

**Voltage Power  
Optimisation**

ESTA Bristol  
19<sup>th</sup> May 2010

# A 2020 Vision for Energy Efficiency in the UK



**Presented by: Alex Rathmell**



# *The challenges*

## **Financial**

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- Volatile electricity prices
- Increasing prices over time
- Effect of recession

## **Legislative**



- Trading Schemes (EU)
- Climate Agreements
- CRC Energy Efficiency Scheme

## **Environmental**



- Copenhagen failed, now up to us
- Corporate responsibility
- UK's carbon target: 34% by 2020
- London's target: 60% by 2025

## **Technical**

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- The Energy Gap – 2014
- Effects of poor power quality
- Higher voltage than required

# Who are we?

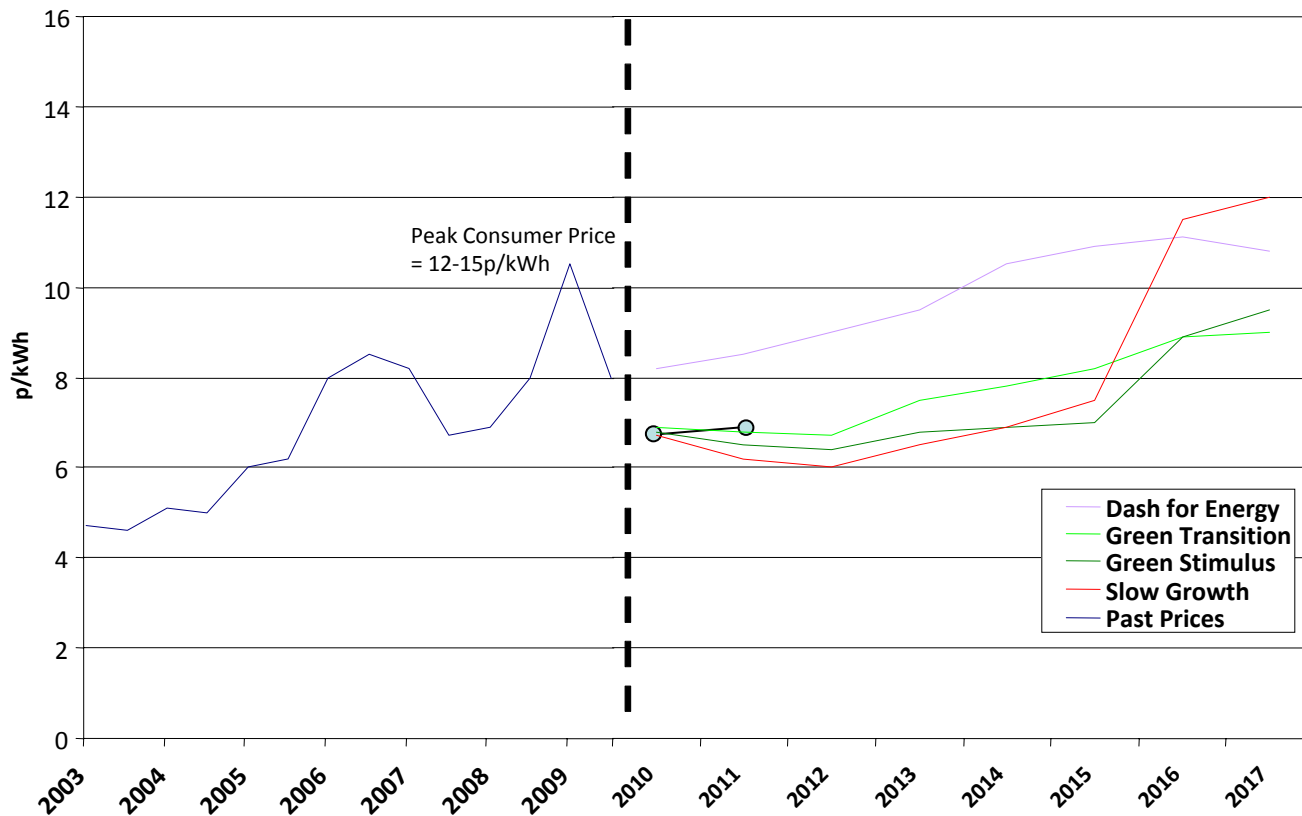


- Suppliers of **Voltage Power Optimisation** technology since 2001
- An energy-efficiency device installed on the **mains electrical incomer** to optimise voltage and improve power quality
- **Savings** result from reducing losses across the site's load, and are determined from the main utility meter
- Average saving **12-13%**, 20-40 installations per week
- The UK's **fastest-growing** energy efficiency company

