DCIM Deployment at University of Queensland

Don Caruana, Team Leader Data Centre Operations, UQ

UQ's Data Centre Environment

ITS (Data Centre team of three) manages 280 racks in 9 data centres

- 5 at St Lucia
- 1 at CCR (Herston)
- 1 at Gatton
- 1 by agreement on behalf of TRI (PA Hospital)
- 1 commercial facility at Polaris, Springfield

DC Team accountable for Data Centre power, cooling, security, fire protection, rack deployment and layout except for Polaris facility.

Data Centre team on-call outside normal business hours

Power cost approx. $600,000 per annum
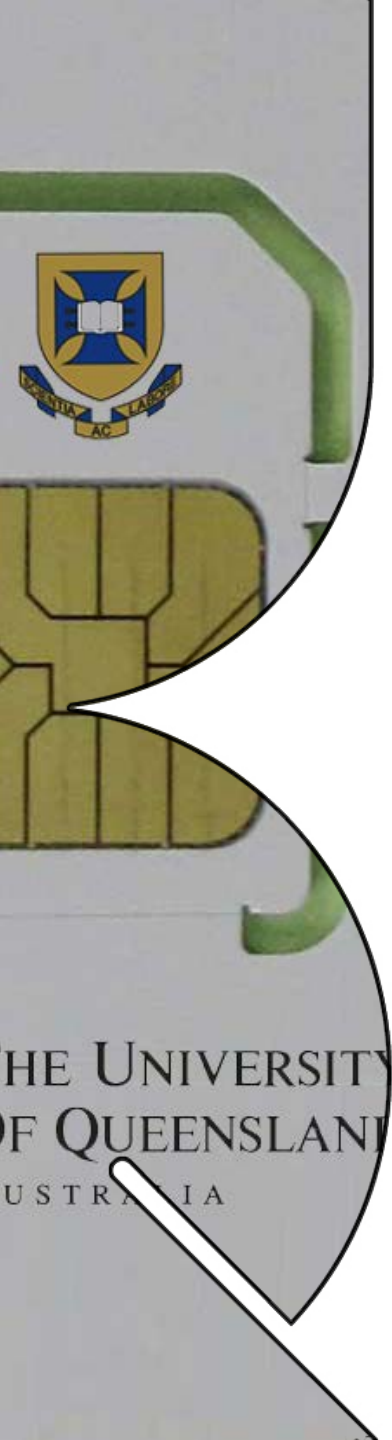
DC Management in a University

What I have learnt in past 15 years.

1) Dedicated ITS FM Team accountable for Data Centre operational management
   - Daily operations
   - Monitoring – DCIM tool
   - Strong links to network and infrastructure team, monitor installs, storage installs, FM works.

2) Relationship with Facilities Management department
   - Build and maintain strong working relationships with key FM personnel. Ensure they understand the mission critical nature of the Data Centre/s

3) Business Continuity in DC Context
   - Risk management
   - Risk Identification
   - Business Impact Analysis
   - Risk rectification cost
   - Residual risk

DC Management in a University

4) Capacity management
- Load v Capacity management (Enabler -> DCIM)
- Regular reports to management

5) Cost of service
- Annual budget – what if insufficient – power, cool, network, contract maintenance.
- Regular reports to management (Enabler -> DCIM)

DCIM tool selection

Avantax, Fujitsu, iTracs ((iiSolutions), OpenDCIM, Trellis (Emerson), Struxuware (APC/Schneider)

Deciding factors:

- Capable of monitoring 1000+ devices
  - Air Conditioners
  - DC room temperature and humidity
  - Rack temperature
  - Water leaks under floor
  - Environmental monitors / netbotz
  - Rack power rails (PDUs) and auto transfer switches (ATSs)
  - UPS
  - Power meters and power monitors
  - Phase Failure relays
  - Generators
  - Cameras
- Cost considering
- Significant proportion of devices in UQ DCs were APC

Struxuware / Data Centre Expert deployment

DCE purchased December 2012, 90% complete 2014, 100% 2015

Noted that for every dollar spent on the tool (including licences) another three were spent on smart devices - PDUs, power meters and monitors, wireless temp sensors, leak ropes, smart cards for CRACs, netbotz…..

Starting Point – Create the rules

- Tree Structure
- Passwords on devices
- Naming conventions
- Thresholds and reporting
- Device totals – my tracking progress tool

Tree Structure and passwords

Data Centre
- Air con
- Environmentals
  - Netbotz
  - Rack temps (= virtual sensors via PDU)
  - Room temps
    - Data Centre
    - Plant room
  - Leak sensors
- Power
  - PDU, ATS
  - UPPS
  - Generator
  - Power Meters
  - Power Monitors
  - MSB - Phase Failure relays

Naming conventions

Device	Name format	Label (Examples)
ATS	datacentre-rack#-ats	ccr-b5-ats
		tri-c8-ats
Power Rail	datacentre-rack#-pr#	ccr-b7-pr1
		ccr-b7-pr2
		dc2-d4-pr2
		dc2-d4-pr3
UPS	datacentre-ups#	dc3-ups1
	datacentre-room#-ups#	tri-8004-ups1
		tri-8004-ups3
		tri-8004-ups4
Power Meters	datacentre-db-name-pm	dc2-db-2e1-pm
	datacentre-msb-metername-pm	dc3-msb-db3e2-pm
		dc3-msb-ac_unit_3-pm
		dc2-msb-db2e1-pm
Generator	location-generator	prn-gen
Air Con	datacentre-ac#	tri-ac1
		gpn2-ac2
	location-room#-ac#	gpn-110-ac1
		prn-104-ac1
		tri-8002-ac1
Netbotz	datacentre-rack#-netbotz	dc3-b9-netbotz
Temp Sensor - Rack	datacentre-rack#-temp#	dc3-b2-temp1
		tri-j9-temp1
Temp Sensor – Room	datacentre-room#-temp#	dc3-room-temp1
		dc3-room-temp3
Temp Sensor – Plant Room	location-room#-temp#	tri-8002-temp1
		prn-104-temp1
		gpn-110-temp1
Leak Detection	datacentre-leak#	tri-leak1
		gpn1-leak1

