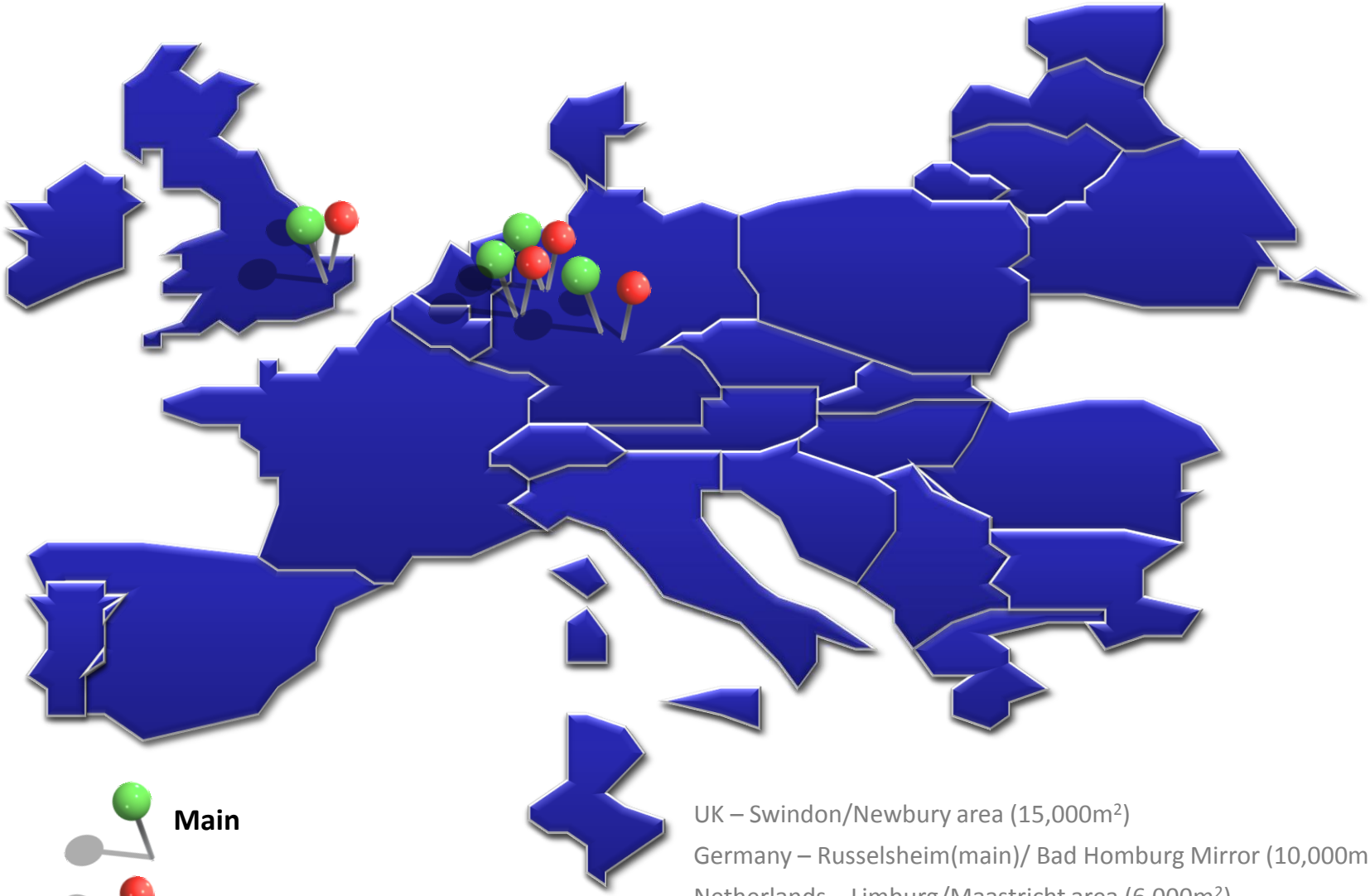
Case Study:
The design of a modern data centre

Jeffrey Brindle
Technical Director, HP Critical Facilities Services

EMEA Roll-out



Main

Mirror

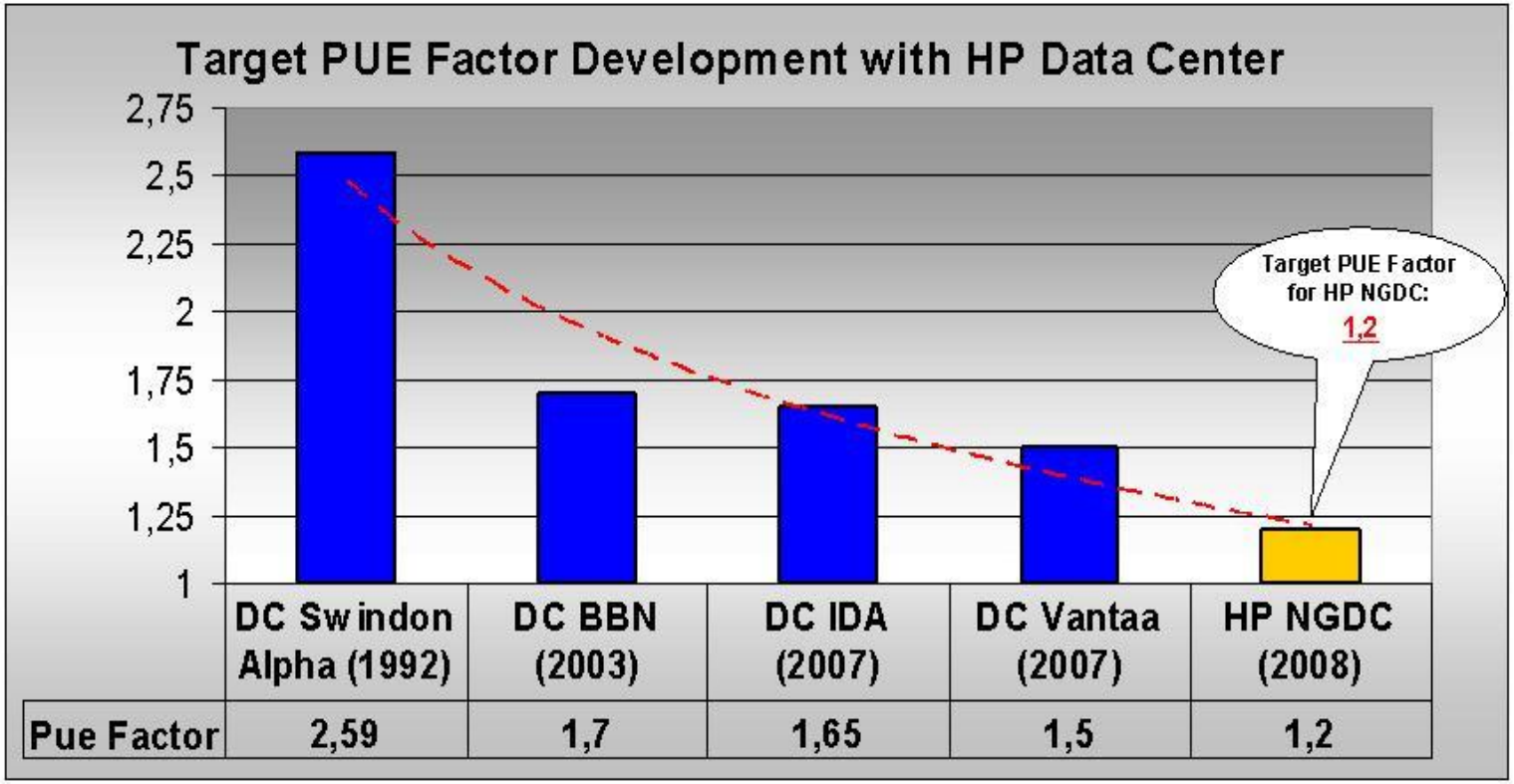
UK – Swindon/Newbury area (15,000m^2)

