U.S. Department of Energy
Office of Clean Energy Demonstrations

FY2025 Project and Portfolio Analysis Support
NATIONAL LABORATORY CALL FOR PROPOSALS

This Lab Call is being issued by the U.S. Department of Energy's Office of Clean Energy Demonstrations (OCED)

FY25 OCED Analysis Laboratory Call

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Introduction

Background

The Office of Clean Energy Demonstrations (OCED) was established in December 2021 to help scale the emerging technologies needed to tackle our most pressing climate challenges and achieve net zero emissions by 2050. OCED is managing more than $27 billion in funding to deliver clean energy demonstration projects at scale in partnership with the private sector to accelerate deployment, market adoption, and the equitable transition to a decarbonized energy system.

OCED builds confidence in the private sector by addressing technical, commercial, social, and other risks experienced in first-of-a-kind (FOAK) demonstrations at scale for clean energy technologies, and it plays a key role in DOE's mission to ensure America's security and prosperity. These FOAK demonstrations will create new facilities and retrofit existing facilities that will continue operating well beyond the period of federal funding. Demonstrating these energy solutions will resolve critical commercial adoption risks, ensuring bankability, marketability, and replicability – as well as providing tangible and meaningful community benefits. These demonstrations will also strengthen domestic manufacturing and supply chains for these vital technologies, creating good jobs across the nation and enhancing national competitiveness and security.

A driver for creating OCED was for it to be a center of excellence for large-scale demonstrations and project management oversight. To advance the Department's ability to manage complex projects, OCED will develop strong capabilities for project management oversight and use phased approaches that align with and leverage industry best practices to manage portfolio risk from project development through operations. A core aim of OCED demonstration projects is to rapidly reduce the technical, economic, and systemic uncertainties associated with precommercial technology, including techno-economic performance, life cycle impacts, market acceptance, safety, regulatory, and community, workforce, and energy justice issues. Effectively adopting projects of this kind requires robust due diligence, including independent assessments overseeing the dissemination of techno-economic and other data to show progress and impacts and catalyze private sector adoption.

The National Laboratories can play a critical role in supporting the successful demonstration of FOAK technologies. The subject matter expertise, facility capabilities, modeling and analysis tools, and convening power of the National Laboratories can support OCED and its broad-reaching portfolio of projects in identifying and overcoming technical, market, regulatory, and other challenges to deploying clean energy technologies. Additionally, OCED can harness the National Laboratories existing body of work in targeted technology development expertise, applied R&D programs and related resources, such as data and modeling tools, to accelerate the R&D feedback loops and amplify progress against barriers to commercial deployment.

The topics in the OCED Analysis Lab Call begin to lay the foundation for longer term activities at

the National Laboratories tied to OCED's growing project portfolio and long-term strategy. With over $27 billion (Federal funds) in project investments, OCED will be collecting and analyzing valuable datasets for a variety of purposes such as baselining and tracking project-level techno-economic analysis, life cycle assessments, community benefits, proformas, project and portfolio risk management, state-of-technology updates, updated cost and performance targets, markets and energy outlook, regulatory and policy implications, and more.

For more information on OCED's priorities, please see the OCED Multi-year Program Plan (MYPP) and the Pathway to Commercial Liftoff series.

Process and Funding

All topics in this OCED Analysis Lab Call will be competitively selected. Topics will leverage both existing capabilities and drive development of new analysis capabilities that address the specific challenges faced by scaling up clean energy demonstration projects in OCED's portfolio. In some cases, following review of concept papers, OCED may request that individual respondents collaborate to provide more integrated and comprehensive support. More details on the review criteria can be found in the "Concept Paper Review Criteria" section below.

OCED Timeline

Task	Date(s):
Release lab call to labs	March 29, 2024
Feedback sessions (Hybrid Webinars)	April 23-24, 2024
Concept papers + slide decks due	June 13, 2024 at 5:00 pm EST
Formal feedback sessions	Week of July 15, 2024
Revised CP, teaming, and budget	August 23, 2024
Initial funding decisions	September 6, 2024

Table 1. Lab Call: At-a-Glance with Anticipated Annual funding (starting in FY25)

Topics	Anticipated # of awards	FY25	FY26	FY27
1. OCED techno-economic analysis standards and tools	1-4	$4M-$8M	$4M-$8M	$4M-$8M
2. OCED support for quantifying and verifying life cycle environmental impacts	4-7	$5M-$9M	$5M-$9M	$5M-$9M
3. Quantification of socioeconomic impacts	1-4	$1-$1.5M	$1-$1.5M	$1-$1.5M
4. Security	1-3	$1M	$1M-$2M	$1M-$2M
5. Rapid response technical support	1-2	$2M	$2M	$2M

6. Assessment and Mapping of Current and Future Hydrogen and Carbon-related Infrastructure	1	$2M-$4M	$2M-$4M	$2M-$4M
7. Alternative Fuels and Energy Carriers in Context for the U.S.	1	$500k-$1M	$500k-$1M	
8. Clean Hydrogen "State of the Market" Reporting and Economic Scenario Modeling	1	$1M-$2M	$1M-$2M	$1M-$2M
9. Energy Markets and Grid Midterm Regional Outlook (3-10 years)	1	$500k-$1M	$500k-$1M	$500k-$1M
10. Data Management	1	Up to $5M *(funding to come from Topics 1-5)*	Up to $5M *(funding to come from Topics 1-5)*	Up to $5M *(funding to come from Topics 1-5)*

Concept Paper Review Criteria

Concept Paper Evaluation Criteria

- Technical Merit (40%): The proposed work is relevant to OCED's FOAK demonstration portfolio, builds off existing capabilities and/or fills a significant gap in an area aligned with OCED's analysis needs. This criterion will be evaluated primarily based on sections 1: Problem Overview, 2: Project Objectives and 3: Technical Description.
- Project Approach (30%): The applicant clearly describes the analysis capabilities and approach, and the analysis approach is appropriate to meet the identified objectives. This criterion will be evaluated primarily based on section 4: Project Structure/Approach.
- Team & Budget Suitability (30%): The team leadership and management for the proposed work includes the appropriate qualifications, experience, capabilities, and other resources (e.g., equipment, personnel, partnerships, etc.) necessary to complete the proposed scope of work in partnership with OCED. The team can manage firewalls and conflicts of interest appropriately to be able to access OCED data sets. For scopes of work that leverage external partnerships, the applicant has submitted strong letters of commitment. The budget of the proposal is appropriate for the proposed scope and delineated budget of the topic/subtopic.

Concept Paper Guidance, Concept Slide Decks and Feedback Sessions

- Concept papers should be no more than three pages per subtopic/area of interest. Cover page, references, and letters of commitment/support do not count toward the page limit.
    - The cover page should include the project title, the specific Lab Call subtopic/area of interest being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality. The cover page is not included in the page limit.
    - 1) The Project Overview should provide a concise background for the proposed effort that addresses the background of the opportunity or issue addressed, barriers and how the project will address them, and how this project's approach differs from (and/or continues) existing projects funded by DOE (as applicable). If this is a multi-performer project, this section should include a description of each performer's role and responsibility.
    - 2) The Project Objectives should describe the project-specific goals, objectives, and expected outcomes, and the critical success factors in achieving that goal.
    - 3) The Technical Description should provide a description of the proposed work and its feasibility, including the principles and objectives that will be pursued during the project. Details on the technical aspects of the goals, objectives, and outcomes should be included in this section to explain the specific technical areas to be addressed.
    - 4) The Project Structure/Approach should include key milestones, with one go/no-go decision annually. Key tasks should be listed with brief descriptions for each task, including roles for the team and responsibilities of any partners. An initial cost estimate (total) for each major task group should be provided. For most topics/subtopics, OCED is seeking to initiate an ongoing, foundational effort of analysis support that goes beyond 1 year of effort to support its growing project portfolio. In those topics/subtopics, the Labs should use Table 1 for FY25 and outyear planning.
    - Concept papers should be submitted to OCED Exchange by 5:00 PM Eastern Time on

6/13/2024. Please use .docx format and title files according to "Lead laboratory – Subtopic or Area of Interest Number – Short title". For example, "OCED – 1.1 – TEA Example Project.docx".

- For concept slide decks:
  - Labs may submit only one concept slide per subtopic/area of interest.
  - Concept slides should be submitted to OCED Exchange by 5:00 PM Eastern Time on 6/13/2024. Please use .pptx format and title files according to "Lead laboratory – Subtopic or Area of Interest Number – Short title". For example, "OCED – 1.1 – TEA Example Project.pptx".
- For feedback sessions (hybrid webinars):
  - DOE will host a hybrid info session over zoom and in-person at DOE headquarters at the Forrestal Building in Washington, D.C. on April 23-24, 2024
  - The info session will provide an overview of the application process and a description of each topic area
  - Time will be allotted for feedback and questions from the national labs for each topic area
  - Additional information with the time, conference room, and zoom link will be posted on the landing page on OCED Exchange.
- For formal feedback sessions:
  - Formal feedback sessions will be held over Teams and in-person at DOE headquarters at the Forrestal Building in Washington, D.C on the week of July 15, 2024
  - Notes collected during the formal feedback sessions will be collated and provided to the labs before formal feedback sessions take place
  - Labs should prepare a 10-minute presentation focused on merit review criteria. Presentations should be limited to 3-5 slides that cover scope of work, breakdown of team and budget, and response to written feedback. Note that presentations need not cover National Lab background not directly related to proposed lab activities.
  - Clarifying information with time and links will be posted on the landing page on Exchange.
- For revised concept papers, teaming and budget:
  - Applicants will be expected to incorporate feedback from formal feedback sessions to update concept papers, including refined teaming and budget documentation. These updates will be submitted via OCED Exchange
  - Because of the structure of OCED Exchange, applicants will submit these updated concept papers and supporting documents as full applications in Exchange.

