

Current MeerKAT Power Projections

PITF Oxford 2010

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SKA SOUTH AFRICA
SQUARE KILOMETRE ARRAY





- Reserve comments on SKA Power design and scenario building for 2nd talk today
- MeerKAT power design detail in previous PITF meetings
 - Grid as transmission medium, wheeling renewable and traditional baseload power to achieve extremely high availability and reliability requirement

KAT-7 Antenna Systems



ANTENNA SYSTEMS	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
KAT-7 Power Measurements	2.8				
KAT-7 Drives (Maximum torque)	1.7				
Feeds, RF, electronics	1.1				
KAT-7 Cooling Budget (excl. Cryo)	0.495				
KAT-7 Cooling Fluid Circulation	0.605				
KAT-7 Cryo	0.520				
TOTAL	4.42	7		30.94	

MeerKAT Antenna Systems (Offset)



ANTENNA SYSTEMS	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
MeerKAT Power Requirement (Max Drive)	8.16				
MeerKAT Cooling Budget	1.485				
MeerKAT Cooling Fluid Circulation	0.605				
TOTAL	10.25		64		656

- Increase in drive power requirement due to shift from prime focus to offset – this has NOT been optimised yet

MeerKAT Array Processor Station



ARRAY PROCESSOR CENTRE	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
Telescope 19" racks (40 racks) (DBE = 55, computing = 145)	5		40		200
Other Systems (10 Racks)	5		10		50
Maser	10		1		10
Electrical HVAC	250		1		250
Building Management System	10		1		10
Lab/Control Room	30		1		30
TOTAL					550

Construction Shed



CONSTRUCTION SHED	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
Lights	11	1	0	11	0
Plugs	3	1	0	3	0
Mould cooling heating	37	1	0	37	0
Compressor	50	1	0	50	0
10 Ton Crane	30	1	0	30	0
TOTAL				121	

Construction Shed Extension



CONSTRUCTION SHED EXTENSION	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
Lights	11	0	1	0	11
Plugs	3	0	1	0	3
Mould cooling heating	37	0	1	0	37
Crane	40	0	1	0	40
TOTAL					91

Power Facility



POWER FACILITY	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
Lights & Plugs	20	0	1	0	20
Electrical HVAC	50	0	1	0	50
UPS Motors	TBD				
TOTAL					70

