SCTE ISBE CABLE-TEC EXPO '16

SEPTEMBER 26-29 PHILADELPHIA

OREO
Overall Room Energy Optimization
'The Cooling Chapter'

Stewart Grierson

Managing Director

Upnorth Group (UK) for Virgin Media/Liberty Global

Society of Cable Telecommunications Engineers

International Society of Broadband Experts

#CableTecExpo

Essential Knowledge for Cable Professionals™

OREO：Overall Room Energy Optimization

Overview :

- Who we are?
- What is OREO?
- Our OREO journey
  - Key points for consideration
  - Lessons learned
  - Potential pitfalls

Upnorth^ Group
Environmentally Powerful

Virgin media

LIBERTY GLOBAL®

OREO：Overall Room Energy Optimization

The Cooling Chapter

1. OREO - Introduction
2. OREO - Energy Share
3. OREO - Why Now? Our 4 Year Journey
4. OREO - Cooling, Capacity, Consumption & Engagement
5. OREO - Data Source, Information & IMS
6. OREO - Outlined Solution
7. OREO - Trial Projects Data
8. OREO - Performance Summary
9. OREO - Summary

OREO | Introduction

What is it?

Standardisation of an End to End Plan to improve Energy Performance in **Cooling** our Existing Technical Sites.

- End to End Plan being: -
  - Establish Requirements
  - Energy Performance Rating of Sites
  - Agree Client Parameters
  - Research & Assess Suitable Technologies
  - Services Design
  - Delivery
  - **OREO Management**

OREO | Introduction

What is OREO Management?

- Very different from conventional Asset Service & Maintenance Plans
- Service Road Map
- Combination of Asset & Services Performance Management
- Reliance on Real Time Data
  - Efficiency
  - Capacity
  - Faults
- Dashboard Visibility

Terminology

- **PUE** - Power Usage Effectiveness - Measure of Energy Efficiency

  "It's the ratio between the total power entering the data centre and the power used to run the IT equipment"

$$PUE = \frac{\text{Total Facility Energy}}{\text{IT Equipment Energy}}$$

The optimal PUE is 1.0 (>2.0 is inefficient)

- **IT Load** - The amount of energy consumed by servers and network equipment in the Data
- **IT Overhead** - Power consumed for compensating losses in Powering Process and for charging UPS system batteries
- **Cooling** - Cooling provided in the Data Centre to offset Heat Gains i.e. Loads
- **Over Cooling** - Excess Cooling provided to:
  - Reduce temperature within a time frame
  - To overcome inefficiencies in the distribution system

Do you NEED an OREO Plan?

Do you have Energy to SAVE?

Do I NEED an OREO Plan?

Investigating Potential

- Do we need to save **Energy?**
- How Efficient is the **Estate?**
- How Efficient is each **Site?**
- How Efficient is each **Room?**
- How Efficient are our **Competitors?**

Do I NEED an OREO Plan?

What to do? How to do it?

- What **Information** do we actually have?
  - ✓ Assessment Data Checklist?
- What **Calculations** will be used?
- Are these the right **Calculations?**
- Who will undertake these **Assessments?**
- What **Technology** can we use?
- Is this the right **Technology?**

Do I NEED an OREO Plan?

