

**Voltage Power
Optimisation**

ESTA 2020 Vision

A 2020 Vision for Energy Efficiency in the UK



Presented by: Hilary Wood



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)



The challenges

Financial

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

Legislative



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

Environmental

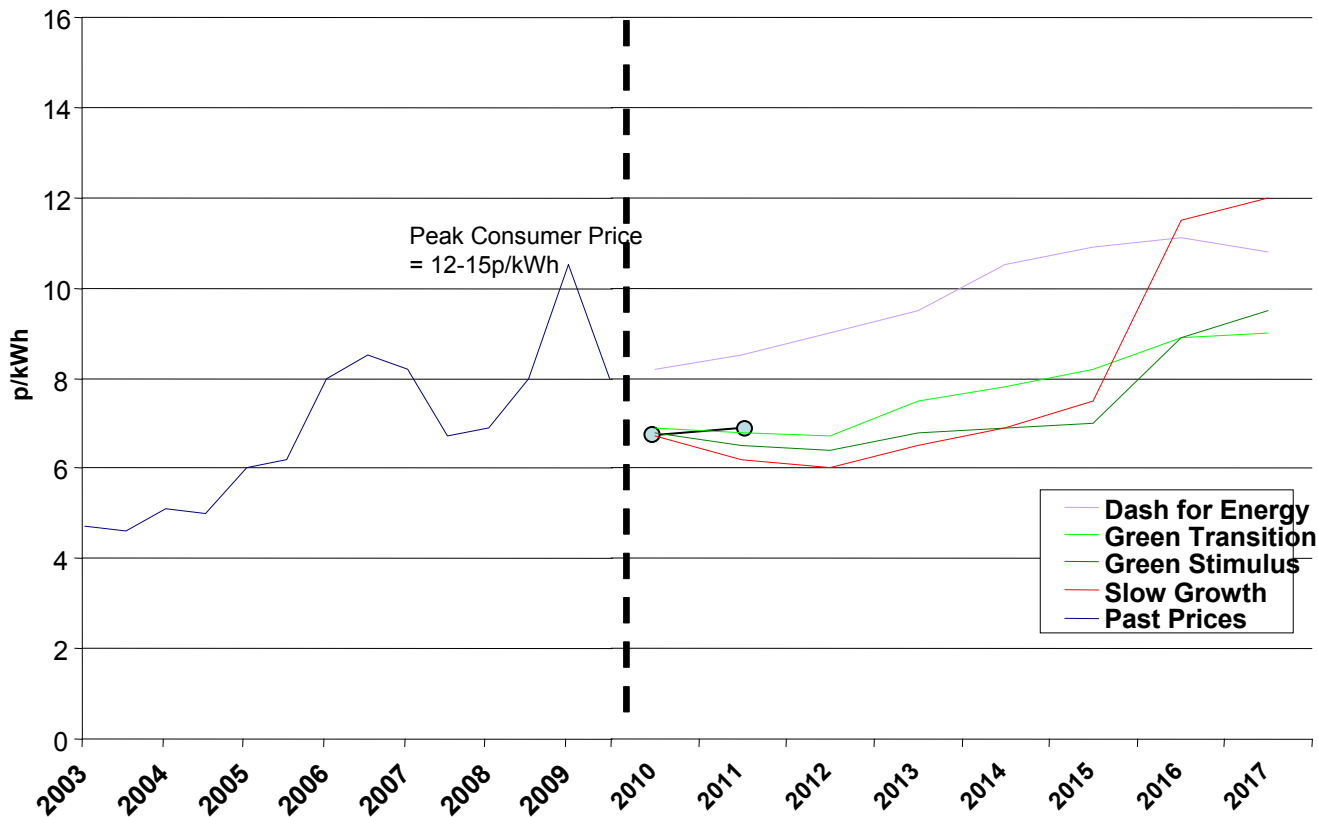


- Copenhagen failed, now up to us
- Corporate responsibility
- UK's carbon target: 34% by 2020
- London's target: 60% by 2025

Technical

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

Electricity Prices – Historic and Future



Peak Consumer Price
= 12-15p/kWh

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

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).

