systems and equipment, e.g. those contributed by KEK. Aging and deterioration inevitably start to compromise facility availability. The recommendation from the IAC meeting in 2022 regarding securing funding both for improving and upgrading aging and obsolete accelerator equipment and systems remains relevant.

- The two recommendations from the IAC meeting in 2022 regarding electricity prices did not need to be fully addressed as concerns were not realized and operations continued throughout the year. Electricity prices peaked in 2023, but the effect this would have had was offset by not having to pay for the days lost during the two fire incidents. The challenge of high electricity prices remains as a pressure on J-PARC operation and an appropriate strategy should be maintained for reduced electrical usage, procurement of electricity in alternative ways and optimization of technical activities if there is no beam operation due to electricity costs and funding limitations.
- A full response to the recommendation from the IAC meeting in 2022 regarding identification of strategic accelerator development initiatives aligned with J-PARC's long-term missions will be provided after the symposium 'Future of J-PARC, Future by J-PARC' planned in October 2024.
- Attracting and retaining talented accelerator researchers/experts and strengthening the workforce are essential to J-PARC's future undertaking. Concrete accelerator initiatives and R&D projects will be important in this regard.

Recommendations:

- Establish appropriate response protocols in accordance with the category and severity of incidents to ensure that impact on user operation is minimized. User satisfaction is vital to a user facility like J-PARC. Every effort should be made to protect machine availability and long-term sustainability.
- Create a 10-year strategic operational project for the accelerator and use this as leverage to enhance accelerator operations funding to maximize user time and reduce the risk of growing obsolescence issues resulting in significant unplanned downtime. It is becoming increasingly clear that the current J-PARC accelerator budget is not sufficient to address all the emerging issues of aging equipment, highly radioactive equipment maintenance and fluctuating electricity costs, all against a background of post-pandemic inflation.
- Use the output from the J-PARC symposium in October 2024 to identify accelerator development initiatives aligned with J-PARC's long-term missions and create a task force to explore these initiatives further. In the longer-term use accelerator development initiatives as a way to attract talented researchers to the facility.

PARTICLE AND NUCLEAR PHYSICS

Findings:

- The muon g-2 experiment construction continues. The budget approval for the muon g-2 experiment is a very important milestone.
- The achievement of 100kW slow extraction to Hadron Hall is a critical milestone.
- Achievement of 760kW operation of MR-FX for neutrino production is a major accomplishment. Completion of the power supply upgrades for neutrino production is a significant step towards 1.3MW.
- Limited machine time for neutrino and hadron physics remains a concern under a flat operating budget. Both FX and SX require ~4 cycles per year for optimal program while funding is available for ~6.5 cycles only. It is critical to provide beam to the users in FY24 after challenging years of reduced beam time due to accidents and high electricity cost.
- It is critical to achieve availability of 1.3 MW beam power from MR by the start of the HyperK experiment. HyperK is on track to start data collection in 2027.
- Timelines for nuclear and particle physics programs are expected to be adjusted due to the realities of the funding and priorities, with delays foreseen for the Hadron Hall extension.
- T2K updated their oscillation measurement and combined it with the NoVA experiment, resolving the tension between the results from the individual experiments for the normal hierarchy. They expect to accumulate about twice more data with better beam and detectors which will substantially improve ultimate experiment sensitivity before HyperK starts. The new SuperFDG detector will improve studies of neutrino-nucleus cross sections.
- The new world leading upper limit $BR(KL \rightarrow \pi^0 \nu \nu) < 2.0 \times 10^{-9}$ @ 90% C.L. by the KOTO experiment is a major achievement. The detector upgrades that have recently been implemented will increase background rejection and will be instrumental in pushing this limit further in forthcoming data taking over the next several years.
- The COMET experiment is skipping the remaining Phase-alpha for further beam studies under consideration of available beam to not delay forthcoming Phase-I runs.
- The major science highlight is the unique and challenging measurements of lifetimes of hypernuclei.