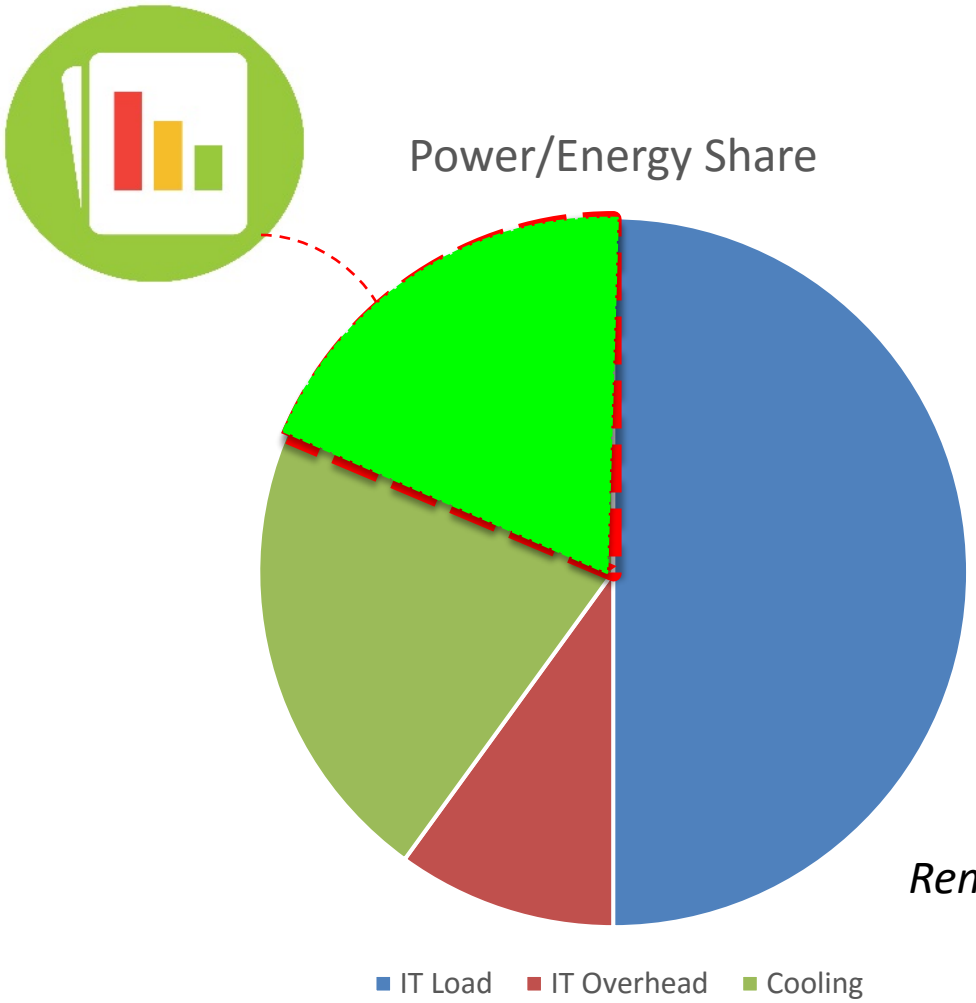
Commit & Deliver

- How do we **Identify** Sites?
- How do we **Agree** Solutions?
- How do we Manage **Programme?**
- How do we Manage **Risk?**
- How do we Manage **Investment?**
- How do we Manage **Return?**

2. OREO – Energy Share

Where is our **Power & Energy** being consumed?

2. OREO – Energy Share



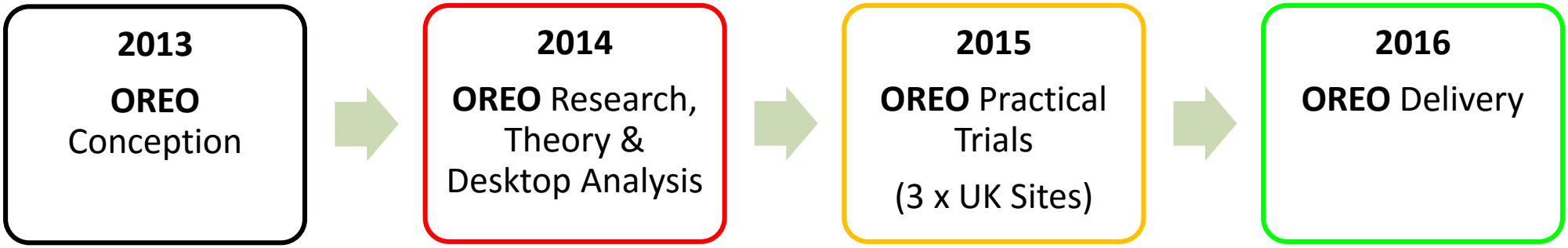
"By halving Cooling demand we affect Total demand by 20%"

Remember 50% generally is untouchable (Servers)

3. OREO – Why Now?

- **Opportunity** - First Generation Sites now end of life (20-30 years old)
- **Conditions** - Equipment may not need to be maintained at 20°C/68°F anymore
- **Environmental** - Responsibility to improve
- **Business** - Responsibility to improve
- **Competition** - Energy is indirectly what we trade, we need to manage cost on sales to remain Competitive in our markets

OREO – Our 4 Year Journey



We agreed to **Partner** with our Client

Realisation that a **Solution** was required

Assess and agree the **Science**, establish a firm **Concept** and agree **Metrics**

Build & Validate the **Concept**

Deploy & Benefit Programme ongoing, **Deploying OREO** Improvement into **68 UK Sites**

THE ENERGY AWARDS 15

Energy Awards 2015

Winners

Excellence in Demand Reduction

Virgin Media & Partners
"Screw-it Lets Do It"

AWARD RECOGNITION | 2015

Datacenter Dynamics Awards2015

Winners

Energy Efficiency Improvers Award

Virgin Media & Partners
"The Virginity Project"

AWARD RECOGNITION | 2015

Datacenter Dynamics Awards2015

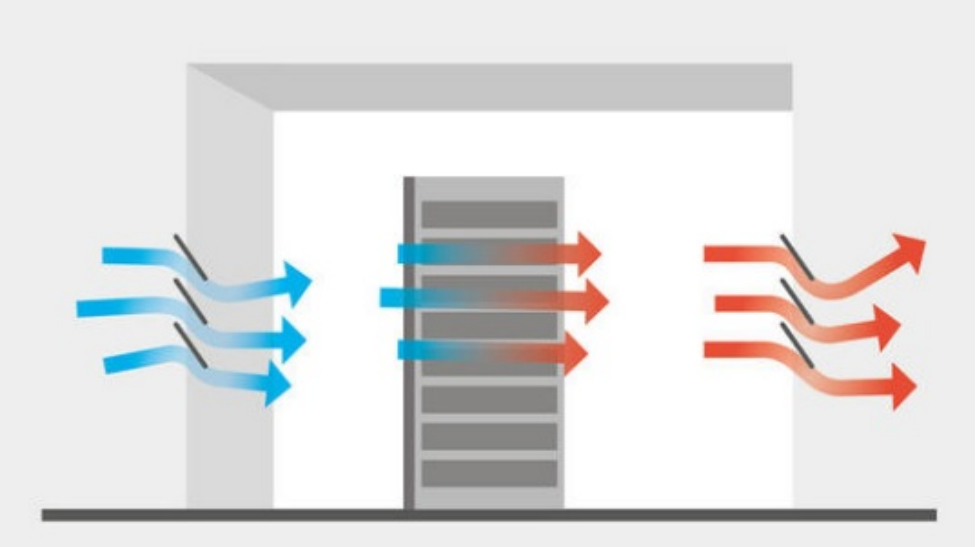
Winners

Datacenter Environmental Team of the Year

Virgin Media & Partners
"Cooling Partnership"

