

Working with



## Data Centre Energy & Cost Efficiency Simulation Software

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**Overview of Tools**

**Structure of the BCS Simulator**

**Input Data**

**Sample Output**

**Development Path**

# Overview of Tools

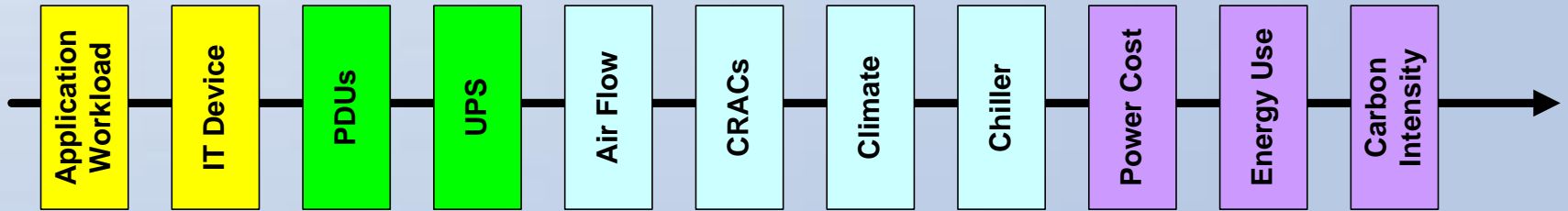
- Existing tools
  - Computational Fluid Dynamics
  - Server benchmarking
  - Chiller technology comparisons
  - Carbon ‘calculators’
  - Device specific comparators

The data centre is not a set of independent components that can be individually tuned

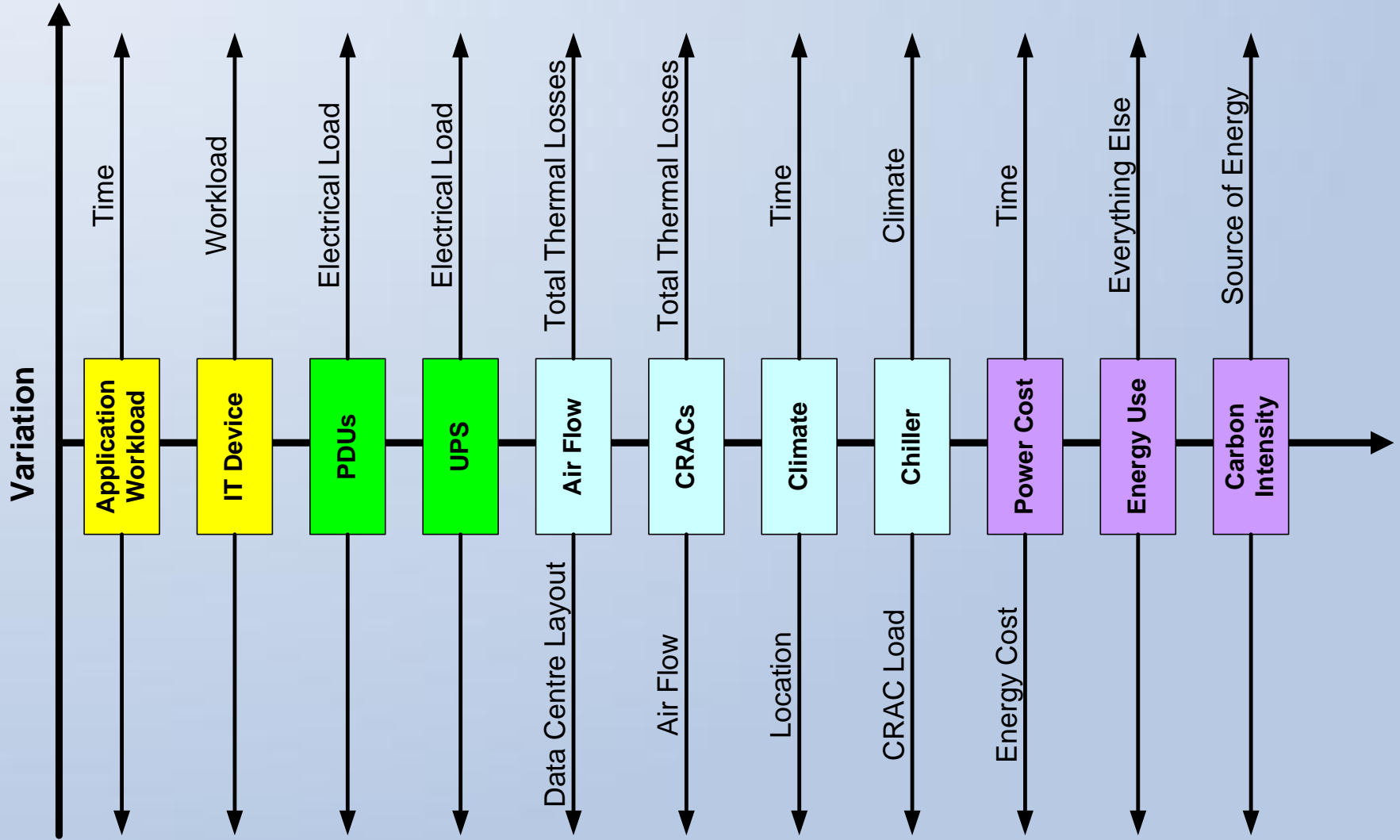
The data centre is a complex and interdependent system

Only a holistic tool can give useful answers

# BCS Simulator Coverage Areas



# BCS Simulator Understands Variability



# BCS Simulation Tool

The BCS model is the minimally complex solution to cover the problem domain

The simulator implements the model

The user interface provides a wrapper for the simulator

# Framework Tool

One tool to cover the entire system, allowing the simulation of components in a realistic context.

No need to develop more partial tools, you can now contribute to the open, trusted tool instead.

