National Synchrotron Light Source II (NSLS-II)
Science Advisory Committee

Meeting Report – September 19-20, 2017

Attending: Harald Reichert (Chair), Ingrid Pickering (Vice Chair), Franz Hennies, Stephen Kevan, Eugene Lavely, Janet Smith, Soichi Wakatsuki, Jen Bohon (representing UEC)

Regrets: Bruce Gates, John Hemminger, Robert Hettel

Preamble

The Science Advisory Committee (SAC) of the National Synchrotron Light Source II (NSLS-II) met at Brookhaven National Laboratory (BNL) on September 19-20, 2017. The SAC overall is very complimentary about the progress to date and especially over the last six months, which has been accomplished as a result of the dedication and enthusiasm of the entire NSLS-II team.

The SAC was provided with a charge by the management and was asked to provide feedback on three major aspects of the facility development, which are detailed in Sections 1-3 of the report, along with comments on the development and operations of four specific beamlines (Section 4). Additional comments are provided in Section 5, with suggestions of topics for future meetings in Section 6.

1. Accelerator

1.1. Is the accelerator studies program appropriately sized and planned to deliver design performance?

The Accelerator program appears to be very robust with clear performance goal priorities. As before, the SAC questions the goal to reach 500 mA as a priority if it diverts resources from reaching other performance enhancements, such as increased stability in the beamlines or other beamline improvements. The SAC encourages the NSLS-II staff to continue considering the option of operating at less than 500 mA in the near term if other performance enhancements are thereby enabled. The SAC endorses the basic performance priorities of reliability/stability/intensity/brightness.

One area that was not covered in the meeting is the status of work to reduce vertical emittance from the present 30 pm-rad to below 10 pm-rad so that the vertical coherent fraction would be increased for users. At the March 2017 meeting a plan for reaching a reliable reduction in horizontal-vertical coupling was presented. This included a plan to reduce the skew quadrupole integral in variable-gap IDs by shimming IDs, adding compact skew correctors, implementing feed-forward on existing skew quads and other measures. The feed-forward scheme had already been tried for at least one ID and seemed to work in keeping 8.5 pm emittance. It would be good to hear about progress in this program at the next SAC meeting.

1.2. Are the appropriate steps being taken to mitigate the issues observed at high currents?

The Accelerator division is mitigating component overheating issues related to beam current by replacing faulty RF contact spring fingers in flange joints and the connections to ceramic kicker chambers. Fan cooling has already been added for the ceramic chambers with positive results. The

temperatures of stripline kickers will be carefully monitored as beam is increased with corrective steps being taken if problems are encountered.

Substantial issues remain for going beyond 400 mA: a third RF cavity system is needed and funding has been provided for preparing the cavity by itself for installation without an additional RF power station. The third cavity will provide back-up capability in case another cavity has problems. Ultimately a third RF power station will be needed.

The plan to implement the superconducting third harmonic cavity system appears to be on hold, with no plan to complete its installation. While there are technical and funding issues related to this system, it ultimately could provide improved lifetime, beam stability and lower component heating at high current if it is ever installed.

1.3. Is the attention being paid to possible upgrades in performance at an appropriate level?

The continued attention to beam stability and plans to improve the RF system are commendable. The longer term plan to study possible lattice conversions to reach lower emittance are also appropriate. Already some relatively modest-cost ideas have emerged that could reduce emittance towards the 100-pm scale. Ultimately, a complete (and costly) lattice replacement could push the emittance down by another order of magnitude.

2. Operations and Beamline Development

2.1. Is the in-house science program appropriately sized and valued? Are there opportunities for improvements?

As in any synchrotron facility, in-house science is essential to the success of NSLS-II. Cultivating the research success of the staff is an essential component in staff retention and recruitment as well as enabling beamline personnel to lead, with passion, the development of new capabilities and the growth of their user community. The SAC is pleased to be informed about the many excellent science projects involving NSLS-II staff presented in talks throughout this and previous meetings.

