Quantum Leap Challenge Institutes (QLCI)

QLCI Management Team

National Science Foundation

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NSF 19-559: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505634

Please submit questions to: QLCI@nsf.gov

What is the Quantum Leap initiative?

Quantum Leap: One of the NSF Research Big Ideas

Discovery and exploitation of quantum science and engineering to realize dramatic advances in devices, systems, and in science and engineering itself.

- Exploiting quantum mechanics to observe, manipulate, and control the behavior of particles at atomic and subatomic scales;
- Enabling breakthrough discoveries in both naturally-occurring and in engineered quantum systems; and
- Developing next-generation quantum technologies and devices for sensing, information processing, communications, and computing.

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What are Quantum Leap Challenge Institutes (QLCI) ?

- The QLCI program will support **large-scale projects** driven by a ***cross-disciplinary challenge research theme*** for advancing the frontiers of quantum information science and engineering.
- Timely and bold research agenda aimed at making breakthroughs on compelling challenges in a 5-year period.
- Conceptualize, develop, and implement **revolutionary** new approaches and technologies for quantum information processing.
- Research will span the focus areas of **quantum computation**, **quantum communication**, **quantum simulation, or quantum sensing.**
- Part of **the NSF-wide Quantum Leap** effort and will be **managed by program directors across multiple divisions and directorates.**

Related documents:

- ***National Strategic Overview for Quantum Information Science***, National Science and Technology Council, September 2018
- ***National Quantum Initiative*** **Act**, H.R. 6227, December 21, 2018

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Types of Awards and Important Deadlines

- The QLCI program will support two types of awards:
  - **Conceptualization Grants (CGs)** funded at a level of $100,000-$150,000 for 12 months
  - **Challenge Institute (CI) awards** funded at a level of up to $5,000,000/year for 5 years
- **Two rounds** of competition:
  - ROUND I (2019-2020): **CG or CI proposals** *but not both*
  - ROUND II (2020-2021): **CI proposals only**
  - **CG awardees will have the opportunity to submit a CI proposal in Round II**

ROUND I Deadlines (CG or CI but not both)

Conceptualization Grant (CG) Proposals	Due Date
Letters of Intent for CG proposals	1-Apr-19
CG proposals	3-Jun-19

Challenge Institute (CI) Proposals	Due Date
Letters of Intent for CI preliminary proposals	3-Jun-19
CI preliminary proposals due	1-Aug-19
CI full proposals (by invitation)	2-Jan-20

ROUND II Deadlines (CI only)

Challenge Institute (CI) Proposals	Due Date
Letters of Intent for CI preliminary proposals	3-Aug-20
CI preliminary proposals	1-Sep-20
CI full proposals (by invitation)	1-Feb-21

Who can submit proposals?

- **Eligible Institutions**:
  - US institutions of higher education
  - US non-profit, non-academic organizations associated with educational or research activities
- **Limits on the number of proposals from an institution**: None.
- **Limits on the number of proposals per PI or co-PI**:
  - **Conceptualization Grant (CG) proposals:** An individual may serve as PI, co-PI, or other senior personnel on no more than **two** CG proposals.
  - **Challenge Institute (CI) proposals**: An individual may serve as PI, co-PI, or other senior personnel on no more than **one** CI preliminary (or full) proposal.
- **Note**: In Round I, teams can either **apply for a CG or a CI but not both.**

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What activities will Challenge Institutes conduct?

- **Cross-Disciplinary Research**
  - **Focus areas:** quantum computation, quantum communication, quantum simulation, quantum sensing.
  - ***Challenge Research Theme*** could center on **one** focus area or span **multiple** focus areas.
- **Education, Training, and Workforce Development**
  - Develop creative approaches for cross-disciplinary training of a quantum-smart workforce.
  - Develop new curricula and programs that span multiple disciplines.
- **Research Coordination and Community Engagement**
  - Facilitate and accelerate discovery and innovation within the Challenge Institute.
  - Engage wider research community in quantum information science and engineering.
- **Synergistic Partnerships and Infrastructure Development**
  - Develop partnerships with industry, US national laboratories, and international partners.
  - Leverage resources at partner institutions: laboratory facilities, testbeds, cyberinfrastructure...
  - Create a lasting, dynamic partnership ecosystem.

