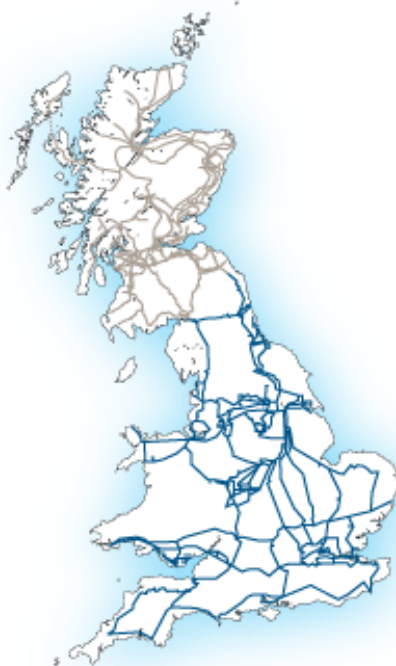


What is the Smart Grid for? Who needs it?

Smart Grids & Cleanpower Conference
24/25 June 2010
<http://bit.ly/cleanpower>

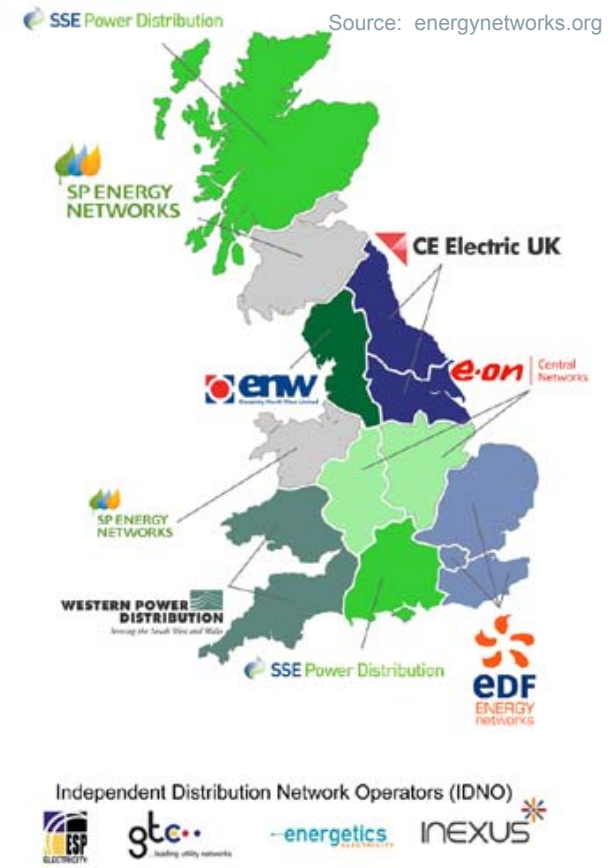
Before we were smart

Source: National Grid



Includes Scottish electricity transmission system and English and Welsh electricity transmission system

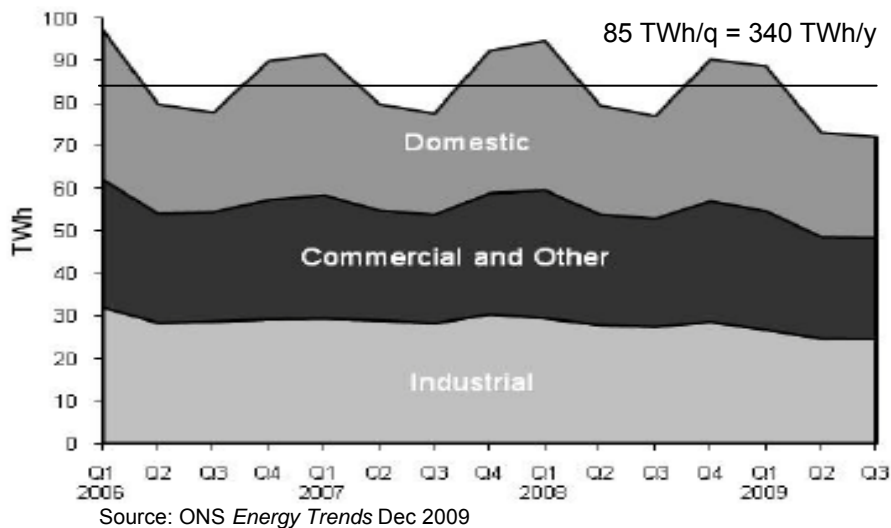
Source: energynetworks.org



The “grid” had inherited a *de facto* mission

To deliver any amount of energy to anyone entitled to consume it, whenever they want it

