

Request for Proposals (RFP)

(Updated on Aug 27, 2026)

The 2027 International Future Energy Challenge (IFEC2027)

<http://energychallenge.weebly.com>



A student competition sponsored by the
The Institute of Electrical and Electronics Engineers (IEEE)

July, 2027

Utah State University and the NSF ASPIRE Engineering Research Center
Logan, Utah, USA



1. IFEC 2027 Organizing Committee and Schedule

Organizing Committee

General Chair Hongjie Wang, Utah State University	General Co-chair Regan Zane, Utah State University
Technical Committee Chair Hang Dai, Utah State University	Technical Committee Co-chair Bryce Hesterman, ASPIRE Foundation
Technical Committee Co-chair Abdullah Baig, Utah State University	Local Organizing Chairs Mario Harper, Utah State University Ramish Majeed Raja, Utah State University
Publicity Chairs Aditya Zade, Delta Electronics Dakota Goodrich, Utah State University	Finance Chair Mariam Rasheed, Ford Motor

Steering Committee

Steering Committee Chair

Giri Venkataramanan, University of Wisconsin-Madison

Competition Timeline

Date	Milestone / Activity
Oct. 6, 2026	IFEC 2027 workshop / Q&A at ECCE 2026
Oct. 31, 2026	Proposal deadline (with letter of support)
Nov. 30, 2026	Notification of proposal acceptance
Mar. 7, 2027	Progress workshop at APEC 2027
Mar. 22, 2027	Notification of finalists
July (TBD), 2027	Final competition at Utah State University, Logan, Utah, USA

Schedule status

The dates above reflect the current IFEC 2027 plan. The organizing committee may issue updates as competition logistics are finalized. For updates, please check:

<http://energychallenge.weebly.com>

2. IFEC Introduction

Scope

The International Future Energy Challenge (IFEC) is an international student competition for innovation, conservation, and effective use of electrical energy. The competition is open to college and university student teams from recognized engineering programs worldwide, with participation based on a competitive proposal process.

Introduction

In 2001, the U.S. Department of Energy (DOE), in partnership with the National Association of State Energy Officials (NASEO), the Institute of Electrical and Electronics Engineers (IEEE), the Department of Defense (DOD), and other sponsors, organized the first Future Energy Challenge competition. The objective was to build prototype, low-cost inverters to support fuel cell power systems. This competition was originally open to schools in North America with accredited engineering programs. The 2001 Future Energy Challenge focused on the emerging field of distributed electricity generation systems, seeking to dramatically improve the design, reduce the cost of dc-ac inverters, and interface systems for use in distributed generation systems. The objectives were to design elegant, manufactural systems that would reduce the costs of commercial interface systems by at least 50% and, thereby, accelerate the deployment of distributed generation systems in homes and buildings. Final events were conducted at the National Energy Technology Laboratory (NETL) in Morgantown, WV, USA. Speakers from IEEE, DOE, and DOD introduced the competition and interacted with students during the event week. Hardware was tested with an experimental fuel cell at the NETL site.

To continue and expand the success of 2001 and other 16 IFECs over the years, the 2027 International Future Energy Challenge (IFEC) topic is the “**Universal Power Processing Unit**”: a compact, isolated, high-performance power converter intended to accept ac or dc input sources and deliver multiple useful electrical outputs. A central motivation for the 2027 challenge is the global need for flexible and accessible electric power. The IFEC 2027 highlights that approximately 3 billion people live in energy poverty and more than 1 billion people lack access to electricity. A universal power processing unit can help advance adaptable, portable, and efficient power-conversion solutions for energy-access and off-grid applications. The challenge encourages creative topologies, advanced devices, control strategies, packaging, magnetics, thermal management, EMI mitigation, and protection approaches that can enable robust power access across diverse environments.

Utah State University (USU) will host the IFEC2027 final competition in Logan, Utah, USA. USU has participated in IFEC competitions since 2019 and is the headquarters of the NSF ASPIRE Engineering Research Center. The university provides state-of-the-art transportation-electrification research infrastructure, including the Electric Vehicle and Roadway Facility (EVR). Logan is approximately a 1.5-hour drive from Salt Lake City International Airport.

Detailed travel, lodging, testing, and event logistics will be announced separately.

