# Continued Presentation Space Solar Power Developments at Boeing

**Mark Henley**

**The Boeing Company**

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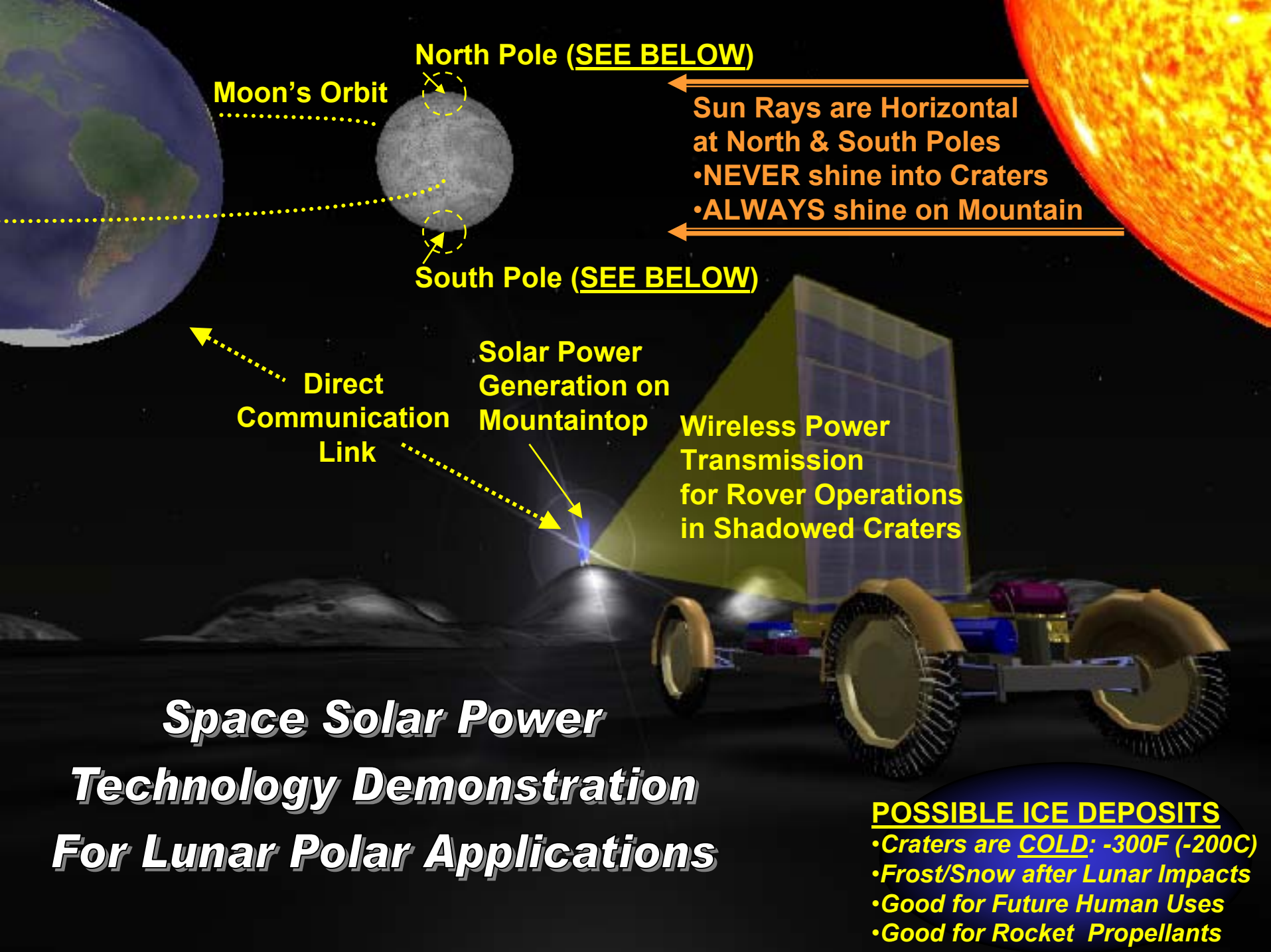
# MSC-1B: 10 kWe Lunar Polar SSPS

