



National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

NSF 14-102

Dear Colleague Letter: US-China Collaborative Research in Environmental Sustainability

Dear Colleagues:

The NSF Engineering Directorate (ENG) and the National Natural Science Foundation of China (NSFC) Department of Engineering and Material Sciences (DEMS) are partnering to encourage joint research by U.S. - China teams collaborating on fundamental research that addresses critical environmental sustainability challenges.

The U.S. and China have the two largest economies on Earth and also have important engineering, technology, business and trade relationships with each other. Both nations face significant environmental sustainability challenges, for example in water and energy, urban sustainability, and manufacturing. Fundamental research is needed to provide the foundational knowledge for addressing these challenges.

This call is for research proposals from joint U.S. - China teams in two environmental sustainability topic areas:

- Topic 1. Combustion Related to Sustainable Energy
- Topic 2. Sustainable Manufacturing

Every proposal must include the participation of researchers from at least one U.S. institution and at least one China institution. Proposals that do not comply with this requirement will be returned without review. Each U.S. - China team is to submit the same proposal, in English, to each of NSF and NSFC. NSF will fund the U.S. researchers of winning teams (up to a total of \$500K for 4 years for each winning proposal), while NSFC will fund the China researchers of winning teams (up to a total of 3 million yuan for 4 years for each winning proposal). In total, no more than 3 joint NSF-NSFC project grants are expected to be funded. A critical evaluation factor for such a proposal will be the extent to which the proposal articulates a compelling rationale for why the proposed research project is significantly better than a comparable research project that could be pursued by a U.S. team working without such a collaboration. Another evaluation factor will concern the quality of collaboration and leveraging by the joint team compared to the U.S. and China researchers working separately. This rationale is to be presented in the Project Description section of the proposal. Each proposal must include a management plan that clearly specifies the role of team researchers from both the U.S. and China, and the mechanisms through which close collaboration will be assured. The management plan is not to exceed 3 pages and is to be included in the supplementary document file of the electronic submission.

Cyberinfrastructure proposals are outside the scope of this call.

Topic 1. Combustion Related to Sustainable Energy

In both the U.S. and China, over 80 percent of energy usage is derived through combustion. Combustion

processes provide the energy for electricity generation (e.g., from coal and natural gas), transportation (e.g., internal combustion engines in cars and trucks), building space and hot water heating, and industrial processes. Combustion results not only in useful energy conversion, but also pollution. One example of pollution from combustion is soot, in particular particulates of size 2.5 microns or smaller that cause smog that not only obscures vision, but also can result in respiratory distress and serious health problems. Combustion also generates greenhouse gases (e.g., CO₂) that drive global warming and climate change. Fundamental research is needed to decrease the adverse environmental impacts of combustion processes.

Examples of fundamental research needs in the area of Topic 1 include but are not limited to:

- Increased knowledge of fundamental mechanisms related to combustion carbon (CO₂) capture technologies, such as oxy-fuel combustion processes and chemical looping
- increased knowledge of fundamental mechanisms for gasification (coal, biomass, coal/biomass mixtures)
- Increased understanding of fundamental combustion reaction mechanisms for pollutant emissions (e.g., particulates, NO_x), with efforts focused on reduction of such emissions from combustion systems (e.g., coal, internal combustion engines)
- Increasing combustion efficiency is outside the scope of this call for proposals. Also, separation proposals related to combustion (e.g., for gases, such as CO₂ and O₂, and for removal of particulates by such separation processes as filtration) are not within the scope of this call. For U.S. researchers, such separations proposals should be redirected to the Chemical and Biological Separations program (CBS) of the CBET Division of NSF.

Topic 2. Sustainable Manufacturing

Manufacturing is vital for the economies of both the U.S. and China. At the same time, manufacturing operations consume huge quantities of resources (materials, water, energy) and result in pollution of air, water, and land. For example, in the U.S. the industrial sector is the origin of one fifth of the nation's annual greenhouse gas emissions (EPA, <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>), while in China the ratio is over one half ("The second national communication on climate change of the People's Republic of China," China National Development and Reform Commission, November 2012, http://unfccc.int/essential_background/library/items/3599.php?rec=j&preref=7666#beg).

Fundamental research is needed to provide a sound scientific and engineering basis for reducing emissions and improving efficiencies of resource consumption. Ultimately, means for efficient recycle, reuse, remanufacture, and closed-loop production processes will be required.

Examples of fundamental research needs for Topic 2 include but are not limited to:

- Systems-based approaches incorporating multidisciplinary frameworks (engineering, environmental, economic, social) for the creation of solutions for complex sustainable manufacturing challenges
- Development of theoretical foundations for efficiency improvement approaches that span both mechanical and chemical manufacturing operations
- Basic research on digital manufacturing approaches for advancing sustainable manufacturing

PROPOSAL SUBMISSION

US-based researchers, through their U.S. institutions, may submit unsolicited proposals to collaborate with China-based researchers on either of the two topics listed and described above to the CBET/ENG Environmental Sustainability (7643) program during the window October 1 - November 5, 2014. The

window closes at 5:00 pm submitter's local time on November 5, 2014. More information on the CBET/ENG Environmental Sustainability program and submittal procedures is posted at: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501027&org=CBET&from=home.

Each U.S.- China team is responsible for ensuring that their counterpart submits a matching proposal by the required deadline. Each submitted proposal must include a letter from the collaborator. For NSF proposals, the collaborator letter is to be included in the supplementary documents file of the electronic submission.

REVIEW AND AWARD PROCESS

The review and award process will follow NSF and NSFC guidelines specified in their respective policy documents. NSF and NSFC will conduct separate reviews of eligible submitted proposals in accordance with their review policies and regulations. NSF and NSFC will exchange their review results (with reviewer names redacted) and reach consensus, through discussion, on which projects are high enough priority to both sides to warrant joint funding. NSF and NSFC will make awards to the U.S. and Chinese institutions respectively.

Questions concerning this opportunity may be emailed to the CBET Environmental Sustainability program director, Bruce Hamilton (bhamilto@nsf.gov) or the CBET Combustion program director, Ruy-Hung Chen (ruchen@nsf.gov).

Sincerely,

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Assistant Director for Engineering