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What are Conceptualization Grants (CG) ?

- 12-month grants offered only in Round I.
- Support the formation of multi-disciplinary research teams to develop a comprehensive vision for a CI proposal in Round II.
- **Successful CG proposals** must present a clear strategy and plan of activities to crystallize a compelling CI proposal:
  - **Stakeholder and community engagement** for brainstorming and development of ideas
  - **Plans to attract and engage research talent** across different disciplines
  - **Identification of challenge theme(s)** for advancing the research frontiers of quantum information science and engineering
  - **Formation of cross-disciplinary research teams** for the chosen challenge research theme and major activities
- **Note:** It is not required to submit a CG proposal to compete for a CI award.

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What are Challenge Institute (CI) awards ?

- 5-year awards to establish and operate Quantum Leap Challenge Institutes (QLCIs)
- **Cooperative agreements** – funding increments subject to agreed-upon milestones, annual project reviews, site visits, and availability of funds.
- **Preliminary proposals are required for CI proposals**
  - CI preliminary proposals will undergo a full merit review.
  - A precursor to a ***Strategic Plan*** to be developed in the full proposal.
  - It is **not** required to have a CG award prior to submitting a CI preliminary proposal.
- **A subset of teams will be invited to submit a CI full proposal** – only invited CI full proposals will be considered.

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What goes into a CI Preliminary Proposal ?

- Identification of a **compelling challenge research theme**, specific **research goals,** and **milestones** for advancing the frontiers of quantum information science and engineering.
- Identification of the **cross-disciplinary research team** forming the Challenge Institute, including any potential mergers among CG awardees.
- An overview of **findings, concepts, or preliminary results** that shape the Institute's vision.
- Evidence to show that the team can **effectively collaborate across the different disciplines**.
- An overview of the **proposed major activities in the four core areas***: Research; Education, Training, and Workforce Development; Research Coordination and Community Engagement; and Synergistic Partnerships and Infrastructure Development*.
- A summary of **prior experience of the team** with the key elements of quantum information science and engineering identified for the Challenge Institute.
- A summary of **key activities that were undertaken by the proposing team**, as part of a CG or otherwise, in preparation for the Challenge Institute preliminary proposal submission.

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What more goes into a CI Full Proposal ?

Each Challenge Institute team is expected to develop a ***Strategic Plan*** that will guide the establishment, operation, and evolution of the Institute. The Strategic Plan must include, but is not limited to, the following elements:

- **Challenge Research Theme, Focus Research Areas, and Research Community**
- **Education, Training, and Workforce Development**
- **Synergistic Partnerships and Infrastructure Development**
- **Cross-Disciplinary Research Coordination and Growth**
- **Institute Management and Sustainability**
- **Institute Ramp-Up Plan -** A description of concrete implementation activities necessary to establish the institute and to have it fully operational within six months of the start of the project

See Sec. V.A.5 of the program solicitation NSF 19-559 for details.

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Summary: Types of Awards and Timeline

- The QLCI program will support two types of awards:
  - **Conceptualization Grants (CGs)** funded at a level of $100,000-$150,000 for 12 months.
  - **Challenge Institute (CI) awards** funded at a level of up to $5,000,000/year for 5 years.

