



# Benefits of Space Solar Power

Kevin Dillon  
Member, President's Advisory Council  
National Space Society  
June 1, 2022

# The National Space Society

- “The National Space Society (NSS) is an independent, nonpartisan, educational, grassroots, non-profit organization dedicated to the creation of a spacefaring civilization.”
- NSS is the preeminent citizen’s voice on space exploration, development, and settlement.
- NSS Vision is “People living and working in thriving communities beyond the Earth and the use of the vast resources of space for the dramatic betterment of humanity.”
- Learn more: <https://space.nss.org/>



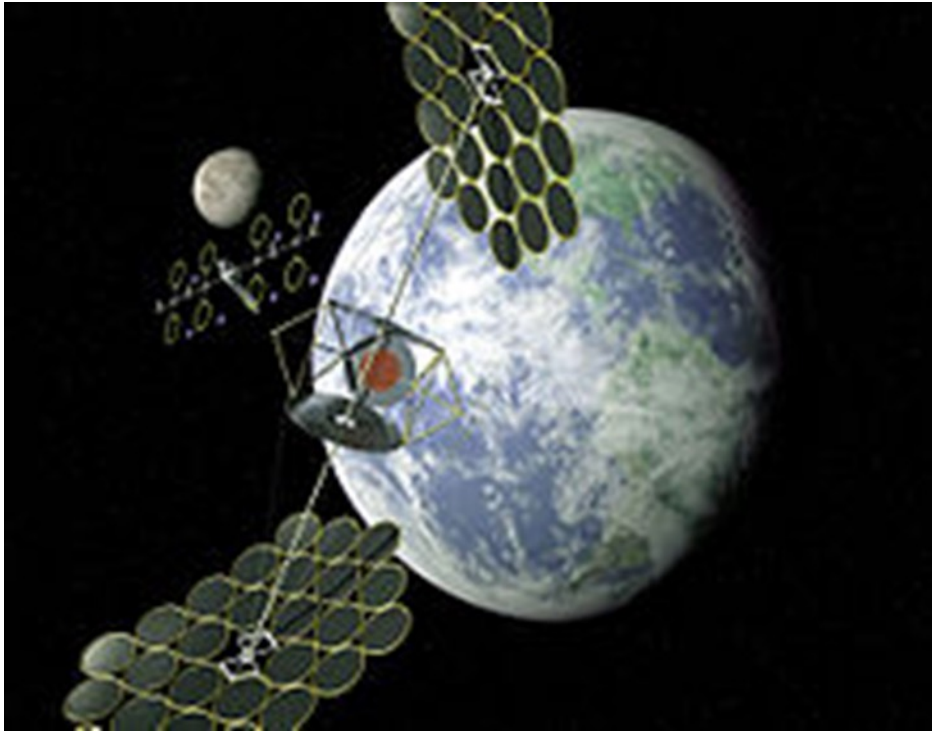
# What is Space Solar Power

- “Place very large solar arrays into continuously and intensely sunlit Earth orbit (1,366 watts/m<sup>2</sup>), collect gigawatts of electrical energy, electromagnetically beam it to Earth, and receive it on the surface for use either as baseload power via direct connection to the existing electrical grid, conversion into manufactured synthetic hydrocarbon fuels, or as low-intensity broadcast power beamed directly to consumers.”