Note: Partnerships between National Laboratories (Labs) are strongly encouraged where it supports the technical merit, approach, team suitability, and budget for the analysis project. Proposals that include partnerships outside of the Labs are required to include a letter of commitment from each external party, with an estimate of the amount of time and budget they will allocate to the project. As appropriate by topic and subtopic, Labs are expected in most cases to be able to leverage OCED data sets from projects in its portfolio and related market intelligence. Labs are expected to be able to install necessary firewalls and manage COIs/NDA to access these data sets. Labs are expected to identify whether any other data resources (such as additional industry data or RD&D data from related DOE offices) involved

in the proposal are existing and/or will be collected.

Labs are encouraged to email questions and comments about this Lab Call to OCEDAnalysisLabCall@hq.doe.gov. Please seek to consolidate comments and questions within team for AOIs or by labs for overall feedback. Early questions will be used to help inform initial feedback sessions.

Topic 1: OCED Techno-Economic Analysis (TEA) Standards and Tools

Background: A key step in achieving OCED's goals is developing analytical tools and standards to facilitate a quantified understanding of the economic viability of projects and technologies within OCED's portfolio to make internal decisions and to share externally to amplify progress and spur more private-sector momentum. Here, we seek proposals that center around the techno-economic and financial performance of awarded projects in support of OCED's portfolio of clean energy demonstrations. Proposals that seek to address all four TEA areas of interest in one proposal are encouraged. Moreover, it is the intent of OCED to integrate the strongest responses across areas of interest into a single, collaborative TEA topic area award to ensure consistency of performance. OCED may have additional tasks for TEA support outside of these areas of interest over time targeted at other programs within OCED.

A key element of producing relevant analysis will be the identification, collection, storage, and management of data sets which serve as analysis inputs. In keeping with OCED's mission of commercialization and market adoption, it is critical that analytic results, as well as aggregated, anonymized, and enriched data sets, be efficiently accessible to a variety of stakeholders, securely and subject to robust governance to protect confidentiality. Proposals for a given TEA area of interest should include a plan and infrastructure as needed to manage the associated data. Alternatively, data management support may be submitted as a separate concept paper to Topic 10, but budget should be adjusted accordingly for concept papers to Topic 1. OCED will need to consider the efficacy, scale, and cost of the proposed data infrastructure as well as its ability to integrate with other OCED data and analytics capabilities, e.g. cloud, mesh, marketplace, catalog. The cost of this infrastructure should be delineated as a component of the total cost.

OCED recognizes both that analysis and data management for a given technology must be closely aligned to expertise in that technology. However, approaching each technology as a fully distinct task is also likely to result in duplicative work and will limit the ability to consolidate views across technologies to inform broader strategy. Proposals should seek to address both of these concerns.

Areas of Interest: Three areas of interest (AOIs) have been identified under Topic 1:

- TEA for hydrogen production, transport, storage and end-use projects
- TEA for carbon management projects, including direct air capture and point source carbon capture, across OCED's portfolio
- TEA for industrial demonstration projects
- TEA for long duration energy storage (LDES), renewables and nuclear

Estimated Budget: $4M – 8M
Estimated Number of Awards: 1-5
Expected Project Duration: 3 years

Note of funds:
OCED has allocated $4M-8M in funds for FY25 Topic 1. In FY24, OCED will select from meritorious proposals to make selections for FY25, with expected funding continuation through FY27.

Area of interest 1.1: TEA for OCED's Hydrogen Production, Transport, Storage and End-use Projects

Details: Provide technical support to OCED to consistently evaluate the financial performance of hydrogen projects in OCED's portfolio in a manner that has high fidelity and is rapidly executable. OCED is looking for proposals to help refine standards that recipients must follow when performing and documenting TEA and develop tools to enable OCED to validate and use recipient provided TEA information to perform further analysis. Specific areas of interest include (but are not exclusive to):

1. Identification of TEA standards (techniques and metrics) that should be utilized when evaluating financial performance of commercial deployments.
2. Development and enhancement of TEA modeling tools to facilitate user-friendly, rapid, scenario and sensitivity analyses across the hydrogen supply chain (production, transportation, storage and end-uses). Proposals that focus on end-use sectors or regional variability are highly encouraged. Proposals that build on the functionality of existing tools (e.g. by incorporating higher resolution features or additional metrics) are also encouraged to apply. Proposals that duplicate existing resources will not be successful.[1]
3. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of TEA/performance estimates.
4. Sector- and technology-oriented analytics which enable generalized insights based on analysis of awarded projects.
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses. Recommendations/guidance should include a data gap assessment.
6. Recommendations/guidance for data collection, storage, and stewardship of project data including recommendations for how to work with recipients to ensure that proprietary data concerns do not unduly hamper OCED's ability to leverage project data.
7. Integration of real-world data to refine assumptions in model results.

Guidance: Prospective teams should demonstrate expertise in hydrogen system technology and economics, including tax credits/ incentives. We also seek innovative, user-friendly approaches to provide dynamic and flexible scenario and sensitivity modeling. More information on DOE's Regional Clean Hydrogen Hubs can be found here, however lab support will include all hydrogen projects in OCED's portfolio. Potential deliverables include a 1.) Definition of key input/critical performance data and TEA standards for different asset types, 2.) Project-level TEA support capturing and integrating critical input and performance data 3) Flexible TEA tools that can be both used internally and published to facilitate commercialization grounded in real world data and approach from OCEDs projects, or develop interoperability between existing tools used to develop TEAs, e.g., GREET, H2FAST, H2Lite, GCAM, etc., 4) Multi-project assessments for clustered or inter-connected projects and 5) Analysis of system expansion options or opportunities for hydrogen hubs to understand how investments can be leveraged to facilitate sectoral growth. Work may include hydrogen projects across OCED's portfolio, not exclusively in support of the Regional Clean Hydrogen Hubs program.

Area of interest 1.2: TEA for Carbon Management Projects, Including Direct Air Capture and Point Source Carbon Capture, Across OCED's Portfolio

Details: Provide high fidelity, rapidly executable technical support to OCED to consistently evaluate

[1] For all modeling, assumptions should be fully transparent (e.g., time-matching power, sourcing natural gas and performance variability related to climate/weather conditions).

the financial performance of OCED projects using carbon management (Direct air capture, point source capture, CO2 transport and storage) technology. OCED is looking for proposals to help refine standards that recipients must follow when performing and documenting TEA, and develop tools to enable OCED to validate and use recipient provided TEA information to perform further analysis. Specific items of interest include (but are not exclusive to):

1. Identification of TEA standards (techniques and metrics) that should be utilized when evaluating financial performance of commercial deployments.
2. Development and enhancement of TEA modeling tools to facilitate user-friendly, rapid, scenario and sensitivity analyses for the project economics/financials of carbon management projects. If proposing technology specific process models, those models should estimate the composition and conditions of carbon capture system emission streams, including impacts on criteria air pollutants and emergent/secondary pollutants, e.g., ammonia and amines. Proposals that build on the functionality of existing tools (e.g. by incorporating higher resolution features or additional metrics) are also encouraged to apply. Proposals that duplicate existing resources will not be successful.[2]
3. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of TEA/performance estimates.
4. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses. Recommendations/guidance should include a data gap assessment.
6. Recommendations/guidance for data collection, storage, and stewardship of project data including recommendations for how to work with recipients to ensure that proprietary data concerns do not unduly hamper OCED's ability to leverage project data.
7. Integration of real-world data to reduce uncertainty in model results.

Guidance: Prospective teams should demonstrate expertise in carbon management system technology and economics, including tax credits/ incentives. We also seek innovative, user-friendly approaches to provide dynamic and flexible scenario and sensitivity modeling. More information on OCED's DAC and point source capture programs can be found here. Potential deliverables include a 1.) Definition of key input/critical performance data and TEA standards for different asset types, 2.) Project-level TEA support capturing and integrating critical input and performance data and 3) Flexible TEA tools that be both used internally and published to facilitate commercialization grounded in real world data and approach from OCEDs projects, or develop interoperability between existing tools used to develop TEAs.

Area of interest 1.3: TEA for Industrial Demonstration Technologies

Details: Provide high fidelity, rapidly executable technical support to OCED to consistently evaluate the financial performance of OCED projects in energy intensive industries including cement manufacturing, aluminum, iron and steel, glass, pulp and paper, and chemicals and refining. OCED is looking for proposals to help refine standards that recipients must follow when performing and documenting TEA for these technologies, and develop tools to enable OCED to validate and use recipient provided TEA information to perform further analysis. Specific items of interest include

[2] For all modeling, assumptions should be fully transparent (e.g., time-matching power, sourcing natural gas and performance variability related to climate/weather conditions).

(but are not exclusive to):

1. Identification of TEA standards (techniques and metrics) that should be utilized when evaluating financial performance of commercial deployments.
2. Development/enhancement of TEA modeling tools to facilitate user-friendly, rapid, scenario and sensitivity analyses for the project economics/financials for technologies aligned to projects selected for OCED's Industrial Demonstrations Program. Proposals that build on the functionality of existing tools (e.g. by incorporating higher resolution features or additional metrics) are also encouraged to apply. Proposals that duplicate existing resources will not be successful.[3]
3. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of TEA/performance estimates.
4. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses. Recommendations/guidance should include a data gap assessment.
6. Recommendations/guidance for data collection, storage, and stewardship of project data including recommendations for how to work with recipients to ensure that proprietary data concerns do not unduly hamper OCED's ability to leverage project data.
7. Integration of real-world data to reduce uncertainty in model results.

Guidance: Prospective teams should demonstrate expertise across major sectors and technology solutions for decarbonizing sectors outlined in the Industrial Decarb Liftoff report series (i.e., iron & steel, aluminum, glass, chemicals & refining, cement, pulp & paper, food & beverage) and the Industrial Decarbonization Roadmap. Similarly, applicants should demonstrate familiarity with underlying project economics, including relevant tax credits/ incentives. We also seek innovative, user-friendly approaches to provide dynamic and flexible scenario and sensitivity modeling. More information on OCED's industrial decarbonization programs can be found here. Potential deliverables include a 1.) Definition of key input/critical performance data and TEA standards for different asset types, 2.) Project-level TEA support capturing and integrating critical input and performance data and 3) Flexible TEA tools that can be both used internally and published to facilitate commercialization grounded in real world data and approach from OCEDs projects.