Germany – Russelsheim(main)/ Bad Homburg Mirror (10,000m^2)

Netherlands – Limburg/Maastricht area (6,000m^2)

Belgium – Hasselt area (6,000m^2)

Sustainability

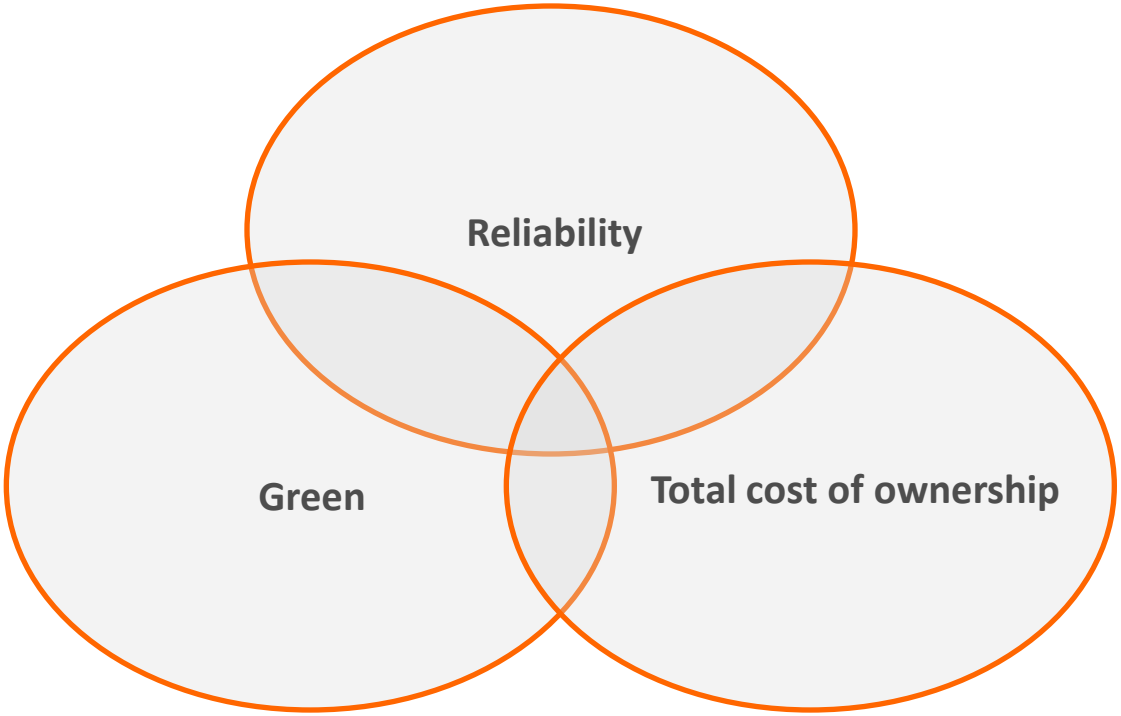


PUE trends - HP

Overview

- **Scope:**
  - Generic Design, Main (2/8kw m^2) & Mirror Sites (1/4kw m^2)
  - Modular DC for Out-Sourcing to be built any where in Europe
  - Minimise Capital Cost
  - Optimise TCO (over Life time)
  - Minimise Energy Costs
  - Flexible. Accommodate changes in Technology (Future Proof)
  - Tier 3
- **Deployment**
  - CFS produce Generic Design

Striking the Right Balance between -



Data Centre Electrical Infrastructure Topologies – Reliability Table

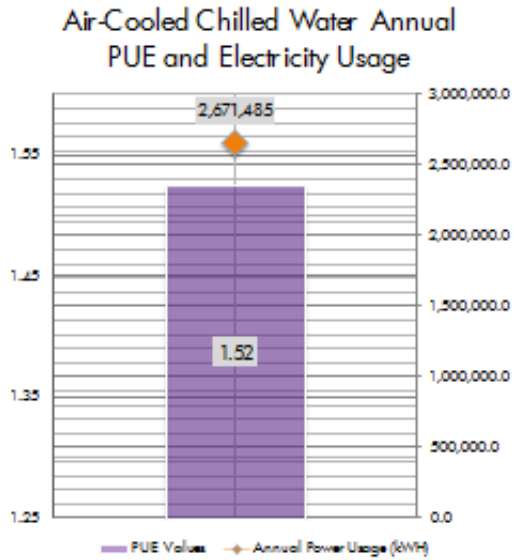
Description of RBD	MTBF (Hours)	Inherent Availability (A_i)	Probability of Failure in 5 years
N + 1 UPS system - dual cord loads	32,509	0.99981626	58.16%
Utility and N + 1 UPS system, ASTSs - dual cord loads	65,056	0.99999821	8.02%
Distributed Redundant (2-3) UPS system - dual cord loads	161,646	0.99997994	7.43%
2N UPS system - dual cord loads	214,182	0.99998723	6.56%
2(N + 1) UPS system - dual cord loads	305,251	0.9999868	6.49%
Redundant Reserve (2-3) UPS System, ASTSs - dual cord loads	257,459	0.99999058	2.58%
Distributed Redundant (2-3) UPS system, ASTSs - dual cord loads	256,674	0.99999046	2.72%
2N UPS system, ASTSs - dual cord loads	445,691	0.99999845	1.12%
2(N + 1) UPS system, ASTSs - dual cord loads	989,960	0.99999839	0.88%