ROUND I (CG or CI proposals *but not both*)

Conceptualization Grant (CG) Proposals	Due Date
Letters of Intent for CG proposals due	April 1, 2019
CG proposals due	June 3, 2019

Challenge Institute (CI) Proposals	Due Date
Letters of Intent for CI preliminary proposals due	June 3, 2019
CI preliminary proposals due	Aug 1, 2019
CI full proposals (by invitation only) due	Jan 2, 2020

ROUND II (CI proposals only)

Challenge Institute (CI) Proposals	Due Date
Letters of Intent for CI preliminary proposals due	Aug 3, 2020
CI preliminary proposals due	Sep 1, 2020
CI full proposals (by invitation only) due	Feb 1, 2021

Quantum Leap Challenge Institutes (QLCI)

Questions and Answers

Please submit questions to: QLCI@nsf.gov

QLCI Questions and Answers: **Project Formulation**

Q1: How is the QLCI program different from other NSF programs supporting large-scale quantum information science and engineering research projects?

A1: Quantum Leap Challenge Institutes are to:

- Foster **multi-disciplinary** approaches to specific scientific/technological challenges; **and**
- Develop new cross-disciplinary approaches for **education, training, and workforce development**; **and**
- Promote a **sustainable innovation ecosystem** where expertise from various disciplines, institutions, and industry can be leveraged as needed, to overcome scientific, technological, and workforce challenges in quantum information science and engineering.

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QLCI Questions and Answers: **Project Formulation**

Q2: Would it be advisable to address multiple research areas in one project?

A2: Addressing multiple research areas is certainly feasible if that makes sense for an Institute's overall unifying challenge research theme, but multiple areas are not required. Potential research focus areas include but are not limited to

- Quantum communication
- Quantum computation
- Quantum simulation
- Quantum sensing

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QLCI Questions and Answers: **Project Formulation**

Q3: Is the potential Challenge Institute necessarily a single physical institute or can it:

- be a network;
- have a hub-and spokes structure;
- be wholly virtual?

A3: The QLCI program solicitation does not constrain the nature of a proposed Institute.

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QLCI Questions and Answers: **Project Formulation**

Q4: If I participate in a project awarded by a different NSF program, or have a proposal pending to a different NSF program, am I at a disadvantage in applying to the QLCI program?

A4: Applications to other NSF programs do not preclude PIs from applying to the QLCI program. Nor does involvement in other NSF-funded centers or projects preclude an application to the QLCI program.
Note, however, that the QLCI program aims to support activities of a different scope from those of other programs.
Successful QLCI proposals will make clear the distinction between the QLCI activity and other projects in the Current & Pending Support for the senior project personnel.

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QLCI Questions and Answers: **Project Formulation**

Q5: Is my plan competitive enough?

A5: Proposals will be reviewed according to the information in Section VI.A. "Merit Review Principles and Criteria" of the QLCI program solicitation NSF 19-559.
The NSF program directors are not able to provide feedback on project ideas prior to submission of proposals.

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QLCI Questions and Answers: **Competition Timeline**

Q6: If we submit an LOI for a Conceptualization Grant (CG), but then later decide to pursue a Challenge Institute (CI) proposal under Round I, would we be able to withdraw the CG LOI and submit a new LOI for the CI?

A6: Prospective teams may submit either a CG or a CI proposal, but not both, in Round I. A CG Letter of Intent would not need to be withdrawn if plans change, but a new Letter of Intent for the new CI proposal is needed.

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QLCI Questions and Answers: **Competition Timeline**

Q7: If we submit a Challenge Institute (CI) proposal for Round I, would that process be fully completed by the time the LOI for Round II is due?
If so, if our CI proposal for Round I is not selected, would we be able to submit another proposal under Round II?

A7: The QLCI program encourages teams who are not ready to submit a CI proposal this year to instead apply for a Conceptualization Grant to facilitate team building and planning. The timeline is designed to allow teams who receive a Conceptualization Grant to submit a preliminary proposal for a Challenge Institute approximately one year later. While it may be possible, the QLCI program does not anticipate that teams whose proposals for a Challenge Institute were declined in Round I would reapply in Round II.