Area of interest 1.4: TEA for Long Duration Energy Storage, Renewables and Nuclear

Details: Provide high fidelity, rapidly executable technical support to OCED to consistently evaluate the financial performance of OCED projects using LDES, renewable electricity and/or nuclear energy technologies. OCED is looking for proposals to help refine standards that recipients must follow when performing and documenting TEA for these technologies, and develop tools to enable OCED to validate and use recipient provided TEA information to perform further analysis. Specific items of interest include (but are not exclusive to):

8. Identification of TEA standards (techniques and metrics) that should be utilized when evaluating financial performance of commercial deployments.
9. Identification/development/enhancement of TEA modeling tools to facilitate user-friendly, rapid, scenario and sensitivity analyses for the project economics/financials for LDES and

[3] For all modeling, assumptions should be fully transparent (e.g., time-matching power, sourcing natural gas and performance variability related to climate/weather conditions).

Renewables projects and components of projects within OCED's portfolio. Proposals that build on the functionality of existing tools (e.g. by incorporating higher resolution features or additional metrics) are also encouraged to apply. Proposals that duplicate existing resources will not be successful.[4]

10. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of TEA/performance estimates.
11. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
12. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses. Recommendations/guidance should include a data gap assessment.
13. Recommendations/guidance for data collection, storage, and stewardship of project data including recommendations for how to work with recipients to ensure that proprietary data concerns do not unduly hamper OCED's ability to leverage project data.
14. Integration of real-world data to reduce uncertainty in model results.

Guidance: Prospective teams should demonstrate expertise in LDES, renewables and/or nuclear energy technology and economics, including tax credits/ incentives. Teams may apply to this AOI for either LDES and renewables, or nuclear, or both. We also seek innovative, user-friendly approaches to provide dynamic and flexible scenario and sensitivity modeling. More information on OCED's LDES and Renewables programs can be found on OCED's website here, with additional information on nuclear projects to follow. Potential deliverables include a 1.) Definition of key input/critical performance data and TEA standards for different asset types, 2.) Project-level TEA support capturing and integrating critical input and performance data and 3) Flexible TEA tools that be both used internally and published to facilitate commercialization grounded in real world data and approach from OCEDs projects, or develop interoperability between existing tools used to develop TEAs.

[4] For all modeling, assumptions should be fully transparent (e.g., time-matching power, sourcing natural gas and performance variability related to climate/weather conditions).

Topic 2: OCED Support for Quantifying and Verifying Life Cycle Environmental Impacts

Background: A key step in achieving DOE's decarbonization goals is quantifying and verifying the greenhouse gas (GHG) emissions, air quality impacts, and water impacts of OCED's awarded projects throughout their development and execution. Here, we seek concept papers that center around quantifying the full life cycle[5] environmental impacts of awarded projects in support of OCED's portfolio of clean energy demonstrations and the Justice 40 initiative.

Essential to producing relevant analysis will be the identification, collection, storage, and management of data sets which serve as analysis inputs. In keeping with OCED's mission of commercialization and market adoption, it is critical that analytic results, as well as aggregated, anonymized, and enriched data sets, be efficiently accessible to a variety of stakeholders, securely and subject to robust governance in order to protect confidentiality. Proposals for a given subtopic should include a plan and infrastructure as needed to manage the associated data. Alternatively, data management support may be submitted as a separate concept paper to Topic 10, but budget should be adjusted accordingly for concept papers to Topic 2. OCED will need to consider the efficacy, scale, and cost of the proposed data infrastructure as well as its ability to integrate with other OCED data and analytics capabilities, e.g. cloud, mesh, marketplace, catalog. The cost of this infrastructure should be delineated as a component of the total cost.

OCED recognizes both that analysis and data management for a given technology must be closely aligned to expertise in that technology. However, approaching each technology as a fully distinct task is also likely to result in duplicative work and will limit the ability to consolidate views across technologies to inform broader strategy. Proposals should seek to address both of these concerns.

Topics: Four subtopics have been identified under Topic 2:

- Life cycle assessment (LCA) Support for Decarbonization Technologies
- Emissions Monitoring, Reporting, and Verification
- Water Impacts of Awarded Projects
- Air Quality Impacts of OCED Programs.

Note that it is the intent of OCED to integrate the strongest responses across the areas of interest within subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance. Moreover, OCED may have additional tasks for LCA support outside of these subtopics over time targeted at other programs within OCED.

Note of funds:
OCED has allocated $5M-9M per year for Topic 2 covering all four subtopics for at least a three-year arc of work. This scope of work may continue beyond the initial three years, depending on the team's performance and remaining needs to support OCED's portfolio.

Subtopic 2.1: LCA Support for Decarbonization Technologies

Details: This subtopic seeks proposals that will provide ongoing LCA support for a broad range of

[5] For a description of life cycle assessment principles and framework, see ISO 14040 and ISO 14044.

decarbonization technologies across multiple industries. Note that it is the intent of OCED to integrate the strongest responses across subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance.

Four areas of interest have been identified under this subtopic:

- LCA for Carbon Management Technologies
- LCA for Industrial Demonstration Technologies
- LCA for Clean Hydrogen Technologies
- LCA for Long Duration Energy Storage, Renewables, and Nuclear Energy

Estimated Budget: $3.25M – $5.5M
Estimated Number of Awards: 1-5
Expected Project Duration: 3 years

Area of interest 2.1.1: LCA for Carbon Management Technologies

Details: This AOI seeks proposals that will provide ongoing LCA support on a project-by-project basis for point source carbon capture and direct air capture technologies. Applicants to this AOI should be equipped to provide OCED with surge capacity to review, critique, and provide additional analysis on LCAs for OCED's diverse array of carbon management projects. Note that it is the intent of OCED to integrate the strongest responses across subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance. Specific lab activities include (but are not exclusive to):

1. Ongoing support for comprehensive life cycle emissions modeling using best practices and tools that have been identified by the awarded team.
2. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of emissions estimates, highlighting key gaps and uncertainties related to carbon capture technologies.
3. Quantification of emissions implications of pertinent market scenarios such as the projected price and availability of renewables.
4. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects; and
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.
6. Identification and development of tools for data collection, storage, and stewardship.

Guidance: More information on DOE's Regional DAC Hubs can be found here. Concept papers are invited that explore the comprehensive life cycle emissions impacts associated with federal tax incentives, with a particular emphasis on incentives like 45Q and 45V. We also encourage concept papers that detail how applicants will utilize and contribute to the Federal LCA commons.[6] Proposed methodologies should specify any LCA related tools and software (e.g., GREET, OpenLCA, etc.) to be used in the analysis. We also seek innovative approaches to mitigate and optimize environmental outcomes. Potential deliverables include a 1.) high level report with data analysis, process flow diagrams and discussion and 2.) emissions models for each project.

[6] See lcacommons.gov for more information.

Area of interest 2.1.2: LCA for Industrial Demonstrations Technologies

Details: Provide high fidelity, rapidly executable technical support to OCED to consistently evaluate the life cycle emissions impacts of OCED projects in energy intensive industries including cement manufacturing, aluminum, iron and steel, glass, pulp and paper, and chemicals and refining. A key challenge for this area of interest is robustly quantifying life cycle emissions for a diverse array of decarbonization technologies applied across a wide range of industries. Applicants to this AOI should be equipped to provide OCED with surge capacity to review, critique, and provide additional analysis on LCAs for OCED's diverse array of industrial demonstration projects. Note that it is the intent of OCED to integrate the strongest responses across subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance. Specific lab activities include (but are not exclusive to):

1. Comprehensive life cycle emissions modeling using best practices[7] to be updated throughout project design and execution.
2. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of emissions estimates, highlighting key gaps and uncertainties.
3. Analysis of input and output flows from industrial systems models and incorporation of these data into project-level analysis.
4. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.
6. Identification and development of tools for data collection, storage, and stewardship.

Guidance: More information on OCED's Industrial Demonstrations Program can be found here. We seek teams with demonstrated expertise in specific industrial sectors and/or decarbonization technologies. Proposed methodologies should specify any LCA related tools and software (e.g., GREET, OpenLCA, etc.) to be used in the analysis. We encourage concept papers that outline specific methodological considerations for quantifying life cycle emissions for major sectors and technology solutions for decarbonizing sectors outlined in the Industrial Decarbonization Liftoff report series (i.e., iron & steel, aluminum, glass, chemicals & refining, cement, pulp & paper, food & beverage). We also encourage projects that explore the comprehensive life cycle emissions impacts associated with federal tax incentives including 40B, 45V, 45Q, and 45Z. Concept papers should detail how applicants will utilize and contribute to the Federal LCA commons. Potential deliverables include a 1.) high level report with data analysis, process flow diagrams and discussion and 2.) emissions models for each project.

Area of interest 2.1.3: LCA for Clean Hydrogen Technologies

Details: This AOI seeks proposals that will provide ongoing LCA support on a project-by-project basis for clean hydrogen technologies including hydrogen production, transport, storage, and end-use applications. Applicants to this AOI should be equipped to provide OCED with surge capacity to review, critique, and provide additional analysis on LCAs for OCED's diverse array of hydrogen related projects. Note that it is the intent of OCED to integrate the strongest responses across subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance. Specific lab activities include

[7] See ISO 14040 and ISO 14044 for a description of LCA best practices including requirements and guidelines for selecting appropriate system boundaries.

(but are not exclusive to):

1. Life cycle emissions modeling using Argonne National Lab's Greenhouse Gases, Regulated Emissions, and Energy Use in Technology (GREET) model to be updated throughout project design and execution.
2. Scenario and sensitivity analyses that assess emissions impacts of different market scenarios, feedstocks, and hydrogen production technologies.
3. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of emissions estimates.
4. Development and support for OCED LCA standards for use in assessment of clean hydrogen technologies and identification of assumptions and related gaps that impact analysis results.
5. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
6. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.
7. Identification and development of tools for data collection, storage, and stewardship.