(Sunday Times Fast Track 100)



# Electricity Prices – Historic and Future



Underlying wholesale prices from “Ofgem Electricity and Gas Market Supply Report”, Doc reference 23/10, 22 February 2010, page 22, Fig 4.3 (Annual Forward Contract).

Underlying wholesale prices obtained from “Ofgem Project Discovery Energy Market”, Doc Reference 122/09, Scenario, 9 October 2009, page 51, Fig 3.19.

Some of the groups who responded to the Project Discovery Price Scenarios saying they thought forward price predictions were too low:

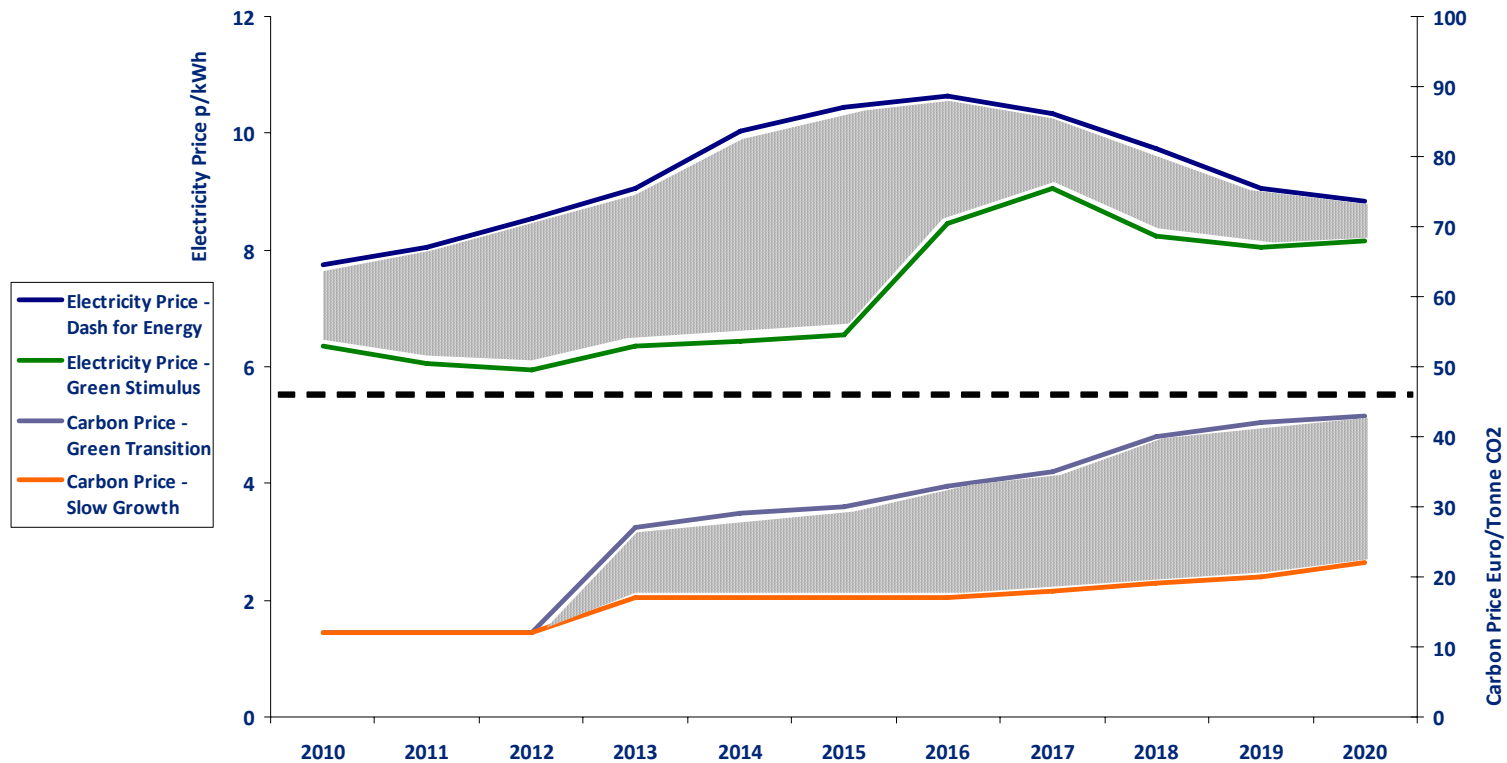
- Which
- Centrica
- EDF
- EON
- SSE



Delivery charges assumed to be 3p/kWh ○ Based on wholesale prices April 2010

# Forward Electricity and Carbon Prices

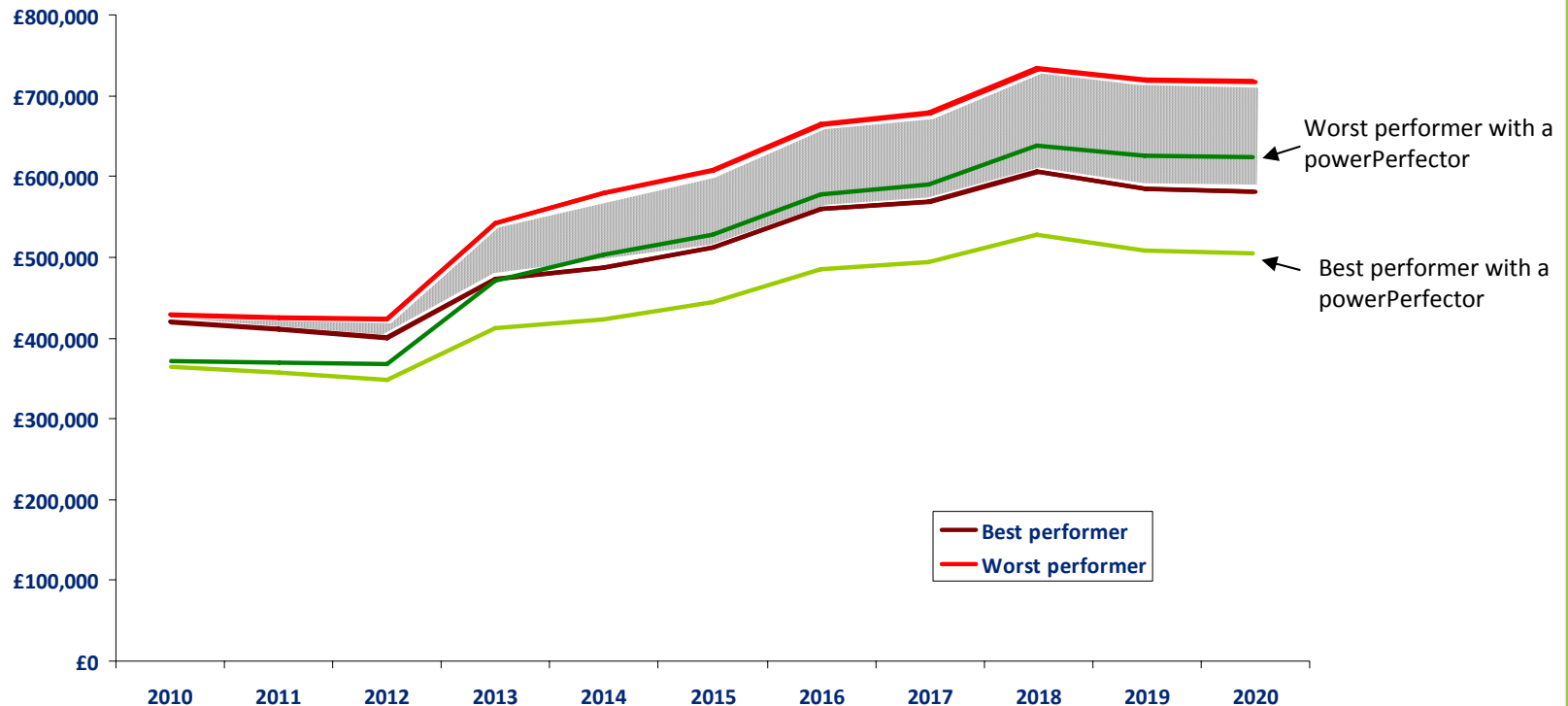
Electricity and Carbon Prices, 2010-2020



