
2021
Datacentre Power Systems & Solutions
Adam Gibson

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Adam Gibson
Data Centre builder, operator, designer | Network and Server Engineer | Fibre Operations
Chief Operations and Technical officer for data centres, with experience in top tiered data centres within Australia. With a broad knowledge of the critical systems operations. Complimenting this is varied experience in systems engineering and network design. Adam's skill set has proven to be an influential and advisory board approved rated.
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HIGH LEVEL

Why is power and energy so important to us now?!

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The Internet and “the cloud” are stored in large facilities. These facilities or data centres rely on power sources both on and off grid to keep the building cooled, security controlled and overall 100% available. With 3% of the global energy being consumed by data centres there is a need to look and understand how, why and what to do for the future.

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A BUILDING TO STORE DATA

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Why a DC

CORE COMPONENTS

Key aspects of what a data centre offers

- Power
- Cooling
- Security
- Connectivity

Benefits

- Beneficial costs of operation
- Improved solutions on services
- Redundancy
- Resiliency
- Compliancy
- Larger opportunities

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Part Two

Power…… What does it do to/for the facility? Why is it important?

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Power is the core of any DC

The true source of support

Without a primary and secondary power source of supply. A DC is a fancy computer warehouse.

- Cooling is reliant on power
- Networking is reliant on power
- Overall facility is reliant on power

- It is not just power available now, but what will be used in the next 5, 10 and 25 years.
- Are there options to expand the power generation
- Working with the power provider to understand the demand on the grid

BATTERY STORAGE

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UPS
Part Three
Styles of UPS
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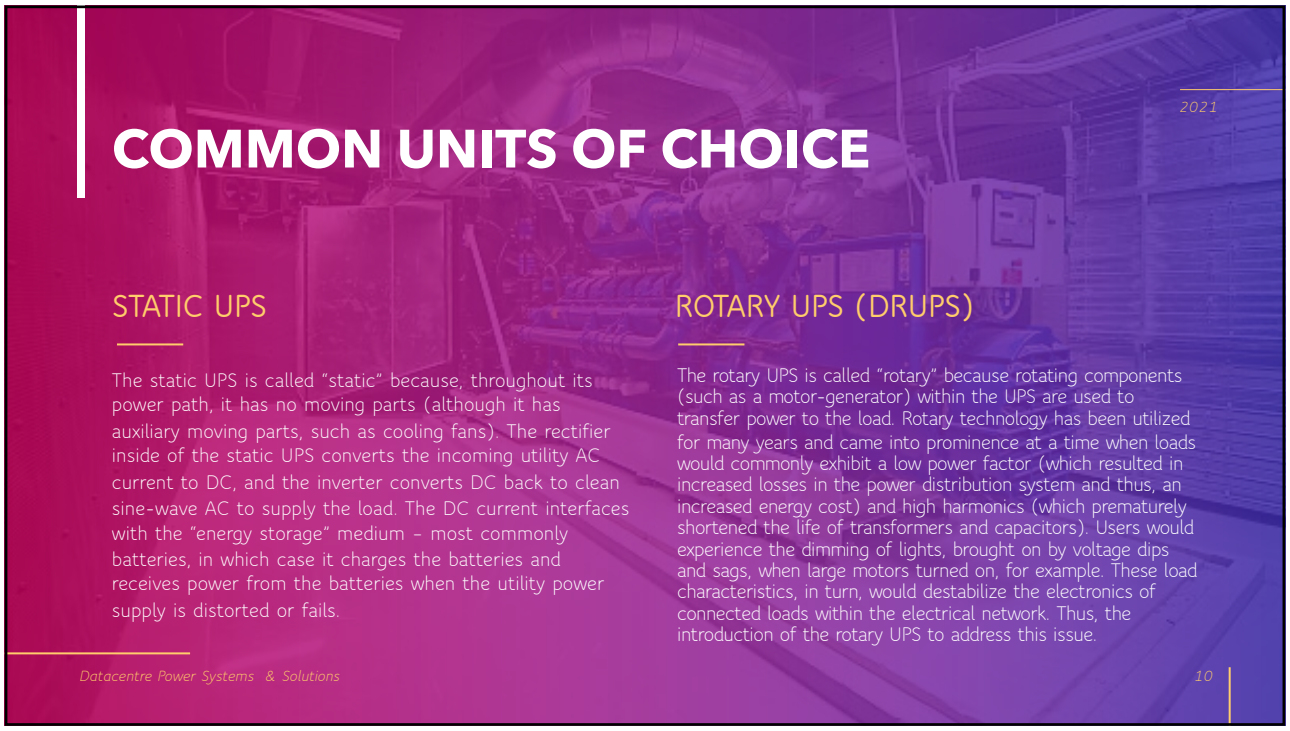
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COMMON UNITS OF CHOICE
STATIC UPS
The static UPS is called "static" because, throughout its power path, it has no moving parts (although it has auxiliary moving parts, such as cooling fans). The rectifier inside of the static UPS converts the incoming utility AC current to DC, and the inverter converts DC back to clean sine-wave AC to supply the load. The DC current interfaces with the "energy storage" medium – most commonly batteries, in which case it charges the batteries and receives power from the batteries when the utility power supply is distorted or fails.
ROTARY UPS (DRUPS)
The rotary UPS is called "rotary" because rotating components (such as a motor-generator) within the UPS are used to transfer power to the load. Rotary technology has been utilized for many years and came into prominence at a time when loads would commonly exhibit a low power factor (which resulted in increased losses in the power distribution system and thus, an increased energy cost) and high harmonics (which prematurely shortened the life of transformers and capacitors). Users would experience the dimming of lights, brought on by voltage dips and sags, when large motors turned on, for example. These load characteristics, in turn, would destabilize the electronics of connected loads within the electrical network. Thus, the introduction of the rotary UPS to address this issue.
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Part Four

