# 1NC Sunvite R2

## NC

### Framework

#### In setting an end, every agent must recognize freedom as a necessary good, Gewirth 84 bracketed for grammar and gendered language

[Alan Gewirth, () "The Ontological Basis of Natural Law: A Critique and an Alternative" American Journal Of Jurisprudence: Vol. 29: Iss. 1 Article 5, 1984, https://scholarship.law.nd.edu/ajj/vol29/iss1/5/, DOA:9-10-2018 // WWBW Recut LHP AV]

Let me briefly sketch the main line of argument that leads to this conclusion. As I have said, the argument is based on the generic features of human action. To begin with, **every agent acts for purposes [t]he[y] regards as good.** Hence, **[t]he[y] must regard as necessary goods the freedom** and well being **that [is]** are the generic features and **necessary conditions of** his **action** and successful action in general. From this, it follows that **every agent logically must hold or accept** that he has **rights to these conditions**. For if he were **to deny** that he has **these rights**, then he **would** have to **admit that it is permissible** for other persons **to remove** from him the very **conditions** of freedom and well-being **that**, as **an agent**, he **must have**. But **it is contradictory** for him **to hold both that [t]he[y] must have these conditions and also that he may not have them.** Hence, on pain of self-contradiction, every agent must accept that he has rights to freedom and well-being. Moreover, **every agent must further admit that all other agents also have those rights, since all other actual or prospective agents have the same general characteristics of agency** on which he must ground his own right-claims. What I am saying, then, is that every agent, simply by virtue of being an agent, must regard his freedom and well being as necessary goods and must hold that he and all other actual or prospective agents have rights to these necessary goods. Hence, every agent, on pain of self-contradiction, must accept the following principle: Act in accord with the generic rights of your recipients as well as of yourself. The generic rights are rights to the generic features of action, freedom, and well-being. I call this the Principle of Generic Consistency (PGC), because it combines the formal consideration of consistency with the material consideration of the generic features and rights of action.

#### Prefer –

#### A] performativity – argumentation requires the assumption that freedom is good – else agents would be unable to make arguments

#### B] prerequisite – condoning any action requires condoning the freedom required to take that action – so my theory’s a prerequisite to theirs and my offense acts as a side-constraint to your framework.

#### C] culpability – absent a conception of free will, people can just claim they were acting of desires they can’t control.

#### The universality of freedom justifies a libertarian state. Otteson 09

Otteson 09 brackets in original James R. Otteson (professor of philosophy and economics at Yeshiva University) “Kantian Individualism and Political Libertarianism” The Independent Review, v. 13, n. 3, Winter 2009

In a crucial passage in Metaphysics of Morals, Kant writes that the “Universal Principle of Right” is “‘[e]very action which by itself or by its maxim enables the freedom of each individual’s will to co-exist with the freedom of everyone else in accordance with a universal law is right.’” He concludes, “Thus the universal law of right is as follows: **let your external actions be such that the free application of your will can co-exist with the freedom of everyone in accordance with a universal law**” (1991, 133, emphasis in original).5 **This** stipulation **becomes** for Kant **the grounding justification for the existence of a state**, its raison d’être, and the reason we leave the state of nature is to secure this sphere of maximum freedom compatible with the same freedom of all others. Because this freedom must be complete, in the sense of being as full as possible given the existence of other persons who demand similar freedom, it entails that **the state may**—indeed, must—**secure this condition** of freedom, **but undertake to do nothing else because any other** state **activities** would **compromise** **the** very **autonomy the state seeks to defend**. **Kant’s position** thus outlines and implies a political philosophy that **is broadly libertarian**; that is, **it endorses a state constructed with the sole aim of protecting** its citizens **against invasions of** their **liberty**. For Kant, individuals create a state to protect their moral agency, and in doing so they consent to coercion only insofar as it is required to prevent themselves or others from impinging on their own or others’ agency. In his argument, **individuals cannot rationally consent to a state that instructs them in morals, coerces virtuous behavior, commands them to trade or not, directs their pursuit of happiness, or forcibly requires them to provide for** their own or **others**’ pursuits of happiness. And except in cases of punishment for wrongdoing,6 **this** severe limitation on the scope of the state’s authority **must always be respected**: “The rights of man must be held sacred, however great a sacrifice the ruling power may have to make. There can be no half measures here; it is no use devising hybrid solutions such as a pragmatically conditioned right halfway between right and utility. For all politics must bend the knee before right, although politics may hope in return to arrive, however slowly, at a stage of lasting brilliance” (Perpetual Peace, 1991, 125). The implication is that **a Kantian state protects** against invasions of **freedom and does nothing else**; in the absence of invasions or threats of invasions, it is inactive.