Thresholds and reporting

Struxuware Threshold Setting and Notification				
Device	**Warning** Threshold	**Critical** Threshold	**Warning** Notification	**Critical** Notification
Power				
PDU 16 amp 3-phase or single-phase - Load per phase	7 amp	8 amp	Email	Email
PDU 32 amp 3-phase power rails on 32amp CB	14 amps	16 amps	Email	Email
PDU - loss of power to a phase, or loss of comms to PDU		n/a		Email and SMS
ATS 16 amp	10 amp	12 amp	Email	Email
UPS - General event/fault		n/a		Email and SMS
UPS 200kva Current per phase - 80% of capacity (DC1, DC2, DC3, CCR)	194 amp	n/a	Email and SMS	n/a
UPS temp	30^0C	40^0C	Email and SMS	Email and SMS
Generator - Run state		n/a		Email and SMS
TRI power load per rack	5kw	6.4kw	Email	Email
Prentice generator	General Alarm	Control Switch Position	Email	Email/SMS
Phase Fail Relay		Open/Closed		Email/SMS
Cooling				
Rack inlet temp sensors	28^0C	32^0C	Email	Email ~~and SMS~~
Room temp sensors	32^0C	35^0C	Email and SMS	Email and SMS
CRAC units - Return Air	32^0C	35^0C	Email and SMS	Email and SMS
Humidity -%RH	<20 or >80	<15 or >85	Email	Email
All Devices				
Loss of connectivity to a device		n/a		Email and SMS

Device totals – Tracking progress

Example from Prentice Data Centre 2

DEVICE TOTALS	DCE (Struxuware)					
	Device total	Devices in DCE	To be added in DCE	Cannot be added in DCE	Current Licence count	Final Licence count
DC2 - 33 racks A1>8 B1>9 C1>8 D1>8 (C1 passive) - single & 3 phase					AUDITED 18/1/17	
Air con	3	3			3	3
Environmentals						
Netbotz - 550	1	1			1	1
Rack temp sensors (virtual)	31	31			0	0
DC temp/hum sensors	2	2			0	0
Leak detection sensor	1	1			0	0
Security cameras	6					
Power						
ATS	6	6			6	6
Power Meter	7	7			7	7
Power Monitor	4	4			4	4
Power Rails	60	58	2		58	60
Power Rails - dumb in 1 rack	4			4		
UPS	1	1			1	1
Phase Fail relay	2	2			0	0

Device totals – All DCs

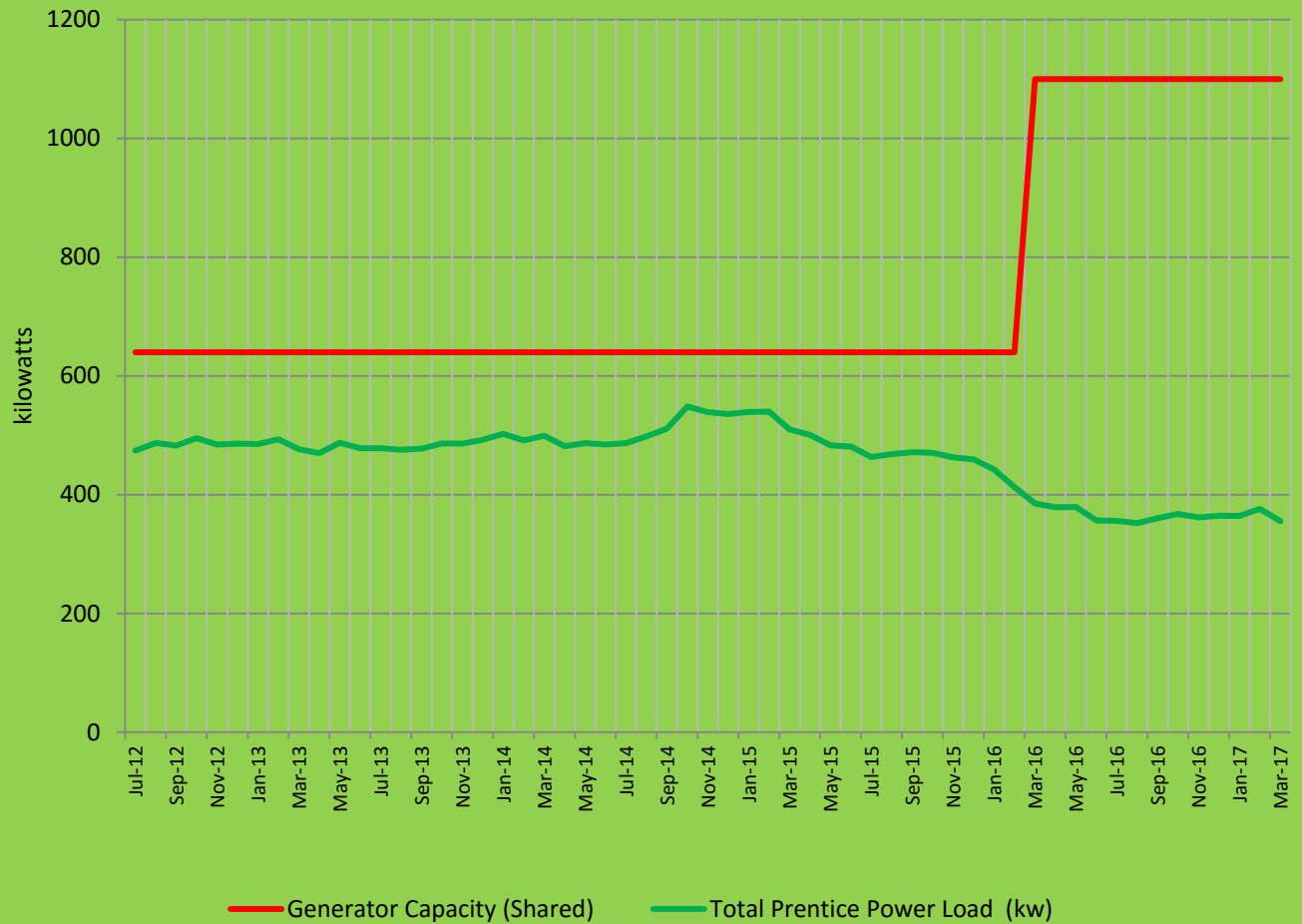|	Device total	Devices in DCE	To be added in DCE	Cannot be added in DCE	Current Licence count -	Final Licence count
DEVICE TOTAL	1011	931	8	35	637	649