Delivery charges for electricity assumed to be 3p/kWh

# Forward Price of 6,000MWh for best and worst performers in CRC league table

Electrical and Carbon Cost of 6,000MWh 2010 - 2020



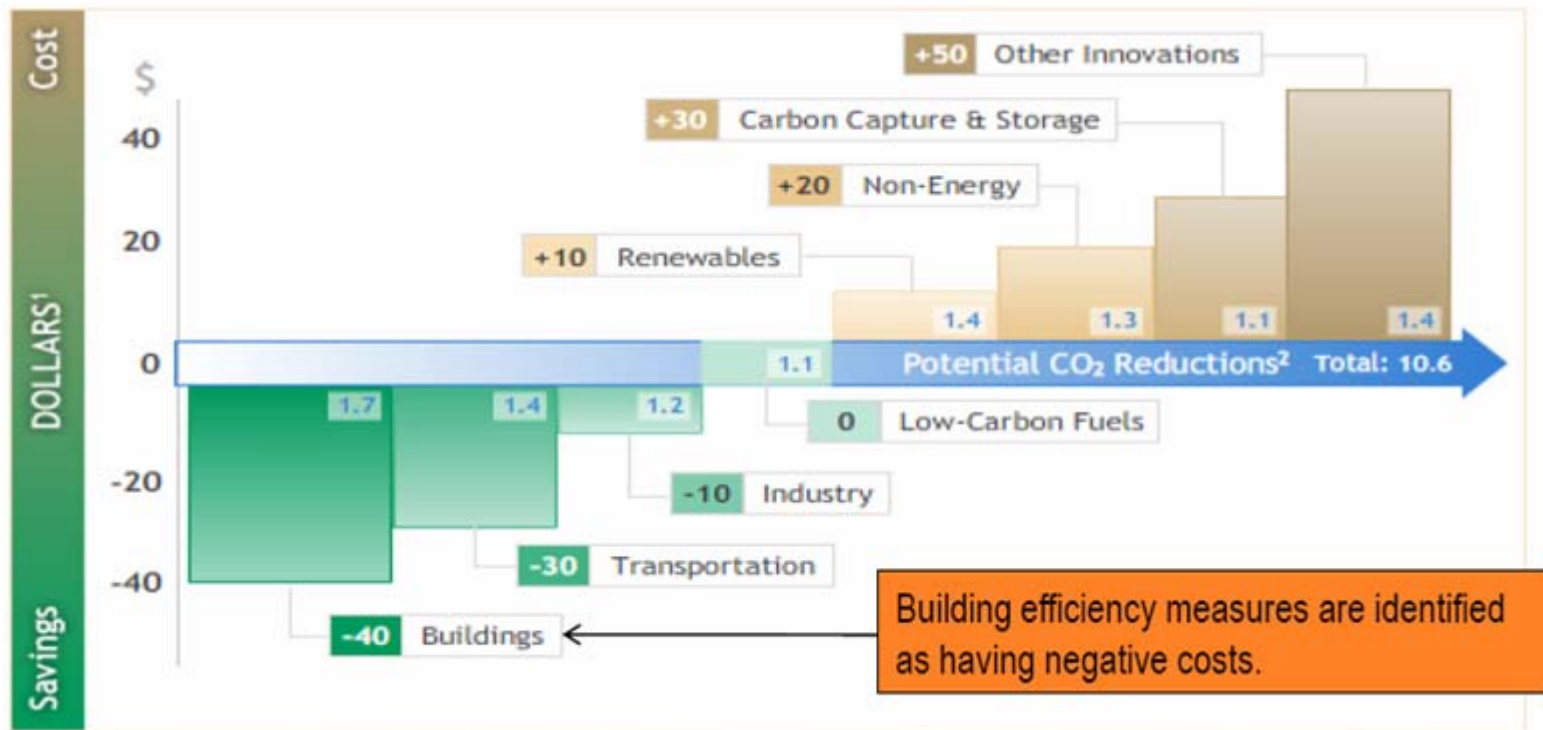
Assumptions:

