PEER Request for Proposal (RFP): Solicitation TSRP-PEER 22-01

Introduction

The Pacific Earthquake Engineering Research (PEER) is a multi-campus center that has continuing funding from the State of California related to the seismic performance of transportation and related systems. This funding supports the Transportation Systems Research Program (TSRP), the purpose of which is to lessen the impacts of earthquakes and other natural hazards on the transportation systems of California, including highways and bridges, port facilities, high-speed rail, airports, and other related systems.

Funding from the TSRP supports transportation-related research that uses and extends PEER's performance-based engineering (PBE) methodologies, and integrates fundamental knowledge, enabling technologies, and systems. The program also aims to integrate seismological, geotechnical, structural, hydrodynamic, and socio-economical aspects of earthquake engineering, and involve theoretical, computational, experimental, and field investigations. The program encourages vigorous interactions between practitioners and researchers.

The PEER TSRP is coordinated by PEER Research Committee (PEER-RC). Proposals will be reviewed by external reviewers, who will be determined by this committee, among experts who have not submitted proposals to this solicitation.

Requested Proposals

The PEER-RC is soliciting proposals for one-year projects related to the performance of transportation and related systems exposed to seismic, tsunami and other natural hazards. The proposed projects should be aligned with the current TSRP research priorities (Appendix A) and vision (http://peer.berkeley.edu/transportation). The topics in Appendix A include a subset of the topics of previous years' RFPs that best (a) fill the gaps in funded research, (b) provide the largest impact/visibility, and (c) align with PEER's strategic plan and vision.

Regardless of the technical area, all proposals must meet the following requirements:

1. Be led by investigators from the PEER core institutions[1]. *PEER Business and Industry Partners (BIPs)* interested in this solicitation are strongly encouraged to collaborate with the researchers at PEER's core institutions and submit a joint proposal.
2. Each investigator is limited to be the PI or co-PI on **one** proposal only.
3. Contribute substantially to the PBE of transportation systems.
4. Enable substantial progress for a reasonable investment (e.g., based on previous research or matching opportunities).
5. Have significant broader impacts and potential to be expanded as bigger projects.

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[1]PEER combines resources of major research universities in Western USA (UC Berkeley, CALTECH, OSU, Stanford, UC Davis, UCI, UCLA, UCSD, UNR, USC, and UW) where earthquake hazards are largest.

Investigators must commit to:
1. Working as part of the overall TSRP team, sharing information, data, models, outcomes, and ideas needed for other projects;
2. Attending at least two meetings per each year of funding: the PEER Annual Meeting (usually held in January) and the PEER Researchers' Workshop (usually held in summer);
3. Submitting a research highlight at the beginning of the project for distribution to the PEER community; and
4. Writing a PEER report at the end of the project, documenting the project contributions.

Where possible, the projects should:
1. Leverage the investments of other programs within or outside of PEER,
2. Engage the practitioner community,
3. Use OpenSees as the primary computational platform, and if applicable, contribute (or improve) and document new elements, material models or numerical solution strategies and share any developed analytical models with the PEER community,
4. Incorporate NHERI SimCenter computational tools as appropriate in the proposed research. Details of SimCenter computational tools can be found at https://simcenter.designsafe-ci.org/research-tools/overview/, these include many tools, e.g. uncertainty quantification with OpenSEES and other finite element codes, computational wind tools, PBE tools, and a large 1.8M building regional seismic risk workflow example that can be leveraged for multiple purposes. All SimCenter software is open source and thus ideally suited for research use and modification. Tools are designed to run locally as well as on DesignSafe/TACC[2], and
5. If experimental in nature, use the PEER core institution testing facilities and organize blind prediction contests from the test outcomes, if possible, with additional in-kind support from the PEER headquarters staff and researchers.

Proposals will be evaluated based on the primary criteria of technical merit and broader impact. Further, proposals that collaborate with other PEER projects, proposals with matching funding, proposals with innovative research ideas, proposals that explicitly aim at data/model sharing (not only results) upon project completion, proposals from early career PIs (assistant or associate professors), and proposals with PIs who have not received TSRP funding in the past four years will be viewed favorably. In addition to the above considerations, projects will be selected to result in a diversity of specializations that promote innovative research.