- The realization of the intermediate phase of KISS2 experiment of KEK at RIKEN is an important priority.
- The IAC thanks the outgoing Particle and Nuclear Physics PAC Chair and welcome the new PAC Chair who gave an excellent presentation on the important prioritization work by the PAC.

Recommendations:

- The IAC would like to receive an update on the timeline for the muon g-2 experiment at the next meeting.
- Challenges with completing approved experiments and large numbers of “pending” experiments is a concern. Reducing the number of experiments and completing them in a shorter period of time is expected. The IAC would like to receive an update on the progress at the next meeting.
- Updated timelines for the nuclear and particle physics program should be communicated to all stakeholders before the end of this year. The IAC would like to see this update at the next meeting.
- KEK IPNS and J-PARC should closely coordinate the planning of the October 2024 workshop.

MATERIALS AND LIFE SCIENCE - NEUTRONS

Findings:

- Iterative improvements in the target vessel design and operation have resulted in reductions in the primary limiting factor for target lifetime - cavitation erosion – and have avoided unexpected failures. Progress is being made towards two-year replacement rather than the current one-year.
- Other operational target related issues, e.g. tritium release, tooling, cryogenics, continue to require attention.
- There has been continued development of instruments and techniques, for example polarisation on BL23 and BL18, large area detector development on BL18 and fine radial collimators on BL11.
- There have been a number of high impact experiments, for example on All-Solid-State Li Batteries and High Strength Magnesium Alloy.
- MLF at 25Hz and ~800 kW is currently the world's highest brilliance neutron source. While output metrics are good (demand, publication rate, impact, industry use) it is not clear that the source capability is being fully exploited. Staff numbers remain low, which is a significant factor.
- The management of the Ibaraki beamlines will transfer from Ibaraki University to CROSS. Ibaraki Prefecture will continue to provide funding. The IAC would like to thank Ibaraki University for their very successful past management of the Ibaraki beamlines.
- Two new proposal mechanisms have been introduced – 'Priority use' and 'Promotion for industrial use'.
- Proposals from international users continue to increase, but there has been a gradual decrease in proposals from Japanese institutions.
- The "MLF Double" plan is intended to double the capability of MLF through instrument upgrades and other improvements.
- The proposal for MLF Target Station 2 has been endorsed by the Science Council of Japan.

Recommendations:

- The systematic approach to target development should continue. It was recognised in the past that reliable operation is more important than increased power on target, and this has not changed. Progress is slow, but there is definitely still progress.
- The decreasing demand from Japanese researchers is a cause for concern, particularly because most international users are from China and this may not continue when CSNS rapidly increases its number of operating instruments over the next few years. The restart of JRR-3 may have been a factor, with users now spread across two facilities. J-JOIN should undertake actions to increase the demand from Japan. J-PARC should continue efforts to increase the staffing levels as this is likely to be a factor.
- The new proposal mechanisms should be tried, but need to be monitored to ensure that the desired outcomes are achieved and there is not a negative impact on the rest of the programme.
- MLF should put in place a process for collecting and prioritising sub-projects within MLF Double to ensure maximum benefit, and then create a project plan. This plan would need to consider the available budget and staffing required to deliver it, and should include the strategies to obtain the funds to deliver it. Key stakeholders (e.g. users) should be engaged in developing the plan, which should then be communicated to wider stakeholders to obtain their support.
- User engagement in MLF Double could be used as a springboard to further develop ideas and support for TS2.