Chart 5.3 Electricity consumption



Average Domestic, Unrestricted Customer - Daily Profile

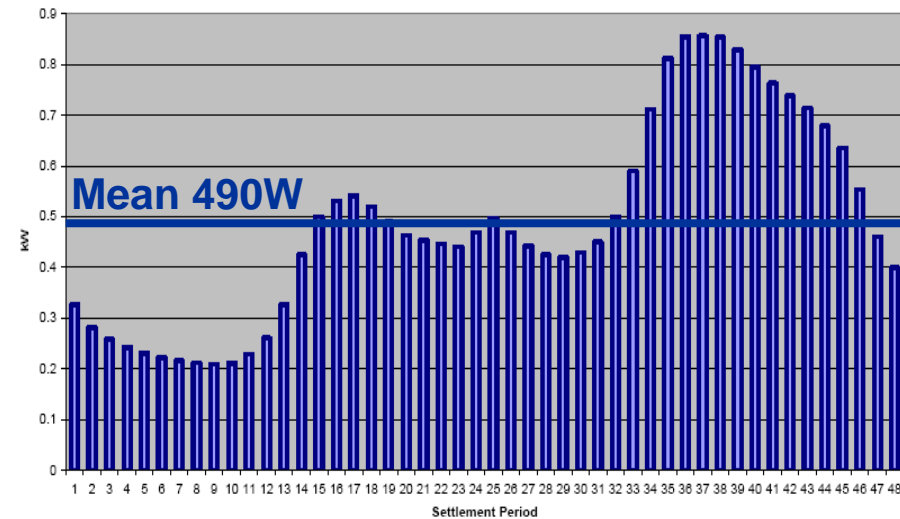


Figure 1

Source: Ofgem

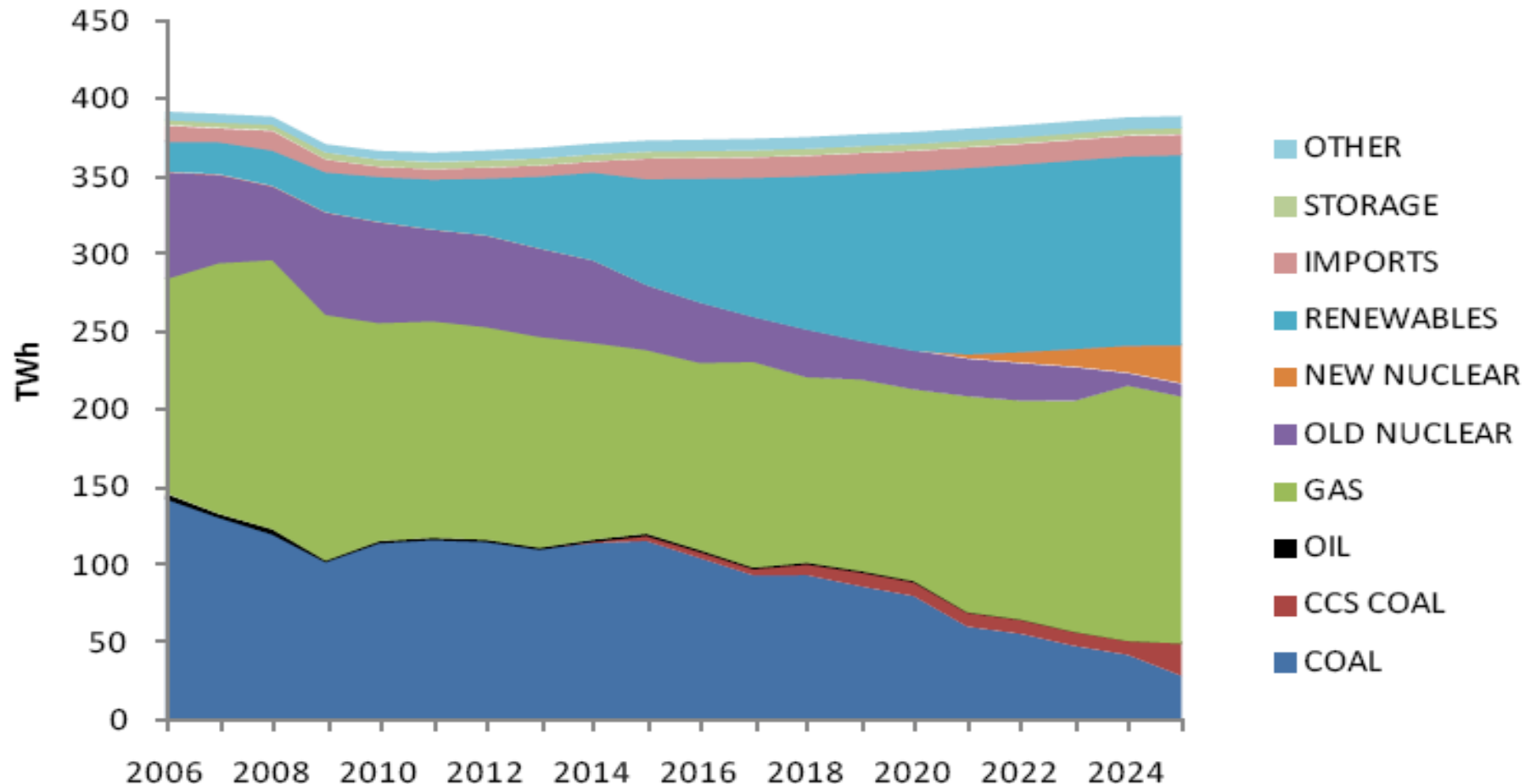
National Grid’s actual vision statement is:

“We, at National Grid, will be the foremost international electricity and gas company, delivering unparalleled safety, reliability and efficiency, vital to the wellbeing of our customers and communities”.

“We are committed to being an innovative leader in energy management and to safeguarding our global environment for future generations”.

Overall demand tends to rise, and current sources are declining

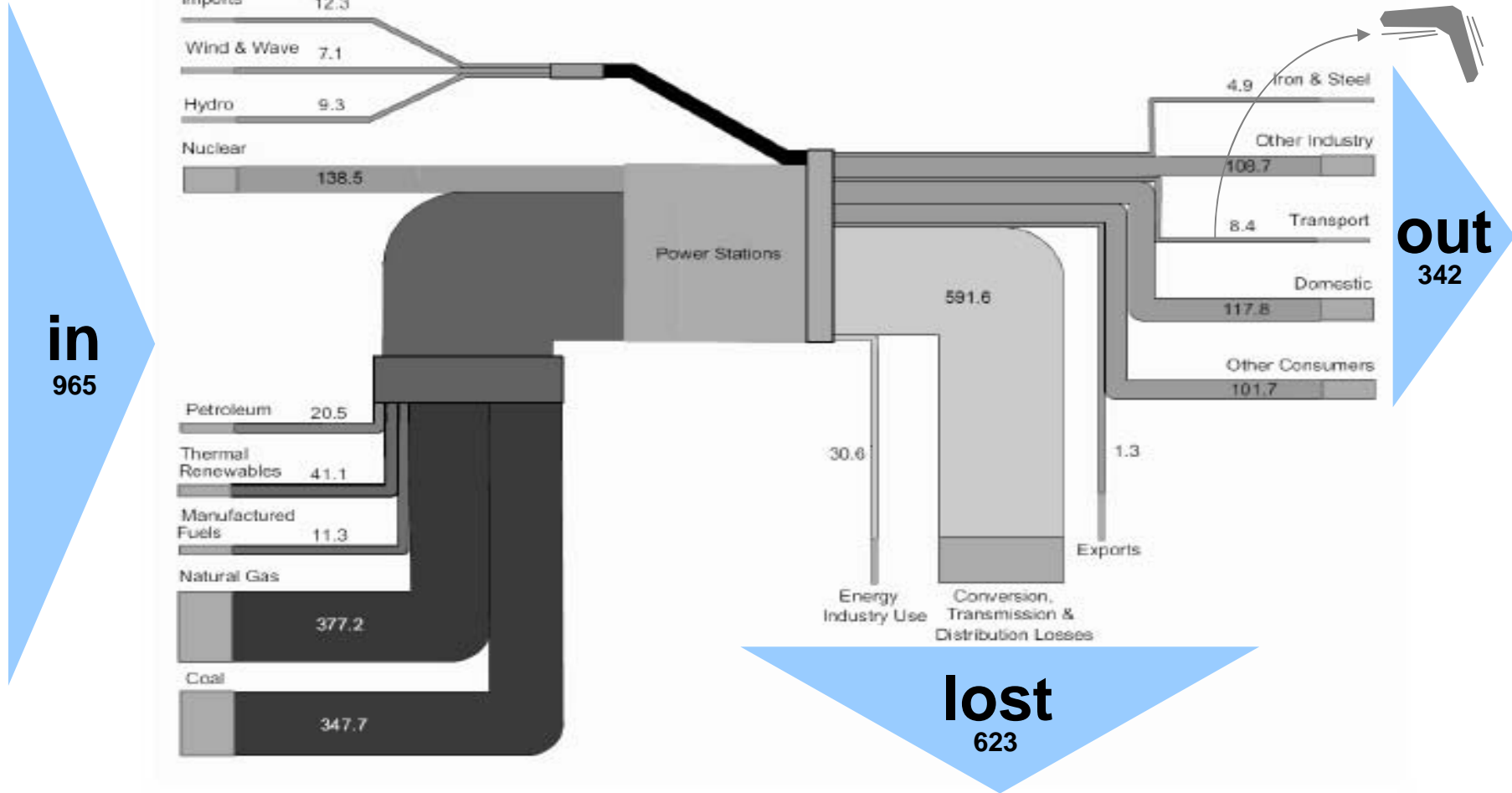
Chart 6.3: Electricity supply³⁵ by fuel for all generators.