1. Delivery charges = 3p/kWh
2. Electricity and Carbon follow "Green Transition" price scenario
3. Euro – Pound exchange rate = 1:1



# Why Building Efficiency? The U.S. experience...

Cutting U.S. Global Warming Pollution 80% by 2050: Cost & Payoff by Sector



Source: Natural Resources Defense Council, cited by Clinton Climate Initiative  
<http://www.nrdc.org/globalwarming/blueprint/default.asp>



# *The greatest makeover ever?*

## **Aim**

To prove the viability of energy efficiency retrofit projects to dramatically increase building energy efficiency and reduce its overall carbon output with sensible payback periods and enhanced profitability.

## **Initiatives**

Evaluated more than 60 to get to 17 viable projects and 8 that will be installed; Windows, Radiator Insulation, Lighting, HVAC, Control System, Energy Management Systems

## **Costs and Benefits**

Estimated project cost of \$20 million, annual energy savings of \$4.4 million, energy and cost reduction of 39%.  
All this from a retrofit project!

## **What of the UK?**

London Development Agency is progressing the Building Energy Efficiency Programme which is based on framework agreement to deliver guaranteed savings that will become self-funding after initial investment.



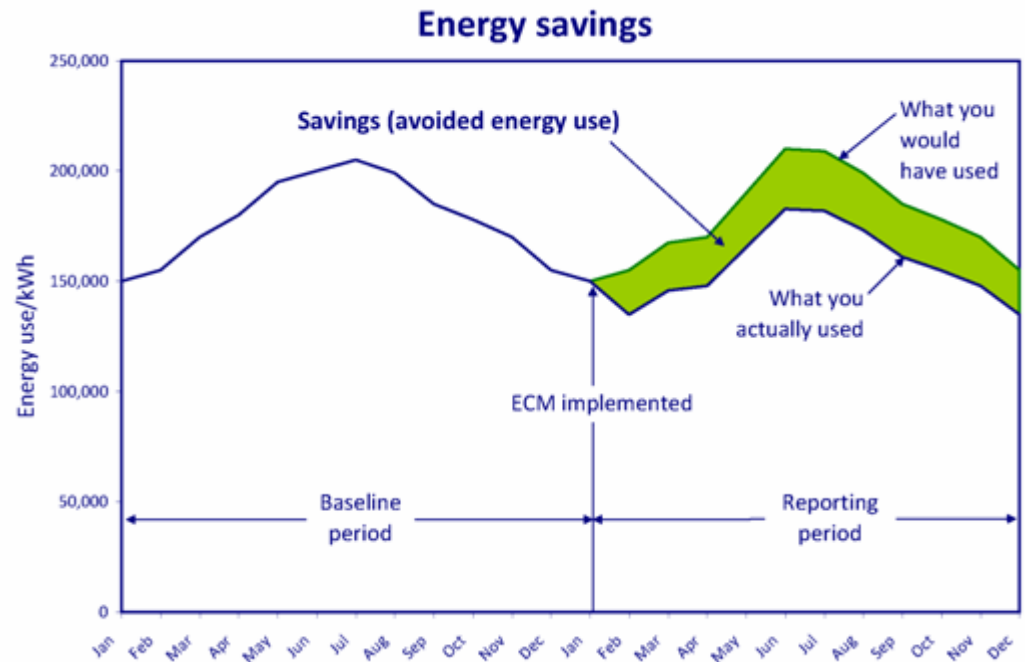
# ***Building Energy Efficiency Programme (BEEP)***

- First project to be delivered through the **Clinton Climate Initiative**.
- Aims to retrofit 1750+ public buildings in London with **energy efficiency equipment**
- Savings of **20 – 50%** identified
- Designed to **overcome barriers** in access to finance and internal capacity
- Establishment of a framework for energy services companies (**ESCO**)
- **ESCO guarantees** savings