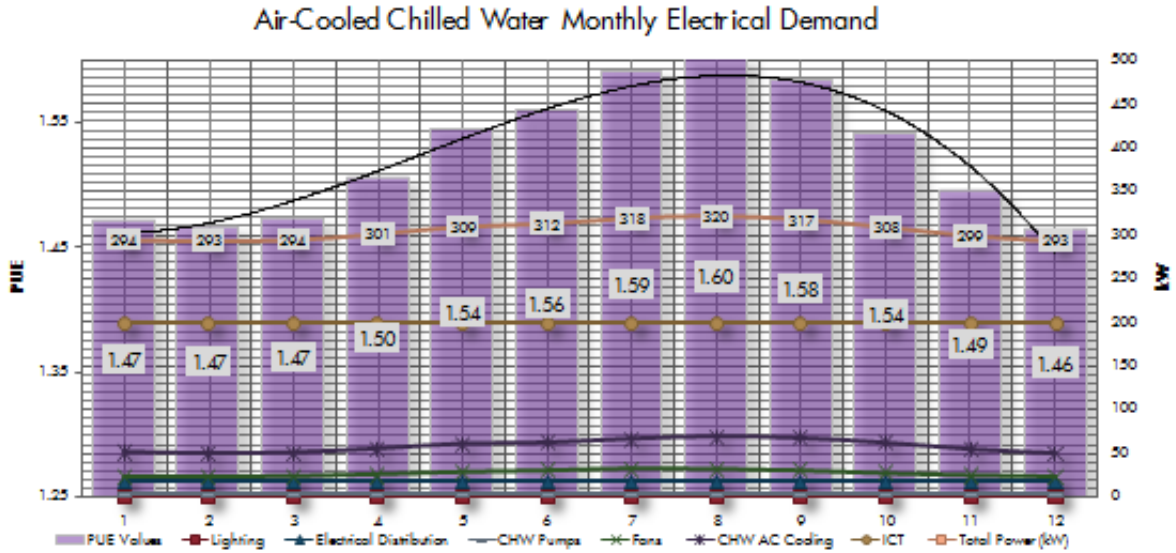
Data Centre Characteristics

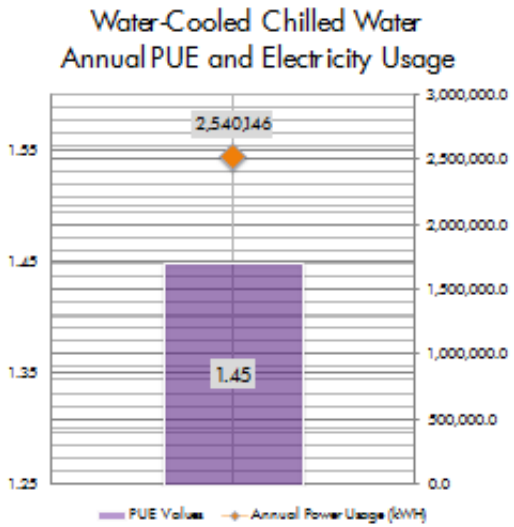
by business

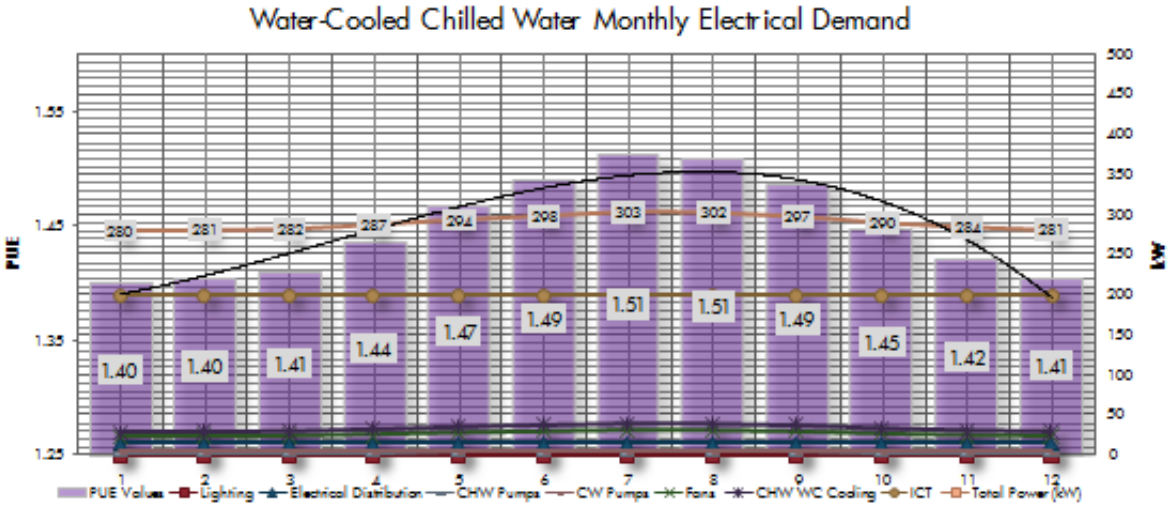
	Enterprise	Internet Provider	Co locator
Density kwatts/m²	1.5-3	9.5-14	1-1.2
Tier	3-4	1-2	2-3