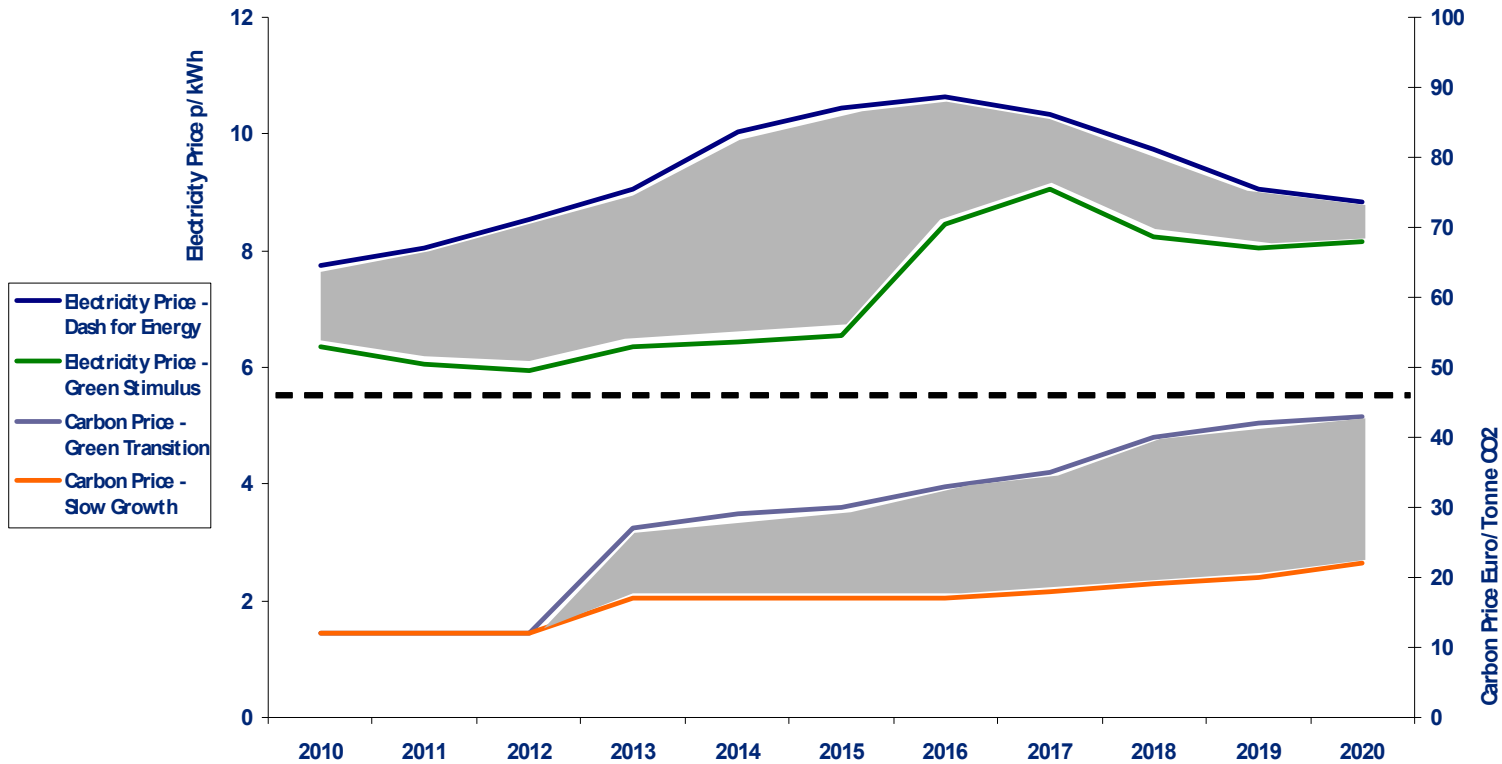
Underlying wholesale prices obtained from "Ofgem Project Discovery Energy Market", Doc Reference 122/09, Scenario, 9 October 2009, page 51, Fig 3.19.



