LAMPIRAN

Lampiran 1 Tabel Kalkulasi Tenaga di Wilayah Bulan
Sumber: (Wingo, 2015)

Lunar Development Power Worksheet	Nonpolar	N Pole	N Pole 10 m	S Pole	S Pole 10 m
Power (kWh)					
Power available during day	35,400	59,868	61,185	63,019	65,915
Max power for a month	17,700	50,625	52,876	56,093	61,367
Realistic power for a month	16,461	47,081	49,175	52,167	57,071
Losses	1,239	3,544	3,701	3,927	4,296
Average kWh available	23.25	66.50	69.46	73.68	80.61
Variables nonpolar					
Power available (kW)	100				
Hours of day/night	354				
Hours in a lunar month	708				
Power efficiency	93%				
Variables north pole site 2N					
Illumination fraction	84.56%				
Illumination fraction 10 m	86.42%				
Hours of daylight	598.68				
Hours of daylight 10 m	611.85				
Hours of night	109.32				
Hours of night 10 m	96.15				
Variables south pole site 1S					
Illumination fraction	89.01%				
Illumination fraction 10 m	93.10%				
Hours of daylight	630.19				
Hours of daylight 10 m	659.15				
Hours of night	77.81				
Hours of night 10 m	48.85				

Lampiran 2 Tabel Komposisi Permukaan Bulan, Batuan, dan Fraksi Mineral
Sumber: Waldron (Wingo, 2015)

Low-Titanium Basalts				
Modal Abund.	**Pyroxene**	**Olivine**	**Plagioclase**	**Opaques**
Vol%	**42–60%**	**0–36%**	**17–33%**	**1–11%**
Component (wt%)				
SiO_2	41.2–54.0	33.5–38.1	44.4–48.2	<1.0
Al_2O_3	0.6–11.9	–	32.0–35.2	0.1–1.2
TiO_2	0.2–3.0	–	–	50.7–53.9
Cr_2O_3	0–1.5	0.3–0.7	–	0.2–0.8
FeO	13.1–44.5	21.1–47.2	0.4–2.6	44.1–46.8
MnO	0–0.6	0.1–0.4	–	0.3–0.5
MgO	0.3–26.3	18.5–39.2	0.1–1.2	0.1–2.3
CaO	2.0–16.9	0–0.3	16.9–19.2	<1.0
Na_2O	0–0.1	–	0.4–1.3	–
K_2O	–	–	0–0.3	–

No.	Nama Ruang	Kapasitas (Orang)	Jml	Analisis Besaran					Luas (m^2)	Sirkulasi	Total Luas (m^2)	Total Luas (m^2)*	Sumber
				Unit	Perabot	Ukuran p×l (m)		Luas (m^2)					
BANGUNAN UTAMA													
AIRLOCK MODUL													
1	*Airlock Area*	6	2	2	Panel Kontrol	0,5	1	0,5	1	100%	46	46	ISS; MCLH
				5	Tabung Tekanan Udara dan Oksigen	1	1	1	5				
				1	Sirkulasi Barang	4	4	16	16				
				2	Pintu Modul	2	0,25	0,5	1				
2	*Spacesuit and Repair Area*	10	2	6	*Spacesuit*	3	3	9	54	70%	254,575	255	ISS; MCLH
				6	*Spacesuit Stand*	3	3	9	54				
				2	*Emergency Supply*	0,5	1	0,5	1				
				3	Tangki Air	0,5	0,5	0,25	0,75				
				8	ISPR	1	1	1	8				
				1	Sirkulasi Barang	4	4	16	16				
				4	Kru	2	2	4	16				
3	Dekontaminasi Area	10	2	2	ISPR	1	1	1	2	70%	38,097	39	AP
				2	Rak Pakaian	1	1	1	2				
				1	Tempat Sampah	0,4	0,4	0,16	0,16				
				1	Vakum	1	1	1	1				
				1	Dekontaminan	0,5	0,5	0,25	0,25				
				1	Sirkulasi Barang	4	4	16	16				
				2	*Emergency Supply*	0,5	1	0,5	1				
											TOTAL =		340