Awards and Financial Support

There will be a Grand Prize of \$10,000 and three additional awards granted at \$5,000, \$3,000, and \$1,000 each. The detailed technical specifications for the 2027 competition are listed on the following page. Travel support of \$1,000 for teams with a distance of less than 5000 km and \$2,000 for a distance of 5000 km and above will be provided, which is applicable to the final competition.

3. IFEC2027 Topic: Universal Power Processing Unit

Tentative technical requirements

The following specifications are based on the current IFEC 2027 technical presentation and are intended to guide proposal development. Final competition rules may refine test procedures, connector details, and selected performance requirements.

3.1 Input Capability

- One input port only. Auxiliary power inputs are not permitted.
- The unit shall accept 24 V to 400 V dc.
- The same input port shall accept 90 V to 277 V single-phase ac over a frequency range of 50 Hz to 100 Hz.

3.2 Output Capability

- USB-A: regulated 5 V output, up to 2 A.
- USB-C: adaptive output compliant with the USB Power Delivery 3.2 Power Range specification, up to 48 V and 5 A.
- AC output: NEMA 1-15 interface providing nominal 120 V at 60 Hz, up to 240 VA.
- The three output ports should be capable of providing power simultaneously.
- Total combined output power: 240 W across the available output interfaces. The converter shall actively limit power to prevent overloading of any individual output port.

3.3 Functional and Performance Requirements

Requirement	Target / Requirement
AC input power factor	≥ 0.98 at loads greater than 5 W.
Galvanic isolation	At least 1 kV between the input and any output.

Requirement	Target / Requirement
EMI / harmonics	Meet IEC 61000-3-2 Class D requirements.
USB-A ripple	≤ 100 mV peak-to-peak.
USB-C ripple	$\leq 1\%$ peak-to-peak relative to the actual dc output voltage.
Full-load efficiency	$\geq 90\%$. * Efficiency will be tested at several different load conditions.
Environment	Operate without derating from -20°C to $+50^{\circ}\text{C}$ and up to 100% relative humidity; immersion safety is not required. * Analysis of how this is achieved is required in the report. *The unit will be tested at room temperature.
Touch safety / exterior temperature	No exterior location shall exceed 60°C during operation under specified conditions.
Mass/hold-up/protection	Mass ≤ 500 g, excluding physical input connector adapters; target hold-up time 200 ms; protections required on both input and output sides. A mass and volume analysis in the proposal/report is required.
Manufacturing cost	A cost analysis in the proposal/report is required.

*** Volume, mass, and cost will be scored relatively among the teams**

3.4 Design Freedom and Innovation

Teams are encouraged to explore innovative converter topologies, semiconductor technologies, magnetic structures, control methods, packaging approaches, EMI solutions, thermal-management concepts, and protection strategies. The proposal should clearly explain how the selected architecture can satisfy the broad input range while maintaining isolation, efficiency, compactness, safety, multi-output capability, and cost.

4. Competition and Proposal Requirements

Competition Title

The 2027 IEEE International Future Energy Challenge (IFEC2027) Student Competition

Topic

Universal Power Processing Unit

Competition Period

Fall 2026 through July 2027, with the final competition scheduled for July (TBD), 2027, at Utah State University in Logan, Utah, USA.

Challenge Program Awards

A Grand Prize of \$10,000 and three additional awards granted at \$5,000, \$3,000, and \$1,000 each. The Organizing Committee may announce other prize categories, award amounts, and any travel-support provisions for IFEC 2027.

External Support

Individual schools should solicit project funding from companies, foundations, utilities, manufacturers, government agencies, or other sources. There is no limitation for the sources of project funding.

Eligibility

- Eligible schools must have an accredited or similarly officially recognized engineering program (through the Accreditation Board for Engineering Technology (ABET) or equivalent); be a college or university with engineering curricula leading to a full first degree or higher; have the support of the school's administration; establish a team of student engineers with an identified faculty advisor; demonstrate the necessary faculty and financial support commitments; and demonstrate a strong commitment to undergraduate engineering education through their proposal.
- University Eligibility Limit: Each university campus is limited to supporting only one team.
- To confirm eligibility, potential participating schools must submit a **Letter of Support** (Attachment II) with the project proposal by October 31, 2026, to hongjie.wang@usu.edu.
- For each team, the minimum undergraduate student number is three to qualify for the competition. Graduate students can only participate as graduate advisors. Up to two graduate students are allowed per team. Interdisciplinary teams are encouraged where they strengthen the technical and educational goals of the project.