Source: DECC ~ Updated Energy and Emissions Projections URN 10D5/10, June 2010

And we have to put in a lot more than we get out

Electricity flow chart 2008 (TWh)



Source: Digest of UK Energy Statistics 2009

What was new?

A combination of events greatly focussed attention on the potential for radical change



Customer service was perceived as poor

Pollution was becoming connected to global warming

Concern was rising about the security of our supplies

We found we were not alone

The quadruple whammy - 1

The “super-complaint”

In 2004 energywatch was given the power to bring a complaint to the Regulator even if it did not have a specific consumer willing to front the case.

In 2005 it did just that, focusing on billing errors.

energywatch

Ofgem found that Suppliers were not generally in breach of their licences, but the process still needed to be better.

The quadruple whammy - 1

Suppliers argued that the only way they could improve billing accuracy, would be if they introduced automatic meter reading..
..but this would cost more.

The search began to find *other* benefits that arose from AMR, that could justify the extra expenditure.

AMR → **AMI** → **Smart Metering** → **Smart Grid**

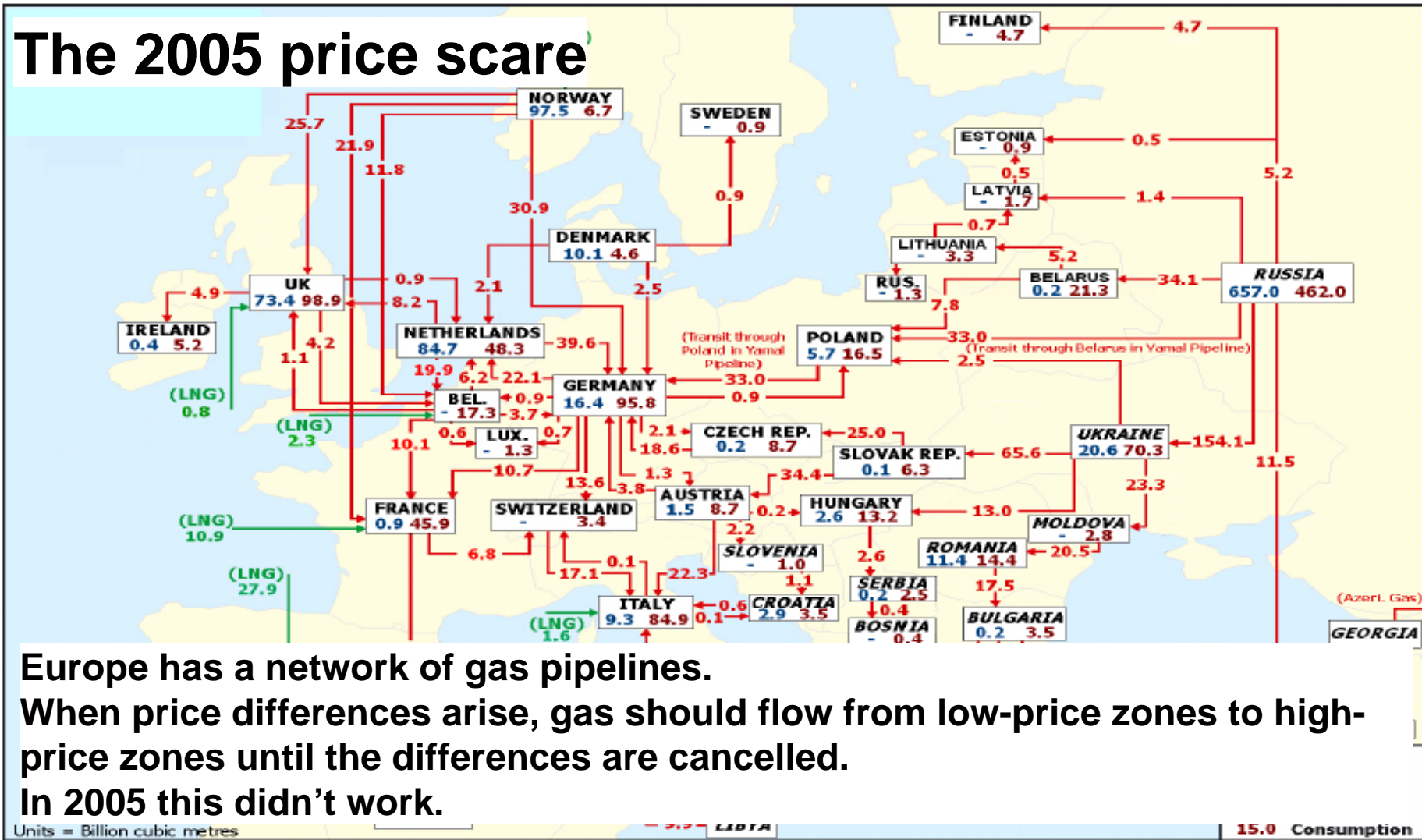
After numerous government funded studies, *improved energy efficiency* was found to be the main gain..