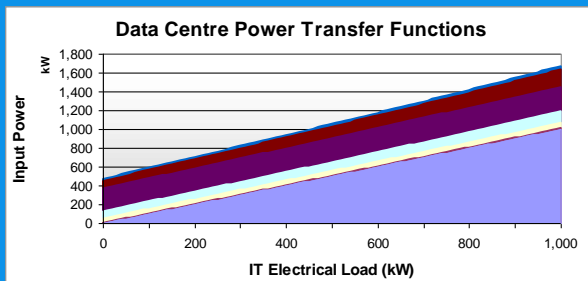
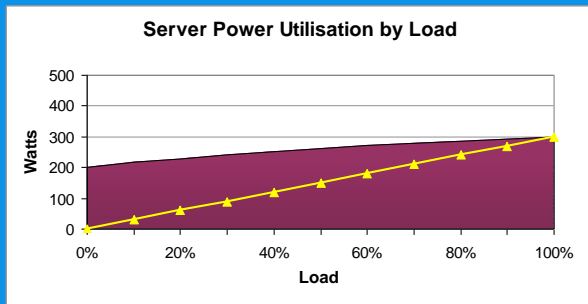
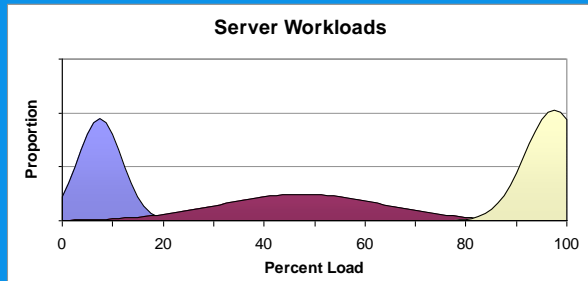
# Framework Tool

Designed to facilitate the incorporation of new or enhanced component models and data