Guidance: More information on DOE's Regional Clean Hydrogen Hubs can be found here. Prospective teams should demonstrate expertise using GREET for emissions estimates. Concept papers are invited that explore the comprehensive life cycle emissions impacts associated with federal tax incentives, with a particular emphasis on incentives like 45V and 45Q. We also seek innovative approaches to mitigate and optimize environmental outcomes. Concept papers should detail how applicants will utilize and contribute to the Federal LCA Commons. Potential deliverables include a 1.) high level report that includes data analysis, process flow diagrams and discussion and 2.) GREET model files for each project.

Area of interest 2.1.4: LCA for Long Duration Energy Storage (LDES), Renewables and Nuclear Energy

Details: This AOI seeks proposals that will provide ongoing LCA support on a project-by-project basis for clean energy technologies including solar, wind, hydroelectricity, LDES, and nuclear. Applicants to this AOI should be equipped to provide OCED with surge capacity to review, critique, and provide additional analysis on LCAs for OCED's diverse array of clean energy related projects. Note that it is the intent of OCED to integrate the strongest responses across subtopic 2.1 into a single, collaborative LCA topic area award to ensure consistency of performance. Specific lab activities include (but are not exclusive to):

1. Ongoing support for comprehensive life cycle emissions modeling using best practices and tools that have been identified by the awarded team.
2. Scenario and sensitivity analyses that assess emissions impacts of different market scenarios, feedstocks, and hydrogen production technologies.
3. Development of uncertainty quantification methodologies to inform confidence determination and interpretation of emissions estimates.
4. Development and support for OCED LCA standards for use in assessment of specific technologies and identification of assumptions and related gaps that impact analysis results.
5. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
6. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.

7. Identification and development of tools for data collection, storage, and stewardship.

Guidance: OCED programs relevant to this area of interest include Clean Energy on Current and Former Mine Lands, Hydrogen Hubs, Long Duration Energy Storage, Industrial Demonstrations, and more . Prospective teams should demonstrate expertise in specific technologies and analysis of marginal emission factors where applicable. Concept papers are invited that explore the comprehensive life cycle emissions impacts associated with federal tax incentives. We also seek innovative approaches to mitigate and optimize environmental outcomes. Concept papers should detail how applicants will utilize and contribute to the Federal LCA commons. Potential deliverables include a 1.) high level report that includes data analysis, process flow diagrams and discussion and 2.) LCA model files for each project.

Subtopic 2.2: Emissions Monitoring, Reporting, and Verification

Details: As OCED's portfolio of projects progress through the execution phase, verifying LCA results against real world performance will be critical for assessing program success and refining model assumptions. This subtopic seeks support for analyzing emission monitoring and reporting data through the execution phase of awarded projects. Specific lab activities include (but are not exclusive to):

1. Analysis of large volumes of emissions data such as those from continuous emissions monitoring systems in industrial settings.
2. Review of project-level approaches to emissions monitoring, reporting, and verification to ensure transparency and alignment with program level emissions goals.
3. Validation of modeled emissions estimates against real world data using robust statistical analysis.
4. Guidance and recommendations for integrating real-world emissions data into modeling frameworks to better refine project-level life cycle emissions estimates.
5. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.
6. Identification and development of tools for data collection, storage, and stewardship.

Guidance: Concept papers should demonstrate expertise in analyzing large volumes of emissions monitoring and reporting data, describe the expected approach to data processing and analysis, and identify key performance metrics to be used in assessments. We welcome proposals that will use standard emissions monitoring data to conduct novel and creative analyses. Potential deliverables include a high-level report with data analysis and discussion and curated datasets for use in future OCED analysis.

Estimated Budget: $500K - $1M
Estimated Number of Awards: 1
Expected Project Duration: 3 years

Subtopic 2.3: Water Impacts of awarded projects

Details: Evaluating water use and water quality impacts of the clean energy transition are key to safeguarding public health, minimizing environmental degradation, and ensuring the long-term availability of water resources. This subtopic seeks support for quantifying water impacts of DOE's Regional Clean

Hydrogen Hubs, Carbon Management programs (Direct Air Capture Hubs, Carbon Capture Large Scale Pilots, and Carbon Capture Demonstrations), and the Industrial Demonstrations Program. Specific lab activities include (but are not exclusive to):

1. Development and enhancement of analysis tools to characterize water impacts.
2. Technical support for assessing water use and water quality impacts (i.e., freshwater eutrophication, freshwater acidification, human toxicity, and ecotoxicity) on a project-by-project basis.
3. Targeted assessments of opportunities to improve water quality, reduce water stress, and/or improve efficiency of water use.
4. Identification and assessment of key gaps and uncertainties in existing LCA tools (e.g., GREET, OpenLCA) used to assess water impacts.
5. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
6. Recommendations/guidance for the identification and analysis of data from awarded projects as well as other sources to drive and inform the above tools, methodologies, and analyses.

Guidance: Concept papers should detail the expected approach to data analysis and identify key performance metrics to be used in the assessment. Potential deliverables include a high-level report with data analysis and discussion and curated datasets for use in future OCED analysis.
Estimated Budget: $500K - $1M
Estimated Number of Awards: 1
Expected Project Duration: 3 years

Subtopic 2.4: Air Quality Impacts of OCED Programs

Details: This subtopic seeks proposals that will evaluate the air quality impacts of awarded projects through atmospheric chemistry modeling. We specifically seek support quantifying the air quality impacts of DOE's Regional Clean Hydrogen Hubs, Carbon Management programs (Direct Air Capture Hubs, Carbon Capture Large Scale Pilots, and Carbon Capture Demonstrations), and the Industrial Demonstrations Program. Specific lab activities include (but are not exclusive to):

1. Quantification of local- to regional-scale air quality impacts of market adoption of clean energy technologies in OCED's portfolio compared to business-as-usual emissions scenarios using atmospheric chemistry modeling.
2. Identification and assessment of key gaps and uncertainties in existing LCA tools (e.g., GREET, OpenLCA) used to estimate air pollutant emissions.
3. Comparison of air quality tools (e.g., CMAQ, WRF-Chem, dispersion models, etc.) and workstreams to develop targeted methodologies for assessing net air quality impacts of OCED's projects and programs.
4. Targeted recommendations for OCED's programs to help maximize benefits and minimize potential air quality tradeoffs.
5. Identification of emerging air pollutants associated with novel technologies (e.g., carbon capture, hydrogen production, etc.) and assessment of the corresponding environmental impacts.
6. Sector- and technology-oriented analytics which enable generalized conclusions based on analysis of awarded projects.
7. Development of a dashboard to visualize analysis results and key takeaways.
8. Recommendations/guidance for the identification and analysis of data from awarded projects as

well as other sources to drive and inform the above tools, methodologies, and analyses.

Guidance: Concept papers should detail the expected approach for data collection and methods for processing and interpreting those data. Concept papers that include atmospheric chemistry modeling should identify and justify the specific models to be used. Please also provide spatial and temporal considerations of the proposed work. We encourage proposals that will contextualize model results by analyzing of the social cost of air pollution impacts. Potential deliverables include a high-level report with data analysis and discussion, a dashboard visualizing model results, and curated datasets for use in future OCED analysis.

Estimated Budget: $750K - $1.5M
Estimated Number of Awards: 1-2
Expected Project Duration: 3 years

Topic 3: Quantification of Socioeconomic Impacts

Background: Disadvantaged communities (including Tribal communities), fossil energy communities, and rural communities have been disproportionately burdened by the environmental, health, and social risks associated with energy and industrial infrastructure.[8,9,10] OCED's funded projects need to engage deeply with impacted communities and workers to quantify social risks, assess labor needs and workforce development, and mitigate potential environmental burdens of individual projects. OCED's funded projects should also examine environmental impacts and benefits in the context of cumulative burdens, identify opportunities for creating tangible benefits, and address disproportionate impact. Here, we seek concept papers that explicitly quantify the impact of funded projects on disadvantaged communities, fossil energy communities, and rural communities in support of OCED's portfolio of clean energy demonstrations and the Justice 40 initiative.

The DOE Office of Energy Justice and Equity (EJE, formerly the Office of Economic Impact and Diversity) with input from the White House Environmental Justice Advisory Council (WHEJAC), identified eight (8) policy priorities to guide DOE's implementation of the J40 initiative (as applied to disadvantaged communities):[11]

1. A decrease in energy burden.
2. A decrease in environmental exposure and burdens.
3. An increase in clean energy jobs, job pipeline, and job training for individuals.
4. Increases in clean energy enterprise creation and contracting (e.g., minority-owned or disadvantaged business enterprises).
5. An increase in energy democracy.
6. An increase in access to low-cost capital.
7. Increased parity in clean energy technology access and adoption.
8. An increase in energy resiliency.

A benefit to a disadvantaged community can be identified and measured if it "achieves or contributes to one or more of the eight priorities identified above."[11] The DOE General Guidance for Justice 40 Implementation provides example metrics for identifying and calculating benefits. Performers may not be able to complete these calculations themselves, and lab assistance may be needed. For the purposes of this call, *communities of interest* include disadvantaged communities (including Tribal communities), fossil energy communities, and rural and remote communities, as defined.[8,9,10]

Areas of Interest: Four areas of interest have been identified under Topic 3:

- Analysis and quantification of economic impacts flowing to identified communities of interest.

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[8] Disadvantaged communities (including Tribal communities) and disproportionate burdens as defined by the Climate and Economic Justice Screening Tool (CEJST).
[9] Fossil energy communities as defined by "Covered Census Tract" in Section 40209 of the Infrastructure Investment and Jobs Act (H.R. 3684); which means a census tract "(A) in which, after December 31, 1999, a coal mine had closed; (B) in which, after December 31, 2009, a coal-fired electricity generating unit had been retired; or (C) that is immediately adjacent to a census tract described in (A) or (B)."
[10] Rural Communities as defined in the Bipartisan Infrastructure Law Section 40103 "a city, town, or unincorporated area that has a population of not more than 10,000 inhabitants."
[11] Department of Energy General Guidance for Justice40 Implementation, Version 1.1, July 2023. Available online: DOE Justice40 General Guidance 72523.pdf (energy.gov).

