Request for Proposals: Open Task

2027

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About

The Open Task was established to give teams the opportunity to identify a real-world environmental challenge and develop an innovative solution through research, design, and the construction of a fully operational bench-scale demonstration.

Teams are encouraged to address issues of current national or global significance. Solutions may be designed for a specific community while considering broader applicability to other communities facing similar challenges.

Topic Selection

Topics must focus on environmental issues, including, but not limited to, energy, food, air, and water. The topic chosen must maintain the goals of the contest to solve:

- real-world,
- technically challenging,
- demonstrable,
- innovative solutions that are
- economically feasible and
- could be implemented on a large scale.

Study WERC's other Tasks. To help teams design a project that is rigorous and competitive during judging, teams are encouraged to refer to Task 1-5 problem statements to understand the expected scope and outcomes of contest tasks.

When selecting a task, teams should be mindful that:

1. The design must produce measurable results that serve as proof of concept for the design. For example, if the project has the goal of cleaning up a particular type of air pollution:
    a. The team will bring their pollution-removing bench-scale model to the contest.
    b. The contest staff will provide an air sample containing the pollutant; the team will run this through their bench-scale apparatus and collect the resulting air sample (that should now be cleaner).
    c. The WERC staff will send this "cleaned" air sample to NMSU labs to validate the team's results.
2. All bench-scale prototypes may run from 10 am on Monday until 2 pm on Tuesday. No overnight operations unless approved by WERC's Safety Officer.
3. Computer simulations should not be the primary means of demonstrating the design, unless approved in advance by WERC.

Problem Statement

Your team will identify a real-life environmental challenge in an emerging technological area, design the solution to the problem, and identify the potential market for your solution.

Build an apparatus to demonstrate a bench-scale version of your full-scale solution, evaluate the cost of building and operating a full-scale version of the proposed solution, and consider regulations and implications for implementing the solution in full scale.

Design Requirements

Your proposed design should provide specific details and outcomes as follows.

- Design an innovative product or process. Conduct literature reviews to direct your design. Ensure that your proposed design does not duplicate technology that is in use or reported in the literature.
- Describe the product or process and explain why it is valuable to society and the environment.
- Develop, demonstrate, and present a complete package that includes technical performance as well as financial, regulatory, and safety information.
- Submit an appropriate system diagram that illustrates the major components of the proposed design, their functions, and the flow of materials, energy, information, or products between them. Include all inputs. Report both desired outputs and potential unintended outputs (losses, waste streams, emissions, inefficiencies, etc.)

  Examples of system diagrams:
  - Process-flow diagram (PFD). Include mass and energy balances (input and output rates, including waste streams, reactants, reaction rates, etc.).
  - Device/System Architecture Diagram: Major components and their interactions.
  - Communication/Network Architecture Diagram: Collection, transmission, storage, and analysis of information.
  - Mechanical Layout or Assembly Diagram: Physical arrangement and connections of components.
- Build an experimental apparatus to demonstrate your process. Validate the prototype's operational feasibility and sustainability through extended bench-scale studies conducted at your institution, and report these in your deliverables.
- Identify the analytical testing protocol(s) that will be used to evaluate your solution at the contest. Share this with the WERC staff in the 30% Project Review and the Experimental Safety Plan (ESP).
- Identify waste streams, if any, for your design and plans to address them.
- Identify the hazards of the proposed solution and approaches to mitigate them.
- Discuss your plan's adherence to appropriate federal (USA), state, and local laws and regulations. Attend WERC's EH&S Short Course for tips for addressing regulatory issues. (See *Team Manual*)
- Discuss the advantages and disadvantages of your solution versus both current technologies and other possible approaches (consider cost, ease of operation, elegance of design, waste minimization, energy efficiency, etc.).
- Include a Public Involvement Plan and/or a Community Relations Plan, as applicable (see *Team Manual*).
- Present a business case for your technology, including potential incentives from appropriate levels of government and supporting economic metrics.