HABITAT MODUL													
4	Ruang Berkumpul	12	1	4	ISRU	1	1	1	4	100%	21	21	AP
				2	Meja	1	3	3	6				
				2	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,5				
5	Area Dokumentasi	4	1	1	*Photospectrometric System*	2	2	4	4	70%	28,9	30	ISS
				1	*Videospectrometric System*	2	2	4	4				
				1	*Window Observational Research*	2	2	4	4				
				1	*Sun Monitoring*	1	2	2	2				
				1	*DLS Earth Sensing Image Spectrometer*	1	1	1	1				
				2	ISRU	1	1	1	2				
6	Area Komunikasi	6	1	1	ISRU	1	1	1	1	70%	9,775	10	ISS
				2	*Space Communication*	1	1	1	2				
				1	*Global Transmission Services*	1	0,5	0,5	0,5				
				1	*The Communication & Tracking System*	1	1	1	1				
				1	*Laptop Compartment*	0,5	0,5	0,25	0,25				
				1	*Internal Communication System*	1	1	1	1				

7	Area Tidur	12	1	12	*Crew Compratment*	1	2	2	24	70%	40,8	41	MCLH
8	Dapur	12	1	1	*Kitchen Unit*	1	1	1	1	70%	5,1	6	MCLH
				1	*Foods Storage*	1	1	1	1				
				1	*Water Compartement*	1	1	1	1				
9	Area Kontrol	4	1	2	*Power Storage*	2	2	4	8	70%	24,65	25	ISS
				1	*Power Control*	1	1	1	1				
				1	*Airflow and Plumbing Control*	1	1	1	1				
				1	*Thermal Control*	1	0,5	0,5	0,5				
				1	*Lighting Panel*	1	1						
				2	*Computer and Data Management*	1	2	2	4				
10	Area *Environmental Control and Life Support System*	4	1	1	*Oxygen Generation System Rack*	1	1	1	1	70%	6,8	7	ISS
				1	*Water Recovery System Rack 1*	1	1	1	1				
				1	*Water Recovery System Rack 2*	1	1	1	1				
				1	*Common Cabin Air Assembly*	1	1	1	1				
11	*Toilet & Waste Management Compartment*	2	1	2	*Waste Hygiene Compartment*	1	1	1	2	100%	12	12	ISS
				2	*Water Storage*	1	1	1	2				
				2	ISPR	1	1	1	2				
12	Kapsul Limbah	2	1	1	*Trash Airlock*	1,5	2	3	3	70%	5,1	6	ISS
												TOTAL =	158

MODUL PENYAMBUNG/NODE													
1	Selasar	6	1	2	ISPR	1	1	1	2	70%	4,25	5	AP
				2	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,5				
												TOTAL =	5
MODUL LABORATORIUM													
LABORATORIUM BIOLOGIS													
1	Area Eksperimen	6	1	1	Meja + Laptop Kerja	0,6	0,5	0,3	0,3	70%	60,095	61	ISS
				2	ISPR	1	0,55	0,55	1,1				
				1	*BioLab Experiment Laboratory*	1	1	1	1				
				2	*Cell Science*	1	0,6	0,6	1,2				
				1	*Biomoleculer Sequencer*	1	1	1	1				
				1	*Life Sciences Glovebox*	1	1	1	1				
				1	*Multi-purpose Small Payload Rack*	1	1	1	1				
				1	*Polar*	1	1	1	1				
				1	*Minus Eighty Laboratory Freezer*	1	1	1	1				
				1	*Kriogem-3M*	1	0,5	0,5	0,5				
				1	*Commercial Generic Bioprocessing Apparatus*	1	1	1	1				
				1	*Space Automated Bioproduct Laboratory*	1	1	1	1				

				2	*Bioculture System Facility*	1	0,5	0,5	1				
				1	*TBU-N Low temperature incubator*	1	1	1	1				
				1	*TBU-V High temperature incubator*	1	1	1	1				
				1	*Advance Biological Reseach System*	1	1	1	1				
				4	*Cell Biology Experiment Facility*	1	0,5	0,5	2				
				2	*Aquatic Habitat*	1	0,5	0,5	1				
				4	*Mouse Habitat Unit*	1	0,5	0,5	2				
				3	*Rodent Research Hardware System*	1	0,5	0,5	1,5				
				2	*Microscope Observation System*	1	1	1	2				
				1	*WetLab*	1	1	1	1				
				2	*NanoRacks Plate Reader*	1	0,5	0,5	1				
				1	*European Modular Cultivation System*	1	0,5	0,5	0,5				
				1	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,25				
				1	Sirkulasi Barang	3	3	9	9				
2	*Storage*	6	1	4	ISPR	1	1	1	4	70%	13,09	14	AP
				2	Eksperimen Rack	1	1	1	2				
				2	Rak Komponen	1	0,6	0,6	1,2				
				2	*Countainer*	0,5	0,5	0,25	0,5				