Publish performance data in standard formats that we can use to compare devices

# Structure of the BCS Simulator

# BCS Data Centre Model

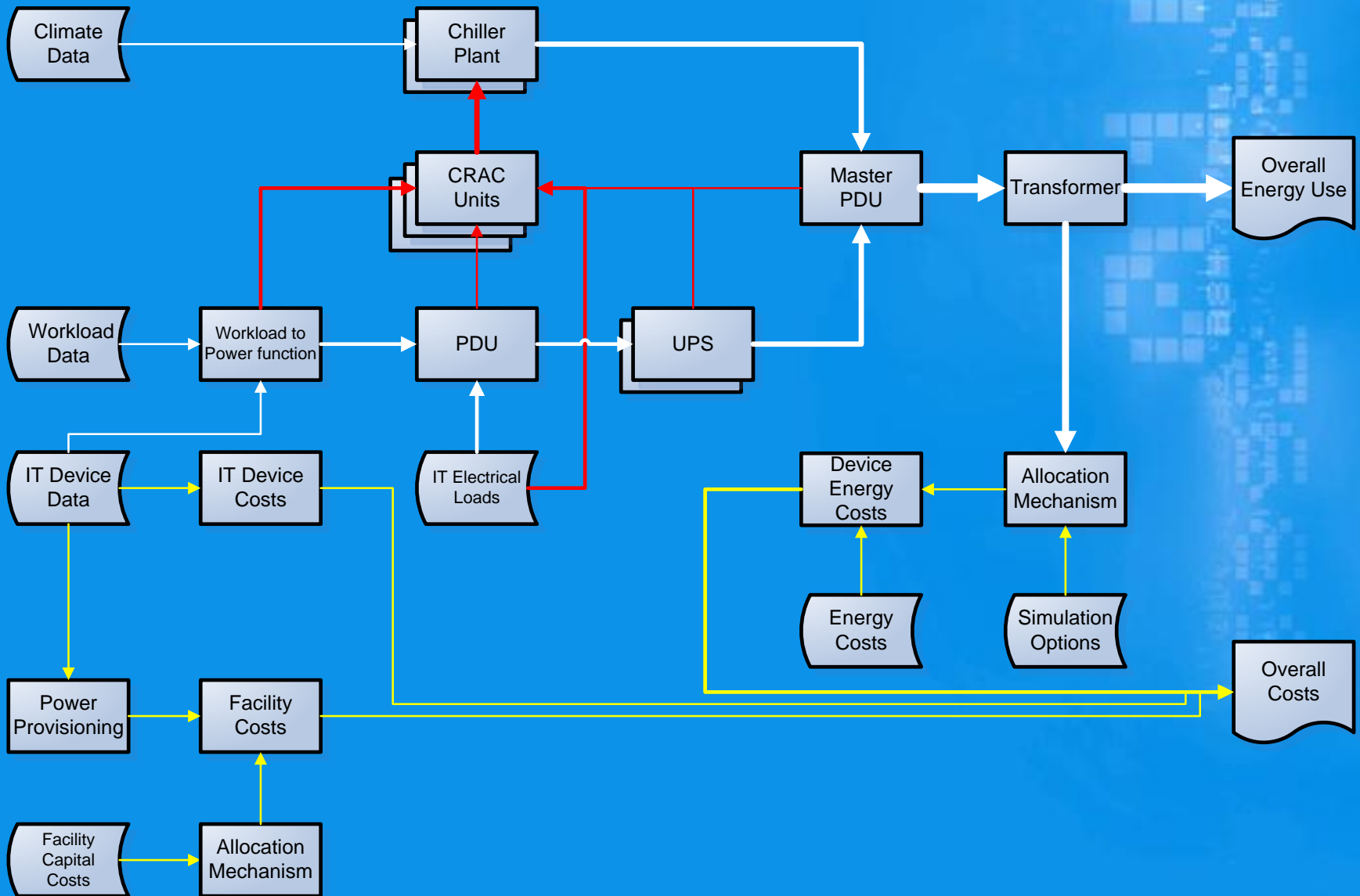


IT Workload

IT Device Load to  
Power Function

Data Centre Power  
Transfer Function

# Per Device Costs

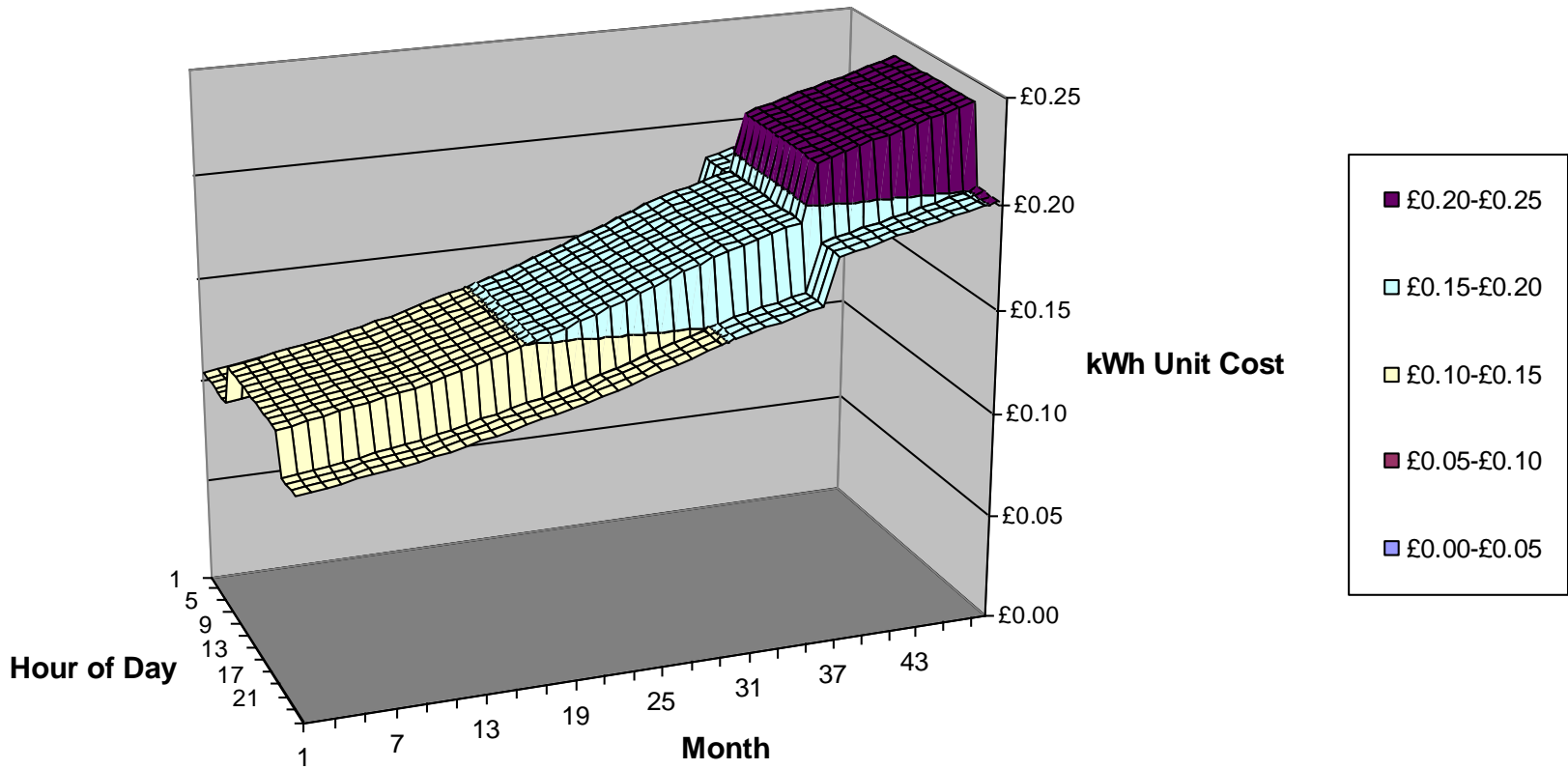