#### Thus, the standard is consistency with a libertarian state.

#### Impact calc – Aggregation fails – there is no one for whom aggregate good is good-for. Korsgaard:

Christine Korsgaard, “The Origin of the Good and Our Animal Nature” Harvard, n.d. RE

According to the second view I will consider, hedonism, the good just is pleasurable experience or consciousness and the absence of painful experience or consciousness. What makes a being capable of having a final good is simply that the being is conscious. Otherwise, its good is not relative to its nature. As is often noticed, on this theory it is a real question whether some of the other animals might not have a better life, or at least be capable of having a better life, than human beings, given their apparent enthusiasm for simple and readily available joys. Although I’ll treat it as a separate theory, hedonism, I believe, has an inherent tendency to collapse either into a version of the intrinsic value theory, or into a version of the third view I am about to describe. Obviously, it is possible to regard hedonism simply as a particular instance of the intrinsic value theory, one that singles out conscious experience as the only possible bearer of intrinsic value. But I think this way of looking at hedonism does not do justice to the intuition that has made hedonism seem plausible to so many thinkers, which is precisely the idea that the final good must have an irreducibly subjective or relational element. That is, what makes hedonism seem plausible is precisely the idea that the final good for a sensate being must be something that can be felt or experienced as a good by that being. It is something that can be perceived or experienced as welcome or positive from the being’s own point of view, and that is therefore relative to the being’s own point of view.9 The intrinsic value version of hedonism tries to capture the essentially subjective element of the final good by attaching objective intrinsic value to a subjective experience, but when this move is made the essentially relational or relative character of subjectivity tends to drop out. The goodness of the experience is detached from its goodness for the being who is having the experience, and instead is located in the character of the experience itself. This defect shows up most clearly in utilitarian versions of hedonism, which allow us to add the goodness of pleasant experiences across the boundaries between persons or between animals. There is no subject for whom the total of these aggregated experiences is a good, so the aggregate good has completely lost that relational character: the goods are detached from the beings from whom they are good. This relational element of value, I believe, is better captured by the third theory I am about to describe.

#### Prefer –

#### 1] Coherence – anything else is either repugnant or infinitely regressive, Boaz 15 bracketed for glang:

David Boaz, executive vice president of the Cato Institute, “The Libertarian Mind: A Manifesto for Freedom”, 2/10/15, <https://books.google.com/books/about/The_Libertarian_Mind.html?id=zs8NBAAAQBAJ>. //LHP AV \*Bracketed for gendered language\*

Any theory of rights has to begin somewhere. Most libertarian philosophers would begin the argument earlier than Jefferson did. **Humans**, unlike animals, come into the world without an instinctive knowledge of what their needs are and how to fulfill them. As Aristotle said, man is a reasoning and deliberating animal; humans use the power of reason to understand their own needs, the world around them, and how to use the world to satisfy their needs. So they **need a social system that allows them to** use their **reason,** to **act** in the world, and to **cooperate with others** to achieve purposes that no one individual could accomplish. Every person is a unique individual. Humans are social animals—we like interacting with others, and we profit from it— **but** **we** think and **act individually**. **Each** individual **owns himself or herself [themselves]**. **What other possibilities** besides self—ownership **are there?**  • **Someone** – a king or a master race – **could own others.** Plato and Aristotle did argue that there were different kinds of humans, some more competent than others and thus endowed with the right and responsibility to rule, just as adults guide children. Some forms of socialism and collectivism are—explicitly or implicitly—-based on the notion that many people are not competent to make decisions about their own lives, so that the more  talented should make decisions for them. **But** that would mean **there were no universal** human **rights,** only rights **that** some haveand others do not**, denying the** essential **humanity of those who are** deemed to be **owned**.  • **Everyone owns everyone**, a fully-fledged communist system. **In such** a system, **before any**one **could** take an **act**ion**, [t]he[y] would need to get permission from everyone** else. **But how could each** other person **grant permission without consulting everyone else**? **You’d have an infinite regress, making any action** at all logically **impossible**. ln practice, since such mutual ownership is impossible, this system would break down into the previous one: some- one, or some group, would own everyone else. That is what happened in the communist states: the party became a dictatorial ruling elite.  Thus, either communism or aristocratic rule would divide the world into factions or classe. **The only possibility** that is humane, logical, and suited to the nature of human beings **is self-ownership**. Obviously, this discussion has only scratched the surface of the question of self-ownership; in any event, I rather like Jefferson’s simple declaration: Natural rights are self-evident.