- Analysis and quantification of human health impacts flowing to communities of interest.
- Social Risk evaluation to support assessment of project readiness and project phase advancement across multiple provisions.
- Impact evaluation and tool, model, or dashboard development to support multiple provisions across the eight (8) policy priorities listed above, where applicable.

Estimated Budget: $1M - $1.5M
Estimated Number of Awards: 1-4
Expected Project Duration: 3 years

Note of funds:
OCED has allocated $1-1.5M per year for Topic 3 covering all four areas of interest discussed for at least a three-year arc of work. This scope of work may continue beyond the initial three years, depending on the team's performance and remaining needs to support OCED's portfolio.

Area of Interest 3.1: Analysis and quantification of economic impacts to identified communities of interest.

Details: This area of interest seeks concept papers that will evaluate the economic impacts of awarded projects using project-specific data and/or economic models. We specifically seek support quantifying the economic impacts of DOE's Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program. Analyses will be site- and community-specific. Laboratory tasks may include (but are not exclusive to):

1. Economic analysis and/or modeling to quantify project impacts on jobs, clean energy enterprise creation and contracts for minority-owned or disadvantaged business enterprises, and increased energy democracy.
2. A proposal to capture and analyze project-specific increase access to low-cost capital in communities of interest.
3. A framework for validation of modeled results within the context of location, technology type and installation size/capacity, and installation costs.

Guidance: Concept papers should be limited to the technology or technologies described in the Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program FOAs. Concept papers should include a description of the methodological approach that will be used to conduct proposed analyses. Analyses should include differentiation between short-term and long-term economic impacts of awarded projects or programs enacted with project funding. Plan to calculate and report values for each community of interest separately. Interdisciplinary collaboration with experts in economics, social science, and environmental engineering is encouraged. Potential deliverables include a final written report documenting analysis results.

Area of Interest 3.2: Analysis and quantification of human health impacts flowing to communities of interest.

Details: This area of interest seeks concept papers that will evaluate the human health impacts of awarded projects using project specific data and/or models. We specifically seek support quantifying environmental exposure in communities of interest (within the context of any existing human health risks/impacts due to historical burdens) resulting from investment in DOE's Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional DAC Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program. Analyses will be site- and community-specific. Laboratory tasks may include (but are not exclusive to):

1. Analysis and quantification of pollution burden associated with project-specific communities of interest following construction and execution of DOE-funded projects.
2. Analysis and quantification of project impacts on legacy contamination, and project impacts to soil, surface waters, subsurface waters, habitat, etc., within or affecting communities of interest.
3. A plan to utilize findings from areas of interest 2.3 and 2.4 to explicitly consider human health impacts in project-specific communities of interest, particularly in the context of any existing legacy pollution.
4. Examination of human health impacts in the context of other historical cumulative burdens associated with project-specific communities of interest, accounting for associated mitigation measures implemented by project performers.

Guidance: Concept papers should be limited to the technology or technologies described in the Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program FOAs. Concept papers should include a description of the methodological approach that will be used to conduct proposed analyses. Analyses should include differentiation between short-term and long-term human health impacts of awarded projects or programs enacted with project funding. Plan to calculate and report values for each community of interest separately. Interdisciplinary collaboration with experts in economics, social science, and environmental engineering is encouraged. Potential deliverables include a final written report documenting analysis results.

Area of Interest 3.3: Development of Social Risk evaluation framework to support assessment of project readiness and project phase advancement across multiple provisions.

Details: This area of interest seeks concept papers that will develop a Social Risk evaluation framework to support assessment of project readiness and project phase advancement across multiple provisions. We specifically seek support quantifying the risk associated with potential social and/or cultural impacts resulting from investment in DOE's Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects,

and Industrial Demonstrations Program. Social and/or cultural risk impacts to communities of interest should be identified separately from other areas of risk identified for the community at large. Analyses will be site- and community-specific. Laboratory tasks may include (but are not exclusive to):

1. Development of a social risk evaluation framework to support assessment of project readiness and project phase advancement across multiple provisions, in collaboration with DOE, to eventually be integrated into the Adoption Readiness Level framework.
2. Differentiation between social and/or cultural risks from DOE-funded project that are expected to impact identified communities of interest vs impacts to areas not defined as a community of interest.[8,9,10]
3. Differentiation between potential short-term and long-term social and cultural impacts of awarded projects, and associated social risks identified.

Guidance: Concept papers should be limited to the technology or technologies described in the Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program FOAs. Plan to calculate and report values for each community of interest separately. Interdisciplinary collaboration with experts in economics, social science, and environmental engineering is encouraged. Potential deliverables include a final written report documenting assumptions, methods, and other relevant information necessary for correct use of the framework.

Area of Interest 3.4: Impact evaluation and tool, model, or dashboard development to support multiple provisions across the eight (8) policy priorities,[11] where applicable.

Details: This area of interest seeks concept papers that will complete impact evaluation across the eight (8) policy priorities detailed in DOE's J40 guidance,[11] where applicable. Proposed analyses should focus on statistical methods and quasi-experimental design typically associated with impact evaluation (e.g. difference-in-difference, matching, regression discontinuity, benefit-cost analysis, etc.).[12] In many cases, to fully capture the J40 impacts associated with DOE projects, retrospective impact evaluations will be necessary. Development of tool(s), model(s), and/or dashboard(s) that present summarized analyses or data visualizations are encouraged. We specifically seek support quantifying the effectiveness of job training programs (and related), job pipeline development programs; economic net benefits attributable to DOE funded projects, and program adoption rates and/or performance for communities of interest. These impacts should be evaluated as related to investment in DOE's Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program. Analyses will be site- and community-specific Laboratory tasks may include (but are not exclusive to):

1. Analysis and quantification of job training programs, workforce development programs, or

[12] U.S. Department of Energy Office of Energy Efficiency & Renewable Energy (EERE) EERE Impact Evaluation Method Guide for Justice 40, Equity, and Workforce Diversity Goals, December 2023. Available online: energy.gov/node/4836565/.

recruitment and retention program impacts in communities of interest resulting from DOE funded projects.
2. Analysis and quantification of job pipeline impacts in communities of interest resulting from DOE funded projects.
3. Analysis and quantification of program performance impacts in communities of interest (e.g., number of households adopting or benefitting from technology (MWh), calculated decrease in household energy burden, increase in community resilience, technical assistance program effectiveness, etc.) resulting from DOE funded projects, as applicable to identified provisions.
4. A final written report documenting analysis results.

Guidance: Concept papers should be limited to the technology or technologies described in the Regional Clean Hydrogen Hubs, Carbon Capture Large-Scale Pilots, Carbon Capture Demonstrations, Regional Direct Air Capture Hubs, Long-Duration Energy Storage Demonstrations, Advanced Reactor Demonstration Projects, and Industrial Demonstrations Program FOAs. Proposed projects should include a description of the methodological approach that will be used to conduct proposed analyses and which type of program is targeted with the identified method. Analyses should include differentiation between short-term and long-term impacts and outcomes identified. Plan to calculate and report values for each community of interest separately. Interdisciplinary collaboration with experts in economics, social science, and environmental engineering is encouraged. Concept papers that leverage or build upon/enhance existing resources are encouraged. Proposals that seek to duplicate existing tools will not be successful. Potential deliverables include a final written documenting definitions, assumptions, methods, and other relevant information necessary for correct use of any associated tools, models, or dashboards developed.

Topic 4: Resilience & Security Analysis

Background: OCED funds energy infrastructure demonstration projects that directly connect to regional transmission and/or local distribution grids. OCED projects will also in some cases result in generation of protected intellectual property (IP) and integration of protected and/or advanced technologies into US critical infrastructure systems. OCED resilience & security analyses include assessing project related vulnerabilities (including but not limited potential foreign influence) that may negatively affect system resilience or economic security as well as development and tracking of appropriate mitigations in the areas of cybersecurity, physical and/or information security, climate and critical infrastructure resilience.

Areas of Interest: Three areas of interest have been identified under Topic 4:

- Physical and cyber security of OCED projects and related critical infrastructure implications
- Sensitive but unclassified critical infrastructure, intellectual property, or economic security related information protection and scenario analyses, to include foreign influence vetting as needed and appropriate
- Assess and evaluate critical infrastructure resilience impacts originating from a variety of sources including but not limited to foreign influence, changing system characteristics resulting from OCED projects, climate change, and other natural hazards.

Estimated Budget: $1M
Estimated Number of Awards: 1-3

Note of funds:
OCED has allocated up to $1M in funds for FY25 Topic 4. As OCED's portfolio of projects progress from planning to implementation stages the annual budget for this topic area may increase. In FY24, OCED will select from meritorious proposals to make selections for FY25, with expected funding continuation through FY27.

Area of Interest 4.1: Physical and cyber security of OCED projects and related critical infrastructure implications

Details: This subtopic seeks proposals to assess, advise and provide reports and findings on the physical and cyber-security of critical infrastructures across project plan, build, and operate phases. Physical security includes all aspects of the protection of personnel, property, and physical assets from actions and events that could cause loss or damage to the demonstration project. Cybersecurity includes all aspects of the protection of IT systems (including physical ones), networks, devices, and data from unauthorized access, criminal use, or accidental negligence to ensure the confidentiality, integrity, and availability or information for the demonstration project. Cybersecurity can also be a critical tool in providing infrastructure security and continuity, including building cyber-level safeguards against unauthorized access to mechanical systems. Proposals should walk through how they will identify, analyze, and mitigate threats and opportunities in the cyber-physical environment. Specific areas of interest include (but are not exclusive to):

1. Assess project sites to identify potential physical and cyber-security vulnerabilities and

recommend corrective actions and/or mitigation strategies.