Other



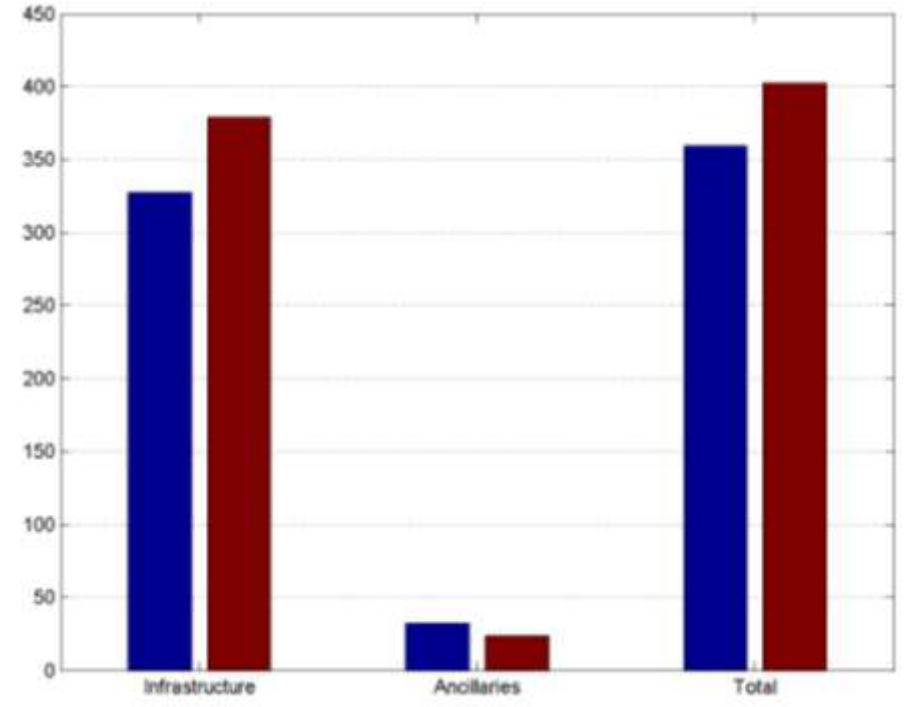
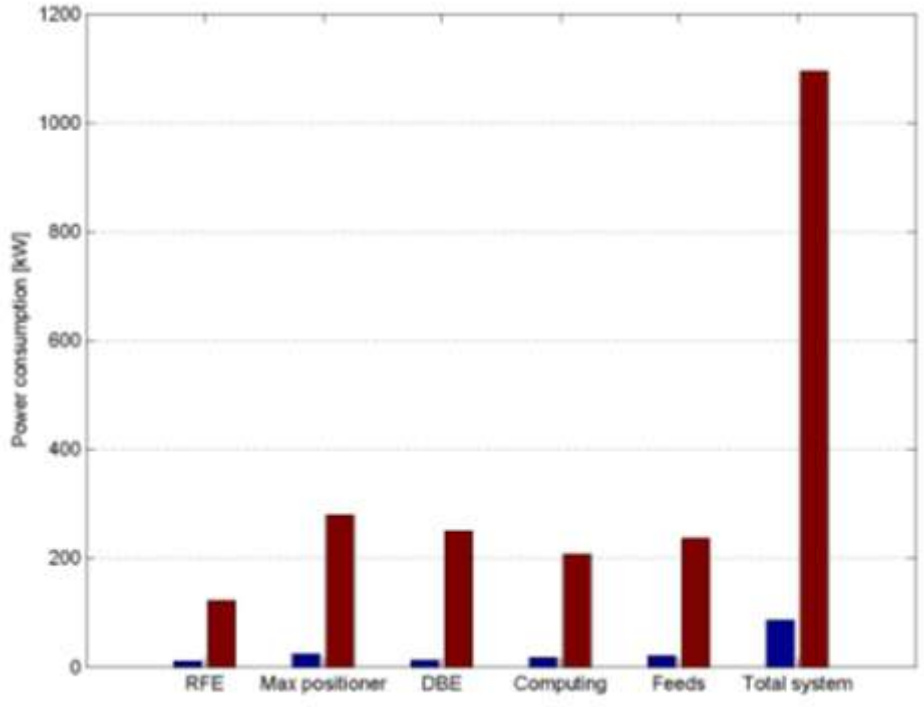
PEDESTAL INTEGRATIONS	Load (kW)	Quantity		Total Load (kW)	
		KAT-7	MeerKAT	KAT-7	MeerKAT
Lights & Plugs	30		1	0	30
15ton crane	45		1	0	45
TOTAL					75
ACCOMODATION ETC					
Accommodation	10	1	0	10	0
Guardhouse	5	1	0	5	0
Lights & Plugs	30		1	0	30
TOTAL				15	30

