

INTERNATIONAL SPACE SOLAR POWER STUDENT COMPETITION | 2020-2021

DATE: 12 April 2021

SUBJECT: The International Space Solar Power (SSP) Student Project Competition [2021]

Dear Colleague(s),

The need to advance the goals of STEM (science, technology, engineering & mathematics) education is especially important in encouraging the emergence of future generations of researchers, technologists and innovators in the space sector in general, and in particular in the special fields of expertise required for the successful exploration, development and eventual settlement of space. The critical topic of Space Solar Power (SSP) – harvesting solar energy in space affordably and delivering it to markets in space and on Earth – has been studied as a vision for Humanity's future for almost 50 years. This topic has never been more important as Climate Change issues have become increasingly clear and the need for safe, clean, reliable energy in cis-Lunar space for science, exploration and commercial activity is undenied.

And yet there are almost no undergraduate or graduate courses (and no degrees of which we are aware) offered on this topic at either the undergraduate or the graduate levels in accredited colleges or universities. If Space Solar Power – which is both critical to space development and settlement and an increasingly important option in efforts to mitigate Climate Change – is to become a reality, this must change.

SPACE Canadaⁱ, the International Astronautical Federation (IAF) Power Committee, Commission III of the International Academy of Astronautics (IAA), the Space Generation Advisory Council (SGAC), the National Space Society (NSS) International Space Development Conference (ISDC) SSP Track in a cooperative effort have organized an annual faculty advised, student-conducted international research and engineering research/paper competition on the topic of Space Solar Power.ⁱⁱ The early years of the Competition have been highly successful – involving many project proposals and multiple university / college participants and dozens of students; leading to original research studies that were presented at the annual IAF Power Symposia of the International Astronautical Congress (IAC) in Adelaide, Australia (2017), Bremen, Germany (2018) and Washington, DC USA (2019), The Cyber Edition (2020), and Dubai, UAE (2021). On the basis of these first years, the participating organizations have decided to continue this effort during 2020-2021. These can be viewed on SpaceCanada.org

This letter is the announcement of the 2021 competition.

Upon request, additional details concerning the Competition will be provided;ⁱⁱⁱ the key points are as follows:

1. This will be an annual competition; this is the fifth cycle: 2020-2021.^{iv}
2. The purpose of the competition is to engender new, meaningful and credible student research projects in the broad field of Space Solar Power, and to support the presentation of the best of the various projects in an international forum including explicit recognition of the best research with a formal prize.

ⁱ SPACE Canada is a non-profit, non-governmental organization based in Canada; the purpose of the organization is to promote international dialogue on and understanding of the topic of Space Solar Power.

ⁱⁱ It is anticipated that with time some organizations may be added as participants in implementing the annual competition, while others may choose not to be involved; as the foundation of the competition, SPACE Canada is the principal sponsor of the effort, and the prizes. Cooperation has been established among SPACE Canada, the IAF Power Committee, the IAF Power Committee, the ISDC SSP Track organizers and the IAF Space Generation Advisory Council (SGAC).

ⁱⁱⁱ Additional information and updates will be posted to <http://SPACECanada.org> as appropriate.

^{iv} This competition builds upon and integrates earlier independent events (prior to 2017): an annual SSP visualization competition held in conjunction with the NSS ISDC conference, and a yearly SSP student paper competition resulting in a paper and presentation at the annual International Astronautical Congress (IAC), organized by the IAF Power Committee and the IAF SGAC.

3. The International Space Solar Power Student Competition Prize during 2020-2021 will have four parts: (a) registration support for selected semi-finalist teams to attend the annual ISDC (see below); (b) a formal certificate of recognition for selected semi-finalist teams (as a team, and for each team member, including

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the faculty advisor); (c) travel and registration support for up to two selected finalist teams to attend the annual IAC SSP Symposium (see below); (d) a formal certificate and a plaque for the selected winning team(s) (the plaque for the team, and a certificate for each participant, including the faculty advisor).

4. The competition is open to participation by faculty-coached, student-implemented project team, including a faculty advisor, not fewer than two undergraduate students and potentially one or more graduate students from any accredited international college or university. A given project team may involve more than a single university in an integrated team; however, each team from any participating college or university must include not less than two undergraduate students and one faculty advisor.

