



Fiscal Year 2019 Solicitation

Key Dates	
Solicitation Issue Date	October 11, 2018
Link to Pre-Recorded Informational Webinar	https://proposalsott.inl.gov/Home/tcf_resources.aspx
Submission Deadline for Proposal Eligibility Declarations (See Section IV)	November 5, 2018 5:00 p.m. (ET)
Submission Deadline for Proposals (See Section VI)	January 23, 2019 5:00 p.m. (ET)
Expected Date for Selection Notifications	Summer 2019

Summary Information	
Means of Submission	Applicants must register with and submit proposal materials through OTT's submission portal, Proposal and Review Operations Platforms (<i>PROPs</i>), which is administered by Idaho National Laboratory: https://proposalsott.inl.gov . OTT will not review or consider proposals submitted through any other means.
Total Amount to be Provided	DOE expects to make available approximately \$26.1M - \$28.3 million of Federal funding for award(s) under this Solicitation. See table on page. Future amounts are subject to congressional appropriations. DOE reserves the right to issue one, multiple, or no awards. Award amounts are: <ul style="list-style-type: none"> • Topic 1 Technology Maturation: \$100,000-\$150,000 • Topic 2 Cooperative Development: \$250,000-\$750,000
Period of Performance	Topic 1 Technology Maturation: 6-12 months Topic 2 Cooperative Development: 12-24 months Awarded projects in both topics are required to report metrics and participate in OTT's TCF program evaluation for up to 5 years from award date.
Eligible Entities	U.S. Department of Energy National Laboratories, Plants, and Sites
TCF Matching Funds/Non-Federal Cost Requirement	Projects require matching non-Federal funds of at least 50% of the total project cost.
Submission of Multiple Proposals	National Laboratories, Plants, and Sites may submit multiple proposals. There is no limit on the number of proposals a National Laboratory, Plant, or Site may submit.
Proposal Eligibility Declarations	Proposal Eligibility Declarations are mandatory. Proposal Eligibility Declarations consist of information requested via an online form and an attachment for upload.
Proposal Forms	The proposal requirements are contained in this document. There is a six-page limit for Topic 1 Technology Maturation proposals. The page limit for Topic 2 Cooperative Development proposals is 12 pages. Proposals will only be accepted with a corresponding tracking number from an eligible Proposal Eligibility Declaration.
Questions	Questions about the TCF program rules and proposal process should be directed to TCF@hq.doe.gov . Questions about using <i>PROPs</i> , the online application system, should be directed to TCFsubmissions@inl.gov . Note: All questions and answers will be distributed via email to the points of contact listed in Appendix D as well as to everyone who submits a question. Please do not provide proprietary or business sensitive information when posing questions Questions about Proposal Eligibility Declarations must be submitted by 5:00 p.m. (ET) on October 31, 2018 and questions about Proposals must be submitted by 5:00 p.m. (ET) on January 17, 2019. Questions submitted after these deadlines may not be answered.

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Section I: Background and Description of the Solicitation

A. SUMMARY

In support of the U.S. Department of Energy's (DOE's) efforts to increase the commercial impact of DOE National Laboratories, Plants, and Sites (hereinafter referred to as DOE Facilities) and their engagement with industry—as well as to fulfill statutory direction in the Energy Policy Act of 2005 (EPAc 2005)—DOE's Office of Technology Transitions (OTT) seeks proposals for its Technology Commercialization Fund (TCF). The TCF is intended to facilitate the commercialization of energy technologies with promising potential that are developed at DOE Facilities. The TCF is part of a broader set of initiatives to foster stronger partnerships among DOE Facilities, private sector companies, and other entities involved in bringing energy technologies to the marketplace. EPAc 2005 encourages and supports the development of energy systems across the entire range of generation sources. DOE strongly encourages applicants to look across their portfolios of applied energy programs for candidate technologies. A complete list of eligible technology areas is provided in Appendix A.

B. GOALS

The TCF is part of a broad array of activities that DOE and its Facilities undertake to ensure Federal research and development (R&D) investments in technology with commercial potential to find their way to a viable market. The TCF Federal funds are matched with non-Federal contributions to:

1. Perform technology maturation with the intent of attracting a private partner that is willing to support the technology's commercialization.
2. Support cooperative development of technology with a private partner for a specific commercial application.

C. BACKGROUND

DOE's enterprise of Facilities has a more than 70-year history of delivering world-class science and technology solutions to pressing national issues. DOE Facilities are proven partners in collaborative R&D projects that provide the foundational science and technology for the private sector to then derive new products and processes in myriad industries. DOE's annual multibillion-dollar investment in research at DOE Facilities results in the invention and development of novel technologies and other forms of intellectual property (IP). DOE Facilities have developed partnerships with private parties to pursue commercial applications of these technologies. To date, there have been thousands of licenses between DOE Facilities and private partners. Nevertheless, an even larger reservoir of IP has not transitioned to the private sector because a technology may not be mature enough to attract a partner—or its market potential may not be fully understood.

DOE's Facilities have consistently identified as a problem the lack of sufficient resources to develop technologies to a stage that attracts private sector interest. In many cases, public funding—from DOE or other sources—supports R&D activities up to an early Technology Readiness Level (TRL), but such funding is cut off before the technology matures to a point that a business will enter into a cooperative R&D agreement or seek to license the technology. A 2013 report commissioned by the White House Office of Science and Technology Policy concluded that “[m]any promising early-stage technologies developed at Department of Energy [N]ational [L]aboratories require ‘maturation’ in the form of additional development, testing, or prototyping before companies are willing to invest in them for commercial purposes.”^a

^a IDA Science and Technology Policy Institute. “Department of Energy Technology Maturation Programs.” May 2013. Available online at: <https://www.ida.org/~media/Corporate/Files/Publications/STPIPubs/ida-p-5013.ashx> (accessed December 8, 2017).

Congress authorized under Section 1001 of EPOA 2005, as amended, the establishment of the Technology Commercialization Fund (TCF):

e) TECHNOLOGY COMMERCIALIZATION FUND – The Secretary shall establish an Energy Technology Commercialization Fund, using 0.9% of the amount made available to the Department for applied energy research, development, demonstration, and commercial application for each fiscal year based on future planned activities and the amount of the appropriations for the fiscal year, to be used to provide matching funds with private partners to promote promising energy technologies for commercial purposes.

The TCF provides an opportunity to support collaboration between DOE Facilities and private industry. Specifically, the TCF is intended to incentivize DOE Facilities to pursue active industry engagement and customer scouting for select, promising energy technologies. Researchers at DOE Facilities, as well as their technology transfer offices, often lack the resources or a particular DOE Program Office's guidance to focus on actively engaging industry partners to commercialize their technologies.^{b, c}

Through TCF, DOE's applied energy Program Offices (discussed in Appendix A) and its Facilities can pursue a strategic, forward-looking, competitive approach to commercializing their technologies. This process better enables DOE Facilities to prepare these technologies for commercial adoption, identify the highest-quality prospective partners, and assist those industry partners in evaluating the technologies for their business models. Potential benefits of this approach include:

1. Creating a stronger incentive for DOE Facilities to identify both their most promising technologies for commercialization and industry partners
2. Empowering a broader set of potential industry partners to engage with the DOE Facilities
3. Enabling DOE Facilities to identify a commercialization pathway for technologies with good potential
4. Promoting crosscutting technologies across DOE's Program Offices and technology areas

D. TCF STRUCTURE

Proposals must pursue one of the following two Topic Areas:

Topic 1 Technology Maturation

Topic 1 Technology Maturation projects focus on DOE Facility-developed technologies that have commercial promise, have reached a TRL of at least three (TRL 3), and have the potential to attract a private partner. The target TCF funding for each Topic 1 award is \$100,000-\$150,000. The target period of performance for a Topic 1 award is 6-12 months.

Topic 2 Cooperative Development

Topic 2 Cooperative Development projects focus on technologies for which DOE Facilities have already identified a commercial partner willing to execute a partnership agreement. Cooperative Research and Development Agreements (CRADAs) are the preferred agreement type for all TCF projects. This Topic supports cooperative development with a private partner of a commercial application for technology developed at DOE Facilities. Applicants will have already undertaken some form of evaluation to determine if the technology is viable for commercialization—such as IP mapping, participation in the Energy I-Corps program, or other activities. The target TCF funding for

^b OTT 2015 RFI input from the National Laboratories put significant emphasis on the importance of more strategic industry engagement in order to attract industry and identify partners to commercialize technology.

^c A key finding from the temporary EERE Technology Commercialization Fund from FY2007-2008 found that National Laboratories would have benefited from additional time and resources to search for the most promising industry partners.

each Topic 2 award is \$250,000-\$750,000. The target period of performance for a Topic 2 award is 12-24 months.

OTT has implemented a metric and evaluation plan to assess progress and achievements of TCF-funded Topic 1 and Topic 2 projects. All Awardees are required to provide metrics for up to five years from the award date.

E. SCOPE OF PROJECTS

The scope of a project should allow it to meet TCF's goals for the type of project it is—i.e., technology maturation or cooperative development. The activities described below correlate to the independent merit review criteria in Section IV. All projects, whether proposed as Topic 1 or Topic 2, need to address the four areas described here. Depending on the Topic area, the breadth and level of detail will vary. In all cases, proposals must address the following items to the degree of specificity appropriate to the chosen topic area.

1. Commercial Impact

Both Topic 1 and Topic 2 proposals need to address the proposed technology's potential market impacts if it is commercialized. Topic 1 projects are intended to focus on technology maturation, but need to provide evidence that the technology has potential market impact. Topic 2 projects are intended to focus primarily on the commercialization of the technology in concert with a private partner. Therefore, a Topic 2 proposal should contain more expansive information about the commercial impact of the technology. In any case, there must be a clear explanation of the current or anticipated market for the technology. This should include a description of the significant market need that the project addresses. The applicant should also specify whether the proposed technology could achieve market penetration independent of complementary technologies, processes, or other requirements. If other factors, such as policy or regulations, are required for the technology to achieve market penetration, the applicant should identify them and discuss the circumstances.

2. Technical Maturation

Proposals for both Topic 1 and Topic 2 need to address what the project intends to accomplish in terms of advancing the maturity of the technology. Topic 1 projects are intended to focus on technology maturation as the primary objective. Therefore, the proposal should be principally focused in this area. Topic 2 projects may require that the technology be further matured or demonstrated at a larger scale. Topic 2 proposals should describe which technology maturation activities need to be undertaken to achieve the commercialization goals of the project. In any case, there must be a clear explanation of the current state of the technology, as well as the anticipated state of the technology at the end of the project. To the degree they can be anticipated, the applicant should explain the technical challenges and unanswered technical questions that must be addressed to reach the desired maturity of the technology. There should be an explanation of any complementary technology(ies) necessary for the proposed technology to function and to have relevance in the market.

3. Project Plan

Both Topic 1 and Topic 2 proposals need to include a project plan, which should center around the objectives of the project. Depending on the topic area and the specific project objectives, the plan should focus on tasks and activities to accomplish those objectives. There must be a clear explanation of the goals and outcomes of the proposed project, and a viable approach to address the technical and commercialization challenges of bringing the technology to the market. Tasks should be clearly linked to performance metrics and deliverables. There must also be a delineation of technical and market risks and uncertainties, as well as a plan to manage or retire them.

4. Project Team and Resources

There must be a clear articulation that the project team and resources are qualified and capable of successfully completing the project. This includes both the laboratory and partner teams. The proposal must clearly define team members' roles and responsibilities. There should be evidence that the necessary personnel, facilities, and equipment are available and committed to the project.

Section II: Eligibility for Award

Applicants for a TCF award are required to meet the eligibility requirements described in this section.

A. APPLICANTS

Eligible applicants are any DOE Facilities as defined in Section I to include the U.S. Department of Energy National Laboratories, Plants and Sites.^d No other entities, public or private, are eligible for award. Applicants are eligible for multiple awards under this solicitation. Multiple DOE Facilities may partner together on a single proposal.

B. PROJECTS

Eligible applicants may propose projects under one of two topic areas:

- Topic 1 Technology Maturation
- Topic 2 Cooperative Development

Topic 1 projects may—but are not required to—involve a partner. Topic 2 projects must involve a partner. TCF projects that involve partners are expected to use a CRADA as the partnering mechanism. If a Facility wishes to use a different partnership mechanism for a specific project, it must secure permission ahead of time from OTT for the deviation. Requests should be submitted to TCF@hq.doe.gov and must include a justification for using an alternate mechanism. After consulting DOE's Office of General Counsel, OTT will respond in writing to either approve or disapprove the request.

