

Preface

I. Introduction and Framework

This proposal is for the construction of a third generation synchrotron light source in the Republic of Armenia. The goals of the proposal are to restore and develop scientific capability and health for an area of the world which has either been ravaged through the dissolution of the former Soviet Union with subsequent major losses of scientific support and funding or has historically been lacking in the level of scientific research being conducted. At the present time, no comparable facility exists for probably a distance of 2000 miles from the selected site for the facility. A large pool of talent presently exists in many of the fields of science in which the facility expects to be engaged such as molecular biology, medicine, pharmacology, materials science, chemistry, environmental science, geology, and micro-technology. Unfortunately, the absence of adequate financial and physical resources is resulting in a deteriorating infrastructure which is adversely affecting the educational, economic, scientific, and technological elements of the societies.

With the establishment of the Center for the Advancement of Natural Discoveries using Light Emission (CANDLE), a germinating effort will be made to reverse this condition with the CANDLE light source acting as the seed from which new scientific enterprises may grow and flourish. Considerable care and thought have gone into developing the framework in which the goals might best be accomplished. The following lists some of the principles adopted in formulating the organizational structure.

1. The governing body is to be a private, non-profit foundation with no formal ties to either governments in the U.S. or abroad, including Armenia. This decision was reached in the recognition that control or influence by governments could easily politicize the enterprise and to make it an instrument of national policy.
2. The facility is to be open to all serious scientists with meritorious proposals and programs independent of race, national origin, sex, and religious belief. Objective reviews by teams of scientists and their recommendations will be critical to the selection of the accepted programs.
3. Procedures for the issuance of grants for the construction and operation of the facility are to be based upon a peer review as conducted for similar facilities in the U.S. such as SPEAR3. Initial funding for CANDLE has consisted in supporting the development of a Technical Design Analysis, an extensive document which constitutes a major portion of this present proposal. Teams of reviewers selected and recommended by the National Science Foundation to the U.S. State Department will consider the merits of this proposal. Upon an assessment that the reviewers' recommendations are favorable, the project would be expected to move on to a construction phase.
4. The procedure for management of appropriated and awarded funds by the State Department must contain proper monitoring and auditing to ensure that the usage of funds is consistent with the stipulated program in the Technical Design Analysis.

The Director of the CANDLE project, Professor Alexander Abashian, Professor Emeritus at Virginia Tech, is the Principal Investigator for the prior grant made to his University. The major portion of that grant contained a sub-contract to the CANDLE Foundation, whose President is Mr. Jirair Hovnanian, a noted and successful homebuilder in the U.S. The CANDLE Foundation, in turn, established a CANDLE, Armenia subsidiary responsible for the actual conduct of the work in Armenia.

The CANDLE Foundation has the responsibility of complying with the terms of the sub-contract to the satisfaction of the Principal Investigator and to his University who, in turn, are responsible to the State Department for the satisfying terms of the grant award. Through this procedure, the U.S. State Department deals with recognized and legal institutions within the U.S. which contract with a recognized entity with a legal presence in Armenia to perform the work.

The above described mechanism has worked smoothly and well since the inception of the award and is being proposed for the administration and management of the CANDLE project during its pre-construction and construction phases as well. Since a major portion of the funding for the project is expected to come from U.S. sources, public and private, and the project is to be directed by a U.S. scientist, it is entirely appropriate that U.S. institutions assume these technical and financial responsibilities. By doing so, we will be able to ensure that proper and responsible management of those funds together with strict accounting procedures will be employed.

II. Proposal Structure

As previously noted, there are special and particular issues dealing with the rationale for the facility as well as technical and scientific considerations which deserve attention in the proposal. Questions such as the following come to mind:

- Why is Armenia selected for a facility to be used on an international basis?
- What is the technical ability of scientists in Armenia to build a sophisticated and quality device?
- What is the demand for this facility by scientists in the area?
- In what ways will construction of the facility benefit the area?
- Of what benefit is the facility to the U.S.?
- How will the completed facility be operated and supported?

