

Pressurized Rover Mission Concepts and Expected Capabilities



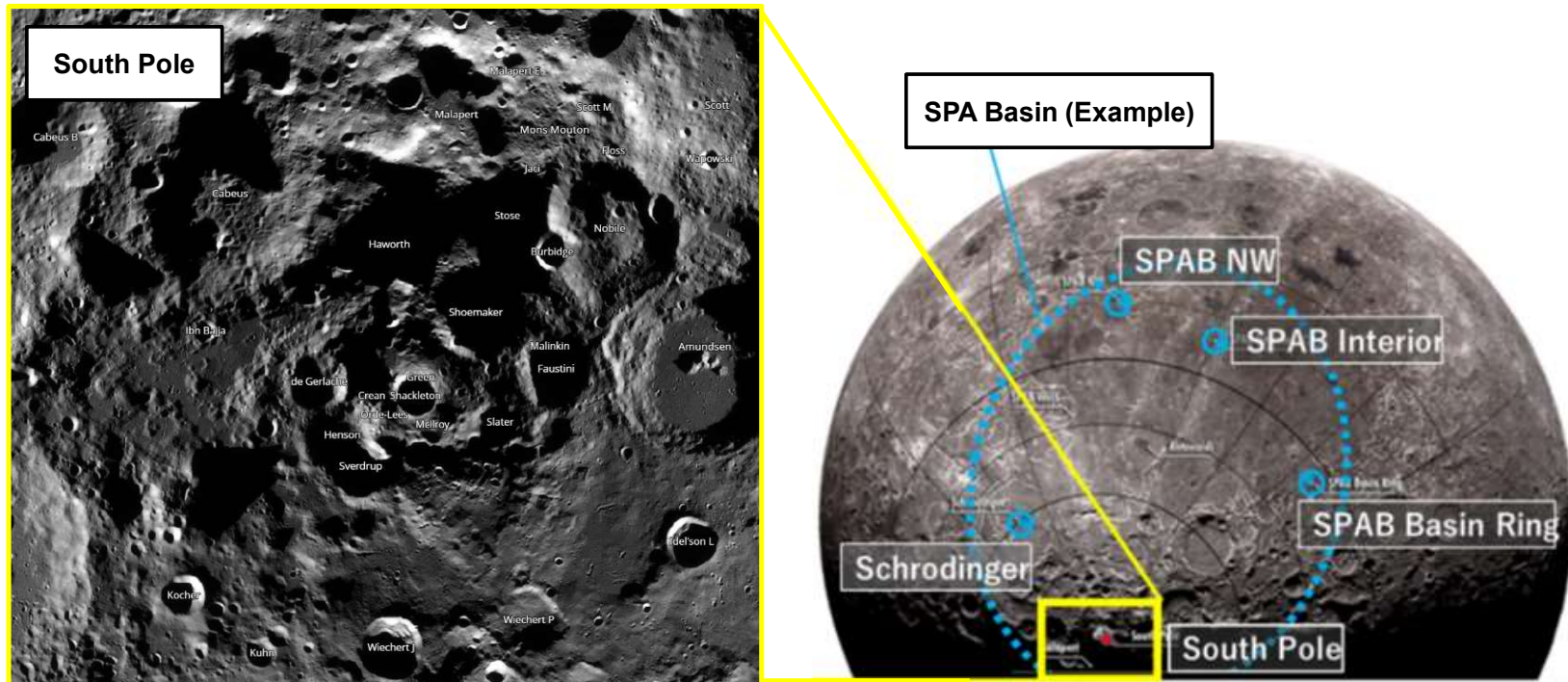
IMPORTANT NOTE

Information contained herein this material are still notional and reference only.
These may differ from the actual PR capabilities and constraints as the project evolves.

PR CONCEPT OF OPERATIONS

PR Mission Overview

- Launch in 2031 with life-time operation on the lunar surface for 10 years
- Phase 1 will focus on the south pole region while going off the pole in phase 2 to maximize the scientific return
- 31 continuous Earth days (28 days nominal + 3 days margin) for crewed mission once per year
- 330 days of uncrewed exploration by remote operation from the ground per year.