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

Forward Electricity and Carbon Prices

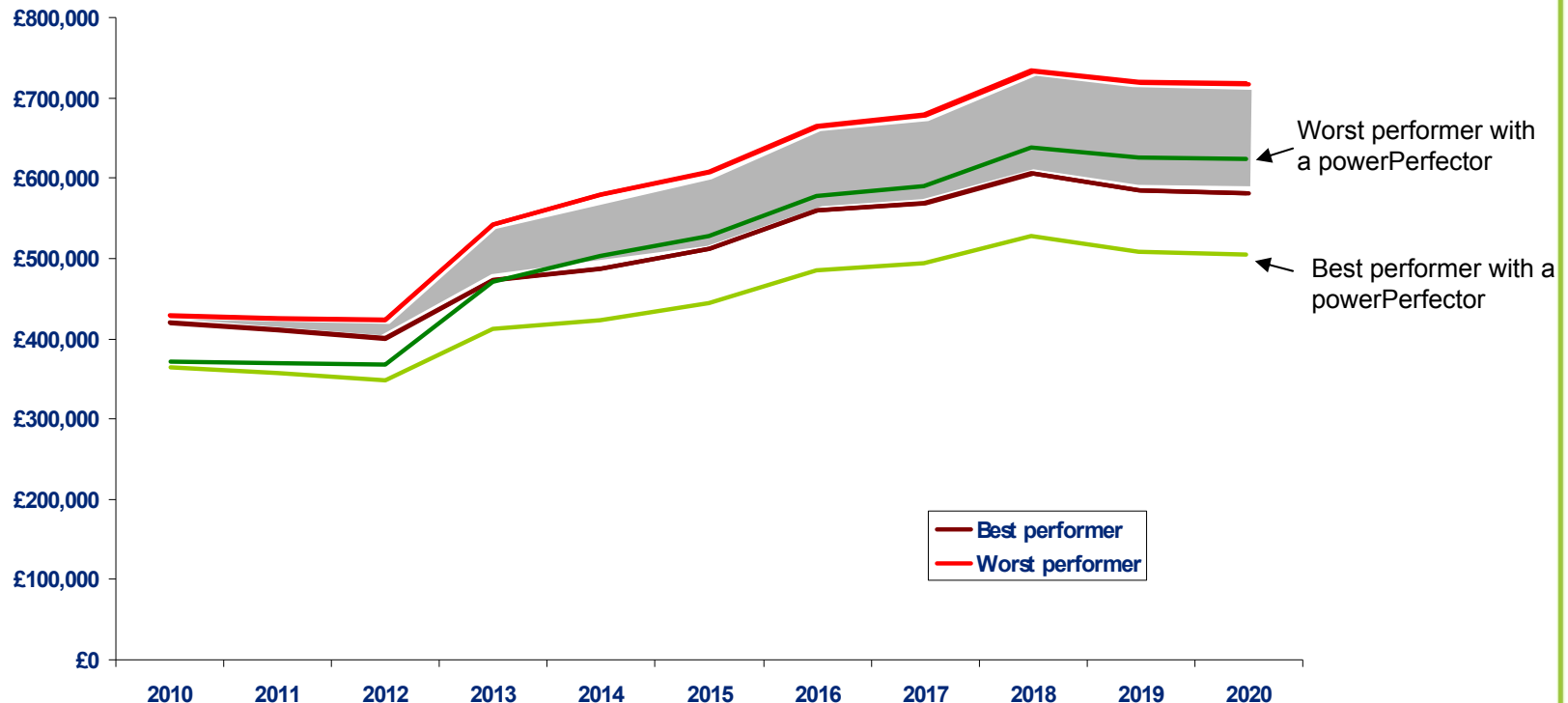
Electricity and Carbon Prices, 2010-2020



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



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!