- Economic Analysis. Teams are advised to create a multi-disciplinary team by inviting a business major to help develop economic plans for full-scale implementation of your design.
  Select from the two approaches to economic analysis (TEA or Business Plan).
  - ***Techno-Economic Assessment and Analysis (TEA).*** Use this approach if your solution involves a one-time build, followed by the maintenance and operation of a treatment or process.
    - The TEA will include your estimate of capital costs (CAPEX) and operational costs (OPEX) for a full-scale solution, along with graphical representation of your cost data.
    - Capital expenses typically include, but are not limited to, equipment, pipes, pumps, etc. Do not include costs of buildings and appurtenances to the treatment process.
    - Operating expenses (OPEX) should include, but not be limited to, materials needed, including consumables (chemicals, sacrificial components, etc.), transportation, etc. In addition to other operating costs your team identifies, include these operating costs:
      - Labor rates: Professional engineer ($150/hr), operator ($70/hour). These include fringe benefits.
      - Disposal costs, if any.
      - Energy costs: research an industrial natural gas rate and state in $/MM BTU; an electricity rate of $0.09/kWh. Include additional operating costs your team identifies.
    - Include a financial analysis of the salable value of any potential product. Note that the location of a production plant relative to the location of raw materials and, again, to final consumers, will have a major impact on the cost of the final product.
    - Visualization tools: Use tools such as sensitivity analyses, graphs, and other visuals to illustrate how key parameters impact system performance and economics.

  - ***Business Plan.*** Use this approach if your team is designing a device that will be manufactured.
    - Costs, cost-recovery structure, recovery rate, and schedule.
    - Level of profit to show viability to a prospective lender (as an indication of ability to pay off a loan needed to set up the manufacturing process).
    - Projected sales forecast, market potential, potential market share
    - Reduction in the marginal cost of each device as manufacturing progresses over successive years (to reflect economies of scale: i.e., the cost of manufacturing a single car is $50M, but the cost of manufacturing 5M cars is $30,000 each).

- To be considered for the WERC P2 Award, in a separate section of the report (titled “Pollution Prevention”), document success in improving energy efficiency, preventing pollution, and/or minimizing waste, as it applies to your project.
- Address safety aspects of operating your technology:
  - For the full-scale design: Address in the written report.
  - For the bench-scale demonstration: Address in the written report and the ESP.
- Discuss the intangible benefits of the product or process, if any.
- Report any use of AI, machine learning, predictive modeling, automation, or other decision-support tools, and describe how the tools were used. These resources may be used only to support the team’s independent engineering research, analysis, calculations, assumptions, and conclusions. Teams remain fully responsible for verifying all information, performing the underlying engineering analysis, and defending their design decisions based on their own work.

Bench Scale Demonstration April 6, 2027

Teams shall design and construct a functional bench-scale prototype that clearly conveys the proposed solution. The prototype shall be demonstrated during the contest in Las Cruces, NM, April 2027.

- WERC will manage analytical testing of your prototype at the contest.
- All bench-scale prototypes may run from 10 am on Monday until 2 pm on Tuesday.
- Any overnight operations must be approved in the ESP.
- Samples, data reports, etc., must be submitted by Tuesday, 6 April 2027 at 2:00 pm for WERC to conduct independent analyses.
- When designing the prototype, keep in mind that the contest is held at a banquet facility. Standard 120V power is available. However, typical lab resources such as fume hoods, ovens, etc., will not be available.

Bench-scale Prototype Testing. Your team's 30% Project Review and approved Experimental Safety Plan (ESP) will guide WERC's analytical testing procedures for your project during the contest. These two forms are required to ensure that your bench-scale prototype is appropriate for the facility and will operate safely

Bench-scale-related submissions:

- ***30% Project Review:*** focuses on the basic prototype setup and the system diagram for your project and your plans for demonstrating the prototype to the judges. (See more details on p. 5).
- ***ESP:*** The ESP includes everything in the 30% Project Review, any updates since the 30%, plus all safety concerns and mitigation plans for operating your bench-scale demonstration at the contest.
    - The ESP form is posted on the WERC website (Forms).
    - Instructions for preparing the ESP are provided in the *ESP Preparation* short course and the *Team Manual*. Your entire team is required to attend the mandatory short course.
    - Teams will not be able to run a bench-scale demonstration if the ESP is not received by the deadline of March 5, 2027.
    - The ESP form includes items such as:
        - Submit a detailed list of analytical testing needed for WERC to evaluate the bench-scale results. (Do we need to send your resulting samples to a lab? What laboratory analyses will be needed? What will the samples likely contain? Will we need to make measurements at your booth? etc.)
        - State the estimated time needed to run the bench-scale demonstration.
        - Estimate the time required for WERC's labs to analyze results from your bench-scale prototype.