2. Assess project physical and cyber-security plans and procedures to identify gaps and recommend best practice solutions.
3. Recommend physical and cyber-security technology, systems, tools, and methods that can be applied as tailored security solutions for individual project site's needs.
4. Provide detailed and thorough systems engineering and design research to identify critical fail points in interactive cyber-physical systems.
5. Providing recommendations to test and augment protection tools while assessing worst-case scenario outcomes, understanding the specifics of individual technical systems.
6. Look for cutting edge cybersecurity technology, systems, tools and methods that can be recommended and applied as tailored cybersecurity solutions for individual to project's needs.
7. Make recommendations OCED.
8. Advise OCED personnel, including senior leadership, within area of expertise.
9. Provide written reports and recommendations on results and findings.

Guidance: Prospective performing teams should demonstrate prior experience and expertise in physical security across the full range of project management phases. Proposals should detail specific experience working in civilian, private-sector, and commercial projects and systems. Performing teams must have awareness, experience, and credibility in navigating industry priorities (including cost/risk balancing, specific private-sector threats, and industry standards) while maintaining focus on security best practices. https://www.energy.gov/oced/regional-clean-hydrogen-hubs-0

Area of Interest 4.2: Sensitive but unclassified critical infrastructure, intellectual property, or economic security related information protection and scenario analyses, to include foreign influence vetting as needed and appropriate

Details: This subtopic seeks expertise on protections for critical infrastructure, intellectual property, and economic security. Proposals should include methodologies and systems for technology-specific information protection, scenario-based testing and analysis of potential impacts and mitigations, and proactive vetting procedures for high-impact risks as appropriate. Support may include systemic review of and preparation for potential risks including but not limited to foreign influence, intellectual property security, and potential or realized critical infrastructure impacts. Specific areas of interest include (but are not exclusive to):

1. Expertise in navigating sensitive but unclassified project design, execution, and operations.
2. Detailed review of critical infrastructure and intellectual property impacts in commercial environments.
3. Providing proactive research and scenario testing of multiple potential impacts.
4. Vetting for foreign influence structured as applicable when necessary and appropriate.
5. Make recommendations to OCED.
6. Advise OCED personnel including senior leadership within area of expertise.
7. Provide written reports and recommendations on results and findings.

Guidance: Prospective performing teams should demonstrate prior experience and expertise in mechanical systems develop and control across the full range of project management phases and list

applicable and cybersecurity certifications. Proposals should detail specific examples of identifying, building, assessing, and/or reverse engineering cybersecurity solutions to physical infrastructure threats, and physical/mechanical solutions to cybersecurity threats.

Are of Interest 4.3: Assess and evaluate critical infrastructure resilience impacts originating from a variety of sources.

Details: This subtopic seeks proposals that will provide expertise in infrastructure resilience and potential impacts from multiple exposure factors. Impact sources may include foreign influence, changing technology and project elements, and natural hazards, across project plan, build, and operate phases. Proposals should include methods to detect, evaluate, identify, and assess both potential impacts and subsequent resilience techniques. Support may include analyzing a proposal, project, participants, or other factors to identify potential or actual impacts that could disrupt or compromise a project. Resilience may include monitoring, identification, and mitigation efforts used to detect, neutralize, and/or prevent impacts before they create vulnerabilities. Expertise should include understanding sources and impacts of foreign influence, (organizations or individuals to sway or impact U.S. policies, decisions, or activities), internal or external bad actors, negligence or accidents that present security risks, and/or climate change and natural hazards that may impact infrastructure resilience.

Specific tasks will depend on emerging needs but may include the following:

1. Providing research on infrastructure resilience and detection, evaluation, identification, assessment, response and mitigation of potential impacts.
2. Knowledge of and strategic approaches to identifying a broad suite of potential infrastructure impacts.
3. Pairing risk identification with appropriate tracking and mitigation techniques.
4. Developing and implementing best practices specific to OCED projects.
5. Make recommendations to OCED.
6. Providing written reports and recommendations on results and findings.

Guidance: Prospective performing teams should demonstrate prior experience and expertise in impact detection, evaluation, identification, assessment, response and mitigation tools and methods across the full range of project management phases and list applicable certifications. A participant in 4.3 could also qualify in either of the above 2 subtopics.

Topic 5: Technical Support for Clean Energy Projects

Background: OCED expects its demonstration project portfolio will encompass a wide range of technology performance, scale up, and integration risks, and seeks DOE National Laboratory expertise to identify, assess and manage those project risks. As such, OCED seeks to leverage a wide range of expertise that currently exists within the DOE National Laboratory complex including but not limited to modeling and simulation at component and system levels, project options and trade-offs analyses to support decision making and prioritization, technology specific subject matter expertise and associated performance, integration and scale up risk identification, evaluation, and management.

This task will be managed through OCED's Physical Science and Engineering (PSE) team within OCED's Project Management Division. PSE is tasked to provide a broad range of fact-based, traceable, purposeful, and data-supported evaluations and reviews for OCED-awarded clean energy projects throughout the duration of the cooperative agreements. The overarching goal of the PSE team is to integrate technical expertise with demonstration project management oversight and decision-making. Task 5 focuses on expanding the depth and breadth of the PSE team's capabilities by integrating Laboratory resources. In some circumstances, while executing Task 5 activities, OCED will expect Laboratory experts to work directly with OCED-contracted Independent Engineering firms to ensure Laboratory expertise is appropriately integrated into OCED's overarching project management oversight approach.

Task 5 is intended to enhance the capabilities of PSE by providing areas and depths of expertise that are beyond the standard available in the practical engineering market. The expectation is that the Laboratory contributions under this call will use cutting-edge knowledge and unique facilities and equipment to provide services in specialized areas of OCED projects that are not within the capabilities of typical independent engineering firms. Of particular interest are, but are not limited to, environmental and climate science, advanced energy systems, materials science and nanotechnology, nuclear science and technology, national security concerns for large-scale energy infrastructure, and cross-cutting analyses of novel clean-energy technology deployments.

Topics: Two subtopics have been identified under Topic 5:

- Modeling and Simulation capabilities
- Specialty Systems & Scale Up Expertise

Note of funds:
OCED has allocated up to $2M in funds for FY25 Topic 5. As OCED's project portfolio matures from planning to implementation phases Topic 5 annual budgets may increase and focus may be refined to target highest risk or most complex projects. In FY24, OCED will select from meritorious proposals to make selections for FY25, with expected funding continuation through FY27.

Subtopic 5.1: Modeling and Simulation Capabilities

Details: This subtopic seeks proposals for capabilities in leveraging or developing digital engineering[13] tools

[13] Digital engineering in this context is defined as the construction of digital (computer) models that represent every characteristic

including process and program models and simulations[14] of OCED projects across project plan, build and operate phases.

Laboratory support will likely involve a wide range of digital engineering activities primarily focused on processes and technologies related to clean H_2, LDES, direct air capture, point-source carbon capture, and/or those relevant to OCED's Industrial Demonstration Program (e.g., iron and steel, aluminum, cement and concrete, glass, pulp & paper, chemicals and refining, etc.).

The primary laboratory task within this subtopic will likely be working with the PSE Team and associated engineers to apply the full range of digital engineering tools and create useful, accurate and predictive models and simulations for critical and/or enabling project sub-elements, use these models to identify areas of high risk technical concern, and then propose alternatives based on analyses that will lower the risk of failure.

Additional tasks may include (but not exclusive):

1. Creating, building, running, interpreting, and evaluating digital system models and sub-systems.
2. Creating, building, running, interpreting, and evaluating simulations.
3. Coordinating modeling and simulation efforts and reporting results.
4. Identifying and collecting critical data, as relevant and required, for optimizing models and simulations.
5. Utilizing digital system models and simulations to test performance assumptions for predictive, rough-order-of-magnitude (ROM) validation of project technologies.
6. Leveraging and/or developing decision support modeling tools to support OCED's evaluation of project trade-offs.
7. Make recommendations to the relevant OCED Staff.
8. Providing written reports and recommendations on results and findings.
9. Documenting how the models work including all assumptions and limitations.

Guidance: Prospective performing teams should demonstrate prior experience and expertise with digital engineering especially modeling and simulation, and across the full range of project management phases including operations. Ideally participants should be knowledgeable in one or more of the clean energy program areas mentioned above. Participants are expected to focus activities on de-risking the success of the industrial deployments by providing options and tradeoff analyses to support OCED decision-making and prioritization. These efforts are not intended to directly provide process optimization support.

Estimated Budget: $1M
Estimated Number of Awards: 1
Expected Project Duration: FY2025-2027

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of a complex product or system that is to be developed and is an integrated digital approach using authoritative sources of system data and models as a continuum through the development and life of a system.

[14] Modeling and simulation is defined as the use of models (e.g., mathematical statistical, physical, or logical representation of a system, sub-component, entity, process, or sub-process) as a basis for simulations to develop realistic data utilized for managerial, project and/or technical decision making.

Subtopic 5.2: Specialty Systems & Scale Up Expertise

Details: This subtopic seeks proposals that will provide specialty technical capabilities in one or more of OCED's portfolio technologies to provide data, information, and analysis on specific technical topics and advanced or emerging technologies. This expertise de-risk the successful integration, performance, scale-up, and deployment of critical technologies in the OCED projects.

Laboratory support will likely involve a range of technical activities focused on technologies related to clean hydrogen, long-duration energy storage (LDES), direct air capture, carbon capture and technologies relevant to OCED's Industrial Demonstration Program. This support may also include analysis of construction and building methods and operating procedures to help validate that these clean energy technologies can work as planned and be scaled to an industrial level.

Specific laboratory tasks within this subtopic may include (but are not exclusive to):

1. Identify project and technology specific performance, integration, and scale up risks; working with OCED appointed Independent Engineers to incorporate technology specific risks into technical risk management approach.
2. Analyze the feasibility and limitations of critical and/or enabling technologies; Provide analyses of alternatives for critical and/or enabling technologies to reduce project risk.
3. Evaluating the scalability of the demonstration projects and the technologies therein into full-sized industrial facilities and estimate the reproducibility of these industrial facilities.
4. Evaluate project or portfolio dependencies on critical materials availability and supply chains
5. Collaborate with modeling & simulation subtask to evaluate project options, performance envelopes and other relevant factors to support effective project planning and decision making
6. Make recommendations to the relevant OCED Staff
7. Providing written reports and recommendations on results and findings.
8. Investigate emerging technical issues, assess options, and recommend path(s) forward for OCED consideration

Guidance: Prospective performing teams should demonstrate prior experience and expertise in one or more of the above engineering disciplines, in one or more areas discussed in the above areas of interest, and ideally in one or more of the clean energy program areas.

