NEGATION:

In this debate, I negate the following:
Resolved: The appropriation of outer space by private entities is unjust.

Value: My value is mitigating the risk of existential threats, since maintaining humanity is the most just thing possible.

Criteria: My criteria is Rule Utilitarianism which means doing the greatest good for the greatest number of people, without violating the standards set forth by the UDHR (universal declaration of human rights)" - john stuart mill

A: Definition of Appropriation

"Appropriation of outer space" by private entities refers to the exercise of exclusive control of space – private entities can no longer exclusively act in space – they must act alongside public entities

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

Contention 1: Counterplan: Appropriation of outer space by private entities is unjust except for when it is in a public-private partnership.

A: Plan Text:

Smith 21 - Fisher Smith (Fisher Smith is a second year law student at the University of Mississippi where he is currently part of the Space Law concentration. Additionally, he is part of the Ole Miss Trial Advocacy Board and a junior staff editor on the Air and Space Law Journal at

the university.) - March 31, 2021 - “Public-Private Partnerships: The Way To Space” - NSS - https://space.nss.org/public-private-partnerships-the-way-to-space/

In recent years, private companies have begun to push the boundaries of outer space, making it more affordable to launch rockets and developing new technologies that have revolutionized the industry. SpaceX, Blue Origin, Nanoracks, Rocket Lab, and Made in Space (now Redwire), among others, have changed the space industry dramatically. As recently as the early 2000’s, the only way to launch payloads into space was to go through governmental entities such as NASA, European Space Agency, Roscosmos and the China National Space Administration (CNSA). Today, the U.S. has been leading the way in purchasing launch services from private companies, and **the private companies themselves work with other companies and investors to launch non-government payloads. However,** while these companies have accomplished much, **there is still a need for an organized, governmental role in space development**. Government involvement is necessary **to ensure that the public maintains access to space and to advance the frontier of development beyond Earth.** For instance, consider NASA and the American government. NASA’s ongoing scientific efforts are characterized by four key strategic goals: 1) expanding knowledge of our human species, 2) creating “sustainable long-term exploration and utilization” of outer space for the whole species, 3) addressing national challenges and aiding in economic development, and 4) continuing to optimize and develop their capabilities and operations within outer space. **NASA’s ongoing commitments are** to develop outer space and technology for the United States and **for humanity as a whole.** Their missions of exploration, scientific discovery and technological development have continued to advance humanity. **The fundamental structure of democratic governments** such as those in the U.S. **allow regular people to influence and participate in space development policy**. People can vote for and petition their elected representatives to promote certain policies for the use of outer space, or join non-profits such as the National Space Society (NSS) to represent their views. This allows anyone to have a say in our development of outer space. While private companies are pushing the boundaries of outer space, NASA and the US government have the ability to create policies that encourage more rapid and beneficial development in space. The National Space Society (NSS) advocates that the government promote policies for infrastructure development and reusability for outer space expansion. The successful model of public-private partnerships that has been used to transport both cargo and crew to the International Space station via the commercial purchase of launch services should be extended throughout cis-lunar space. Further, through NASA, NSS recommends that the government continue to promote international cooperation. The international community has cooperated in the past, particularly with the International Space Station. By continuing this partnership, **multiple States can contribute** to outer space exploration and development**, and private organizations can** continue to **provide vital services at lower cost, allowing government funds to accomplish more in space.** While past developments in outer space have been led by governments and governmental space agencies, that is no longer true. **Private organizations have reignited space exploration and provided a way for humanity** to continue to expand and revolutionize technology needed **to expand beyond Earth, without many of the hurdles, including cost and regulations, that** sometimes **hamper government advances.** But, the path to the stars is not paved by one or the other. Instead, **cooperation, between** States, **gov**ernmental agencies**, and private companies,** will **ensure that we continue to push our boundaries into space.**

Scenario 1: Mars Colonization

A: The journey to and establishment of Mars, relies on the presence of private entities in partnership with the gov

Chaben 2020 - Jack Chaben (Jack is a recent graduate of George Washington University where he earned a Bachelor of Arts degree in political science with a minor in computer science. He took particular interest in the growing role of technology in the development and administration of policy both domestically and internationally) - "Extending Humanity's Reach: A Public-Private Framework for Space Exploration" - University of South Florida Board of Trustees - https://www.jstor.org/stable/pdf/26936546.pdf