Candidate Exploration Region

Mission Concept and System Requirements

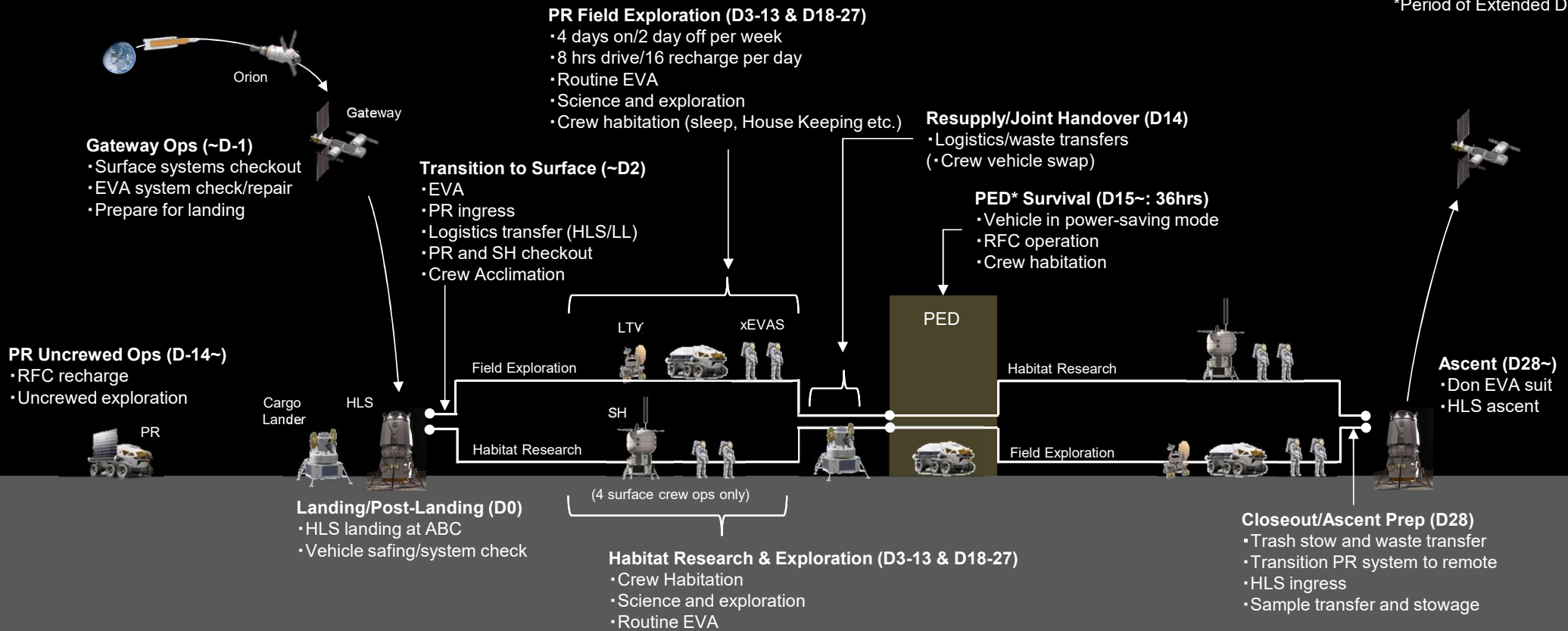


Key Parameters		Phase 1	Phase 2
<u>Mission Concept</u>	Operational Life	2031~ (10 years)	
	Number of Crew	2	
	Exploration Area	South Pole Region	SPA basin / Nectaris (example)
	Crewed Mission Cadence	1 crewed mission per year	
<u>System Requirements</u>	Crewed Duration	31 days (including 3days margin)	-
	Period of Extended Darkness (PED) Duration	Crewed : 36hrs Uncrewed : 192hrs	Uncrewed : 14.5days
	Crewed Traversing Distance	26 km/day	
	Life Traversing Distance	10,000 km	
	Max Operational Mass	18,000 kg @ crewed mission (14days resupply)	
	Cargo Mass	3,000kg (14days) / 2,600 kg (7days)	
	EVA Frequency	24hrs EVA/wk/crew, Max. 3 times EVA/wk	
	Max. Velocity	15 km/h	
	Max Slope	± 20 degree	
	Max Obstacle	30 cm @ flat surface, (7cm @20deg slope)	