Energy Modeling

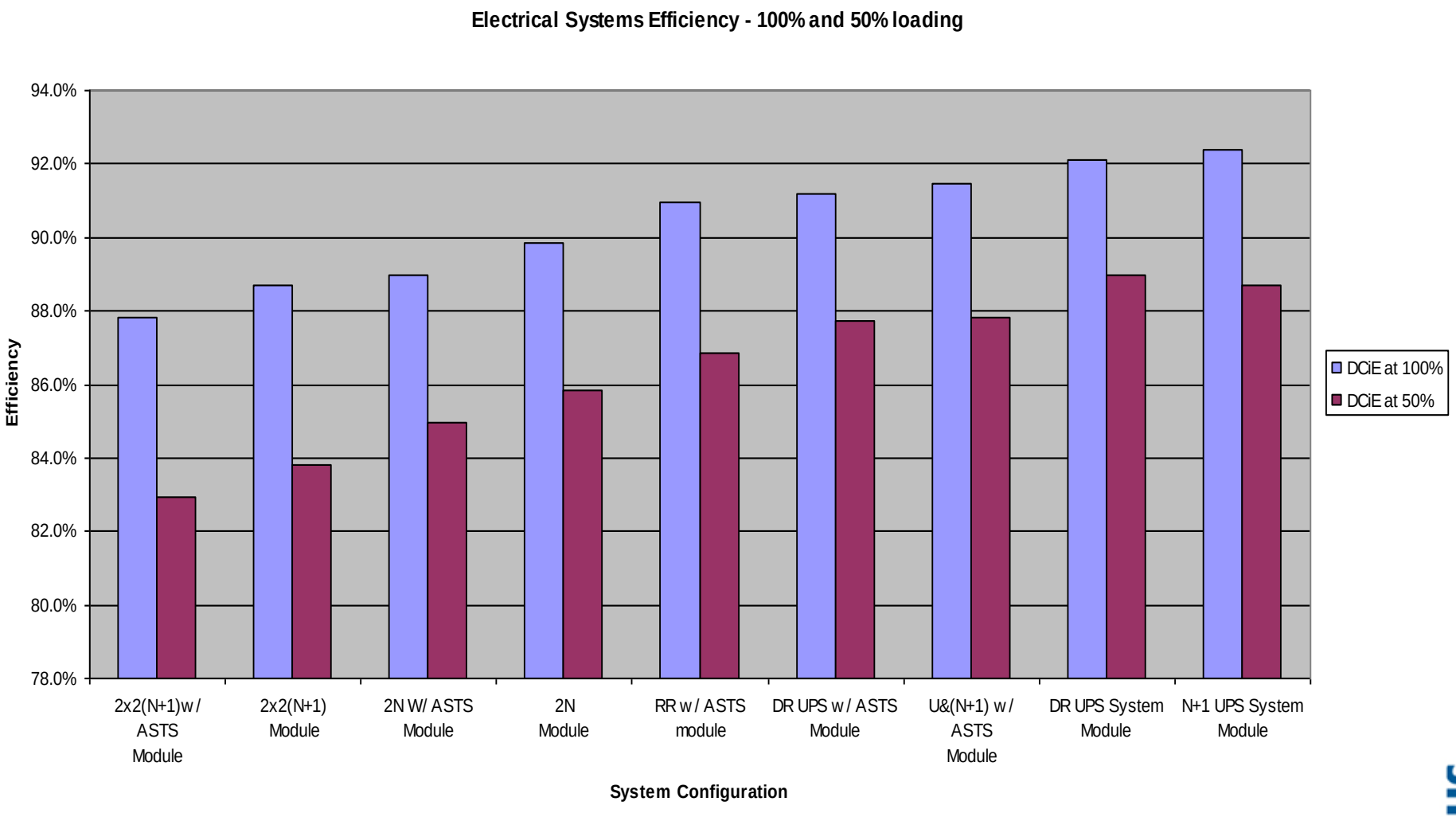




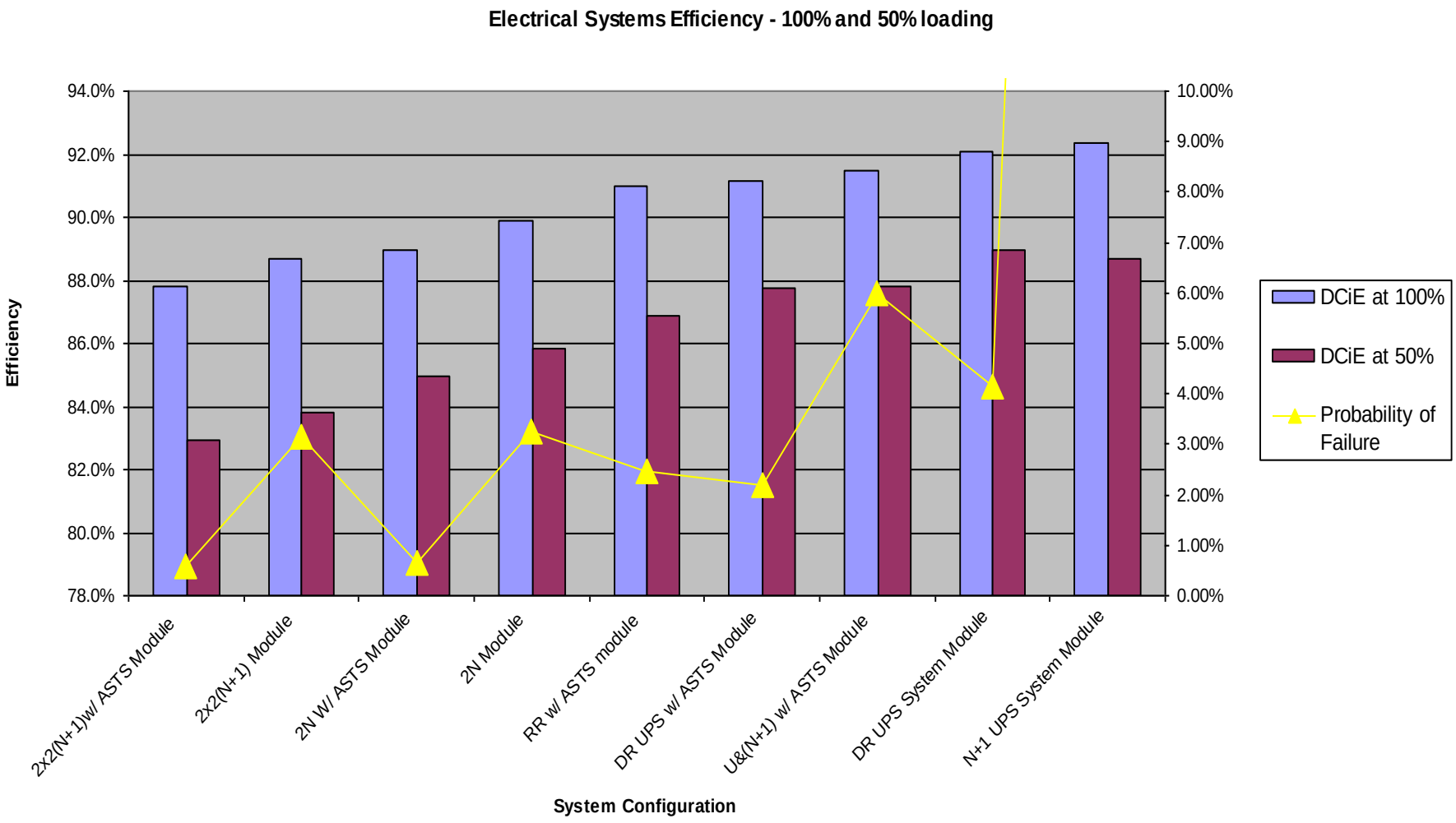




Efficiency at 100% and 50% loading



Efficiency vs. Reliability



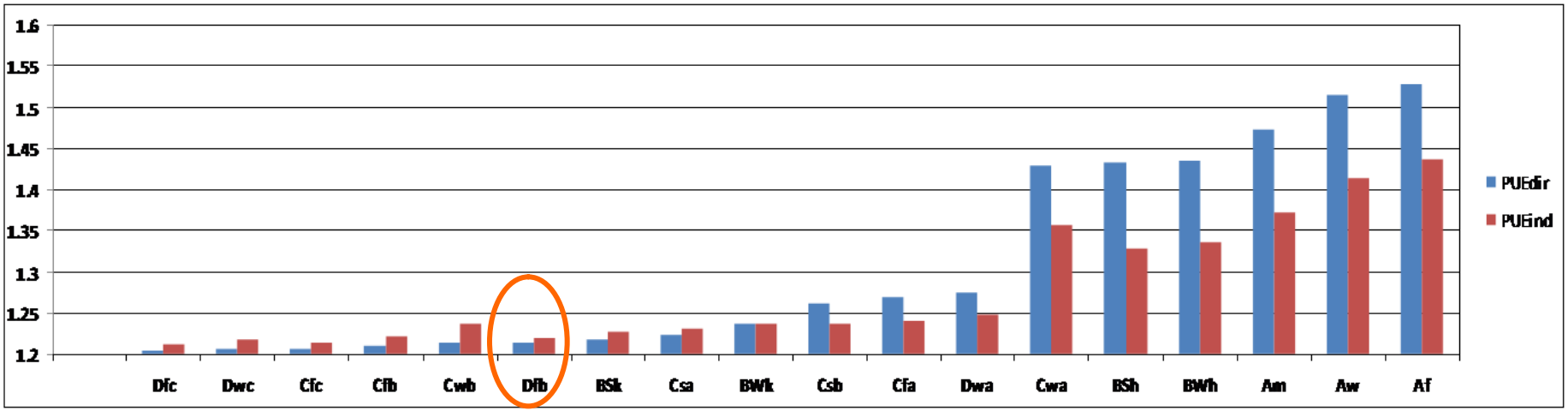
Next Generation Data Centres
SAMPLE PROJECT

eFOCUS

Free Cooling - Bratislava

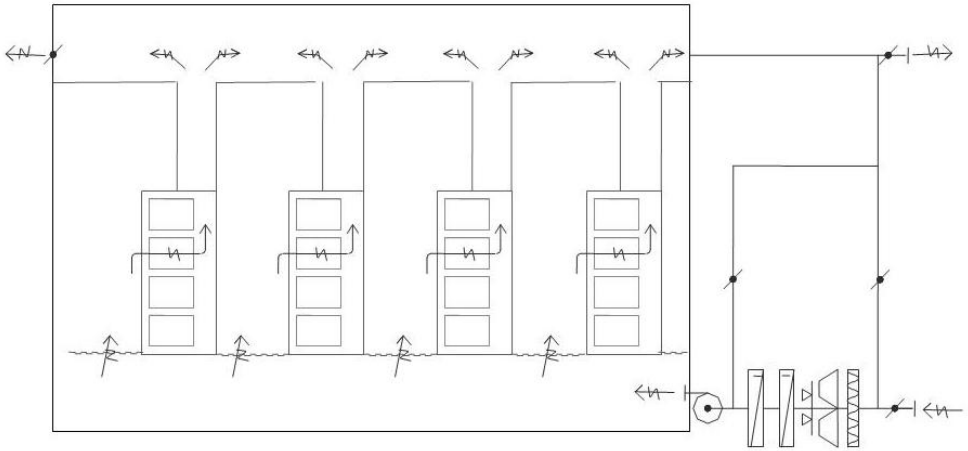
Bratislava – Dfb classification

- **PUE 1.21 Direct Air-free Cooling achievable**