3	Area Pembersihan	4	1	2	Rak Alat	1	1	1	2	70%	7,65	8	AP
				1	Troli Kebersihan	1	2	2	2				
				2	*Wastafel*	0,5	0,5	0,25	0,5				
4	*Waste Management Compartment*	2	1	1	*Trash Airlock*	1,5	1,5	2,25	2,25	70%	5,525	6	ISS
				1	*Water Storage*	1	1	1	1				
												TOTAL =	89
LABORATORIUM FISIKA													
5	Area Eksperimen	6	1	1	*NanoRacks Astrium Centrifuge*	1	0,5	0,5	0,5	70%	25,15	26	ISS
				1	*Combustion Integrated Rack*	1	1	1	1				
				1	*Advance Combustion via Microgravitasi Experiment*	1	1	1	1				
				1	*Chamber for Combustion Experiment*	1	1	1	1				
				1	*ElectroMagnetic Levitator*	1	1	1	1				
				1	*Electrostatic Levitation Furnace*	1	1	1	1				
				1	*Vynoslivost Experiment Facility*	1	0,5	0,5	0,5				
				1	*Fluids Integrated Rack*	1	1	1	1				
				1	*Fluid Science Laboratory*	1	1	1	1				
				1	*Cold Atom Laboratory*	1	0,5	0,5	0,5				

				1	*Plasma Kristal - 4*	1	0,5	0,5	0,5				
				1	*Device for the study of Critical Liquids and Crystallization*	1	1	1	1				
				2	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,5				
				1	*Sirkulasi Barang*	3	3	9	9				
6	*Storage*	6	1	4	ISPR	1	1	1	4	70%	15,3	16	AP
				2	Eksperimen Rack	1	1	1	2				
				2	Rak Komponen	1	1	1	2				
				4	*Countainer*	0,5	0,5	0,25	1				
7	Area Pembersihan	4	1	2	Rak Alat	1	1	1	2	70%	7,225	8	AP
				1	Troli Kebersihan	1	2	2	2				
				1	*Wastafel*	0,5	0,5	0,25	0,25				
8	*Waste Management Compartment*	2	1	1	*Trash Airlock*	1,5	1,5	2,25	2,25	70%	5,525	6	ISS
				1	*Water Storage*	1	1	1	1				
TOTAL = 56													
LABORATORIUM MATERIAL/ELEMEN													
9	Area Eksperimen	6	1	2	*Additive Manufacturing Facility*	1	1	1	2	60%	39,55	40	ISS
				10	*Microscope Observation System*	1	1	1	10				
				1	*Materials Science Research Rack*	1	1	1	1				

				1	*Material Science Laboratory*	1	1	1	1				
				1	*Material Lunar Experiment*	2	3	6	6				
				1	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,25				
				1	Sirkulasi Barang	3	3	9	9				
10	*Storage*	6	1	5	ISPR	1	1	1	5	70%	17,85	18	AP
				2	*Eksperimen Rack*	1	1	1	2				
				2	Rak Komponen	1	1	1	2				
				6	*Countainer*	0,5	0,5	0,25	1,5				
11	Area Pembersihan	4	1	2	Rak	0,5	0,4	0,2	0,4	70%	9,605	10	AP
				2	Troli Kebersihan	1	2	2	4				
				1	Rak Alat	1	1	1	1				
				1	*Wastafel*	0,5	0,5	0,25	0,25				
12	*Waste Management Compartment*	2	1	1	*Trash Airlock*	1,5	1,5	2,25	2,25	70%	5,525	6	ISS
				1	*Water Storage*	1	1	1	1				
TOTAL = 74													
LABORATORIUM FISIK/CHeCS													
13	*Health Maintenance System/Crew Medical Restraint System*	10	2	1	Meja + Laptop Kerja	1,2	0,6	0,72	0,72	70%	71,468	72	ISS
				2	ISPR Loker	0,4	0,4	0,16	0,32				
				1	*Cycle Ergometer with Vibrator Isolation System*	2	1	2	2				
				1	*Human Research Facility*	2	2	4	4				