As SpaceX successfully demonstrated its evolving and increasingly powerful capabilities with the launch of its Falcon Heavy rocket in 2017, excitement for space travel surged. This renewed enthusiasm for space, however, differed fundamentally from the triumph of Apollo 11; it came at the hands of a private company, not a national agency that served as a proxy for the entire country in an international battle. Despite this operational shift of NASA's role, new SAAs are allowing the agency to benefit from the relatively rapid pace of innovation in the private sector, while still creating a new sense of possibility in space. In **a major act in this public-private phase of space travel, a foundational step in the journey to Mars, NASA partnered with SpaceX to successfully launch astronauts** to the ISS in the company's Crew Dragon capsule **on May 30, 2020.** The National Aeronautics and Space Administration's SpaceX Demo-2 mission marked not only the first commercially constructed and operated manned space flight, but the first time since the Space Shuttle's retirement that astronauts launched from American soil.33 **The agency plans to continue** to send humans back to the ISS using commercial vehicles from SpaceX **and**, eventually, Boeing. Conducted under the mandate of the C3PO, **these** privately flown missions, purchased by NASA, **can end the dependence on Russia to launch American astronauts and spur competition** in the commercial space sector as companies strive to win NASA's lucrative business.34 In addition to demonstrating the feasibility of public-private partnerships in space, **the ability of private companies to conduct** these **routinized missions to the ISS becomes a crucial step in** the development of the capabilities necessary for **missions to Mars.** Engaging in repeatable missions to the ISS allows private companies to simulate the launch, travel, and landing processes that will be crucial as manned missions into deep space transition from proof-of-concept missions to cost-effective routine transportation. Sustained travel to LEO alone, though, will not stimulate the innovation necessary **for missions to Mars.** Rather, to prepare for this ultimate goal, **private companies should conduct** progressively complex **missions through contracts with NASA to fill the gaps** the agency opens as it dedicates its resources to novel missions into deeper space. Through this supplementary relationship, private space companies gain the opportunity to build upon their technologies and refine their processes to ensure the transition from wholly public agency based missions to routine public-private trips is as seamless as possible. The Global Exploration Roadmap (GER), a coordinated international framework to advance human exploration of the solar system, expresses the importance of an "evolution of critical capabilities which are necessary for executing increasingly complex missions to multiple destinations," culminating with Mars. While the GER of 2013, along with its 2018 refinements, underestimates the role of public-private partnerships in the development of manned missions to Mars, it establishes a functional path to reach the red planet through international collaboration between space agencies. The integration of public-private partnerships into this proposed itinerary, however, will unlock increased flexibility in the efforts of public space agencies. In its three-phase plan, the GER identifies potential commercial opportunities only in missions to the Moon and its vicinity.36 The GER recognizes the existing role of commercial actors in LEO, especially in the continued use of the ISS, but cites only the technologies of participating space agencies as the potential means to conduct human missions into deep space.37 Each phase of the GER identifies a key step in the development of the capabilities to conduct missions to Mars, each building upon another in complexity to gain crucial knowledge and experience. While international collaboration