UPS basics: How does it work?

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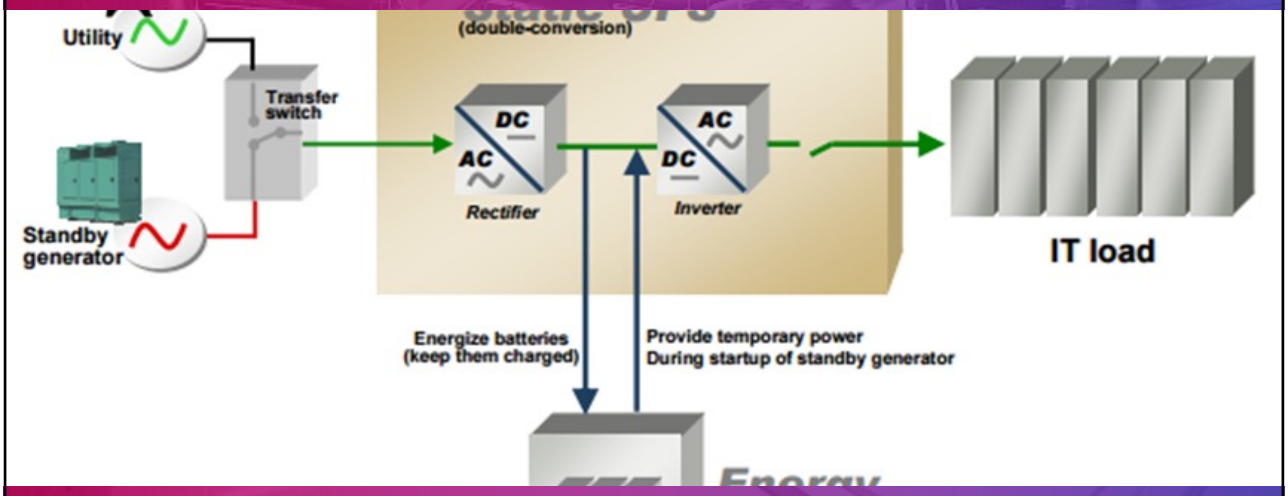
STATIC UPS



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Did you know? Batteries may be the number one contributor to UPS failure

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DIFFERENT BATTERIES

VRLA batteries

Valve-Regulated Lead-Acid.

During the charging of a lead-acid battery, hydrogen is normally liberated. In a vented battery, the hydrogen escapes into the atmosphere. In a VRLA battery, the hydrogen recombines with oxygen inside battery, so, water loss is minimized. Under normal float conditions, virtually all the hydrogen and oxygen is recombined. Re-sealable valves vent non-recombined gases only when pressure exceeds a safety threshold.

Lithium-ion batteries

Lithium based batteries have multiple significant benefits over alternative DC storage techniques for UPS applications. The technology has matured in heavy duty applications like electric vehicles, and is considered ideal for critical power backup. Small size and light weight are the primary benefits, but additional features like built-in battery management (not just monitoring), make lithium-ion an attractive alternative to traditional batteries.