# Input Data



# Fully Representative Data

Utility Power Costs



# Sample Output

# **Simulator Output**

## **Example Scenario**

**Same Computing Workload**

**100 One App Per Server Servers**

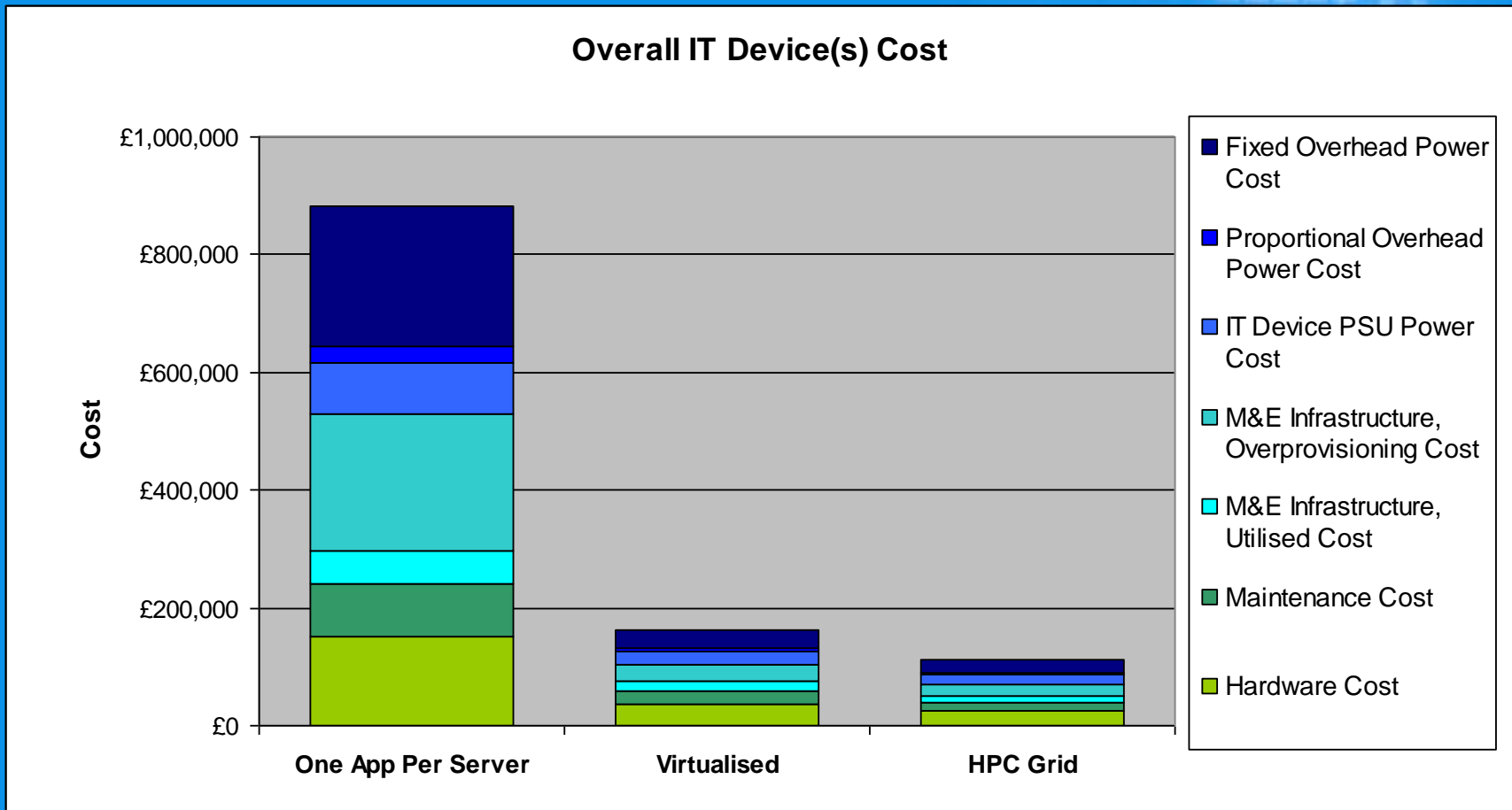
**15 Virtualised Servers**

**10 HPC Grid Servers**

**Old N+1 Data Centre, Nameplate Provisioning**

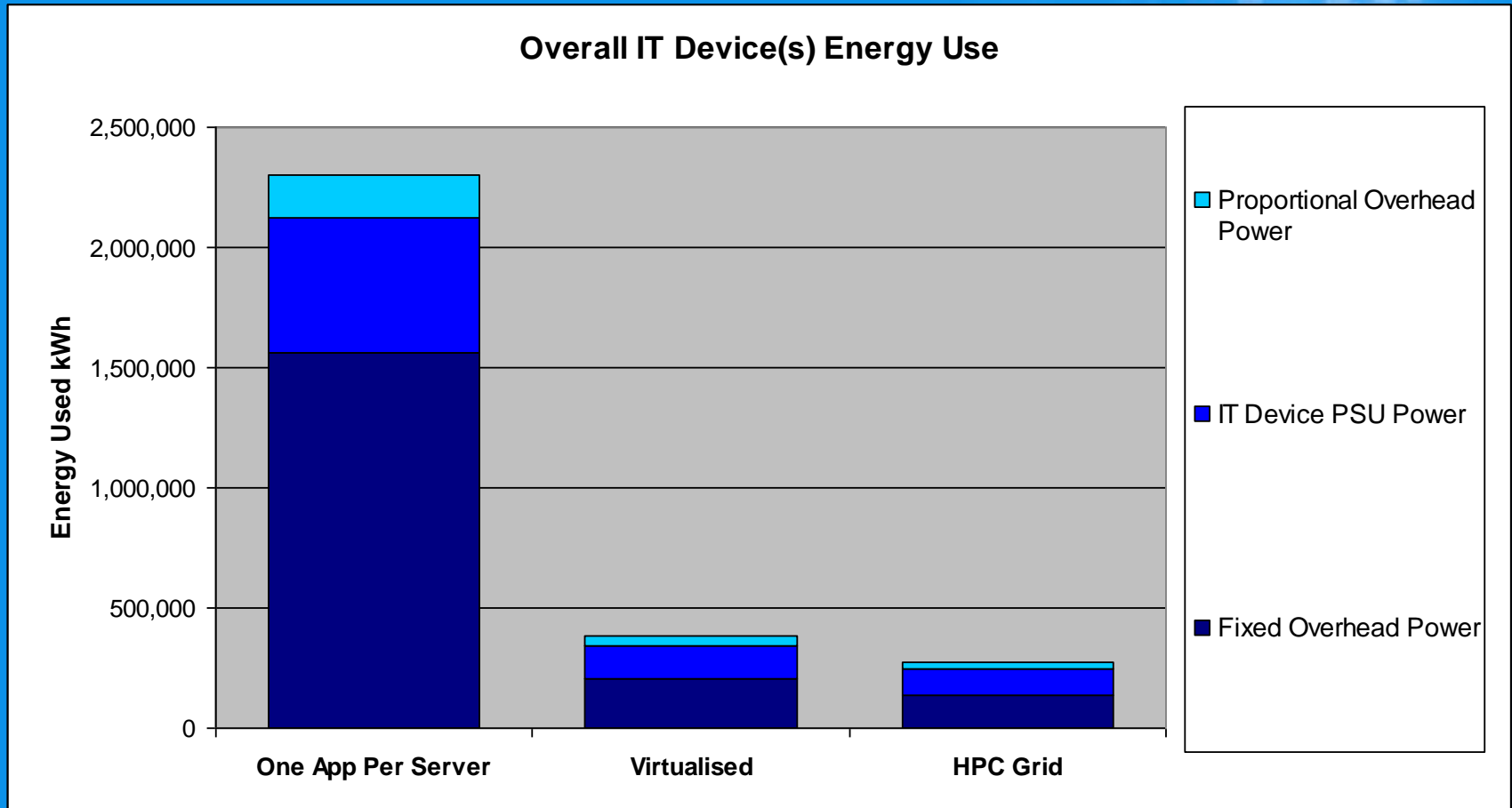