Topic 1 Technology Maturation—\$100,000-\$150,000 per award

Eligible projects for Topic 1 must involve currently existing DOE Facility technology or IP with a TRL of at least three (TRL 3) that demonstrates evidence of commercial potential. TRL 3 is evidenced by a technology having demonstrated analytical and experimental proof of concept in a laboratory environment. For example, have either experiments or modeling and simulation validated performance prediction of technology capability? Have design techniques been identified or developed? Have scaling studies been initiated? Projects funded under Topic 1 have a performance period of 6-12 months. The target Topic 1 award amount is \$100,000-\$150,000.

Topic 2 Cooperative Development—\$250,000-\$750,000 per award

Eligible projects for Topic 2 must involve currently existing laboratory technology or intellectual property, and the laboratory must have a non-Federal partner with a defined commercial application for the technology. The partner(s) must be identified in the proposal for funding. A CRADA does not have to be in place to be eligible for award, however. If funds are allocated before a CRADA is in place, work may not begin until it is executed. If a CRADA between the laboratory and partner is not executed within 6 months of DOE's obligating the funds to the Facility, the Department may cancel the award. A project or work scope being executed under an existing CRADA or other partnership agreement is not eligible for an award under the TCF. Projects funded under Topic 2 have a performance period of 12-24 months. The target Topic 2 award amount is \$250,000 to \$750,000.

Relevance Considerations

All projects proposed for funding must demonstrate mission area relevance to one or two of the DOE Program Office Technology Areas (i.e., Congressional control accounts) identified in Appendix A. It is incumbent on applicants to identify and select the correct Program Office(s) and Technology Area(s). DOE Facilities may submit proposals with cross-programmatic application or benefit. As an example, a wind farm load forecasting model could be applicable to the Wind Energy Technology Area within the

^d NETL is ineligible for an award for a Topic 1 project unless it finds a private partner.

Office of Energy Efficiency and Renewable Energy, as well as to the Transmission Reliability and Resilience Technology Area within the Office of Electricity.

Intellectual Property (IP): Patent and Copyright Protection

All TCF projects must have the patent or copyright protection described below in place for their technologies **by the time DOE obligates TCF funding**:

- **Topic 1.** Applicants must have filed a provisional or non-provisional patent application or for copyright protection, if applicable. This is the minimum requirement.
- **Topic 2.** Applicants must have filed a non-provisional patent application or for copyright protection, if applicable. This is the minimum requirement.

When Applicants submit their Proposal Eligibility Declarations, they agree to have those protections in place by the time they receive funding, if their proposal is selected for award. (Please see the Project Administrative Detail and Summary affirmation in Section V. C.1.d). Applicants must have the above described protections in place by the time DOE obligates TCF funding. Unless these patent or copyright protections are already in place, applicants will have a window to file the necessary application between their FY19 selection notification and when DOE obligates TCF funding at the Lab.

Additional Funding Eligibility Considerations

If a technology received funding as a Topic 1 project, it is eligible to receive funding as a Topic 2 project, provided the following conditions are met by the time applicants submit a Full Proposal:

- The project (scope of work) is complete and was successful in accomplishing the project's goals
- The project has complied with all interim reporting requirements (a final report is due three months from the completion of the scope of work, but is not a precursor for selection in FY19)
- The new funding request meets the Solicitation's requirements and advances the technology toward commercialization.

If a technology received funding as a Topic 1 project, it is not eligible for additional TCF funding as a Topic 1 project.

If a technology received funding as a Topic 2 project, it is not eligible for additional TCF funding.

C. PARTNERS

Partners can be any non-Federal entity, including private companies, state or local governments—or entities created by a state or local government—universities, or non-profit organizations. Partners must agree to engage in activities that focus on commercializing or deploying technologies in the marketplace.

D. MATCHING FUNDS

All projects require matching funds of at least 50% of the total project cost, which must come from non-Federally-appropriated funds. If a DOE Facility is providing the matching funds, it must be a cash contribution. If a private partner is providing the matching funding, it can be a cash or in-kind contribution. Applicants should ensure that in-kind contributions meet all of DOE's requirements pertaining to in-kind contributions. DOE Facilities are ultimately responsible for verifying that all matching contributions are made and properly accounted for. For more information and examples, please see Appendix B.

Section III: Award Information & Administration

A. TYPE OF AWARD INSTRUMENT

TCF awards will be documented and funded through the existing work authorization and funds management processes of the DOE Program Office providing the funding. DOE Facilities will be required to track Federal funds in accordance with normal Departmental processes. DOE Facilities will also be required to track non-Federal funds in accordance with established DOE Facility accounting processes.

B. ESTIMATED FUNDING

DOE anticipates that approximately \$26.1 - \$28.3 will be available for the TCF in Fiscal Year (FY) 2019.

OTT anticipates that available funding will breakdown across the participating Program Offices as follows:

Participating DOE Program Office	Estimated FY19 Funding Range
Energy Efficiency and Renewable Energy (EERE)	\$14.5M - \$15.5M
Nuclear Energy (NE)	\$6.0M - \$6.7M
Fossil Energy (FE)	\$4.2M - \$4.5M
Electricity Delivery and Energy Reliability (OE)	\$0.7M - \$0.8M
Cybersecurity, Energy Security, and Emergency Response (CESER)	\$0.7M - \$0.8M
Total TCF	\$26.1M - \$28.3M

Future amounts are subject to congressional appropriations. DOE may issue one, multiple, or no awards.

Number of Selections: The number of selections will be based on the number of meritorious proposals and the availability of congressionally appropriated funds in each DOE Program Office or Technology Area.

Funding will be allocated from one or two appropriation accounts/Technology Areas listed in Appendix A.

Funding Amount per Selection:

Topic 1 Projects - \$100,000-\$150,000 per award
Topic 2 Projects - \$250,000-\$750,000 per award

DOE reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this Solicitation.

C. PERIOD OF PERFORMANCE

Topic 1 projects: 6-12 months
Topic 2 Projects: 12-24 months

D. CROSSCUTTING AWARDS AND MISSION AREA RELEVANCE

DOE Facilities may submit proposals they view as having crosscutting applicability or benefit. At the mandatory Proposal Eligibility Declaration, applicants may identify up to **two (2)** Technology Areas per proposal, and **must** provide a short explanation for **each selection** that articulates the technology's mission area relevance. DOE is under no obligation to accept an applicant's determination of crosscutting applicability. DOE reserves the right to make final determinations about which Program Offices will bear what share of the costs for crosscutting awards.

E. MULTIPLE AWARDS

DOE Facilities are eligible for more than one award. Awards are made on a per proposal basis. Each proposal must define a single project. Individual proposals are not eligible for multiple awards.

F. DECISION NOTIFICATIONS

DOE's decisions are final when communicated to applicants. OTT notifies each proposal's points of contact in writing of its decisions and provides a summary to each Facilities' Tech Transfer Office. The first notification follows the Proposal Eligibility Declaration review. This is a go-no-go decision that determines whether or not DOE will accept a Full Proposal for the corresponding Proposal Eligibility Declaration.

Notification of DOE's TCF selection decisions follows the conclusion of the evaluation and selection process. DOE's decision to select a project for award is not an authorization to begin performance. Selected projects are required to finalize the Scope of Work (SOW)/Work Plan with the funding Program Office(s) prior to work authorization and release of funds. OTT and/or the funding DOE Program Office(s) reserve the right to request additional or clarifying information before proceeding to the SOW finalization stage.

OTT provides reviewer comments to all applicants as soon as practical after selections are announced.

G. SUCCESSFUL SUBMISSIONS

If selected for award, OTT reserves the right to require additional or clarifying information for any reason.

H. PROJECT ADMINISTRATION

Projects selected for award are managed by the DOE Facilities in accordance with their requisite policies and procedures. Each awarded project will be funded according to the Program Office Technology Areas (Congressional control accounts) listed in Appendix A. Applicants are encouraged to select up to two Program Office Technology Areas as applicable to their project's crosscutting potential—and to its mission area relevance to each selection. Please see the description of mission area relevance reviews within Section IV for more information.

The template for TCF-funded project's final report is in Appendix C.

Section IV: Proposal Requirements and Review Information

A: PROPOSAL ELIGIBILITY DECLARATIONS AND ELIGIBILITY REVIEWS

Proposal Eligibility Declarations are mandatory. When applicants begin the process to create a new Proposal Eligibility Declaration, *PROPs* will generate a discrete tracking number for use during the full submission phase. **The deadline to submit Proposal Eligibility Declarations is 5:00 p.m. (ET) on November 5, 2018. OTT WILL NOT ACCEPT PROPOSAL ELIGIBILITY DECLARATIONS AFTER THE DEADLINE.**

At the Proposal Eligibility Declaration stage, applicants must select a Primary Technology Area to which their proposal relates. Applicants may also select an optional Secondary Technology Area. Primary and Secondary Technology Areas may be within different DOE Program Offices, or within the same DOE Program Office. All Proposal Eligibility Declarations are subject to a review to determine whether or not DOE will accept a Full Proposal for the same project. OTT's multi-phase eligibility review is in place to determine:

1. That the applicant is an eligible entity under this solicitation
2. That the Proposal Eligibility Declaration is complete and contains all the required information
3. That all mandatory requirements are satisfied
4. That the Proposal Eligibility Declaration describes a project responsive to this Solicitation's objectives
5. That the Proposal Eligibility Declaration demonstrates and accurately articulates mission area relevance to the applicant-selected Program Office(s) and Technology Area(s).

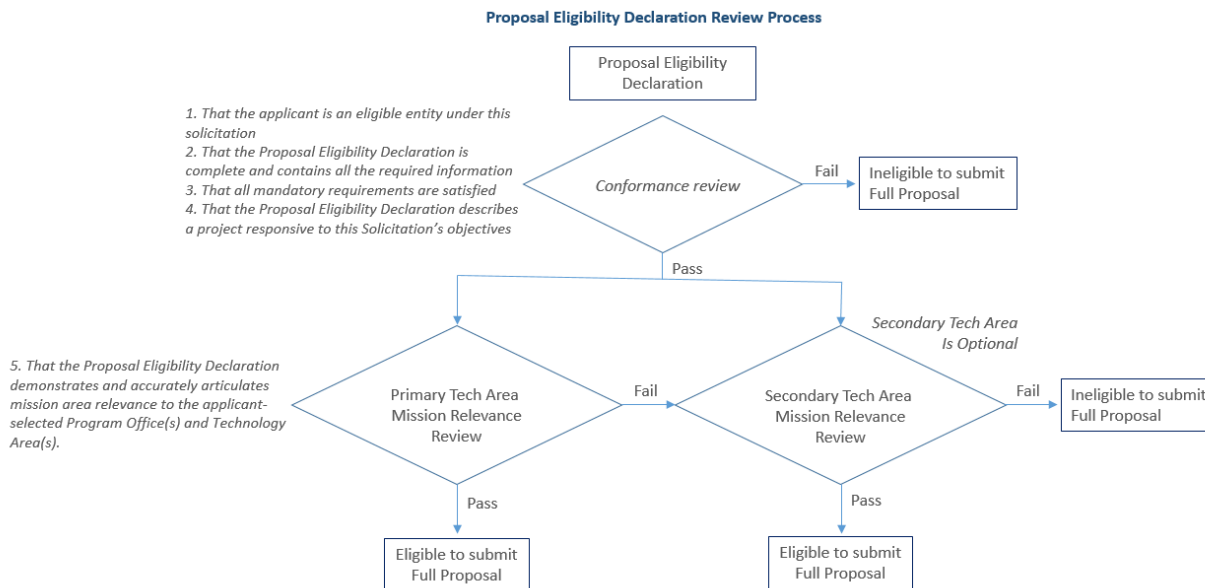
INCOMPLETE PROPOSAL ELIGIBILITY DECLARATIONS OR PROPOSAL ELIGIBILITY DECLARATIONS WITH INCORRECT OR INACCURATE INFORMATION (I.E., ANY PROPOSAL ELEMENT) WILL NOT BE ELIGIBLE TO SUBMIT FULL PROPOSALS.

Conformance and Mission Area Relevance Reviews

Items 1-4 above describe the conformance review for Proposal Eligibility Declarations. In addition to this conformance review, Proposal Eligibility Declarations also receive a review for mission area relevance in the applicant-selected Technology Area(s). This is captured in item 5 above. To be eligible to submit Full Proposals, Proposal Eligibility Declarations must pass both the conformance review **and** the relevance review in **at least one** of the applicant-selected Technology Areas—Primary (mandatory) or Secondary (optional).

If an applicant only selects a Primary Technology Area, and the Proposal Eligibility Declaration fails that mission area relevance review, the applicant is not eligible to submit a Full Proposal for that Proposal Eligibility Declaration. If a Proposal Eligibility Declaration fails the mission area relevance review in the Primary Technology Area, it may still pass in a Secondary Area, if the applicant selected one. In that case, the Secondary Technology Area becomes the new Primary Technical Area.

