

# **RLtec**

***Innovative energy solutions***



## **Our Mission**

We are a dynamic, visionary and ambitious company committed to improving the way electricity is supplied and consumed. reducing greenhouse gas emissions and reducing the overall cost of electricity supply.

## **Electricity Innovations for Sustainable Development**

**NESTA**

David Hirst, Chief Technologist

14<sup>th</sup> November 2007

## Outline Agenda

- Electricity: its magic; and its cost
- ResponsiveLoad – the founding technology
- Demand Side Participation – the vision
- Route to Commercialisation

## The Magic of Electricity

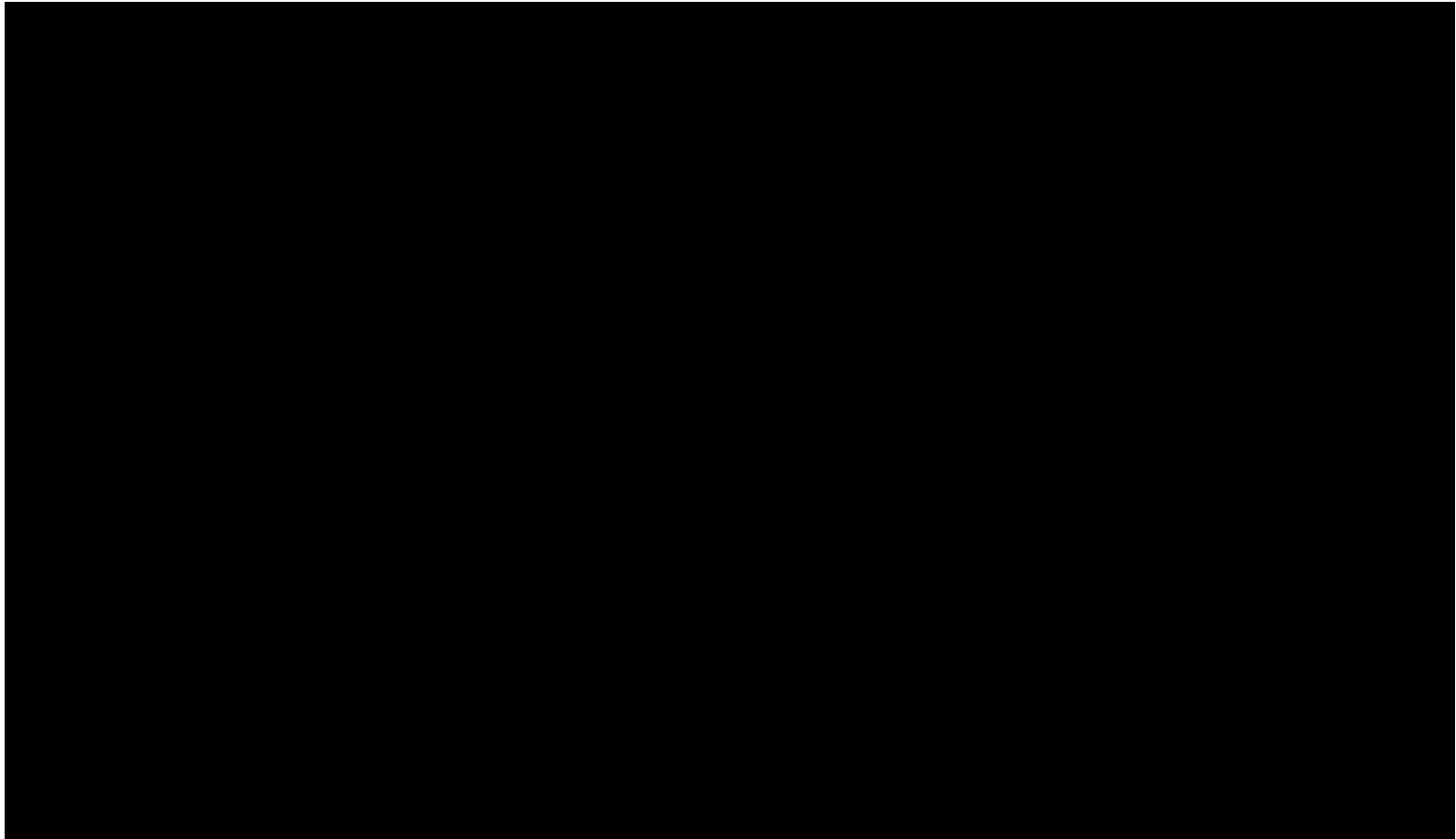
- “Western civilisation” depends upon it
  - Embedded in all aspects of our lives
  - Central to Industry & Commerce
  - No “IT” without it: No TV, no PCs, no Internet
- Huge enabler of human well-being
  - Lighting: efficient and free of (indoor) emissions
  - Information & Entertainment
  - Medicine & Food Preservation by **cooling**
  - Cooking & Hot Drinks
  - Hot water & Laundry
  - Water pumping
- Development Freedoms
  - Irrigation