1	*Muscle Atrophy Resistive Exercies System*	2	2	4	4
1	*Osteoporosis Experiments on Orbit*	1	0,5	0,5	0,5
1	*Advance Resistive Exercise Device*	2	2	4	4
1	*Combine Operational Load Bearing External Resistive Treadmill*	2	2	4	4
1	*ELITE S2*	1	0,5	0,5	0,5
1	*Cardiovascular Research System*	1	1	1	1
1	*Locomotor System*	2	2	4	4
1	*Weighless Adaption*	2	2	4	4
1	*Intra-Vehicula Tissue Equivalent Propotional Counter*	1	1	1	1
1	*Measuring Radiation Hazards in Space*	1	1	1	1
1	*Onboard Diagnostic Kit*	0,5	0,5	0,25	0,25
1	*Passive Dosimeter for Lifescience Experiments in Space*	0,5	0,5	0,25	0,25
1	*Percutaneous Electrical Muscle Stimulator*	3	3	9	9

				1	*Scoop Stretcher*	0,5	2	1	1				
				2	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,5				
													72
AGRIKULTUR MODUL													
AIRLOCK MODUL													
1	*Airlock Area*	4	1	2	Panel Kontrol	0,5	1	0,5	1	100%	51	51	ISS; MCLH
				5	Tabung Tekanan Udara dan Oksigen	1,5	1	1,5	7,5				
				1	Sirkulasi Barang	4	4	16	16				
				2	Pintu Modul	2	0,25	0,5	1				
2	*Spacesuit and Repair Area*	6	1	6	*Spacesuit*	3	3	9	54	70%	238	240	ISS; MCLH
				6	*Spacesuit Stand*	3	3	9	54				
				2	*Emergency Supply*	0,5	1	0,5	1				
				4	Tangki Air	0,5	0,5	0,25	1				
				4	ISPR	1,5	1	1,5	6				
				1	Sirkulasi Barang	4	4	16	16				
				2	Kru	2	2	4	8				
4	Dekontaminasi Area	6	1	2	ISPR	1,2	1,2	1,44	2,88	70%	38,845	40	AP
				2	Rak Pakaian	0,5	0,5	0,25	0,5				
				1	Tempat Sampah	1,2	0,6	0,72	0,72				
				1	Vakum	1,5	1	1,5	1,5				
				1	Dekontaminan	0,5	0,5	0,25	0,25				
				1	Sirkulasi Barang	4	4	16	16				
				2	*Emergency Supply*	0,5	1	0,5	1				
												TOTAL =	331

MODUL LABORATORIUM													
5	Area Tanam	6	1	5	*Vegetable Production System*	1	3	3	15	100%	31	31	ISS
				2	*Airflow Ventilation Fan*	0,5	0,5	0,25	0,5				
6	Area Eksperimen	4	1	2	*Microscope Observation System*	1	1	1	2	70%	6,8	7	ISS
				2	ISPR	1	1	1	2				
7	*Storage*	4	1	4	ISPR	1	1	1	4	70%	10,54	11	AP
				2	*Plant Habitat*	1	1	1	2				
				1	*Wastafel*	0,5	0,4	0,2	0,2				
8	Area Penyimpanan Hasil Panen	6	1	1	Troli Barang	1	2	2	2	70%	11,39	12	AP
				6	*Countainer*	0,5	0,9	0,45	2,7				
				2	ISPR	1	1	1	2				
9	*Waste Management Compartment*	2	1	2	*Wastafel*	1	0,5	0,5	1	70%	3,4	4	ISS
				1	*Water Storage*	1	1	1	1				
											TOTAL =		396