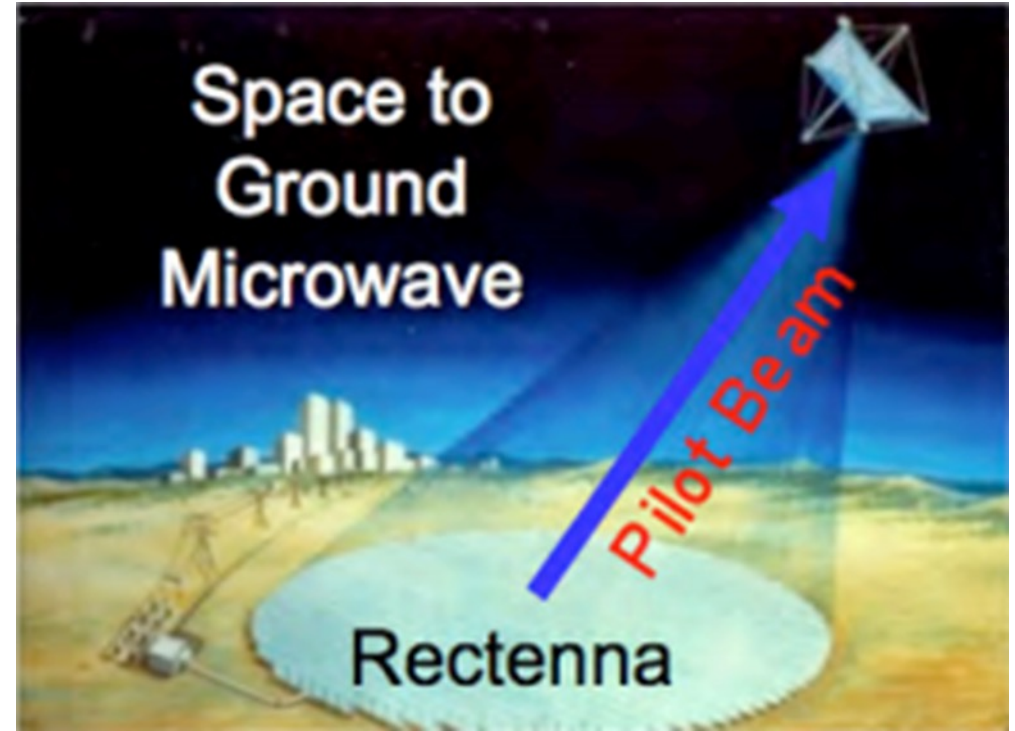
-- Peter Glaser, 1968

- Enabling factor: Enhancement of international Space Traffic Management mechanisms and procedures.

# How Space Solar Power Works



NASA  
[http://science.ksc.nasa.gov/shuttle/nexgen/Nexgen/Images/solar\\_power\\_satellite\\_concept.jpg](http://science.ksc.nasa.gov/shuttle/nexgen/Nexgen/Images/solar_power_satellite_concept.jpg)



NASA  
[http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20110013138\\_2011013651.pdf](http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20110013138_2011013651.pdf)

# Is Space Solar Power Realistic?

- Wireless Power Transmission has been demonstrated for decades and SSP issue solutions appear possible in the near future - unlike fusion.
- Manufacturing and launch costs have been going down and are going down further.
- New SSP designs like SPS-Alpha, ultra-light Cal Tech project, and Cassiopeia are improved over past ideas.
- Highly modular & sandwich designs are a big step forward.
- Robotics should mean large numbers of humans in space are no longer required to assemble the SSP units.

# Why Space Solar Power?

- SSP will enhance the use of outer space resources for creation of a peaceful and sustainable human civilization
- The ability to provide power and ancillary services when and where needed is essential to virtually all aspects of human endeavor. The United States of America (US), Europe and our partners should offer to make the investment necessary to enhance our power infrastructures to ensure:
  - Energy independence
  - Energy security
  - Resiliency for normal energy grid operations as well as disaster response and recovery

# The Space 2030 Agenda

- Objective 1.2: Facilitate and promote the integration of the space sector with other sectors, including energy, public health, the environment, climate change. . . as well as the development of multi-stakeholder partnerships leading to innovative space-based solutions ...for implementing the Sustainable Development Goals. (Emphasis added.)
- Objective 1.6: Promote the use of space-based solutions in global efforts to ensure sustainable forest and ocean economies. (Emphasis added.)
- Objective 2.4: Advance the role of space technologies in...addressing climate change and facilitating the transition to low-emission societies, and promote international collaboration in that regard, in line with...international mechanisms and organizations. (Emphasis added.)
- Objective 2.5: Promote the use of space-based technologies in all phases of the disaster management cycle, applicable to both natural and man-made disasters . . . response, recovery, reconstruction and rehabilitation.... (Emphasis added.)