Total MeerKAT Power Requirement

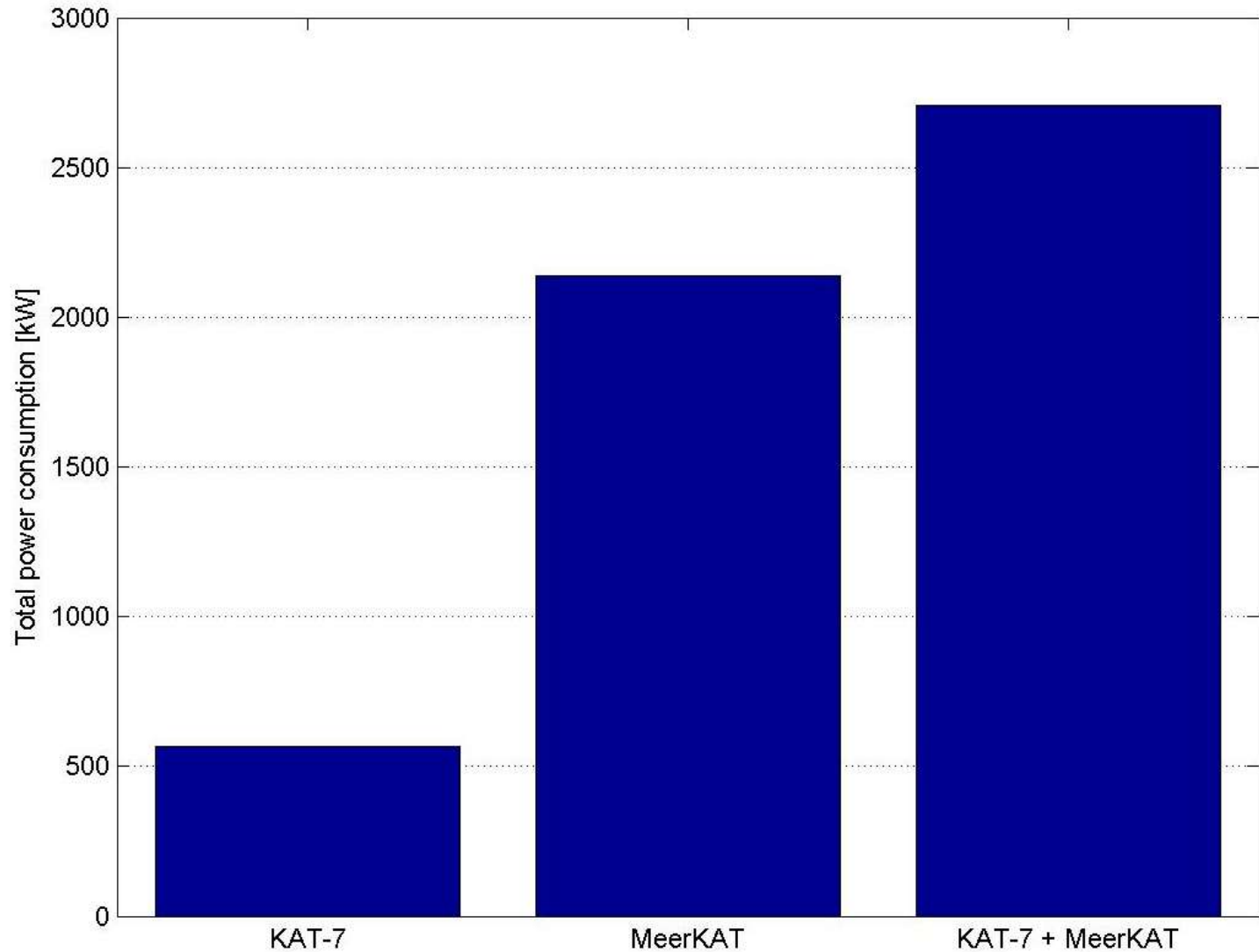


			Load (kW)
		Total	1588
		Total kVA at PF of 0.9	1764
		Growth Margin 10%	1941

2009 Modelling of MeerKAT Power Requirement



2009 Modelling of MeerKAT Power Requirement



SKA Implications



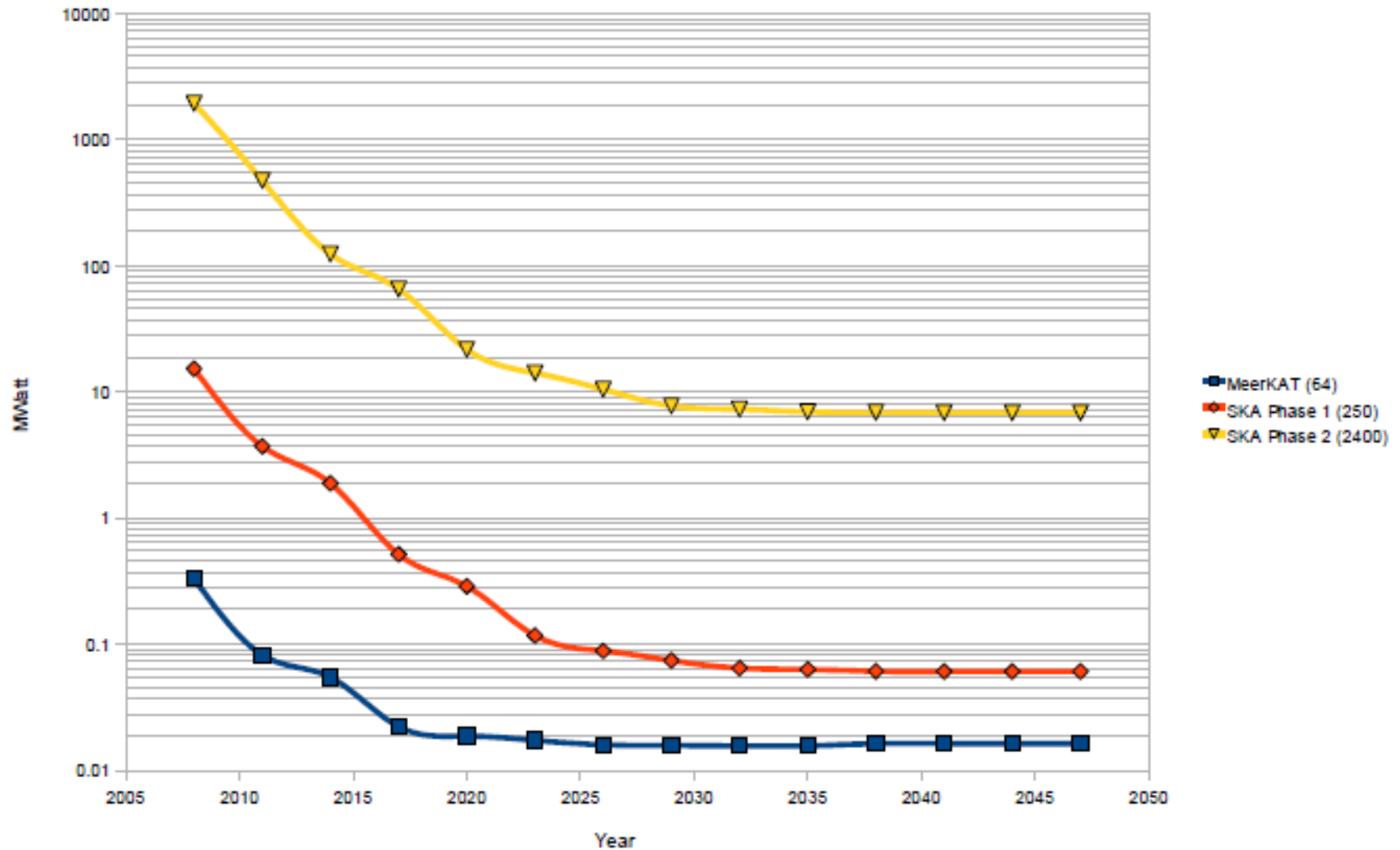
- No significant differences from previous modelling – within 10-15%
- Decrease has resulted due to:
 - Decrease from 80 dishes to 64 dishes
 - Decrease in motor drive power usage following on-site measurements of KAT-7 dishes
- Scalings for SKA
 - Introduced to
 - Meet an operational requirement for total power consumption
 - Meet A. Kemble's prediction in presentation at PITF Manchester 2010 for supercomputer power requirement projects
 - Computing (post-correlation data processing)
 - Assuming imaging over entire FOV at 1.4GHz, 12m dish, require a reduction to 0.1% of actual projection from this analysis
 - In presentation on Friday – SKA == 40 * fastest computer today = 4MW
 - Need to improve correlation between projections, and what is on the ground
 - Digital Backends
 - Assuming correlation of 2400 beams
 - Feasible, and can probably meet a lower target

SKA Implications (CASPER)