Artemis Lunar Surface Mission Overview



*Period of Extended Darkness

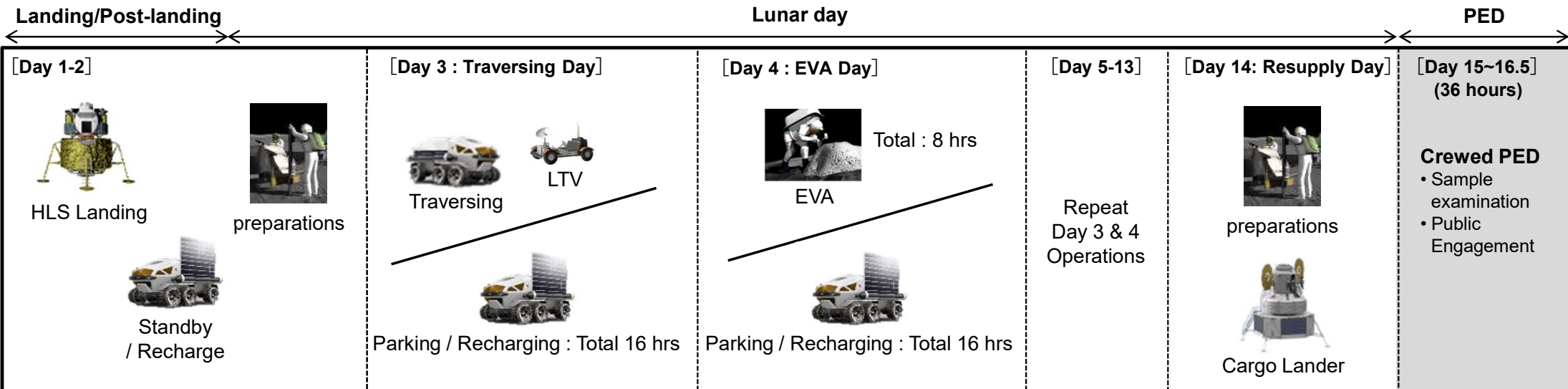


Mission Timeline



PR Operation - Crewed Mission

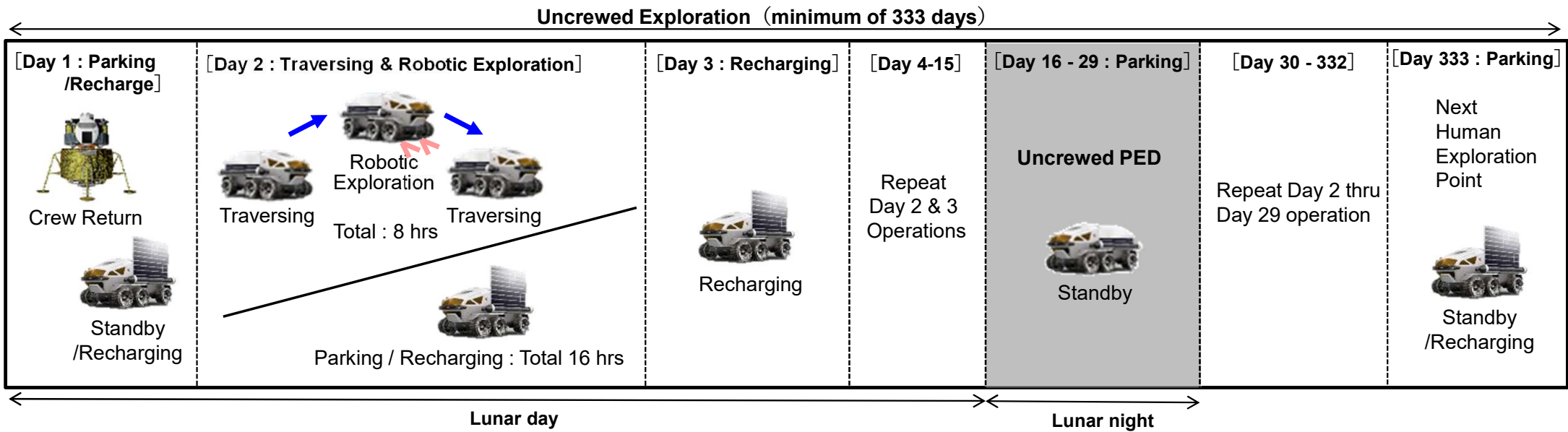
- 8 hours of traversing and EVA, 16 hours of Li-ion battery recharging in one Earth day (24 hours) will be repeated during lunar exploration day. Exploration will be conducted 3times in a week.
 - ✓ PR uses Li-ion battery for traversing and housekeeping energy during 8hrs of traversing.
 - ✓ During parking and recharging, PR deploys solar array.
 - ✓ During EVA, cabin of cabin as airlock will be kept under vacuum condition.
- During period of extended darkness (PED, maximum of 36 hours), no exploration but sample examination and/or public engagement are performed. PR will be at the area where PR can go back to HLS in contingency.
 - ✓ PR uses Fuel cell for housekeeping energy during lunar night.
- When traversing more than 10 km away from safe haven, for contingency return, LTV should always accompany the PR.