The Proposal Eligibility Declaration review processes are depicted in the diagram below:



Proposal Eligibility Declarations that fail the conformance review or do not pass at least one mission area relevance review are eliminated from further consideration. DOE will not accept full proposals for those Proposal Eligibility Declarations. DOE anticipates making eligibility notifications by 5:00 p.m. (ET) on December 5, 2018.

B: FULL PROPOSALS AND ELIGIBILITY REVIEW

Proposals will only be accepted with a corresponding tracking number from an eligible Proposal Eligibility Declaration—and only in the Technology Area(s) in which it passed the mission area relevance review(s). **FULL PROPOSALS ARE DUE BY 5:00 P.M. (ET) ON JANUARY 23, 2019. OTT WILL NOT ACCEPT FULL PROPOSALS AFTER THE DEADLINE.** All Full Proposals will be subject to an eligibility review to determine that:

1. The Full Proposal matches the project described in the corresponding Proposal Eligibility Declaration
2. The Full Proposal for funding is complete and contains all the information required
3. All mandatory requirements are satisfied
4. The proposed project is responsive to the objectives of this Solicitation

PROPOSALS THAT FAIL TO PASS THE ELIGIBILITY REVIEW WILL NOT BE FORWARDED FOR INDEPENDENT MERIT REVIEW AND WILL BE ELIMINATED FROM FURTHER CONSIDERATION.

C: MERIT REVIEW CRITERIA

Proposals that pass the eligibility screen will be forwarded for independent merit review. Proposals are independently merit reviewed only in their Primary Technology Areas. OTT makes use of Secondary Technology Areas during the Merit Review Committee meeting in cases where possibilities might exist to fund meritorious projects after funding is exhausted in the Primary Technology Area. TCF Selections are based on the following merit review criteria:

1. Commercialization Evaluation (35% of composite score)

Commercial Impact Criterion consist of the following components:

- Extent to which the proposed technology will result in a commercially-successful product and/or company
- Extent to which the proposed technology has the ability to be successfully commercialized in a reasonable timeframe (3-5 years)
- Extent to which the proposed technology represents an innovative or significant improvement from current state of the art technologies that results in either a product or solution that transforms or replaces existing industry approaches or is a new product or solution that can be widely used by the existing industry and will have significant market impact
- Extent to which the project team understands the market and its barriers to commercialization
- Extent to which the applicant identifies and discusses factors or circumstances such as policy or regulations are required for the technology to achieve market penetration

2. Technical Merit Evaluation (65% of composite score)

Technical Impact consists of three criteria within which are multiple components as described below along with their individual contributions to this portion of the composite score:

Technical Merit Criterion 1: Technology Maturity (40%)

- Technology has achieved a TRL 3, which is defined as a technology having demonstrated analytical and experimental proof of concept in a laboratory environment. For example, have experiments or modeling and simulation validated performance prediction of technology capability? Have design techniques been identified or developed? Have scaling studies been initiated?
- Extent to which the applicant describes an understanding of complementary technologies or processes that are necessary for the technology to have relevance in the market.
- Extent to which the applicant describes an understanding of technical issues to be addressed to achieve a successful commercial deployment.
- Evidence that the technology can be deployed at scale.

Technical Merit Criterion 2: Project Plan (40%)

- Technical and Commercialization Approach –
 - Quality and reasonableness of the applicant’s plan for closing technical gaps and addressing unanswered technical questions.
 - Quality and reasonableness of the applicant’s business plan for market penetration/adoption.
- Risk Management –
 - Extent to which applicant discusses and demonstrates understanding of the key technical and commercial uncertainty and risks involved in the proposed work.
 - Extent to which applicant adequately describes how applicant’s team will manage and retire risks.
- Goals and Outcomes –
 - Extent to which the project plan clearly describes the goals and outcomes of the project, including measures of technical advancement and business success.
 - Extent to which the proposed tasks and subtask activities in the work plan are verified through performance metrics, milestones, and deliverables that are specific, measurable, aggressive (but attainable), realistic, and timely (i.e., not a report summarizing work that was done).

Technical Merit Criterion 3: Project Team and Resources (20%)

- Capabilities – The extent to which the capability of the Principal Investigator(s) and the proposed team, including partnerships, can address all aspects of the proposed project, including, but not limited to, qualifications, relevant expertise, and time commitment of the individuals on the team.
- Contributions – Clarity, adequacy, and completeness of roles and contributions of each team member in development of the project and/or commercialization of the products, including financial support of partners.
- Readiness – Extent to which the final team, facilities, and equipment required to complete this project is fully in place, assembled, and committed to the project (e.g., are there any key members that are “to be hired at a later date”?).
- Commitment – Extent to which there is demonstrated institutional commitment from senior DOE Facility management and corporate officers of partners.
- Resources – Sufficiency of facilities to support the proposed work—and reasonableness and adequacy of the proposed budget to meet proposed project objectives.

D: PROGRAM POLICY FACTORS

In addition to the criteria above, the following program policy factors may be considered in determining which proposals to select for negotiations:

- The degree to which the proposed project offers an opportunity to facilitate commercialization of a promising technology that does not currently have other programmatic support.
- Whether the proposed project offers crosscutting or multi-program benefit and passed the mission relevance review in both its Primary and Secondary Technical Areas.
- Diverse representation of DOE Facilities in the TCF’s project portfolio.
- Diversity of technologies.
- Diversity of projects spanning participating DOE Program Offices.

Section V: Proposal Submission & Format

A. PROPOSAL SUBMISSION INFORMATION

Proposal forms and instructions are available in *PROPs*, OTT's TCF submission website. To access these materials:

1. Go to <https://proposalsott.inl.gov>
2. Select "Login" from the top right-hand corner of the screen
3. Enter your user credentials or create an account
4. Select "Proposals" from the menu
5. Click on "Create New Proposal" for the type you are creating.

B. DOCUMENT FORMAT REQUIREMENTS

Using templates where provided, all non-budget documentation is to be prepared in a standard 8.5" × 11" document with 1-inch margins all around (i.e., top, bottom, left, and right), using a font size no smaller than Times New Roman 11 point. The required file format is Portable Document Format (PDF) for all documents except for budget spreadsheets. **Applicants should not upload scanned images of their proposals, as this will cause them to fail the conformance review.** CONVERT DOCUMENTS TO PDF. DO NOT SCAN PRINTED COPIES. All spreadsheets are to be uploaded in Excel file format. Do **NOT** lock any cells in the spreadsheet.

C. PROPOSAL ELEMENTS

1. Proposal Eligibility Declaration

Proposal Eligibility Declarations are mandatory. Proposal Eligibility Declarations consist of information requested via an online form and an attachment for upload. Both must be submitted here: <https://proposalsott.inl.gov> by **5:00 p.m. (ET) on November 5, 2018**. The applicant's points of contact should receive an email acknowledging receipt of the proposal within one (1) business day of submission. Facility Tech Transfer Offices should receive a summary of their Proposal Eligibility Declarations within three (3) business days following the submission deadline. Please contact TCFSubmissions@inl.gov if a receipt is not received.

a. Proposal Eligibility Declaration Project Administrative Detail and Summary

Information about the project and the applicant's contact information is requested via the Project Administrative Detail and Summary, which is completed via an online form. All information fields are mandatory. The form asks for the following information:

- i. Project Title. Text box provided on form.
- ii. Period of Performance (6-24 months). Text box provided on form.
- iii. Brief Overview (for public release). Text box provided for a short description of the proposal (2,000 characters or less, including spaces and punctuation). DOE uses this information to determine mission relevance for Full Proposal eligibility, and to assist in identifying Subject Matter Experts (SMEs) to serve as independent merit reviewers, if applicable.
- iv. Principal Investigator (PI) Information. Text box provided for name, phone number, primary email address, and alternate email address.
- v. Tech Transfer Points of Contact (POCs). A courtesy copy of your Program Eligibility Declaration will be sent to the respective Facility Technology Transfer Office points of contact. These fields auto-populate.
- vi. Lead DOE Facility. Select from drop-down list.
- vii. Topic Selection. Drop-down menu provided on form.
- viii. Identification with check boxes from a tree menu of a Primary Program Office/Technology Area (mandatory) and an optional Secondary Program Office/Technology Area to which the project aligns, as well as a brief (1,000

characters or less) description of the technology’s relevance to the selected primary area and optional secondary area, if applicable. A text box is provided on the online form. Please see Appendix A for a list of the eligible Program Offices and their Technology Areas.

- ix. Partner Organization(s) and Points of Contact (name, email, general location), if applicable. Use the text box to provide salutation, first and last name, organization, phone number, email address, city, state, postal code, and country.
- x. Previous TCF Funding. Use a Yes/No radio button to answer whether the TCF previously funded this project and/or technology. If a technology received funding as a Topic 1 project, it may be eligible to receive funding as a Topic 2 project. Please see Section II B. “Additional Funding Eligibility Considerations” for more information. If yes, please provide the tracking ID # (TCF-XX-XXXXX) and give a very brief (500 characters or less) description of the project and its status.
- xi. There is a checkbox to indicate whether the Principal Investigator is now or has in the past participated in DOE’s Energy I-Corps program (<https://www.energy.gov/eere/technology-to-market/energy-i-corps>). Participation in DOE’s Energy I-Corps gives neither an advantage nor a disadvantage to TCF applicants. DOE is simply interested to know whether applicants are or have been Energy I-Corps participants.

b. Proposal Eligibility Declaration Mission Narrative

Applicants must upload a Proposal Eligibility Declaration mission narrative document. The document must contain the following information:

- i. Project Title
- ii. Tracking ID #
- iii. DOE Facilities(s) and proposed Partner(s), if applicable
- iv. A brief project narrative not to exceed 5,000 characters (including spaces and punctuation), which DOE may use for public release, to determine Full Proposal Eligibility, or to assist in identifying independent merit reviewers.

The document must be saved as PDF, and conform to this naming convention: 2019 TCF Proposal Eligibility Declaration “Tracking ID #”.pdf

Note: All information included in the Proposal Eligibility Declaration will be visible once created in *PROPS*.

Please note that the Project Administrative Detail and Summary form includes the following affirmation:

I, my home organization, and my proposed partner(s) have read and agree to the requirements as they are outlined in the Solicitation. Agreement by all parties to these requirements is indicated upon submission.

3. Full Proposals

Proposals must be uploaded in *PROPs* <https://proposalsott.inl.gov> by **5:00 p.m. (ET) on January 23, 2019**. The applicant's points of contact should receive an email acknowledging receipt of the proposal within one (1) business day of submission. Facility Tech Transfer Offices should receive a summary of their proposals within three (3) business days following the submission deadline. Please contact TCFsubmissions@inl.gov if a receipt is not received.

Topic 1 **proposal narrative documents** must not exceed six (6) pages. Topic 2 proposals must not exceed 12 pages. In addition to the narrative document, Full Proposals include the following supplemental pages (but no other information or materials), which do not factor into the 6 and twelve page limits: Budget form, technical summary/abstract for public release, and optional appendices of team (a) members' resumes and/or (b) letters of support. Only the first 6 pages of a Topic 1 proposal narrative and the first 12 pages of a Topic 2 proposal narrative will be reviewed. ***OTT will delete pages in excess of the six (Topic 1) and twelve (Topic 2) page maximums prior to forwarding Full Proposals for review.***

To create a full proposal, login to the <https://proposalsott.inl.gov> site as before and click the "Create New Proposal" link next to the Fiscal Year 2019 Technology Commercialization Fund Full Proposal. The submission system will show the Proposal Eligibility Declarations you already submitted. When you click on the desired Proposal Eligibility Declaration, the system will generate the full proposal page. The tracking number will be the same and all information except the Proposal Eligibility Declaration attachment itself will appear in the full proposal form. That information cannot be updated (email TCF@hq.doe.gov if there are changes between the Proposal Declaration Eligibility and Full Proposal stages). Scroll down immediately and save the proposal.

Note: Applicants must provide information for each of the elements described below; however, the depth of the discussion for each element will depend on whether the proposal is seeking funding under Topic 1 or Topic 2.