#### 2] Epistemic uncertainty requires the minimal state – only the libertarian utopia preserves people’s freedom to pursue their conception of truth, Mack 18:

Eric Mack, June 15, 2018, “Robert Nozick’s Political Philosophy” <https://plato.stanford.edu/entries/nozick-political/#FraDisPro> //LHP AV

The official purpose of Part III of ASU, “Utopia”, is to show that **the minimal state is** not merely legitimate and just; it is also **inspiring**. This purpose is advanced by sketching a framework for utopia that is inspiring and noting that this framework is highly akin to—Nozick actually says “equivalent to” (333)—the minimal state. Yet Nozick also says that the framework might not have any “central authority” (329). Still, the framework is akin to the minimal state because it is an institutional structure that enforces peaceful co-existence among voluntarily formed communities. **It protects the independence of such communities and their freedom to recruit members and also protects the liberty of individuals to enter and exit communities as they respectively choose**. Although Nozick is not explicit about this, we have to presume that the framework enforces the same norms of personal freedom, property, and contractual compliance that the minimal state enforces except insofar as individuals voluntarily relinquish such rights within the communities they enter. The framework is inspiring **because of the way it contributes to persons’ identification of and participation in communities** (and other networks of relationships) **through which they will find meaning and well-being**. It is inspiring to **anyone** **who appreciates how little each of us knows about what sorts of communities best suit** **human** beings in all their depth and diversity and how much the operation of **the framework assists individuals in their discovery of and engagement in communities that enhance their respective well-being.** Moreover, many persons may value the framework not merely for the way it enhances their own good but, also, for the ways in which it allows them to participate vicariously in others’ achievement of their different modes of flourishing (Lomasky 2002). 5.1 The Framework as Discovery Procedure The framework is—or, more precisely, sustains—a discovery procedure. Under the protective umbrella of the framework, individuals are presented with and can try out diverse communities while communities themselves arise and modify themselves in their competitive search to sustain, improve, or increase their membership. A wide range of communities will continually arise out of and in response to the evolving perceptions that diverse individuals will have about what modes of sociality will best suit them and will best attract welcome partners. Communities will survive and perhaps expand or be imitated insofar as they actually embody modes of relationship that serve well their actual or prospective membership or insofar as they successfully refine their offerings in the market place of communities. **The framework also insures that those who are already confident that they know what sort of community is best for them will be free to form those communities by voluntary subscription and, thereby, to manifest their actual value** (or disvalue) to themselves and to other seekers of well-being. Part of Nozick’s sub-text here is **a message to socialist utopians that nothing in the framework (or the minimal state) precludes their non-coercive pursuit of their ideal communities.** How, therefore, can socialists object to the framework (or the minimal state)? This generalizes Nozick’s earlier claims in ASU that that advocates of meaningful work and workers’ control of productive enterprises ought not to be hostile to the minimal state since the minimal state is fully tolerant of non-coercive endeavors to establish such conditions (246–253). In a short essay in Reason magazine published four years after ASU, Nozick asked, “Who Would Choose Socialism?” (Nozick 1978). More precisely, his question was: What percent of the adult population would choose “to participate in socialist interpersonal relations of equality and community” were they in position to choose between “a reasonably attractive socialist option and also a reasonably attractive non-socialist one?” (Nozick 1978: 277). Nozick takes the choice available to Israelis between membership and non-membership in kibbutzim to be a good instance of a choice between such options and notes that around six percent of the adult population of Israel in the 1970s had chosen the socialist option. He speculates that socialists are at least “tempted” to be imperialists precisely because they sense that there will be too few volunteers (Nozick 1978: 279). The discovery procedure that the framework sustains is a version of Millian experiments in living—albeit it is a version that places much more emphasis on the role of a marketplace of communities in providing individuals with experimental options. This discovery procedure (like Millian experiments in living) is, of course, a Hayekian invisible hand process. Given the enormous diversity among individuals, we do not know what one form of community would be best. The idea that there is one best composite answer to all of these questions [about what features utopia has], one best society for everyone to live in, seems to me to be an incredible one. (And the idea that, if there is one, we now know enough to describe it is even more incredible.) (311) Nor do we know what distinct modes of community would be best for distinct types of persons. Thus, we cannot design an inclusive utopia; nor can we design an array of mini-utopia such that some significantly fulfilling community will be available to everyone—or even to most. It is helpful to imagine cavemen sitting together to think up what, for all time, will be the best possible society and then setting out to institute it. Do none of the reasons that make you smile at this apply to us? (313–314) Given our ignorance, the best way to realize utopia—almost certainly many distinct utopia—is through the discovery procedure that the framework sustains. (We should note, however, an implicit, somewhat puzzling, and wholly unnecessary presupposition of Nozick’s discussion, viz, that individuals with utopian aspirations will generally seek out communities that are made up of other individuals like themselves. The suggestion is that chosen communities will be internally homogeneous with heterogeneity existing only across these communities.)