The SAC also was pleased to receive the presentation from the Management regarding the value of in-house science. The detailed account of beamline personnel work-tasks and discretionary spending ($10 K per annum) as presented seems to be appropriate. However, the processes for evaluation of the science still seem somewhat unclear. In addition, there is an urgent need that the plan shared with the SAC be communicated to and discussed with staff, such as at a beamline staff all-hands meeting. Several staff members seemed confused or uncertain about the plan, or perceived devaluation, such as being refused opportunities to travel for invited talks or external beamtime. The SAC questions why the $10 K annual allocation needs to be channeled through and therefore controlled by group leaders, rather than being available to the individual beamlines or staff members. In the future it is important to ensure that the in-house science policy be developed together with beamline staff.

Time is the resource that is most scarce for the majority of beamline staff at this stage in the facility's development. With so much effort being put into construction, commissioning, assisting individual users and cultivating the user community, there is often little time left for a staff member's own research program. Beamline staff need the strong support of management to ensure that they can free up time for research and development. In addition, management should clarify the intended use of beamline discretionary time, and grant beamline staff members more freedom to use it as a seed for collaborations or for their own research.

2.2. Does the controls program have the right mix between the various elements of the program? Are there areas that are significantly under-resourced? Are the priorities of the program clear, transparent and aligned with the priorities of the facility?

The mission of the Controls Group is to enable highly productive science research by developing and providing specialist controls and computing technology for both the facility and the user community. The group has 45 staff distributed among the key program areas ranging across accelerator, beamline control, data acquisition, data analysis and storage, and IT. The size of the Controls team is reasonable for the size of the facility, compared with the other US national facilities. The SAC commends the Controls team efforts on the development of Bluesky and DAMA which are well integrated with efforts in the US and international facilities, realizing impacts in some areas and with the possibility of further proliferation.

Staff retention. Retention in Controls is becoming increasingly difficult as exemplified by the departures of several key personnel; filling positions is also challenging. There is a perceived lack of opportunity for career growth among the group members. Encouragement by management to attend conferences and to interact outside of the laboratory in other ways might improve this situation. The SAC also notes that new hires with fresh minds could bring new ideas, and stresses the importance of mentorship and recognition of the Controls Group by beamline staff and facility management.

Beamline Controls. Beamline Controls is severely underserved across the board, and this matter needs very careful and immediate attention. Beamline Controls personnel feel overworked and underappreciated. There appears to be some blurring of boundaries in that Beamline Controls personnel take on activities such as stringing cables and performing DAMA functions in order to move the project along. The growth in number of beamlines will require even more Controls effort, and thus will reduce the level of service to each beamline even further.

Accelerator Controls. The Accelerator Controls group faces different challenges. Following the impressive ramp-up of the accelerator program, their work has become, by and large, routine, and it is hard to keep the team highly motivated with exciting challenges. The SAC recommends that the facility management, team leaders and staff make efforts on finding new challenges, such as advanced control with AI, machine learning for high stability and reliability of the beam and rapid recovery from faults. This activity could be expanded to include integrated approaches covering both the accelerator and beamline controls and DAMA, which would help cross-train the Controls staff across the board.

Prioritization. The recent workflow scheme for more transparent prioritization including implementation of points-of-contact for 6 science-theme beamline programs needs careful monitoring for successful implementation. Open-mindedness in organization and reporting structures could improve efficiency, productivity and staff morale. It appears that the new scheme has discouraged direct communication between Controls staff and Beamline scientists and engineers, thereby affecting effective work flow and communication on the floor. For instance, Controls engineers used to attend FATs (factory acceptance tests), which helped them identify pitfalls and mistakes before delivery. Now they are not involved in FATs and sometimes find problems after equipment delivery, which could have been detected on the spot at FATs. Similarly, the DAMA Group was uncertain which Controls staff member was their point of contact for problems encountered on each beamline.