MATERIALS AND LIFE SCIENCE – MUSE

Findings:

- IAC appreciates the stable operation of MUSE leading to results and publications with high impact. Such achievements contribute significantly to the acquisition of further research funds such as KAKENHI (Grants-in-Aid for Scientific Research). This includes a new 5-years grant for T μ M to continue the urgent feasibility study.
- IAC welcomes MUSE's participation in the MDX initiative (Material Digital Transformation).
- IAC acknowledges the impressive human resource development program of MUSE.
- IAC is very pleased that the spare muon target has been fabricated and is now being commissioned.
- IAC appreciates the progress in the H-line and the preparations for the extension of the experimental hall for g-2. MuHFS, muonic helium and g-2 are making very good progress.
- IAC appreciates continued progress in the negative muon program.
- U-line continues to prepare for the USM- μ SR user program in U1A, where the low USM rate due to the insufficient laser power is still a matter of concern.
- IAC recognizes the very ambitious plans to upgrade TS1 and for TS2.
- The staff situation still remains a matter of concern for the future success of the facility. IAC notes the importance of hiring and promoting people with broad skills who are able to further develop the instrumentation and methodology of muon research. The present manpower is insufficient for user operation AND the plans to upgrade TS1 and for TS2.
- The low USM rate due to insufficient laser systems is a high risk for the strategic MUSE/J-PARC projects USM- μ SR, T μ M, and muon g-2. A routine laser operation and continuous laser development is not possible with the current number of staff.

Recommendations:

- Laser system for USM generation:
 - IAC strongly recommends that the additional funding required for the new Lyman- α pumping scheme with a Ti:S laser be made available.

- IAC recommends developing a strategy on how to establish a laser group to ensure sustainable operation of the MUSE/J-PARC key muon projects.
 - IAC recommends installing a regularly recurring laser review, or even a standing committee.
- IAC recommends that MSL management establish a system for the strategic development of personnel with the appropriate skills and leadership qualities.
- IAC recommends carefully analyzing how many additional staff is needed for the upgrade of TS1 and conception, design, development, construction and operation of TS2.
- IAC recommends to further build-up MUSE at TS1, its user community, and the exploitation of the scientific possibilities. A strong user community and scientific program will be highly competitive with other international user facilities.
- IAC recommends always having a spare muon target available.
- IAC recommends the continuation of the R&D efforts in the U-line, to provide opportunities for USM- μ SR experiments in U1A to the community as soon as possible, and to continue the feasibility study of T μ M in U1B with high priority.
- IAC recommends the continuation of collaborations with local J-PARC groups, domestic universities and research institutions, as well as with the international muon facilities.
- IAC recommends the continuation of the impressive human research development and outreach program, which is an important investment in the future of the facility.

ADS

Findings:

- ADS work at J-PARC continues to make progress in specific technical areas, but the overall funding and staffing remains sub-critical to achieve the longer term aims.
- ADS is not part of the current Japanese nuclear fuel cycle strategy. In JAEA's 'New Vision and 3 Directions of R&D' the 'Reduction of waste volume and toxicity' is one of the R&D topics, with 'Neutron Transmutation' being part of this. However, this has not yet resulted in improved funding for the J-PARC activities.
- The ADS team have active international and national collaborations.
- A workshop has been held on a possible 'Proton Beam Irradiation Facility' which includes capabilities for soft error testing of semiconductor devices, radio-isotope production and other proton beam applications, as well as ADS related work.

Recommendations:

- The additional capabilities of the 'Proton Beam Irradiation Facility' would have to be justified on their own merits, and without a change in the national position regarding ADS they might be a higher priority (e.g. soft error testing is increasingly demanded). The expanded facility would also have a higher cost. The IAC therefore recommends that this broader facility is not considered as a 'back door' strategy to obtain funding for T-TEF.

Appendix I

Agenda for the International Advisory Committee Meeting of J-PARC

March 4 (Mon)

9:30-10:10 Charge to the Committee /Report from the Director. Takashi KOBAYASHI

Views from Funding Agency and Host Institutes

10:10-10:30 View from MEXT. Goki INADA

10:30-10:50 KEK and J-PARC. Junji HABA

10:50-11:10 JAEA and J-PARC. Hiroyuki OIGAWA

Accelerator

11:10-11:35 Progress and Prospects. Michikazu KINSHO

11:35-11:55 A-TAC View of Accelerator Activities. Jie WEI

11:55-12:40 Lunch + Coffee Break

Material and Life Science I

12:40-13:05 Overview of Neutron Facility. Toshiya OTOMO

13:05-13:25 NAC Review. Jamie SCHULZ (via ZOOM)