# *The problem with guaranteed savings*

- **How are you going to measure it?**
- Customers **depend on the supplier** to tell them how much they have saved
- No **common basis** for measurement
  - Cost reduction
  - Avoided energy use
- **'M&V'** neglected
- **IPMVP offers a solution**



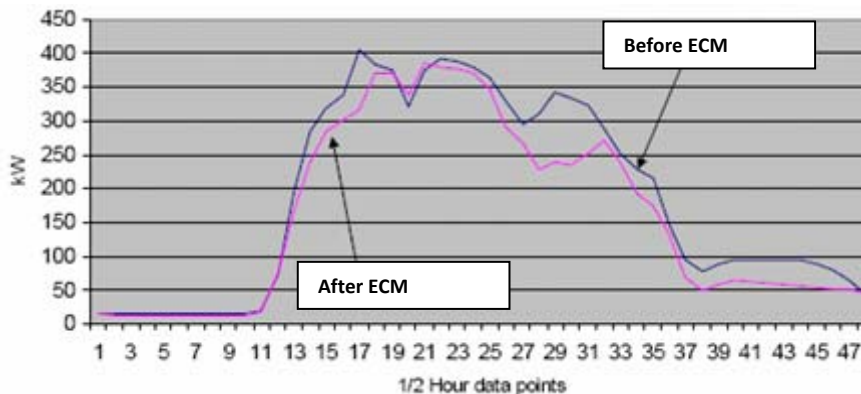
# *powerPerfector and IPMVP*

- **Savings analysis** always part of service
- Savings **guaranteed**
- **Poor understanding** in market of what constitutes an energy saving:  
*Avoided energy use*
- Most analysis simply considers a snapshot **before and after**

“Energy efficiency is recognised as one of the cleanest and most cost effective ‘sources’ of energy”

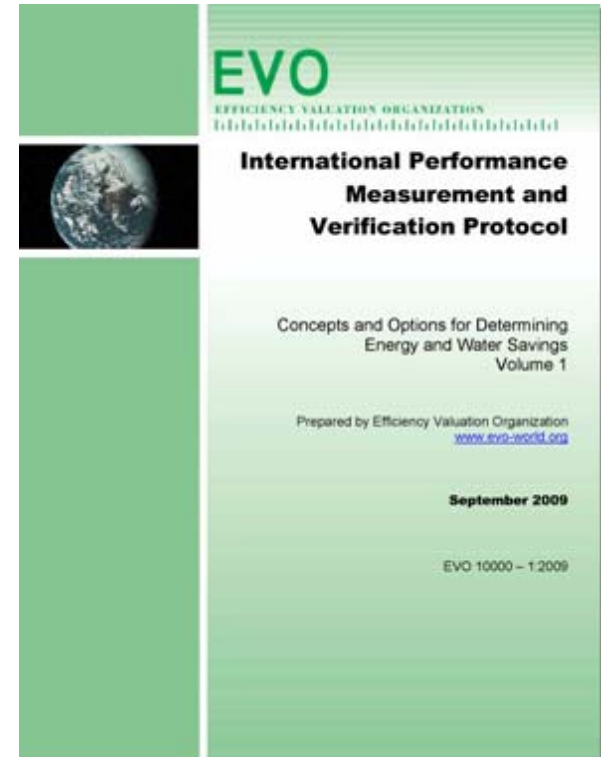
- EVO

**Bad M&V**



# *powerPerfector and IPMVP*

- **IPMVP:**
  - Provides a flexible framework for building Measurement and Verification Plans
  - Enshrines common sense and good practice
  - Provides objectivity, giving meaning to our guarantee
  - Builds knowledge of factors affecting energy use
  - Builds confidence in our technology
- **Why isn't everyone using it!?**
- An **IPMVP Option C** analysis is now integrated into our process



Baseline



M&V Plan



Install



Report




**Gather Data**

Obtain utility meter energy data and any driving variables such as weather or production

**Measurement & Verification Plan**

Create the M&V Plan using the mathematical model to commit to an analysis methodology in advance of the installation



Decide who will be responsible for implementing the plan and monitoring the site for changes such as occupancy, changes to electrical equipment and other energy efficiency measures



