Summary of contribution to the ICANS-X panel discussion

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I have spent the past three years developing neutron nuclear physics research at LANSCE with attention to applied science and fundamental symmetry studies in the energy range from thermal to 10,000 eV. I am, therefore, the only panel member who is not working full time in a neutron scattering program, although I am strongly interested in the subject. Therefore, my perspective on the development of spallation neutron research might be substantially different from the rest of the panel. Also, the views expressed here are personal and are not necessarily those of the Laboratory. My first remarks are related to spallation-source development in general.

First, I assert that the field of neutron-scattering research still is dominated by reactor science although spallation sources have made some inroads. As long as the pulsed sources focus major attention on duplicating the powerful capabilities already in place at reactors, the real potential of the pulsed sources will fail to develop. We must emphasize our advantages of time-of-flight techniques and the very intense epithermal portion of our neutron spectrum. Pulse widths of hundreds of microseconds and cold neutrons should not dominate the planning for future spallation sources unless it becomes impractical to build new reactor sources or it becomes clear that these features put spallation sources substantially ahead of the best reactors.

Turning now to future relationships between spallation sources, I wish to emphasize that each laboratory is unique in important ways and that we all lose by pushing toward some norm rather than taking advantage of our individuality. I will illustrate this by some remarks about the challenge to Los Alamos from other spallation sources and by suggesting a response.

We have heard the reports at this meeting of the excellent reliability records of IPNS and ISIS at 90% and higher, of the significant achievements in proton intensity on target at those facilities, and of an impressive array of spectrometers on line. Where does this leave Los Alamos? At first glance, not very well off. With regard to reliability, even with the PSR operating at 95%, the typical LAMPF condition of 85% leaves a net reliability of about 80%, which is a factor of three worse in unreliability than IPNS. With regard to intensity, even when we meet our 100-microamp specification, we will have no dominating advantage over our competitors.

We also fall short in terms of number and variety of spectrometers. With fewer spectrometers, only moderate intensity advantage, limited annual operating hours, and

most important, inferior reliability, we have to worry that most users who can do their experiments elsewhere will go elsewhere.

The key to the future at Los Alamos is to establish the capability to do experiments that cannot be done anywhere else. This means instruments built for the highest resolution, or for the highest intensity, making the utmost of our low repetition rate and high pulse intensity, and instruments that work in the extremes of the energy range—in particular, the higher energies. Not only would we be able to do experiments that would be nearly impossible elsewhere, we also would be opening up new areas of science. We place ourselves firmly in the avant-garde of neutron scattering and build our image around the innovative and creative. Users will come here in spite of unreliability problems for forefront science that can only be done here.

Fortunately, we are still well positioned to take this direction. The intensity of our neutron pulses, even now, is unmatched, and this advantage will improve substantially. Our target design offers advantages in flexibility and effective moderated neutron intensity. Our spectrometer construction is just beginning, and it is still possible to avoid duplication of instruments elsewhere. Our existing high-intensity powder diffractometer and the Be-filter difference spectrometer already are focused on intensity-limited experiments. We have the world lead in production of polarized beams. We are the only laboratory dealing with high counting rate by measuring neutron-detector current. We have in close proximity experimentalists with long experience in epithermal neutron spectroscopy.

We have strong institutional advantages as well. Our PSR/Line-D complex of Targets 1, 2 and 4 provides solid capabilities simultaneously for neutron scattering, neutron nuclear physics, and defense science. Together, these three make up the most comprehensive neutron-research program anywhere covering almost twelve decades of energy from cold to 800-MeV neutrons. Each of these programs has major growth potential. When the time is right, we have the best in linac and storage-ring technology at Los Alamos to take the next step in neutron intensity for all three programs and also, finally, to eliminate the reliability issue.

Critics will emphasize the risks in the program I advocate, which, I agree, are present. However, duplicating reactor capabilities, following the lead of reactor science, and emphasizing mid-range and general purpose instrumentation that aim at the present average user expose us in an unacceptable competitive position. Prudent risk-taking is the safest route to the future for Los Alamos.

As emphasized earlier, other spallation sources will adopt different positions for sound reasons that are special to their situations. We are probably all better off if the different spallation research programs do not look the same.