

Office of the President

TO MEMBERS OF THE COMMITTEE ON FINANCE:

ACTION ITEM – CONSENT

For Meeting of March 19, 2014

**APPROVAL OF PARTICIPATION IN THE THIRTY-METER TELESCOPE
CONSTRUCTION AND OPERATION**

EXECUTIVE SUMMARY

At the January 2014 meeting, the Regents were updated on the status of the preconstruction activities and proposed construction of the Thirty-Meter Telescope (TMT) in partnership with Caltech, Canada, Japan, China, and India. The actions requested of the Regents at this meeting are:

- Approval for UC participation in and commitment of resources to the formation and operation of a non-profit limited liability company, the TMT International Observatory LLC, which shall construct, own and operate TMT.
- Authorization for the President to execute documents and administer the University's participation in the TMT International Observatory LLC.

RECOMMENDATION

The President of the University recommends that the Committee on Finance recommend that the Regents:

- A. Approve the University's participation in the formation and operation of TMT International Observatory LLC, a non-profit limited liability company (Entity) that shall construct, own and operate the Thirty-Meter Telescope Observatory (Project), subject to the following terms and conditions:
 - (1) The Entity will be jointly owned by the University, the California Institute of Technology and ministries, departments or agencies of the governments of China, India and Japan, and such other scientific organizations as may be admitted under the Entity's organizational documents.
 - (2) The Entity shall be governed by a Board of Governors (Board) and the University shall be entitled to appoint three (3) Governors. The Governors

shall receive no compensation from the Entity other than reimbursement of reasonable expenses.

- B. Approve the commitment and contribution of funds and resources on behalf of the University toward construction of the Project in an amount not to exceed \$175 million.
- C. Approve the commitment and contribution of University funds and resources toward the ongoing operation of the Project.
- D. Authorize the President of the University to oversee the University's participation in the Project and Entity, including (a) the initial determination of whether to vote affirmatively in favor of the Decision to Proceed with construction, or to withdraw from the Project; (b) approval and execution of documents reasonably required to accomplish the foregoing; (c) approval of modifications, addenda, or amendments thereto and; (d) to make University appointments to the Board of the Entity. This authority may not be redelegated.

BACKGROUND

In spring 2003, the Regents approved the University's partnership with the California Institute of Technology to design and build the California Extremely Large Telescope (CELT) through a non-profit corporation now known as TMT Observatory Corporation (TMT Corporation). The Regents authorized the development of a preliminary design for a segmented 30-meter-diameter astronomical telescope "that is patterned after the twin Keck telescopes. (UC and Caltech have been responsible for the creation and operation of the W.M. Keck Observatory in Hawaii.)" The Regents' approval stated that "the mission may be broadened to include not only the preliminary design phase, but also a final design, construction, and commissioning and operation of the observatory."

Since 2003, work has greatly progressed on the design of the telescope, instruments and all aspects of the Observatory. The project has been renamed the Thirty Meter Telescope (TMT) and additional partners have joined the consortium. The current contributors to the TMT partnership are UC, Caltech and:

- Association of Canadian Universities for Research in Astronomy as the Scientific Authority and the Government of Canada, acting by and through the National Research Council of Canada as the Financial Authority (collectively "Canada")
- Japanese astronomy institutions, acting by and through the National Astronomical Observatory of Japan as the Scientific Authority and the National Institutes of Natural Sciences as the Financial Authority (collectively "Japan")
- People's Republic of China, acting by and through the National Astronomical Observatories of Chinese Academy of Sciences as the Scientific Authority on behalf of the Chinese Academy of Sciences, and the Ministry of Science and Technology as the Financial Authority (collectively "China")

- Republic of India, acting by and through the Department of Science and Technology in the dual capacity as the Scientific and Financial Authority (collectively “India”)

UC has played a leadership role since the beginning of the TMT project, in collaboration with Caltech. Chancellor Yang has been Chairman of the TMT Corporation Board (which is made up of six members, three each from UC and Caltech) and the TMT Collaborative Board with three members from each of the TMT partners since 2008. Dr. Edward Stone of Caltech has been the Vice Chair of these two Boards. The Project Scientist since the beginning of the project has been Dr. Jerry Nelson of UCSC. Dr. Nelson is the originator of the segmented-mirror technology that made the Keck Observatory such a great success and which is the scientific basis of the TMT design.

On July 21, 2009, the TMT Collaborative Board, after a multiyear evaluation of different sites and intensive visits and negotiations with the various stakeholders in Hawaii, jointly led by TMT Chair Chancellor Yang and Caltech President Jean-Lou Chameau, selected Mauna Kea on Hawaii Island as the location for the telescope. In February 2011, the University of Hawaii, as a proxy for the consortium, applied for and was granted a Conservation District Use Permit to build and operate the TMT on Mauna Kea. The permit was granted by the Board of Land and Natural Resources of Hawaii’s Department of Land and Natural Resources. On February 20, 2014, the Board of Regents for the University of Hawaii approved the terms of a sublease to the Entity for the Project site.