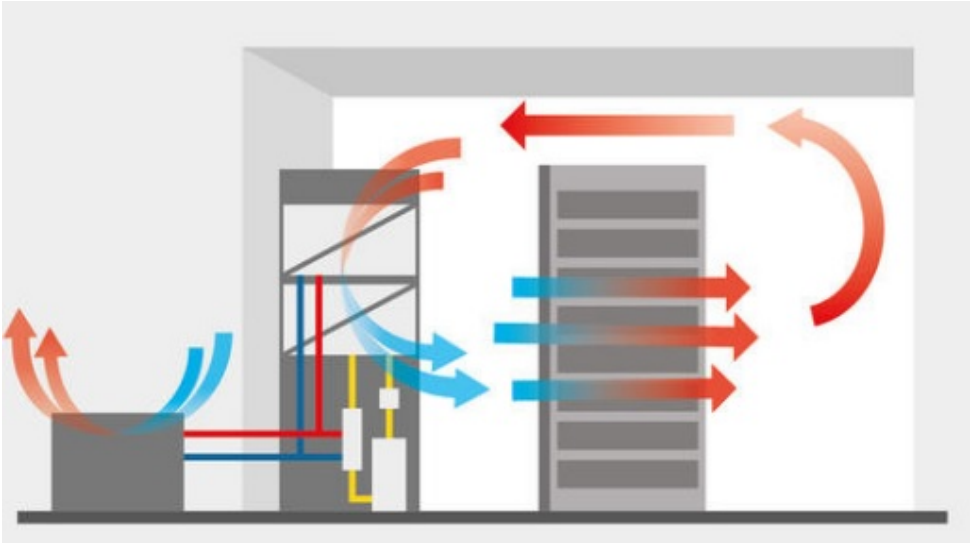
4. OREO | Cooling | Free Cooling

- Firstly ‘Free Cooling’ – nothing is FREE!
- Free Cooling we refer to Advanced Technological Solutions which remove heat for some or all of the time without the need of using Direct Expansion Refrigeration



Direct

‘Or’



InDirect

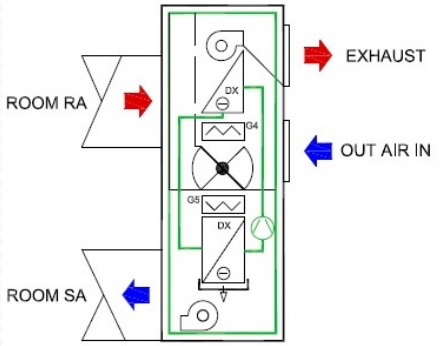
4. OREO | Cooling | Technology

- Common Technologies
- Understanding Efficiency Capability

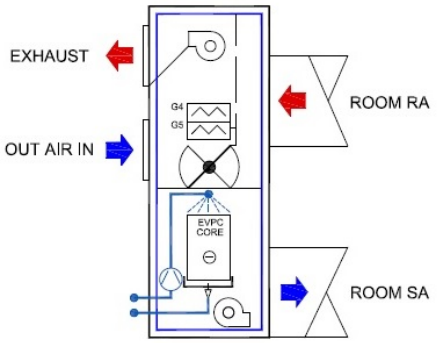
Least Efficient → Most Efficient

DX Cooling

Chilled Water utilising Air Cooling



Fresh Air & DX Packages

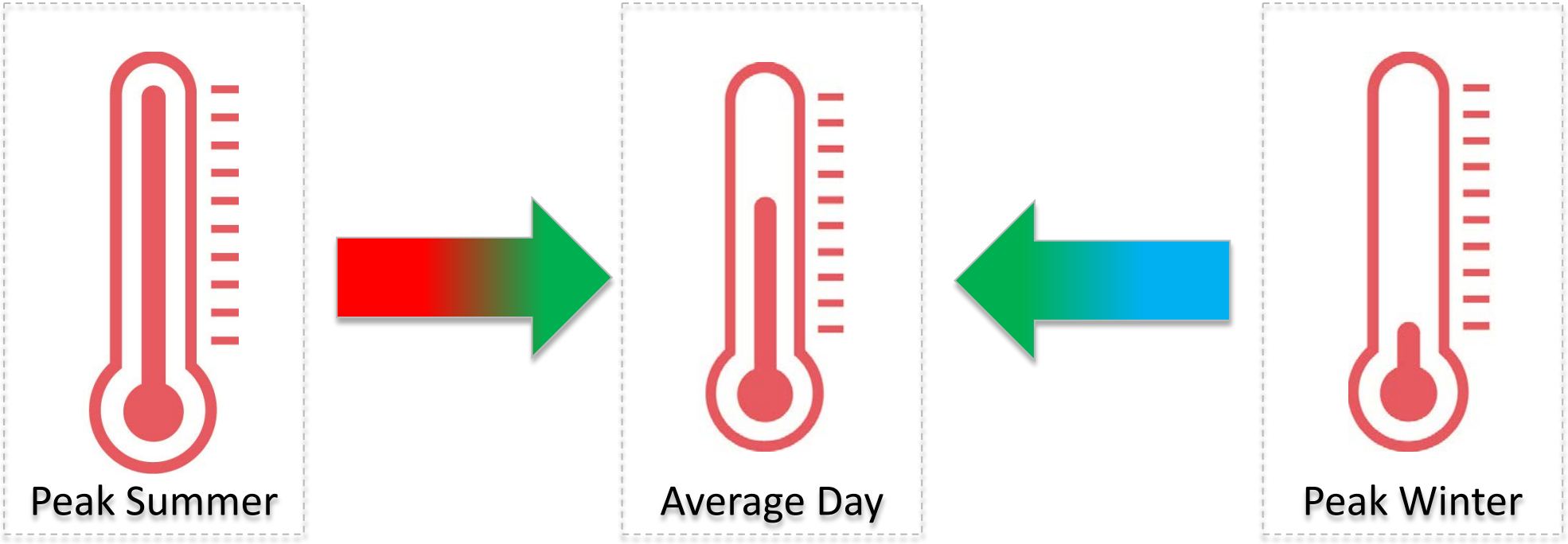


Fresh Air & Evaporative Packages

4. OREO | Cooling | Capacity & Variables

- Capacity, How Much?
- Policy, have you got one?
- IT Heat, do you measure it?
- Variables, weather, growth?
- Resilience, back up modules?