Communication within and beyond the Controls Group. Interaction between the different sectors of the Controls Group needs improvement; regular all-hands meetings of the entire group could be helpful. Personnel should understand the roles and responsibilities of each of their colleagues and be able to identify the correct person to contact for a given task. In addition, the SAC recommends that the leader of the Controls Group reach out to the other departments, especially USCEO and Beamlines, to address facility-wide priority issues.

- *IT infrastructure* presents an increasing issue as the facility transitions more into operation. For example, accessing data on the beamlines requires a user to have multiple user accounts, adding laboriousness to processes of data analysis and transfer/archiving. Additionally, user accounts and directory structures are inconsistently organized across the beamlines; there is need for more dedicated attention to standardization of systems and distribution of improvements or modifications facility wide. The NSLS-II management is strongly urged to make an interim solution on data access and storage policy. Data retention is already a big issue today but expected to become even more serious in the near future. Clarity from the management on how NSLS-II is going to address the future policy issues on data storage and access is strongly needed.
- *User friendliness* of beamline controls is a major complaint according to the user survey by the USCEO Group. Many new beamlines have only command-line beamline control with rudimentary documentation even after achieving operations. Making beamline control user-friendly requires close coordination between Controls and Beamline staff. While developing overarching new control systems is a high priority project of NSLS-II, there is a strong and urgent need to provide some reasonable level of user friendliness in beamline control.
- *Lack of documentation* in some areas (for example, beamline controls especially after instrument readiness review, IRR), might jeopardize equipment and affect future maintenance/upgrade. The SAC recommends that the Controls and Beamline staff address this deficiency.

Given the degree of concern, the SAC recommends a constructive review of the Controls Group by experts, which may include some SAC members.

2.3. Does the SAC have advice on how to proceed at CSX?

The SAC understands that the observed cross-talk between CSX1 and CSX2 beamlines presents difficult choices. We advise further internal analysis validated with external review to find optimized short- and long-term solutions.

This process needs to start by developing cost/benefit analysis for the three solutions presented. This should include, for example, the XPCS time resolution/experiment acquisition time trade-off, the factor of two increase in capacity/beam time provided by the re-canting option, and the possibility of increasing the coherent flux by optimizing the CSX1 undulator period for quantum materials research. The increase of coherent flux at CSX1which is possible just by improving the accelerator emittance (see accelerator section), without any intervention and cost at CSX, could be significant in this context.

To help inform and interpret this cost/benefit analysis, the NSLS-II should also review and update long-term plans for soft x-ray instruments and beamlines. Issues to be addressed include:

- Where do CSX1 and CSX2, for which the operational plan has evolved since the construction project, fit into this soft x-ray plan, and how can these be optimized for the long term?
- What will be the long range impact of soft x-ray XPCS at NSLS-II, with the existing fast CCD detector or with faster detectors being discussed but still needing R&D? What is the best use of NSLS-II resources to achieve the highest impact in the long term – detector R&D, optimized CSX sector, or something else?
- Imaging benefits relatively less from high coherent flux than XPCS. The emergence of an imaging program on CSX1 raises the question of how much imaging vs. scattering will be done there. How do these tools fit into the broader NSLS-II quantum materials program?
- How much APXPS, XAS, chemical RIXS, etc. will NSLS-II have and how much needs to be done on an undulator? APXPS raises special problems when optimizing capacity (e.g., the

need to bake the end station frequently and the serious impact of photolytic carbon deposition). NSLS-II might find that a cost-effective solution includes a bend magnet beamline or two for this kind of science to complement the science done on undulators.

The SAC advises that NSLS-II should consider a near-term solution (e.g., phasing magnet) as a step toward a longer-term solution (e.g., moving CSX2 to a separate sector). Other options are, of course, possible, and these should be considered as well.

The SAC stands ready to help the NSLS-II reach a solution that the facility and the user community are both comfortable with.

2.4. Are the plans outlined to further develop beamlines appropriate, given the current funding situation? Are there opportunities we have missed: to reduce costs, to obtain funding or to leverage other resources?