DCE cannot monitor every device

- 57 cameras motion capture -> axis camera suite

- 1 generator at CCR -> CCR BMS

- 640 batteries at TRI DC -> Power Shield app
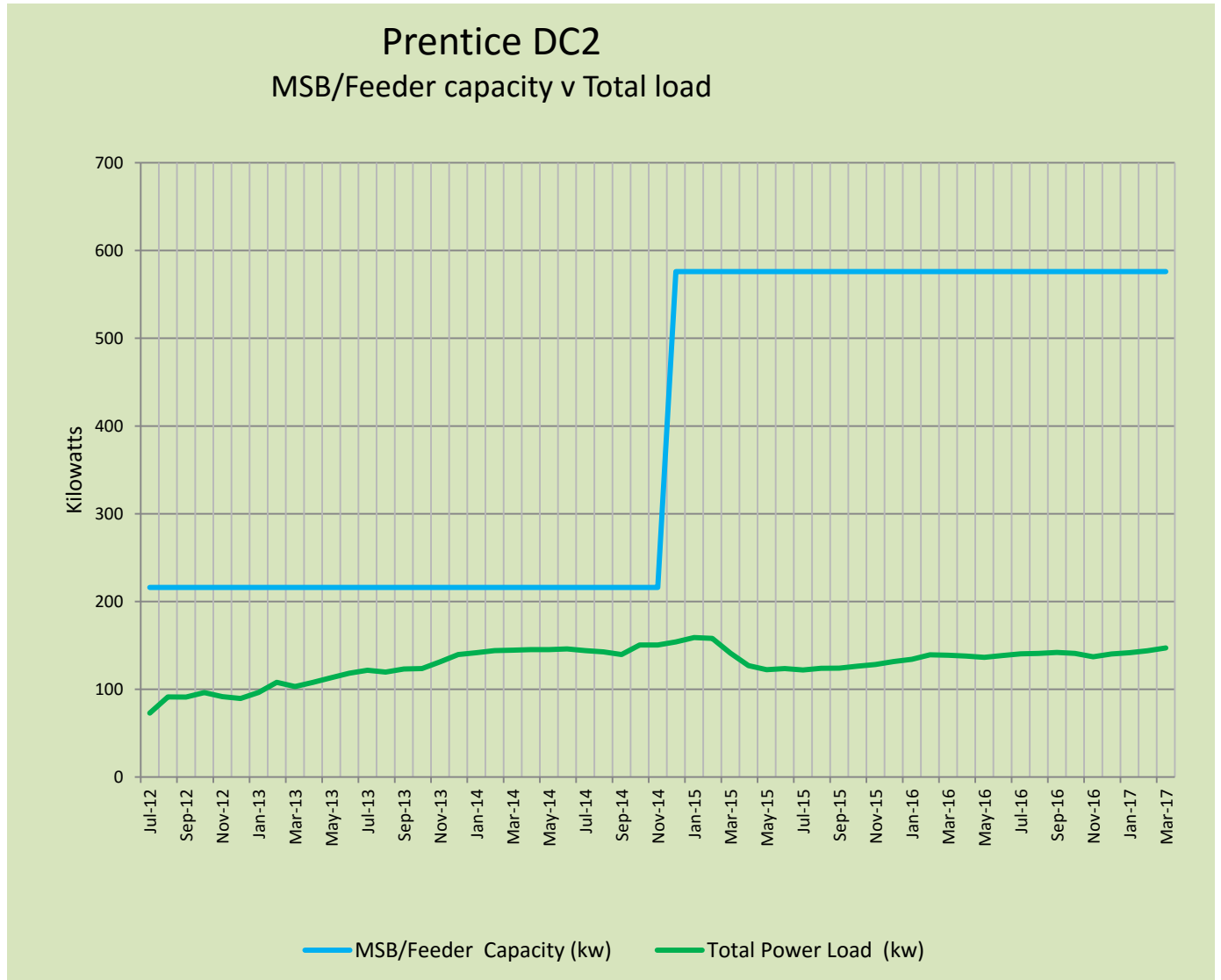
- 2 generators at TRI DC -> TRI BMS

Load and Capacity reports

Prentice DC1, DC2, DC3
Generator capacity v Total Prentice load

Legend: Generator Capacity (Shared) — Total Prentice Power Load (kw)

Load and Capacity reports

Prentice DC2
MSB/Feeder capacity v Total load

MSB/Feeder Capacity (kw) — Total Power Load (kw)