### Contention

#### Injustice requires someone wronged, but initial acquisition doesn’t violate any entity’s rights– therefore, private appropriation of outer space cannot be unjust, Feser 05:

Edward Feser, [Associate Professor of Philosophy at Pasadena City College] “THERE IS NO SUCH THING AS AN UNJUST INITIAL ACQUISITION,” 2005 //LHP AV

The reason **there is no such thing as an unjust initial acquisition** of resources is that there is no such thing as either a just or an unjust initial acquisition of resources. The concept of **justice**, that is to say, simply **does not apply** to initial acquisition. **It applies only after initial acquisition has already taken place**. In particular, it applies only to transfers of property (and derivatively, to the rectification of injustices in transfer). This, it seems to me, is a clear implication of the assumption (rightly) made by Nozick that **external resources are initially unowned**. Consider the following example. **Suppose** **an individual** **A seeks to acquire some previously unowned resource R**. **For it to be** the case that A commits an **injustice** in acquiring R, it would also have to be the case that **there is some individual** **B** (or perhaps a group of individuals) **against whom A commits the injustice**. **But for B to have been wronged** by A’s acquisi- tion of R, **B would have to have had a rightful claim over R,** **a right to R**. By hypothesis, **however**, **B did not have a right to R, because no one had a right to it—it was unowned, after all**. So B was not wronged and could not have been. In fact, **the very first person who could conceivably be wronged by anyone’s use of R would be, not B, but A himself, since A is the first one to own R**. Such a wrong would in the nature of the case be an injustice in transfer—in unjustly taking from A what is rightfully his—not in initial acquisition. **The same thing, by extension, will be true of all unowned resources: it is only after some- one has initially acquired them that anyone could unjustly come to possess them, via unjust transfer**. It is impossible, then, for there to be any injustices in initial acquisition.7

#### self-ownership justifies the appropriation of property – our freedom necessitates being able to set and pursue external things as our ends, including exercising our rights on property. Restricting this arbitrarily limits our freedom which is unjust.

Feser 3, (Edward Feser, 1-1-2005, accessed on 12-15-2021, Cambridge University Press, "THERE IS NO SUCH THING AS AN UNJUST INITIAL ACQUISITION | Social Philosophy and Policy | Cambridge Core", Edward C. Feser is an American philosopher. He is an Associate Professor of Philosophy at Pasadena City College in Pasadena, California. [https://www.cambridge.org/core/journals/social-philosophy-and-policy/article/abs/there-is-no-such-thing-as-an-unjust-initial-acquisition/5C744D6D5C525E711EC75F75BF7109D1)[brackets](https://www.cambridge.org/core/journals/social-philosophy-and-policy/article/abs/there-is-no-such-thing-as-an-unjust-initial-acquisition/5C744D6D5C525E711EC75F75BF7109D1)%5bbrackets) for gen lang]//phs st

V. Some Implications If what I have argued so far is correct, then the way is opened to the following revised case for strongly libertarian Lockean-Nozickian prop-erty rights: We are self-owners, having full property rights to our body parts, powers, talents, energies, etc. As self-owners, we also have a right, given the SOP, not to have our self-owned powers nullified —we have the right, that is, to act within the extra-personal world and thus to acquire rights to extra-personal objects that the use of our self-owned powers requires.39 This might involve the buying or leasing of certain rights or bundles of rights and, correspondingly, the acquiring of lesser or greater degrees of ownership of parts of the external world, but as long as one is able to exercise one’s powers to some degree and is not rendered incapable of acting within that world, the SOP is satisfied. In any case, such rights can only be traded after they are first established by initial acquisition. In initially acquiring a resource, an agent does no one an injustice (it was unowned, after all). Furthermore, [they] has mixed [their] labor with the resource, significantly altering it and/or bringing it under his control, and is himself solely responsible for whatever value or utility the resource has come to have. Thus, [they] has a presumptive right to it, and, if his control and/or alteration (and thus acquisition) of it is (more or less) complete, his own- ership is accordingly (more or less) full. The system of strong private property rights that follows from the acts of initial acquisition performed by countless such agents results, as a matter of empirical fact, in a market economy that inevitably and dramatically increases the number of resources available for use by individuals, and these benefited individuals include those who come along long after initial acquisition has taken place. (Indeed, it especially includes these latecomers, given that they were able to avoid the hard work of being the first to “tame the land” and draw out the value of raw materials.)40 The SOP is thus, in fact, rarely, if ever, violated. The upshot is that a system of Lockean-Nozickian private property rights is morally justified, with a strong presumption against tampering with exist- ing property titles in general. In any case, there is a strong presumption against any general egalitarian redistribution of wealth, and no case what- soever to be made for such redistribution from the general theory of prop- erty just sketched, purged as it is of the Lockean proviso, with all the egalitarian mischief-making the proviso has made possible.