Full Proposal Elements

Proposal Narrative Document (PDF Attachment)

Please identify the following information in this document:

Page limits: **Topic 1, six (6) pages**
 Topic 2, twelve pages

i. Commercialization Plan

- a. The target market(s) for commercialization of the technology/product, including a brief discussion of identified or anticipated market barriers.
- b. Competing technologies/products and estimated timeframe to overcome technical and market barriers.
- c. Proposed commercialization end state of the project, to include whether the technology/product will be available in the identified markets—and if not, the anticipated follow on activities necessary to bring the product to market.
- d. The extent to which the proposed technology will result in a commercially-successful product and/or solution that transforms or replaces existing industry approaches or solutions that can be widely used by the existing industry.
- e. Clear statement of how the proposed technology represents an innovative and significant improvement with respect to existing commercial products or solutions.

ii. Technical Narrative

- f. **Project Description** - Describe the project's goals and objectives. Provide a brief history of the technology development and commercialization efforts to date including current status.
- g. **Project Plan** - Describe the technical and commercialization approach for the project including how you will close technical gaps and address unanswered questions. Clearly state what the business plan for market penetration/adoption is and how you have addressed any assumptions used to form your business strategy. Describe how you will manage technical and commercial risks related to your proposed work and how you will retire those risks as they arise. Clearly articulate the goals and outcomes of the project, including measures of technical and business success.

In addition to the written summary, provide a table with milestones to include a description of the outcomes or goals being achieved. Milestones should be specific, measurable, achievable, realistic, and time-bound (SMART) and represent a tangible and measurable achievement of a project outcome or goal, e.g., completion of a technology upgrade or performance test. The table should also include deliverables with a description of the data and information or knowledge being provided in the deliverable.

- h. **Team & Resources** - Describe the capabilities of the project team, including those of the PI(s), partners, and other members, and how each will contribute to the commercialization of the product. Clearly state the team's and the lab's readiness to begin work on the project. Describe the team's commitment to the project, including that of senior laboratory management and corporate officers of partner organizations. Describe the facilities needed to support the proposed work. As appropriate, include the names of any partners and a description of their businesses, as well as a discussion of the partners' products and services currently in the market. Describe the history of the laboratory's interaction with the partner(s) and the role of the partner(s) in the project including their responsibilities for accomplishment of milestones and deliverables, as well as financial support or in-kind contributions.

The document must be saved in Portable Document Format (PDF), and conform to this naming convention: "2019 TCF Full Proposal Narrative Document[Tracking ID #].pdf".

b) Budget (online form and an Excel file)

Please complete the online form to provide the following information:

- i. TCF ID number and project title
- ii. TCF Funding Requested
- iii. Non-Federal Matching Funds
- iv. Proposed Total Budget
- v. Non-Federal Source Verification (Checkbox)

Use the budget template (provided online) to submit the following information:

- i. Budget by year for the project (FY 2019 and FY 2020, if applicable)
- ii. Budget by cost category:
 - Personnel
 - Travel
 - Equipment
 - Supplies

- Contractual
- Other
 - Total Direct Charges
- Indirect Charges
 - Total Project Costs
- Non-Federal Contributions
 - Cash
 - In-Kind

The template must be saved as an Excel file, and conform to this naming convention: “2019 TCF Budget [Tracking ID #].xlsx”.

c) Technical Summary/Abstract for Public Release (PDF Attachment).

Page Limit: One page.

The project summary/abstract must be suitable for dissemination to the public, and it must not exceed one (1) page. It should be a self-contained document that identifies the name of the applicant; the project director/PI(s); the project title; list of major deliverables; scope and objectives of the project; a description of the project, including major tasks (phases, planned approach, etc.) and methods to be employed; the potential impact of the project (i.e., benefits and outcomes); and major participants (for collaborative projects). This document must not include any proprietary or business-sensitive information because DOE may make it available to the public, if the project is selected for award.

The document must be saved in Portable Document Format (PDF), and conform to this naming convention: “2019 TCF Abstract [Tracking ID #].pdf”.

Section VI: Other Information

A. MODIFICATIONS

Notices of any modifications to this Solicitation will be distributed via email to the points of contact identified in the list in Appendix D.

B. TREATMENT OF PROPOSAL INFORMATION

In general, OTT will use data and other information contained in proposals for evaluation purposes only, unless such information is generally available to the public or is already the property of the Government.

Applicants should not include in their proposals trade secrets or commercial or financial information that is privileged or confidential, unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in this Solicitation. Proposals that contain trade secrets or commercial or financial information that is privileged or confidential—and that the applicant does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation—must be marked as described below. A cover sheet, which does not count against the page limits, must be marked as follows, and must identify the specific pages that contain trade secrets or commercial or financial information that is privileged or confidential.

Notice of Restriction on Disclosure and Use of Data:

“Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential, and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]”

The header and footer of every page that contains trade secrets or privileged commercial or financial information must be marked as follows:

“May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure.”

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

The above referenced markings enable DOE to follow the provisions of 10 CFR 1004.11(d) in the event a Freedom of Information Act (FOIA) request is received for information submitted with a proposal. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under a FOIA request or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

Subject to the specific FOIA exemptions identified in 5 U.S.C. 552(b), all information submitted to OTT by an applicant is subject to public release under the Freedom of Information Act, 5 U.S.C. §552, as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. It is the proposer’s responsibility to review FOIA and its exemptions to understand:

1. What information may be subject to public disclosure; and
2. What information applicants submit to the Government that is protected by law

In some cases, DOE may be unable to make an independent determination regarding which information submitted by a proposer is releasable and which is protected by an exemption. In such

cases, DOE will consult with the proposer, in accordance with 10 C.F.R. §1004.11, to solicit the proposer's views on how the information should be treated.

Appendix A: Eligible DOE Program/Technology Areas

OFFICE OF CYBERSECURITY, ENERGY SECURITY, AND EMERGENCY RESPONSE (CESER)

The Office of Cybersecurity, Energy Security, and Emergency Response (CESER) addresses emerging threats of tomorrow while protecting the reliable flow of energy to Americans today by improving energy infrastructure security and supporting the Department of Energy's (DOE) national security mission. CESER's focus is preparedness and response activities to natural and man-made threats, ensuring a stronger, more prosperous, and secure future for the Nation.

CESER's supports cybersecurity activities in three key areas:

- Strengthening energy sector cybersecurity preparedness
- Coordinating cyber incident response and recovery
- Accelerating research, development and demonstration (RD&D) of game-changing and resilient energy delivery systems

The following technology area within CESER is eligible for TCF funding in FY19:

1. Cybersecurity for Energy Delivery Systems (CE-CEDS)

The vision of CESER's Cybersecurity for Energy Delivery Systems (CEDS) program is that resilient energy delivery systems are designed, installed, operated, and maintained to survive a cyber incident while sustaining critical functions.

CEDS R&D activities are summarized below:

1. Prevent, detect, and mitigate cyber incidents in today's energy delivery systems
 - Decrease the cyber-attack surface and block attempted misuse
 - Decrease the risk of malicious components inserted in the supply chain
 - Enable real-time, continuous cyber situational awareness
 - Automatically detect attempts to execute a function that could de-stabilize the system when the command is issued
 - Characterize cyber incident consequences and automate responses
2. Change the game so that tomorrow's resilient energy delivery systems can survive a cyber incident
 - Anticipate future grid scenarios and design cybersecurity into systems from the start
 - Enable power systems to automatically detect and reject a cyber attack, refusing any commands/actions that do not support grid stability
 - Build strategic partnerships and core capabilities in National Labs
3. Enhanced situational awareness and information sharing

OFFICE OF ELECTRICITY (OE)

The Office of Electricity (OE) provides national leadership to ensure that the Nation’s energy delivery system is secure, resilient and reliable. OE works to develop new technologies to improve the infrastructure that brings electricity into our homes, offices, and factories, and the federal and state electricity policies and programs that shape electricity system planning and market operations. OE does not fund efforts related to the development of generation sources. OE works with private industry and Federal, state, local, and tribal governments on a variety of initiatives to modernize the electric grid and enhance key characteristics of the U.S. electric transmission and distribution systems:

- Reliability—consistent and dependable delivery of high quality power.
- Flexibility—the ability to accommodate changing supply and demand patterns and new technologies.
- Efficiency—low losses in electricity delivery and more optimal use of system assets.
- Resiliency—the ability to withstand and quickly recover from disruptions and maintain critical function.
- Affordability—more optimal deployment of assets to meet system needs and minimize costs.
- Security—the ability to protect system assets and critical functions from unauthorized and undesirable actors.

The following OE Technology Areas are eligible to receive TCF funding in FY 2019:

1. Transmission Reliability and Resilience (OE-TRR). Transmission Reliability and Resilience (TRR) program provides the electric sector with the necessary tools and analyses to assess risks, inform decisions, and improve power system planning and performance including mitigating the risks of large-scale blackouts. TRR is focused on ensuring the reliability and resiliency of the U.S. electric grid through research and development (R&D) concentrated on measurement and control of the electricity system, as well as model development and validation for assessing risks across integrated energy systems. TRR’s mission manifests itself in several key areas:

- a. Advancing electrical engineering through activities in electric grid measurements, models, mathematics, and computation
- b. Developing and validating early-stage proof-of-concept tools intended to enable the electricity system operators and planners to improve reliability, resilience, and security of the system
- c. Enhancing risk-based quantification to improve methods and models used to study power system resilience, recovery, and restoration.

2. Resilient Distribution Systems (OE-RDS). The Resilient Distribution Systems (RDS) program focuses on addressing the challenges facing the electric power grid by developing the innovative technologies, tools, and techniques to enable industry to modernize the distribution portion of the electric delivery system. RDS pursues strategic investments in early-stage research and development of innovative technologies and practices that improve reliability, resilience, outage recovery, and operational efficiency, building upon previous and ongoing grid modernization efforts.

3. Energy Storage (Grid Scale) (OE-ES). Grid scale Energy Storage supports a more resilient, secure, reliable, and economically competitive U.S. energy infrastructure. Energy storage is emerging as an integral component to the grid modernization to provide a diverse range of services including energy management, backup power, load leveling, frequency regulation, voltage support, and grid stabilization. Primarily, the Energy Storage program

focuses on accelerating the development of new materials and device technologies that can lead to significant improvements in the cost and performance of grid scale energy storage systems and accelerated adoption of the energy storage solutions into the grid infrastructure.

4. Transformer Resilience and Advanced Components (OE-TRAC). The Transformer Resilience and Advanced Components (TRAC) program supports modernization, hardening, and resilience of the grid by addressing the unique challenges facing transformers and other critical grid components (grid hardware) that are responsible for carrying and controlling electricity from where it is generated to where it is needed. TRAC addresses the challenges associated with transformers and other grid equipment by focusing on materials research, designs, and concepts that are inherently more secure and resilient.

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY (EERE)

The mission of EERE is to create and sustain American leadership in the transition to a global clean energy economy. Its vision is a strong and prosperous America powered by clean, affordable, and secure energy. The following EERE Program Offices and related Technology Areas are eligible to receive TCF funding in the FY 2019:

1. Advanced Manufacturing (EE-AMO)

Advanced Manufacturing (AMO) supports activities for manufacturing process, information, and materials technologies essential to the efficient and competitive domestic manufacturing of energy products and to support energy productivity across the entire U.S. manufacturing sector. While AMO's mission encompasses a broad range of novel manufacturing and material technologies, it focuses research and development (R&D) efforts on crosscutting, platform technologies relevant to manufacturing in multiple energy fields, and lowers scientific uncertainty that would otherwise limit the subsequent demonstration, adoption and use of the new knowledge gained through R&D; thus ensuring that new energy technologies invented in the United States ultimately result in the domestic manufacture of energy products. For additional information, please see

https://www.energy.gov/sites/prod/files/2017/01/f34/Draft%20Advanced%20Manufacturing%20Office%20MYPP_1.pdf

Specific areas of interest include:

1. Advance cost effective technologies for process heating or drying that improve the properties of manufactured products, and develop alternative, low thermal budget technologies that reduce the energy requirements of materials processing. Process heating operations supply thermal energy needed to transform materials into a wide variety of commodities and end-use consumer products. Over 7 quads of manufacturing energy use annually are related to processes heating (70% of all process energy use), with approximately 36% of that energy lost as waste heat, accounting for over 2,500 TBtu annually. Energy for process heating equipment (e.g., furnaces, heat exchangers, evaporators, kilns, and dryers) can be provided by electricity, steam, and fuels such as natural gas, coal, biomass, and fuel oils. Advances in process heating technologies can lower manufacturing energy and emissions and associated costs, and also enable the manufacture of improved materials, technologies, and products. Key opportunity industries include the petroleum refining, chemicals, forest products, iron and steel, and food and beverage manufacturing industries, which collectively account for more than 80% of all process heating energy use in U.S. manufacturing. However, because process heating operations and systems are used throughout manufacturing, improvements would benefit a wide range of industries. Targets include: 1) Develop low-thermal-budget manufacturing technologies that reduce energy intensity (energy consumed per unit of physical output) by at least 50% compared to 2019 typical technology; 2) Develop advanced process heating unit operations that provide improved properties, quality, and/or product value at cost parity to conventional techniques. See <https://www.energy.gov/sites/prod/files/2016/06/f32/QTR2015-6I-Process-Heating.pdf> for additional information.
2. Advance technologies for waste heat recovery systems that enable the cost-effective capture and use of energy from industrial waste heat in order to reduce overall energy demands of manufacturing facilities. The most energy-intensive industries provide the greatest potential for waste heat recovery. Sectors with significant waste heat recovery potential include aluminum, cement, chemicals, coatings, food, glass, iron and steel, petroleum refining, and paper industries. Also needed are advanced technologies that improve materials, devices, and systems that directly convert energy from one form to another (e.g., waste heat to electricity), in order to realize lifecycle energy efficiency benefits on an economically effective basis. For thermal energy applications, direct thermal energy conversion (DTEC) technologies are in various stages of maturity, and include phase-change, caloric, thermo-acoustic-piezoelectric, thermionic, thermophotovoltaic, and thermoelectric material systems. Targets include: 1) Develop material and system advancements to enable greater recovery from high-temperature (>650°C) and heavily

contaminated industrial waste heat streams, and cost-effectively utilize 30% of available waste heat in this temperature range; 2) Develop enabling technologies for low maintenance, high reliability recovery systems for industrial waste heat streams, and reduce payback period by at least 30% compared to existing systems in various temperature ranges; 3) Develop innovative, cost-effective systems to recover heat from low-temperature (<230°C) waste heat sources and successfully utilize 20% of available waste heat in this temperature range. See <https://www.energy.gov/sites/prod/files/2016/02/f30/QTR2015-6M-Waste-Heat-Recovery.pdf> for additional information.