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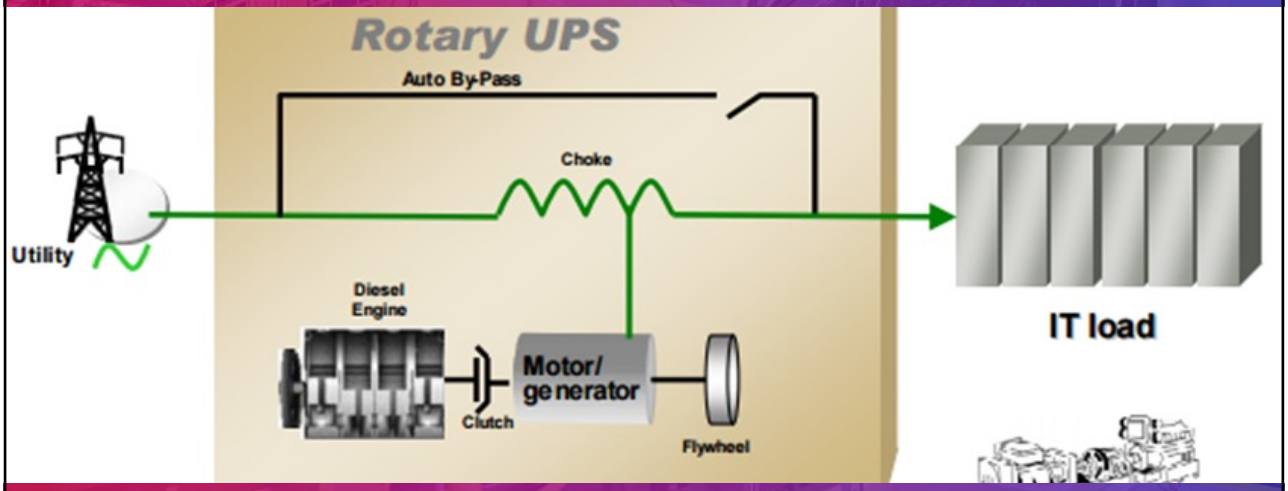
ROTARY UPS