## Electricity is Costing the Earth

- Some 30% of GHG emissions from Electricity production – Historically & Now
- High carbon coal is predominant fuel, now & future
- Renewables growing slowly
  - “Ambient” generation is uncontrolled
  - Demand is said to be inflexible
  - System obstacles to rollout
- Markets sometimes failing

***We have to find and implement better ways - fast***

## The System Frequency



## Costs of Frequency Response

- ~ £100m p.a. in the UK
- Part loaded plant
  - Capacity to increase (& reduce) output
  - Non optimal efficiency
- More flexible plant tends to be older
  - And so less efficient
  - Or very expensive (e.g. Dinorwig)
  - And coal fired
- Big plant is easier to instruct



## Recipe for High Carbon?

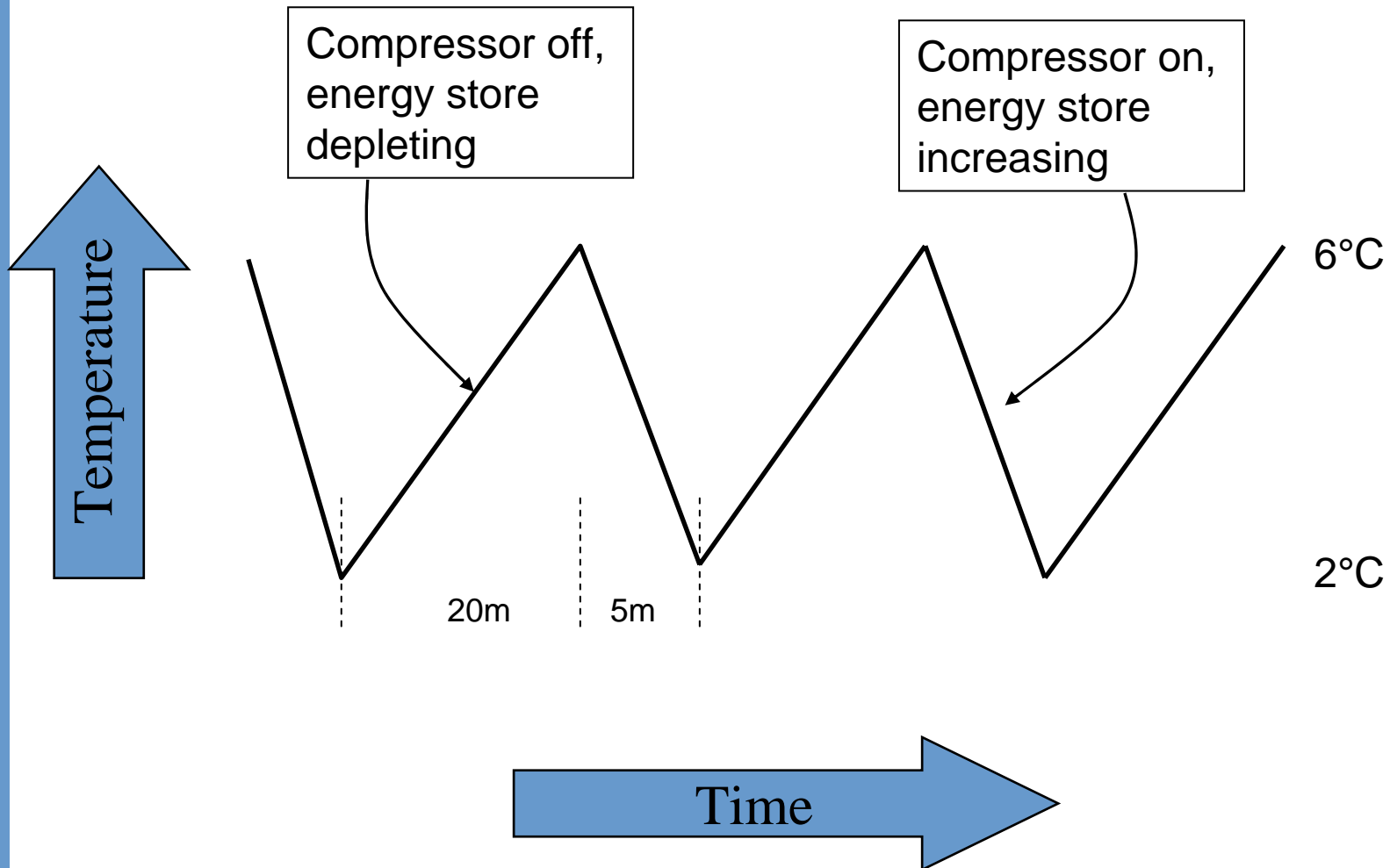
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**Fridges Do It Better**