The SAC acknowledges the difficult funding and planning situation that the NSLS-II management is handling and believes that the current strategy is well adapted to the circumstances. New, not-yet-funded beamline projects are receiving sufficient attention; putting more resources into that development work at the present time does not seem reasonable. Since staff can work only part time with such developments, close attention should be paid to communicating realistic expectations to the staff involved, thus possibly avoiding frustration about slow progress.

The SAC sees a need to increase the current level of operational funding significantly in order for new beamlines to be built, even if investment funding became available. If not, there is a risk of suffocating the organization with too large a number of beamlines and the need to support them. The SAC would like to learn if the NSLS-II management sees a possibility in involving (more) partners in operating beamlines (e.g. by placing postdocs at BNL).

In the light of expected funding developments, identifying and leveraging synergies by standardization becomes imperative. If operational resources cannot be increased, improving efficiency could be a way forward. Value engineering has been presented as a way to improve efficiency in future beamline projects; a similar approach could be taken towards beamline operation and support. The current strategy, in particular in terms of specific actions, is not clear to the SAC. Identifying opportunities for leveraging synergies between beamlines could be a good way of involving staff and their expertise. The SAC would like to see a result-oriented strategy towards this.

From talking to various project personnel, the SAC feels that the project baseline for some of the finished beamline projects was probably defined too low, which has resulted in a transfer of a substantial portion of the burden and cost of finalizing (e.g., control systems) into operations, thereby seriously exacerbating the controls issues discussed in Section 2.2 above.

3. User Program

3.1. Is the user program making appropriate progress?

The user program seems to be growing well. The facility is achieving the ambitious DOE milestones for unique users that were set prior to NSLS-II start-up. A prompt start to user operations generally accelerates overall beamline development by highlighting small problems or deficiencies that were not apparent in commissioning. The SAC is pleased that management has kept to an ambitious start of user operations for all beamlines; however, while the SAC encourages the continuation of this practice as more beamlines are built, this cannot be done without improvements to the Beamline Controls development activities (see Section 2.2 above). The establishment of the new User Services, Communications, Education & Outreach (USCEO) office with direct report to the facility director is

enthusiastically endorsed, and the set of priorities described for the user experience task force are appropriate. The move to streamline and consolidate user access (boarding passes, one stop GUV center badging/TLD, etc.) is also very positive.

The PASS user proposal system remains difficult to use for users, beamline staff and reviewers; this needs to be addressed. We learned from the staff that this notorious system is slated for replacement. Access to the current user laboratories needs to be streamlined, and additional laboratories are needed to keep up with the experimental demands of a rapidly expanding user population. We would welcome an update on these items at the next report to the SAC about the user program.

3.2. Does the proposal review and allocation produce the appropriate balance between new users and experienced users?

It is difficult to judge the right balance between new users and experienced ones before the user program produces a substantial number of publications. Presumably the proportion of new users will continue to drop and will plateau at some future level.

There is some concern about the small fraction of General User (GU) time allocated for the MX beamlines in proportion to the Block Allocation Group (BAG) allocation. The low success rate for GU proposals could discourage users and may favor more established groups over new users. Due to the nature of these beamlines, it is reasonable to consider increasing the Rapid Access (RA) fraction of beam time, concomitantly with reducing or even removing the GU fraction. Information about the number of user groups in each BAG would be helpful in deciding whether our concern is valid.

3.3. Are the publication rates in line with what would be expected for this point in the life of the facility?

The publications are expected to lag, and 3 years is a standard lag phase, so this is not a concern.

3.4. Is the proposal for the triennial review of the beamlines reasonable? Does the SAC have other suggestions for how it might be run?