## Case

### Definition

#### “Appropriation of outer space” by private entities refers to the exercise of exclusive control of space.

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

Outweighs –

A] specificity

B] theirs is “typically”

### Contention

#### Space-Based Solar Power (SBSP) is a megaconstellation, and it’s going to happen within 10 years in the squo. Aff banning private space appropriation kills the necessary tech,David 11/3:

David, Leonard. 11/03/21 Space Solar Power’s Time May Finally Be Coming.”https://www.space.com/space-solar-power-research-advances // LHP BT + LHP PS

The sun never sets in space. **The idea of** harvesting solar energyvia power-beaming satelliteshas therefore long intrigued researchers looking for ways to feed an energy-ravenous [Earth](https://www.space.com/54-earth-history-composition-and-atmosphere.html). That reflection has fomented for decades but is now garnering new looks all over the world: Technologists in the U.S. and China, experts in Japan and researchers within the European Space Agency and the United Kingdom Space Agency are all working to make space-based solar power a reality. Related: [Solar power stations in space could be the answer to our energy needs](https://www.space.com/solar-power-stations-in-space-could-be-the-answer-to-our-energy-needs.html) History machine Peter Glaser, the father of the solar power satellite concept. (Image credit: Arthur D. Little Inc.) The idea of wireless power transmission dates back to [Nikola Tesla](https://www.livescience.com/45950-nikola-tesla-biography.html) near the end of the 19th century. Fast-forwarding to 1968, the notion of a solar power satellite was detailed and patented by U.S. space pioneer Peter Glaser. He blueprinted a novel way to collect energy from sunlight using solar cells and beam down an energetic muscle of microwaves to receiving antennas ("rectennas") on Earth. Those microwaves could then be converted to electrical energy and supplied to the power grid. Then, in the mid-1970s, microwave power transmission experiments in the tens of kilowatts were successfully conducted at the Goldstone Deep Space Communications Complex in California, a facility of NASA's [Jet Propulsion Laboratory](https://www.space.com/16952-nasa-jet-propulsion-laboratory.html). And this "power trip" doesn't stop there.The Space Solar Power Incremental and Demonstrations Research (SSPIDR) project is designed to beam power from space to Earth. SSPIDR consists of several small-scale flight experiments that will mature technology needed to build a prototype solar power distribution system. (Image credit: Air Force Research Laboratory (AFRL)) Impressive **advances Over the past decade,** researchers have made impressive advances **that** increase **the** likelihood **that space solar power (**SSP**)** will be realized during the next decade, said John Mankins, president of Artemis Innovation Management Solutions of Santa Maria, California. His view: the longstanding vision for SSP as a sustainable energy alternative should be revisited in light of such recent advances.Bolstering that outlook is a set of key perspectives, Mankins told Space.com. "Climate change is really going to be a disaster. Nations are committed to go [carbon net-zero](https://www.livescience.com/climate-report-net-zero.html) … and they have no idea how to do it."**The** rapidly unfolding value of "NewSpace**" is also** reshaping the landscape of 21st century space activities**, he added. "Two of the biggest hurdles to the realization of SSP have always been the cost of launch and the cost of hardware**," said Mankins. "Add flight rate, and all of a sudden you're looking at numbers always talked about for solar power satellites."Related: [What is climate change?](https://www.livescience.com/climate-change.html) Megaconstellations **Another** recent change isthedawn of the megaconstellations, Mankins added. **That's** exemplified by SpaceX's [Starlink](https://www.space.com/spacex-starlink-satellites.html) broadband network**, a** mass-production effort that now cranks out 30 tons of satellites a month**. SpaceX is on course to potentially manufacture 40,000 satellites within five years, and launch all of them. "The path to low-cost hardware has been shown," Mankins said. "It's modular and mass-produced. The hurdles of less-expensive launch and lowering hardware costs have been overcome.**"Mankins said that the economics of SSP concepts in the near term, within the next decade, have never been more viable. He flagged advances in space launch capabilities; progress in robotics for space assembly, maintenance and servicing systems; and the growth in various component technologies, such as high-efficiency solid state power amplifiers. **As a result, SSP is ready to see the light of day,** Mankins said.Astroelectricity An early entrant in focusing on understanding the energy policy needed and establishment of SSP is James Michael Snead, president of the Spacefaring Institute. He's adopted the use of the term "astroelectricity" to describe the transmitted electrical power produced by SSP systems.In looking at what he terms the "[coming age of astroelectricity](https://www.youtube.com/watch?v=5E-0NYnAaUA)," he sees a world needing a replacement for oil and natural gas, the two primary sources of energy currently maintaining an industrial standard of living. Snead envisions a world in the year 2100 where about 20% of electrical power comes from terrestrial nuclear and renewables, with 80% supplied by astroelectricity."Just as the military, economic and diplomatic control of Middle East oil has substantially influenced world events for the past 80 years, the control of space solar power platforms will come to dominate outer space activities this century," Snead told Space.com. Wanted: high-priority leadershipIf SSP becomes a