Material and Life Science II

13:25-13:50 MUSE Status. Koichiro SHIMOMURA

13:50-14:10 MAC Review. Thomas PROKSCHA (via ZOOM)

Particle and Nuclear Physics

14:10-14:35 Overview of Particle and Nuclear Physics. Naohito SAITO

14:35-14:50 PAC Report. Taku YAMANAKA (via ZOOM)

14:50-15:00 Coffee Break

Accelerator Driven Transmutation Research

15:00-15:25 ADS Project. Fujio MAEKAWA

Public affairs and communications

15:25-15:40 Public affairs and communications at J-PARC. Fujio NAITO

15:40-15:50 Break

Parallel Sessions

Material and Life Science, Accelerator Driven Transmutation Research

15:50-16:05 Measurement and Evaluation of Nuclide Production Cross Sections: Toward Establishing a Reliable Nuclear Reaction Database. Hiroki IWAMOTO

- 16:05-16:20 Trial measurement of flow induced vibration caused by inner wall damage in the double-wall structure channel (neutron target). Gen Ariyoshi
- 16:20-16:35 Magnetic boson peak in classical spin glasses. Maiko Kofu
- 16:35-16:50 Structural studies of battery materials using neutron diffraction. Kazuhiro Mori
- 16:50-17:05 Wide bandwidth neutron-spin polarizing supermirror due to ferromagnetic interlayer exchange coupling. Ryuji Maruyama
- 17:05-17:20 Non-destructive elemental analysis of historical and cultural properties. Motonobu Tampo

Particle and Nuclear Physics, Accelerator

- 15:50-16:05 Achievement of original designed beam power in J-PARC MR. Takaaki Yasui
- 16:05-16:20 Improvement of longitudinal beam tracking simulation for the J-PARC RCS. Hidefumi Okita
- 16:20-16:35 T2K experiment. Hikaru Tanigawa
- 16:35-16:50 KOTO experiment. Koji Shiomi
- 16:50-17:05 Lifetime measurement of Λ^4 . AKAISHI Takaya
- 17:05-17:20 Development of new readout electronics. Ryotaro Honda

- 17:20-17:30 Break

Executive Session (closed)

- 17:30-18:00 Review and Discussion. IAC Members

- 18:00-18:10 Group Photo

- 19:00-20:30 Reception

March 5 (Tue)

Safety

- 9:30-9:55 Safety at J-PARC. Yoshimi KASUGAI

Radioactive Waste Management

- 9:55-10:15 Radioactive Waste Management. Fujio NAITO

- 10:15-10:25 Coffee Break

Executive Session (closed)

- 10:25-11:25 IAC Members

Close out

- 11:25-11:55 Recommendations. Robert McGREEVY

- 11:55-12:45 Lunch + Coffee Break

- 12:45-15:30 Site Tour

Appendix II

IAC Committee members for 2024

In person:

Hamid Aït ABDERRAHIM
Ken ANDERSEN
Angela BRACCO
Dmitri DENISOV
Akira HASEGAWA
Shinichi KAMEI
Reiner KREUCKEN
Robert McGREEVY
Yoko SUGAWARA
John THOMASON
Jie WEI
Hiromi YOKOYAMA

Remote:

Dan NEUMANN
Thomas PROKSCHA

Unable to attend:

Takeshi EGAMI
Joachim MNICH

Appendix III

Charges to IAC2024 from J-PARC by T. Kobayashi, director

- Evaluate overall performance of J-PARC Center. Promotion of science with safety. Each facility should have a good balance of user program and facility improvements.
- Future vision of the facility.
- Review safety activities at J-PARC. Safety culture is well penetrated thru staff and users?
- Any suggestions to improve the total performance are welcome. Our concerns include but not limited to:
 - Public relations
 - Open access for users
 - More uniform operation combining KEK, JAEA, and CROSS efforts is critical to further success of MLF