Power Projections

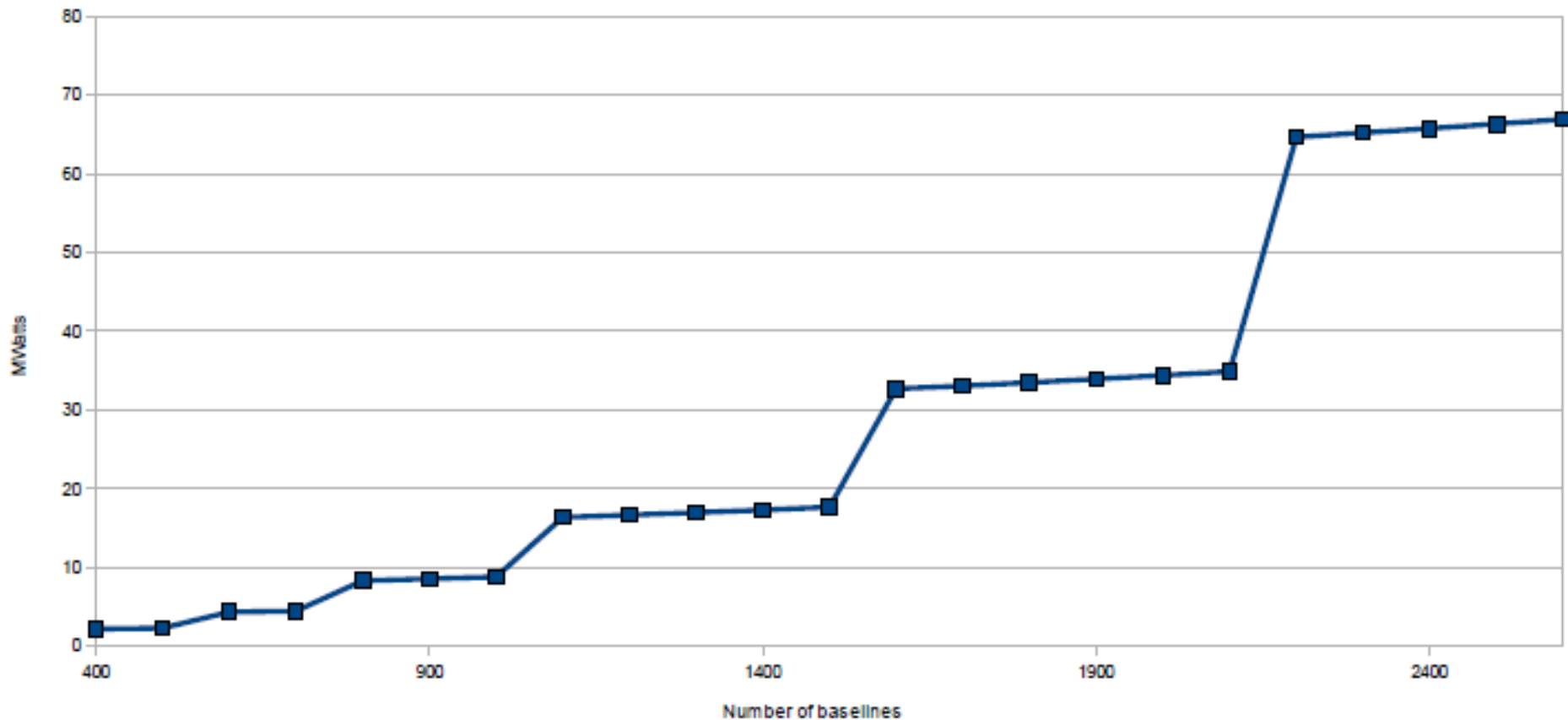
Power Projection



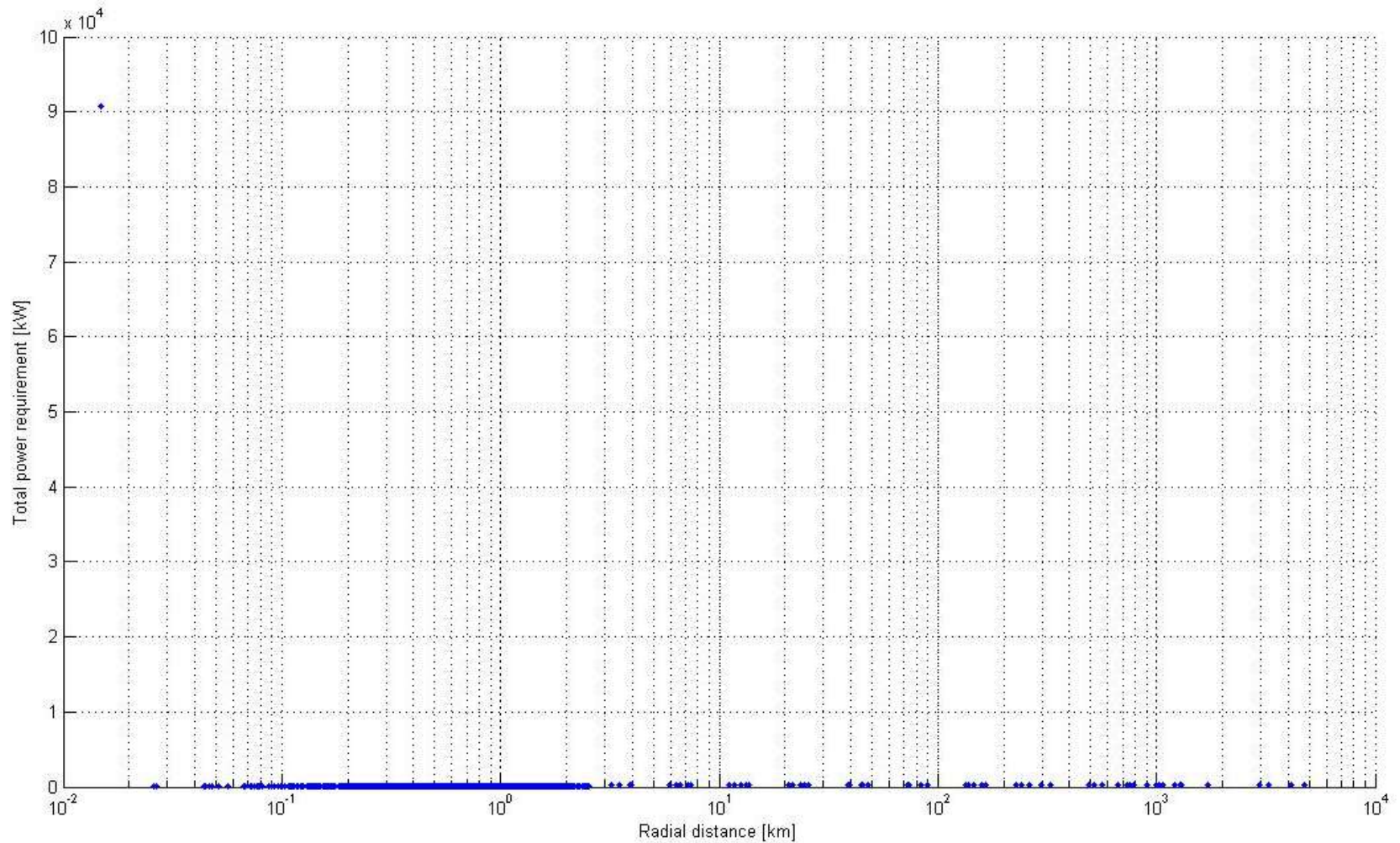
SKA Implications (CASPER)