5. The competition will involve three stages: (1) registration and proposal / abstract submission by proposing teams; (2) following selection of semi-finalists by Competition leaders, preliminary presentation of interim results at the annual NSS International Space Development Conference being held virtually during 24-27 June 2021 (see: <https://isdc2021.nss.org/> ^{vi} and (3) following selection of finalist teams, presentation (with a formal technical paper) of up to three best projects at the IAF Power Committee Solar Power Satellite (SPS) Session at the annual International Astronautical Congress (IAC), to be held October 25-29, 2020 in Dubai, UAE (see: <http://www.iafastro.org/events/iac-iac-2021/>).

6. Semi-finalists in the annual competition will be chosen by an independent review process based on submitted abstracts and draft presentation materials; these will be provided with a fixed level of financial support to assist in their attendance and presentation of interim results at the annual ISDC SSP Track. (A team participating in the ISDC must send to the Conference not less than one member of the student team and one faculty advisor; however otherwise the decision as to who should participate and how the funds should be distributed among team members to meet travel and registration costs will be flexible.)

7. Finalists in the annual competition will be chosen by an independent review process based on the presentations made at the annual ISDC SSP Track, and updated draft research presentation results. In the event that no project teams are adjudged to have achieved a sufficiently high level of technical accomplishment in a given year, no award will be made during that year.

8. The chosen winner(s) will be provided with a fixed level of financial support to assist in their attendance and presentation of interim results at the annual IAC SPS Symposium. A formal paper is required and must be submitted to the IAC according to the rules of the conference. (Participation in the IAC must comprise not less than one student team member and one faculty advisor; however otherwise the decision as to who should participate and how the funds should be distributed among team members to meet travel and registration costs will be flexible.)

^v Funding support provided by Competition will be provided in the form of reimbursement of expenses incurred by a selected and previously-approved team at each stage of the competition; it may be used for (1) airfare, (2) ground transportation, (3) lodging, and (4) meeting registration fees, up to a determined maximum based upon participation levels as well as location of participants. Funds may not be used for reimbursement of food or related expenses.

^{vi} At the ISDC 2021, the normal SSP track will be held during June 24-27, 2021; specific dates are still to be set.

9. In order to be eligible, members of each competing team (as described elsewhere) must be available and able to attend and present at the ISDC (semi-finalist) and the IAC (finalist).

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10. The competition will encompass multiple disciplines, but will be focused each year around a particular Solar Power Satellite concept. During 2020-2021, the focus will be to address key challenges and new innovations/architectures of solar power satellites, with particular attention made to addressing life cycle CO₂ challenges (including, but not limited to, the construction, maintenance, operation and disposal services of SPS satellites).

11. The acceptable disciplines/fields for research projects include (a) architecture level studies; (b) end-to-end energy concepts & technology (including wireless power transmission (WPT), solar power generation, etc.); (c) structural systems, controls and dynamics technology; (d) space transportation technology and engineering for SPS (including Earth-to-orbit or in-space transportation and/or propulsion); (e) space resources utilization for SPS; (f) ground systems and integration; (g) applications of SPS to space missions and markets, such as lunar or Mars surface power, power in space, etc.; (h) near-term SPS system and technology demonstration concepts; (i) space policy, legal and regulatory considerations across all of the above (including international cooperation, spectrum management, space debris, etc., etc.); (j) the potential value of SPS in reaching goals to mitigate climate change issues; and, (k) financing concepts for all of the above.

12. The first deadline for participation in the 2021 competition is development and submission of an abstract for a proposed student research project by not later than **May 19th, 2021**.

We look forward to participation by students and faculty from accredited colleges and universities globally in this year's competition. If you would like to indicate interest in participating, volunteering, or in being part of our team of judges and to obtain additional information, please contact us at the email address below.

With best regards,

John C. Mankins
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Member of the Board, SPACE Canada
Chair, IAF Power Committee
Chair, IAA Space Solar Power Decadal Study Group
Co-Chair, ISDC Space Solar Power Track

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For additional information, please contact us at:
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