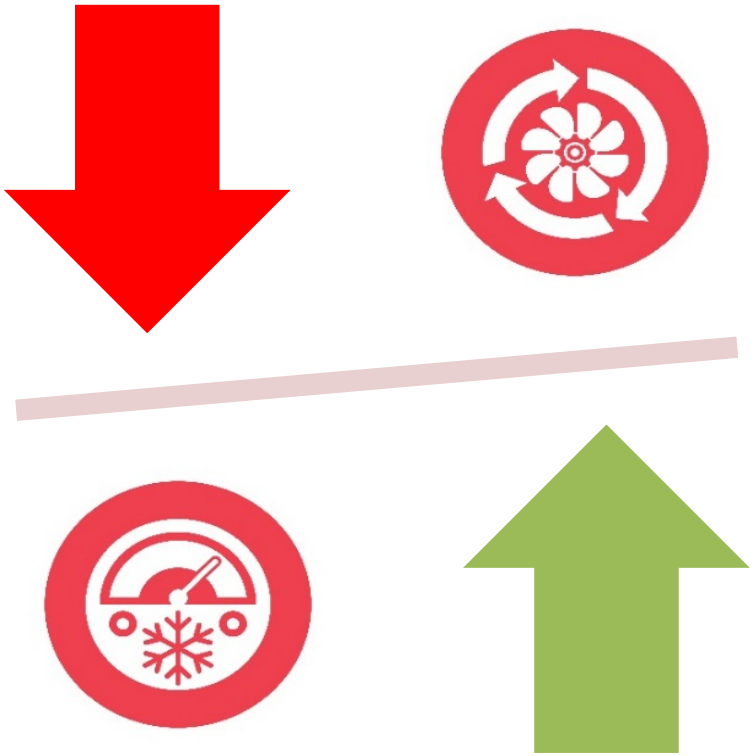
"Capacity required fluctuates due to a number of Variables"



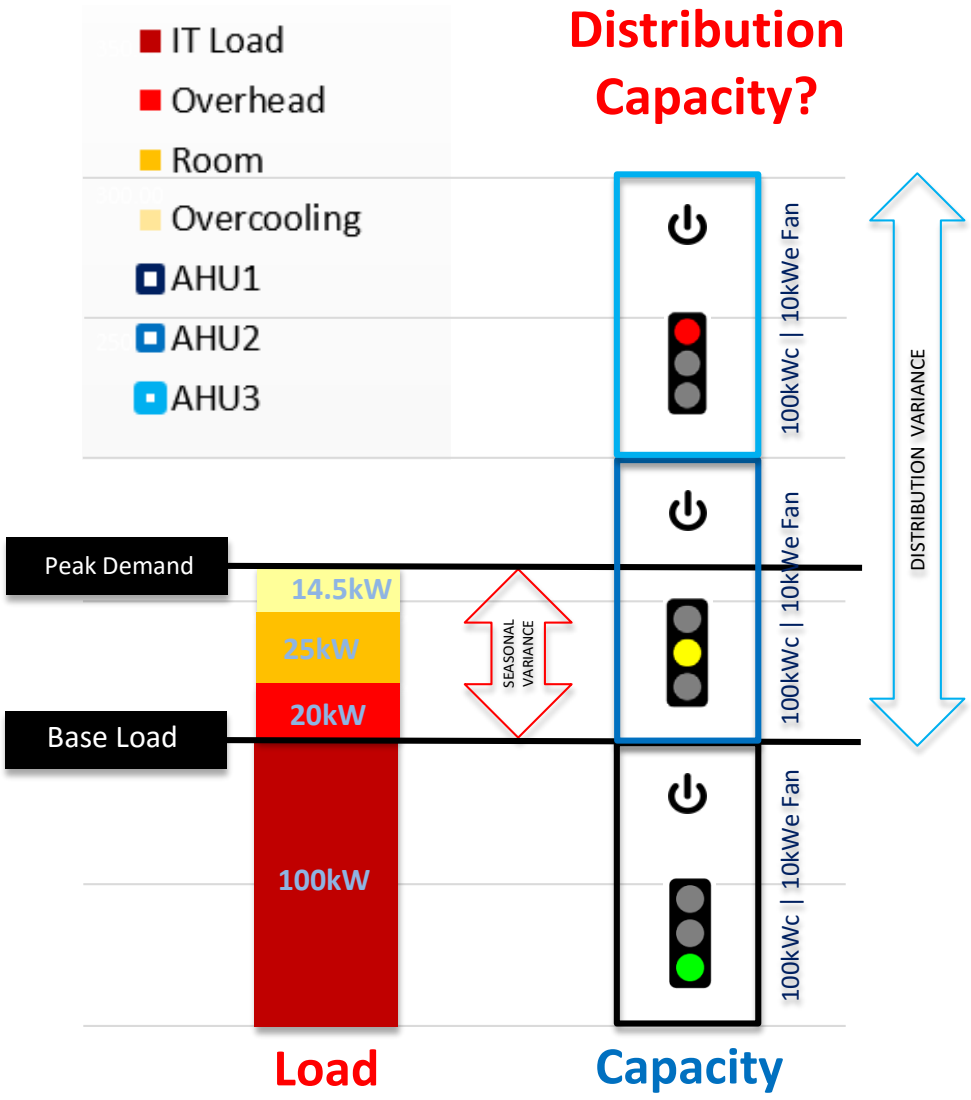
4. OREO | Cooling | Energy Consumption

- What **Consumes** Energy?
- Conventionally
  - Cooling **Generators** i.e. consume Energy Thermostatically?
  - Cooling **Distributors** i.e. consume Energy Constantly?