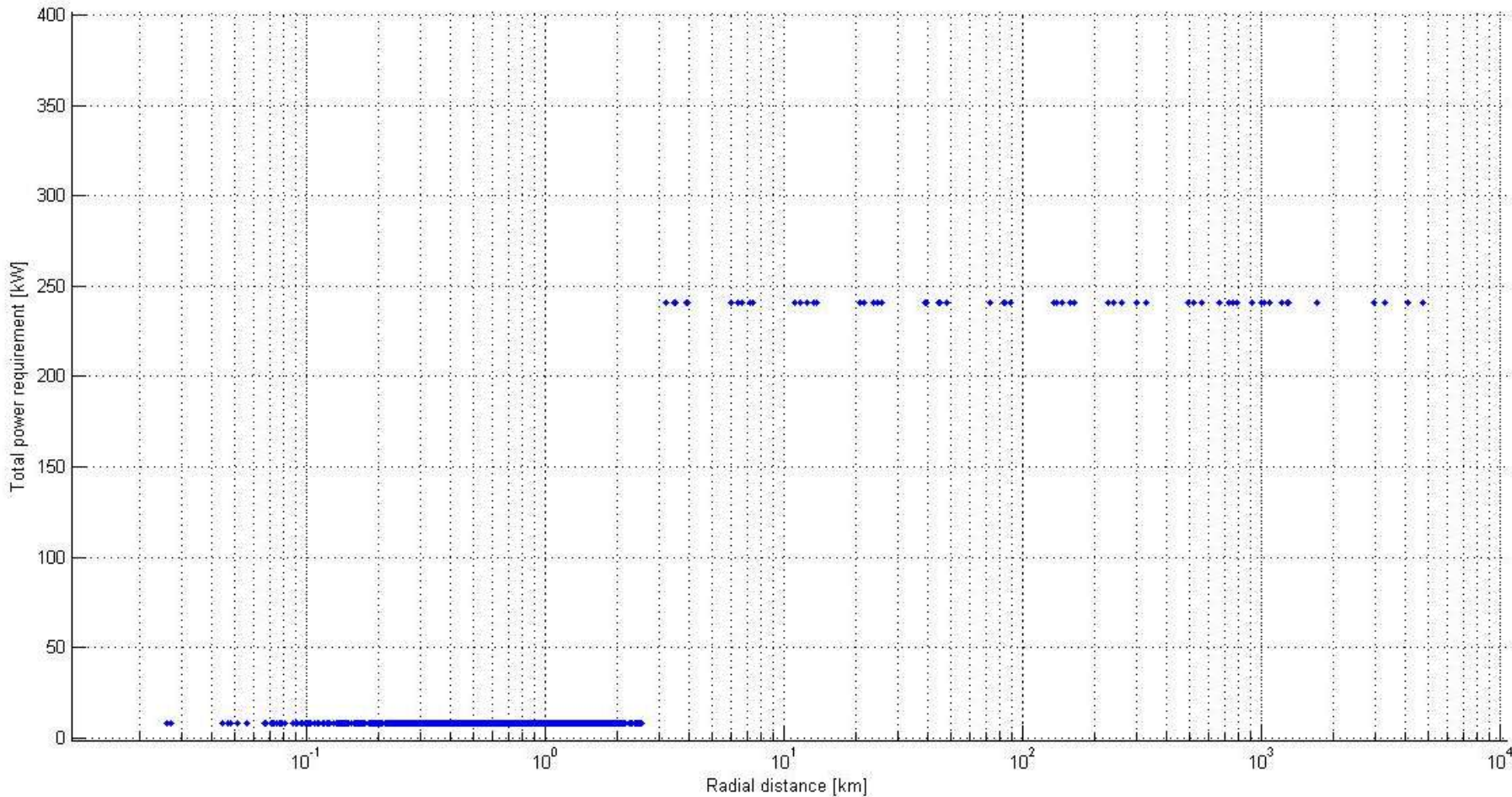
Power project at 2017



Radial power distribution Modelling (2009)