# Simulator Output

## Old N+1 Data Centre, Nameplate



# Simulator Output

## Old N+1 Data Centre, Nameplate



# Simulator Output

## Example Scenario

**Same Computing Workload**

**100 One App Per Server Servers**

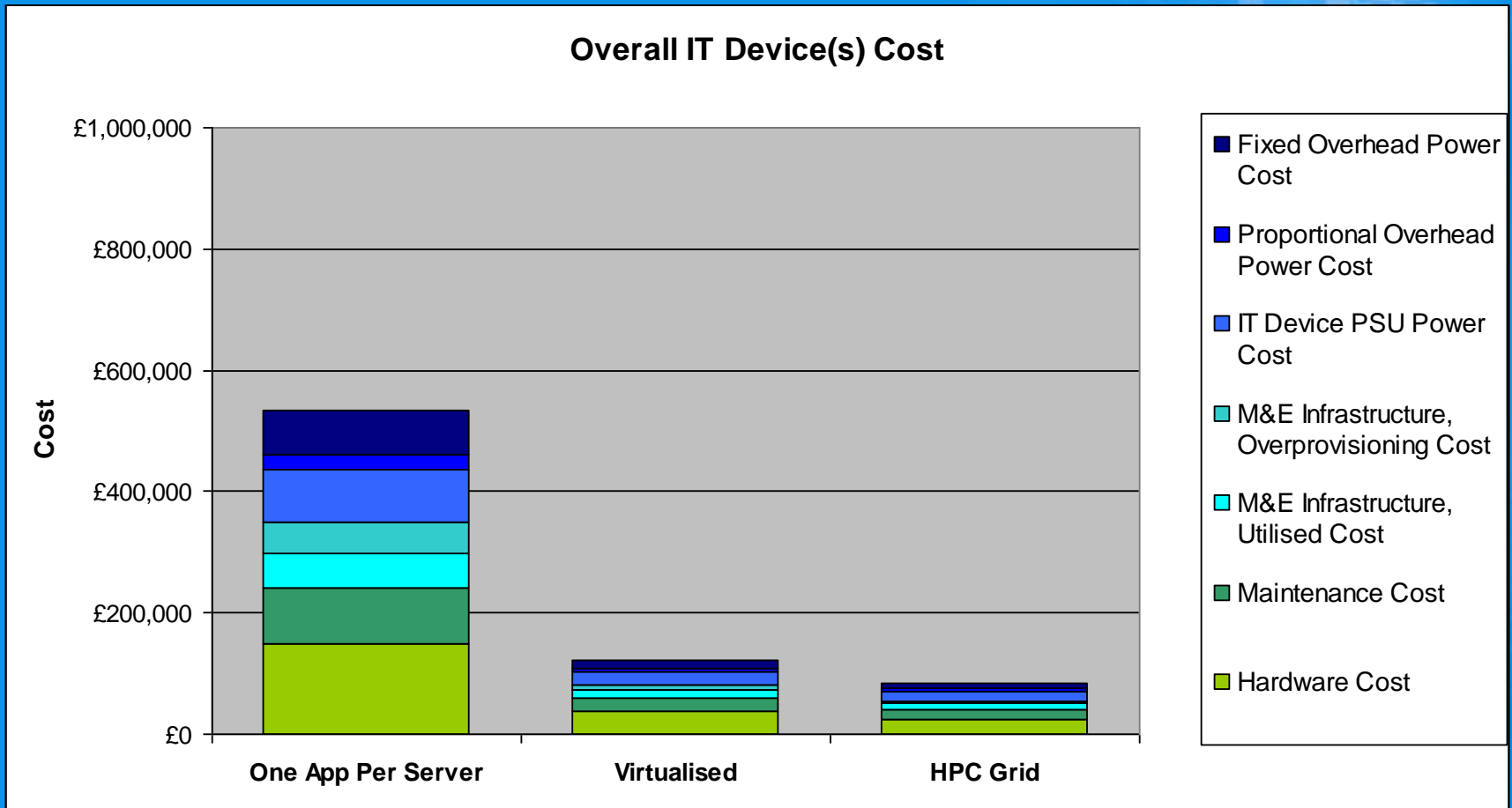
**15 Virtualised Servers**

**10 HPC Grid Servers**

**Old N+1 Data Centre, Peak Provisioning**

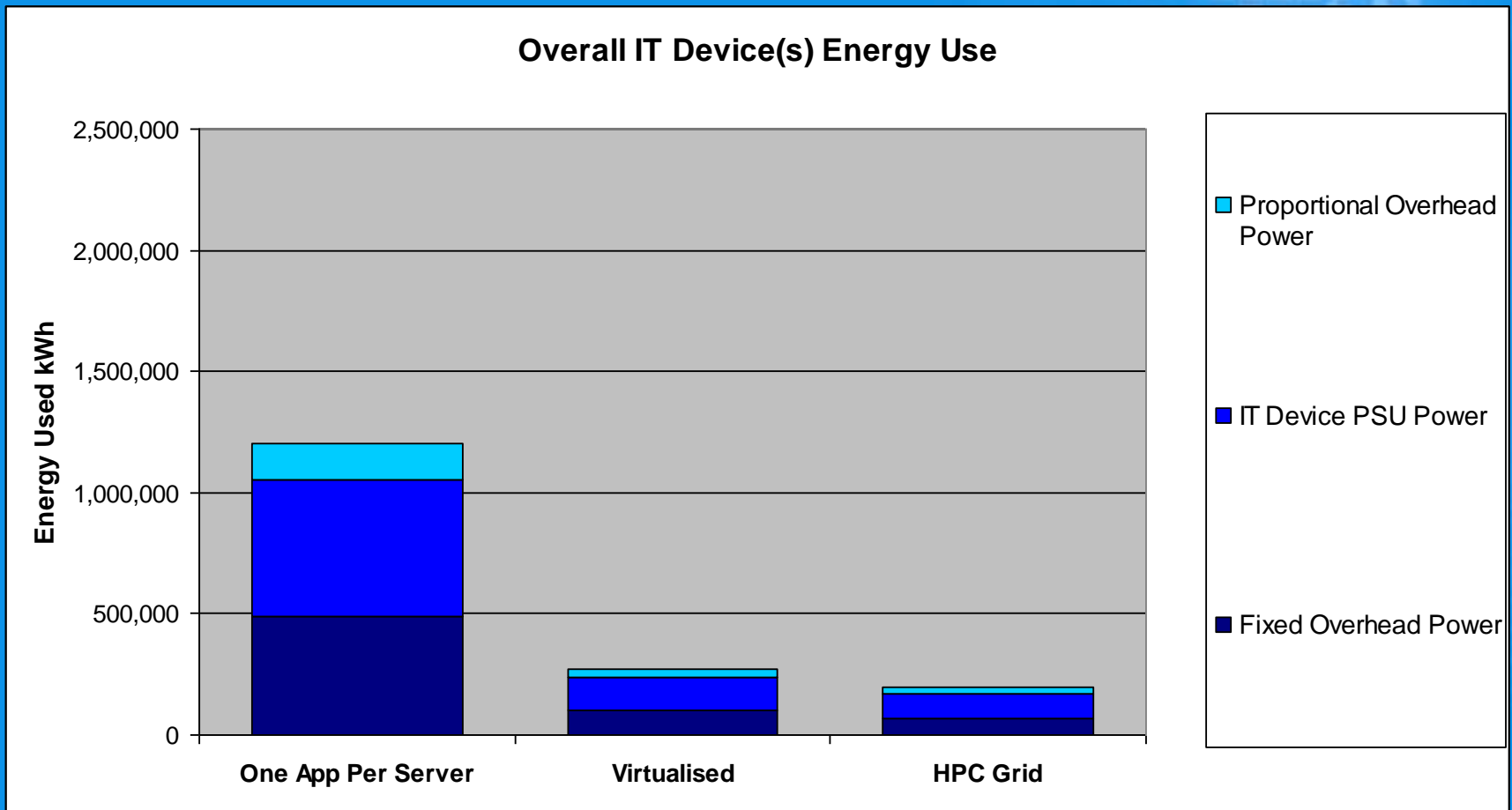
# Simulator Output

## Old N+1 Data Centre, Peak



# Simulator Output

## Old N+1 Data Centre, Peak



# Simulator Output

## EU Code of Conduct Practices

- Cooling
  - “Review and if possible raise target IT equipment intake air temperature”
    - Above the dew point
  - “Review of cooling before IT equipment changes”
  - “Rack air flow management”