OREO delivers a technology solution where Generator and Distributor Energy is proportional to the varying Load requirement



4. OREO | Cooling | Capacity Engagement

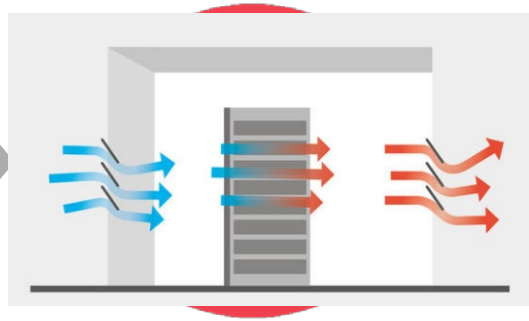


Avoid running everything all of the time

Fans & Pumps

Refrigerators

In Fresh Air Applications Refrigeration may only be required for a fraction of the year

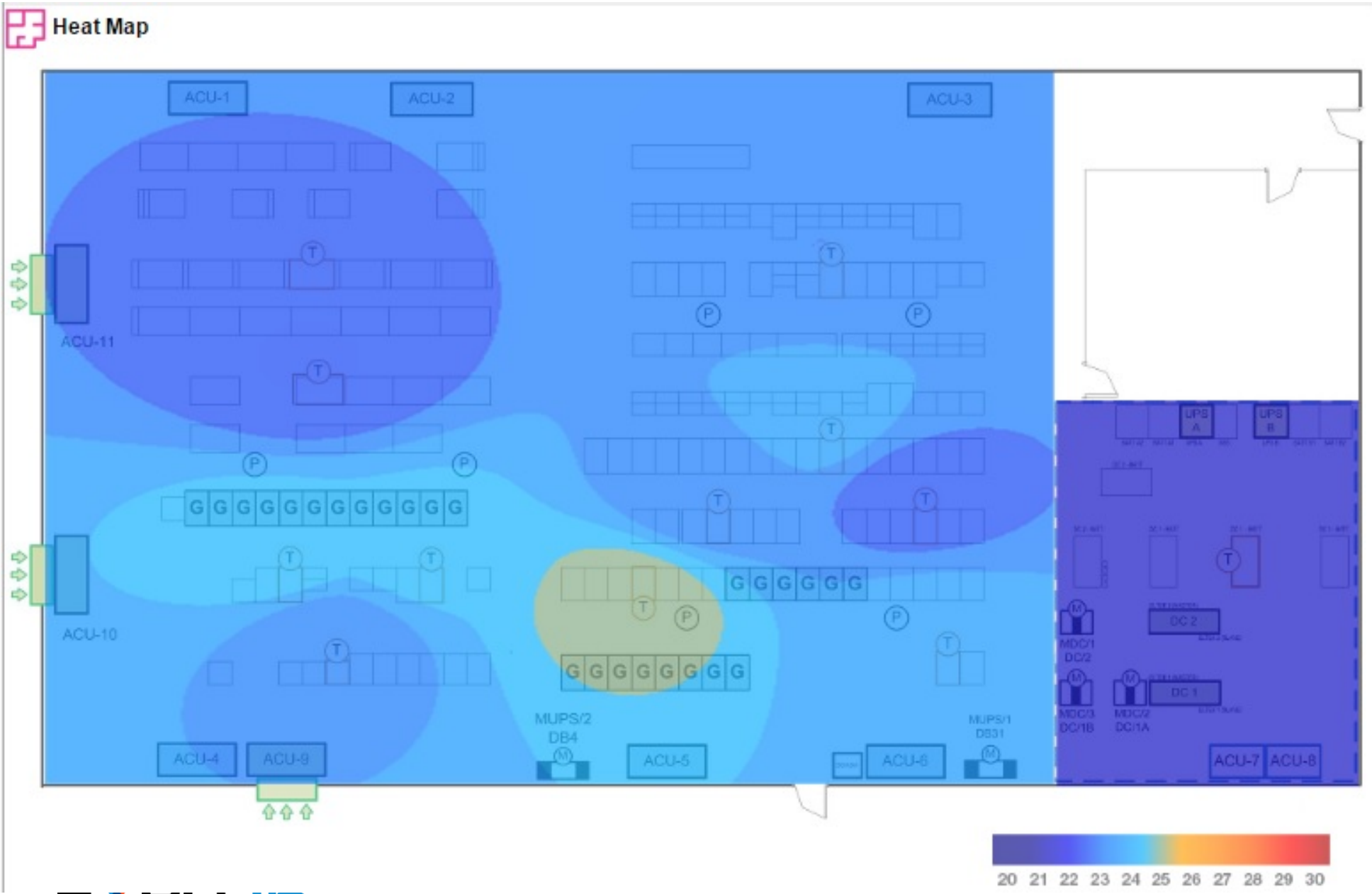


Total Energy Performance

Fan Run Costs

- If, Run 3 all year $26,280
- If, Run 1.5 all year $13,140
- If we then replace with EC fans….$7,884
- Potential saving $18,396 p/a