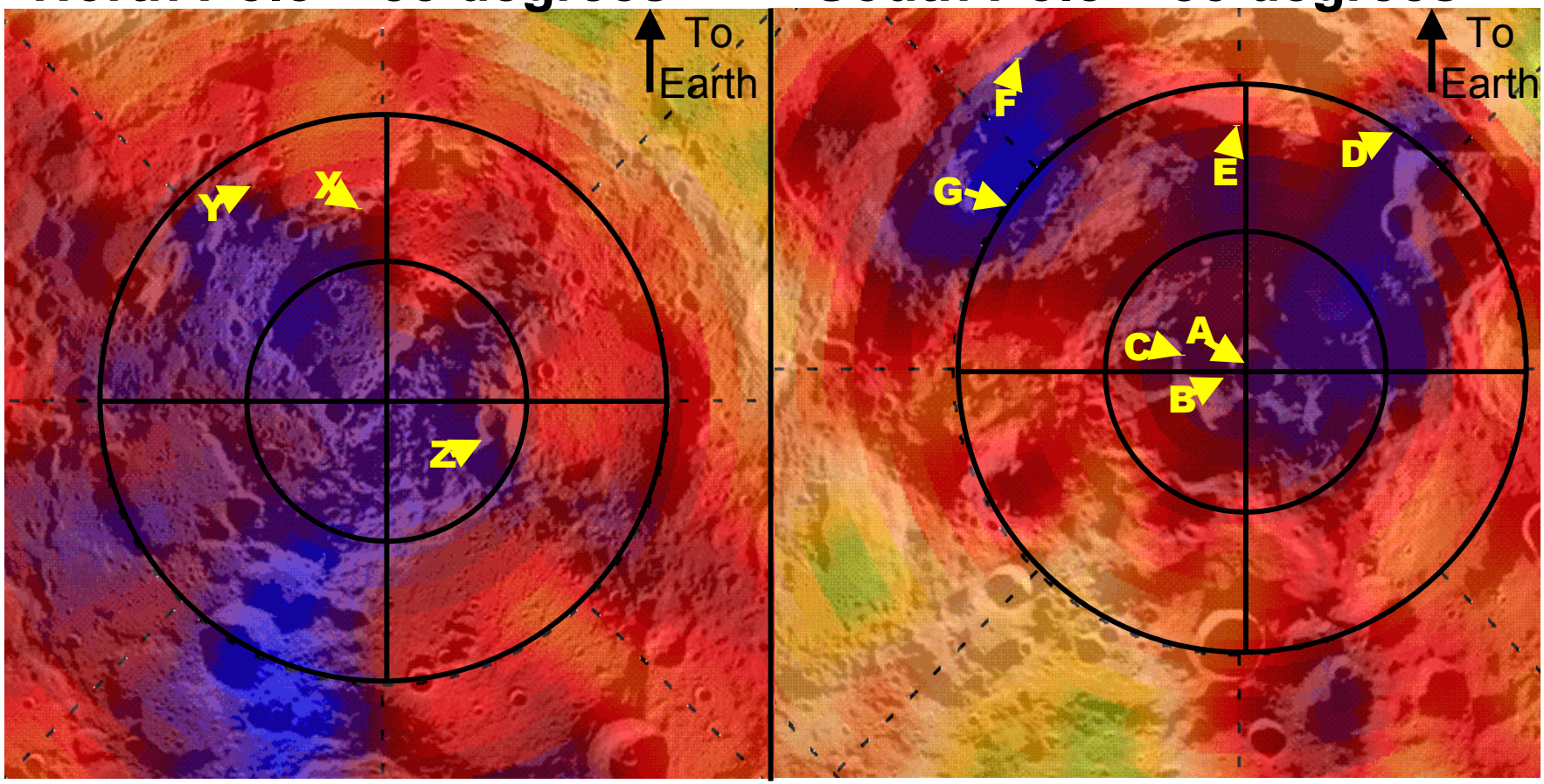
- Technology for Laser-Photo-Voltaic Wireless Power Transmission (Laser-PV WPT) is being developed for lunar polar applications by Boeing and NASA Marshall Space Flight Center
- A lunar polar mission could demonstrate and validate Laser-PV WPT and other SSP technologies, while enabling access to cold, permanently shadowed craters that are believed to contain ice
  - Craters may hold frozen water and other volatiles deposited over billions of years, recording prior impact events on the moon (and Earth)
  - A photo-voltaic-powered rover could use sunlight, when available, and laser light, when required, to explore a wide range of lunar polar terrain.
- The National Research Council recently found that a mission to the moon's South Pole-Aitkin Basin has high priority for Space Science
  - Opportunities for collaboration are TBD


North Pole (SEE BELOW)
Moon's Orbit
Sun Rays are Horizontal
at North & South Poles
•NEVER shine into Craters
•ALWAYS shine on Mountain
South Pole (SEE BELOW)
Direct
Communication
Link
Solar Power
Generation on
Mountaintop
Wireless Power
Transmission
for Rover Operations
in Shadowed Craters
Space Solar Power
Technology Demonstration
For Lunar Polar Applications
POSSIBLE ICE DEPOSITS
•Craters are COLD: -300F (-200C)
•Frost/Snow after Lunar Impacts
•Good for Future Human Uses
•Good for Rocket Propellants