2. Bioenergy Technologies (EE-BETO)

The Bioenergy Technologies Office (BETO) focuses on early- and mid-stage applied research and development (R&D) to strengthen the body of knowledge enabling industry to demonstrate and deploy sustainable bioenergy technologies capable of producing price-competitive biofuels and bioproducts from non-food sources of biomass such as wastes and agricultural residues, and from energy crops like switchgrass, and algae. The Office's primary focus is on R&D to produce "drop-in" biofuels that are compatible with existing fueling infrastructure and vehicles across a range of transportation modes, including renewable-gasoline, -diesel, and -jet fuels. The Office also supports early stage R&D on converting biomass into high-value chemicals and products that can enhance the economics of biofuel production and improve energy security by displacing demand for oil imports and supplementing domestic oil.

For the FY2019 Technology Commercialization Fund (TCF) call, BETO encourages proposals in the following mission areas:

1. **Integrated Bioprocessing Technologies**
Pathways to produce fuels, products or power from biomass rely on process unit operations that must be effectively integrated into complex systems that operate reliably and consistently. This mission area seeks to advance robust process technologies toward commercial demonstration. Process technologies of interest include advanced separations, online sensors for property measurement, model-based process control and process intensification strategies.
2. **Design Solutions and Selection of Material of Construction of Equipment for Long Term use with Biomass and Bio-intermediates.**
This mission area seeks the development/extension of equipment design procedures and material characterization methods employed from current refinery practices to include constituents comprised of biomass and bio-intermediates. This area seeks to develop detailed understanding of the materials used in current equipment as well as corrosion and wear issues from biomass and bio-intermediates in real-world conditions in order to develop solutions.
3. **First Generation Ethanol Biorefinery Process Technology**
First generation (starch based corn ethanol) refineries have the potential to co-produce advanced biofuels and/or bioproducts from corn fiber. This mission area seeks to develop value-adding process technologies for the existing corn ethanol infrastructure.
4. **Innovations in Biomass Processing and Supply Chains**
This mission area seeks to further develop advances made in the Feedstock Supply and Logistics program that contribute to reproducible and repeatable feedstocks delivery that meets the quality, quantity, and cost targets of biorefineries.
5. **Conversion of Wet Waste and Biosolids to Generate Clean Fuel, Reduce Waste to Landfill and Reduce GHG Emissions**
This aligns with BETO's continued focus on accelerating the economic and innovative conversion of wet waste feedstocks, including biosolids (a significant environmental issue in many areas) to biofuels and bioproducts.

6. Technology Development for the Achievement of Industrially Relevant Titrers and/or Expression Levels of Recombinant Proteins in Photosynthetic Algae
This mission area seeks to complement research in the Advanced Algal Systems program, which focuses on increasing algae productivity through the use of advanced biological tools to develop enhanced strains and cultivation practices.
7. Technologies Borne from BETO-funded DOE National Laboratory Led Consortia. BETO has developed and initiated five major lab-led consortia. Technologies that arise from the R&D conducted by these BETO-funded consortia are appropriate and relevant for TCF funding:
 - Agile BioFoundry (ABF)
 - Chemical Catalysis for Bioenergy (ChemCatBio)
 - Separations for Bioenergy (BioESep)
 - Feedstock-Conversion Interface Consortium (FCIC)
 - Co-Optimization of Fuels and Engines (Co-Optima)
8. Advancements in Analytical Methods or Instrumentation
This aligns with the need to develop, standardize, and implement efficient, reliable, and affordable wet chemical and calibrated rapid analytical methods to measure biomass quality characteristics for woody and herbaceous biomass, algal biomass, biosolids and other waste streams, and the resulting process intermediates. Methods and instrumentation also are lacking for quickly, accurately, and economically measuring the chemical, physical, and mechanical properties of these materials. The ability to characterize these materials through online, industrially relevant methods will enable the development of predictive process models, robust and integrated processes, and the associated process controls.
9. Open Topic
Lastly, BETO seeks to encourage DOE national laboratories to submit TCF proposals for any BETO-funded work that has commercial relevance, has an interested industrial partner willing to provide cost-share to develop the national laboratory technology, and furthers BETO's goals.

3. Building Technologies (EE-BTO)

Building Technologies (BTO) supports R&D of innovative building energy technologies such as lighting, space conditioning and refrigeration, windows and envelope and their effective integration into efficient, resilient, grid-interactive, and secure building systems. The ultimate goal is to reduce the average energy use per square foot of all U.S. buildings by 50% from 2010 levels and overcome the high degree of fragmentation across the heterogeneous buildings industry spanning construction to appliance and equipment manufacturing.

The following areas will participate in the FY2019 TCF:

1. Solid-State Lighting. Solid-State Lighting continues to drive innovations in LED and OLED core technologies (i.e., down converters, stable white OLEDs), product development (i.e., LED package development, low-cost OLED electrodes), and manufacturing (i.e., LED test equipment, OLED materials manufacturing).
2. Heating, Ventilation, and Air Conditioning (HVAC), Water Heating, and Appliances. The focus is on the introduction of new heat pumping technologies, new ways of moving heat around. This includes pursuing both vapor compression and non-vapor compression technologies including several crosscutting technologies research areas: heat exchanger research, compressor research, refrigerant research (Low-GWP solutions), motors, integrated energy storage, and materials joining technologies. R&D priorities include developing integrated systems that combine end uses and exploring new or different next-

generation components to find the best possible cost-effective combination, separate sensible and latent cooling AC system (SSLC) offering significant increases in the overall performance of cooling/dehumidification systems compared to conventional vapor-compression air-conditioning systems, and non-vapor compression technologies (no refrigerants, saving energy while reducing environment burdens).

1. **Natural Gas.** BTO's direct-use natural gas R&D is focused on stage fuel-driven very highly efficient equipment for the residential buildings sector. The priority is on innovative solutions that reduce the energy consumption of natural gas and other fuel-driven (propane as well as other alternative fuels) equipment with a coefficient of performance (COP) greater than 1.0. This includes all associated sub-components that impact the performance and cost of fuel-driven equipment, directly or indirectly. A system approach is required for all proposals since the final system's efficiency performance and cost is greatly impacted by the total system configuration.
2. **Building-to-Grid (B2G).** In coordination with the DOE Grid Modernization Initiative, BTO supports R&D in the development of technologies and technology packages that enable thermal energy storage and/or load flexibility to provide improved efficiency of the integrated energy system or extend the service life of utility and building assets. The B2G portfolio includes sensors and controls R&D supporting the design, research, and development of low-cost and fully automated building sensors and controls systems that will improve data collection, monitoring, end-use control and optimization of building energy use. This includes multifunction plug-and-play wireless sensor networks, occupant-centric sensors and controls, granular equipment-level sub-metering, and adaptive and autonomous controls. In addition to ensuring anticipated energy savings through building automation are realized, the subprogram seeks to facilitate effective integration with the evolving electric grid, reduced electricity costs for building owners and tenants, and improved comfort for occupants.
3. **Windows.** R&D efforts are focused on developing next-generation, energy-efficient windows technologies that reduce the amount of energy lost through fenestration, contribute to improved occupant comfort, and have low product and installation costs. Technologies must dramatically reduce thermal losses (U values of 0.15 and lower), and/or actively modulate and control solar load (variable solar heat gain coefficient 0.08 to 0.50 range or greater) to minimize summer cooling and offset winter heating, maximize effective use of daylight to offset electric lighting, while providing outside ventilation air displacing mechanical ventilation whenever possible.
4. **Building Envelope.** R&D efforts are concentrated on cost-effective technologies that include insulation materials for retrofitting walls and commercial building roofing systems, air-sealing technologies that simultaneously prevent the uncontrolled flow of heat, air, and moisture, and diagnostic tools for state and extent estimation.

4. Fuel Cell Technologies (EE-FCTO)

The **Fuel Cell Technologies Office (FCTO)**^e is a key component of the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) portfolio. Hydrogen can be produced from diverse domestic resources, such as natural gas, oil, coal, and biomass, as well as from renewables using methods such as direct or indirect water splitting. Fuel cell electric vehicles using hydrogen can achieve significantly higher efficiencies than combustion engines resulting in overall less energy use. In addition to transportation applications, hydrogen and fuel cell technologies can also serve stationary applications improving energy security and reliability by providing responsive back-up power and other electric and fuel distribution services. Thus, fuel cell and hydrogen technologies are an option that enables American energy dominance through safely and efficiently harnessing domestic resources.

^e FCTO website: <http://energy.gov/eere/fuelcells/fuel-cell-technologies-office>

FCTO addresses key technical challenges for both fuel cells and hydrogen fuels (i.e., hydrogen production, delivery and storage). Light duty vehicles are an emerging application for fuel cells that has earned substantial commercial and government interest worldwide due to the superior efficiencies, reductions in petroleum consumption, and reductions in criteria pollutants possible with fuel cells. Fuel cell electric vehicles (FCEVs) reduce petroleum consumption by about 95% in comparison to conventional light duty vehicles when the hydrogen is produced from natural gas.^f The areas identified in this Lab Call will enable progress toward commercializing light duty FCEVs. Recent analyses project that, if DOE cost targets for FCEVs are met, U.S. petroleum consumption can be reduced by over one million barrels per day.^g

The central mission of FCTO is to stimulate the U.S. economy and global competitiveness by reducing dependence on foreign oil imports and establishing a domestic power and fuel industry using efficient, reliable clean energy technologies through early stage research and technology development. Fuel cells can address our critical energy challenges in all sectors - commercial, residential, industrial, and transportation.

The following FCTO programs will participate in the FY2019 TCF Lab Call:

1. The **Hydrogen Delivery program** provides the industrial gas sector with technologies to reduce the costs of cross-country gas transport, along with the costs and reliability of hydrogen dispensing into niche applications, such as hydrogen fueling stations for fuel cell vehicles. R&D areas of interest within the Delivery program include:
 - a. Lowering the energy consumption and enhancing the scalability of hydrogen gas liquefaction through early-stage applied research (TRL 3) on alternatives to conventional mechanical cycles, such as discovery and use of magnetocaloric materials.
 - b. Enhancing reliability and lowering costs of hydrogen fueling station components through early-stage applied research (TRL 3) on pressure vessel materials and designs, non-mechanical approaches to compression, and development of high-strength polymers and high-accuracy meters (<1.5%) for hydrogen dispensers.
 - c. Lowering the costs of high-pressure hydrogen pipelines through R&D in areas such as microstructural engineering of novel materials, and mechanical evaluations of fiber reinforced polymer.
 - d. Development of components for high-throughput hydrogen compressors through R&D on high-strength materials and component designs, to reliably enable enhancements in hydrogen pipeline capacities.

2. The **Safety, Codes and Standards (SCS) program** supports R&D that provide experimentally validated foundational understanding of the relevant physics, critical data, and safety information needed to define requirements for technically sound and defensible codes and standards. In addition, SCS aims to enable the safe deployment of hydrogen and fuel cell technologies, based on sound and traceable technical and scientific data and analysis. R&D areas of interest within the Safety, Codes and Standards program include:
 - a. Enhancing the reliability and lowering the cost of hydrogen sensing technologies, including safety sensors, contaminant detectors and metrology devices for use in hydrogen fueling stations as well as for other related applications.