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Part Five
Uptime understandings. How long can I keep my DC running for?
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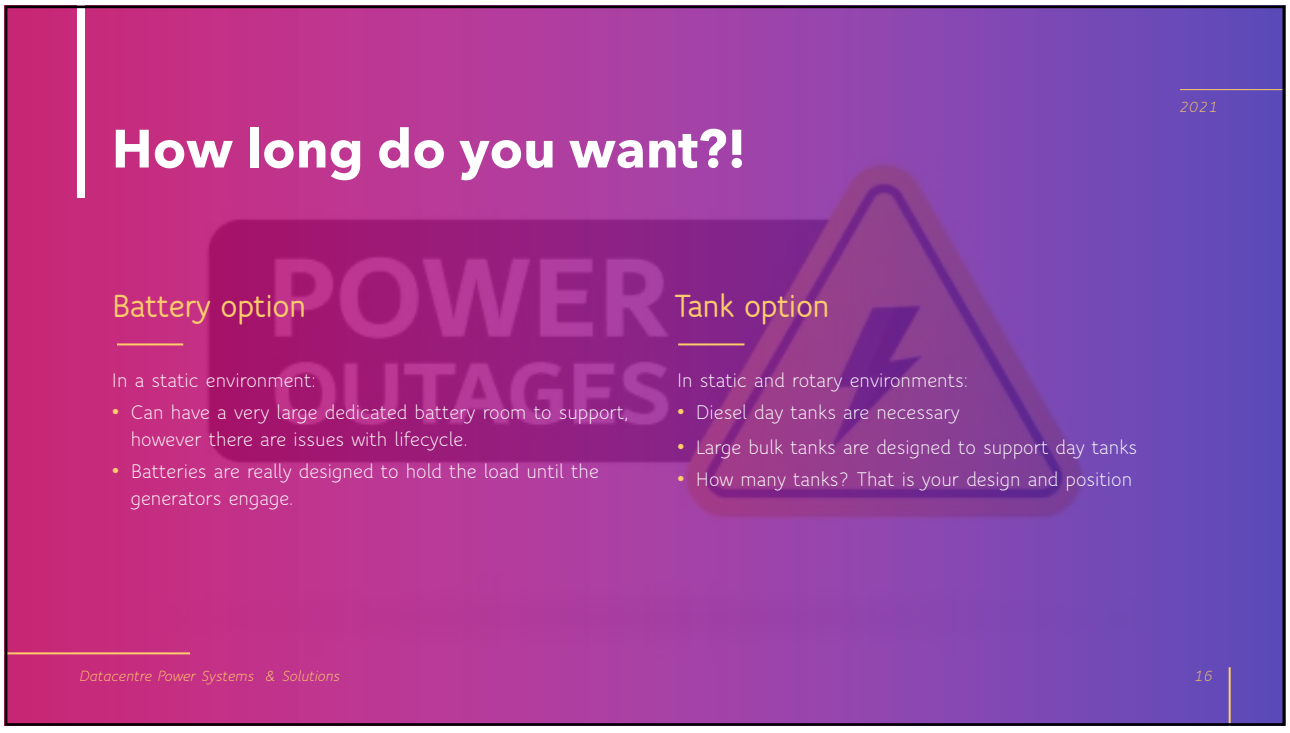
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How long do you want?!
Battery option
In a static environment:
• Can have a very large dedicated battery room to support, however there are issues with lifecycle.
• Batteries are really designed to hold the load until the generators engage.
Tank option
In static and rotary environments:
• Diesel day tanks are necessary
• Large bulk tanks are designed to support day tanks
• How many tanks? That is your design and position
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Part Six
Black and Green (Renewable) Power. What is the difference?
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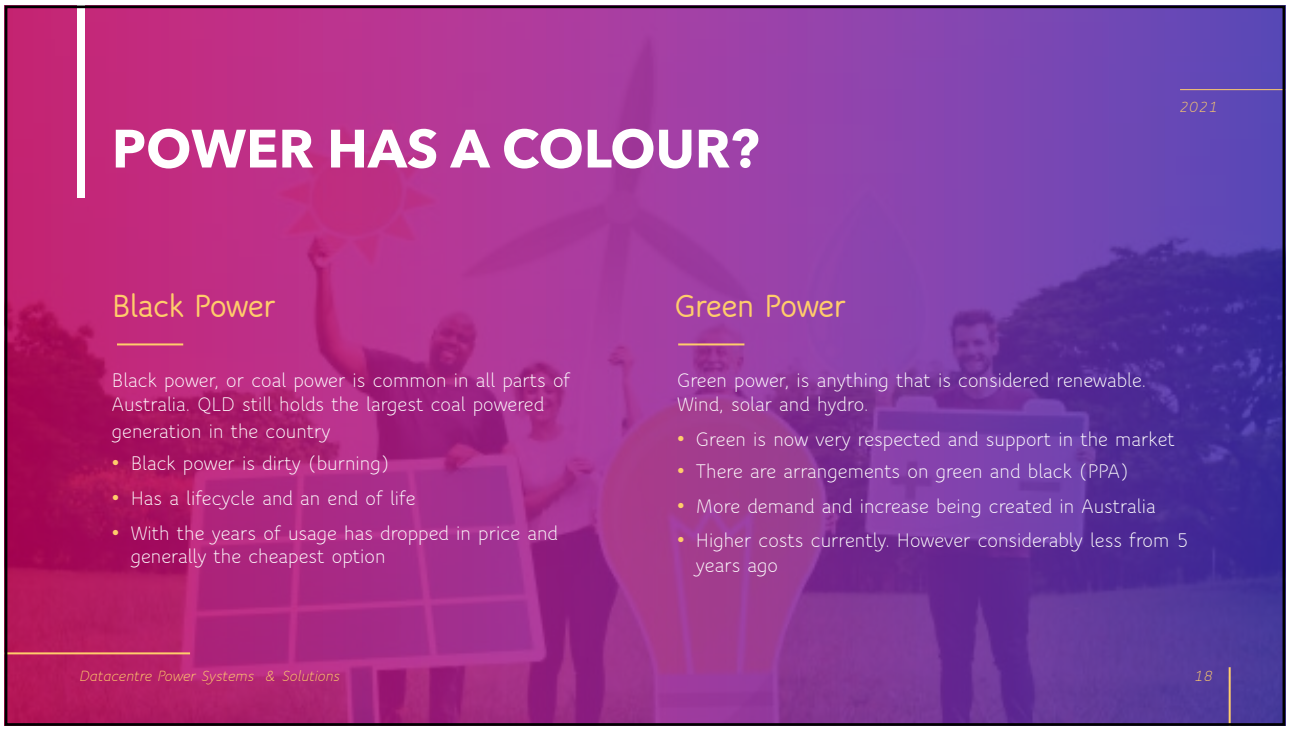
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POWER HAS A COLOUR?
Black Power
Black power, or coal power is common in all parts of Australia. QLD still holds the largest coal powered generation in the country
• Black power is dirty (burning)
• Has a lifecycle and an end of life
• With the years of usage has dropped in price and generally the cheapest option
Green Power
Green power, is anything that is considered renewable. Wind, solar and hydro.
• Green is now very respected and support in the market
• There are arrangements on green and black (PPA)
• More demand and increase being created in Australia
• Higher costs currently. However considerably less from 5 years ago
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PUE – Power Usage Effectiveness