# **Simulator Output**

## **Example Scenario**

**Same Computing Workload**

**100 One App Per Server Servers**

**15 Virtualised Servers**

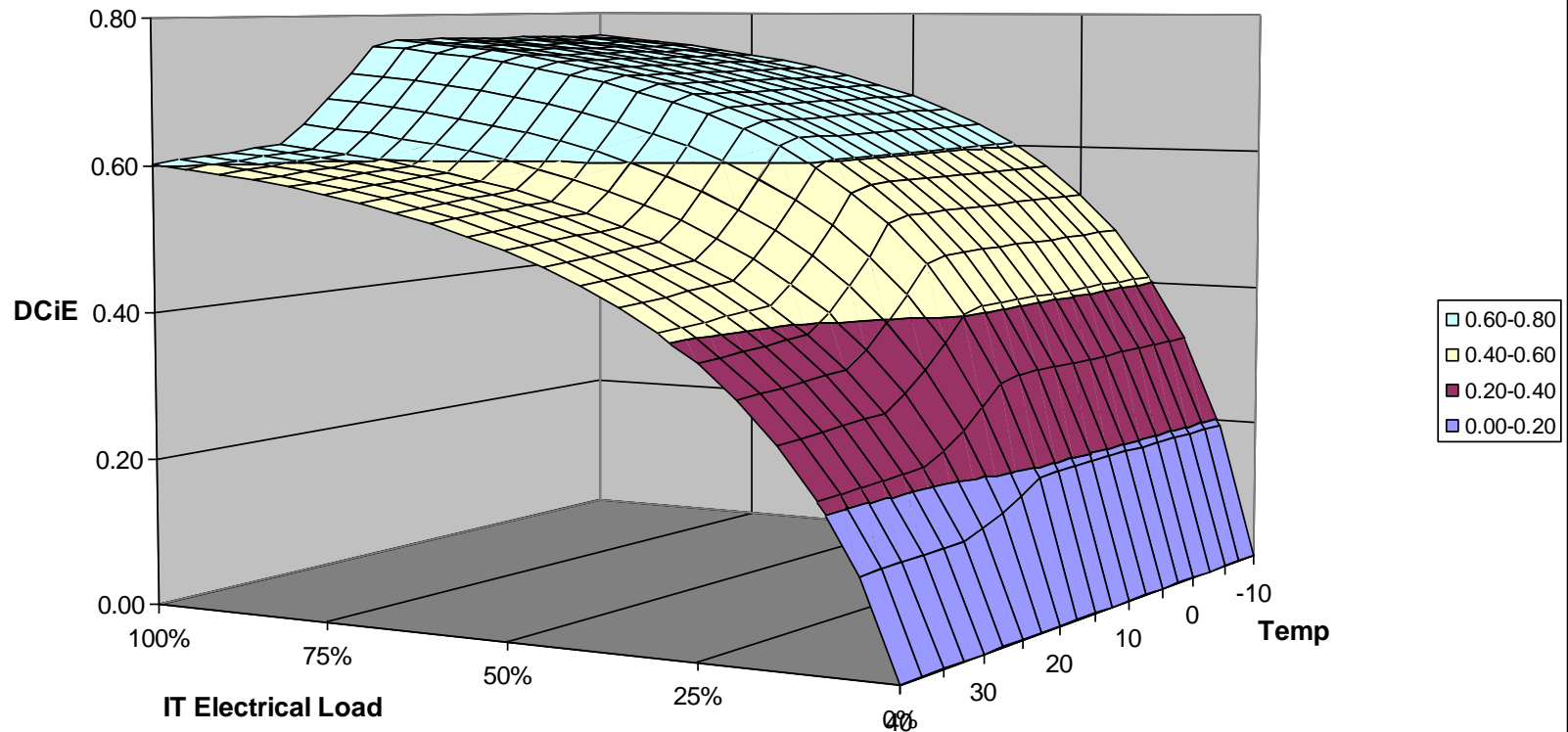
**10 HPC Grid Servers**

**New N+1 Data Centre, Free Cooling**

# Simulator Output

New N+1 Data Centre, Free Cooling 19° C

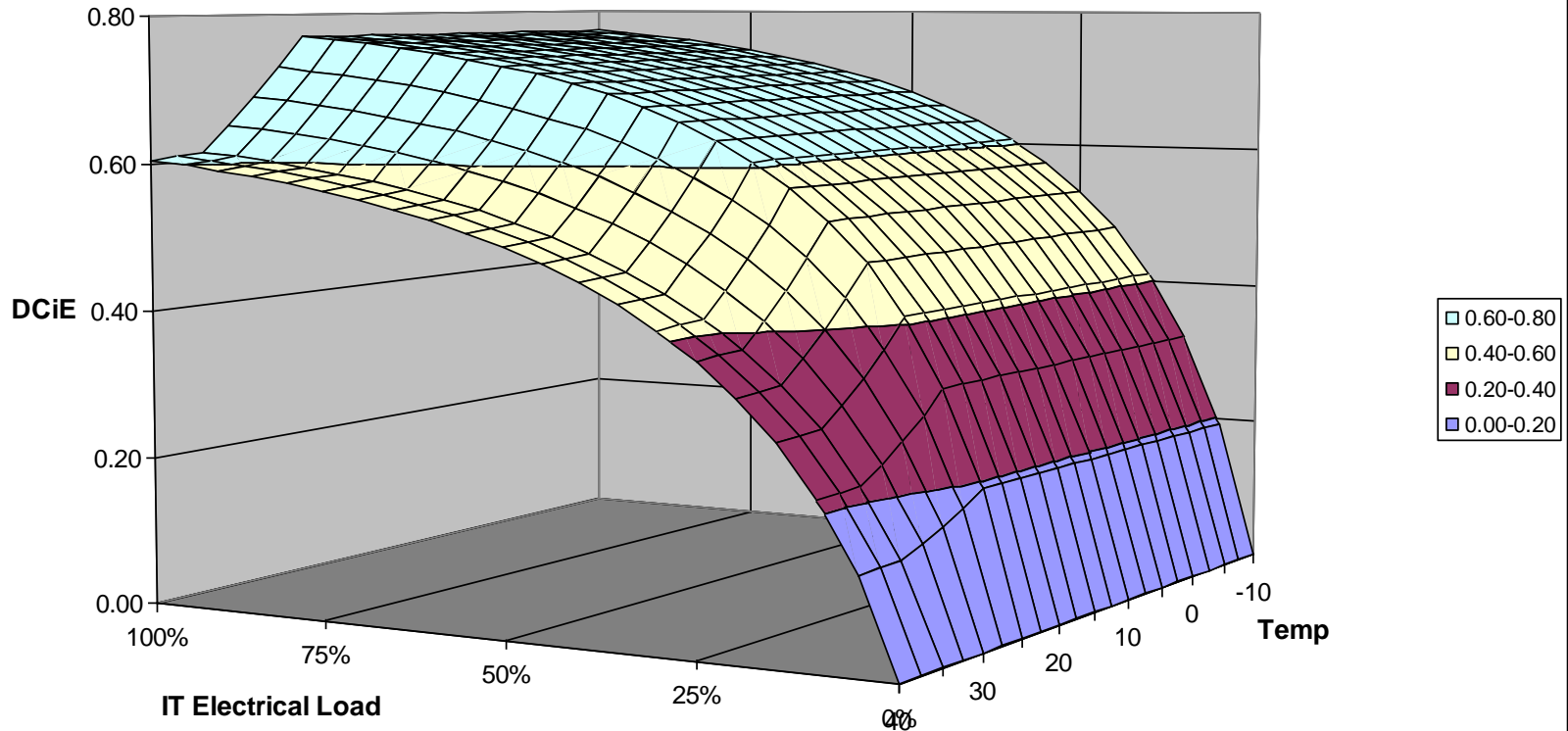
DCiE by IT Electrical Load and External Temperature for Free Cooling



# Simulator Output

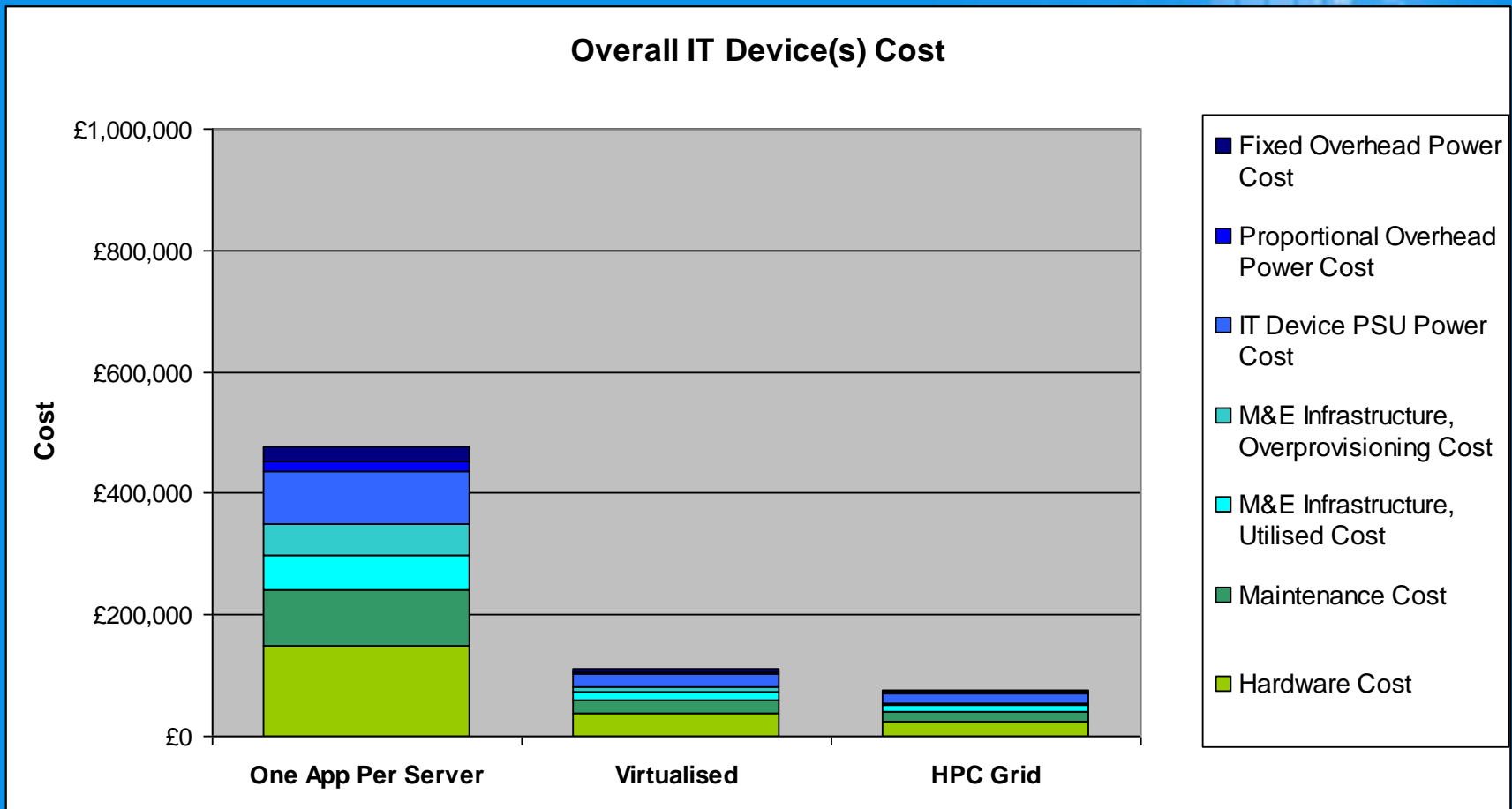
## New N+1 Data Centre, Free Cooling 25° C

