Table 1: Power budget parameters

Parameter name	**Label**	**Unit**
Orbital period	T	s
Planet radius	R	km
Standard gravitational parameter	μ	km^3/s^2
Power required for a subsystem	PR	W
Eclipse Duty Cycle	EDC	%
Sunlight Duty Cycle	SDC	%
Average Orbit Power Required During Eclipse	$AOPR_E$	W
Average Orbit Power Required During Sunlight	$AOPR_S$	W
Earth angular radius	ρ	$^\circ$
Orbit height	h	km
Time of Eclipse	TE	s
Time in Sunlight	TS	s
Energy required during eclipse	EE	Wh
Energy required during sunlight	ES	Wh
Solar panel length	L	m
Solar panel wide	W	m
Packing Factor	PF	/
CubeSat size	$size$	CubeSat Unit U
Effective Area	A_{eff}	m^2
Input surface solar power	P_{in}	W/m^2
Solar array power generated at Begin Of Life	$PSABOL$	W
Solar array power generated at Ending Of Life	$PSAEOL$	W
Solar Cell efficiency at Ending of Life	η_{EOL}	/
Solar Cell efficiency	η	/
Solar Cell Efficiency Degradation Per Year	YD	%
Years of Mission	YM	$years$
Energy Required To Produce	EP	Wh
Power Solar Array Required	$PSAR$	W
Battery Depth of Discharge	DOD	%
Battery Capacity calculated	$Batt$	Wh
Battery Capacity	BC	Wh
Power Margin	$PSAM$	W

Table 2: Power budget constraints

Equation	**Reference**
$T = 2\pi\sqrt{\frac{R^3}{\mu}}$	[1] p.193
$\rho = \arcsin\frac{R}{h+R}$	[1] p.193
$TE = \frac{2\rho}{360}T$	[1] p.193
$TS = T - TE$	[1] p.193
$PSABOL = P_{in}\eta A_{eff}$	[1] p.194
$\eta_{EOL} = \eta(1-YD)^{YM}$	[1] p.194
$PSAEOL = \eta_{EOL}(PSABOL)$	[1] p.194
$A_{eff} = PF * L * W$ With $PF = 1$ if $size = 1$ With $PF = 0.8$ if $size = 2$ With $PF = 0.86$ if $size! = 1$ and $size! = 2$	[1] p.194
$EE = \sum AOPR_E * TE * \frac{1}{3600}$	[1] p.196
$ES = \sum AOPR_S * TS * \frac{1}{3600}$	[1] p.196
$AOPR_E = PR * EDC$	[1] p.195
$AOPR_S = PR * SDC$	[1] p.195
$EP = EE + ES$	[1] p.195
$PSAR = \frac{EP*3600}{TS}$	[1] p.196
$PSAM = PSAEOL - PSAR$	[1] p.196
$Batt = \frac{EE}{DOD}$	[1] p.196

References

[1] C. Cappelletti, S. Battistini, and B. Malphrus, *CubeSat Handbook: From Mission Design to Operations.* Academic Press, 2020.