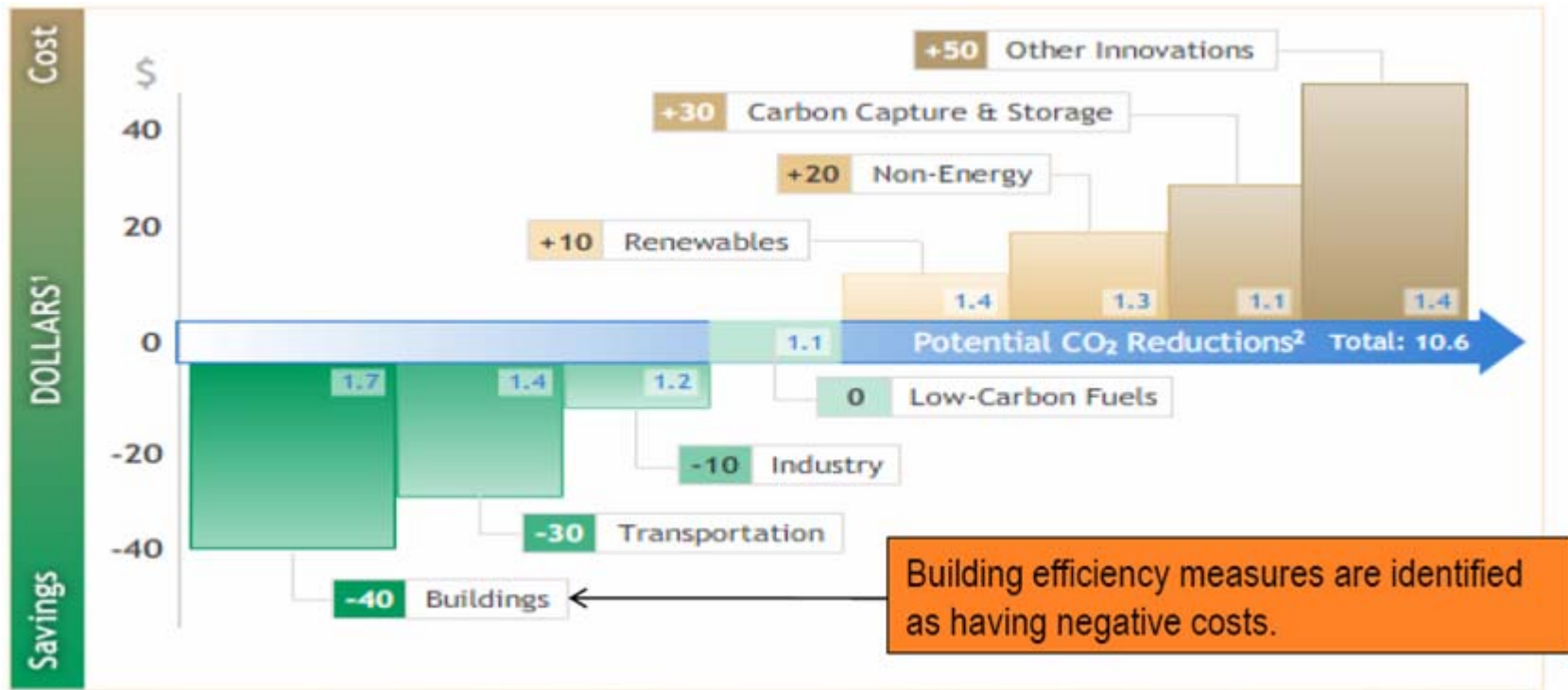
What of the UK?

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.