will remain an essential precursor to sustainable human missions to the red planet, public-private partnerships **will offer innovative solutions to support** this **sustained human presence. In its first phase, the GER aims to preserve the ISS** as an environment **for research and technology testing**. This phase of the plan remains consistent with many of its internationally defined goals, notably the development of exploration technologies that promote the advancement of earth and space science, and extend understanding of the effects of space on human health.38 As the only currently operational phase of the GER, the ISS enables its visitors to gain unique insights into the current capabilities of humans in space. The Station has become a platform upon which various actors in space can conduct research and simulate long-term travel through space.39 Consequently, sustained operation of the ISS has revealed the benefit of maintaining common objectives between international collaborators; its construction and continual evolution as a preparatory environment for deep space travel materialized through integrated international efforts. Since 2011, however, NASA has relied on contracts with private space companies to sustain its scientific presence on the ISS. Through new SAAs, NASA has revealed the importance of the private sector in space, as its partnerships have spurred a continuous cycle of innovation that can meet the GER's plans for continued use of the ISS. This new network of public-private partnerships will facilitate NASA's efforts to send humans to the ISS while enabling the agency to pursue the progressively complex goals of the GER. Ultimately, the commercial space sector, with NASA as its main customer, is becoming the foundation of this international plan to reach Mars, as it assumes increasing responsibility for U.S. missions to the ISS. Public-private partnerships remain similarly important in the subsequent phases of the GER. The international plan advocates for an expansion of the synergy between human and robotic missions to "increase the unique contribution of each to achieving exploration goals." 40 Robotic missions will therefore continue the pursuit of knowledge about the solar system before humans reach uncharted destinations. Gaining access to space through robotic missions can generate fundamental knowledge of the future locations of human space flight. This knowledge-generation facilitates the safety of human explorers while providing key preparatory insight to help guide formulation of future human missions to new destinations. Findings from these robotic missions can significantly affect the confidence with which public-private networks conduct future missions to the lunar surface, and eventually to Mars. When paired with the experience of sustaining a human presence on the ISS, robotic missions around and upon the Moon may **become the next foundational step towards manned missions to Mars.** With a variety of robotic missions planned for the lunar surface in the coming decade, **the role of maturing private space companies grows in importance.** The cost-effective **and** innovative developments of the United States' commercial space sector **have revealed the benefit of shifting responsibility from NASA** and assigning routine missions **to private companies.** This planned proliferation of unmanned reconnaissance missions, that provide a constant stream of information about future destinations for humans, can serve as a model for the robotic exploration phase of the GER. **The repeatability of these robotic missions is highly compatible with the efficient efforts of private companies,** and enables public space agencies to conduct these foundational operations at a lower cost. While **these partnerships enhance the flexibility of space agencies to act within limited budgets,** they also enable private companies to gain the hands-on experience that will be essential to conducting missions to Mars. As a result, robotic missions not only advance the readiness of space agencies, as the GER projects, but also prepare private partners for their transition to conducting increasingly complex routinized missions. The knowledge gained through robotic missions facilitates the next phase of the GER and the next step on the journey to Mars: Human exploration beyond LEO. Similar to the integrated international effort to develop the capabilities to sustain a human presence on the Moon, NASA's Moon to Mars plan considers a robust human transport system to the lunar surface a precursor to missions to Mars. NASA's Artemis program aims to return humans to the Moon by 2024 through the development of a lunar station in orbit, Gateway, followed by sustainable human missions to the lunar surface.41 **This goal of establishing a** permanent presence on the Moon, a potential **model for** future missions to **Mars, depends upon the continued partnership between NASA and private companies**. Without the efficient services of the commercial space sector, NASA's commitment to sustain the human presence on the ISS restrains the agency from exploring beyond LEO. **By shifting** its LEO responsibilities **to priv**ate companies through new SAAs, **NASA gains** the **freedom** necessary **to pursue** its goals on the Moon and further into **deep space**. Consequently, as NASA leads the international effort to sustain humanity on the Moon and develop the capabilities to reach Mars, **the efficiency and flexibility of private space** companies **will become a central part of the journey to the red planet**. The GER defers the definition of missions to deeper space to the future, citing the importance of new discoveries and sustainable technologies to reach Mars. Private space companies will come to define these deep space missions as they efficiently routinize the tasks previously reserved for public agencies and prepare to assume the eventual role of sustaining a human presence on Mars. Artemis marks significant progress along the GER, as it supports the plan for robotic exploration of the Moon, followed by manned-missions to the lunar surface. The program harnesses widespread international collaboration to create a safe, sustainable, and efficient