Load and Capacity reports

Prentice DC2
UPS capacity v ICT load

Legend: UPS Capacity (kw) — ICT Load (kw)
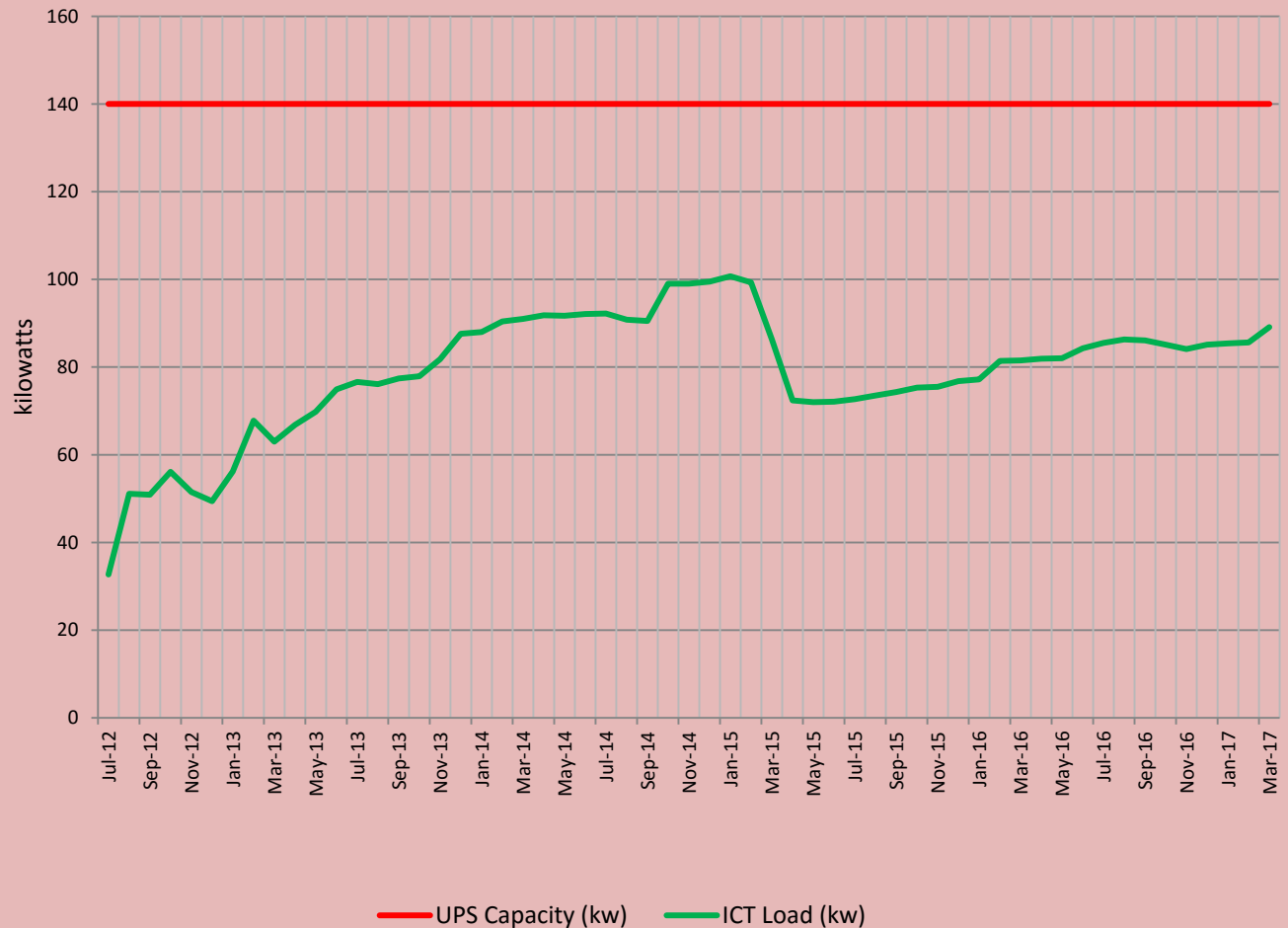
Load and Capacity reports

Prentice DC2
Cooling capacity v Heat load

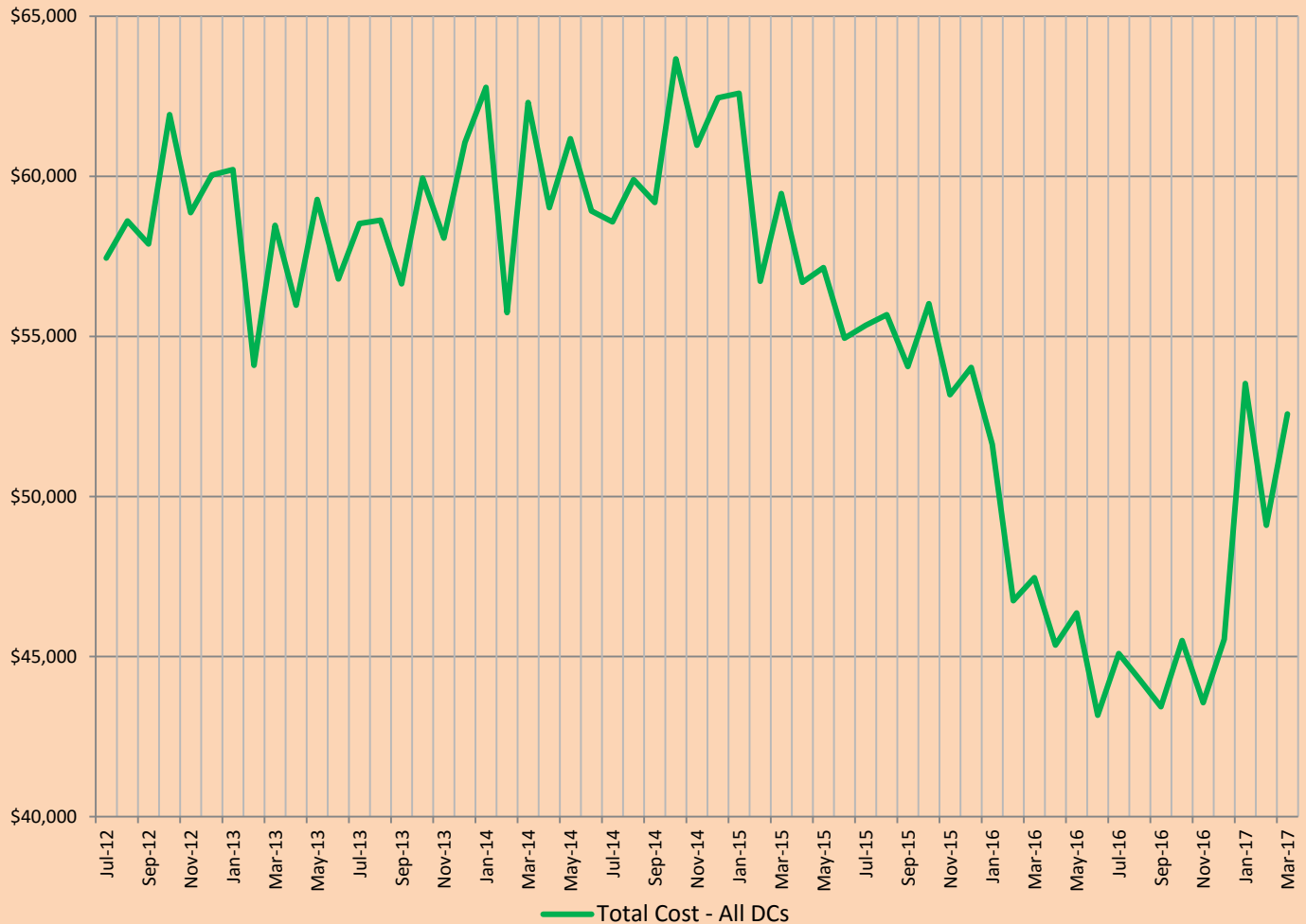Legend:
- Cooling Capacity N+1 (kw)
- Cooling Capacity (kw)
- Heat load