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

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



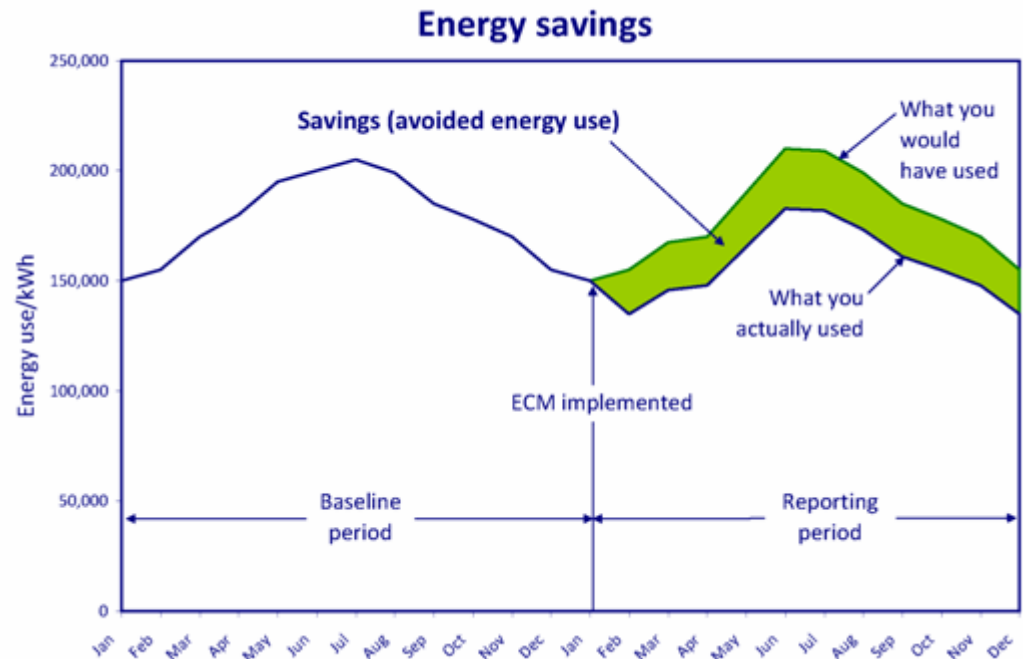
Source: Natural Resources Defense Council, cited by Clinton Climate Initiative
<http://www.nrdc.org/globalwarming/blueprint/default.asp>