- **PUE 1.22 Indirect Free Cooling achievable**



Global PUEs with Free Cooling (Air)

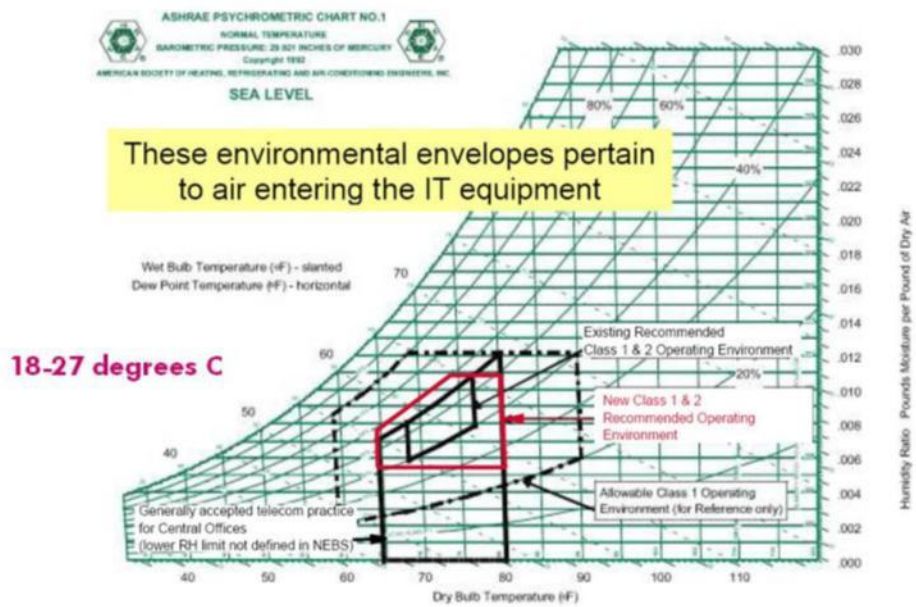
Free Cooling



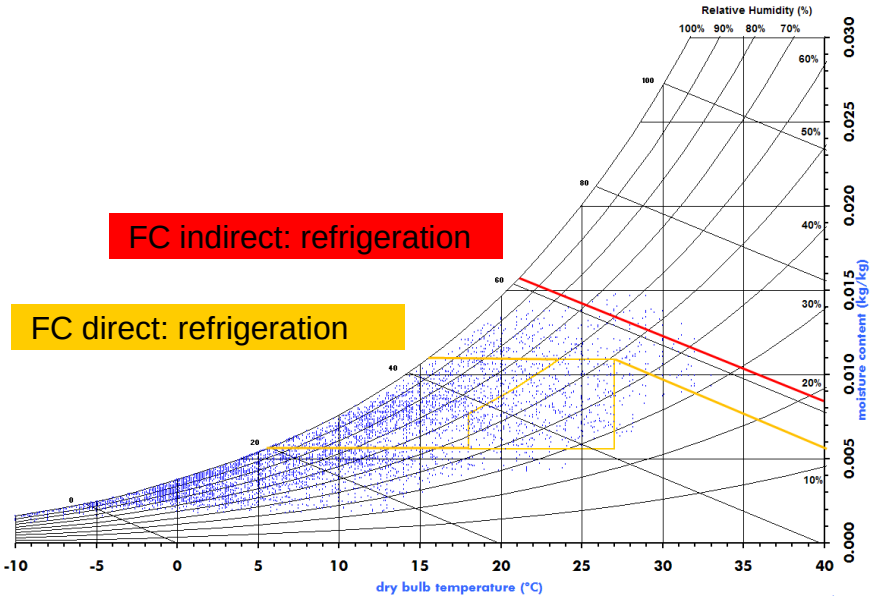
Free cooling supply air-contained system

- **Free cooling allows a significant reduction in the energy required.**
- Legacy data centres typically have PUEs of 2-2.5. Our leading edge data centre designs achieve a PUE of 1.2.