..but the most cost-effective way to achieve this was simply to run a public information campaign¹, not to install smart metering.
Nevertheless, the fuse was lit.

1. See for example BERR – *Impact Assessment of Smart Metering Roll-out for Domestic Consumers and Small Businesses*, April 2008

The quadruple whammy - 2

The 2005 price scare

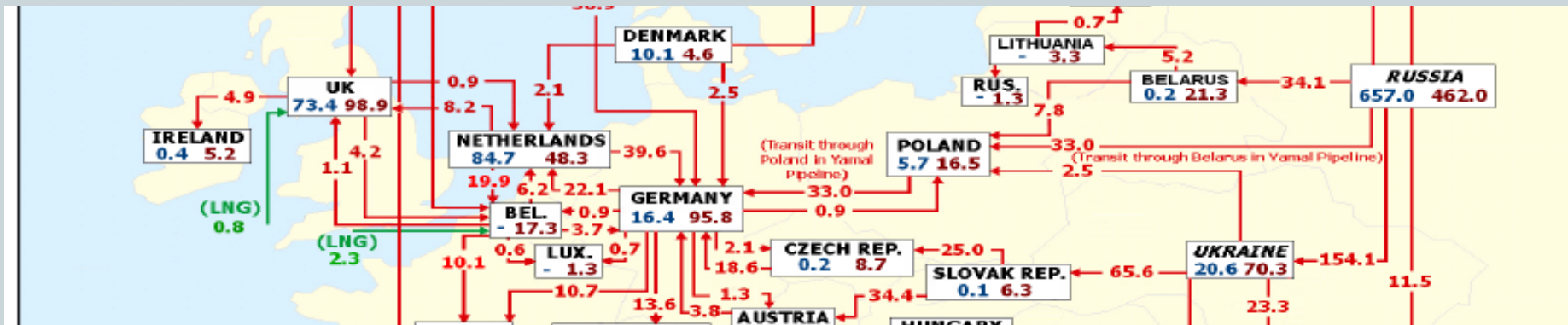


Europe has a network of gas pipelines.
 When price differences arise, gas should flow from low-price zones to high-price zones until the differences are cancelled.
 In 2005 this didn't work.

The quadruple whammy - 2

Between October and November 2005, spot gas prices in UK rose from 30p to 150p per therm.

And electricity retail prices rose from 4p to 10p because 1/3rd of our electricity is generated from gas.



But gas did *not* flow from Europe because:

- (1) There was a contractual dispute between Russia and Ukraine
- (2) Our closer friends' storage was hedged at the *winter* price, not the autumn price.

So a second fuse was lit – we needed to look at the *security* of our supply.

The quadruple whammy - 3

The 2005 Stern Review

Climate change bill supports Stern recommendations

Climate change legislation will form a fundamental part of the UK 's strategy to tackle climate change and address the issues raised by the Stern Review, according to Environment Secretary David Miliband.

...economic case for action on climate change. Doing nothing will be far higher than

Compulsory reductions in emissions

...but significant steps to strengthen the domestic programme on climate change through the Climate Change Programme and the Energy Review.

Climate change legislation

Improved monitoring

- It will put the Government on a legal track to reduce carbon dioxide emissions by 60% by 2050.
- It will establish an independent body – the Carbon Trust – with Government to reduce emissions over time.
- It will create enabling powers to put in place measures needed to achieve our goals.
- It will improve monitoring and reporting arrangements, including how the Government reports to Parliament.

Primary legislation



“The legislation will be introduced as soon as parliamentary time allows. We are also determined to promote the widest possible debate across the country and in Parliament about the contents of the bill.”

The quadruple whammy - 3

The 2005 Stern Review

New energy acts were passed with all-party support in 2008 and 2010

There will be another next year.

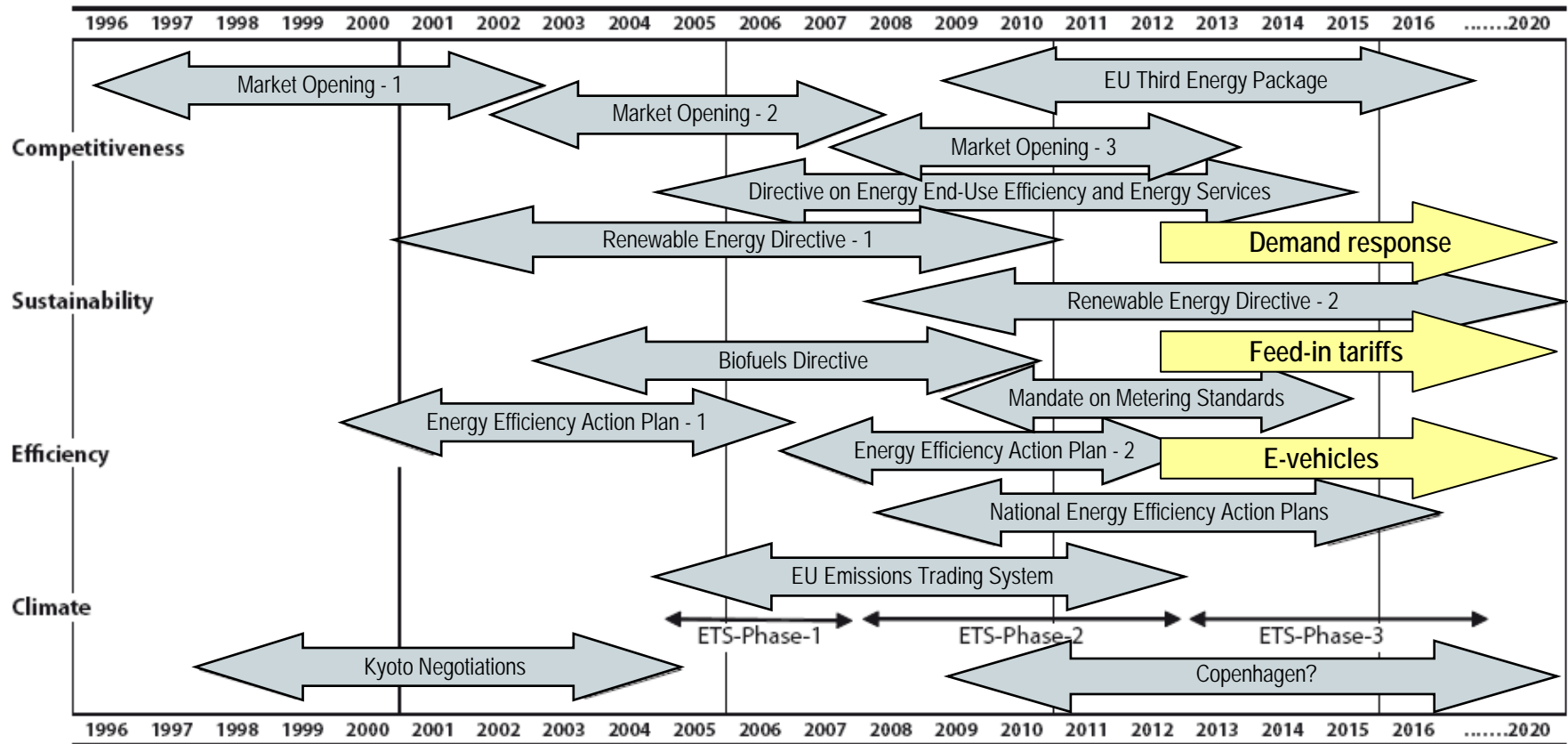
Becoming carbon neutral will soon be a requirement of all future utilities contracts – it will be the “year 2000 compliance” of the next 5 years