In addition to the very large technical effort on observatory design, there have been concerted efforts in many other areas over the past five years. These include the completion the Environmental Impact Statement, the engagement of the Hawaiian community to support the TMT, and many other associated activities that led to the issuance of a Conservation District Use Permit. The recruitment of the international partners, Japan, China and India required many trips to these countries and strategic discussions with audiences ranging from the scientific communities up to the highest levels of government. A Cooperative Agreement with the U.S. National Science Foundation (NSF) was also granted in 2013, and much effort was required to engage the NSF. These activities have been led for the most part by the UC and Caltech TMT Board members with Board Chair Chancellor Yang playing a key role.

On July 25, 2013, the TMT partners signed a Master Agreement which brings together the TMT partners for the purpose of developing, designing, financing, constructing, commissioning, operating, and decommissioning a next-generation, 30-meter-class astronomical observatory. The Master Agreement establishes a formal agreement among the international parties defining the project goals, establishing a governance structure and defining member party rights, obligations and benefits and a multi-step process for securing support and funding for the Project. The first step entailed execution of the Master Agreement by the parties’ scientific authorities in the summer of 2013. President Mark Yudof signed the Master Agreement on behalf the University of California.

The next step will be for the financial authorities of each of the partners to sign the document plan in the spring of 2014. It is anticipated that President Napolitano will sign for the University of California in the coming months.

Following execution of the Master Agreement by the partners' financial authorities, the project will be reviewed for readiness. The partners will then vote on an initial "Decision to Proceed," with the partnership and site preparations in 2014, and a subsequent "Decision to Proceed" with the full construction program anticipated in spring 2015. Upon an affirmative vote, each of the partners will then be bound to deliver their contributions to the construction and operation of the observatory.

Construction of TMT is slated to begin in 2014, with completion of the TMT enclosure and structure expected in 2020. Based on the current schedule, scientific operations are to be initiated in 2022.

UC-CALTECH CONSTRUCTION FUNDING

Funding for the project during the preliminary design and preconstruction phase has come primarily from a \$250 million pledge from the Gordon and Betty Moore Foundation and shared equally by UC and Caltech. Intel cofounder Gordon Moore and his wife, Betty, established the foundation to support bold ideas that create enduring impact in the areas of science, environmental conservation, and patient care. They believe that TMT is a transformative scientific tool. Another \$100 million in matching funds to the Moore gift is being jointly raised by UC and Caltech; UC's \$50-million share is being raised by campus leaders through philanthropic support, building on relationships between the University and generous donors. A fund-raising plan developed by Chancellor Yang in his capacity as Chairman of the TMT Collaborative Board since 2007 has been submitted to and approved by the Gordon and Betty Moore Foundation.

ORGANIZATIONAL STRUCTURE

The TMT partners have established a structure for executing the Project as reflected in the Master Agreement. The Project will be constructed, owned and operated by the Entity which will be organized as a Delaware limited liability company. The Entity will be governed by a Board comprised of three members from each of the equity participants plus additional participation on a non-voting basis from the Gordon and Betty Moore Foundation, the University of Hawaii, and other stakeholders approved by the Board. The organizational structure has been designed to limit the financial risk and exposure to its members. Upon completion of construction and commissioning at first-light, each of the members will be obligated to contribute to the ongoing operations of the Project, including amounts to be reserved for decommissioning, but only in proportion to the members' respective ownership shares. The operating budget for the Project must be approved unanimously by the Board.

ESTIMATED COSTS OF CONSTRUCTION

The current cost estimate for the construction phase is \$1.21 billion (with a 2012 U.S. dollar base year.) With inflation, if the project is started in April 2014 and concludes as planned in late 2022, the inflated cost in then-year U.S. dollars is \$1.49 billion. UC's ownership share is expected to be 12.3 percent of the total. The estimated construction schedule is eight years, and with a 2014 start, the facilities will be in full operation in 2022.

ESTIMATED COSTS OF OPERATION

UC will be responsible for 12.3 percent (its ownership share) of the total operating costs of TMT estimated at \$39M/year (in FY2012\$). The operational monies will become available with the scheduled reduction of the UC portion of the W.M. Keck Observatory operating costs. As of March 31, 2018, UC will have put in, through annual operation costs, the equivalent of the original Keck gift to Caltech that funded construction of the observatory. The agreement between UC and Caltech for management and operation of the Keck Observatory stipulates that starting April 1, 2018, Caltech will be responsible for sharing half of the Keck operation costs, and the UC obligation will be reduced by that amount. For no additional operating funding, UC will retain its current access to the Keck Observatory and gain access to the TMT. The UC TMT operations expenditures will not require any increase in funding for UC astronomy facilities.

IMPORTANCE OF THE TMT PARTNERSHIP TO THE UNIVERSITY

UC has been a world leader in astronomy and astrophysics research for more than 125 years. The Lick (1888) and Keck (1993) observatories have created opportunities for research and partnerships in the fields of astronomy and astrophysics research. There are vibrant and growing astronomy and astrophysics programs on eight of the UC campuses.

The TMT partnership and location of the telescope in Hawaii will not only provide UC scientists, researchers, and students access to the world's most powerful telescope for unrivaled opportunities for new discoveries, but will also create an outstanding platform to develop international collaborations with the University's largest Pacific Rim partners.