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**

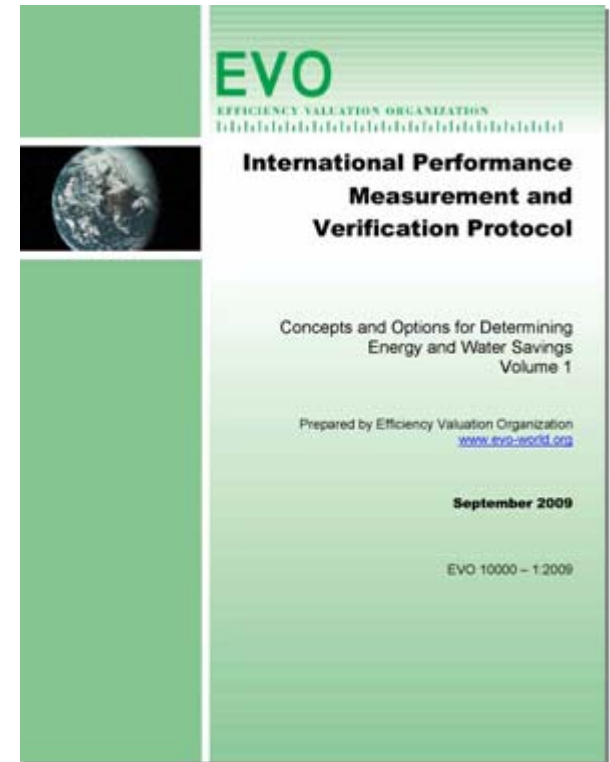
The problem with guaranteed savings

- **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

- **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

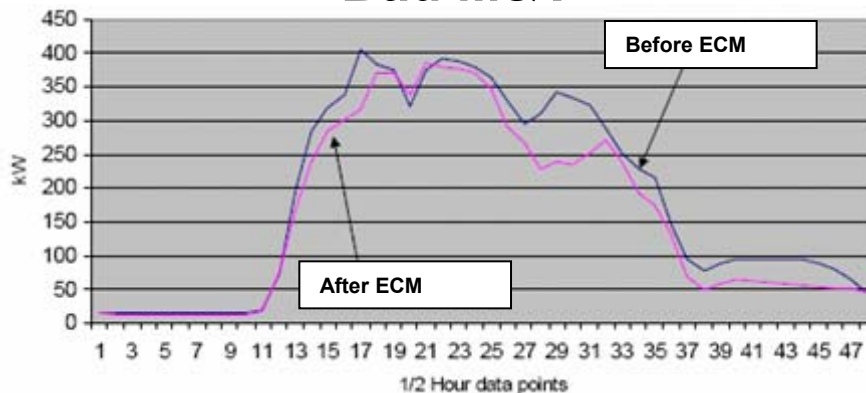


powerPerfector and IPMVP

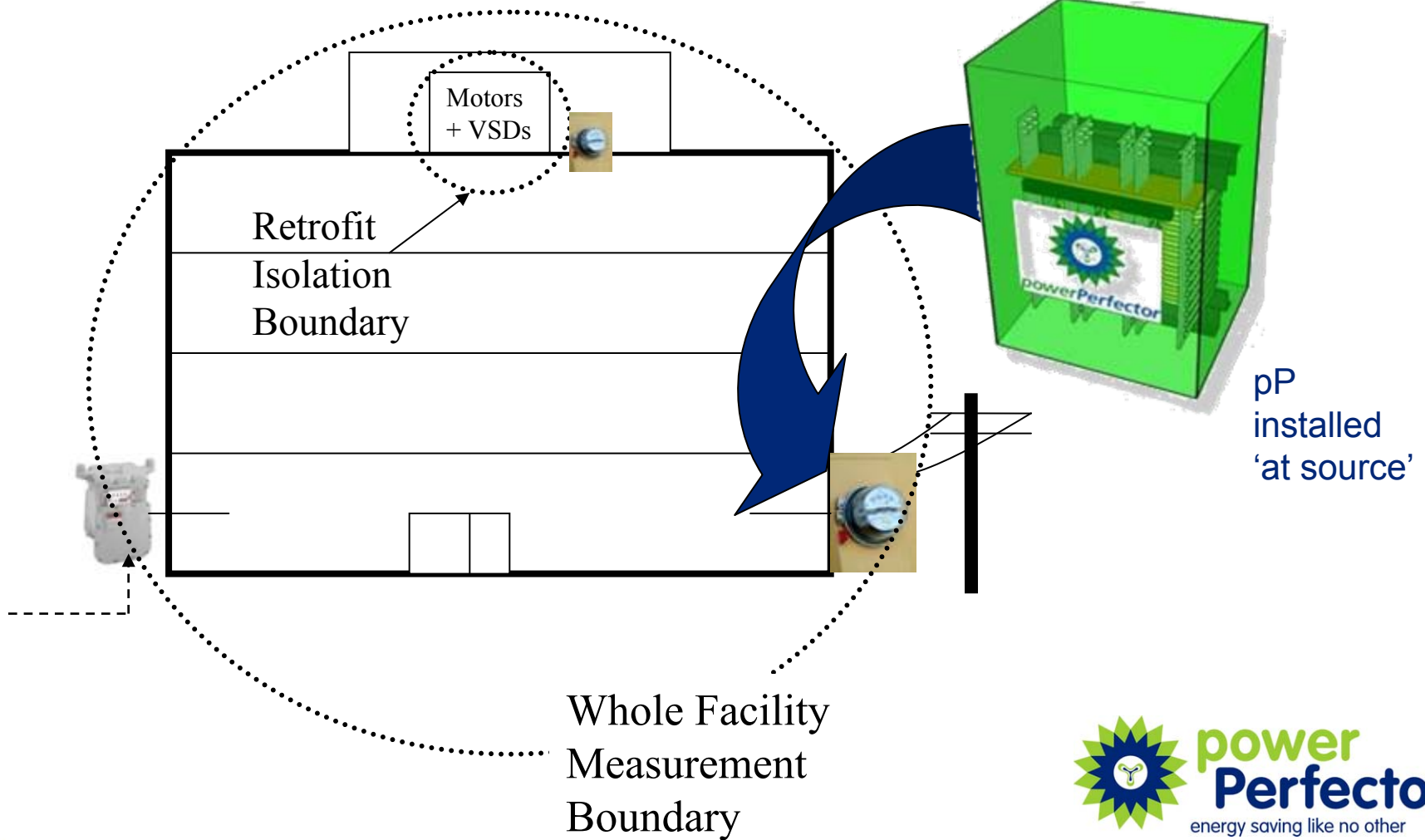
- **Savings analysis** always part of service
- Savings **guaranteed**
- **Poor understanding** in market of what constitutes an energy saving:
Avoided energy use
- Most analysis simply considers a snapshot **before and after**