All the previous policy proposals are either still in, or have been strengthened.

So a third fuse is burning

The quadruple whammy - 4

The European Directives – we are not alone

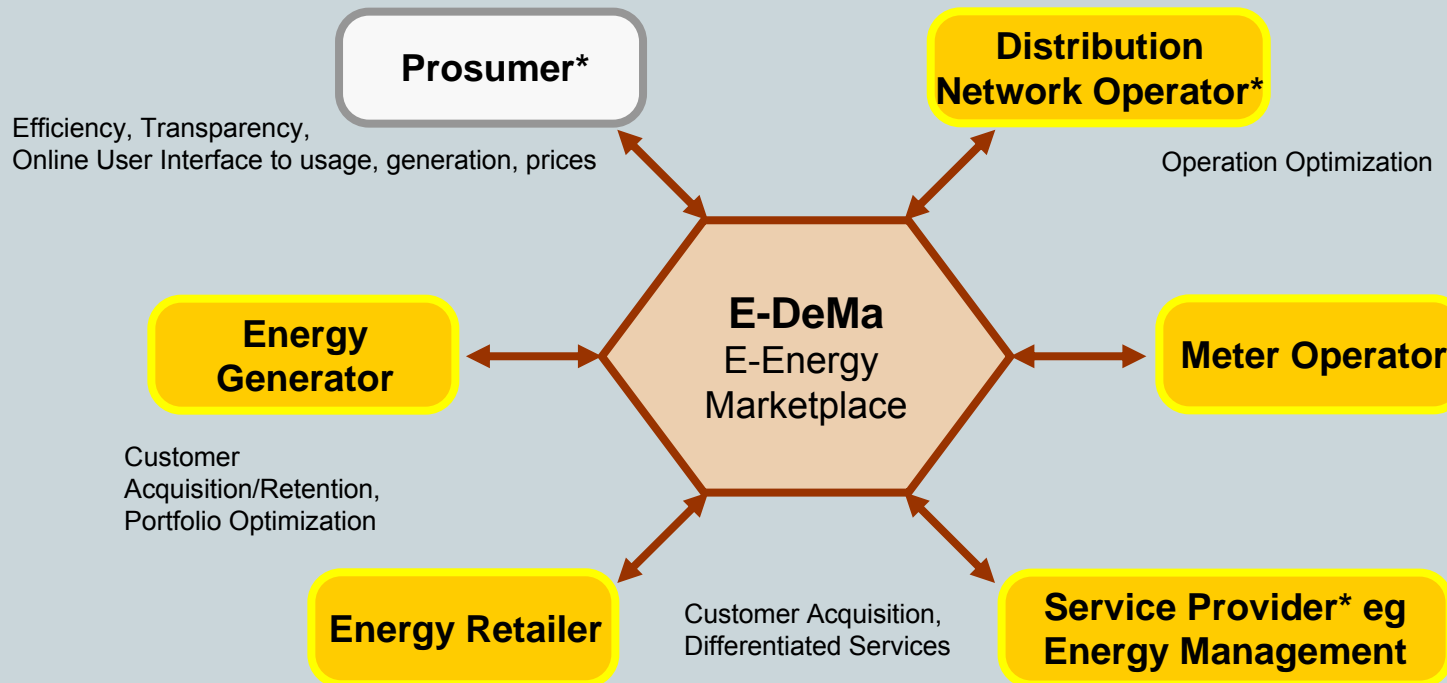


Source: Eurostat Oct 2009, with addition of 2005 Directive, 2009 Mandate and Copenhagen?

The quadruple whammy - 4

How they see it in Germany

The linking of new technologies in power engineering and ICT to solve the coming challenges in the energy sector is referred to as the Smart Grid.¹



So a fourth fuse is lit – we have already agreed to proceed

1. Quoted from the German Commission for Electrical, Electronic & Information Technologies – *The German Roadmap, E-Energy / Smart Grid*, 2010

DECC has re-stated government intent in May 2009

Government strategy is unchanged:

- Reduction of emissions
- Security of Supply

DECC's policy objectives are ¹:

- Provide consumers with better information on energy usage
- Encourage energy efficiency
- Reduce carbon emissions

Government seeks these outcomes²:

- Energy and carbon savings
- Accurate measurement and billing
- Improved consumer service
- Improved network functionality
- Wider policy objectives (eg μ -gen)