The SAC generally concurs with the outline for periodic review of NSLS-II beamlines. Cross-cut reviews are preferred in the steady state; the SAC advises the NSLS-II management to carefully consider whether reviews should be science- or technique-focused. In order to capture the differing visions and development histories of each beamline, the SAC agrees that individual beamline reviews are preferred for the first review, although beamlines with similar vision, development and science (for example AMX and FMX) could be exceptions. Overall the detailed list of topics for each review is excellent. The SAC especially concurs with the explicit inclusion of scientific staff research progress and plans. The SAC suggests that the review also consider a few other topics: beamline technology developments, beamline performance together with its capabilities, portfolio of proposals received from the proposal review panel (PRP), beamline access modes (general user, partner user, BAG), and any other internal or external advice that has influenced beamline activities. The SAC agrees with the overall plan to hold reviews immediately ahead of SAC meetings and to include one or two SAC members on the review committee to provide immediate feedback to the SAC. The planned three-year frequency of reviews could be extended to five years. Beamline reviews should be flexibly scheduled relative to other heavy demands on the beamline staff such as funding reviews.

4. Focus on Specific Beamlines

The SAC heard brief presentations on four of the beamlines, for each of which the SAC was asked to comment on specific aspects.

4.1. AMX (Highly Automated Macromolecular Crystallography Beamline, 17-ID-1)

- *Is the beamline on track to develop world-leading programs? If not, what should be done?*

The SAC commends the AMX group for the rapid and successful start-up of the AMX beamline. Development and operations are supported by a renewable NIH P41 Center grant and funds from DOE BER. These funding sources also support R&D activities of the staff. Jean Jankocic is the newly appointed lead scientist, following the recent retirement of Dieter Schneider. The AMX group aims to provide a modern facility for highly automated high-throughput crystallography, including both routine and challenging projects. They will become world-leading upon meeting a set of automation goals, which seem entirely achievable given the strong start, the careful prioritization of tasks for the immediate future, and sufficient optimization time.

- *Does the beamline have the correct mix between commissioning new capabilities and running a user program?*

The immediate commissioning goals include the full automation of several important user operations (beam size and energy changes) and the completion of a robust, rapid, high-capacity sample-handling system. These are critical to achieving full user operations. The small increase in time for user experiments between the 2017-2 and 2017-3 runs, together with the lack of timeline to full operations, was of some concern.

- *Is the user program looking healthy for this point in its development?*

The user program looks healthy in its first year. The general user program had a strong start in the 2017-1 run, with a substantial increase in 2017-2 but not in 2017-3. It is early for publications, which in crystallography have a usual 1-2 year delay from the experiment, but the SAC anticipates hearing about a number of papers in the next year or two.

- *Is the future plan for the beamline appropriate? Are there opportunities we are missing that we should go after? Conversely, is the beamline pursuing directions that it should not?*

The close collaboration of the AMX and FMX groups under the leadership of Sean McSweeney strengthens both beamlines. Their capabilities are complementary, with AMX providing a highly parallel beam suited for large unit cells and FMX providing a smaller, more brilliant beam for microcrystals or inhomogeneous samples. The SAC also notes some strong external collaborations, including a project to sort partial datasets from a set of slightly different crystals in order to assemble a complete dataset for each crystal type (with H. Bernstein, RIT), to develop acoustic-drop sample delivery (with A. Soares, BNL), and to improve the speed and accuracy of spot finding in diffraction images (with groups at EMBL and ESRF). The SAC recommends that the AMX group keep apprised of relevant developments elsewhere and adopt features that could benefit their user program—there is no need to reinvent the wheel.

4.2. FMX (Frontier Microfocusing Macromolecular Crystallography, 17-ID-2)

- *Is the beamline on track to develop world-leading programs? If not, what should be done?*

The SAC congratulates the FMX group, led by Martin Fuchs, for developing a world-leading beamline for microfocus crystallography. The above-mentioned NIH P41 Center grant and DOE BER funds support the group's activities including staff research. The initial technical capabilities have been demonstrated and the FMX group is rapidly completing the beamline commissioning. The microfocus capability with a high flux density in beam sizes down to 1×1.5 μm combined with a modern user interface to manipulate the sample in the beam is a landmark achievement for both the FMX group (beamline optics) and the NSLS-II facility (excellent source properties).