ASHRAE Levels



ASHRAE Guidelines



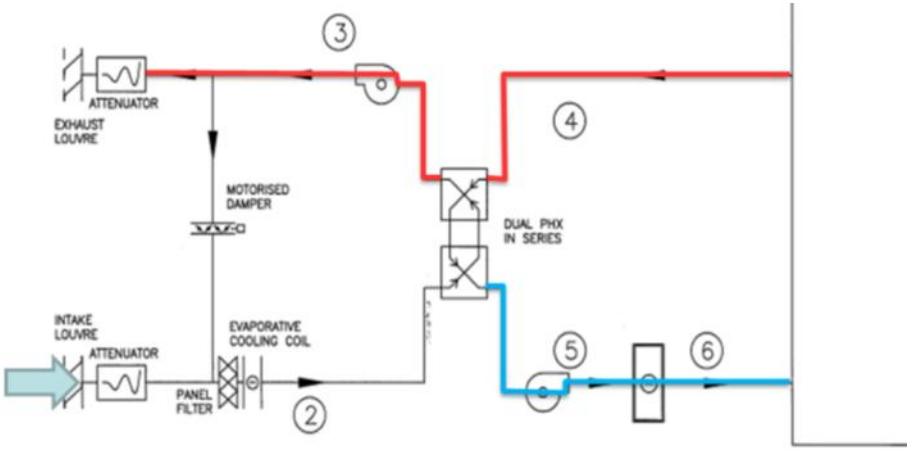
Bratislava

Recommended ASHRAE Levels

Core Design - Mechanical

Objectives

- Provide a high efficiency cooling system
- Ability to run in 100% recirculation mode to deal with adverse external conditions
- Elevated supply temperatures 23°C ± 1°C to increase operational efficiency and effect energy savings
- Benchmarking comparisons with air cooled chillers and CRAC systems

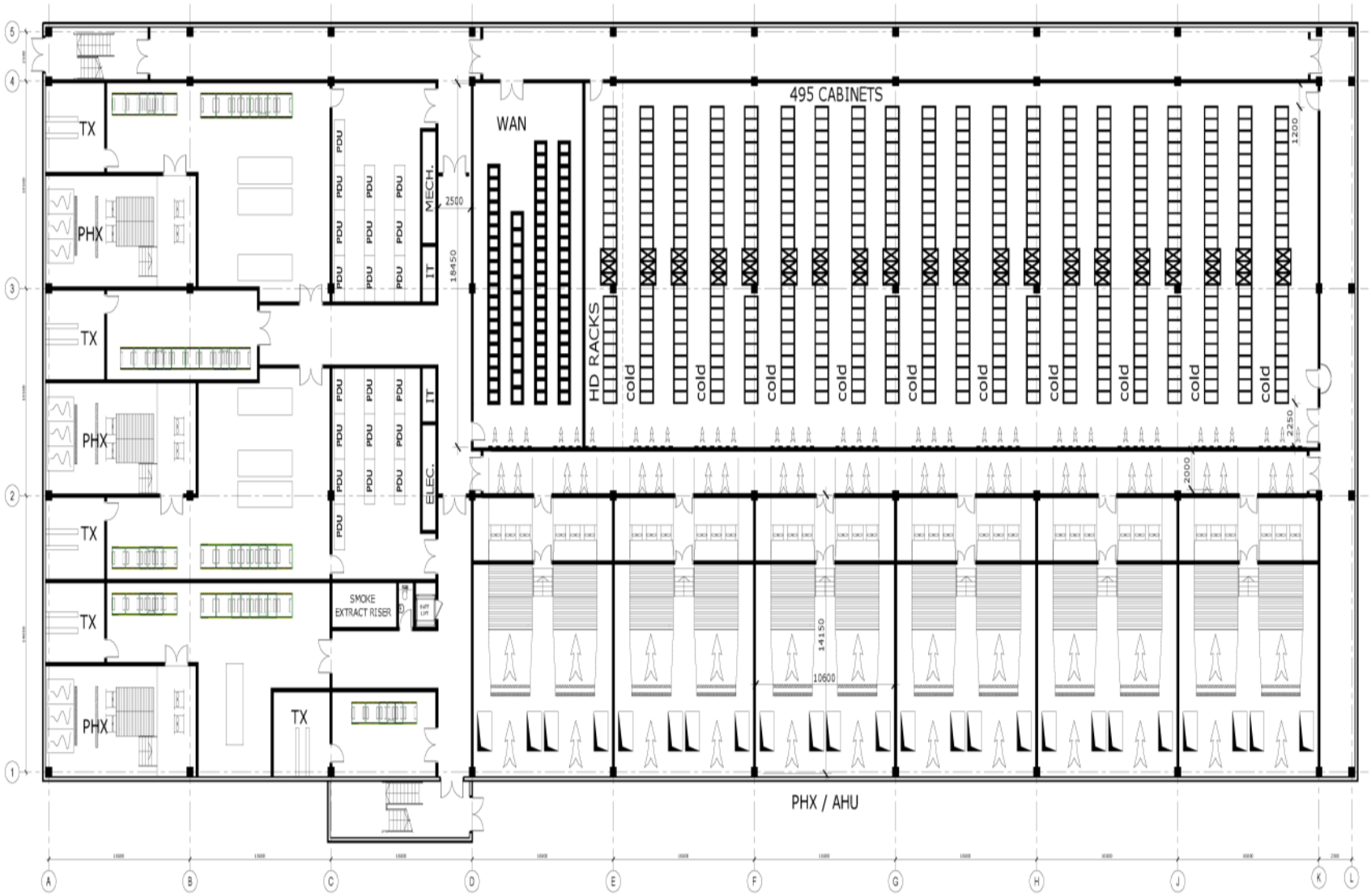


1 *Outside warm dry air*
2 *After evaporative cooler – cooled humid air*
3 *Return heat exchanger – hot humid air*
4 *After heat exchanger – cool and dry*
5 *After cooling coil – cooler and dry*