# Neutron Spectrometer Data from Lunar Prospector Spacecraft

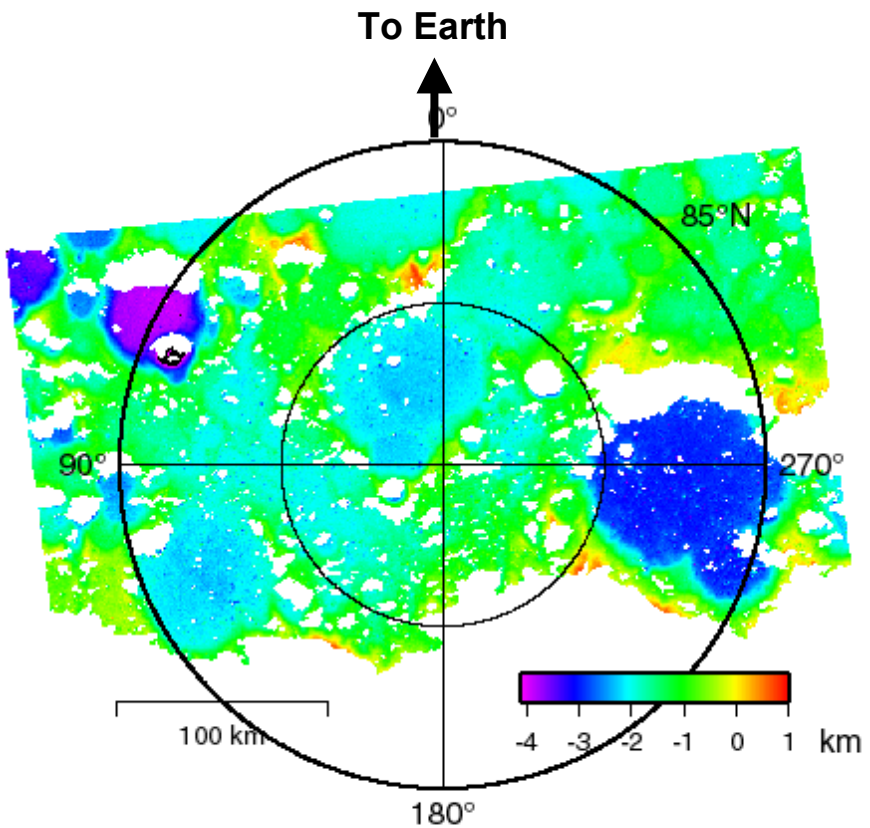
- **BLUE indicates highest Hydrogen concentration**
- **YELLOW indicates candidate Laser-PV WPT sites**