^f https://www.hydrogen.energy.gov/pdfs/16004_life-cycle_ghg_oil_use_cars.pdf

^g https://www.hydrogen.energy.gov/pdfs/16021_ghg_emissions_petroleum_reduction_from_fc.pdf

5. Geothermal Technologies (EE-GTO)

Geothermal Technologies (GTO) supports the effort to commercialize lab developed technologies which can accelerate the deployment of geothermal energy. As part of the FY 2019 Technology Commercialization Fund, GTO seeks to fund projects that align with one or more of the following:

1. Enhanced Geothermal Systems (EGS) is focused on technologies that enable the creation of an engineered geothermal reservoir where there is hot rock but little to no natural permeability or fluid saturation present in the subsurface. Activities of interest include facilitating characterization of local stress, stimulation technologies that improve permeability, and fluid and thermal pathways evolution through space and over time; allowing for economic access to the subsurface thermal resource, while ensuring wellbore integrity over multi-decadal timeframes; and enabling sustainable operation, which involves achieving sufficient productivity for power generation without excessive pressure build up or localization and decrease of flow.
2. Hydrothermal seeks to find new and innovative approaches to exploration that facilitate finding and accessing not yet discovered or “blind” hydrothermal systems. These approaches can include advanced methods to combine various data sets (such as gravity, seismic, and magnetelluric data, among others) to that reduce upfront exploration risk; improvements to drilling technologies that will reduce the cost of accessing the subsurface through abrasive, crystalline rock formations at elevated temperatures and pressures; new technologies that reduce costs for exploration activities such as microhole drilling applications, self-healing cements, subsurface imaging; alternatives to hydraulic fracturing that reduce, or eliminate, the use of water for fracturing and stimulation activities; or other activities that support any of the four subsurface R&D pillars of wellbore integrity, subsurface stress and induced seismicity, permeability manipulation, and new subsurface signals.
3. Low Temperature and Coproduced Resources supports the development of geothermal resources below a temperature of 300°F (150°C) as well as geothermal resources that can be co-developed with existing well-field infrastructure and other clean energy technologies. Activities of interest including thermal desalination processes, mineral recovery from geothermal brines, hybrid systems that pair geothermal with other energy technologies, and direct use of thermal resources for process and space heating applications (including ground source heat pumps). Also of interest are technologies that enable geothermal resources to provide energy storage, flexible generation, and other grid services.
4. GTO also supports the development of general tools that identify and address barriers to geothermal adoption in the United States.

6. Solar Energy Technologies (EE-SETO)

The U.S. Department of Energy Solar Energy Technologies Office (SETO) supports research and development to improve the flexibility and performance of solar technologies that contribute to a reliable and resilient U.S. electric grid. The office invests in innovative research efforts that advance SETO Program Goals to securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs.

The following SETO programs will participate in the FY2019 TCF Lab Call:

1. Photovoltaics:

SETO supports the research and development of photovoltaic (PV) technologies that improve efficiency and reliability, lower manufacturing costs, and drive down the cost of solar electricity. The program funds innovative concepts and experimental designs across a range of materials that have the potential to make solar energy among the least expensive forms of energy available by reaching a levelized cost of energy of \$0.03 per kilowatt-hour. The PV subprogram is particularly interested in proposals to advance inherently scalable devices and manufacturing that show the potential to rapidly increase capacity with reduced capital cost requirements.

Notable PV technology areas of interest include:

- [Crystalline Silicon](#)
- [Cadmium Telluride \(CdTe\)](#)
- [Copper Indium Gallium Diselenide \(CIGS\)](#)
- [Earth-Abundant Materials](#)
- [Hybrid Organic-Inorganic Halide Perovskite](#)
- [Multijunction \(III-V\)](#)
- [Organic](#)

2. Concentrating Solar Power:

SETO supports the development of novel CSP technologies that will lower cost, increase efficiency, and improve reliability compared to current state-of-the-art technologies. These projects explore new operation system designs and innovative concepts in the collector, receiver, thermal storage, heat transfer fluids, and power cycle subsystems that advance the state-of-the-art. The SETO CSP subprogram is most interested in transformative concepts with the potential to break through existing performance barriers, such as efficiency and temperature limitations.

3. Systems Integration:

SETO supports research that advances the reliable, resilient, secure, and affordable integration of solar energy onto the U.S. electric grid through its systems integration subprogram. The systems integration subprogram collaborates with other program offices as part of the Department of Energy's [Grid Modernization Initiative](#) crosscutting research efforts to ensure our country's grid is capable of introducing much more solar generation. The systems integration subprogram focuses on five research areas to enable seamless integration of solar energy onto a modernized electric grid:

- a. [Planning and Operation](#) – Understanding the impacts of increasing penetration of solar energy on grid reliability and power quality and addressing the variability of solar generation and two-way power flows.
- b. [Solar + X](#) – Developing best practices for interconnecting and integrating solar with energy storage and synergistic distributed energy resource technologies to achieve higher asset and utilization and value.
- c. [Power Electronics](#) – Researching power electronic technologies such as smart photovoltaic inverters for flexible power flow control.
- d. [Sensing and Communication](#) – Enhancing situational awareness of solar generation at the grid edge using advanced information, communication, and data analytic technologies.
- e. [Codes and Standards](#) – Informing the standardization of interconnection, interoperability, and cybersecurity for photovoltaics and other distributed energy resource systems.

4. Balance Of System:

The SETO balance of system subprogram works to address challenges associated with non-hardware costs of solar and remove market barriers to the adoption of solar energy technologies throughout the United States. The soft costs subprogram works in the following strategic areas: [networking and technical assistance](#), [data analysis](#), [business innovation](#), and [training](#).

7. Vehicle Technologies (EE-VTO)

The **Vehicle Technologies Office (VTO)** supports research of innovative energy technologies for the efficient and secure transportation of people and goods across America. R&D efforts are focused on reducing the cost and improving the performance of a broad portfolio of advanced vehicle technologies such as electrification, including advanced battery technologies and electric drive systems; advanced combustion engines and fuels, including co-optimized systems; advanced materials for lighter-weight vehicle structures and better powertrains; and energy efficient mobility technologies and systems, including connected and autonomous vehicles as well as innovations in connected infrastructure for significant energy efficiency improvement.

The following VTO program areas will participate in the FY2019 TCF Lab Call

1. **The Battery and Electrification Technologies** subprogram primarily supports R&D to identify new battery chemistry and cell technology with the potential to reduce the cost of electric vehicle batteries by more than half to less than \$100/kWh and increase the range to 300 miles while decreasing the charge time to less than 15 minutes by 2028. The activity also supports the development of technologies to improve power density and lower cost for electric drive systems.
 - a. Advanced Battery Materials Research focuses on early-stage R&D of new materials that offer a significant improvement in either energy or power and have the potential to achieve the DOE battery cost target of \$100/kWh and be capable of charging in 15 minutes or less.
 - b. Advanced Battery Cell R&D focuses on R&D for new battery cell technology that contains new materials and electrodes that can reduce the overall battery cost, weight, and volume while improving energy, life, safety, and fast charging.
 - c. Electric Drive Research focuses on R&D for high power density motor and power electronics that have the potential to enable radical new vehicle architectures by dramatic volume/space reductions and increased durability and reliability. Research includes reducing the volume of electric traction drive systems using high-density integration technologies; leveraging high performance computing for modeling and optimization; utilizing new materials for high-density electric motors; and innovations concerning the integration of power electronics and electric motors to form electric traction drive systems.
2. **The Advanced Combustion and Fuels** program supports R&D to improve understanding of, and ability to manipulate, combustion processes, generating knowledge and insight necessary for industry to develop the next generation of engines and fuels. Approached as a system, fuels, engines, and emission control (exhaust aftertreatment) can be optimized together using a science-based understanding to increase efficiency and vehicle fuel economy. The program pursues areas of research that include:
 - a. Research on advanced combustion strategies such as low temperature combustion, dilute gasoline combustion, and clean diesel combustion with potential for high efficiency and very low engine-out emissions. Experimental combustion research to establish quantitative relationships between in-cylinder processes (fuel injection, air mixing, and combustion), emissions formation, and efficiency improvement potential. Predictive high fidelity models are developed to simulate the fundamental physics of combustion phenomena to achieve results comparable to detailed experiments. Numerical routines are developed for models that can reduce the computational time to enable high fidelity engine models as viable engine design tools for industry.
 - b. Research of fuel properties to determine fuel characteristics that enable higher efficiency advanced combustion approaches such as spark and multi-mode spark ignition/compression ignition regimes. Performance tailored blendstocks, including bio-derived, synthetic and petroleum-based blend stocks could further increase engine efficiency as well. Co-optimization of fuels and engines will focus on advanced conventional and kinetically controlled engine technologies with advanced fuels that enable maximum engine performance.
 - c. control research will focus on catalysts that are active at the lower exhaust temperatures, namely those that provide greater than 90% emission reduction efficiency at about 150°C, addressing barriers such as catalyst activity, selectivity, durability, and cost effectiveness.
3. **The Materials Technology** program enables increased fuel efficiency through lightweight materials for automotive structures and powertrains including advanced materials for high-efficiency engines. Research is focused in two areas
 - a. Improved properties, manufacturability, computational materials science, and enabling technologies, such as joining of dissimilar materials, carbon fiber composites, advanced high-strength steels, aluminum alloys, and magnesium alloys.
 - b. Powertrain-specific technology gaps, such as improved materials properties under high temperature and pressure, to enable out-year powertrain materials requirements.

4. The **Energy Efficient Mobility Systems** program conducts research to identify and develop system-level transportation technologies and innovations that enable an increase in *mobility energy productivity*, or the value derived from the transportation system in terms of cost, convenience, reliability, and accessibility, per unit of energy consumed. The program's research activities focus on both passenger and freight mobility, and include:
 - a. Advanced transportation system modeling and simulation tools to evaluate and understand the energy and mobility implications of emerging technologies such as automated vehicles and vehicle-to-vehicle/vehicle-to-infrastructure communication, and mobility-as-a-service solutions such as ride-hailing and car-sharing.
 - b. High-performance computing-based approaches to large-scale real-time mobility system optimization using vehicle- and infrastructure-based transportation data.
 - c. Advanced technology R&D to develop technology solutions that lead to energy efficiency and mobility benefits, including hardware devices, software solutions, control systems, advanced sensors, and other components that reduce transportation system energy use while enhancing mobility for individuals and businesses.

8. Water Power Technologies (EE-WPTO)

The Water Power Technologies Office (WPTO), which includes hydropower and marine and hydrokinetic (MHK) energy, conducts early-stage research and development to strengthen the body of scientific and engineering knowledge enabling industry to develop and deploy new technologies with the potential to increase hydropower and MHK generation. As part of the FY 2019 Technology Commercialization Fund, WPTO seeks to fund projects that align with its two subprograms:

1. The **Hydropower** subprogram is aligned to the roadmap in the Hydropower Vision, which set forth priority pathways identified by industry, environmental groups, and other hydropower stakeholders as the necessary steps to realize the full potential benefits of hydropower in the U.S. These pathways involve strengthening the body of knowledge that enables industry to develop and deploy new technologies, quantify the value of grid reliability services, address regulatory requirements, and maintain and improve the sustainability of U.S. hydropower assets. WPTO targets both critical technology development challenges currently limiting hydropower generation, as well as research and analysis to improve understanding of how hydropower can contribute to the reliability of the grid. Examples of important technology challenges include reducing the site-specific costs of construction, powerhouse design/installation, and environmental mitigation for new hydropower at non-powered dams and greenfield sites; turbine designs that generate more power at given water flows or increase operational ranges with reduced impacts for existing hydropower facilities; reducing the operations and maintenance costs associated with more impactful modes of operation for grid stabilization; and novel closed-loop pumped storage designs that can be deployed at a wider range of sites and minimize or eliminate environmental impacts.
2. The **MHK** subprogram is committed to investment in R&D that allows the domestic MHK industry to advance and achieve cost competitiveness. This will be accomplished by focusing early-stage research on design concepts that have potential to increase energy capture and annual energy production of devices, improve reliability and availability, and reduce capital and operating/maintenance costs if further developed and deployed by industry. A major programmatic focus is on controls research, where studies have shown that advances can provide significant increases (on the order of 200-300%) in energy capture. Controls strategies and technologies are also being leveraged from other industries (e.g. aerospace, defense) that can maximize power production over a range of ocean conditions. Other priorities include improving and validating modeling tools and methodologies needed to optimize device and array performance and reliability across operational and extreme conditions, and investigating new approaches for safe and cost efficient installation, grid integration, operations, maintenance, and decommissioning of

MHK projects. Recent R&D efforts also include focus on niche applications such as serving remote coastal communities with high electricity costs, charging for ocean-based sensors and underwater vehicles, and non-electric uses like desalination that could provide industry with opportunities to develop and deploy MHK technologies in the near-term.