No	Nama Ruang	Kapasitas (orang)	Jml	Analisis Besaran				Luas (m^2)	Sirkulasi	Total Luas (m^2)	Total Luas (m^2)*	Sumber
				Unit	Perabot	Ukuran pxl (m)	Luas (m^2)					
MODUL SERVIS												
AIRLOCK MODUL												
1	*Airlock Area*	6	1	2	Panel Kontrol	0,5	1	0,5	1	100%	79	80	ISS; MCLH
				5	Tabung Tekanan Udara dan Oksigen	1,5	1	1,5	7,5				
				1	Sirkulasi Barang	4	4	16	16				

				20	Pintu Modul	3	0,25	0,75	15				
2	*Spacesuit and Repair Area*	8	1	8	*Spacesuit*	3	3	9	72	70%	322,575	330	ISS; MCLH
				8	*Spacesuit Stand*	3	3	9	72				
				2	*Emergency Supply*	0,5	1	0,5	1				
				3	Tangki Air	0,5	0,5	0,25	0,75				
				8	ISPR	1,5	1	1,5	12				
				4	Kru	2	2	4	16				
				1	Sirkulasi Barang	4	4	16	16				
3	Dekontaminasi Area	8	1	2	ISPR	1,5	1	1,5	3	70%	42,347	43	AP
				2	Rak Pakaian	1,5	1	1,5	3				
				1	Tempat Sampah	0,4	0,4	0,16	0,16				
				1	Vakum	1,5	1	1,5	1,5				
				1	Dekontaminan	0,5	0,5	0,25	0,25				
				2	*Emergency Supply*	0,5	1	0,5	1				
				1	Sirkulasi Barang	4	4	16	16				
												TOTAL	453
RUANG UTAMA													
1	Ruang Tenaga dan Sumber Daya	6	2	2	Kontrol Panel	1,2	0,8	0,96	1,92	70%	37,264	38	ISS
				10	ISPR	1	1	1	10				
				20	*Power System Rack*	1	0,5	0,5	10				
2	Ruang Suplai	8	1	5	*Battery Rack*	1	1	1	5	70%	12,325	13	AP
				1	Kontrol Panel	0,5	0,5	0,25	0,25				
				2	ISPR	1	1	1	2				
3	*Storage*	8	1	6	ISPR	1	1	1	6	70%	17	17	AP
				2	Troli	1	2	2	4				
												TOTAL	68

LUAR MODUL													
4	Kapsul Darurat	12	2	2	Tangki Bahan Bakar	3	1	3	6	70%	380,256	381	AP
				6	*Emergency Supply*	1	1	1	6				
				3	*Emergency Module*	8,4	8,4	70,56	211,68				
5	Hanggar	10	1	2	ISPR	1	1	1	2	70%	272,952	273	AP
				2	*Workstation Rack*	1	1	1	2				
				2	*Moon Vehicle*	6	2,5	15	30				
				4	*Moon Robot*	2	2	4	16				
				1	*Modul Logistik*	8,4	8,4	70,56	70,56				
				10	*Solar Array*	4	1	4	40				
												TOTAL	654

PLAGIARISM CHECK.ORG

0.23% PLAGIARISM APPROXIMATELY

Report #12812667

PENDAHULUAN Latar Belakang NASA merupakan sebuah badan antariksa yang paling maju saat ini akan tetapi tidak mendominasi seperti pada masa persaingan dengan Roscosmos pada era space race. Selain didasarkan pada faktor persaingan akibat perang dingin (cold war) dan juga didasarkan pada masalah politik dan kapitalisme (McDougall, 2015). Dilansir pada The Guardian (McKie, 2020) era space race masih berlanjut hingga sekarang akan tetapi dengan persaingan untuk eksplorasi tambang dan mineral di Bulan. Eksplorasi sumber daya Bulan menjadi sebuah potensi bisnis dalam waktu dekat untuk membantu penelitian dan pengembangan teknologi di Bulan (Helmore, 2020). Sehingga kebutuhan fasilitas untuk bertahan hidup dan menetap (settlement) di Bulan menjadi dasar penting untuk memulai eksplorasi dan juga kolonisasi di Bulan. Kolonisasi di Bulan sendiri telah dimulai semenjak tahun 1969 dalam misi Apollo 11 (Buzz Aldrin, Michael Collins, Neil Amstrong) dimana para astronot mendarat dipermukaan