30% Project Review

Submission date: Dec. 31, 2026

Early submission: You may submit earlier if you wish to receive feedback sooner.

Submission Form: Use the submission form provided on the Team Site (*URL TBD*)

Submit the 30% Project Review as early as possible. Although the review is not scored, your team will receive early feedback from the judges. You are allowed to change your plans after submitting this report. Include as many items listed below as possible. The more detail provided in your review, the better direction you will get from the judges. (See *Team Manual* for more information.)

As available, in the 30%, include:

- ***A brief description of your project:*** One bulleted list outlining your planned solution to the problem and any anticipated drawbacks.
- ***Your top 3 project goals, and how your design maps to each goal.***
- ***A complete System Diagram:*** as described above in *Design Requirements*.
- ***A 3D diagram, to scale, of your bench-scale setup.*** *Include outer dimensions*.
- ***Proposed bench-scale testing parameters:*** Outline the testing plan WERC will execute, including setup, controlled variables, measurement methods, data capture procedures, and specific success criteria for validating system functionality.
- ***Preliminary data and/or calculations that support the proposed design, if available***. This might include expected chemical reactions (reactants, reaction times, etc.), flow volumes, rates, etc.
- ***Rough cost estimates for the full-scale design that demonstrate project feasibility.*** This will give your team and the judges a chance to consider modifications that might improve the project's outcomes.
- ***All bench-scale setup requests***, such as indoor versus outdoor demonstration area, the potential need to run the process overnight (justify the needs and describe continuous monitoring, power needs, safety measures).
- ***Auxiliary equipment and supplies requests,*** if any, such as pressurized gas cylinders, bulky items, etc. Provide justifications for each requested item.
- ***Indicate any potential safety protocols needed to run your prototype.***

Contest Deliverables (See *Team Manual*)

Each team must submit:

- 30% Project Review
- Experimental Safety Plan (ESP) and Required Short Course
- Technical Report—System design, data analysis, full-scale proposal, and 3 independent audits
- Flash Pitch—Pitch your design to investors, community leaders, or potential funding agencies
- Oral Presentation—Summary of design and key findings
- Poster Presentation—Visual summary of system and results
- Bench-Scale Demonstration—Working model with measurable performance

Evaluation Criteria

Each year, the WERC Environmental Design Contest and its sponsors award more than $35,000 in cash prizes. There are task-specific prizes and overall contest awards. See the *Team Manual* for more information.

Each team is advised to read the *2027 Team Manual* for a comprehensive understanding of the contest evaluation criteria. For a copy of the Team Manual, Public Involvement Plan, and other important resources, visit the WERC website: https://werc.nmsu.edu/team-info/guidelines.html

Judges' evaluation of your entry will include:

- Potential for real-life implementation, including expected reliability and maintainability, and CAPEX and OPEX. The cost/benefit of your solution will be compared with those of other teams.
- Thoroughness and quality of the System Diagram(s).
- Thoroughness and quality of the economic analysis of the full-scale proposal.
- Originality, innovation, and real-world need are evident.
- Successful bench-scale results.
- Other specific evaluation criteria that may be provided at a later date (watch the FAQs), including those suggested by judges as a result of your 30% Project Review.

Dates, Deadlines, FAQs (*dates subject to change—watch website FAQs*)

Today	Email us to reserve a spot for your team. This places your team on the email list for this task. Registration is limited to the first 34 teams.
Weekly	Check FAQs weekly for updates: Task-specific FAQs: 2027 Tasks/Task FAQs General FAQs: WERC General FAQs
Nov. 1 – Dec. 31, 2026	Early Bird Registration (discount applies)
Dec. 31, 2026	30% Project Review Due
Dec. 1, 2026 – March 1, 2027	Mandatory On-demand Course: *Preparing the Experimental Safety Plan*. See WERC's website and *Team Manual* for information.
February 15, 2027	Final date to register a team.
March 1 – 5, 2027	ESP due to Juanita Miller. Include requests for chemicals, materials, etc.
March 26, 2027	Technical Report due
April 4 – 7, 2027	Contest in Las Cruces

Contacts:

Safety Officer ● ESP Approval: Juanita Miller, miljgh@nmsu.edu

Task and Contest Questions: Ginger Scarbrough, werc@nmsu.edu, 575 312-7623 (cell)