- *Does the beamline have the correct mix between commissioning new capabilities and running a user program?*

There is an appropriate mix of commissioning tasks and user beam time; however, it would have been helpful to see a set of milestones—with anticipated dates of completion/delivery—and a timeline to full user operations. Much remains to be completed before the beamline is fully operational; the SAC recommends careful balancing with the growing user program. It is expected that FMX development will be ongoing.

- *Is the user program looking healthy for this point in its development?*

The general user program started in the 2017-1 run with a strong increase in 2017-2. The small increase in user time between the 2017-2 and 2017-3 runs is a minor concern because no plan for ramp-up in the longer term was presented. No user publications have come from FMX, but this is expected given the recent start-up; the SAC anticipates a growing number of publications in the next 1-3 years.

- *Is the future plan for the beamline appropriate? Are there opportunities we are missing that we should go after? Conversely, is the beamline pursuing directions that it should not?*

The FMX collaboration with the Accelerator group through active participation in the Stability Working Group is essential to the success of FMX as the stringent beam-stability requirements for a 1-μm focus are critically dependent on a stable beam from the source. Likewise, a close collaboration with the AMX group strengthens the programs on both beamlines, as they have similar/identical sample handling, data acquisition, data management and data analysis needs. The FMX capabilities are complementary with AMX; the divergent FMX beam is suited to micro-crystals and the more parallel AMX beam to large unit cells, although FMX has already shown that it can resolve ~600-Å unit cells to a reasonable resolution. Much work remains to develop suitable data analysis tools, which should be done in collaboration with the AMX group and other suitable groups worldwide who are developing similar tools. Plans for serial crystallography, additional automation, more robust beam size and energy changes, and plate scanning are appropriate.

4.3. CMS (Complex Materials Scattering, 11-BM)

- *Is the beamline on track to develop world-leading programs? If not, what should be done?*

The SAC compliments the NSLS-II staff on the rapid commissioning and initiation of user program on the CMS beamline. This was a productive beamline at NSLS, and CMS will resurrect that program at NSLS-II. It will probably not be world leading as there are comparable beamlines elsewhere.

- *Does the beamline have the correct mix between commissioning new capabilities and running a user program?*

Yes. The program has started where the related program at NSLS left off, with a good complement of sample environments and capabilities. Other environments are planned for development; these are crucial since they will provide an identity for this beamline among SAXS/WAXS beamlines worldwide.

- *Is the user program looking healthy for this point in its development?*

Masa Fukoto has developed a very good collaboration and partner user agreement with CFN. This will surely produce many high-quality results, and moreover will be popular with BES. Other users are starting to show up and will increase the breadth of the program very quickly.

- *Is the future plan for the beamline appropriate? Are there opportunities we are missing that we should go after? Conversely, is the beamline pursuing directions that it should not?*

Here Fukoto maintains strong ties with a similar program at ALS and with CAMERA. This will help him get the sample/robot/data path up to speed quickly. His connection to CSI will also benefit from these connections.

In sum, the near- and long-term plans for CMS are in place and are very solid. These will lead to a strong and very productive user program within the next year or two.

4.4. XFP (X-ray Footprinting for In Vitro and In Vivo Structural Studies of Biological Macromolecules, 17-BM)

- *Is the beamline on track to develop world-leading programs? If not, what should be done?*

The XFP beamline provides a world-leading unique capability to the biology research community, although the techniques has had a limited user community in a niche area. XFP can be used to elucidate changes in solvent accessible areas of protein and nucleic acid molecules via radiolysis using x-ray generated hydroxyl radicals. With the high power density x-ray beam exceeding 500 W/mm^2 at the sample position from the bending magnet source, the XFP beamline offers advanced capabilities for x-ray footprinting experiments including time-resolved (currently down to 10 ms) protein dynamics and virus assembly and infection studies requiring BSL2 sample handling. The beamline team has strong expertise and experiences from the former x-ray footprinting beamline at NSLS-I, and has started to develop a new user community.