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QLCI Questions and Answers: **Letters of Intent**

Q8: What is the purpose of a Letter of Intent?
Should I expect a response to my Letter of Intent?

A8: Letters of Intent will not be subject to review and are used only to help NSF staff anticipate potential conflicts of interest of potential reviewers for the (subsequent) proposals. The NSF will not provide a response to Letters of Intent, and proposers should not expect feedback.

Please submit questions to: QLCI@nsf.gov

QLCI Questions and Answers: **Letters of Intent**

Q9: In a Letter of Intent, how should I specify whether it applies to a CG project or a CI project?

A9: Please include this information in the text of the Letter of Intent.

Please submit questions to: QLCI@nsf.gov

QLCI Questions and Answers: **Letters of Intent**

Q10: Is the number of senior project personnel limited for a QLCI project? Is the number of participating organizations limited?

A10: There is no limit on the number of senior project personnel or participating organizations in a proposal (or Letter of Intent).
The NSF **Letter of Intent** system has a software limitation on number of entries for Other Senior Project Personnel and Participating Organizations, but this is **not intended** to limit the number of subawards or senior personnel or participating organizations in a QLCI project.
Please simply ensure that all participating organizations (subawardee or not) and senior project personnel (including senior collaborators) are listed somewhere in the text.

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QLCI Questions and Answers: **Letters of Intent**

Q11: How are the potential industrial and national laboratory collaborators identified in the Letter of Intent?
Are they listed as senior personnel, Co-PIs, or simply as collaborators?

A11: Letters of Intent are used only to help NSF staff anticipate potential conflicts of interest of potential reviewers. Please simply ensure that all senior project personnel (including senior collaborators) and their affiliations are listed somewhere. If there is not enough room among the available slots for Other Senior Project Personnel and Participating Organizations, please list the additional senior personnel and organizations in the text boxes of the Letter of Intent.

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QLCI Questions and Answers: **Proposal Submission**

Q12: Is this considered a collaborative project?
Is one organization responsible for the submission?

A12: For submissions involving multiple organizations, the proposal should be submitted from only one (lead) institution, with funding for participating organizations set up through subawards. Proposals should **not** be submitted as separately submitted collaborative proposals.

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QLCI Questions and Answers: **Proposal Submission**

Q13: Is there a limit on the number of PI/co-PIs in a proposal?

A13: There is no limit on the number of senior personnel in a QLCI project; however, the proposal Cover Sheet allows a single PI and at most 4 Co-PIs. An unlimited number of Other Senior Personnel may be included in a proposal.

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QLCI Questions and Answers: **Proposal Submission**

Q14: What budget items are allowed in a Conceptualization Grant (CG) proposal?

A14: There are no restrictions on the type of activities that may be proposed in a CG budget. The most successful CG proposals will reflect concrete plans for development of integrative and multidisciplinary research teams and meaningful stakeholder engagement. Proposals must present a clear strategy for enabling the crystallization of the overall challenge research theme and focus areas for a future Institute.
CGs are not meant to support research on the proposed elements.

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QLCI Questions and Answers: **Proposal Submission**

Q15: Does the NSF 2-month salary limit apply to (non-tenure track) research faculty whose salary is funded through directly billing contracts and grants?

A15: It is not anticipated that the "NSF 2/9 rule" practice would be applied for individuals who are not regular faculty members.
Details on the practice and the associated NSF policy are contained in the NSF PAPPG (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp) section II.C.2.g.(i)(a). That section specifies: "If anticipated, any compensation for [senior] personnel in excess of two months must be disclosed in the proposal budget, justified in the budget justification, and must be specifically approved by NSF in the award notice budget."

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QLCI Questions and Answers: **FFRDC Partnerships**

Q16: Is a Federally Funded Research and Development Center (FFRDC) eligible to participate as a subcontractor to a University?