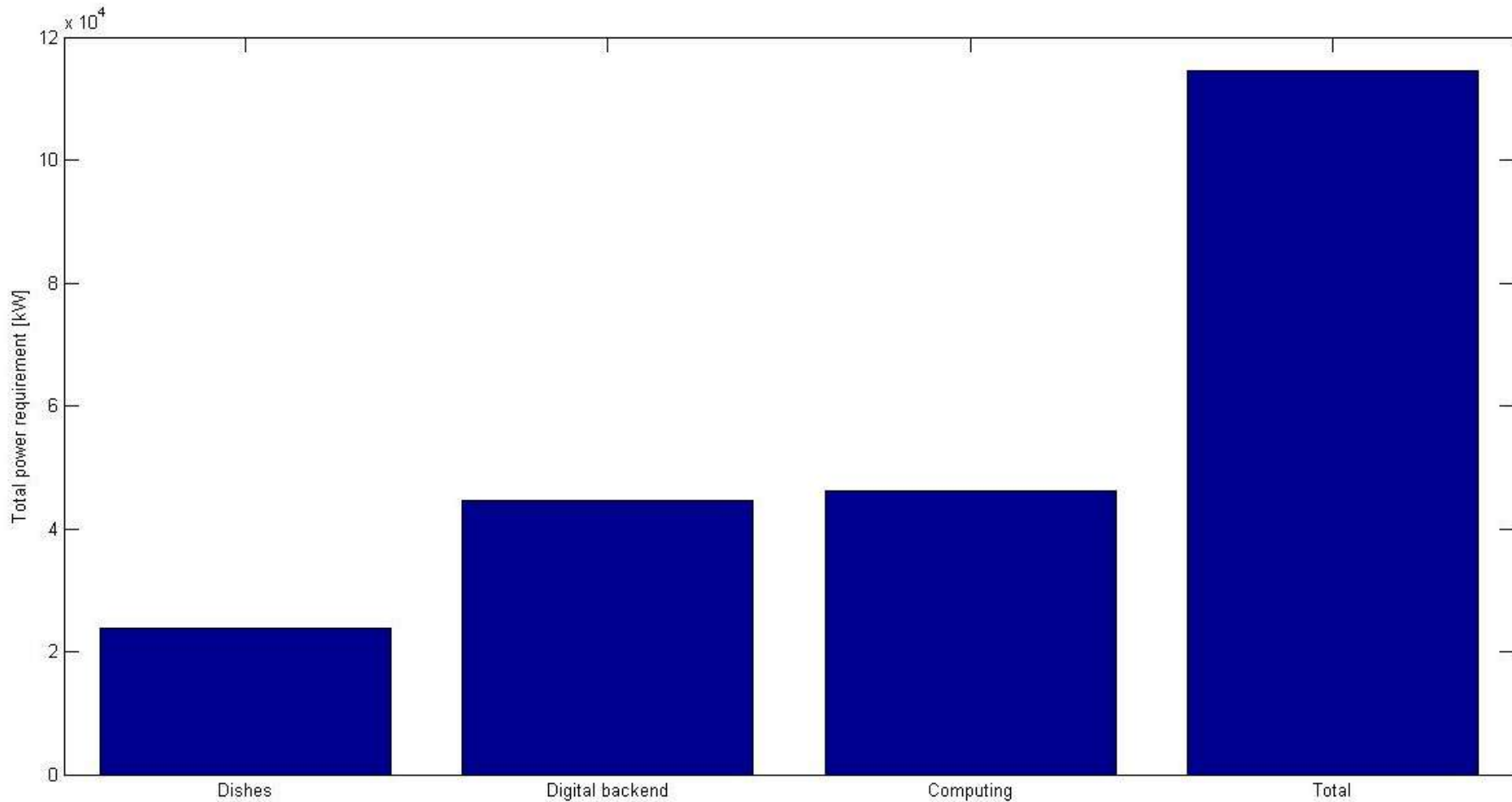


Radial power distribution Modelling (2009)

