

# Notes from Surface Power Monthly Meeting

*August 2020*

## Notes From Discussion

### Announcements:

- Confluence is set up as a communication platform
- Overview provided by Andrea, to request access email her at [ams573@alumni.psu.edu](mailto:ams573@alumni.psu.edu)
- Conference on Advanced Power Systems for Deep Space Exploration being held 27-29 October, see chat notes for details

::Presentation by Koki Ho, Georgia Tech::

::Presentation by AJ Gemer, Lunar Outpost::

- Ross Centers asked how far along determination were regarding requirements for power beamed to the rover
  - AJ Gemer answered that they have a high level analysis on the PSR MAP slide.
- Ross Centers specified he was interested in hardware integrations, two-way communication operational considerations
  - AJ Gemer responded that they've looked into it but are not far along yet.

::Presentation by Craig Peterson, TransAstra::

- Jeff Plate asked whether power consumption models consider weathering on solar panels caused by micro meteor strikes or scouring, and whether a crank is needed to construct the tower.
  - Craig Peterson answered that the tower is self-deploying, no assistance required from outside system.
- Jeff Plate asked how joints will be handled in respect to the dusty abrasive environment.
  - Craig Peterson answered that the unit would be sealed until deployment, and that solar arrays are above ground / deployable to avoid normal detritus
- Ben Bussey pointed out that Earth line-of-sight isn't guaranteed, would mechanism at top enable motion, and also whether calculations have been done to equate mass to the solar array size, where are those numbers coming from.
  - Craig Peterson answered a number of studies have been done, up to megawatt level, and they tried to be as conservative as possible. Tower mechanism would slowly revolve to maintain illumination on solar arrays

### Discussion about fall meeting:

- Dennis Wingo asked if meeting would go into detailed engineering, or just high-level discussions
  - Wes Fuhrman answered that the meeting will address the definition of sustainable, and while some technical discussions would occur there are other venues for technical deep-dives (ISRU Supply and Demand workshop, for example).
- Dennis Wingo re-emphasized the need for level zero requirements, whether considerations should be Moon or Moon and Mars, to provide clarity and focus for lower level requirements.
  - Wes Fuhrman responded that the meeting's first day would address that and give context for breakout sessions on day two.

#### Discussion about 10KW power level for LuSTR:

- Paolo Venneri raised the point that the 10KW power level specified in LuSTR didn't seem to be case or need driven, and asked about communicating the need for more realistic power levels to NASA.
  - Dennis Wingo agreed.
  - Wes Fuhrman agreed.
  - Gene Goldman agreed.
- Karl Hibbitts responded that this was a topic that the ISRU focus group also had concerns about, and that they had communicated to Space Tech.
  - Dennis Wingo responded that he had written some papers that are applicable, and would send them to Karl.
- Wes added that the timescale for fission power isn't short term, so while this RFI has a lower power level, future solicitations will likely incorporate these suggestions.

## Notes From Chat

- For additional information about ISRU Supply and Demand workshop on 17 September, contact Michael Nord at Michael.Nord@jhuapl.edu.
- Power event being held 27-29 October, "Conference on Advanced Power Systems for Deep Space Exploration," details at <https://usasymposium.com/deepspace/default.php>

### ::During Koki Ho Presentation::

- Jeff Plate offered to share resources with Koki Ho about interstellar mining planning

### ::During AJ Gerner Presentation::

- Karl Hibbitts asked about comm rate available from rover to lander
  - AJ Gerner answered that CLPS lander providers are giving 200 megabits, potentially with more available for purchase
- Athonu Chatterjee asked if rovers can work on asteroids
  - AJ Gerner answered that analyses so far are focused on lunar surface, but he would be interested in speaking more

### ::During Craig Peterson Presentation::

- Jeff Plate asked if weathering of solar panels has been considered, and if a crane would be needed to construct the towers.
  - Craig Peterson answered the question live (refer to discussion notes)
    - Jeff Plate added that for their mine replacements are needed every 18 months due to weathering degradation, so they're going with a fission small nuclear reactor
    - Dennis Wingo responded that 18 months is too pessimistic for a solar array, and that adding a small reactor would increase cost by 10-20x.
      - Jeff Plate responded that the heat output would be very valuable for operations.
        - Joel Sercel replied that the 1MW Sun Flower has mass and cost a fraction of equivalent fission power supply while providing 97% duty cycle in PSRs
- Joel Sercel stated:
  - An 800 m tall tower can support 1/3 of its mass on the moon, so single New Glenn could carry 1 MW of electric power
  - Solar array impacts and dust would be the same for all solar power options
  - Wouldn't deploy when dust from landing is active
- Ross Centers asked to hear about deployment mechanisms
  - Craig Peterson answered the question live (refer to discussion notes)
- John Verboncoeur asked for the lifetime of PV under solar concentrated flux without cooling
  - Craig Peterson responded that the solar flux is being reflected, not concentrated, and should have lifetimes similar to the ISS (with debate about micro-meteorite environment & debris)
- Joel Sercel answered 1MW on New Glenn
  - Dennis Wingo responded that a megawatt seems excessively optimistic
    - Joel Sercel responded that there is not excessive optimism in the designs
- Karl Hibbitts stated that requirements settings at L0 and L1 are needed

- Dan Barker pointed out that Points of Eternal Light do go into shadow, and asked if tower goes higher than the height needed to maintain solar insolation?
- Jeff Plate stated that construction, deployment, and maintenance cycles should be addressed
- John Verboncoeur asked about modular power increments, and stated milestones to move from tech demo to production seem important.
- Jeff Plate added modular and scalable
- Rob Button responded to Gene Goldman's comments in discussion about FSP being meant as a tech demo mission to knock down barriers to flying fission power systems in space
- Dennis Poulos stated that scalability is more important than an absolute number