U.S. Department of Energy
and the
National Science Foundation

March 30, 2015

Dr. Donald Geesaman
Chair, DOE/NSF Nuclear Science Advisory Committee
Argonne National Laboratory
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Dr. Geesaman:

This letter is to request that the DOE/NSF Nuclear Science Advisory Committee (NSAC) Subcommittee on Neutrinoless Double Beta Decay (NLDBD) provide additional guidance to the DOE and NSF regarding an effective strategy for implementing a possible second generation U.S. experiment on neutrino-less double beta decay capable of reaching the sensitivity necessary to determine whether the neutrino is a Majorana or Dirac particle under the inverted-hierarchy mass scenario.

As you may know, in May 2014 the report of the NSAC Subcommittee provided recommendations for a strategy for NLDBD. The science case was summarized:

"It is the assessment of this Subcommittee that the pursuit of neutrinoless double beta decay addresses urgent scientific questions of the highest importance, and that sufficiently sensitive second generation experiments would have excellent prospects for a major discovery. Furthermore, we recommend that DOE and NSF support this subject at a level appropriate to ensure a leadership position for the US in this next phase of discovery-caliber research."

The Subcommittee was also charged to assess "the status of ongoing and planned first phase NLDBD experiments toward achieving their goals, including major remaining challenges" and to assess "the science-driven down-select criteria for arriving at the most promising approach to a second generation experiment, including a sensitivity goal …." The Subcommittee was also asked to assess the status and expected progress of related theoretical efforts.

The Subcommittee recommended that the "current generation" experiments continue to be supported, and that

"...the collaborations continue to work to resolve remaining R&D issues in preparation for consideration of a future "second generation" experiment. New techniques that offer promise for dramatic reductions in background levels should also be supported."

Consistent with these recommendations, the NSAC Subcommittee on Neutrinoless Double Beta Decay is requested, in the context of ongoing and planned U.S. efforts as well as international competitiveness, to consider the following:

- Assess the status of ongoing R&D for next-generation NLDBD candidate technology demonstrations for a possible future ton-scale NLDBD experiment.
- For each candidate technology demonstration, identify the major remaining R&D tasks needed ONLY to demonstrate down select criteria, including the sensitivity goals, outlined in the NSAC Report of May 2014. R&D needs for candidate technology demonstrations should be sufficiently documented beyond assertion to allow critical examination both by the panel and by future assessments.
- Identify the time durations needed to accomplish these activities and the corresponding estimated resources, as reported by the candidate technology demonstration groups.

We request that the Subcommittee submit its report to the Office of Science and National Science Foundation by November 2015.

We are aware that this charge represents an additional burden on your time. However, the involvement of the research community is essential to inform the Agencies' decisions regarding investments in this potentially transformative scientific endeavor.

Sincerely,

Patricia M. Dehmer
Acting Director
Office of Science

F. Fleming Crim
Assistant Director
Directorate for Mathematical
and Physical Sciences

cc: Professor Andrew Lankford
Chair, DOE/NSF HEPAP