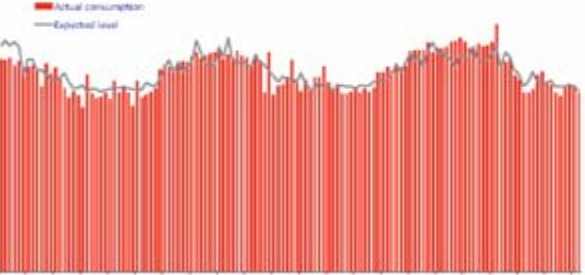
**Data & Adjustments**

Gather the observed energy and variable data. Apply the adjustments determined by variables, as detailed in the M&V Plan.



**Model**

Create a mathematical model using energy data and driving variables



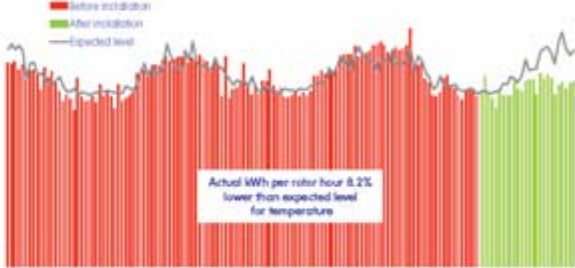
**Audit**



Record any changes to the site that occur over the baseline and reporting periods so that savings attributable to the powerPerfactor can be isolated

**Savings**

Compare actual consumption to the expected consumption derived from the mathematical model, and report the avoided energy usage - i.e. the saving.

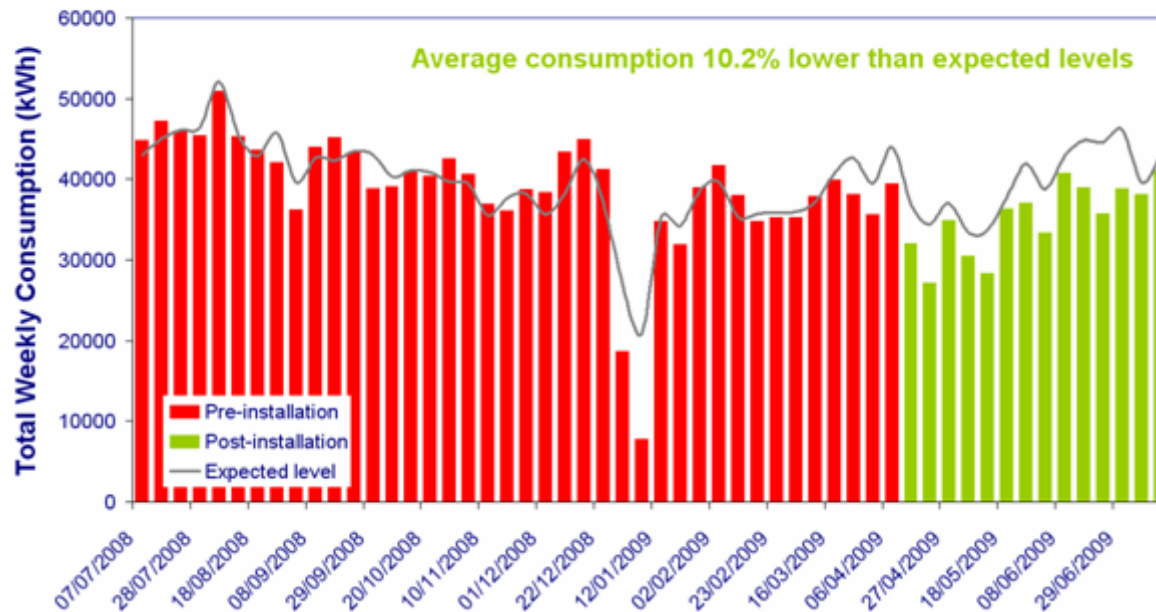


Actual kWh per cubic hour 8.2% lower than expected level for temperature

# Reporting savings

- **3 months** after installation, revisited after a year if required
- Plug in the **actual kWh** consumption
- Deviation from the model is our **saving**