PR Operation - Uncrewed Mission



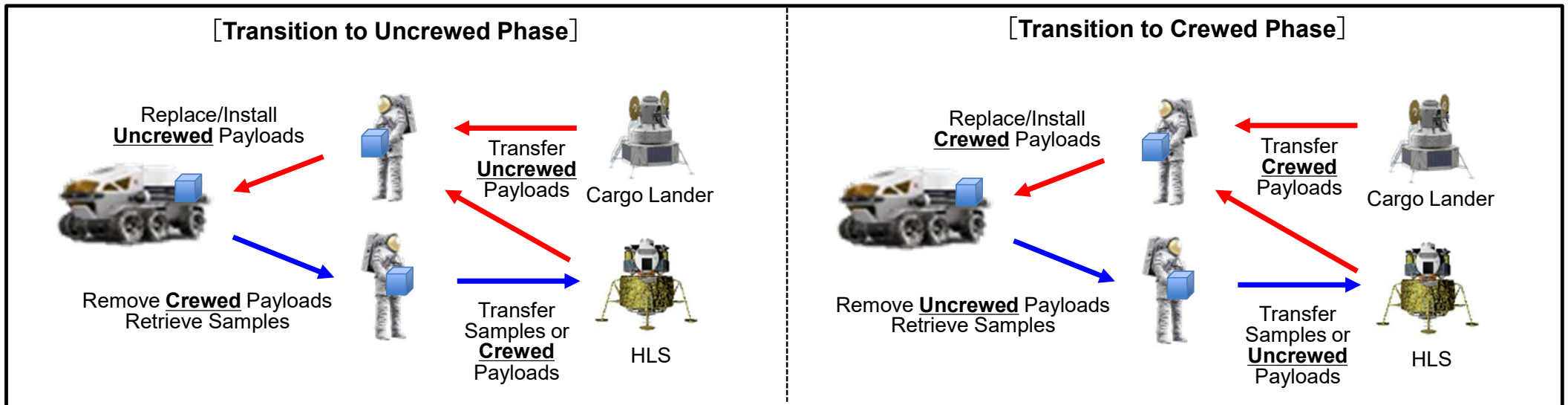
- 8 hours traversing and EVA and 16 + 24 hours of battery recharging in TWO Earth days (48 hours) will be repeated during lunar day.
 - ✓ PR uses Li-ion battery for traversing and housekeeping energy during 8hrs of traversing.
 - ✓ During parking and recharging, PR deploys solar array.
- During lunar night (maximum of 192 hours), no exploration and stand-by to save the power.
 - ✓ PR uses Fuel cell for housekeeping energy during lunar night.
- As no contingency return is required, the Pressurized Rover can traverse a wider area than a crewed mission, while it requires to survive longer PED (5 to 8 days).



PR Operation – Phase Transition (Crewed ↔ Uncrewed)



- When crewed surface mission is complete, crewmember will perform payload-related activities before return to Earth;
 - ✓ Remove or replace (newly install) PR onboard instruments or payloads for uncrewed operations
 - Replacement hardware will be separately delivered to lunar surface via cargo lander, and transferred to PR
 - ✓ Retrieve and transfer samples or crewed payloads (if necessary) to HLS for earth return
- Before starting next crewed surface mission phase, crewmember will perform payload-related activities;
 - ✓ Replace (newly install) PR onboard instruments or payloads for crewed operations
 - Replacement hardware will be separately delivered to lunar surface via cargo lander or HLS
 - ✓ Retrieve and transfer samples or uncrewed payloads (if necessary) to HLS for earth return