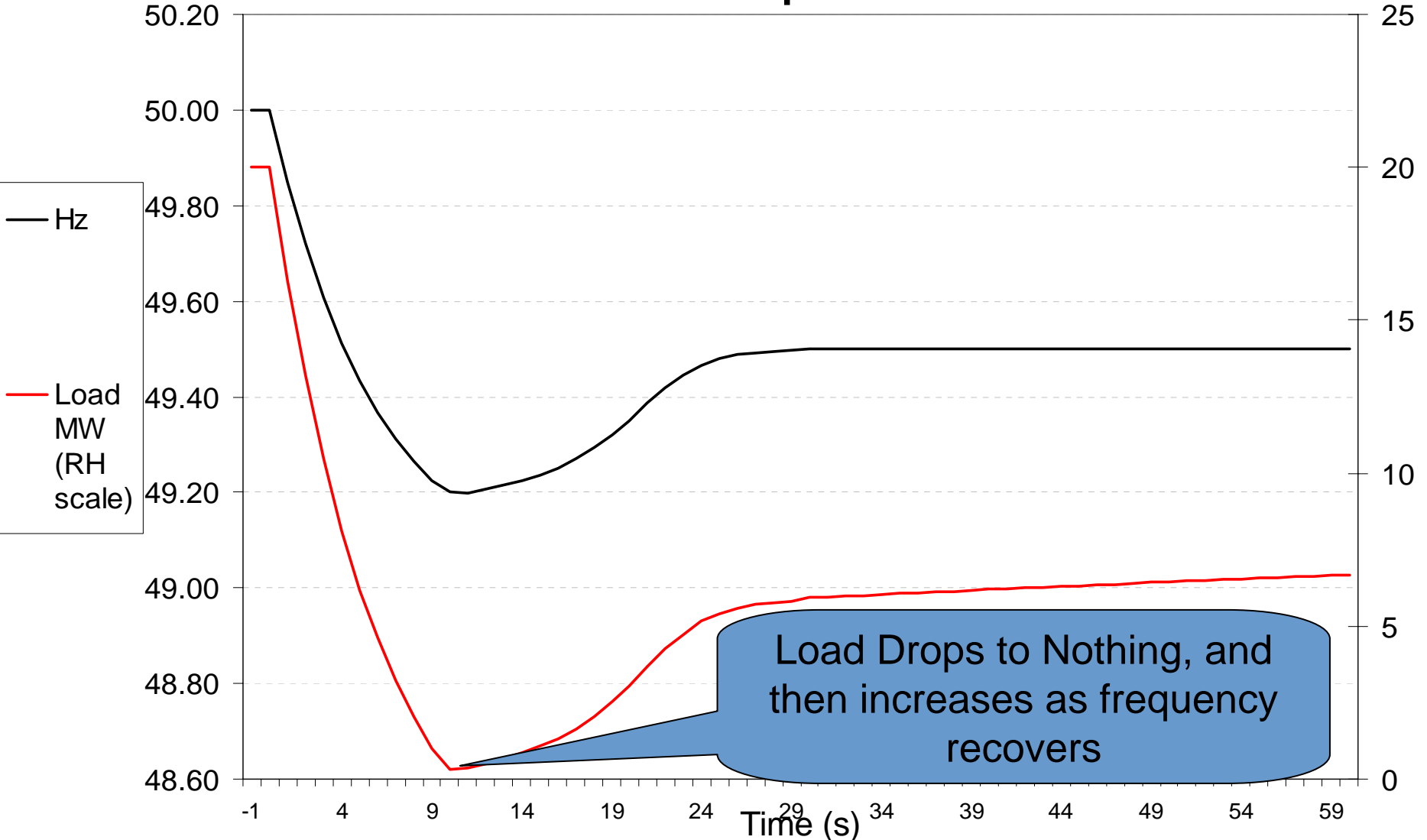
## Domestic Refrigerator Operation



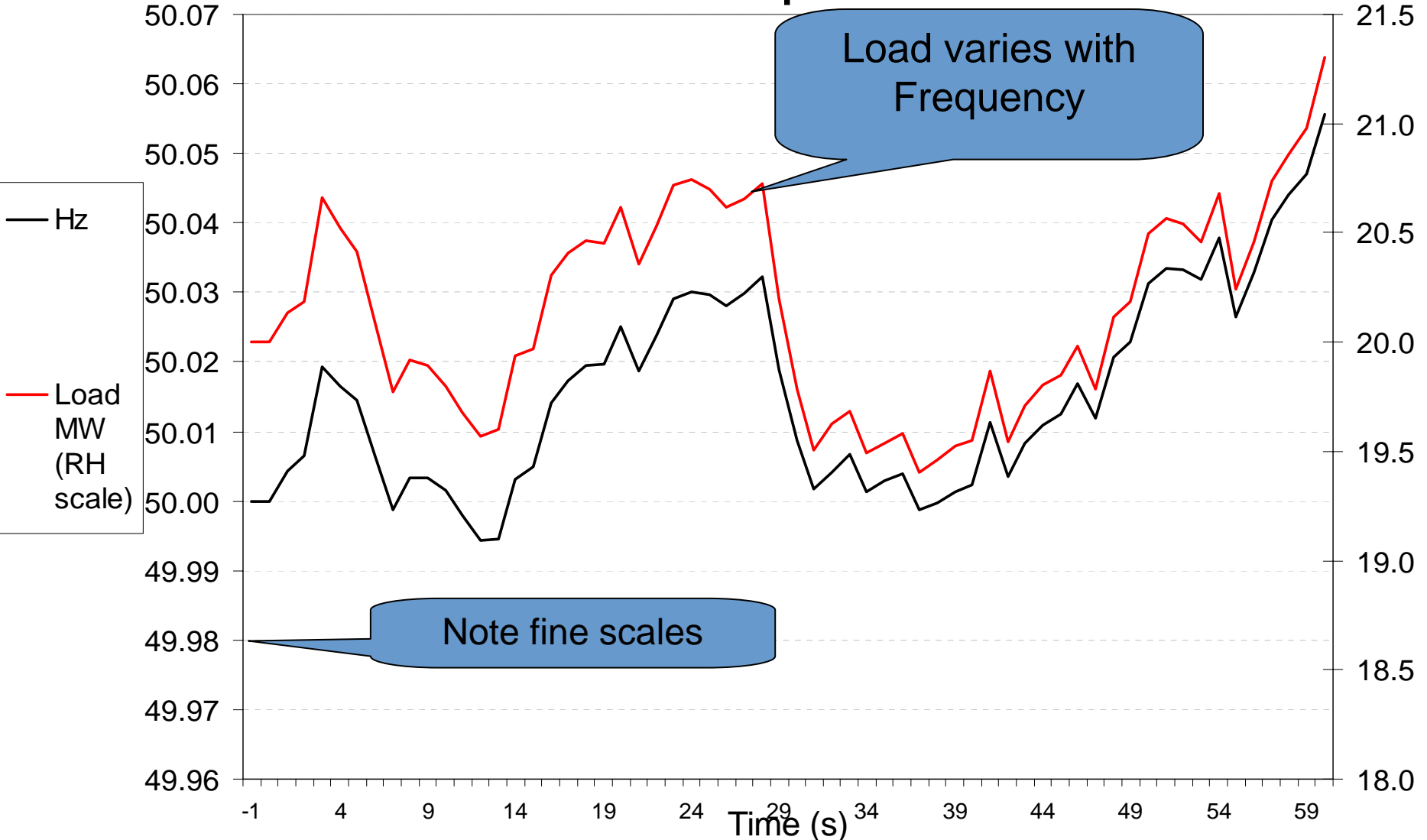




### 1 Minute Response



### 1 Minute Response



## Automatic Balancing Services

- Fridges – 30,000,000
  - ~600MW
  - No running cost
  - No storage loss
  - Near instantaneous
  - Demand (not supply)
- Typical “Genset”
  - 600MW
  - “Hot Standby” charges
  - CO2 no Power, inefficient
  - 9% Transmission losses
  - up to 5 minutes lag