Proposals are expected to have an annual budget **not to exceed $100,000**. The review process for the proposals will involve external reviewers selected by the PEER-RC. It is expected that two (2) projects of about $100k each and four (4) projects of about $75k each will be funded. All proposed research projects will be subject to final approval by the PEER Director.

A list of the current and past TSRP projects is posted on the PEER website at:
https://peer.berkeley.edu/research/transportation-systems/projects.

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[2]Texas Advanced Computing Center

Proposal Submission Instructions

Format

Submit proposals online at https://peer.berkeley.edu/research/transportation-systems/request-proposals. Proposals should be submitted using the form found in the above site. Uploaded attachment may be a Word document or PDF (.doc or .docx or .pdf) and shall include the following:

- maximum of three (3) pages of project description,
- a two-page biographical sketch of the PI(s),
- a one-page summary of results & impact from past PEER projects (applicable only for PIs with completed or continuing PEER projects from PEER TSRP or PEER-Bridge funding), and
- a one-page draft budget.

Filename of the attachment should follow the format:
> "<Topic>_<Last name>_RFP2022_<optional title less than 50 characters>"

For example,
> "Topic3_Mosalam_RFP2022_Resilient bridge column testing hybrid simulation.pdf" or
> "Topic1_Buckle_RFP2022.docx"

Budget

All proposed work should be completed within a period less than or equal to one year. Budgets should be limited to:

1. one month of summer support (or its equivalent) for the PI,
2. one graduate student researcher,
3. experimental expenses,
4. computing expenses,
5. travel to two PEER coordination meetings (including the PEER annual meeting),
6. project-related supplies, and
7. other reasonable expenses, as approved by the PEER-RC.

It is expected that proposing institutions will waive indirect costs, as is the practice for University of California institutions. Final budgets with campus Sponsored Project Office (SPO) approval can be prepared after the initial selection of successful proposals, and any negotiated agreement on scope and budget.

To meet the needs of the TSRP program, PEER-RC may approach proposers to negotiate possible revisions to the scope and budget to better fit the program goals.

Important Dates

The **key dates** for responding to Solicitation PEER 22-01 are:

31 January 2023: submitting questions to peer_center@berkeley.edu
28 February 2023: proposal submission deadline
31 March 2023: completion of the review process of all proposals
01 August 2023: project start date

Appendix A: Research Topics for this Solicitation

Proposals are solicited for research on the topics listed in this appendix. Depending on the submissions, projects may not be awarded in all areas, and it is possible that multiple projects may be selected in some of the areas.

Topic 1. *Effective mitigation methods of soil liquefaction*: This includes developing new methods, tools, and technology that improves liquefaction resistance in consistent and cost-effective ways. Innovative ideas on how to reduce the effects of liquefaction on structures are encouraged.

Topic 2. *Forward uncertainty quantification*: This includes record-to-record variability, parameter uncertainty, modeling uncertainty, and material uncertainty with investigation of these uncertainties on important bridges, port facilities, airports, and transportation systems. Other related topics are lifecycle cost analysis, and Bayesian calibration for parameter identification.

Topic 3. *Cost effective instrumentation and data collection*: This includes sensor development and field testing of bridges and other structures, development of testbeds for validating PBE approaches, collecting data, and developing effective models and algorithms for artificial intelligence (AI) methods. This can also make use of technologies such as non-contact measurement methods, laser scanning, laser-based sensors, mobile sensing systems, drones, etc. This can also include visualization, data mining, and AI tools needed to facilitate checking and generation of input data and evaluation of output data, including uncertainty quantification.

Topic 4. *PBE evaluation of ports, high-speed rails, and airports*: This includes evaluating severity of damage and its consequence caused by earthquakes, tsunami, and other natural hazards and to incorporate Early Warning Systems (EWS) to maintain functionality of these systems.

Topic 5. *Social vulnerability and disparities in seismic risk and impacts*: This includes the development or utilization of PBE tools and methods to improve equity of post-disaster mobility/transportation systems. Studies on community-driven sensing, AI fairness and cross-validation of post-disaster sensing and data analysis are encouraged.

Topic 6. *Going beyond earthquakes*: This includes learning from past development of PBEE in the face of earthquakes, proposals are solicited in extending the PBEE methodologies to other natural hazards including multi-hazards applied to transportation systems.