9. Wind Energy Technologies (EE-WETO)

The following Wind Energy Technologies (WETO) area will participate in the FY2019 TCF Lab Call:

- **Wind Technology Research, Development and Testing and Resource Characterization (RD&T and RC)** aims to reduce the levelized cost of energy (LCOE) for U.S. land-based, offshore, and distributed wind systems to complement traditional electricity sources for the nation. Optimize the cost and performance of the wind plant as an integrated system rather than focusing on the component or turbine level. To address key cost drivers—capital costs, O&M costs, annual energy production (AEP), and financing rates—and improve the performance and reliability of the wind plant overall, Wind Tech RD&T and RC invests in a range of parallel and complementary research and development (R&D) activities to inform wind turbine technology innovations—including those that enable higher hub heights, larger rotors, and improved wind plant energy capture—to provide the opportunity for significant growth in U.S. wind power and U.S. industry competitiveness.

OFFICE OF FOSSIL ENERGY (FE)

The Office of Fossil Energy Research and Development (FER&D) advances transformative and innovative technologies that enable the reliable, efficient, affordable, and environmentally sound use of fossil fuels. Fossil energy sources constitute over 80% of the country's total energy use, and are important to the nation's security, economic prosperity, and growth. These efforts encompass the development of advanced energy systems, crosscutting fossil energy research, advanced Carbon Capture Utilization and Storage (CCUS) technologies. Additionally, FER&D conducts research related to the prudent and sustainable development of domestic oil and gas resources, with a focus on natural gas technologies and unconventional resources.

The following FER&D areas will participate in the FY2019 TCF Lab Call:

1. **Advanced Energy Systems (FE-AES)** includes new technology applications (i.e., pulse combustion, flameless combustion, topping cycles) at both new and existing plants. Also included is research on advanced turbines that can withstand new stresses placed on the sector by the need for demand-response performance, on materials for solid oxide fuel cells and advanced modular gasification systems.
2. **Cross-cutting Research (FE-CCR)** includes work in advanced materials, computational science, and advanced analytical tools, with particular attention to high pressure/high temperature applications. R&D consists of low-cost and reliable multi-sensing sensors capable of detecting temperature, gas species and pressure that—with additional development and scale-up by industry—could ultimately be capable of providing real-time measurements critical to the operation, optimization, reliability and efficiency of the next-generation of fossil fueled power systems. Crosscutting Materials focuses on efforts to use computational tools to discover and design novel materials for fossil fuel applications. Also included is research and development on REE (rare earth elements) recovery from coal or coal by-products.
3. **Carbon Capture (FE-CC)** includes transformational carbon capture technologies such as, but not limited to, non-aqueous solvents, advanced membranes, sorbents, and cryogenic systems. that can significantly reduce the cost of capture from fossil fuel-fired power plants and industrial facilities. Transformational capture systems are considered to be a set of disruptive technologies that can significantly reduce the cost of capture. In addition to post-combustion capture, it also supports pre-combustion R&D that focuses on CO₂ separation from syngas. Applications are sought that develop transformational materials and integrated processes of multiple novel technologies to reduce the cost of capture from coal fired power plants and industrial sources such that the cost of capture and compression to supercritical conditions is below \$30/tonne. Applications that test on natural gas flue gas must describe how the technology supports the development of the same technology for the coal industry. Technology development for industrial sectors not related to the fossil fuel industry will not be considered.
4. **CO₂ Utilization (FE-CU)** includes transformational technologies that convert CO₂ to valuable products and or commodities including, but not limited to, building products, chemicals and fuels, and polymers. Technologies such as mineral carbonation, catalysis, or other technologies to reduce CO₂ to CO or convert directly to products are of interest. Carbon Utilization technologies could be part of a revolution in the manufacturing industry to benefit from the vast resource of carbon dioxide available from the power and industrial sector. Technologies must be able to create carbon based products that are economically competitive, have an overall carbon lifecycle better than similar products in the market and be environmentally sustainable. Applications shall not assume free renewable electricity and hydrogen as part of their lifecycle and economics. Market prices for energy and other

feedstocks such as hydrogen must be assumed to be purchased from the existing markets. Applications that test on natural gas flue gas must describe how the technology supports the development of the same technology for the coal industry. Technology development for industrial sectors not related to the fossil fuel industry will not be considered.

5. **Carbon Storage (FE-CS)** includes the development of technologies that ensure safe, secure, efficient and affordable CO₂ injection and containment in storage complexes in diverse geologic settings. Applications are sought to develop new or advance existing tools, sensors, techniques, and procedures for either on- and offshore that improve wellbore materials and integrity sensing and monitoring, increase reservoir storage efficiency, improve characterization of faults and fracture networks, improve management of reservoir pressure, confirm permanent storage, and identify and mitigate the risk or onset of potential environmental impacts such as leakage or induced seismicity. Approaches that apply machine learning and advanced computational methods are encouraged. Of particular interest are technologies that can improve performance, lower cost, uncertainty and risk in the context of an integrated storage complex management system.
6. **Natural Gas Technologies (FE-NGT)** includes the development of advanced pipeline and Natural Gas infrastructure technologies to aid in cleaner and more effective oil and gas development. R&D of technologies in targeted areas such as advanced materials and coatings, and sensor research and development will improve the operational efficiency of natural gas transmission, distribution, and storage facilities. Additional efforts will support the research and development of natural gas conversion technologies.
7. **Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies (FE-UFET)** investigates technical subsurface dynamics that can contribute to game-changing increases in recovery factor from the typical single-digit range. Research areas of interest focus on: increasing ultimate recovery including new technologies and/or approaches that can enable or accelerate dramatic improvements in drainage volume, and per well resource recovery efficiency; measurements and prediction of seismic events, and/or changes in subsurface stress associated with reservoir stimulation and/or injection and production activities within formations that will provide scientific insights into the relationships, if any, between operational activities and induced seismicity; and, new, integrated, and cost effective treatment options for multiple contaminants and recovery of value-added products from produced water from multiple plays and regions.

OFFICE OF NUCLEAR ENERGY (NE)

The Department of Energy's (DOE) Office of Nuclear Energy (NE) conducts crosscutting nuclear energy research and development (R&D) and associated infrastructure support activities to develop innovative technologies that offer the promise of dramatically improved performance for advanced reactors and fuel cycle concepts while maximizing the impact of DOE resources. The following NE areas will participate in the FY 2019 TCF Lab Call:

1. Fuel Cycle Research and Development (NE-FCRD).

The mission of the FC R&D program is to develop used nuclear fuel management strategies and technologies to support meeting the federal government responsibility to manage and dispose of the Nation's commercial used nuclear fuel and high-level waste and to develop sustainable fuel cycle technologies and options that improve resource utilization and energy generation, reduce waste generation, enhance safety, and limit proliferation risk.

The program's vision is that by mid-century, strategies and technologies for the safe, long-term management and eventual disposal of U.S. commercial used nuclear fuel and any associated fuel cycle technologies that enhance the accident tolerance of light-water reactors and enable sustainable fuel cycles are demonstrated and deployed. Together, these technologies and solutions support the enhanced availability, affordability, safety, and security of nuclear-generated electricity in the United States.

Current challenges include the development of high burn-up fuel and cladding materials to withstand irradiation for longer periods of time with improved accident tolerance; development of simplified materials recovery technologies, waste management (including storage, transportation, and disposal), and proliferation risk reduction methods; and development of processes and tools to evaluate sustainable fuel cycle system options, and to effectively communicate the evaluation results to stakeholders.

2. Reactor Concepts Research, Development, and Demonstration (NE-RCRDD).

The RC RD&D program conducts research and development (R&D) on existing and advanced reactor designs and technologies to enable industry to address technical challenges with maintaining the existing fleet of nuclear reactors and to promote the development of a robust pipeline of advanced reactor designs and technologies and supply chain capabilities. Program activities are designed to address technical, cost, safety, and security issues associated with the existing commercial light water reactor fleet and advanced reactor technologies, such as small modular reactors (SMRs), fast reactors using liquid metal coolants and high temperature reactors using gas or liquid salt coolants.

3. Nuclear Energy Advanced Modeling and Simulation (NE-NEAMS).

The mission of the NEAMS program is to accelerate early-stage development of advanced reactor concepts and enable improved economics of new and existing designs, by providing leading-edge computational tools to U.S. industry. The primary program objective is to develop and deploy these predictive tools and methods to industry, academe, and government, including the Nuclear Regulatory Commission (NRC), for research, analysis, design and regulatory acceptance of advanced reactor and fuel cycle systems. These advanced computational tools employ scalable simulation methods on high performance computing architectures in combination with a science-based, mechanistic approach to physics modeling to allow scientists and engineers to better understand reactor materials properties and coupled phenomena in nuclear energy systems. Consequently these tools span length scales from atomic to mesoscale to continuum, and time scales from picoseconds to seconds to days, and are currently being used to move certain advanced reactor concepts forward to commercialization in several key ways, including design optimization, which is required to fully realize the economic and technological advantages of those concepts. NEAMS capabilities also support development of advanced nuclear fuels, design and analysis of

nuclear fuel experiments, and expansion of NRC confirmatory analysis capabilities in the advanced reactor area.

4. Nuclear Energy Enabling Technologies (NEET) Crosscutting Technology Development (CTD) (NE-NEETCTD).

The NEET CTD program conducts R&D in crosscutting technologies that directly support and enable the development of new and advanced reactor designs and fuel cycle technologies. These technologies will advance the state of nuclear technology, improve its competitiveness, and promote continued contribution to meeting our Nation's energy and environmental challenges. The activities undertaken in this program complement those within the RC RD&D and FC R&D programs and support the Department of Energy's (DOE) Office of Nuclear Energy's (NE) mission to advance U.S. nuclear power in order to meet the nation's energy needs by: 1) enhancing the long-term viability and competitiveness of the existing U.S. reactor fleet; 2) developing an advanced reactor pipeline, and, 3) implementing and maintaining the national strategic fuel cycle and supply chain infrastructure. The knowledge generated through these activities will allow NE to address key challenges affecting nuclear reactor and fuel cycle deployment with a focus on crosscutting innovative technologies.

Appendix B: TCF Match and Non-Federal Match Information

Matching

The terms “matching” and “cost sharing” are often used synonymously and can create confusion. OTT uses the terms “matching” and “non-Federal match” to ensure consistency with Section 1001 of EAct 2005, which authorized the establishment of the Technology Commercialization Fund (TCF). For the TCF, “match” or “matching funds” means that for each dollar of TCF funding provided, a dollar of non-Federal funds is required. Because there is a one-for-one match required for TCF funds, the TCF will never contribute more than 50% of the total cost of any project. It is possible for the non-Federal match to exceed the funding contributed by the TCF, if the DOE site or private partner wishes to provide more than 50% of the total project cost.

What Qualifies for Non-Federal Matching

It is not possible to explain what specifically qualifies for the non-Federal match in one or even a couple of sentences. Please consult the Federal Acquisition Regulations (FAR) or the rules for Federal Financial Assistance at 2 CFR 200 for information about which costs are allowable. In addition, matching non-Federal costs may not be counted if they are paid by the Federal Government under another award.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted.

Additionally, DOE generally does not allow pre-award costs for either Federal cost match or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, DOE generally does not allow pre-award costs prior to the signing of the Selection Statement by the DOE Selection Official.

DOE Financial Assistance Rules 2 CFR Part 200 as amended by 2 CFR Part 910

As stated above, the rules about what is allowable are generally the same within like-types of organizations. The following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

- A. Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the Prime Recipient's non-Federal match if such contributions meet all of the following criteria:
 1. They are verifiable from the recipient's records.
 2. They are not included as contributions for any other Federally-assisted project or program.
 3. They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.
 4. They are allowable under the cost principles applicable to the type of entity incurring the cost.
 5. They are not paid by the Federal Government under another award unless authorized by Federal statute.
 6. They are provided for in the approved budget.

- B. Valuing and documenting contributions.
 1. Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize

depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as non-Federal matching funds, that full value must be the lesser or the following:

- a) The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
 - b) The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.
2. Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.
 3. Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as non-Federal matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.
 4. Valuing property donated by third parties.
 - a) Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the non-Federal match share must be reasonable and must not exceed the fair market value of the property at the time of the donation.
 - b) Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:
 - i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
 - ii. The value of loaned equipment must not exceed its fair rental value.
 5. Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:
 - a) Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.
 - b) The basis for determining the valuation for personal services and property must be documented.



Appendix C: TCF Final Report Template

Final TCF Report for
Click here to enter project title.