Compressor Supply, Swallowfield plc.  
Actual and Expected Consumption Levels



## CASE STUDY

Swallowfield plc.  
Wellington Site  
Installed: April 2009  
Report: August 2009



Full case study available



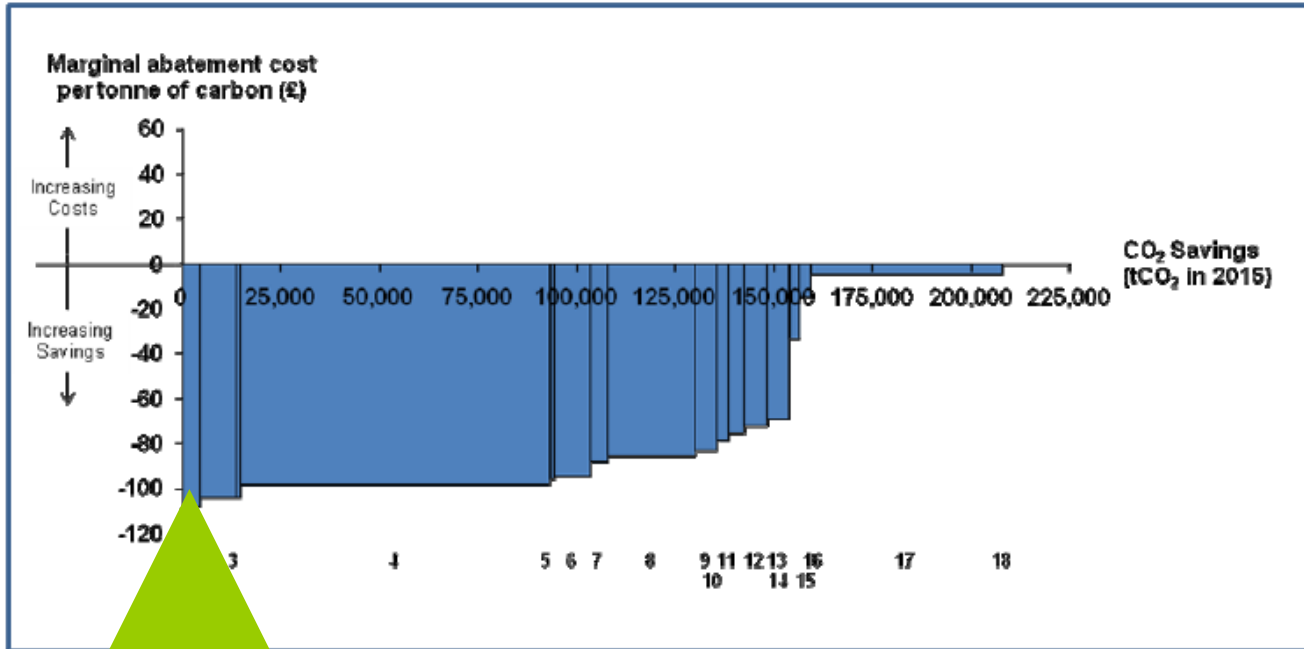
# *Investing in good M&V*

- **Good sense**
- The value of good M&V is realised if **everyone does it**
- Energy efficiency technologies and services **valued alongside** renewable generation
- **The future**
  - IPMVP already being specified in major UK contracts (e.g. the BEEP)
  - Increasing adoption outside US/Canada
  - ...Integration into European standards?
  - We will be providing IPMVP analysis services for other ECMs (not just powerPerfector)



# How does VPO rank?

## MAC Curve for Small/Medium Acute Trusts Category



*NHS Sustainable Development Unit – Carbon Reduction Strategy – Marginal Abatement Cost (MAC) Curve (AEA 2009)*

- **Voltage Power Optimisation** ranked within '**number 1**' (-108 £/tCO<sub>2</sub>)
- This is ahead of other options including:
  - Reduce heating by one degree Celsius
  - Improve the efficiency of chillers
  - CHP installation
  - Variable speed drives
  - Improve lighting controls
  - Building management system optimisation
  - Energy efficient lighting
  - Roof/wall insulation
  - Wind/biomass boiler/solar hot water



power  
**Perfector**

energy saving like no other