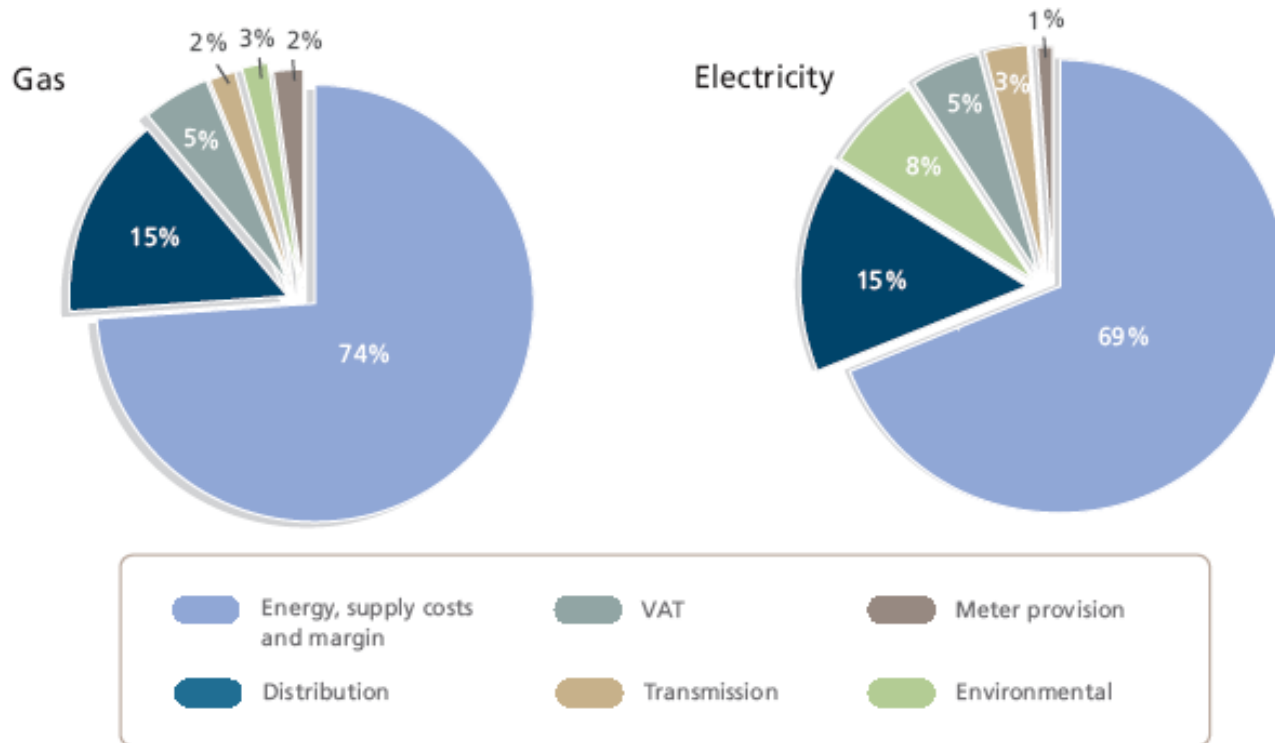
The government's goals are³:

- to maintain the reliability of energy supplies
- to promote competitive markets in UK and beyond
- to ensure that every home is adequately and affordably heated

1. In Impact Analysis May 2009, p1
2. In Impact Analysis May 2009, p10
3. In Impact Analysis May 2009, p8

Some funding has already been opened up

Breakdown of gas and electricity bills. This reflects current gas and electricity prices in June 2009. The current average gas bill for a quarterly credit account is £800 and for electricity it is £445.



The average bills above are based on average annual consumption figures of 3,300 kWh for electricity and 20,500 kWh for gas. They exclude any prompt payment discounts.

Source: Ofgem

We each spend £80 per year on combating climate change already

The costs of combating climate change

EU Emissions Trading Scheme

The EU ETS trading scheme, which puts a price on pollution emitted by electricity generators and heavy industry, is increasing generation costs which feeds through to customers.

For a typical domestic customer with an annual electricity consumption of 3,300 kWh, the cost of EU ETS is estimated to be around **£24** for 2009. This estimate is based on a number of factors and is already reflected in the wholesale electricity cost. Carbon prices are currently low but if they rise again the cost to customers attributed to EU ETS is likely to increase.

CERT (Carbon Emissions Reduction Target)

CERT has been the Government's main method of delivering energy efficiency since April 2008.

It obliges energy suppliers to reduce carbon dioxide emissions by promoting energy efficiency and promoting household-based electricity generation to domestic energy users. The Government is proposing to extend the scheme to 2012. From summer 2009 it is estimated that it will cost each domestic customer using gas and electricity **£45** per year.

CESP (Community Energy Saving Programme):

A new scheme that will oblige electricity suppliers and generators to promote energy efficiency in areas with high levels of low-income households.

Due to start in September 2009 and scheduled to run to 2012 it is estimated CESP will add around **£3** per year for a customer using gas and electricity.

The Renewables Obligation (RO):

Electricity suppliers are obliged by Government to source an annually increasing amount of electricity from renewable sources.

In 2009/10 the RO adds around **£12** to annual electricity bills.

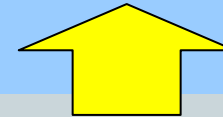
Source: Ofgem

Meanwhile other industries have been tackling the emissions problem



“There’s the car that BMW is ‘banking’ its future on. This amazing tilting, tandem concept is called Simple – and it’s our best look yet at the upcoming project ‘i’ range of eco-friendly, low emission models.

It boasts three wheels and a body that leans to aid cornering, and the 500kg two-seater is capable of 120mpg thanks to a 12kW/hr battery pack”.



Source: autoracingdaily.com 13 Oct 2009

Even a small car like this needs as much energy for a 200km trip as a house does for a whole day.

Does this make the overall problem worse, or better??

It all depends on when you charge the car..

..and what else could you do with a spare 12kWh battery?

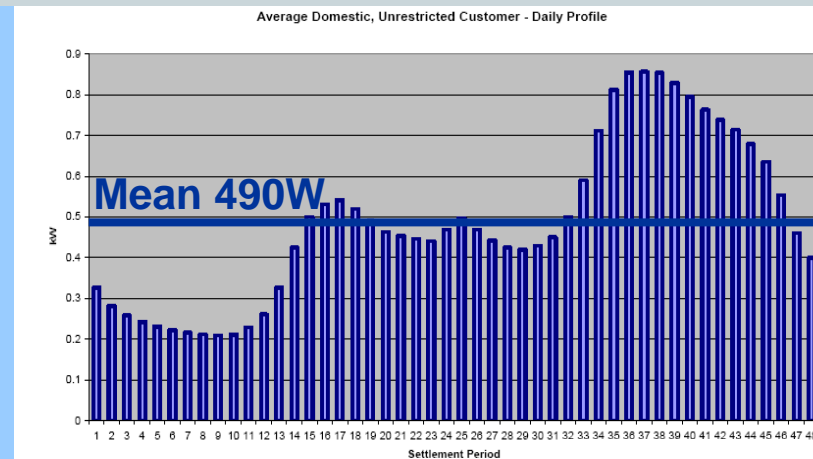


Figure 1

Source: Ofgem

What is the Smart Grid for? Who needs it?