system for lunar exploration. At the crux of Artemis, NASA's Space Launch System (SLS) and Orion capsule will provide the power to carry astronauts and essential cargo beyond LEO and, with future upgrades, to Mars.43 SLS, according to NASA, is the only rocket capable of carrying astronauts and large cargo to the Moon on a single mission.44 Built by the United Launch Alliance, a collaborative partnership between Boeing and Lockheed Martin, SLS is a product of traditional costs-plus agreements.45 Its increasing budget and slipping first launch date reveal the potential disadvantages of these limiting contracts, especially without the competitive pressures inherent in new SAAs. SLS, however, is not the only heavy-lift rocket currently in development; SpaceX and Blue Origin, for example, are each constructing systems to compete with SLS. **SpaceX's Starship** is a fully reusable transportation system set to carry crew **and** cargo to earth orbit, the Moon, and Mars.46 **Blue Origin** is developing **New Glenn**, a semi-reusable rocket that will conduct routine missions to LEO and beyond.47 The National Aeronautics and Space Administration's efforts to build the capability to explore further into space are followed closely by private companies that match, if not supersede, the power and efficiency of SLS. This step outside public-private partnerships through SAAs back into the traditional model of cooperation may enable NASA to exert greater control over its initial flights to the Moon and Mars, but **reveals the efficiency with which private companies can operate.** While NASA may refrain from entering new SAAs with companies like SpaceX or Blue Origin for its flagship missions beyond LEO, the presence and continued efforts of private space companies will become essential to sustaining the presence established by SLS. The efforts of the commercial space industry are not contradictory to, but complementary to NASA. Despite its inefficiency and relative lack of reusability, SLS has stimulated an internationally collaborative building process that will serve as the foundation of a human presence in space, sustained by public-private partnerships. In addition to facilitating the realization of the GER, NASA's efforts also continue to advance United States National Space Policy, as amended by Space Policy Directive 1 of December 2017. Under this presidential directive, NASA will "Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system." 48 Space Launch System will certainly provide the future capability for the United States to extend its presence beyond LEO, but the confluence of the accomplishments of private companies with the pioneering missions of NASA through new SAAs is similarly essential. In addition to its recent launch of NASA astronauts to the ISS, SpaceX, since 2012, has flown eighteen resupply missions to the ISS for NASA under the C3PO.49 The company's cost effective services, bolstered by the reusability of its rockets, have enabled NASA to maintain its research efforts in space by reducing its spending on missions to the ISS. Boeing is currently testing its CST-100 Starliner spacecraft, competing directly with SpaceX to send astronauts to the ISS.50 Despite the vehicle's failed orbital flight test in December 2019, its eventual operation will not only provide NASA another vehicle to power its efforts to maintain the American presence in space, but will spark competition with SpaceX that propels innovation.51 These efforts will continue to transform the United States space program as it regains the ability to launch humans and cargo to the ISS. Crucially, as private companies assume responsibility for missions to the ISS and other locations within LEO, NASA can dedicate a larger part of its budget to SLS and deep space exploration to continue along the GER. This model of commercial reinvigoration of the United States space program provides a seminal framework for exploration beyond LEO that applies to NASA's current mandate and the GER. As the commercial space sector continues to sustain NASA's presence on the ISS, the agency can dedicate its efforts to preparing SLS for missions to the Moon. By extension, once Gateway and manned missions to the lunar surface prove feasible, NASA can shift these missions to the private sector whose vehicles will provide a routine, affordable manner to sustain a human presence on and around the Moon. The significantly reduced cost of public-private missions to the Moon through new SAAs will enable NASA to pivot its resources to preparing SLS for travel to Mars. Meanwhile, private space companies can continue to build upon their experience conducting routine flights to the ISS with insight into the effects of prolonged travel through space on both vehicles and human passengers. First with its pioneering experience returning humans to the ISS and the Moon, then with the increased flexibility for development of SLS afforded to it by the innovation of private companies, NASA will conduct the first manned missions to Mars. Moreover, as private companies begin to conduct routine missions to the Moon as NASA invests in Mars, the allure of efficiency will allow the commercial sector to apply its accumulated experience in space to sustaining humanity on the red planet.

B: It solves a litany of existential threats – don't put all your eggs in one basket.

Fitzgerald 3/9 [(Shanon, Assistant Websites Editor at Liberty Fund), "Why Human Space Exploration Matters," March 9 2021, https://www.econlib.org/why-human-space-exploration-matters/] TDI

While the yields to space exploration and the development of spaceflight technology may appear minimal in the immediate future, shifting our perspective to the longer term renders the human situation vis a viz space exploration extremely clear: **if humans want to survive in**