Load and Capacity reports

Annual PUE per DC

	DC1	DC2	DC3	GPN	CCR
2013					
2014					
2015					
2016					
2017					
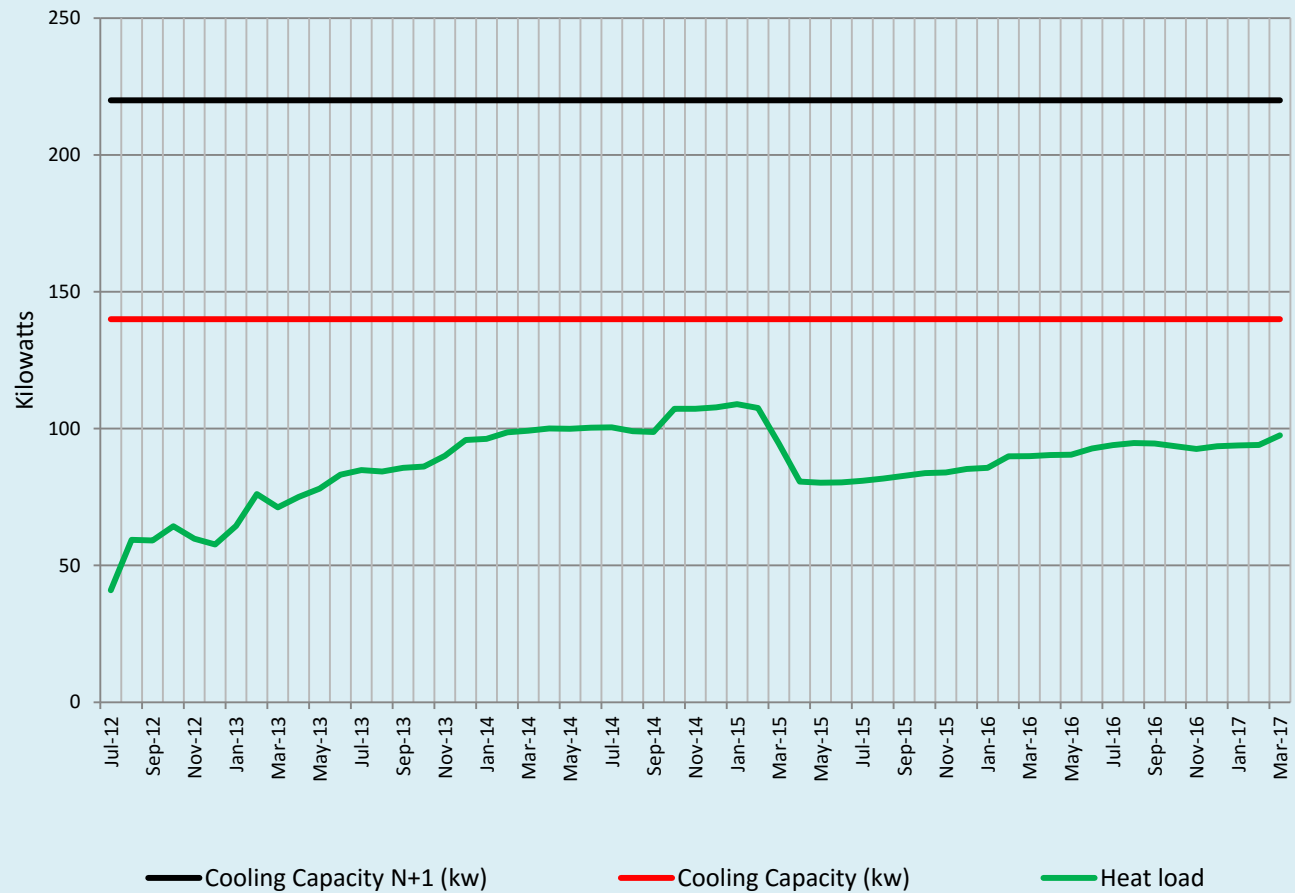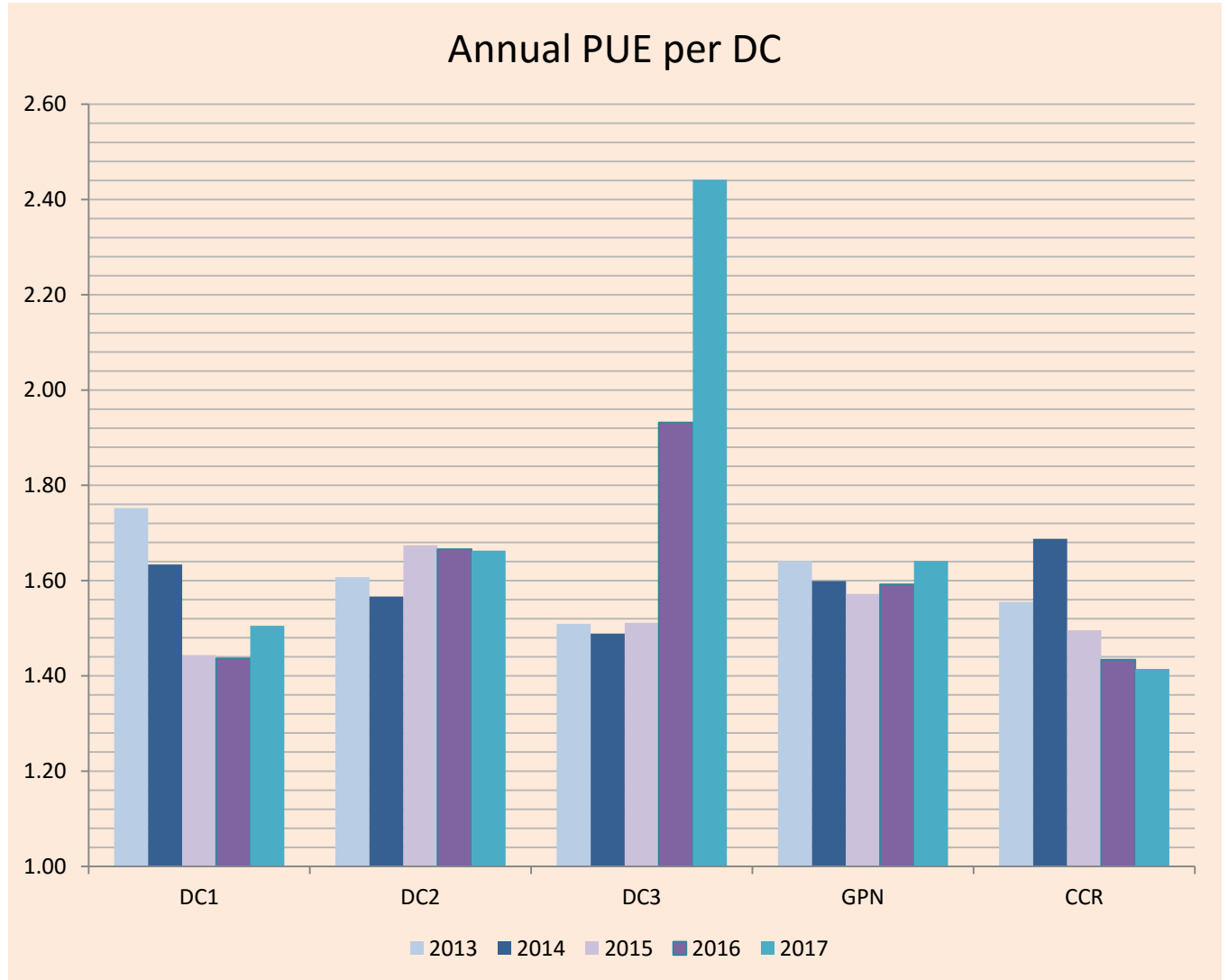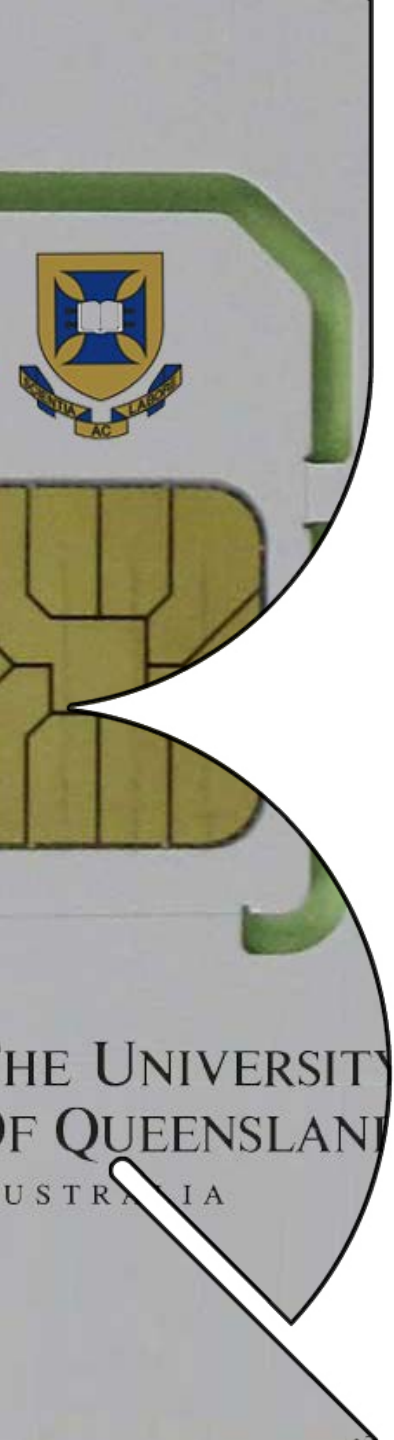