Estimated Budget: $1M
Estimated Number of Awards: 1
Expected Project Duration: FY2025-2027

Topic 6: Assessment and Mapping of Current and Future Hydrogen and Carbon-related Infrastructure

Background: OCED has received more than $27 billion in funding from the Bipartisan Infrastructure Law and Inflation Reduction Act to deliver clean energy demonstrations in partnership with the private sector. This funding is being invested through public-private partnerships to execute a diverse range of emerging technologies that include clean hydrogen, carbon management, and industrial decarbonization. DOE's Pathways to Commercial Liftoff Report on Clean Hydrogen and Carbon Management highlight the critical investments needs for the full scale market adoption of these technologies. The successful implementation of these projects will require an increase in transport infrastructure, utilization, and storage systems to accommodate new production and off-takers of hydrogen (and related hydrogen carriers such as ammonia) and carbon dioxide. OCED seeks proposals focused on assessing the opportunity for new and leverage existing pipeline, utilization, storage, and other related infrastructure, such as multi-model transportation, for hydrogen and carbon dioxide, based on current and future facility locations and markets, both domestic and global.

Areas of Interest: Three areas of interest have been identified under Topic 6 and will be managed as 1 National Lab consortia team, that covers:

- Analysis of current state of carbon transport (including multi-model forms such as trucking, rail, pipeline, shipping, etc.), utilization, and storage infrastructure; assessment of future infrastructure needs in the United States; and analysis of the cost and business cases for various forms of carbon transport, utilization, and storage pathways.
- Analysis of current state of hydrogen and related energy carriers (e.g. ammonia) transport (including multi-model forms such as trucking, rail, pipeline, shipping, etc.), utilization, and storage infrastructure, assessment of future infrastructure needs in the United States, and analysis of the cost and business cases for each form of hydrogen transport, utilization, and storage pathways.
- Development of tools for mapping current and potential infrastructure needed to support the growth of hydrogen and carbon markets that includes consideration of State and Federal regulations, permitting, community impacts, and both domestic and global export markets.

Estimated Budget: $2M - $4M
Estimated Number of Awards: 1
Expected Project Duration: 3+ years

Note on funds: OCED plans on having available $2M-4M per year for Topic 6 covering all three areas of interest discussed for at least a three-year arc of work. This scope of work may continue beyond the initial three years, depending on the team's performance and remaining needs to support OCED's hydrogen and carbon management portfolio.

Area of Interest 6.1: Analysis of Current State of Carbon Transport, Utilization, and Storage Infrastructure and Assessment of Future Needs

Details: This Area of Interest seeks proposals assessing and quantifying the current state and future needs for carbon transport, utilization, and storage infrastructure. This output would be a report focusing on assessing where increased transportation, utilization, and storage systems are needed based on known existing and proposed projects. This includes projects in OCED's portfolio and other non-OCED funded

carbon production, utilization, and storage facilities in carbon management (i.e. direct air capture, point source carbon capture, and other carbon dioxide removal pathways). Transportation systems of interest include trucking, rail, pipeline, shipping, and other methods with potential for high impact, including cost optimization and business cases. Additionally, this topic should consider impacts of electricity grid modeling of future capacity expansion requirements; existing state and Federal policy related to permitting and development; focus on states/regions where infrastructure is likely to be most needed based on OCED's current portfolio; highlight existing and new pipeline, utilization, and storage systems within those states/regions; understanding right of ways and community concerns; and other key policy opportunities or barriers (such as 45V and 45Q) which could impact development.

Guidance: OCED seeks proposals coming from prospective teams with experience in conducting analysis of current and future carbon infrastructure networks (i.e. transport, utilization, and storage), market assessments, permitting, policy, and other barriers. Leveraging existing data, modeling tools, and capabilities from applied R&D offices or industry is encouraged.

Area of Interest 6.2: Analysis of Current State of Hydrogen-Related Infrastructure and Assessment of Future Needs

Details: This subtopic seeks proposals assessing and quantifying the current state and future needs for hydrogen-related infrastructure (such as ammonia) transport, storage, and end-use markets. This output would be a report focusing on assessing where increased transportation, storage, and end-use markets (i.e. domestic and global off takers) are needed based on existing and proposed projects. The focus would be on OCED's portfolio (such as the H2Hubs) and other non-OCED funded hydrogen-related production, transport, storage, and end uses. Transportation systems of interest include trucking, rail, pipeline, shipping, and other methods with potential for high impact based on cost optimization, market size, and business cases. Additionally, this topic should consider impacts of electricity grid modeling of future capacity expansion requirements; existing state and Federal policy related to permitting and development; focusing on states/regions where hydrogen-related infrastructure is most likely needed based on OCED's current portfolio; highlight existing transport, storage, and end-use markets within those states/regions; understanding existing right of ways and community concerns; other key policy opportunities and barriers (such as 45V and 45Q) which could impact development; and factoring in global market dynamics.

Guidance: OCED seeks proposals coming from prospective teams with experience in conducting analysis of current and future hydrogen-related infrastructure networks (i.e. transport, storage, end uses), market assessments, permitting, policy, and other barriers. Leveraging existing data, modeling tools, and capabilities from applied R&D offices or industry is encouraged.

Area of Interest 6.3: Tools for mapping current and potential infrastructure needed to support the growth of hydrogen and carbon markets

Details: This Area of Interest seeks proposals that develop tools enabling OCED and external stakeholders to map potential and proposed hydrogen and carbon transport, storage, and end-use infrastructure needs. Tools in this area of interest should utilize GIS or equivalent capabilities to enable mapping of current and proposed pipeline infrastructure as well as the placement and business case modeling of other transportation systems. Proposed tools would have multiple or all the following capabilities:

1. Mapping potential pipelines for carbon and hydrogen (including related energy carriers, such as ammonia) across the US and generating project investment estimates (e.g. capital cost) with the

ability to identify appropriate technical specifications (including diameter, thickness, pressure, etc.) based on cost optimization and grid capacity expansion models, as well as other scenarios or integrated datasets for volumetric transport needs to offtakers/end-use markets both domestic and global.
2. Mapping potential trucking, rail, and other multi-modal transportation hubs, with the ability to estimate the facility's range, transportation capacity, and amount and total capacity of serviceable hydrogen or carbon projects within range.
3. Financial modeling of business cases for proposed transportation based on capital cost, revenue models (incl. potential demand), and financing structure.
4. Color overlay of counties and states based on existing pipeline permitting policy (ranking from unfavorable to favorable) with policy details included.
5. Overlays of locations with existing pipeline right of ways and existing transportation infrastructure including rail lines, rail storage facilities, pipelines, trucking facilities, and other multi-modal transport facilities.
6. Potential community impacts that would occur from development of modeled transportation systems.

Guidance: OCED seeks proposals to establish or utilize existing teams with experience in network optimization or capacity expansion, pipeline development, and market growth for clean hydrogen and carbon transport and end use market needs. Proposals which leverage and/or build upon existing models and tools related to hydrogen and carbon transport are encouraged to apply.

Topic 7: Alternative Fuels and Energy Carriers in the Context of the United States

Background: A key step in achieving decarbonization goals is the transition to and usage of alternative fuels and energy carriers to displace fossil fuel consumption and achieve emissions reductions across the U.S. economy. Here, we seek proposals focused on understanding the commercial readiness, potential market landscape, and decarbonization scenarios impact opportunity.

Details: This topic seeks proposals that will provide an in-depth analysis report on selected scenarios for alternative fuels and energy carriers contribution to economy-wide decarbonization. This includes providing ongoing and updated analysis regarding the commercial readiness and market landscape for alternative fuels and energy carriers in the United States based on decarbonization scenarios. We encourage proposals that will provide support for an economy-wide breakdown for a variety of alternative fuels and energy carriers including but not limited to aviation, maritime shipping, heavy duty trucking, and key industrial sectors. The breakdown can be recommended by proposing teams. This breakdown should quantify the following metrics with regards to alternative fuels and energy carriers in each sector:

1. The full technical potential for alternative fuels (such as sustainable aviation fuels, methanol, DME, biodiesel, others) and energy carriers.
2. Preferred alternative fuels and energy carriers based on commercial readiness/viability of technology pathways and feedstocks within each sector.
3. Assessment of how much off takers are “willing to pay” in each sector for alternative fuels and energy carriers vs. traditional fuels, based on both current and future technology cost and performance metrics.
4. Current and projected demand for alternative fuels and energy carriers based on relevant or suitable models (such as GCAM and NEMS or others).
5. Quantification of the emissions, land, and water use impact of alternative fuels and energy carriers based on its feedstocks, transportation and storage, and consumption when compared to traditional fuels, utilizing the GREET model or suitable alternatives.
6. The impact toward net zero emissions for each alternative fuel and energy carrier / conversion / and feedstock pathway, in comparison with the traditional fuels used in each sector.
7. Characterize the air quality impacts of alternative fuels and energy carriers when compared to traditional fuels used in each sector.
8. Feedstock forecasting to highlight demand for resources utilized to produce alternative fuels and energy carriers, possibly incorporating existing feedstock demand studies and forecasts. Forecasting should include a technical potential and economic potential.
9. Analysis of existing production capabilities for alternative fuels and pathways to increase production capacity. This includes characterizing the current state of technology, adoption readiness, and costs for producing alternative fuels and energy carriers within each sector.
10. Tracking of capital deal flow in the project pipeline to characterize process of deal making and capital flow to alternative fuel and energy carrier companies/projects from early feasibility, design, FID, construction, and operations.

Guidance: OCED seeks proposals coming from prospective teams with experience in conducting analysis related to market assessments, technical and commercial adoption readiness, and demand forecasts.