perpetuity, we need to establish ourselves on other planets in addition to Earth. It is as simple as that. And yet we are not doing all that much to make that happen. To be clear, I'm long on Earth, too, and hope that technological improvements will continue to allow our species to get "more from less" right here on the third rock from the sun, enabling us to keep occupying the planet that saw us evolve into consciousness. I like to imagine that the distant future on Earth has the potential to be an extremely pleasant one, as advances in our scientific understanding and bio-technical praxis should hopefully allow our descendants to clean up any of the remaining messes previous generations will have left behind (e.g., nuclear and industrial waste, high amounts of atmospheric carbon, other lingering nasties) and stable-state free societies will hopefully allow all persons (or very nearly all persons) to live free and meaningful lives in productive community and exchange with their fellows. As the previous qualification highlights, the trickiest problems here on Earth and extending to wherever humans end up in the spacefaring age will still be social and political, and their successful resolution will depend more on the future state of our governing arts than our hard sciences. But **regarding the negative events that could very well happen to Earth** I think we all need to be equally clear: **life might not make it here.** There is no guarantee that it will, and in the very long run, **with the expansion and subsequent death of our sun, we know with** near **certainty that it will not.** Consider **just a few possible extinction-level events that could strike even earlier: large meteors, supervolcanic eruptions, drastic climactic disruption of the "Snowball Earth" variety**. As SpaceX founder and Tesla CEO Elon Musk recently observed on the Joe Rogan Experience podcast, **"A species that does not become multiplanetary is simply waiting around until there is some extinction event,** either self-inflicted or external." This statement, applied to the human species, is obviously true on its face. As doomsday events go a giant asteroid might be more shocking, since we (people living today) have never experienced one before while concerned atomic scientists warn us about the nuclear bomb all the time, but the odds that we blow ourselves up are still there. Slim, but there. It's more plausible that a severe nuclear war and the nuclear winter it would likely trigger would leave the human population greatly reduced as opposed to completely extinct, but then the question becomes: why is that a risk we would want to take? The bomb is here to stay for now, but there is no reason that 100% of known life in the universe needs to stay here on Earth to keep it company, waiting around for something even more destructive to show up. While we're on that happy subject: Do you have any good intuitions about our collective chances against hostile, or simply arrogant or domineering, technologically-advanced extraterrestrial lifeforms, if and/or when they decide to pay us a visit on our home turf? These scary situation sketches will suffice. At bottom, **the core reason I am a believer in the need to make life—and not just human life—multiplanetary is** the same basic reason I would never counsel a friend to keep all their money and valuables in one place: **diversification is good.** Wisdom and experience suggest we store precious resources in multiple safe(ish) places. Diversification limits our exposure to risk, and increases our resilience when bad things do happen. One reserve gets hit, two or three others survive, and you probably feel that the effort to spread things out was worth it. What I'm saying here has strong undercurrents of common sense, yet **our approach to the human population itself—the universal store and font of "human capital"—does not currently prioritize diversification to the degree our technological capabilities would allow.** The distribution of the human population, and of almost all human knowledge and works, is overwhelmingly local. (Let us set to one side the possibility that aliens somewhere maintain an archive of captured human information.) Establishing outposts at least as large as those we maintain in Antarctica on the Moon and Mars, or other more suitable sites, by the end of this century would be a great first step toward genuinely diversifying the physical locations of the most precious resources known to us: human consciousness and creativity, human love and human soul, the great works in which all these things are displayed. Add also to this list repositories of scientific knowledge and knowhow, seed reserves, and certain materials necessary to re-start the manufacturing of fundamental technologies. **Spreading these goods to a few additional locations within the solar system would be a major species-and-civilization-level accomplishment** that all living at the time could feel satisfied by, and even take some pride in. And this is something that we seem to be just on the cusp of being able to do, given our recent and rapid technological advances in rocketry, computers, and materials science and engineering, among other important fields for space exploration and settlement. Quickly the uniplanetary human situation is becoming, if it is not already, one of pure choice.

Contention 2: Space-Based Solar Power

A: The privatization of space is essential to solar power satellites - only private companies can fund and develop .

National Space Society, 2006 [12-6-2006, "Introduction to the motion to the National Space Society Board of Directors", http://www.sspi.gatech.edu/sunsatcorpfaq.pdf]