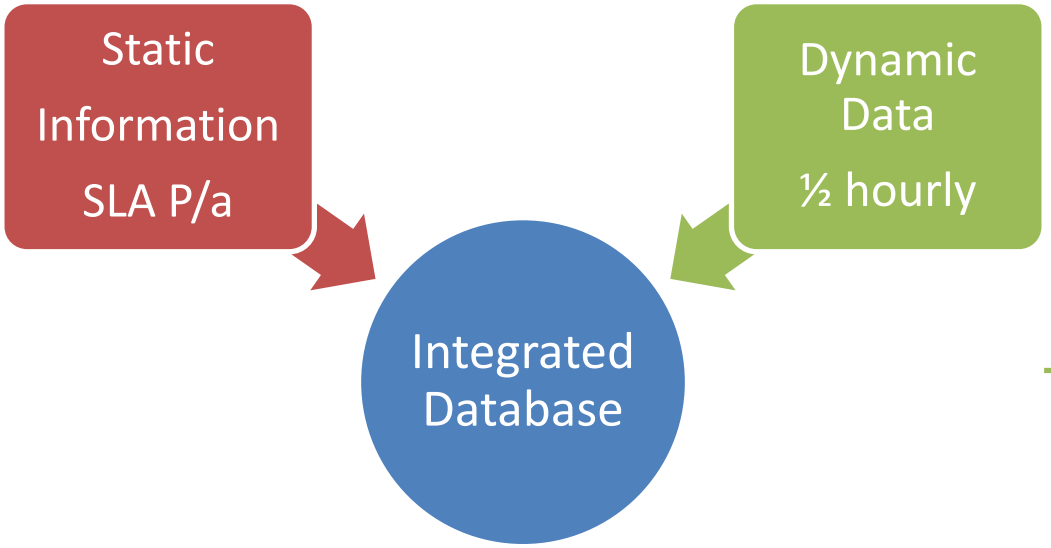
SAVING COOLING ENERGY MEANS REDUCING COOLING PROVIDED!



Where does it all start?

- Where all Research Starts…
- With Engineering Data & Information
- Accuracy & Accessibility?

Integrated Information

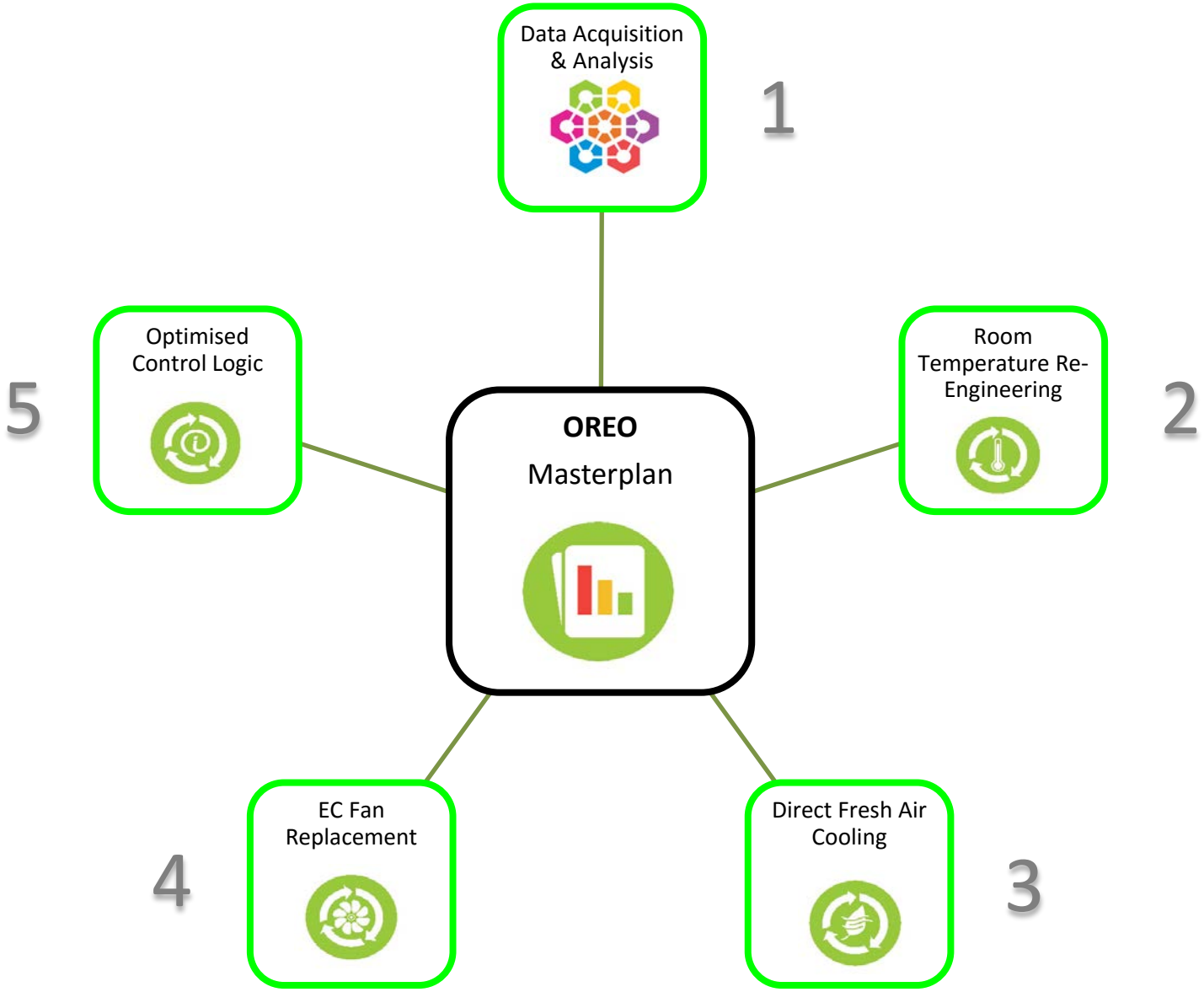


Static	Site Information
	Asset Information
	Standards
	Documentation
Dynamic	Billing Data
	Power & Energy Data
	Environment Monitoring
	Faults & Alarms