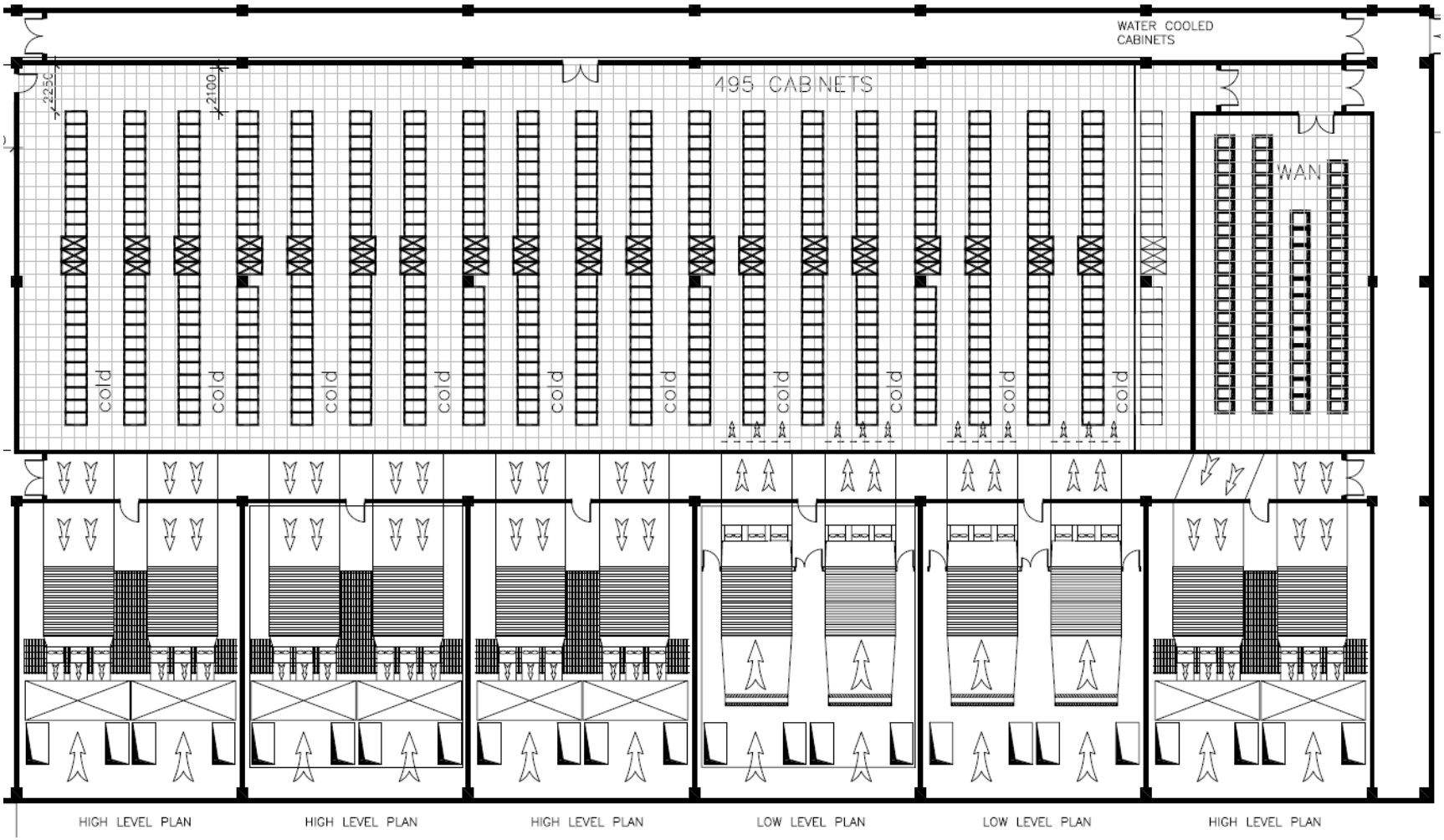
Innovative Free Cooling/Adiabatic Cooling System (PUE 1.25)

- Fresh air into data hall by separate system
- Redundancy in fans (N+1) on re-circulated and fresh air
- Redundancy in Units
- Large filtration and adiabatic cooling for increased efficiency and reduced maintenance
- Supplementary cooling coil for peak conditions
- Duplicated to provide UPS room cooling
- Recirculation damper to prevent de-humidification of the data centre in low ambient conditions
- Patent Applied for System

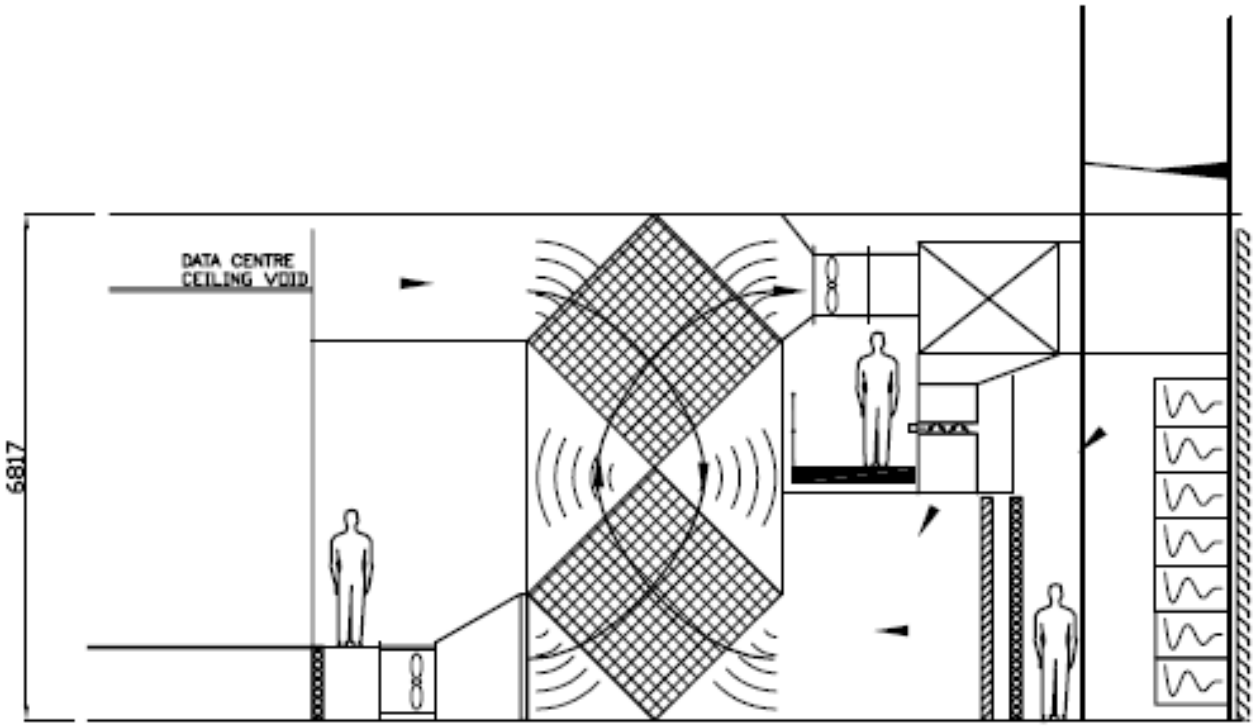
NGDC Layout


495 CABINETS
WAN
HD RACKS
cold
TX
PHX
PDU
MECH.
IT
ELEC.
SMOKE EXTRACT RISER
PHX / AHU
2500
18450
1200
2250
2000
14150
10600

