

## ENERGY FUTURES: MANAGING BULIMIA OR ANOREXIA?

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### Introduction

The last 50 years has seen major changes in the energy market:

- World energy use has increased five-fold.
- Oil prices have been some of the highest and lowest in real terms since oil was discovered.
- Large proportions of our easily recoverable fossil reserves have been discovered and extracted
- New sources of energy have been commercially exploited – nuclear, solar, wind and tidal energy.

Buildings and their operation are intrinsically linked to the energy market as heating, lighting and cooling of buildings accounts for a up to 50% of fossil fuel use in developed countries.

The next 20 years is also likely to see big changes in the energy market. Two extreme scenarios can be envisaged if we assume that global warming is a real phenomenon:

1. **Bulimia: ‘pathologically insatiable hunger’.** This scenario assumes ‘business as usual’ i.e. an ever-increasing energy consumption resulting in increased global warming.

2. **Anorexia ‘loss of appetite’.** This scenario assumes that global warming is taken seriously and radical steps are taken to reduce world energy consumption.

The following paper speculates on the impact that either of these scenarios may have, focusing specifically on buildings and their use. However, the future is likely to be more rational and so fall somewhere between these two extremes!

### Bulimia

The “business as usual” scenario assumes increasing unchecked energy use, as developing countries increase their energy consumption and population, and strive to reach the same quality of life as developed countries. Global warming kicks in with a vengeance well before fossil fuels run out. World instability increases as much of the easily accessible oil and gas reserves are located in just a few parts of the world. The Southern UK may initially benefit with warmer dryer summers and milder winters. However, rising sea levels and an increase in the occurrence of gales result in large areas of currently populated land are put at risk of flooding. The cost of sea defences escalate and a ‘managed retreat’ of business facilities from vulnerable sites is undertaken. Summertime overheating and hence the use of air conditioning increases. Warmer winters only marginally reduce space heating energy consumption because much of the benefit is taken as improved thermal comfort.

### Anorexia

In order to allow developing countries to reach similar levels of quality of life demanded in developed countries and to accommodate the expanding world population, it has been estimated that a reduction in fossil fuel use by up to one tenth in developed countries is necessary. This will require radical action to reduce building energy consumption including the following:

- **Switch supply to low, or no, CO2 emission sources:** This will involve increased use of modern combined cycle gas turbines, combined heat and

power and renewable energy, particularly offshore wind turbine and biomass in the UK.

- **Improve building fabric efficiency.** Increased use of external insulation to insulate the existing building stock and high performance glazing such as evacuated glazing.
- **Improve appliance efficiency.** Lights and appliances have considerable potential for improval including the reduction of ‘phantom’ loads when not in use. Improving appliance efficiency will also help alleviate the need for energy intensive air conditioning.
- **Realistic control:** Developments in control design and installation will be forced to move away from what may work theoretically to more appropriate ergonomic design and installation.
- **Motivation and changes in use:** Technical fixes such as improved energy efficiency have not on their own resulted in a reduction in total energy consumption, therefore changes in use will have to be implemented. Information dissemination as a motivator has only a limited impact and so there will be increased legislation and major increases in fuel prices e.g. CO2 taxation. High energy prices are likely to motivate changes in work patterns. For example, workplaces located closer to workers and main public transport routes. Increased teleworking from home, and video conferencing. Phasing out of non-essential energy intensive businesses, e.g. all year round ski centres with man made snow. This will lead to increased adaptation of buildings for change of use. Radical reappraisal of what energy is actually used for. For example, at present, largely because energy is cheap, we attempt to control the entire environment within a building. Instead, buildings could be designed to ameliorate the environment as much as possible through passive means and then rely on localised/personalised control to produce acceptable conditions.