Without adhering to the order of the above listing, we wish to present a brief perspective in which the proposal might be viewed and which is detailed in the proposal.

The world is experiencing a situation where developments occurring in one part of the world are seriously affecting distant nations in many important ways. Developed countries are becoming increasingly aware of the need to help address the problems of nations in distress. A notable example of such problems is that of the republics of the former Soviet Union which are undergoing transitions to free and open democracies from a centralized and dictatorial political structure. These transitions have frequently resulted in a breakdown of the general economy but have been especially damaging to enterprises which rely upon state funding for much of their support, such as basic research. The almost complete abandonment of such support by governments has resulted in a huge loss

in income for professionals, operating funds to conduct the research, and funds to maintain facilities. Consequences of this lack of fiscal support include migrations to the West, wastage of scientific talent into jobs of subsistence, lowering of educational and economic activity over the entire population, and a deterioration of physical plant.

The situation is analogous to the situation which occurred throughout much of Europe at the conclusion of the devastating Second World War. America's answer to these problems was the Marshall Plan, an effort to rebuild the infrastructure of those nations in an attempt to make them economically strong and less likely to be receptive to future authoritarian regimes. This plan was spectacularly successful and led to a Europe which today consists of a set of thriving and stable democracies. Adoption of a similar plan to the Marshall Plan for the republics of the former Soviet Union makes equally good sense and is likely to have similar benefits.

The CANDLE project contains desirable features which can help to address the problems facing those countries in the scientific, educational, and technical areas of the society in a very cost effective manner. The facility, expected to cost somewhat less than \$50 million dollars, can address a major part of the research problems for thousands of scientists in many different specialties for many of the nations in the area centered upon Armenia. Spinoffs in education, technology and the overall economy are also indicated.

Armenia, itself, is a country which has historically always placed a great deal of emphasis upon education, particularly in the areas of science and engineering. As discussed further in this proposal, its technological importance during the time of the Soviet Union far outstripped its population percentages. Its scientific pool of talent is well matched to the expected potential capabilities of the facility. In the past, the Yervan Physics Institute constructed and operated ARUS, a 6 Gev electron synchrotron and in the process developed experts in the area of accelerator operation and design. Although that facility is no longer current, younger scientists have maintained their interests in electron machines by working at foreign laboratories such as DESY in Germany and the Thomas Jefferson Laboratory in the U.S. A measure of their expertise is that the Technical Design Analysis of this Proposal has been entirely prepared by Armenian machine builders and scientists. The reader will find many unique and innovative features incorporated in the CANDLE design.

The Republic of Armenia is also particularly well suited to house an international facility, having many of the desirable attributes which Switzerland has in hosting the CERN facility. Armenia is a longtime Christian nation whose inclinations, ethics, and standards resemble those of the West. With a very large Diaspora population residing in the West, close ties with those societies have been maintained. Armenia is a neutral country with a highly educated population with a talent for mathematics, science, and technology and a large work force (underemployed) in those areas. In the most recent listings of levels of freedom in various countries, Armenia was listed in the mostly free category, close to the rating for France. Visiting scientists from abroad would experience little difficulty in adjusting to the Armenian culture.

Because so many diverse issues need to be addressed, we have chosen to issue the proposal in two parts, the first of which is a Technical Design Analysis. This part is essentially a Design Report for CANDLE and addresses design of the various components including

injector, booster and storage ring, civil construction, costs, schedules, beam lines, scientific proposals and users. The second part deals with broader peripheral questions and include sections on the following:

Scientific Case
Educational Case
Economic Case

We hope the reader will be able to refer to the two volumes for detailed information. We believe that by doing so, the reader will be able to become better informed not only of the technical features of the facility but also to attain a broader perspective of the need and expected benefits. We hope the reader will gain the confidence that the proposal has been very well considered, that the facility can meet the goals outlined, and that the talent and expertise exists to successfully bring this important and competitive synchrotron light source into reality.

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