# SUSTAINABLE DEVELOPMENT GOALS



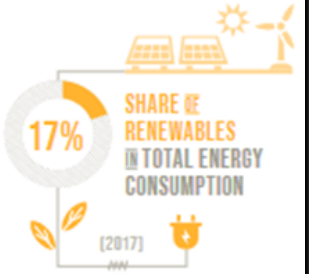
## ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

### BEFORE COVID-19

### EFFORTS NEED SCALING UP ON SUSTAINABLE ENERGY

**789 MILLION** PEOPLE LACK ELECTRICITY (2018)

### STEPPED-UP EFFORTS IN RENEWABLE ENERGY ARE NEEDED



### COVID-19 IMPLICATIONS

### AFFORDABLE AND RELIABLE ENERGY IS CRITICAL FOR HEALTH FACILITIES



FINANCIAL FLOWS TO DEV FOR RENEWABLE ENERGY



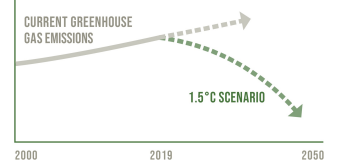
## TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

### THE CLIMATE CRISIS CONTINUES, LARGELY UNABATED



2020 GLOBAL AVERAGE TEMPERATURE AT

### RISING GREENHOUSE GAS EMISSIONS REQUIRE SHIFTING ECONOMIES TOWARDS CARBON NEUTRALITY



### CLIMATE FINANCE INCREASED

BY 10% FROM 2015-2016 TO 2017-2018, REACHING AN ANNUAL AVERAGE OF \$48.7 BILLION



IRG/SDGS/REPORT/2021/

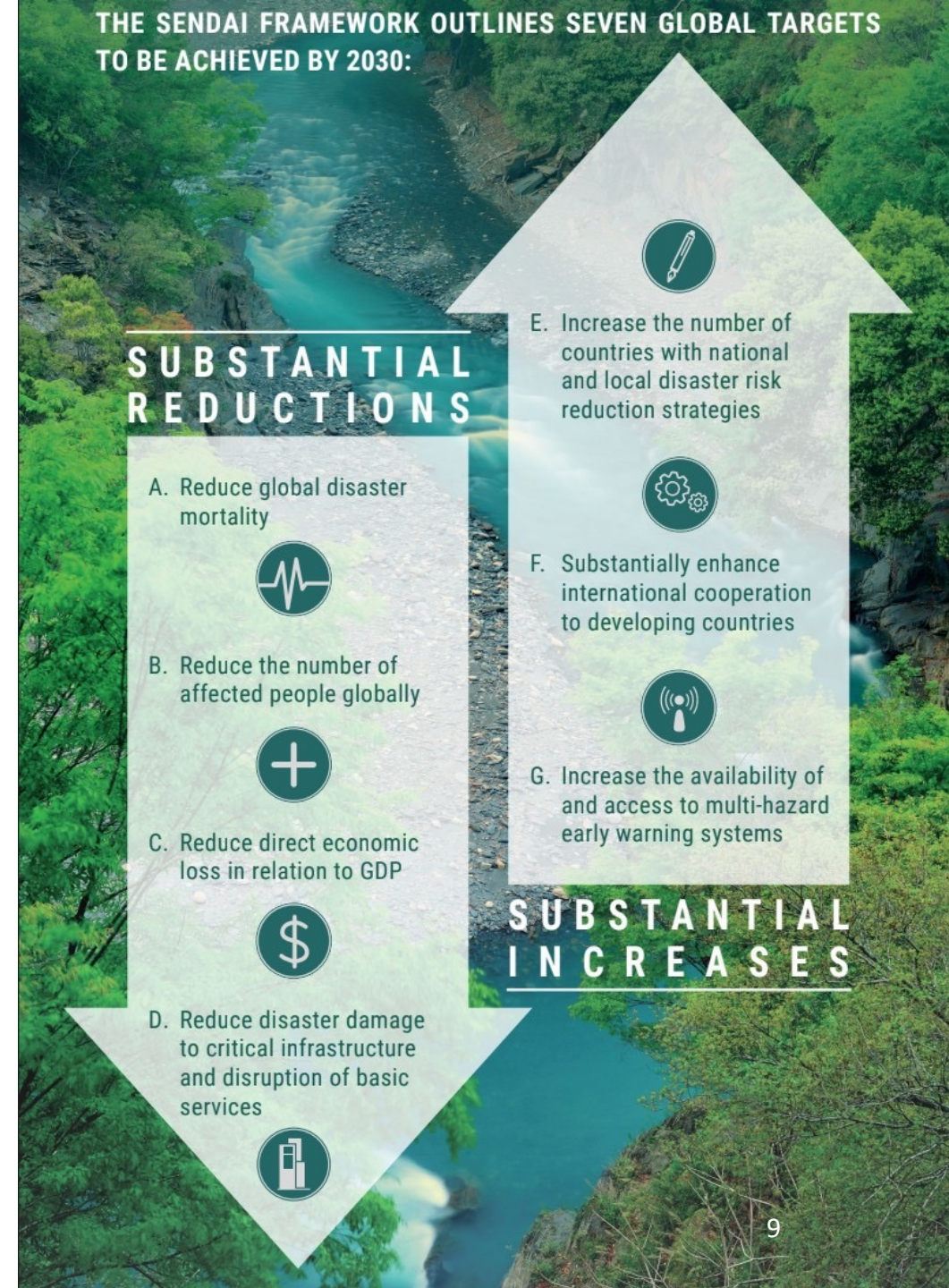




# Space Solar Power & Disaster Relief

- The 3 largest cost factors associated with disasters are lack of:
  - 1) energy,
  - 2) communications, and
  - 3) nighttime illumination (for around-the-clock relief and recovery efforts).

Solar power satellites could provide affordable power to enable these *crucial* relief elements!



# Sendai Framework Priorities

- Understanding disaster risk in all its dimensions -- for risk assessment, prevention, mitigation, preparedness & response.
- Strengthening disaster risk governance to better manage disaster risk at national, regional, & global levels -- for prevention, mitigation, preparedness, response, recovery, & rehabilitation.
- Investing in disaster risk prevention & reduction thru structural & nonstructural measures -- to enhance the resilience of persons, communities, and countries.
- Enhancing disaster preparedness for effective response and to “build back better” -- in recovery, rehabilitation, and reconstruction.