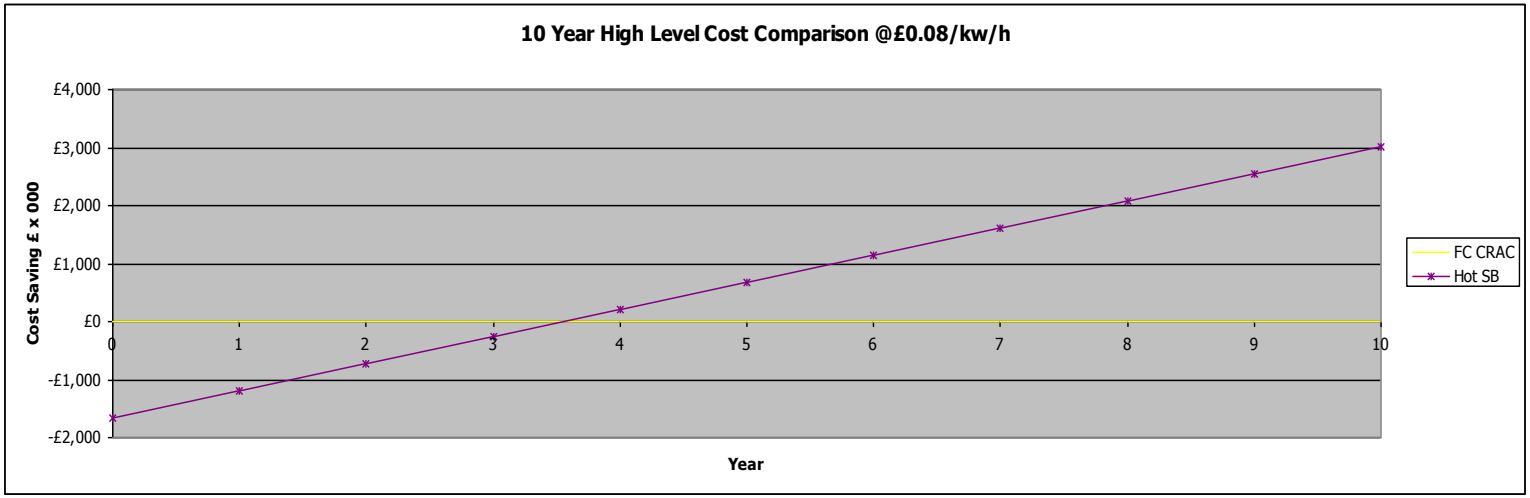
Overall Plan

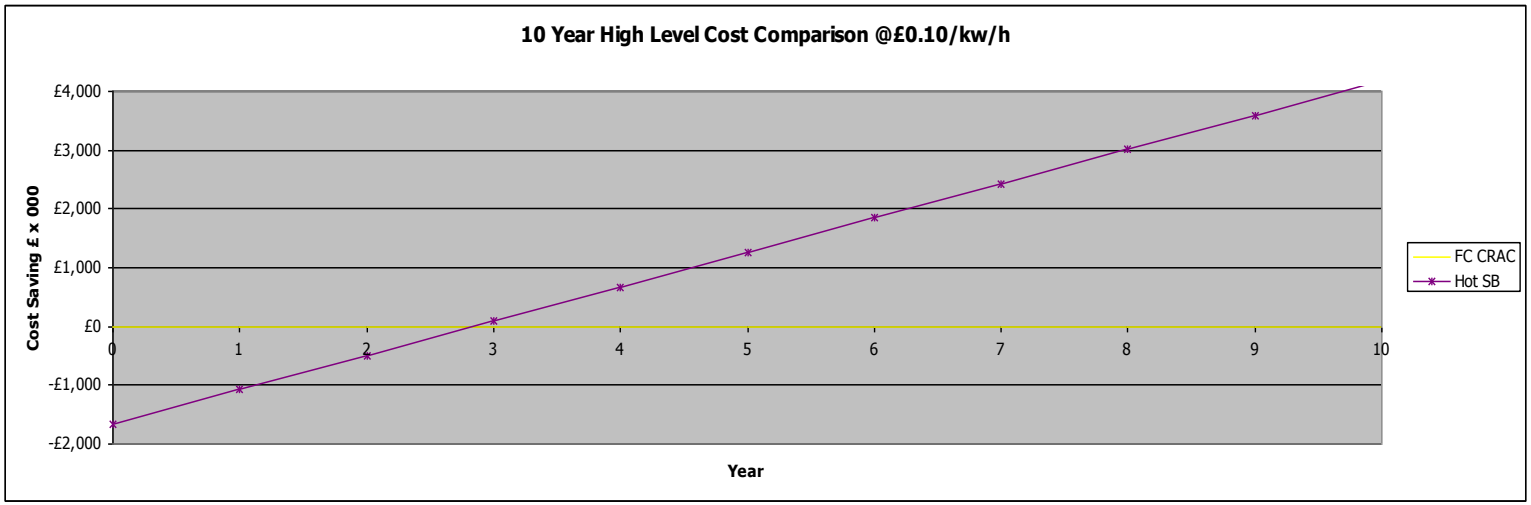


Elevation/Section



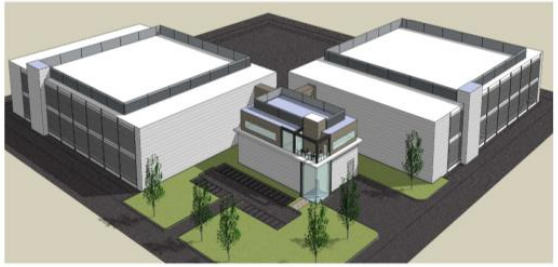
Budget

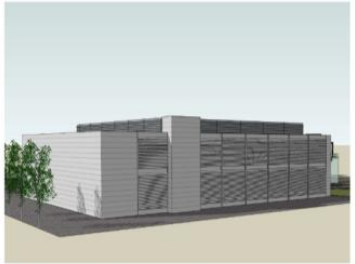




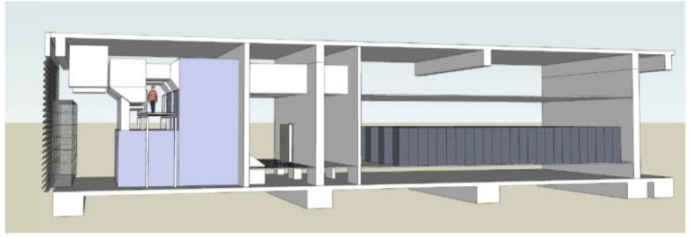
Pay Back – Energy Savings

Site Visuals





Site Visuals



Thank you for your attention

© 2010 Digit, s.r.o.

Email:

jeffrey.brindle@hp.com