EXPECTED UTILIZATION CAPABILITIES

PR Payload Architecture

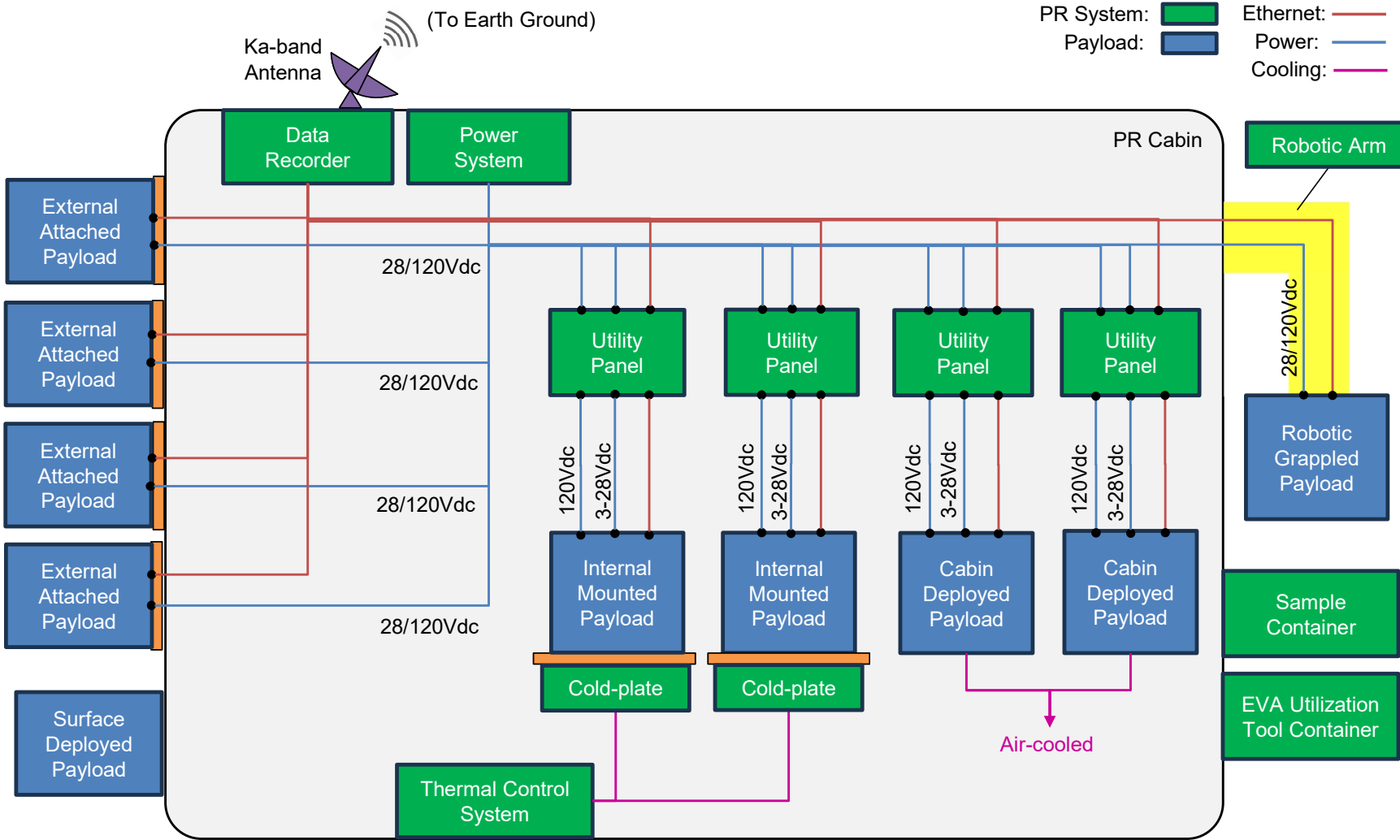
- **Payload Accommodation (see next slide for details)**

- External Attached or Surface Deployed Payload: PR will provide power, data/communication connections, and mechanical attachments for payloads at a minimum of four locations on the vehicle. Also, accommodate suited crewmembers in performing safe swap-out of payloads.
- Robotic Grappled Payload: PR may include a robotic arm. Additionally, it will also provide mechanical attachments.
- Internal Mounted Payload: PR will provide power, data/communication connections, and mechanical attachments at a minimum of two locations for payloads inside the vehicle.
- Cabin Deployed Payload: PR will include an interior flat, stable work surface with at least two nearby power outlets to facilitate interior science activities that involve deploying powered utilization devices that are restowed after utilization procedures are completed.
- Stowage: PR will provide stowage for utilization tools and samples

- **Payload Operations**

- Generally speaking, payloads will receive power, data (wireless and hardline), thermal, and structural accommodations.
- The PR will provide for commanding of payloads, as applicable, by either crew aboard PR or a remote operator. Data generated by payloads may be stored locally on the PR and downlinked to ground as bandwidth allows, and the PR will allow for encryption or other protection of sensitive data as needed.
- The PR will also provide telemetry and metadata, as needed by payloads to perform science data calibrations needed to accurately interpret science data.

Payload Accommodation in Pressurized Rover (Notional)



External Payload Mount Location