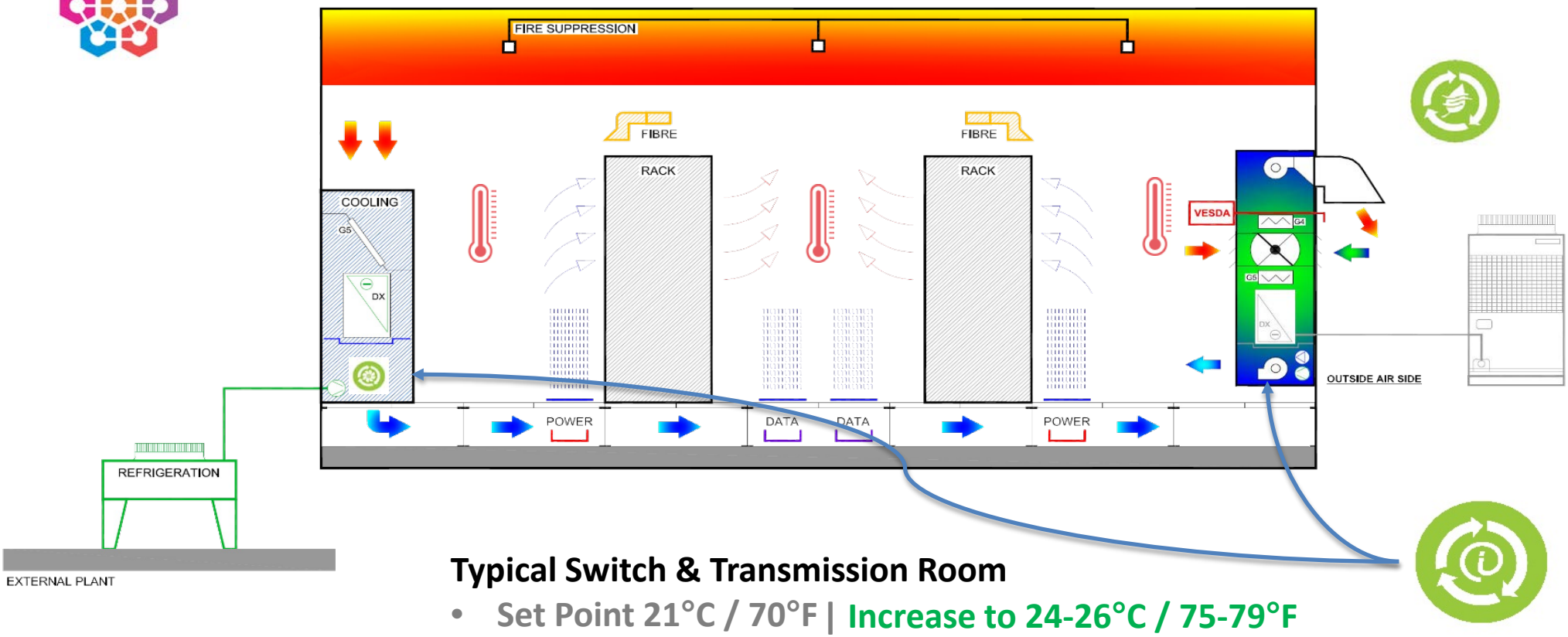
IRIS Modular Support Systems

OREO Management Platform and Spring Board into DCIM

6. OREO | Outlined Solution



Typical Project Improvement Example – AS EXSITING



Typical Switch & Transmission Room

- Set Point 21°C / 70°F | **Increase to 24-26°C / 75-79°F**
- DX Cooling | **Introduce Free Cooling**
- N+1 Hot Standby | **OREO Room Capacity Control & Cold Standby**
- Active Overcooling 86% | **Results in Overcooling limit 20%**

7. OREO | Trial Project Data

Proof of Concept Builds								
Site	Environment Category	Size of Data Centre (m^2)	IT Load Annual Average (kW)	Average PUE Before	Average PUE After	Energy Saving kWh 1 Year	% Site Energy Saving 1 Year	Money Saved ($/Pa over Benchmark) $0.12/kWh
Site-A	Type 2	818	337	1.74	1.21	1,561,350	30%	$187,362
Site-B	Type 3	481	127	2.08	1.65	483,272	20%	$57,992
Site-C	Type 2	295	124	1.9	1.6	323,704	15%	$38,844
Totals & Averages				1.91	1.49	2,368,326	25%	$284,198

The RAG colour bands represent order in % of energy saved. However it should be noted that when we factor in the portion of the Technical Facility Developed in these trials the improvement initiative results become more linear.