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

Bad M&V



IPMVP Option C






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



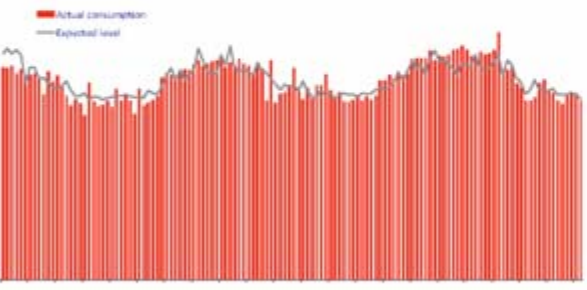
Data & Adjustments

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



— Actual consumption
— Expected level

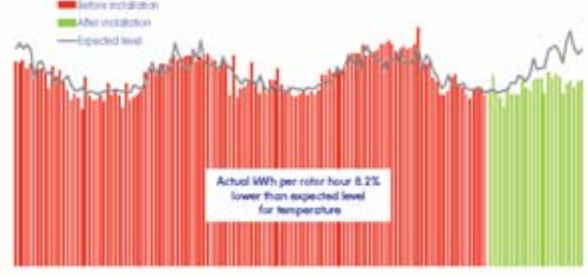
Audit



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.

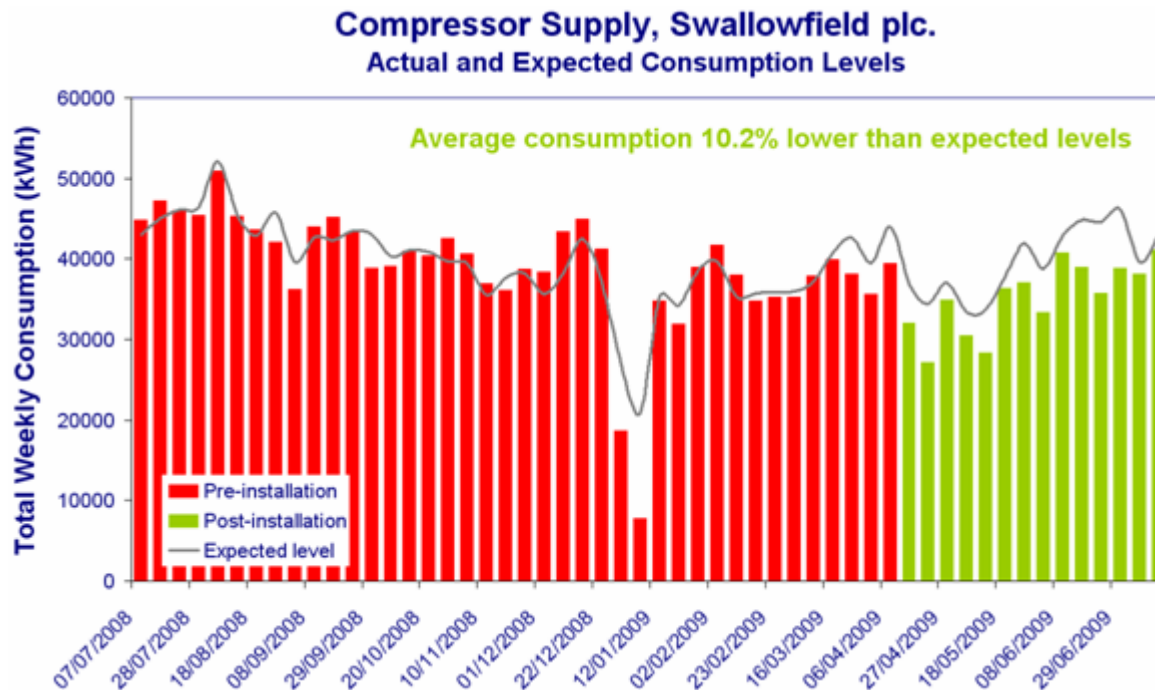