A16: The top priority of the QLCI program is to support the US academic community in advancing the frontiers of quantum information science and engineering. The program will provide support for collaborations of US-university-based faculty, postdoctoral researchers, and graduate students as appropriate with non-academic partners, including travel expenses, consultant fees, facility charges, usage fees, etc.
NSF does not normally support research or education activities by scientists, engineers, or educators employed by Federal agencies or FFRDCs. Under exceptional circumstances, projects at FFRDCs that can make unique contributions not available elsewhere may receive NSF support.

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QLCI Questions and Answers: **Industrial Partnerships**

Q17: Can companies receive NSF funds?

A17: Section II.B.4 of the QLCI program solicitation describes the general nature of partnerships between Quantum Leap Challenge Institutes and industrial partners.

In general, industrial research partners are not permitted to use or receive NSF funds. Small businesses (per the Small Business Administration definition, which includes an upper limit of 500 employees) may be able to leverage relevant programs from the NSF IIP Division (https://seedfund.nsf.gov/). All partnerships need to be aligned with the research goals and objectives of the Institute.

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QLCI Questions and Answers: **Industrial Partnerships**

Q18: How can companies benefit from becoming part of a QLCI proposal?

A18: Potential benefits to industrial partners include:

- Opportunity to collaborate (on a pre-competitive basis) with QLCIs to further the objectives of both the QLCIs and the industrial partners.
- Opportunity to provide technical input to QLCI research directions.
- Opportunity to provide input regarding use-cases, thereby helping technology translation for commercial and societal outcomes.
- Access to the next-generation workforce.
- Access to QLCI intellectual property under agreed-upon conditions.
- Interactions among industrial partners, with benefits such as:
  - Networking/collaboration to develop solutions for targeted use-cases;
  - Insight into the state of R&D to better plan adoption of technologies.

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QLCI Questions and Answers: **International Partnerships**

Q19: Do all participating investigators need to be based in the US?

A19: It is anticipated that the Challenge Institute teams will develop synergistic partnerships with international partners as appropriate for the project.

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QLCI Questions and Answers: **International Partnerships**

Q20: Is it encouraged or discouraged to have funded co-PIs from institutions outside the US?

A20: The QLCI program encourages collaborative arrangements and development of shared infrastructure with international partners, as appropriate for the project. The top priority of the QLCI program is to support the US academic community in advancing the frontiers of quantum information science and engineering. The program will provide support for collaborations of US-university-based faculty, postdoctoral researchers, and graduate students as appropriate with non-US partners, including travel expenses, consultant fees, etc.

The QLCI program will not give high priority to requests to support salary of non-US collaborators.

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QLCI Questions and Answers: **International Partnerships**

Q21: Are there limitations on how expenditures can be allocated for non-US universities?

A21: Yes; support of participating institutions is to be arranged through subawards managed by the submitting institution. It is the responsibility of the Sponsored Research Office (SRO) of the submitting institution to determine the allowability of subaward expenses, subject to the NSF regulations that apply to awardees; these are known to the SRO.

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QLCI Questions and Answers

Q22: What's next?

A22:

Round I (CG and CI proposals):	
Letters of Intent for **CG** proposals due	Apr 1, 2019
CG proposals due	June 3, 2019
Letters of Intent for **CI** preliminary proposals (Round I) due	June 3, 2019
CI preliminary proposals (Round I) due	Aug 1, 2019
CI full proposals (by invitation only) due	Jan 2, 2020
Round II (CI proposals only):	
Letters of Intent for **CI** preliminary proposals (Round II) due	Aug 3, 2020
CI preliminary proposals (Round II) due	Sep 1, 2020
CI full proposals (by invitation only) due	Feb 1, 2021

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Quantum Leap Challenge Institutes (QLCI)

Thanks for your interest!

Please see all the information in the program solicitation NSF 19-559 available at

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505634

It is planned to post the webinar slides on that page within a week.

For additional questions, send e-mail to

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