**North Pole > 85 degrees** **South Pole > 85 degrees**

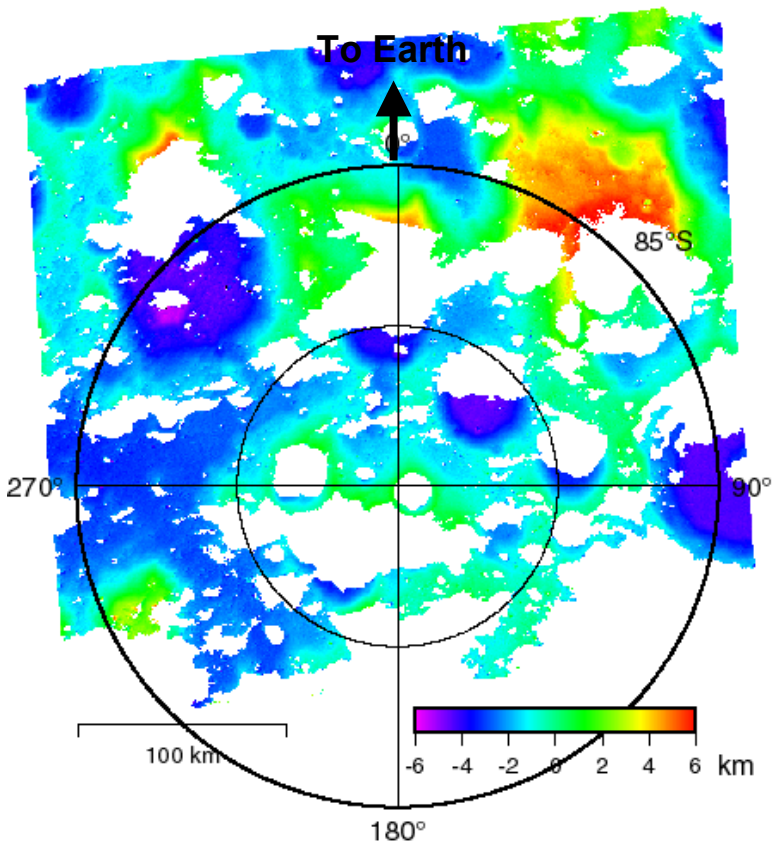


# Radar-Derived Topography of the Moon's North and South Poles

- **Note Difference in Vertical Scale!!!**



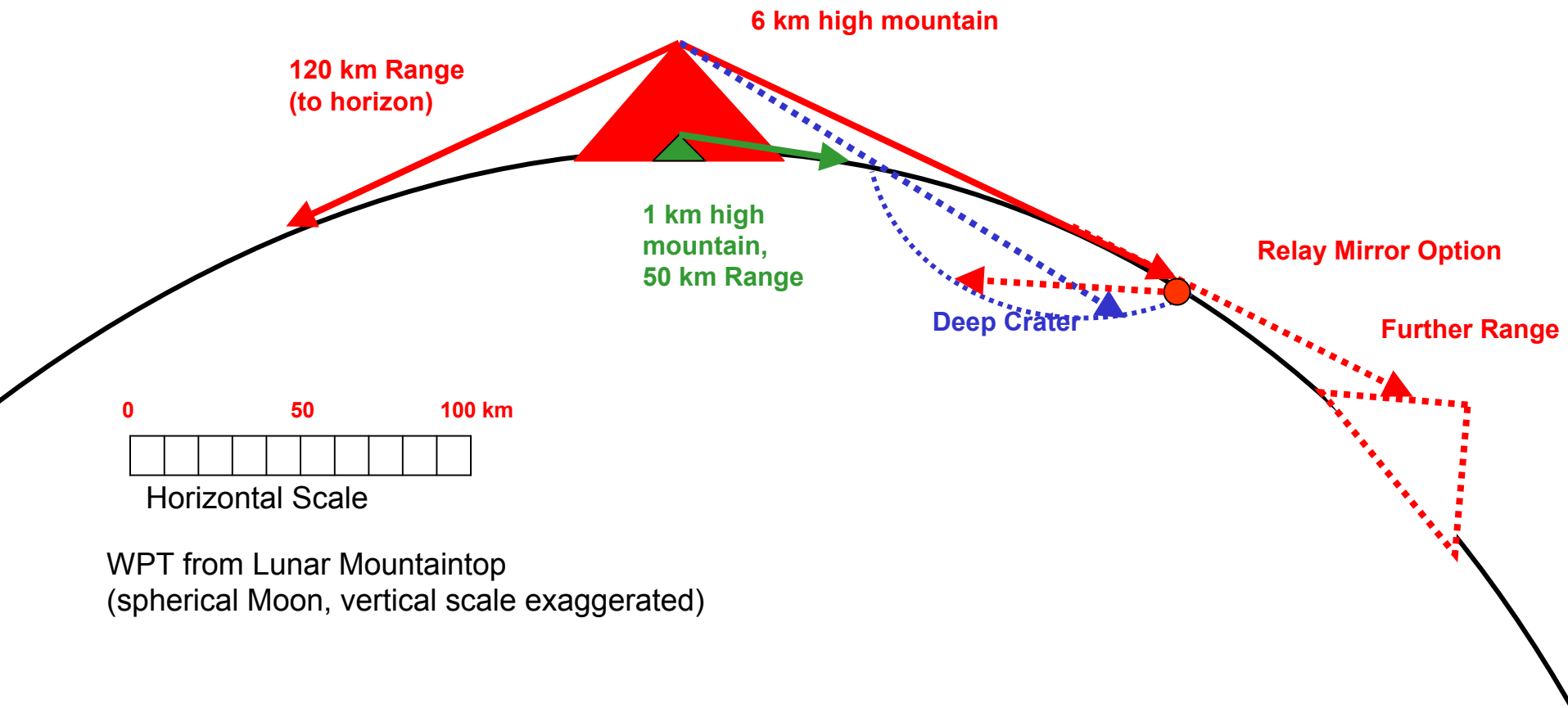

North Pole > 85 degrees




South Pole > 85 degrees

# Laser Range Depends on Topography

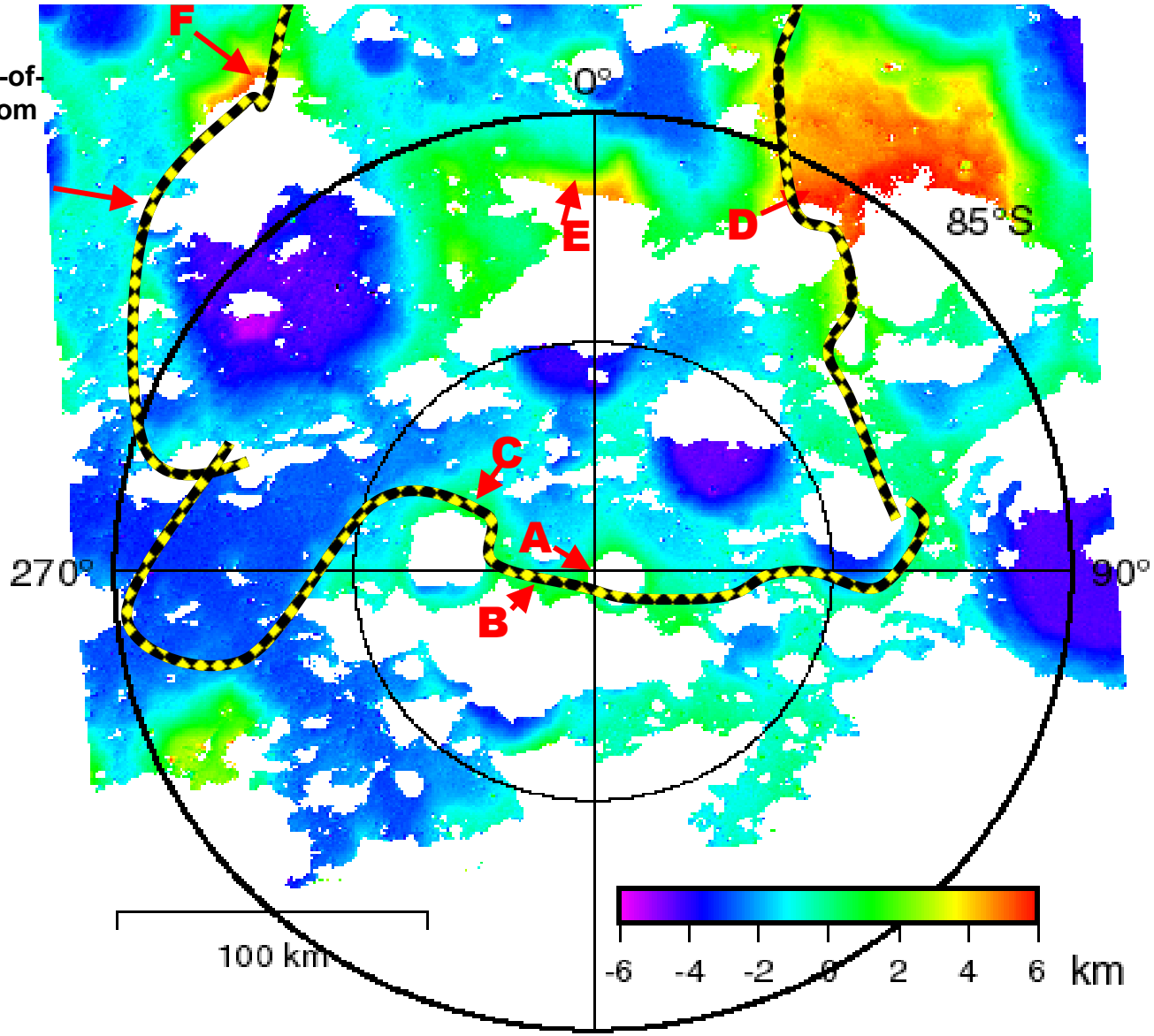
Transmitter on lunar mountain could beam power > 100 km




WPT from Lunar Mountaintop
(spherical Moon, vertical scale exaggerated)

# Laser Range from Example Mountain-Top (Direct Line-of-Sight from Point E)

**Maximum Line-of-Sight Range from Mountain "E"**



# Apollo Lunar Roving Vehicle (LRV): Candidate for Lunar Laser-PV WPT Mission

**Key Features:**
**Flight-proven on the Moon**
**2 flight-qualified units still exist**
**Long Distance Roving Capability**
**Large Platform for WPT Receiver**

**LRV Modifications for MSC-2 Use**
**Add Large Photo-Voltaic Panel**
**Revise Batteries (rechargeable)**
**Revise Deployment System**
**Revise Data / Comm. Interfaces**
**Delete Crew Interfaces (optional)**
**Add Teleoperation Capability**
**Extend Range of Ops (TBD x 100 km)**
**Requalify for Low T Ops (~100 Kelvin)**
**Add Scientific Payload Interfaces**