reality later this century, Snead said, the U.S. military will be required to protect and defend these new sources of national energy security just as it guards oil infrastructure in the Persian Gulf today."While some people are developing SSP concepts that would be launched from the Earth and autonomously assembled in geostationary Earth orbit, I do not see this as a successful proposition," said Snead. He believes that building the thousands of SSP platforms needed requires a substantial [space industrialization effort](https://www.space.com/nasa-low-earth-orbit-iss-commercialization.html) involving more than a million people in space by the end of the century. The starting point, Snead said, will be establishing the enabling "astrologistics" infrastructure operating throughout the Earth-moon system. He stressed that those astrologistics require high-priority U.S. Air Force — not [Space Force](https://www.space.com/42089-space-force.html) — leadership to draw upon nearly a century of human flight/operational logistics experience and expertise.That is necessary to manage industry's efforts to design and build the required new human spaceflight systems, with a clearly needed emphasis on safety and effectiveness, Snead said. As these new military astrologistics capabilities begin, Snead contends, commercialization of these capabilities will extend these safety and operational benefits to support the coming space industrial revolution needed to undertake SSP. "This is exactly what happened to enable U.S. airline manufacturers to dominate the airline and air cargo industry for decades. It is a successful model to now replicate in space — a model that neither NASA nor the U.S. Space Force can effectively execute," Snead said. The U.S. Naval Research Laboratory’s Paul Jaffe holds a module designed for space solar power investigations in front of a customized vacuum chamber used to test the device. (Image credit: NRL/Jamie Hartman) 'Performing like a champ' While new artwork, economic plots and conceptual SPS thinking and visions flow, there's an in-space technology experiment already underway. On its latest mission, which launched in May 2020, the Space Force's robotic [X-37B space plane](https://www.space.com/25275-x37b-space-plane.html) is toting the Photovoltaic Radio-frequency Antenna Module Flight Experiment (PRAM-FX), a Naval Research Laboratory (NRL) investigation into transforming solar power into radio-frequency microwave energy. The focus of that X-37B investigation is not establishing an actual power-beaming link, but more on appraising the performance of sunlight-to-microwave conversion. "It is performing like a champ," said Paul Jaffe, an NRL electronics engineer working on power beaming and solar power satellites. "We are getting data regularly, and that data is exceeding our expectations," he told Space.com. [PRAM-FX](https://www.space.com/x-37b-space-plane-solar-power-beaming) is principally made out of commercial parts, not "space-grade" hardware. "The fact that it is continuing to operate and give us positive results is quite encouraging," Jaffe said. Commercial parts are mass-produced, while many space-grade parts are one-offs. Solar power satellites, like those envisioned in high Earth orbit, would have thousands of elements made out of similar components being tested onboard the X-37B, Jaffe said. [The US Space Force's secretive X-37B space plane: 10 surprising facts](https://www.space.com/x-37b-military-space-plane-surprising-facts) Space-based solar power could help the UK achieve net-zero emissions by 2050, according to a leading British systems, engineering and technology company. (Image credit: Frazer-Nash Consultancy) Making the economics work There's much more work ahead, of course. "The big strike against space solar power has always been making the economics work. People who have looked at the idea seriously do understand that, from a physics standpoint, there is no reason you couldn't do it," Jaffe said. "With mass production of space hardware, and with the cost reduction of space access, it is more plausible that it could work," he added. "I would caution against excessive optimism … but also point out that things are changing. There are a lot of encouraging developments." SPS will assuredly be compared to a "levelized cost of energy" metric, Jaffe concluded. "There's just not enough data to come up with a levelized cost of energy basis for space solar power. It's premature. What you are seeing now is laying the foundation for that sort of evaluation." Clear, affordable path To that end, Mankins of Artemis Innovation Management Solutions has rolled out SPS-ALPHA ("Solar Power Satellite by means of Arbitrarily Large Phased Array"), a design he showcased at the 72nd International Astronautical Congress, which was held from Oct. 25 to Oct. 29 in Dubai, United Arab Emirates. Detailing a business model and step-by-step SSP roadmap, he feels the concept promises a clear, affordable path to deploying a critically needed new energy option. "**I believe you could have operational solar power satellites to scale within a decade,"** Mankins said. That possibility, combined with the fact that multiple nations are eying SSP as a promising power generation system of the future, begs a question: Is there a solar power satellite race afoot? It is close to that, Mankins said. "I think it has to be cooperation among friends and allies. But I think it's very likely to end up being competition with China. The longer we wait with regard to the urgency of policies on [climate change](https://www.space.com/climate-change-dimming-earth), the more likely it is we're going to miss the boat." Mankins is a 26-year veteran of assessing SSP and the technologies required. "The moment has come," he said. "I think the right answer is really clear: We need to just go do it."