1. Royal Commission Environmental Pollution 2000

## Electricity Markets are Broken & Need Fixing

- Low carbon behaviour “punished”
  - BETTA penalises Wind, Wave and CHP
  - Small scale exports unrewarded (or worse)
  - Zero carbon technologies compete with “gifted” CO<sub>2</sub>
- No “market” in transmission – monopoly supply – blocking wind, keeping coal
- Nuclear generation “bailed out”
- Heat Distribution “too expensive” – so individual boilers!
- USA “Standard Model” widely ignored

## **Electricity Markets are Broken & Need Fixing**



NE America 14 August 2003

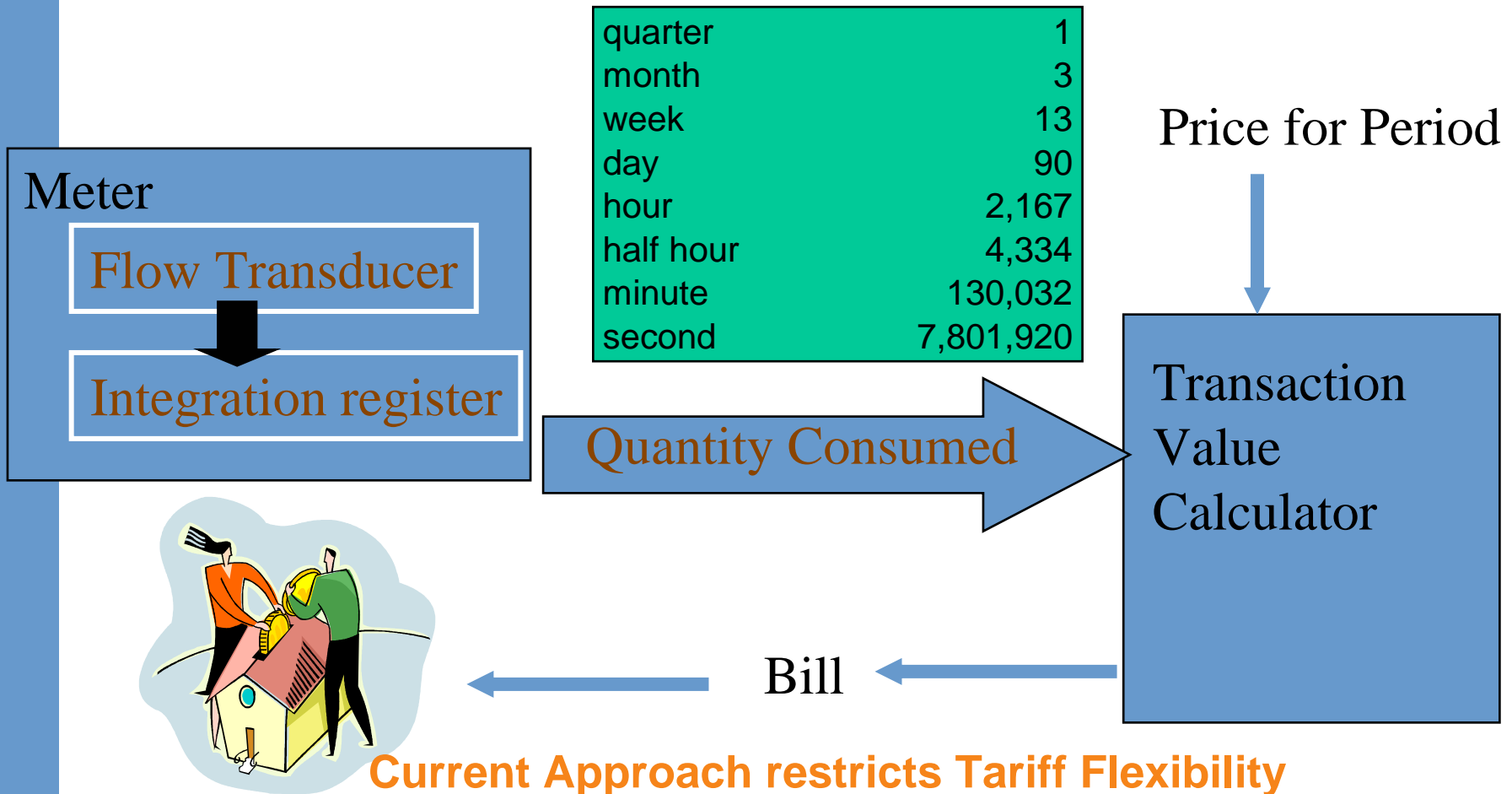
London 28 September 2003

Italy 28 September 2003

Europe 4<sup>th</sup> November 2006

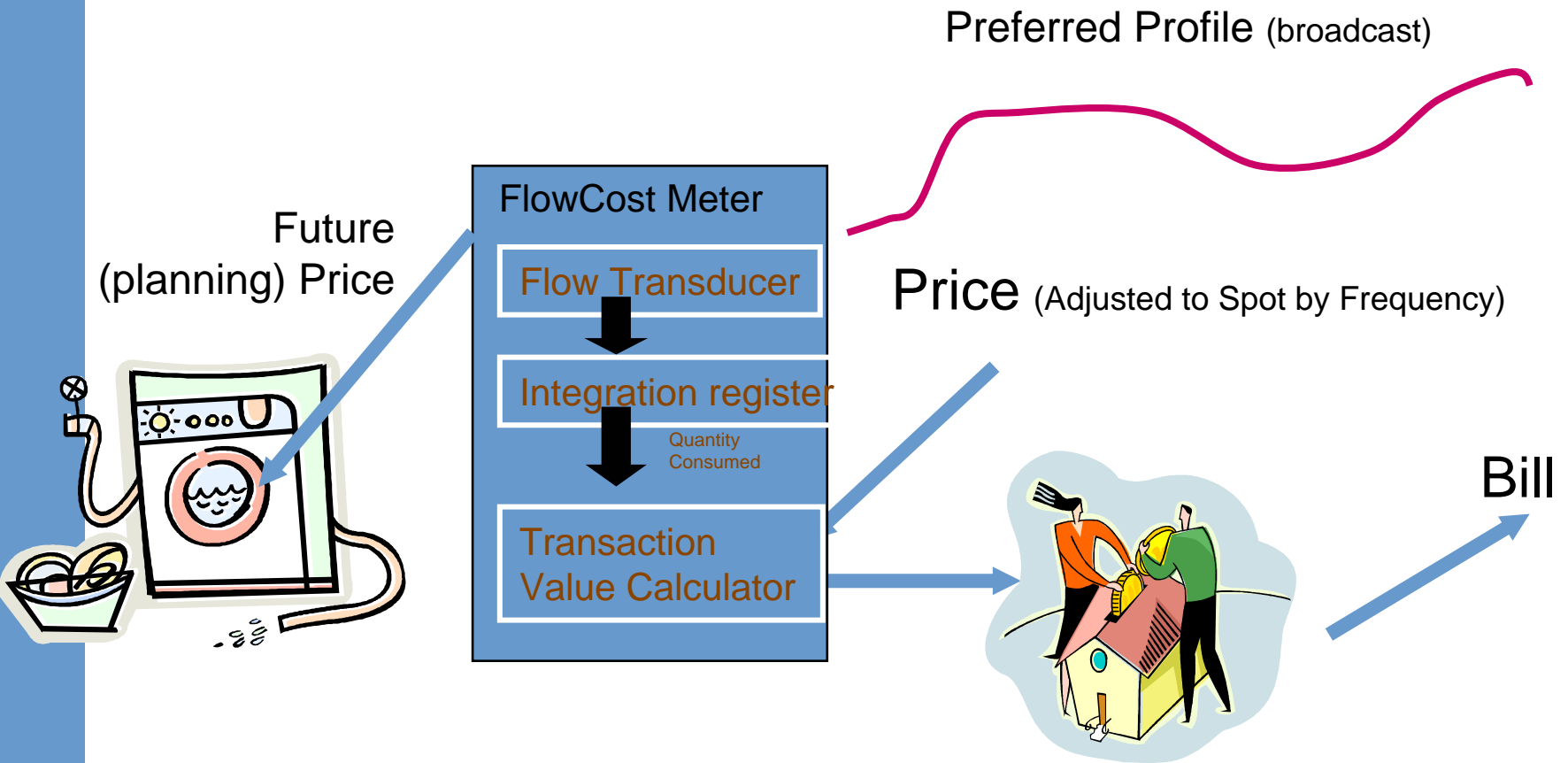
Most “disturbances” arise in the few minutes after the hour, when “markets” reschedule

## Meter Data Flows & Processes



Wrong Weights & Measures?