Click here to enter TCF tracking Number (TCF-1X-XXXXX).

Click here to enter name(s) of author(s).

Click here to enter month and year (of final report).

Prepared for the
U.S. Department of Energy
Office of Technology Transitions

**Note: This template is current as of October 2018.
Please contact OTT (TCF@hq.doe.gov) for an updated
version before beginning a final report.**

DISCLAIMER

This information was prepared as an account of work sponsored by an agency of the U.S. Government. Neither the U.S. Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness, of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. References herein to any specific commercial product, process, or service by trade name, trade mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof.

[Click here to enter Project Title](#)
[Click here to enter TCF tracking Number \(TCF-1X-XXXXX\).](#)

PROJECT INFORMATION

TCF Tracking Number: [Click here to enter TCF Tracking Number \(TCF-1X-XXXX\).](#)
Start Date: [Click here to enter a date.](#) **Completion Date:** [Click here to enter a date.](#)
Point(s) of Contact at DOE Facility: [Click here to enter name\(s\) of POC\(s\) at DOE Facility](#)

Partner(s) and Point(s) of Contact (if applicable): [Click here to enter name\(s\) of partner organization\(s\) and POC\(s\) there, if applicable.](#)

Type of partnership agreement used (if applicable) (e.g., CRADA, ACT, contract): [Click here to enter type of partnership agreement used \(if applicable\).](#)

Funding Table

Year	TCF Funding		Matching Funding	
	Planned	Actual	Planned	Actual
1	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX
2 (if applicable)	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX
Total	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX	\$XXX,XXX

Click here to enter Project Title
Click here to enter TCF tracking Number (TCF-1X-XXXXX).

Source of TCF funding
Check box(es) to indicate which DOE Program Office(s) funded your project

Office of Cybersecurity, Energy Security, and Emergency Response (CESER)

- Cybersecurity for Energy Delivery Systems (FY19)

Office of Electricity (OE) (Office of Electricity and Energy Reliability FY16-FY18)

- Clean Energy Transmission and Reliability (FY16; FY17)
 Cybersecurity for Energy Delivery Systems (FY17)
 Energy Storage (FY16; FY17)
 Energy Storage (Grid Scale) (FY18; FY19)
 Resilient Distribution Systems (FY18; FY19)
 Smart Grid Research and Development (FY16; FY17)
 Transformer Resilience and Advanced Components (FY19)
 Transmission Reliability (FY18; FY19)

Office of Energy Efficiency and Renewable Energy (EE)

- | | |
|---|---|
| <input type="checkbox"/> Advanced Manufacturing (FY16; FY17; FY18; FY19) | <input type="checkbox"/> Solar Energy Technologies (FY16; FY17; FY18; FY19) |
| <input type="checkbox"/> Bioenergy Technologies (FY16; FY17; FY18; FY19) | <input type="checkbox"/> Vehicle Technologies (FY16; FY17; FY18; FY19) |
| <input type="checkbox"/> Building Technologies (FY16; FY17; FY18; FY19) | <input type="checkbox"/> Water Power Technologies (FY16; FY17; FY18; FY19) |
| <input type="checkbox"/> Fuel Cell Technologies (FY16; FY17; FY18; FY19) | <input type="checkbox"/> Wind Energy Technologies (FY16; FY17; FY18; FY19) |
| <input type="checkbox"/> Geothermal Technologies (FY16; FY17; FY18; FY19) | |

Office of Fossil Energy (FE)

- Advanced Energy Systems (FY16; FY17; FY18; FY19)
 Carbon Capture (FY16; FY17; FY19)
 Carbon Capture and Utilization (FY18)
 Carbon Storage (FY16; FY17; FY18; FY19)
 CO2 Utilization
 Coal R&D (FY16; FY17)
 Cross-cutting Research (FY16; FY17; FY18; FY19)
 Natural Gas Technologies (FY16; FY17; FY18; FY19)
 Supercritical Transformation Electric Power (STEP) R&D (FY16; FY17)
 Unconventional Fossil Energy Technologies (FY16; FY17)
 Unconventional Fossil Energy Technologies from Petroleum – Oil Technologies (FY18; FY19)

Office of Nuclear Energy (NE)

- Fuel Cycle Research and Development (FY16; FY17; FY18; FY19)
 Nuclear Energy Advanced Modeling and Simulation (FY18; FY19)
 Nuclear Energy Enabling Technologies (FY16; FY17)
 Nuclear Energy Enabling Technologies (NEET) Crosscutting Technology Development (CTD) (FY18; FY19)
 Reactor Concepts R&D (FY16; FY17)
 Reactor Concepts Research, Development and Demonstrations (FY18; FY19)
 Supercritical Transformation Electric Power (STEP) R&D (FY16; FY17)

[Click here to enter Project Title](#)
[Click here to enter TCF tracking Number \(TCF-1X-XXXXX\).](#)

Scope and Objective

[Click here to enter text describing the project scope and objectives.](#)

PROJECT ACCOMPLISHMENTS

Benefit to DOE

[Click here to provide a brief summary of the benefits derived from the project \(e.g., new subject inventions, new project partners, additional partner contributions\).](#)

[Reference Appendix A as needed.](#)

Market Viability

[Click here to describe state of market viability at project inception and project completion.](#)

Generated Data and Reports

[Click here to list journal articles, reports, etc.](#)

Path Forward

[Click here to discuss anticipated next steps toward commercialization \(12-18 month horizon\).](#)

Click here to enter Project Title
 Click here to enter TCF tracking Number (TCF-1X-XXXXX).

APPENDIX A: CLOSEOUT CHECKLIST

Yes	No	N/A	Check the appropriate response) to the following statements:
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All proposed work identified under the project and all outstanding issues have been completed and/or resolved.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Partner(s) (if applicable) has been notified of the completion of the project and established date of completion.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Protected CRADA Information has been stamped, when appropriate, in accordance with the CRADA and DOE Facility policy.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Funding Program Office notified of completion, and established date of completion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Office of Technology Transitions notified of completion, and established date of completion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Remaining funds dispositioned

CONSTRAINTS/EXTERNAL INFLUENCES

If the activity was unsuccessful, select one or more of the following reasons.

- | | |
|--|---|
| <input type="checkbox"/> Technical or manufacturing problems | <input type="checkbox"/> Changes in market conditions |
| <input type="checkbox"/> Funding Availability | <input type="checkbox"/> Competing Technology |
| <input type="checkbox"/> Personnel Changes | <input type="checkbox"/> Legislative/Regulatory Impacts |
| <input type="checkbox"/> Work Scope Changes | <input type="checkbox"/> Changes in Partner Objectives |
| <input type="checkbox"/> Other (please specify): Click here to enter text. | |

FOLLOW-ON ACTIVITIES

If applicable, check the box(es) below to identify follow-on activity that resulted from your project. In the adjacent column enter a number to indicate how many of each. (e.g., CRADAs # 2 indicates that your project resulted in two follow-on CRADAs.)

Activity	Number of instances	Activity	Number of instances
<input type="checkbox"/> CRADAs	# Click here to enter #.	<input type="checkbox"/> Licenses	# Click here to enter #.
<input type="checkbox"/> Cost-shared Contracts	# Click here to enter #.	<input type="checkbox"/> Copyrights	# Click here to enter #.
<input type="checkbox"/> Invention Disclosures	# Click here to enter #.	<input type="checkbox"/> Reimbursable SPP	# Click here to enter #.
<input type="checkbox"/> Technical Assistance	# Click here to enter #.	<input type="checkbox"/> Use of Facilities	# Click here to enter #.
<input type="checkbox"/> Patent Applications	# Click here to enter #.		

Did your project receive any awards (e.g., R&D 100)? No Yes
[Click here to list awards your project received.](#)

[Click here to enter Project Title](#)
[Click here to enter TCF tracking Number \(TCF-1X-XXXXX\).](#)

Acknowledgements

Signatures below indicates the following:

1. The Partner(s) (if applicable) has reviewed the final report and concurs with the statements made therein.
2. The Partner (if applicable) agrees that any modifications from the initial proposal were discussed and agreed to during the term of the project.
3. The Partner (if applicable) certifies that all reports either complete or in process are listed and all subject inventions and the associated intellectual property protection measures attributable to the project have been disclosed or are included on a list attached to this report.

Click here to enter PI's Name.		Click here to enter today's date
P.I. Name	Signature	Date

Click here to enter TTO's name.		Click here to enter today's date
Facility Tech Transfer Officer	Signature	Date

Appendix D: TCF Points of Contact (POCs)
at DOE National Laboratories and Facilities

Facility	TCF Points of Contact
The Ames Laboratory	Stacy Joiner sjoiner@ameslab.gov 515-294-5932 Julienne Krennrich jmkrenn@ameslab.gov 515-294-1202
Argonne National Laboratory	Hemant Bhimnathwala hbhimnathwala@anl.gov 630-252-2354 David McCallum dsm@anl.gov 630-252-4338 Suresh Sunderrajan ssunderrajan@anl.gov 630-252-8111
Brookhaven National Laboratory	Erick Hunt ehunt@bnl.gov 631-344-2103 Martin Schoonen, mschoonen@bnl.gov 631-344-4014
Fermi National Accelerator Laboratory	Thomas K. Kroc kroc@fnal.gov 630-840-6955 Cherri J. Schmidt cherri@fnal.gov 630-840-5178
Idaho National Laboratory	Lisa Aldrich lisa.aldrich@inl.gov 208-569-0405. Mark Kaczor mark.kaczor@inl.gov 208-526-1340.
Kansas City National Security Campus	Andrew Myers amyers@kcp.com 816-488-4432 Michele Weigand Mweigand@kcp.com 816-488-6725

Facility	TCF Points of Contact
Lawrence Berkeley National Laboratory	<p>Shanshan Li shanshanli@lbl.gov 510-486-5366</p> <p>Elsie Quaiter-Randall equaiterandall@lbl.gov 515-486-7234</p>
Lawrence Livermore National Laboratory	<p>Rich Rankin Rankin8@llnl.gov 925-423-9353</p> <p>Mike Sharer Sharer1@llnl.gov 925-422-9839</p>
Los Alamos National Laboratory	<p>Kathleen Mcdonald kathleen_m@lanl.gov 505-667-5844</p> <p>MaryAnn D. Morgan mary_ann@lanl.gov 505-667-5324</p> <p>Antonio Redondo redondo@lanl.gov 505-667-9738</p>
National Energy Technology Laboratory	<p>Jessica Lamp jessica.lamp@netl.doe.gov 412-386-7417</p> <p>Michael Nowak michael.nowak@netl.doe.gov 412-386-6020</p>
National Renewable Energy Laboratory	<p>Eric Payne eric.payne@nrel.gov 303-275-3166</p> <p>Jennifer Ramsey jennifer.ramsey@nrel.gov 303-275-4435</p>
Nevada National Security Site	<p>Robert Koss kossrj@nv.doe.gov (702) 295-1213</p> <p>Matthew Pasulka pasulkmp@nv.doe.gov (702) 295-2963</p>

Facility	TCF Points of Contact
Oak Ridge National Laboratory	<p>Nestor E. Franco francone@ornl.gov 865-574-0534</p> <p>Michael J. Paulus 865-574-1051 paulusmj@ornl.gov</p>
Pacific Northwest National Laboratory	<p>Lee Cheatham robert.cheatham@pnnl.gov 509-375-6597</p> <p>Ron Thomas ron.thomas@pnnl.gov 509-372-6042</p>
Pantex Plant	<p>Jeremy Benton jeremy.benton@cns.doe.gov 865-241-5981</p>
Princeton Plasma Physics Laboratory	<p>Laurie Bagley lbagley@pppl.gov 609-243-2425</p> <p>Aileen Pritch apritch@pppl.gov 609-243-2245</p>
Sandia National Laboratories	<p>Liz Hillman elucero@sandia.gov 505-206-8434</p> <p>Mary Monson mamonso@sandia.gov 505-844-3289</p> <p>Rene Sells rmgonza@sandia.gov 505-844-2882</p>
Savannah River National Laboratory	<p>Matthew J. Biasiny matthew.biasiny@srnl.doe.gov 803-725-0406</p> <p>Jennifer Holroyd jennifer.holroyd@srnl.doe.gov 803-725-8482</p>
SLAC National Accelerator Laboratory	<p>Mark Hartney Mhartney@slac.stanford.edu 650-926-4805</p> <p>Evan Elder eelder@slac.stanford.edu 650-926-3580</p>

Facility	TCF Points of Contact
Thomas Jefferson National Accelerator Facility	Deborah Dowd dowd@jlab.org 757-269-7180 Drew Weisenberger drew@jlab.org 757-269-7090
Y-12 National Security Complex	Jeremy Benton Jeremy.Benton@cns.doe.gov 865-241-5981