#### SBSP key to solve climate change, Katete 12-17:

Katete, Esthere. (December 17 2021) “Space-Based Solar Power: The Future Source of Energy?”https://www.greenmatch.co.uk/blog/2020/02/space-based-solar-power // LHP BT + LHP PS

Space-based solar power (SBSP) involves collecting the sun’s energy in space, and then wirelessly transmitting it to Earth. There are several [advantages to solar energy](https://www.greenmatch.co.uk/blog/2014/08/5-advantages-and-5-disadvantages-of-solar-energy). Although expensive, it **is** **a** great source of [clean energy](https://www.greenmatch.co.uk/blog/clean-energy) that has the capacity to provide more energythan the world consumes **or is predicted to consume in the future**. A space-based solar power technological process includes using [solar panels](https://www.greenmatch.co.uk/solar-energy/solar-panels) to collect solar energy in space with reflectors or inflatable mirrors that direct solar radiation onto solar panels, and then beaming it on Earth through a microwave or laser. The energy is then received on Earth via a microwave antenna (a rectenna). **According to the [National Space Society](https://space.nss.org/space-solar-power/" \t "_blank),** space-based solar power **has the** potential to dwarf all the other sources of energy combined**. They argue that space-based solar power can provide large quantities of energy** with very little negative environmental impact**. It can also** solve our current energy and greenhouse gas emissions problems**.** The infographic below highlights information about space-based solar power, current related trends, and what different countries are doing in terms of research and funding. Current Global Energy Consumption and Trends **The** world’s energy consumption is only growing. According to a report by the University of Oxford’s Our World in Data, on the global primary energy consumption, the current world consumption is over 160,000 TWh annually. Solar energy contributes only 585 TWh. Although there is an increase in renewable energy solutions, investments, and usage, oil, coal, and gas still generate more than 80% of the global energy that is consumed - with solar energy generating less than 1%. Between 2004 and 2015, investments in renewable energy increased by 600% from £36.2 billion (US$46.7 billion) to £220.6 billion (US$284.8 billion). Current predictions indicate that the world population will reach [9.7 billion by 2050](https://www.un.org/development/desa/en/news/population/world-population-prospects-2019.html). With the increase in population, the world energy consumption is also predicted to grow by 50% by 2050. In addition, climate change impacts are accelerating. Although we generate a big percentage of the world energy from fossil fuels, fossil fuels contribute significantly to the increase of climate change. **Comparatively,** solar energy is the [safest source of energy](https://ourworldindata.org/uploads/2020/02/Safest-source-of-energy.png) today - though it still only contributes a small percentage of the global energy production. The death rates from solar production are 1,230 times lower than coal, and it has one of the lowest CO2 emissions, at 5g CO2 eq per kWh. Why Space-Based Solar Power? Space-based solar power has several benefits; unlike solar panels on our roofs that can only generate electricity during the day, space-based solar power can generate continuous electricity, 24 hours a day, 99% of the year. This is because, unlike Earth, the space environment does not have night and day, and the satellites are in the Earth's shadow for only a maximum of 72 minutes per night. **Space-based solar panels can generate** 2,000 gigawatts of power constantly. This is **40 times more energy than a solar panel would generate on Earth annually**. This is also several folds higher than the [efficiency of solar panels](https://www.greenmatch.co.uk/blog/2014/11/how-efficient-are-solar-panels) today. **What’s more, is that space-based** solar power would generate [0% greenhouse gas emissions](https://space.nss.org/space-solar-power/) unlike other alternatives **energy like nuclear, coal, oil, gas, and ethanol**. The current source of energy that generates the lowest CO2 is nuclear power, which generates CO2 of 5g CO2 eq per kWh. **Space-based solar power** generates almost 0% hazardous waste to our environment **compared to nuclear power**. Why Are We Not There Yet? While space-based solar power is an innovative concept, we are not able to fully launch a system into space yet. Launching a space-based solar system is very expensive. In fact, the cost is estimated to be about 100 times too high to compete with current utility costs. One of the causes