Appendix A
Battery Comparison Table

Specifications	Battery type					
	Lead Acid	NiCd	NiMH	Li-ion		
				Cobalt	Manganese	Phosphate
Specific energy (Wh/kg)	30–50	45–80	60–120	150–250	100–150	90–120
Internal resistance	Very low	Very low	Low	Moderate	Low	Very low
Cycle life (80% DoD)	200–300	1000	300–500	500–1000	500–1000	1000–2000
Charge time (h)	8–16	1–2	2–4	2–4	1–2	1–2
Overcharge tolerance	High	Moderate	Low	Low. No trickle charge		
Self-discharge/month at room temp	5%	20%	30%	<5% Protection circuit consumes 3%		
Nominal cell voltage (V)	2	1.2	1.2	3.6	3.7	3.2–3.3
Charge temperature (°C)	−20–50	0–45		0–45		
Discharge temperature (°C)	−20–50	−20–65		−20–60		
Maintenance requirement	3–6 months (topping charge)	Full discharge every 90 days during full use		Maintenance free		
Safety requirement	Thermally stable	Thermally stable, fuse protection		Protection circuit mandatory		
In use since	Late 1800s	1950	1990	1991	1996	1999
Toxicity	Very high	Very high	Low	Low		
Coulombic efficiency	~90%	~70% slow charge ~90% fast charge		99%		
Cost	Low	Moderate		High		

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C. Kotze, *A Broadband Apparatus for Underserviced Remote Communities*,
Southern Space Studies, https://doi.org/10.1007/978-3-030-15766-1

Appendix B
Structural Module Bill of Material

Bill of material	Module	Sub-module			Count	External modules connector	Part number	
	[SM]	[SM].[MS]						
Vertical support poles	Bottom halve	Front	Left	VBFL	1		[SM].[MS]	VBFL
			Centre	VBFC	1	Yes	[SM].[MS]	VBFC
			Right	VBFR	1		[SM].[MS]	VBFR
		Back	Left	VBBL	1		[SM].[MS]	VBBL
			Centre	VBBC	1	Yes	[SM].[MS]	VBBC
			Right	VBBR	1		[SM].[MS]	VBBR
		Centre	Left	VBCL	1	Yes	[SM].[MS]	VBCL
			Right	VBCR	1	Yes	[SM].[MS]	VBCR
	Top halve	Front	Left	VTFL	1		[SM].[MS]	VTFL
			Centre	VTFC	1		[SM].[MS]	VTFC
			Right	VTFR	1		[SM].[MS]	VTFR
		Back	Left	VTBL	1		[SM].[MS]	VTBL
			Centre	VTBC	1		[SM].[MS]	VTBC
			Right	VTBR	1		[SM].[MS]	VTBR

(continued)

C. Kotze, *A Broadband Apparatus for Underserviced Remote Communities*,
Southern Space Studies, https://doi.org/10.1007/978-3-030-15766-1

(continued)

Bill of material	Module	Sub-module			Count	External modules connector	Part number	
	[SM]	[SM].[MS]						
		Centre	Left	VTCL	1		[SM].[MS]	VTCL
			Right	VTCR	1		[SM].[MS]	VTCR
Horizonatl support beams	Top	Front	Left	HTFL	1		[SM].[MS]	HTFL
			Centre	HTFC	1		[SM].[MS]	HTFC
			Right	HTFR	1		[SM].[MS]	HTFR
		Back	Left	HTBL	1		[SM].[MS]	HTBL
			Centre	HTBC	1		[SM].[MS]	HTBC
			Right	HTFR	1		[SM].[MS]	HTFR
Cross beams	Top	Front	Left	XTFL	1		[SM].[MS]	XTFL
			Right	XTFR	1		[SM].[MS]	XTFR
		Back	Left	XTBL	1		[SM].[MS]	XTBL
			Right	XTFR	1		[SM].[MS]	XTFR
		Centre	Left	XTBL	1		[SM].[MS]	XTBL
			Right	XTFR	1		[SM].[MS]	XTFR
Connectors	Corner	Front	Left	CCFL	1	Yes	[SM].[MS]	CCFL
			Right	CCFR	1	Yes	[SM].[MS]	CCFR
		Back	Left	CCBL	1	Yes	[SM].[MS]	CCBL
			Right	CCFR	1	Yes	[SM].[MS]	CCFR
	T-pieces	Front	Left	CTFL	1		[SM].[MS]	CTFL
			Right	CTFR	1		[SM].[MS]	CTFR
		Back	Left	CTBL	1		[SM].[MS]	CTBL
			Right	CTFR	1		[SM].[MS]	CTFR
	Cross	Centre	Centre	CCCC	1	Yes	[SM].[MS]	CCCC

(continued)

(continued)

Bill of material	Module	Sub-module			Count	External modules connector	Part number	
	[SM]	[SM].[MS]						
Terminators	Foot pieces	Front	Left	TFFL	1		[SM].[MS]	TFFL
			Centre	TFFC	1		[SM].[MS]	TFFC
			Right	TFFR	1		[SM].[MS]	TFFR
		Back	Left	TFBL	1		[SM].[MS]	TFBL
			Centre	TFBC	1		[SM].[MS]	TFBC
			Right	TFBR	1		[SM].[MS]	TFBR
		Centre	Left	TFCL	1		[SM].[MS]	TFCL
			Right	TFCR	1		[SM].[MS]	TFCR
Roof utility mount		Centre	Top	RUTM	1		[SM].[MS]	RUTM
			Bottom	RUBM	1		[SM].[MS]	RUBM
Effector expansion		Top	Front	EFTF	1	Yes	[SM].[MS]	EFTF
			Back	EFTB	1	Yes	[SM].[MS]	EFTB
			Right	EFTR	1	Yes	[SM].[MS]	EFTR
			Left	EFTL	1	Yes	[SM].[MS]	EFTL
Data expansion		Foot	Left	DEFL	1	Yes	[SM].[MS]	DEFL
			Right	DEFR	1	Yes	[SM].[MS]	DEFR
		Top	Front	DETF	1	Yes	[SM].[MS]	DETF
			Back	DETB	1	Yes	[SM].[MS]	DETB
Total		55						

Appendix C
United Nations Sustainable Development Goals

SDG	SDG description
SDG 1	End poverty in all its forms everywhere
SDG 2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
SDG 3	Ensure healthy lives and promote well-being for all at all ages
SDG 4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all
SDG 5	Achieve gender equality and empower all women and girls
SDG 6	Ensure availability and sustainable management of water and sanitation for all
SDG 7	Ensure access to affordable, reliable, sustainable, and modern energy for all
SDG 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
SDG 10	Reduce inequality within and among countries
SDG 11	Make cities and human settlements inclusive, safe, resilient and sustainable
SDG 12	Ensure sustainable consumption and production patterns
SDG 13	Take urgent action to combat climate change and its impacts (in line with the United Nations Framework Convention on Climate Change)
SDG 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
SDG 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
SDG 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
SDG 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development

C. Kotze, *A Broadband Apparatus for Underserviced Remote Communities*,
Southern Space Studies, https://doi.org/10.1007/978-3-030-15766-1

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