# International Collaborative Partnership

NSS proposes the introduction of a resolution which would express the belief that solar energy gathered by on-orbit satellites and delivered to Earth should be made available to the nations of the world as soon as practicable and on a global and non-discriminatory basis.

# Legal Considerations

- Outer Space Treaty
- Article I: Exploration and use of space carried out for the benefit ... of all countries. Facilitate and encourage international cooperation in scientific investigation.
- Article II: No national appropriation.
- Article III: Promote international cooperation and understanding.
- Article VI: State Parties have international responsibility for national (governmental & non-governmental) activities.



# Legal Considerations, cont.

- Article VII: Launching States internationally liable for damages to other State Parties.
- Article VIII: State Parties maintain jurisdiction and control over space objects.
- Article IX: Exploration and use to be guided by the principle of cooperation.
- Articles X and XI: Promote international cooperation by being transparent and sharing information.



# Challenges

---

- Export control laws and regulations: enabling technology sharing.
- Spectrum allocation management.
- Integrated and coordinated research and development investment.
- Health and safety considerations: identify how standards will be established.
- Enabling public-private partnerships.
- Development of one or more terrestrial multilaterally-scoped Space Solar Power Test Ranges and Proving Grounds.
- Frequency allocation.

# Thank You.

---

NSS SSP Legal  
Team:

Alfred Anzaldua  
Michelle Hanlon  
Dan Hawk  
John Mankins

Ayomide Jide-Omole  
Bailey Cunningham  
Kevin Dillon  
Quinn McKemey

<https://space.nss.org/space-solar-power/>



AnzalduaAlfred@gmail.comMichelle.Hanlon@nss.org



Itspaceagency@gmail.com



John.C.Mankins@gmail.com



JideOmoleay@gmail.com



Bailey.Cunningham@nss.org



Kevin.dk.Dillon@gmail.com



QMckemey@gmail.com