## Tariff Broadcasting







## Dishwasher Calculations

- Consumption 1.4kWh
- Runs two nights in three
- Flexibility 23.00 to 07.00
- Scale: 10 million
- **Storage: 10 GWh**

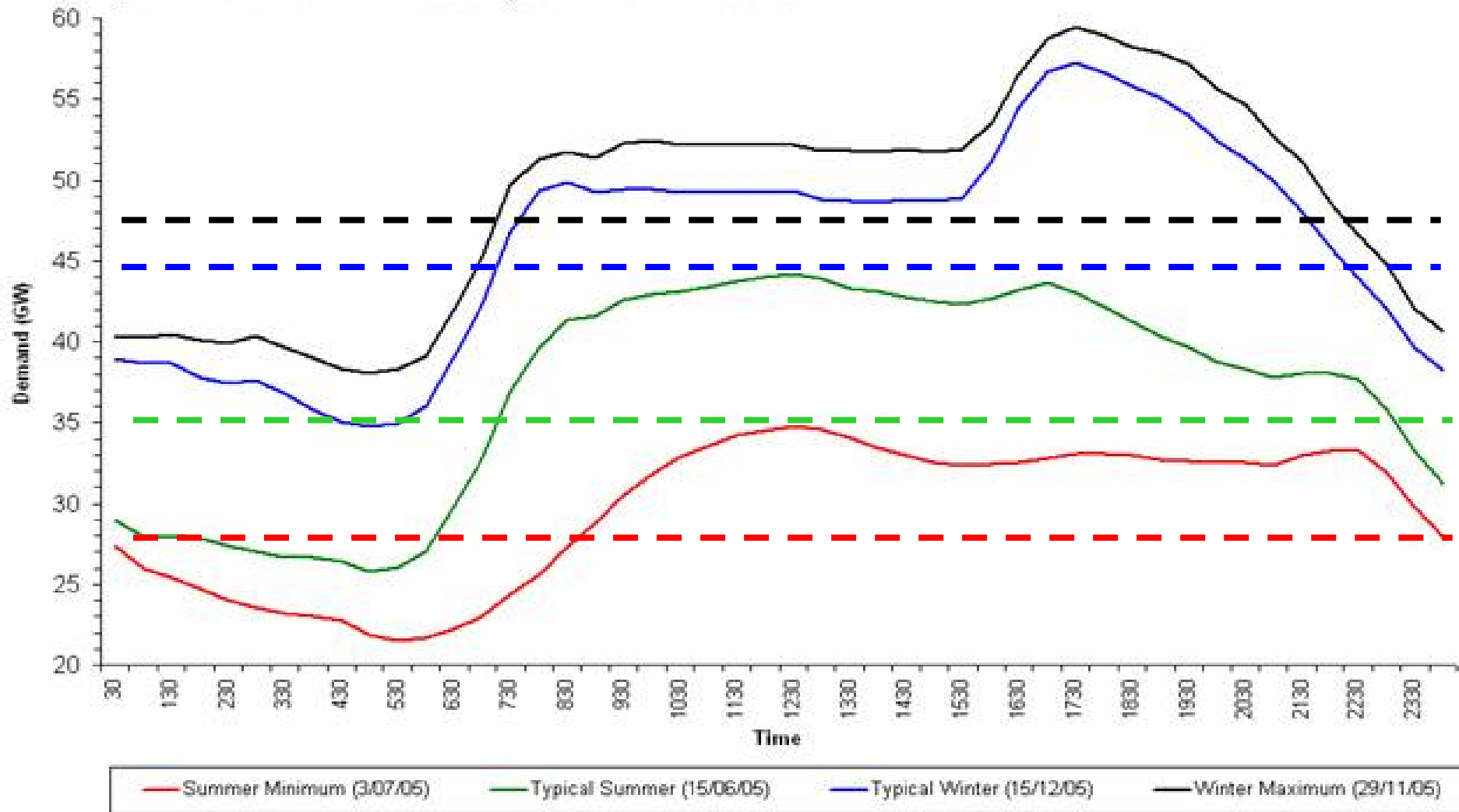
## Ambient Generation

- When Wind (or sun) is forecast, then suppliers will decrease prices
- When prices decrease, then more appliances will run