The smart grid enables us all to participate in the balancing of energy supply and demand both nationally and locally, to support a secure low-carbon energy industry.

It enables us to adopt new sustainable distributed electricity supply technologies and also to meet entirely new demands.

The smart grid does everything that the old one did, AND..

It includes Transmission and Distribution

It provides the interactive features needed for new applications

It tells us what is happening

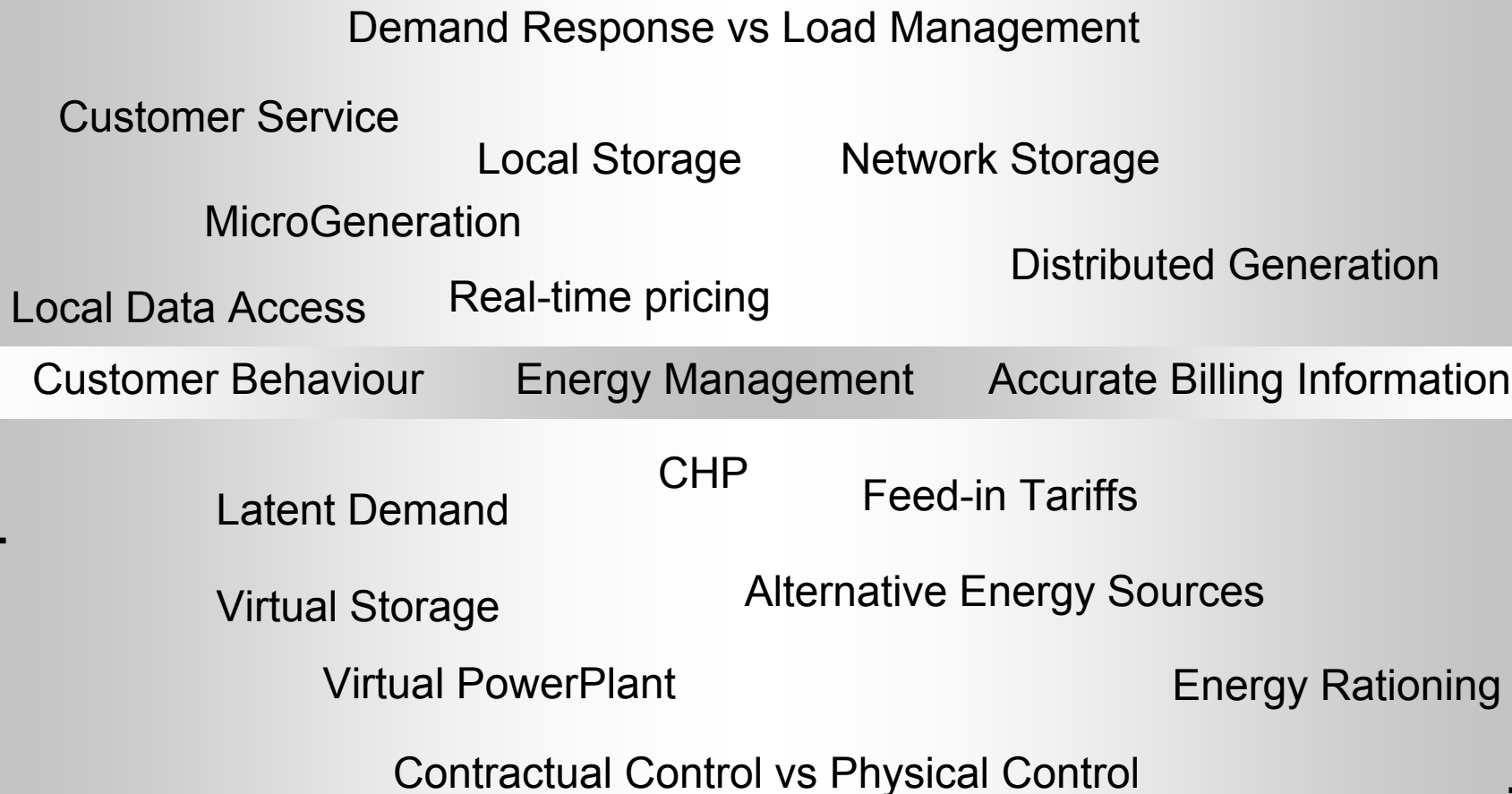
It enables us to record, plan, control, model, anticipate, avoid, deliver.