Load and Capacity reports
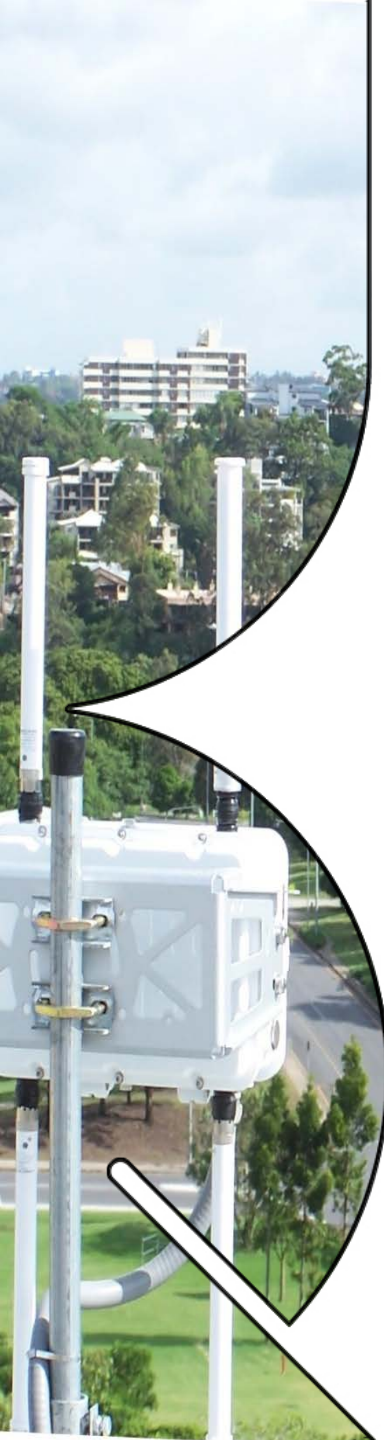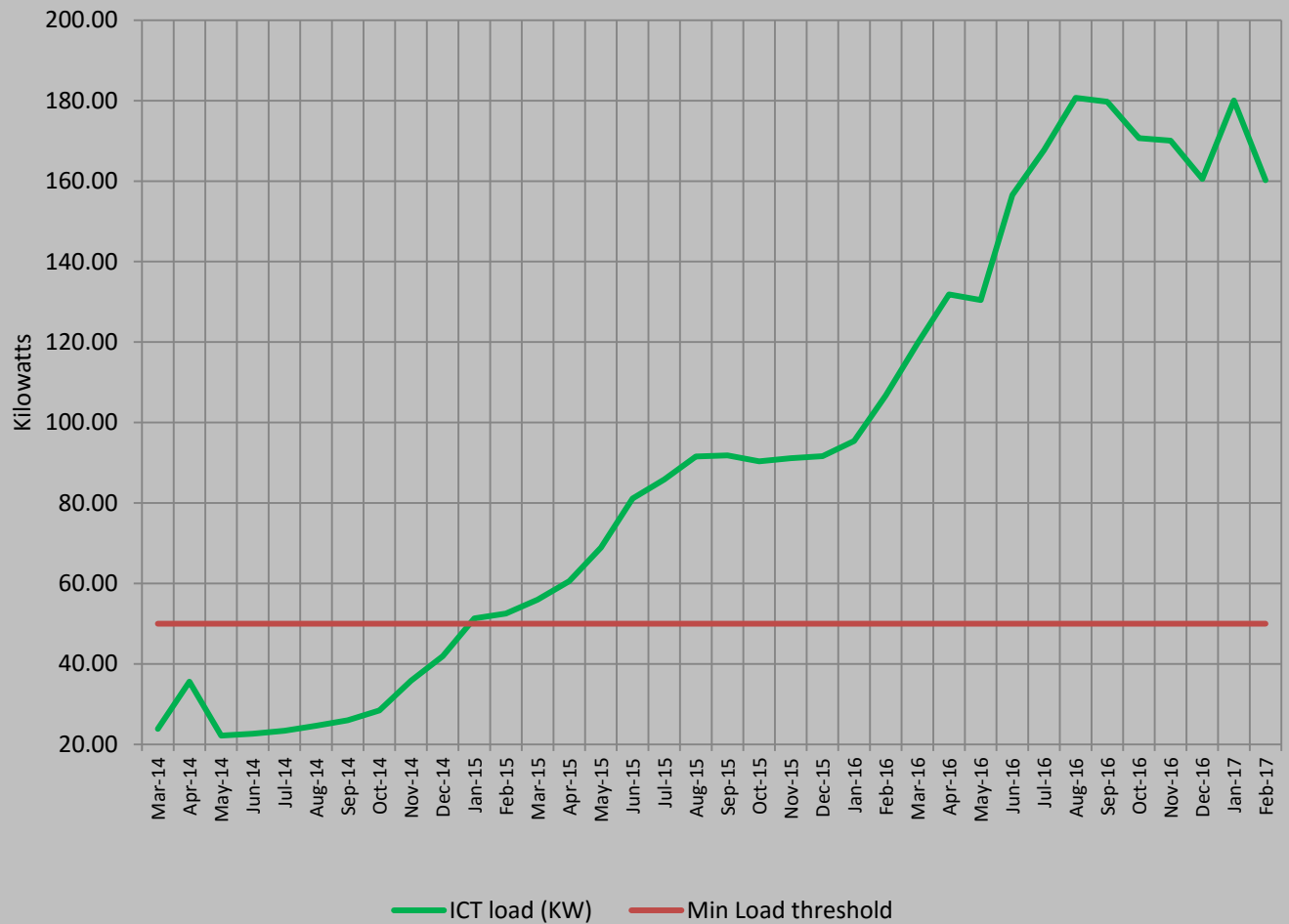