**Do your Laundry When the Wind is Blowing**

## Generation Capacity is often idle

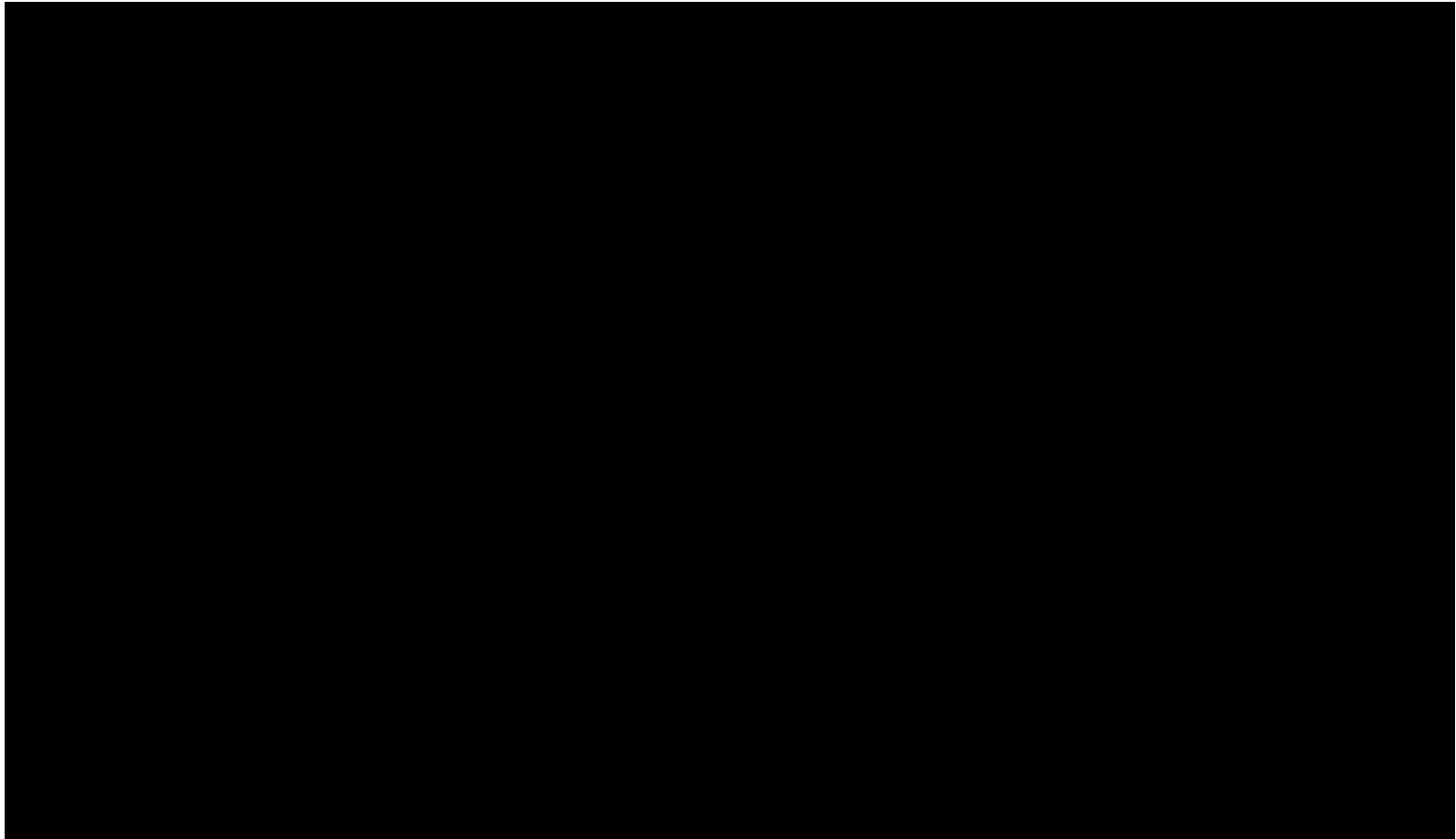
Figure 2.2 - Summer and Winter GB Daily Demand Profiles in 2005/06



## Route to Commercialisation

- Concept formed mid 1999 – while CDA for NETA
- Patent Filed 7<sup>th</sup> April 2000
- Part time pursuit – “Business Concept to Hobby”
- Founding Patent awarded May 2002
- Extensions filed late 2003 – 30 month deadline
- Electrolux discussions opened Sept 2004
- Low Carbon Accelerator first funding June 2006
- Three Directors team
- First testing complete February 2007
- LCA second funding January 2007
- Serious Grid discussions opened June 2007
- 100 fridge trial – in progress

## The System Frequency



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