DCiE by IT Electrical Load and External Temperature for Free Cooling



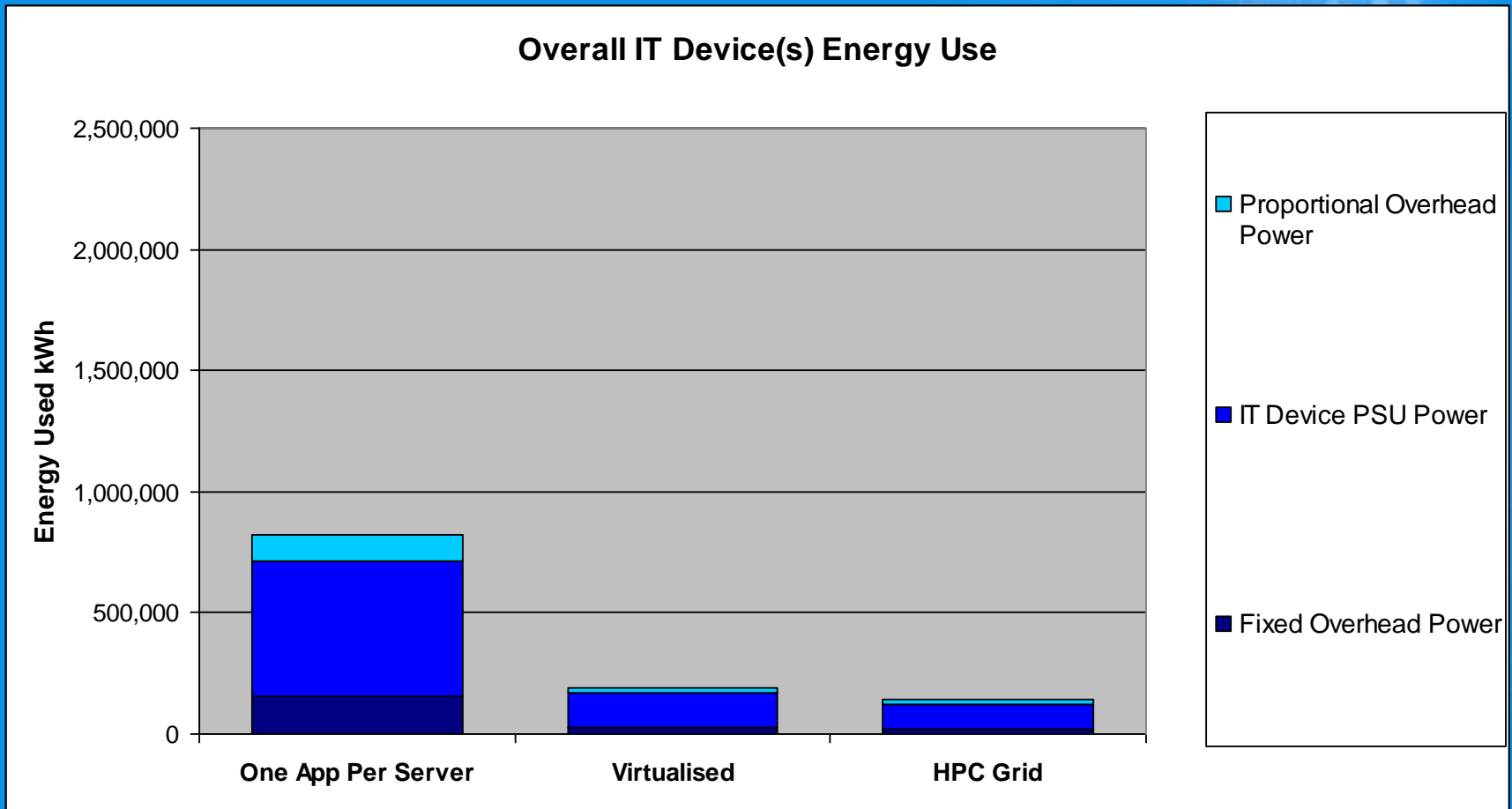
# Simulator Output

## New N+1 Data Centre, Free Cooling 25° C



# Simulator Output

New N+1 Data Centre, Free Cooling 25° C



# Development Path

# Development Path

Data Centre energy use and cost is a complex problem that we are only starting to understand

Deliver marginal and fair share, per business service energy and financial costs to enable holistic carbon management

# Thank You

## Contact Details

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