Total Monthly Cost - All ITS DCs

Load and Capacity reports

Average Power per Rack
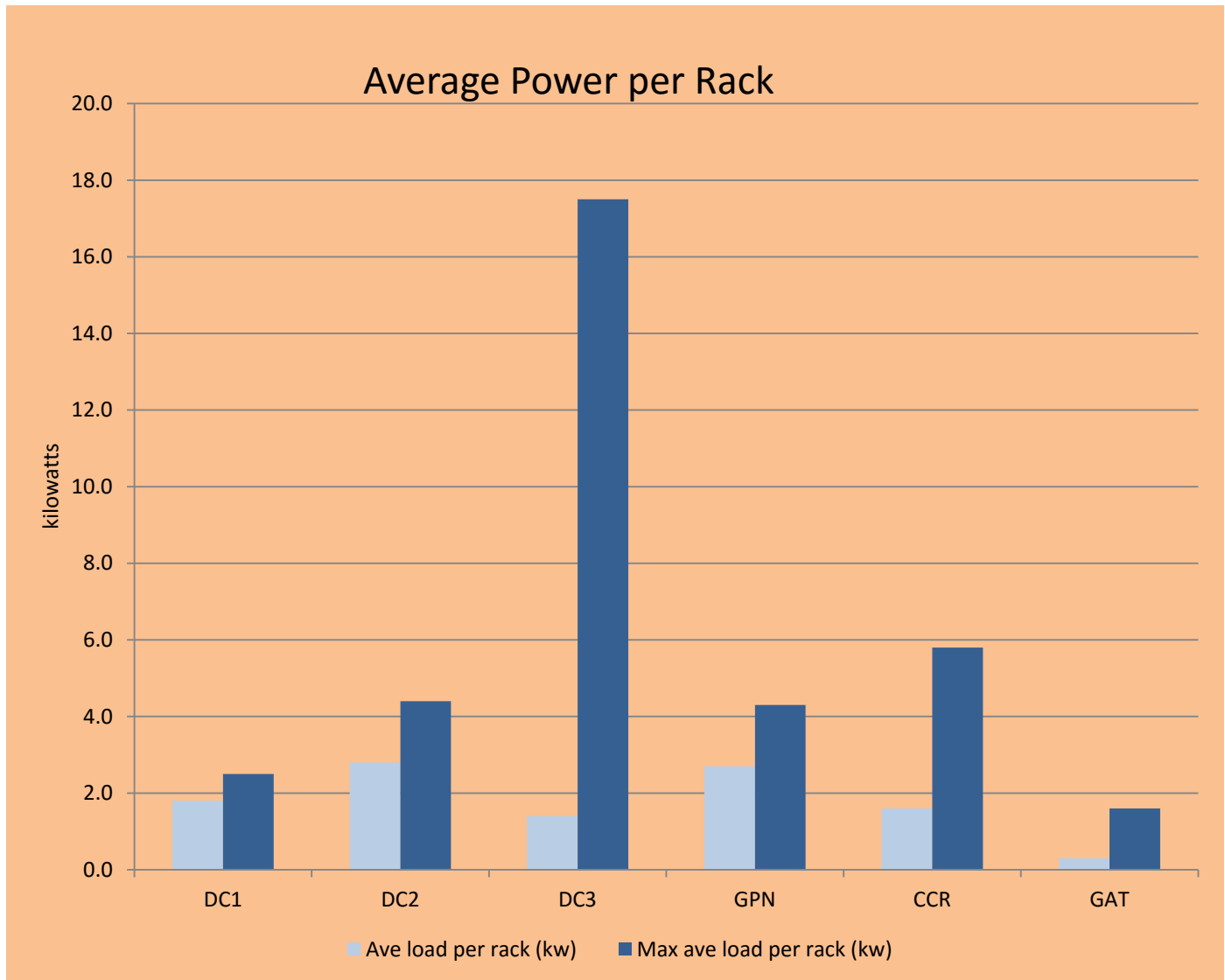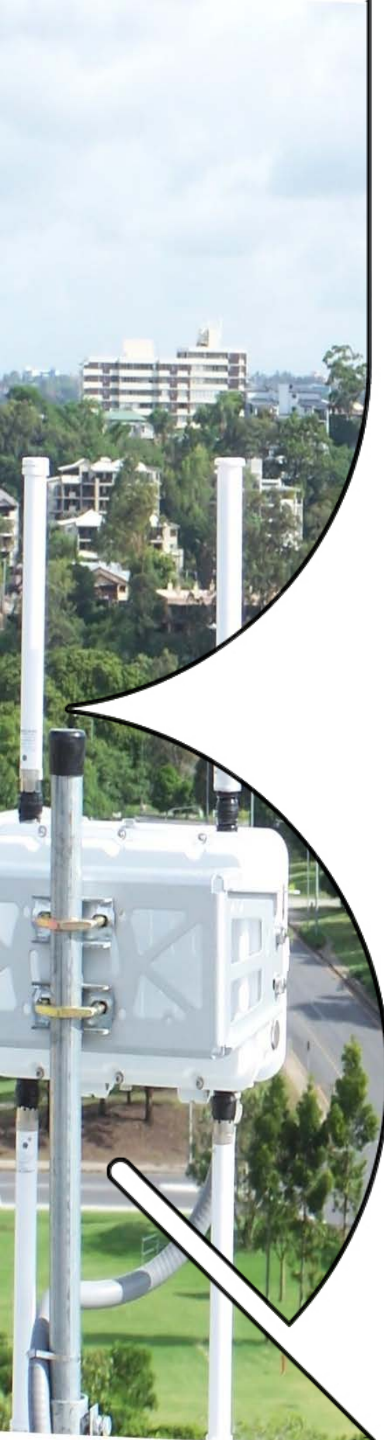
Load and Capacity reports
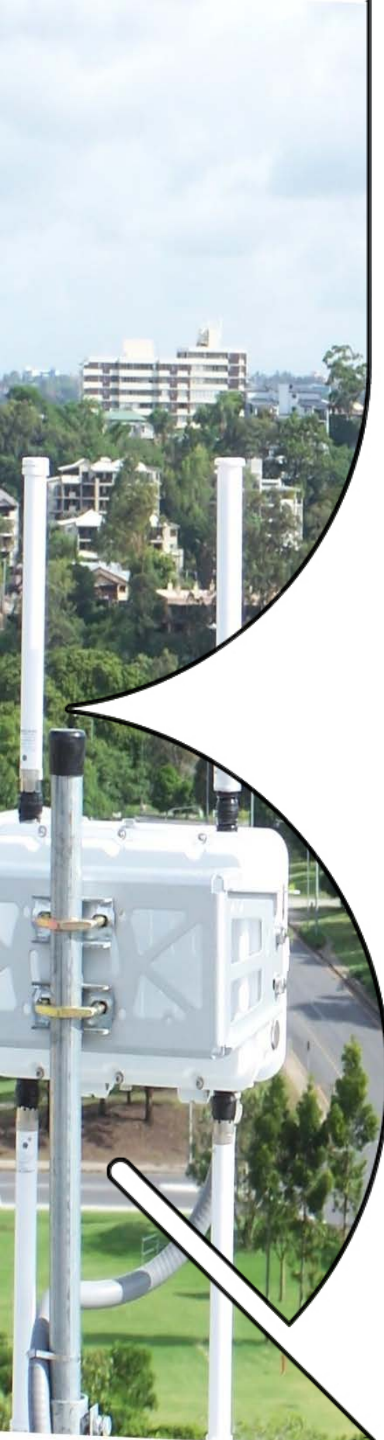
Polaris DC
ICT Load

What does DCE deliver

Confidence – when alerts column is blank every device is within thresholds, that's confidence when 24x7 service delivery is demanded.

Confidence – management receive monthly load and capacity data – accept business cases more readily when they trust the operation

Pro-active response rather than reactive to daily operational issues