- *Does the beamline have the correct mix between commissioning new capabilities and running a user program?*

The commissioning and ramping up processes are well balanced at this stage of the beamline development. During the three runs in 2017, the beamline has evolved from no GU experiments to 46% GU and 14% Partner User (PU) experiments with healthy growth in the number of users. They now accept rapid access proposals in addition. Because of the small size of the XFP community, the SAC welcomes the excellent introduction of an XAS capability on this beamline. This will complement the other life science capabilities at NSLS-II, and help cooperation between the XFP team and the NSLS-II staff for synergistic operation of these beamlines.

- *Is the user program looking healthy for this point in its development?*

There is a rapid ramping up for user operation on x-ray footprinting with some exciting results including the time-resolved study of association of G-protein Coupled Receptor (GPCR) and G proteins in collaboration with Brian Kobilka's group at Stanford, and single-stranded RNA genome dynamics during viral infection, a collaboration with Stockley Group in University of Leeds. The latter has been possible with XFP's BSL2 level sample handling capability. Both examples can be used as a showcase for attracting future user community, and the SAC recommends that the XFP staff make more aggressive efforts in attracting new users from the wider biology communities.

- *Is the future plan for the beamline appropriate? Are there opportunities we are missing that we should go after? Conversely, is the beamline pursuing directions that it should not?*

Joining the BAG system may be a good way forward for the XFP beamline to be integrated with the life science MX and SAXS beamlines. The SAC recommends both XFP and ABBIX integrated project team to explore successful high-impact applications through combined use of these capabilities.

The SAC welcomes the efforts in bringing external funds for purchasing an on-site mass spectrometer (MS) for much more rapid feedback of footprinting of protein samples. Currently, users must quench the radiolysis reactions on the beamline, and bring samples to a remote MS apparatus, such as at Case Western Reserve University where the XFP team has high-end instruments. An on-site MS would enable a much faster turnaround of users going home with data already in hand, hence much higher overall beamline performance and science outputs.

5. Additional Comments

Utilities. Interaction with the utilities group yielded several excellent suggestions. The first suggestion was to update the RSI for the mechanical utilities to reflect the current capabilities of NSLS-II systems. Circulation of the updated document and increased attention to defining specific parameters (for example: water flow rates, air pressures) during design reviews will likely save cost later in needing to adapt to incompatible systems. In addition, establishment of standard equipment (for example: cryo-coolers) across the facility would help in enabling maintenance of spares and fostering development of in-house knowledge of their control systems for rapid troubleshooting during crises. Having on-call personnel for responding to off-hours crises would be advisable.

6. Items for Future SAC Meetings

The SAC wishes to receive input on the following during upcoming meetings:

Accelerator: The SAC would like to hear a report on work to reduce vertical emittance from the present 30 pm-rad to below 10 pm-rad so that the vertical coherent fraction would be increased for users (see section 1.1).

Vertical emittance impact on beamlines: The SAC suggests investigating and reporting the possible gain in CSX-1 performance due to the increase in coherent fraction by running the storage ring at reduced (design) emittance. Is there an expected gain at other beamlines? Why should it be acceptable to not implement this improvement? Include this in an accelerator improvement time plan.

Controls: The SAC would like an update on the Controls Group operations (Section 2.2).

Partner initiatives: The SAC would like to learn about new developments in partner initiatives (see Section 2.4).

Value engineering: Value engineering has been presented as a way to improve efficiency in future beamline projects; a similar approach could be taken towards beamline operation and support. The current strategy, in particular in terms of specific actions, is not clear to the SAC. Identifying opportunities for leveraging synergies between beamlines could be a good way of involving staff and their expertise. The SAC would like to see a result-oriented strategy towards this (see Section 2.4).

User program: SAC would welcome an update on the status of the PASS user proposal system as well as a report on access to the current user laboratories and plans for additional laboratories (see Section 3.1), at the next report to the SAC about the user program.

Beamlines in commissioning: For future updates on beamlines in commissioning (e.g. Section 4), the SAC would like to know what critical tasks must be completed before full user operations can begin, and what is the anticipated timeline.