of the high costs is the high cost of launching the panels to space, which is mostly due to the high mass per watt generated by the current solar panels. In other words, the solar panels are currently too heavy per watt generated to make it feasible. Currently, the cost of launching in space is estimated to be £7,716 per kilogram - approximately £154 per watt. In comparison to the cost that homeowners pay today, which is approximately £2 per watt peak, the cost in space is extremely high to be competitive. In UK homes, the [installation cost of solar panels](https://www.greenmatch.co.uk/blog/2014/08/what-is-the-installation-cost-for-solar-panels) can be as low as £1.5 per watt. Other reasons for high costs include the overall high transport costs to space. This is because transporting all other materials that are needed to space would require many space shuttle launches, and these space shuttles are currently not reusable. So, not only is the launch of solar panels themselves expensive, but the additional materials needing to be transported is also expensive. A lot of research and engineering is still ongoing to find the most feasible way to launch space-based solar panels and launch systems, at a lower cost. The environment out in space also has several hazards that could cause damage to the solar panels. These include space debris and extreme solar radiation, which could degrade the solar panels up to 8 times faster than panels installed on Earth. Finally, there is a potential of wasting large amounts of energy when transporting or during transmission from space to Earth. Therefore, scientists and engineers must continue their R&D efforts to ensure little to no energy is lost during the process. Current SBSP Projects and Progress The key players in SBSP include China, the US, and Japan, who have shown progress in terms of technology advancements, partnerships, and launch plans. China is already progressing to launch into space. The China Aerospace Science and Technology Corporation plans to launch small to medium solar satellites in the stratosphere that can harness energy in space between 2021 and 2025. China also plans to generate one megawatt of energy from space-based solar panels by 2030, and to be operating a commercially viable solar space station by 2050. In the US, there are ongoing partnerships and investments. For example, a $100 million partnership between Northrop Grumman and U.S. Air Force Research Laboratory has been established to provide advanced technology for SBSP. Also in the US, a $17.5 million collaboration between Northrop Grumman Corporation and Caltech was set up to develop the space solar power project called ‘The Space Solar Power Initiative’. The initiative’s goal was to develop scientific and technological innovations that would enable a space-based solar power system generate electricity at a cost comparable to current sources of electricity. There has been ongoing research and technological advancements. In the US, the development of the SPS-ALPHA Mark-II concept is underway. This, if successful, would enable construction of huge platforms in space that can remotely deliver tens of thousands of megawatts of electricity to Earth, using wireless power transmissions. This will also enable delivery of affordable power to Earth and on space missions. In addition, progress is being made to build reusable launch systems. Success in this will lower the cost of transport to space and overall cost of space-based solar power. An example is SpaceX, that is currently working on reusable launch vehicles that can be used for transport to space. In Japan, researchers successfully transmitted electric power wirelessly using microwaves. Researchers transformed 1.8 kW of electric power into microwaves and accurately transmitted it into a receiver that was 55 metres away. This was a technological advancement towards bringing SBSP closer to reality. Japan also made space-based solar systems part of its future space exploration vision. Future Outlook for SBSP Fossil fuels are finite and can eventually run out. According to predictions, oil and natural gas could run out in 50 years and coal production in 115 years. With ongoing research and investments, there is a high possibility that space-based solar power is the viable [future of solar power](https://www.greenmatch.co.uk/blog/2015/01/the-future-for-solar-power-in-the-uk). If the cost of space-based solar power can be lowered, it is likely to be a major source of sustainable energy that cannot diminish. Major players like China, who already have timelines of implementing the technology in space, may be able to provide some key learnings for future improvements in the technology.