NSO/Tucson
950 N. Cherry Avenue
P.O. Box 26732
Tucson, AZ 85726-6732
Ph. (520) 318-8294; Fax (520) 318-8278
Email: *nso@noao.edu*

NSO/Sunspot
P.O. Box 62
Sunspot, NM 88349-0062
Ph. (505) 434-7000
Fax (505) 434-7029 or 7079
Email: *nso@sunspot.noao.edu*

September 7, 2010

TO: Legislative Federal Economic Stimulus Program Oversight Commission

SUBJECT: The Advanced Technology Solar Telescope Project

Broad Outline of Project

Science Goals

The Advanced Technology Solar Telescope—ATST—will be the forefront instrument for studying the Sun's magnetic field. The Sun sustains life on Earth and impacts human endeavors in space through variations in its radiative, magnetic and particle output as caused by magnetic activity. The solar atmosphere is controlled by magnetic fields – yet most of the field has remained invisible to observation and is truly the dark energy problem of solar physics. The ATST is the first major instrument designed by the astronomical community in all of its aspects as a tool for magnetic remote sensing. Its collecting area, spatial resolution, wavelength performance and integral focal plane instrumentation are all targeted for understanding how magnetic fields affect the physical properties of the Sun.

The ATST addresses the basic questions: What is the nature of solar magnetism; how does that magnetism control our star; and how can we model and predict its changing outputs that affect the Earth? Models of magnetoconvection predict that the Sun's magnetic fields coalesce and dissipate at spatial scales of a few tens of kilometers, well beyond the reach of current telescopes in space or on the ground. These elementary magnetic building blocks, or magnetic fibrils, are strongly linked to the Sun's properties as a variable magnetic star. The unambiguous measurement of magnetic fibril characteristics and the buffeting of these fibrils by turbulence, the coalescence of fields into strong concentrations such as pores and sunspots, their role in transporting and dissipating energy, the resulting solar activity, and the validation or rejection of models for these processes are major goals of the ATST.

Project Overview

The ATST project officially began in 2001 when the National Science Foundation funded a proposal to design the ATST and to search for a site. This effort resulted in a proposal to

NSF in 2004 to enter into a construction phase. The construction phase was approved in late 2009 and funding to begin the construction phase was received in 2010.

The site survey started with 72 sites that were investigated with respect to their site characteristics and weather conditions. From these six sites were chosen for extensive site testing. Weather, atmospheric turbulence (that distorts solar images), and sky clarity (needed to image the outer layers of the solar atmosphere) were monitored with an array of instruments for a period of 1-2 years. Three sites stood out and additional monitoring was performed at these sites for another 2 years. Haleakala on Maui was the only site meeting all the ATST scientific requirements.

NSO and its partners presented a Final Design and Management Plan to an NSF review panel in May of 2009. The panel recommended to NSF that the project was ready to proceed into construction and the overall cost was capped by the National Science Board at $298M in August of 2009.

The ATST consists of several major components that include:

1. Support Building and Equipment
2. Telescope Enclosure
3. Telescope Assembly
4. Wavefront Correction System
5. Instrument Systems
6. High level controls/software
7. Environmental and Cultural Mediation

The project is in the process of letting contracts for many of the subsystems. To date, these have included the primary mirror fabrication and the enclosure assembly, and requests for proposals have been released for the Telescope Mount Assembly, primary mirror polishing and the primary mirror support cell. Construction of the support buildings on Maui awaits approval of the Conservation District Use Permit (CDUP) from the Department of Land and Natural Resources. The project has hired two persons on Maui, leased office space and will be adding a two more persons shortly. We are in the process of finding a cultural monitor and biologist for the construction process on Haleakala.

ARRA spending and jobs in Hawai'i

ARRA funds account for $146 million of the total $298 million allocated to the ATST project. These funds have helped the project retain approximately 18 employees and to add 12 more to help with construction. ARRA funding will be used in Hawaii to complete site preparation, construction of the support and utility buildings and equipment, instrumentation, cultural and environmental mitigation and many other miscellaneous activities such as travel to the island by our engineering staff. The University of Hawaii submitted the Conservation District Use Application in June of 2010 and assuming no litigation, a permit could be issued in December of 2010 and construction would begin shortly after on Haleakala. The project is negotiating a project labor agreement which ensures the use of local Hawaiian labor for site preparation and constructing the support and utilities building. We would also plan to engage Hawaiian companies as we reach the stage

of purchasing supplies, optics, camera systems and many other items. Major Components of ARRA spending include:

- Team payroll
- Project Management
- Environmental/Cultural Mitigations
- Telescope Mount Assembly
- M1 Mirror and Assembly
- Wavefront Correction
- Instrumentation
- Site Prep
- Support Facility
- Utility Building

Estimated Hawaiian ARRA Expenditures

- Local Employees to date (4.3fte) - $2.5M
- Project Management - $.62M
- Environmental/Cultural Mitigations - $5.5M
- Instrumentation - $4.65M
- Site Work - $3.35M
- Support Building - $13.70M
- Utility Building - $1.66M
- Miscellaneous Expenditures (travel, equipment, etc.) - $6M

Of course, in addition to the expenditure of ARRA funds, the project will also spend NSO base funds and Major Research Equipment and Facilities Construction (MREFC) funds in Hawaii to complete the construction and operate the facility for the next 50 years.

Sincerely yours,

Stephen L. Keil, Director
National Solar Observatory
Sunspot, NM 88349
505 434-7039
skeil@nso.edu