Estimated Budget: $500K - $1M
Estimated Number of Awards: 1
Expected Project Duration: FY2025-2026 (This is meant to be a 1–2-year study)

Topic 8: Clean Hydrogen "State of the Market" Reporting and Economic Scenario Modeling

Background: The U.S. clean hydrogen market is poised for rapid growth and commercial scaling, as described in DOE's Pathways to Commercial Liftoff Report on Clean Hydrogen. In particular, the Hydrogen Hubs (H2Hubs) and the H2DI demand-side programs managed by OCED represent a catalytic investment to jumpstart the growth of regional clean hydrogen opportunities that span the country and will accelerate the progress of clean hydrogen production, delivery, and end-use. Additional OCED and DOE programs are also accelerating clean hydrogen progress by unlocking flexible, lower-cost production and high-impact applications of clean hydrogen for emissions reduction, including in the industrial sector. Collectively, these programs will advance progress towards the goals articulated in the National Hydrogen Strategy and Roadmap and H2 Liftoff report. At the same time, all these programs operate within the surrounding context of the rapidly evolving commercial landscape such as infrastructure needs, manufacturing and supply chain challenges, workforce development needs, regulatory and policy uncertainty (such as 45V and 45Q), and market dynamics of clean hydrogen and related fuels.

Areas of Interest: Two areas of interest have been identified under Topic 8 and will be managed as one National Lab consortia team:

- Develop market data capture and reporting for quarterly "state of the market" data summaries,
- Develop economic scenario modeling for clean hydrogen.

Estimated Budget: $1M - $2M
Estimated Number of Awards: 1
Expected Project Duration: 3+ years

Note on funds: OCED plans on having available $1M-2M per year for Topic 8 covering both Areas of Interest discussed for at least a three-year arc of work. This scope of work may continue beyond the initial three years, depending on the team's performance and remaining needs to support OCED's hydrogen portfolio.

Area of Interest 8.1: Develop market data capture and reporting for quarterly "state of the market" data summaries

OCED is seeking proposals to design, implement, and maintain a quarterly "Clean Hydrogen State of the Market" report that synthesizes current status and key updates in relevant market indicators for the growth of the U.S. clean hydrogen economy – similar to how the Quarterly Solar Industry Update is used in the solar technology development space. This subtopic would require the design, data sourcing, synthesis, and vetting of key data indicators from the clean hydrogen market for publication in a quarterly "State of the Market" slide deck format. This type of reporting would ultimately feed into Clean Hydrogen Liftoff-report style tracking and updates, with likely first report ready in Summer 2025. Data sources from across DOE, including OCED and the demand-side program partner entity, H2DI, could feed into this reporting format, among other data sets both internal and externally available. OCED sees high value in establishing a core expert team involving one or more National Labs, who maintain and execute these industry reporting functions on a regular basis. Examples of the types of content that would be envisioned include:

1. Summary of total clean hydrogen production capacity build pipeline ("project funnel") across the U.S. – tagged by key project characteristics such as financing status (planned, announced,

FID, etc.), production pathway, delivery approach, and end-use offtake.
2. Summary of clean hydrogen end-use offtake capacity and locational mapping across the U.S. – tagged by application, delivery style, etc.
3. Cost summaries and trending for key hydrogen production equipment, including electrolyzers and associated components.
4. Global tracking of country-level hydrogen and hydrogen-derivative imports, exports, and end uses.
5. Pricing data and terms, where available, for clean hydrogen contracts.
6. U.S.-wide state-by-state and Federal level policy and incentive summary tracker.
7. Headline news aggregation from major private sector industry players.

Deliverables:

- Clean hydrogen "State of the Market" reports and Liftoff-style quarterly updates, including power points to be used internally and public-facing.

Note that this Area of Interest is focused on tracking, vetting, and synthesis of externally sourced market data and specifically does not include the analyses described below in Area of Interest 2 – although OCED anticipates that a single team would address both needs. Deliverables from Area of Interest 1 will be released in coordination with other DOE market analyses (e.g. existing tracking of manufacturing supply chain - Building America's Clean Energy Future | Department of Energy).

Guidance: OCED seeks proposals to establish or leverage a team to design and implement this type of market tracking capability. OCED anticipates that some respondents may propose to partner with and/or leverage market data tracking firms (e.g. S&P, BNEF, McKinsey, etc.) as part of their approach. However, the content and synthesized data in the final reports must be published and freely accessible.

Area of Interest 8.2: Economic scenario modeling for clean hydrogen

This area of interest would require the development of forward-looking market scenarios and analyses for the clean hydrogen economy, both at the U.S. national and regional level, as well as global markets. Teams should plan to leverage integrated assessment, infrastructure expansion, systems-level, and/or energy market modeling capabilities to analyze and articulate a range of possible futures for the development of clean hydrogen commercial uses and markets (both domestic and global).

Examples of the type of analysis that would be envisioned include:

- Forward-looking trends and scenario ranges informed by market data tracking from Area of Interest 1.
- National level and regional scenarios of clean hydrogen capacity ramp-up scenarios, including disaggregation by production pathway (reformation, electrolytic, nuclear, etc.), regulatory, policy (i.e. 45V and 45Q), end-use demands by market, sector, location, technology type, and/or other market characteristics.
- Identification and discussion of key "pivot points" that impact the deployment of clean hydrogen and hydrogen derivatives across specific dimensions such as end-use and delivery method.
- Quantification of GHG emissions benefits associated with clean hydrogen and hydrogen derivative deployments across analyzed scenarios.

Deliverables:

- Clean hydrogen economic scenario analysis reporting – biannual reports (DOE internal)
- As-needed support for OCED on emergent strategy and analysis topics

Guidance: OCED seeks proposals to build a core team delivering on regular reporting around economic deployment scenarios and key market drivers for the development of the clean hydrogen economy. Close collaboration is envisioned between this team, OCED staff, and potentially with the H2Hubs, and demand-side program led by H2DI. Proposals that identify collaborations and/or outreach and engagement with the financial ecosystem are strongly encouraged.

Topic 9: Energy Markets and Grid – Mid-term Regional Outlook

Background: Grid decarbonization is both an essential element in every net-zero scenario goal, and a catalytic accelerant of sectoral emissions reductions via electrification and other emerging solutions including building technologies, electric vehicles, alternative fuel production, electrolytic hydrogen, industrial electrification, and carbon dioxide removal (Carbon Capture, Direct Air Capture, and other CDR pathways). While energy systems and market structures are undergoing a period of transition, near- and mid-term regional outlooks will be essential fact base elements to evaluate the impact opportunity of specific program, projects, and solution sets.

Projects in OCED's portfolio have the potential to directly impact local and regional grids and energy markets through:

- Advanced technologies for low-carbon power generation and storage.
- Grid-interfacing technologies such as industrial electrification, electrolytic hydrogen production or carbon dioxide removal.
- Distributed energy resources and virtual power plans.
- Power system solutions at the local, regional and facility level.

To inform both the project-specific commercial realities and the portfolio-level impact opportunity assessment of specific programmatic approaches, OCED is seeking partners to develop and maintain a near to mid-term (3-10 year) regional outlook of recent and forecasted pricing and emerging rules that will impact bidding strategies and price forecasts across organized power markets for the U.S.

This topic would require the development or customization of energy and power markets data synthesis and forecasting in a set of tools with adequate data granularity to support financial evaluations of commercial projects seeking to either produce or consume grid power. In contrast with long term scenario-driven power system modeling, this approach would emphasize the current state of market rules and anticipated near-term changes, bidding strategies, and best-available forecasts of near-term power production assets, capacity market or resource adequacy commitments, planning scenario 8760 load forecasts, etc.

Deliverables:

- Semi-annual summary reporting on recent pricing and mid-term pricing forecasts across all cleared markets [in 7-10] regions across the continental U.S., Alaska, and Hawaii
- Summary reporting on headline-level regulatory market changes that are likely to impact power markets in the near-term [monthly plus semi-annual synthesis].
- Semi-annual summary reporting on power generation asset mix, load growth forecasting profiles and drivers of power load, proposed capacity installations, and major developments in transmission build plans.

Guidance: Proposals that leverage partnerships with existing market intelligence datasets and assumptions as well as tools and approaches that regularly integrate with private sector and commercial stakeholders, utilities and grid operators, and regulatory bodies are strongly encouraged.

Estimated Budget: $500K-$1M
Estimated Number of Funded Projects: 1
Expected Project Duration: 3+ years

Topic 10: Data Management

Background: OCED views data management as a key element in the development of flexible and reproducible analysis frameworks. This includes the identification, collection, storage, and management of data sets which serve as analysis inputs. In keeping with OCED's mission of commercialization and market adoption, it is critical that analytic results, as well as aggregated, anonymized, and enriched data sets, be efficiently accessible to a variety of stakeholders, secure, and subject to robust governance to protect confidentiality.

OCED recognizes that there are significant benefits to tightly coupling management of a given data set with analysis of that particular data set. OCED also recognizes, however, that developing a distinct data management approach for each analysis capability is likely to result in duplicative work and will limit the ability to consolidate views across technologies to inform broader strategy.

OCED would therefore welcome proposals for a consolidated data management approach and/or platform. Proposals for consolidated approaches should:

- Take into consideration the data requirements of multiple analysis topics.
- Include a practical plan for coordination and change management to ensure successful connectivity with analysis platforms while benefiting from modern technology and development practices.
- Address the need for both collaboration and robust security.
- Facilitate access to all lab and DOE employees providing analytical support to OCED.
- Ensure that centralization does not lead to maintaining multiple copies of data sets, rather than a single source of truth.
- Design interoperability and standardized frameworks, including data mesh infrastructure.
- Build an enterprise catalog of datasets.
- Include a plan to facilitate stewardship of data sets by those who are respectively best positioned to do so.
- Include a proposal for ongoing maintenance.
- Delineate among expected costs of hardware, cloud services, development, and maintenance.

Guidance: Proposals that also incorporate one or more analysis topics, rather than addressing this topic on a purely standalone basis, are encouraged.

Estimated Budget: up to $5M *(funding to come from Topics 1-5)*
Estimated Number of Funded Projects: 1
Expected Project Duration: 3+ years