Space Solar Power must be a commercial or public/private company, as Comsat was. **Several organizations, such as NASA and DOE are vying to assume control of the space solar** power / wireless power transfer research venue to enlarge their empires. **Neither organization would move space solar power an inch closer to commercial reality** because neither organization would "win" by doing that. Rather, **placing space solar power / wireless power transfer "research and development" under their control will delay the formation of a power satellite industry**, **delay the lowering in cost of orbital space transportation**, delay the formation of innumerable other cis-lunar industries, including asteroid protection, and, finally, incidentally for NSS, delay space settlement in general. **NASA doing anything in space costs ten times as much compared to commercial enterprise doing it.** IF commercial enterprise can do it, then commercial development is the way to go. (Some things, like the Apollo program, telescopes on the moon, or Mars development cannot be done commercially.) So Space solar power and many other goals await organizations chartered and committed to doing those things. For example, if NASA could support 6 settlers on the moon for 2 billion dollars per year, commercial (public/private) enterprises could do it for one tenth of that cost. The 10 to 1 ratio applies across the board. Most importantly the development is ten times more easily sustained by reason of the lower cost. And actually probably a hundred times more likely to be sustained, since NASA has no significant history of income-generating activity. A renaissance in commercial cis-lunar space markets beckons. If and when SSP is built, greatly reduced launch costs will provide unprecedented access to space and space operations - from in-situ resource utilization and improved observation and communications to space settlement, and many products we can only dream of today - beginning with SSP – promising to provide reliable power delivery and global energy security with improved international prosperity at greatly reduced environmental impact. Therefore we present and commend the following motion to the Board of Directors: Motion to recommend the chartering by Congress of a Space Solar Power Corporation. The National Space Society recommends the enactment of legislation by the Congress to charter a Space Solar Power Corporation. This corporation would be directed to research, design, develop, build and operate a Space Solar Power System (SSPS). The corporation would receive special financial incentives designed to coordinate a lowering in commercial launch to orbit costs commensurate with, and as a direct result of a massively expanded market.

B: Private companies need access to geostationary orbital bands to maximize space based solar power.

Rouge, 2007 – former Director, National Security Space Office [Joseph D., October 9, 2007, "Space‑Based Solar Power As an Opportunity for Strategic Security," https://space.nss.org/space-based-solar-power-as-an-opportunity-for-strategic-security/]

The reservoir of Space‑Based Solar Power is almost unimaginably vast, with room for growth far past the foreseeable needs of the entire human civilization for the next century and beyond. In the vicinity of Earth, each and every hour there are 1.366 gigawatts of solar energy continuously pouring through every square kilometer of space. **If one were to stretch that around the circumference of geostationary orbit, that 1 km‑wide ring receives over 210 terawatt‑years of power annually. The amount of energy coursing through that one thin band of space in just one year is roughly equivalent to the energy contained in ALL known recoverable oil reserves on Earth** (approximately 250 terawatt years), and far exceeds the projected 30TW of annual demand in mid century. The energy output of the fusion‑powered Sun is billions of times beyond that, and it will last for billions of years—orders of magnitude beyond all other known sources combined. Space‑Based Solar Power taps directly into the largest known energy resource in the solar system. This is not to minimize the difficulties and practicalities of economically developing and utilizing this resource or the tremendous time and effort it would take to do so. Nevertheless, it is important to realize that there is a tremendous reservoir of energy—clean, renewable energy—available to the human civilization if it can develop the means to effectively capture it.

C: Solar Power Satellites solve climate change – it is the only source that can replace all fossil fuels

National Space Society, 2011 [June 3, 2011, "Space Solar Power: Limitless clean energy from space", https://space.nss.org/space-solar-power-info/]

The United States and the world need to find new sources of clean energy. Space Solar Power gathers energy from sunlight in space and transmits it wirelessly to Earth. **Space solar power can solve our energy and greenhouse gas emissions problems**. Not just help, **not just take a step in the right direction, but solve. Space solar power can provide large quantities of energy to each and every person on Earth with very little environmental impact.** The solar energy available in space is literally billions of times greater than we use today. The lifetime of the sun is an estimated 4-5 billion years, making space solar power a truly long-term energy solution. As Earth receives only one part in 2.3 billion of the Sun's output, **space solar power is by far the largest potential energy source available, dwarfing all others combined**. Solar energy is routinely used on nearly all spacecraft today. This technology on a larger scale, combined with already demonstrated wireless power transmission (see 2-minute video of demo), can supply nearly all the electrical needs of our planet. Another need is to move away from fossil fuels for our transportation system. While electricity powers few vehicles today, hybrids will soon evolve into plug-in hybrids which can use electric energy from the grid. As batteries, super-capacitors, and fuel cells improve, the gasoline engine will gradually play a smaller and smaller role in transportation – but only if we can generate the enormous quantities of electrical energy we need. It doesn't help to remove fossil fuels from vehicles if you just turn around and use fossil fuels again to generate the electricity to power those vehicles. Space solar power can provide the needed clean power for any future electric transportation system. While all viable energy options should be pursued with vigor, space solar power has a number of substantial advantages over other energy sources.