— Before installation
— After installation
— Expected level

Actual kWh per rotor hour 0.2% 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**



Full case study available



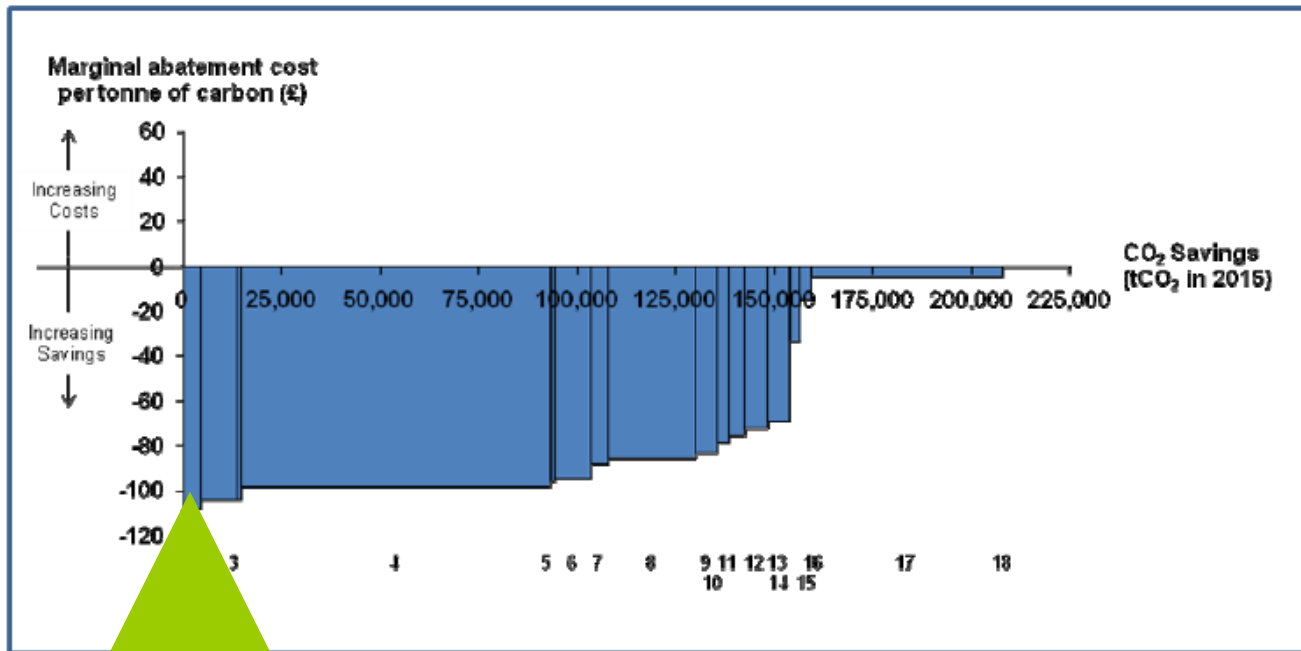
Investing in good M&V

- 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



- **Voltage Power Optimisation** ranked within **'number 1'** (-108 £/tCO₂)
- 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