Intellectual Property

Consistent with prior IFEC practice, the competition does not intend to restrict the use or protection of inventions or other intellectual property produced by participating teams. The final competition in July 2027 includes public presentation and demonstration of team technology; teams seeking intellectual-property protection should plan accordingly before public disclosure.

How to Participate

Participation is on a proposal basis. Interested universities must submit a proposal before the

proposal deadline. Proposals will be judged by a distinguished panel of volunteer experts from the IEEE and the industry. Schools with successful proposals will be notified one month after the proposal deadline. Student teams will then carry out the work and prepare hardware prototypes and reports. Deadlines for the qualification reports are also listed in the attachment and will be posted on the IFEC website. The reports will be judged by a similar expert panel. All selected teams are invited to present their progress during the workshop in APEC, 2027. Afterwards, feedback will be given to the team. Up to 8 project teams will be invited to the final competition in Logan, UT, USA, in July 2027. A Final Report will be due at the competition event.

Judging Panels and Judging

Experts from IEEE Power Electronics Society (and others to be announced) and representatives from manufacturers, national labs, independent test labs, utilities, and R&D engineers.

Judging score schemes will be set up mainly based on functionality performance, system efficiency, power density, and cost. Adoption of wide bandgap devices in innovative circuit topologies to achieve higher efficiency and size reduction is highly encouraged.

5. Proposals

Proposals will be judged on the quality of plans, the likelihood that a team will be successful in meeting the IFEC2027 objectives, technical and production feasibility, and degree of innovation. Other key criteria are evidence of the school's commitment, capability, experience, and resources to implement their design over the one-year span of the competition. Commitment to excellence in undergraduate education is important, and acceptable proposals will involve undergraduate students as the primary team members. For each team, the minimum undergraduate student number is two to qualify for the competition. Interdisciplinary teams are encouraged. Graduate students are not excluded but are limited to a graduate advisor role in the team. The upper limit of graduate student participants is two for each team.

The impact on undergraduate education is a critical judging criterion. **Proposals are limited to 12 double-spaced pages total, including all diagrams, attachments, and appendixes.** Schools that are invited to participate in the IFEC2027 are expected to adhere to the basic plans described in their proposals. Approval of the competition organizers must be sought for significant changes in plans or engineering designs. Only one proposal will be considered for each school. Proposals must be submitted electronically in PDF format.

Proposal Objectives

Respondents should express their ideas and plans relevant to the competition topic area. The project should include the construction and operation of a complete hardware prototype. The proposal must address both technical and organizational issues for each phase of the prototype's development and testing. It must contain a realistic project budget, along with a plan to secure the

necessary funding. The educational goals, including any course credit provided for work related to the 2027 International Future Energy Challenge, and how the project relates to other efforts within the school and at the regional or national level should be addressed. A Letter of Support from an official of the school confirming a commitment to participate in the competition and stating the type(s) and level of support for the team's participation in the competition should be attached, and is not counted toward the 12-page limit.

Administrative Considerations and Limitations

This section describes the limitations placed on the proposal. Compliance is mandatory.

Language	Proposals must be written in English.
Length	Proposals are limited to 12 single-sided double-spaced pages of text, figures, and appendixes. The page size must be 8.5" x 11" or A4, and the font size must be no smaller than 10-point. Margins should be at least 25 mm. The Preliminary Team Information Form (Attachment I in this RFP), Support Letter (Attachment II in this RFP) from the school, government entities, or private sector organizations will not count in the proposal length.
Authors	Proposals are to be prepared by the student team in collaboration with the faculty advisor(s).
Signatures	Proposals must be signed by all authors of the proposal (or the student team leader) and the faculty advisor.
Letter of Support	Proposals must be accompanied by a letter of support from an appropriate Dean, Department Chair, or other authorized school official. The letter must confirm the school's commitment to participate. It must also state the type(s) and value of support from the institution. School support should match the value of cash and in-kind support from the team's principal sponsors. Additional letters of support from other team sponsors are optional. A sample letter is provided as Attachment II.
Preliminary Team Data	Submit one copy of the Preliminary Team Information Form (Attachment I) with the proposal, then an updated copy with the progress reports to the address below. This form does not count in the 12-page limit.
Due Date	All proposals must be received by close of business on October 31, 2026 for full consideration.
Proposal Submission	The electronic copy of the proposal in PDF format must be sent to hongjie.wang@usu.edu by e-mail, with a copy to the IFEC2027 chairs. General Chair: Hongjie Wang Department of Electrical and Computer Engineering, Utah State