Not forgetting.. Accurate billing

The keys to the Smart Grid are:
Appropriate Communications and Data Security

Local Empowerment / Chaos

Central Control / Dictatorship



Secs

Mins

Hours

Days

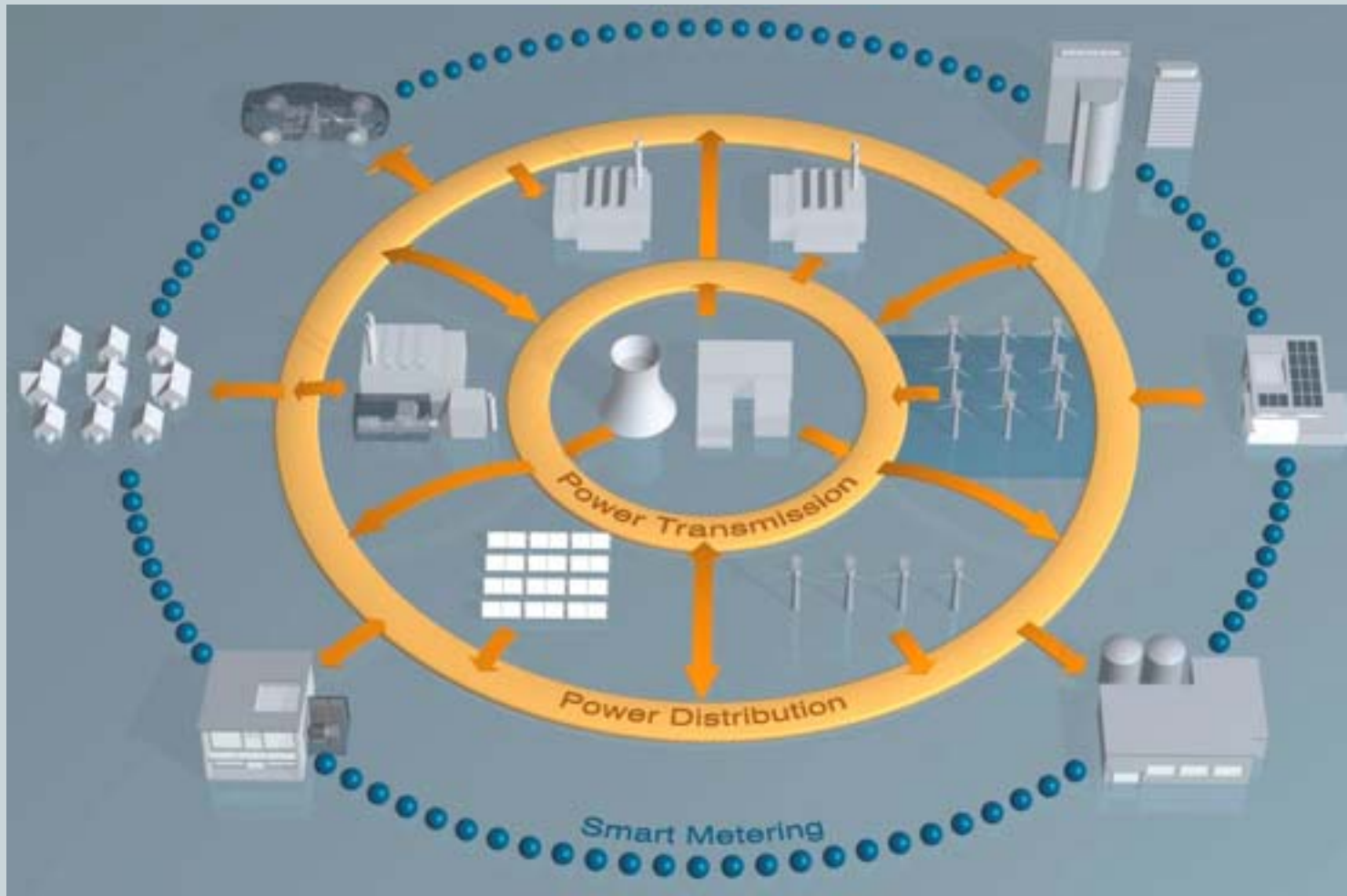
Weeks

Smart Grid – the three core aspects

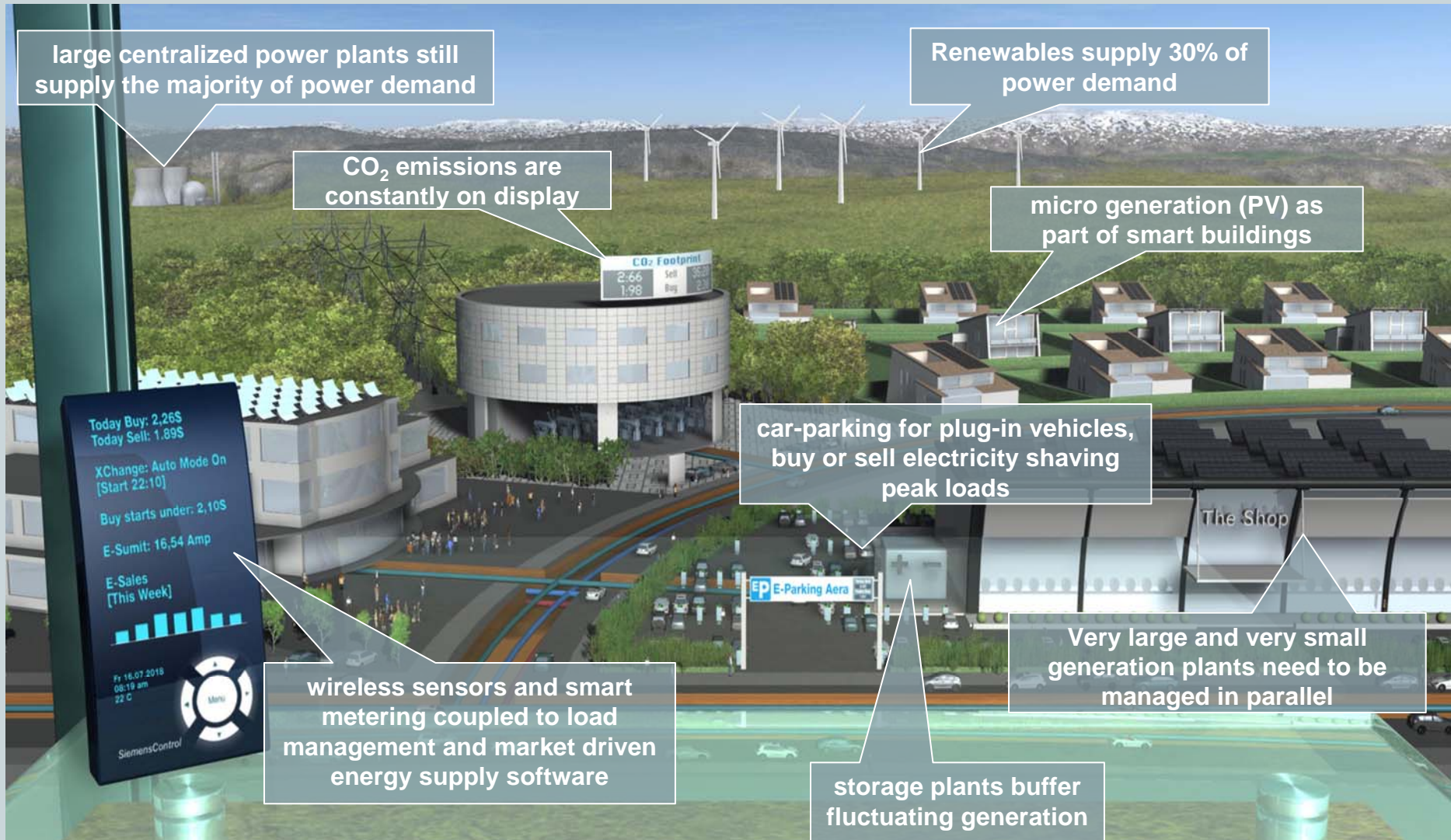
1. Improved performance

2. New architecture

3. New applications



What will smart energy look like? Big issues for sustainability on a more local scale.



Thank you

A long-exposure photograph of the London skyline at night, viewed from across the River Thames. The city lights are reflected in the water, and several boats are visible in the foreground. The sky is a deep blue, and the overall atmosphere is serene and urban.

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