- Site-A, (1 of 1 Data Centre Developed representing 100% of the IT load)
- Site-B, (1 of 2 Switch Rooms Developed representing 85% of the IT load)
- Site-C, (1 of 2 Switch Rooms Developed representing 50% of the IT load)

For the purpose of this, SCTE Submission the energy savings have been monetised in American Dollars and are based on a unit rate of $0.12/kWh

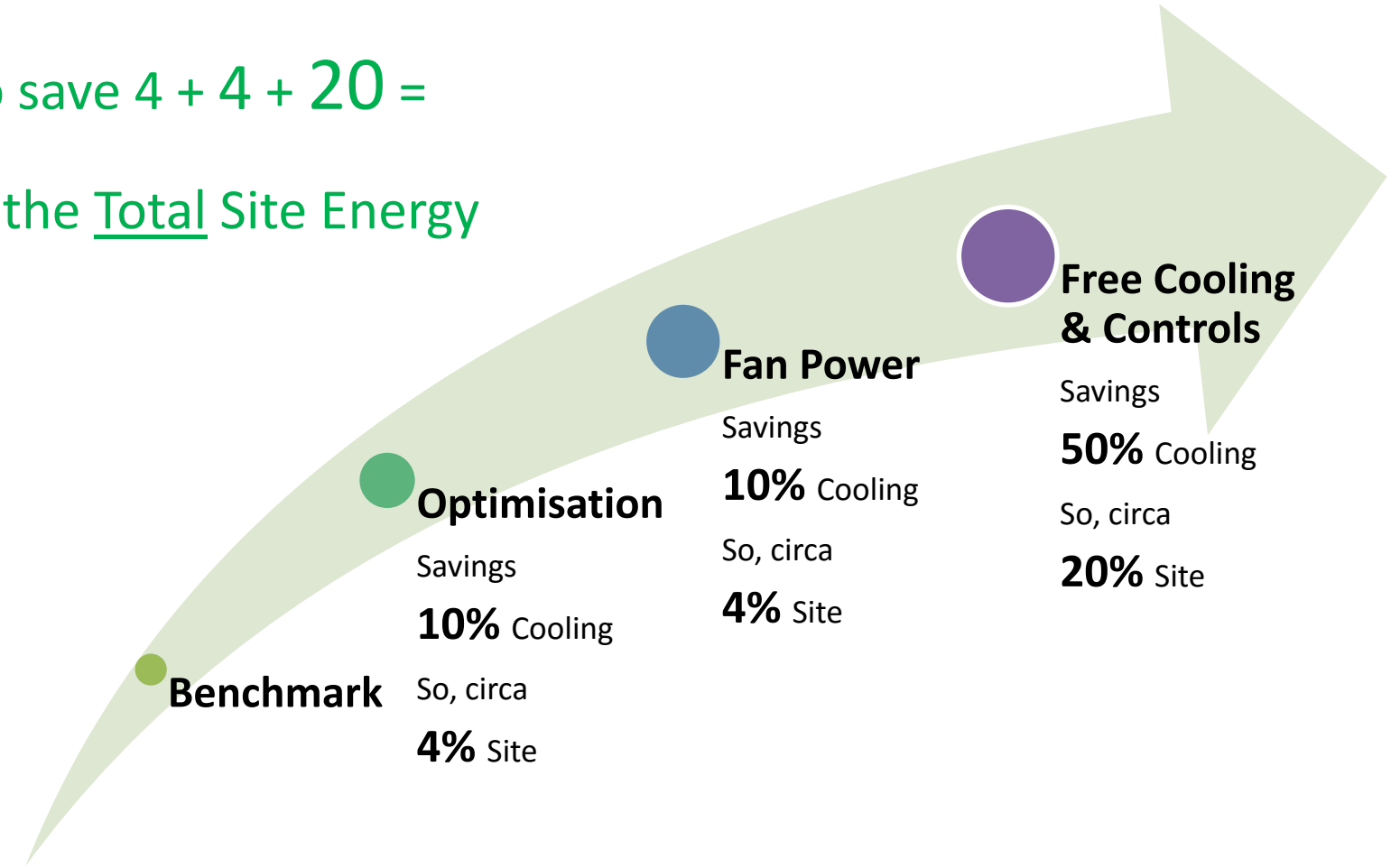
8. Performance Summary

Lets put these **Energy Savings** into **Context?**

- When we deploy **OREO** to **Existing Rooms** in which **100% of Network Load** is accommodated and the Sites are Technical Only i.e. not Corporate Facilities

- Potential to save 4 + 4 + 20 =

  28% of the Total Site Energy



9. OREO | Summary

- Establishing our OREO Plan took 4 years
- During this time we developed an ability to save up to 28% of our Technical Estate Energy Consumption
- We decided, if ‘Payback Period’ > 4years = **DON’T DO IT!**
- Some ‘Energy Saving Potential’ comes as a result of replacing components in existing Assets i.e. Fans, we decided after the trial not to do this if the Assets were more than 10 years old
- When we reduce Cooling Capacity to save money we must have eyes on Business Overheating Risk
- **Our current Deployment Programme to 68 Sites is looking to yield savings in the region of $6.4m p/a**

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NABISCO
Milk's Favorite Cookie
OREO
LIFT
EASY OPEN PULL TAB
CHOCOLATE
SANDWICH COOKIES
NET WT
14.3 OZ (405g)
OREO
ORIGINAL
1 OREO
(11g)=
53 kcal
3%
GDA*

Infrastructure

- Establishing a **'Real Time' Management Database** is Key and could be considered a **Vital First Step**

- Collect data from all native sources **(M&E Plant, SCADA etc)** before deploying any overbuilt or 'GAP' monitoring!

- **Agree Calculations & Access Tools** to ensure Compliance & Track Record can be determined <u>without</u> repetitive excessive Consulting