The ranking

PUE	DCiE	Level of Efficieny
3.0	33%	Very Inefficient
2.5	40%	Inefficient
2.0	50%	Average
1.5	67%	Efficient
1.2	83%	Very Efficient

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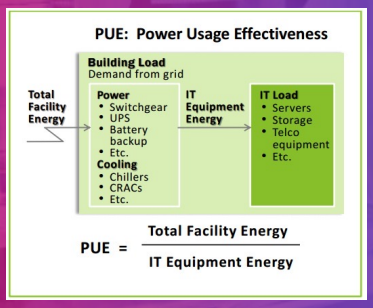
How it works



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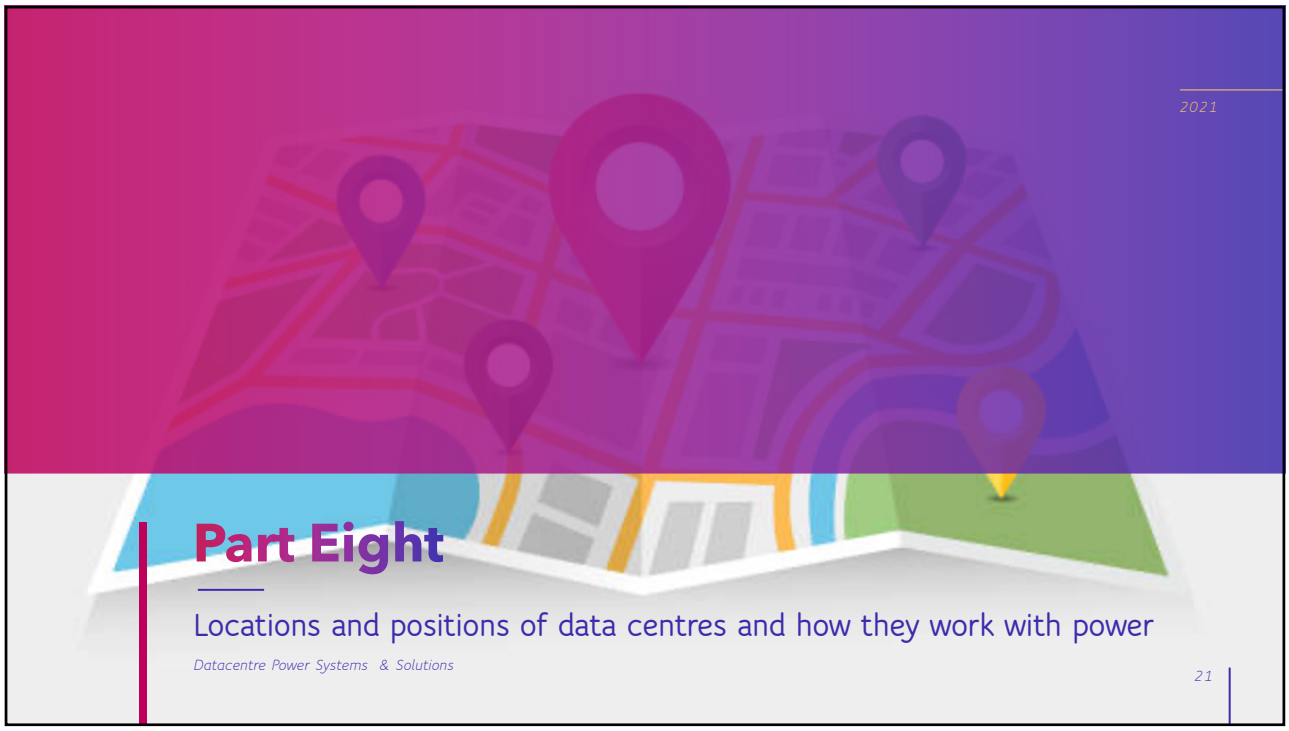
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Part Eight
Locations and positions of data centres and how they work with power
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WHERE IS THE BEST TO BUILD
LOCATION
Whilst power is very important to the facility. There are some basic components that are explored before accepting an agreed site
• Are you close to Petrol stations, water towers withing 2km
• Are you within 5km of dumps/landfill sites, cargo railways, major airports, chemical plants
• In 13km are you located beside a minor airport, munitions site or military base with explosives
GROWTH
How is the area for growth, will there be an exhaustion of power?
• Contact the power supplier
• Look at the generation sources
• Council or state government support for different power solutions
• National support for high energy consumers
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