	University Logan, UT, USA 84322 Email: hongjie.wang@usu.edu General Co-Chair: Regan Zane Department of Electrical and Computer Engineering, Utah State University Logan, UT, USA 84322 Email: regan.zane@usu.edu Technical Committee Chair: Hang Dai Department of Electrical and Computer Engineering, Utah State University Logan, UT, USA 84322 Email: hang.dai@usu.edu
Information	The Organizing Committee of IFEC2027 maintains the website at http://energychallenge.weebly.com/. The site will include the most recent schedule and rule updates, frequently asked questions, details about judging and scoring, and other teams' information. It should be checked regularly.
Contact Email	hongjie.wang@usu.edu



ATTACHMENT I Preliminary Team Information Form

2027 IEEE INTERNATIONAL FUTURE ENERGY CHALLENGE

UNIVERSAL POWER PROCESSING UNIT

University	
Corresponding address	
Primary contact	Name: Telephone: Email:
Faculty advisor(s)	Name: Department: E-mail:
Faculty advisor(s)	Name: Department: E-mail:

Preliminary Team Members

Name	Major / Field	Degree	Expected Graduation Date	Role

Team Lead Signature: _____ **Date:** _____

Faculty Advisor Signature: _____ **Date:** _____

ATTACHMENT II
LETTER OF SUPPORT
Submit with Proposal

[The letter below is an example, which should not be simply copied. Please send a letter with similar content on your university letterhead.]

Hongjie Wang, Associate Professor
Department of Electrical and Computer Engineering, Utah State University
Logan, UT, USA 84322

Dear IFEC2027 General Chair,

Our university has organized a student team to participate in the 2027 International Future Energy Challenge. Our proposal is enclosed. A Preliminary Team Participation Form is attached, listing our contact person, the faculty advisor(s), and some of the students who plan to be involved. The team will keep an eye on the Energy Challenge website for detailed rules and other information. We understand that we will be notified whether we have been accepted to participate by November 30, 2026. If we are accepted, we agree to have our student team perform the design tasks and prepare the reports and hardware prototypes required for the competition. Our school is prepared to support the team with the following resources:

- A final year project course, XXX, has been authorized to provide engineering students across several disciplines with the opportunity to include this project in their curricula. Laboratory space has been arranged for this course.
- A faculty advisor, Prof. XXX, has been identified and has been formally assigned to teach the project course and to advise the student team as a portion of his/her regular duties.
- A graduate advisor has been identified to help manage the student team and to supervise direct laboratory activity. This student is supported with a Teaching Assistantship, which represents a funding commitment of our university of approximately \$X.
- The student team will be provided with an appropriate level of technician and machine shop support to assist them with package preparation and assembly. This assistance represents a funding commitment of approximately \$X, and we consider this as a matching commitment for any in-kind support received from external sponsors.
- In addition, we will provide limited funds to help secure special parts and equipment, with a total commitment of up to \$X.
- The student team will be encouraged to secure outside sponsorship. Our university strongly supports all these efforts and will match any outside cash support 1:1 up to an additional total of \$X.

In the event that our school receives prizes from the competition, we are committed to using

approximately X% of this money for scholarships for the student team members. The remainder of the funds will be added to our Team Design Program fund, which supports this and similar projects through sponsorship matching, travel funds for participation in competition events, and other direct costs of large team design projects. In the event that our team creates new inventions in the topic area, our university also provides the possibility of assisting with the organization of a start-up company.

We understand the importance of student team projects in the engineering curriculum and look forward to our participation in the 2027 International Future Energy Challenge.

Sincerely,

(Head of Department, Dean of Engineering or similar school official)