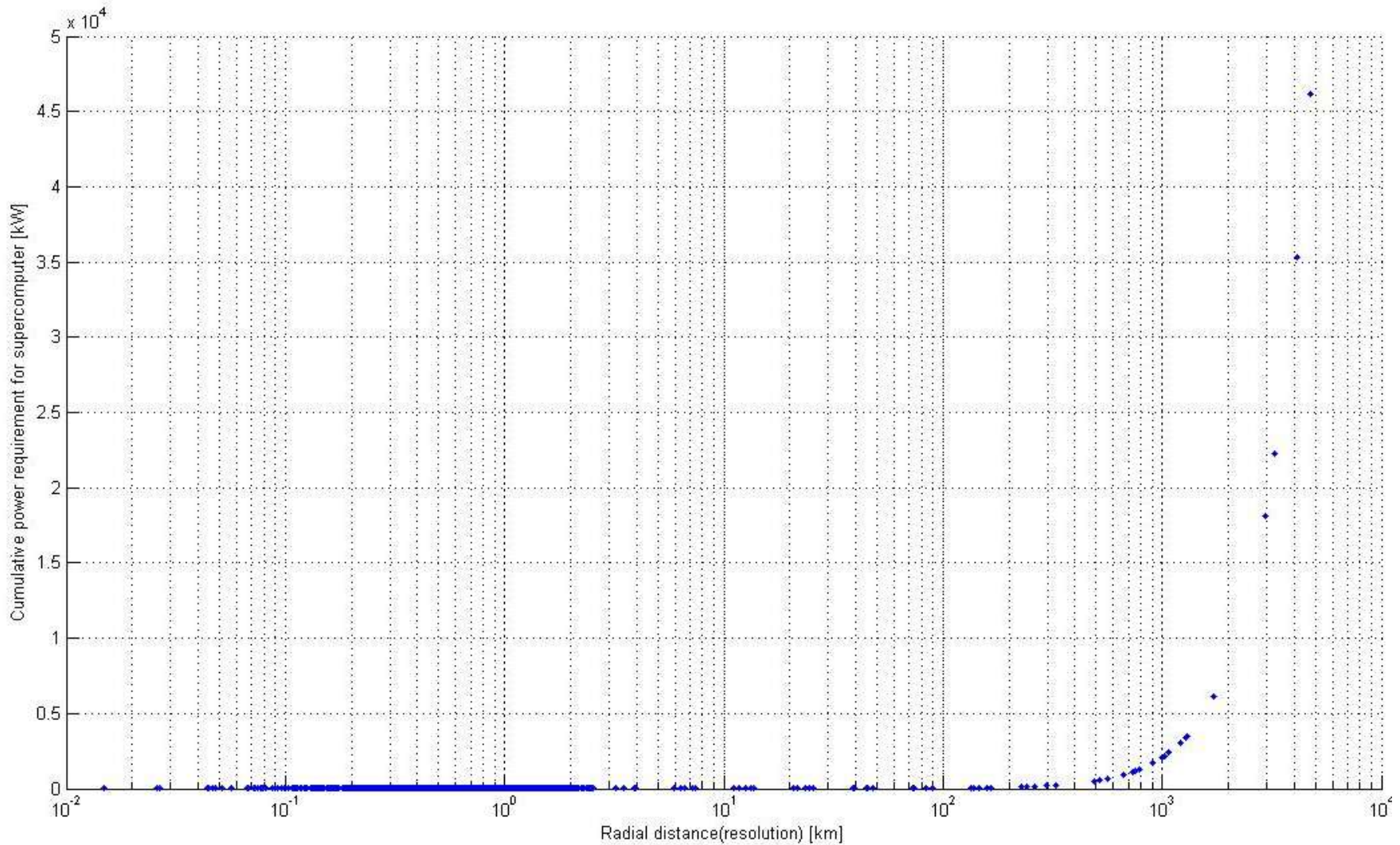


- 2009 modelling provided for 8kW per dish – no significant change in results

Total power requirements



Computing power = fn(max baseline)





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