

# The IET ENERGY PRINCIPLES

The Institution of Engineering and Technology primer on energy policy

Over the last few years, energy has advanced rapidly up the public and political agenda, and we now have political consensus around the need to act urgently to mitigate climate change and safeguard the security and affordability of our energy supplies. We are not short of opportunities to debate the direction of our energy policy - but do we have our perspective right?



# The IET Energy Principles

The Institution of **Engineering and Technology** primer on energy policy

Energy is often seen as a complex technical issue. While it is true that technical knowledge is fundamental to the development of sound energy policy, it is all too easy to lose sight of the big picture.

At the IET, we believe that there are certain high-level principles derived from engineering that offer policy-makers a comprehensive vantage point from which to review energy policy. Here we do not offer technical solutions, but guidance towards effective policy-making based on sound expert knowledge and experience.

We hope the IET Principles will prove useful in the course of the ongoing debate on the UK energy policy. The IET will continue to act as a resource for authoritative, independent information on all energy technologies.

We appreciate that solutions will not be easy, but only those based on sound principles will have a hope of succeeding.

## 1. Think of the big picture – the whole energy system

- Energy is not just Electricity. We use more of our diminishing natural gas supplies for heating than for power, while transport is the fastest growing energy consuming and carbon emitting sector.
- The energy system includes energy consumers as well as suppliers; people as well as technology and resources.
- There can be no workable solutions to the energy challenge so long as these key parts of the energy system remain policy 'blind spots'.
- Think across the whole physical system and policy environment when considering how to achieve delivery outcomes.
- To reduce waste and environmental impact across the energy system, follow the **Energy Hierarchy**.

## 2. There is no silver bullet

- The scale of the challenge is enormous and there will be no single solution. Investment will be needed at many times the levels from recent history.
- The only approach capable of meeting the challenge is a mix of 'hard' and 'soft' policies, large scale and small scale, dispersed and centralised.
- Diversity is the watchword. Policy should seek to balance the risks and rewards of all the different options.
- Fossil fuels currently meet 90% of the UK's energy needs, and any measures to enable their contribution to fall below 50% over the next 50 years will need the most urgent and energetic attention.

## The Energy Hierarchy

The Energy Hierarchy is a simple principle for prioritising solutions: a sensible energy policy should make its first priority the reduction of energy use before seeking to meet demand by the cleanest means possible.

Sustainable



Unsustainable

- Energy conservation - changing behaviour to reduce demand
- Energy efficiency - using technology to reduce demand
- Renewable, sustainable energy sources - setting a course to replace fossil fuels
- Conventional energy sources - using low/no-carbon technologies
- Exploitation of conventional energy sources as we do now.

# Low energy technologies

## Currently available

- Passive design
- Effective orientation of buildings
- Building insulation, double glazing
- Energy efficient lighting
- Energy efficient appliances
- Correct installation of boilers
- Simple building controls, sensors, systems
- Energy efficient electrical motors

## Newly emerging or existing but financially expensive

- Reduced consumption electronic goods; reduced standby consumption
- Smart meters and displays
- Smart grids
- LED lighting
- Advanced controls for buildings and appliances
- Breakthroughs in ground / air source heat pump technologies
- New building materials and technologies e.g. low e-glazing, active shading, daylight linking
- High efficiency solar panels
- Active power distribution networks

### 3. Energy policy is for the long term

- Energy infrastructure is critical and pervasive - it takes a long time to build and stays in service long enough to shape the lives of several generations.
- Building a fleet of energy facilities for a given technology takes a lot longer than building a single example - assume two decades for a major rollout of a new electricity generation technology, for example.
- We are not starting from a clean sheet of paper - our decisions are constrained by the infrastructure of previous generations.
- Decisions today will be part of our system in 2050, way beyond the normal political cycle.
- Second-guessing the future is a dangerous exercise - policy should guard against unintended consequences by combining strategic vision with flexibility.

### 4. Consumers first

- Decisions made now on major changes in energy supply can only deliver results 10-15 years from now.
- Therefore, within the next 10-15 years the only serious rewards can come from far-reaching and effective measures to reduce demand for energy.
- There is a lot of scope to reduce demand using energy efficient technologies without impacting on our quality of life.

### 5. Don't underestimate the people factor

- Half our energy is used directly by individuals for transportation and in the home, and this proportion is increasing.
- Energy use is tied to wealth. No country has been able to reduce its energy demand while growing its economy. Nothing short of a radical culture change or very large price increases can break this connection.
- Technology is often the easy part - persuading people to take it into their lives is the real challenge. In parallel with research into new technologies, we have a major task to understand and tap into people's attitudes to energy use.

### 6. Make the markets work for you

- Markets must be fit for their intended purpose and their limitations recognised - the quality of the regulatory and market environment will determine whether government targets are met.
- Clarity, simplicity and consistency are the best means to encourage an entrepreneurial response - piecemeal solutions and micromanagement have the opposite effect.

- The success of international systems like emissions trading will depend critically on sensitive political handling, long-term planning and effective implementation.
- The market has become global, so the UK is in competition to attract investment in new energy technologies, systems and infrastructure.

### 7. Make sure we have the people for the job

- Make sure that the right foundations are there - the education system needs to promote the basic building blocks of science and technology, like maths and physics.
- Show commitment and direction in tackling the energy challenge - young people will choose careers in energy if they see it to be relevant and promising.
- Work more closely with employers in the energy industry to understand their requirements.

### 8. Innovation – it takes more than bright ideas

- New technologies will have to be developed urgently, but innovation remains a risky, costly and time-consuming business.
- Find ways to help new technologies along the perilous path from the lab to the market - the UK's excellent track record in supporting academic research needs to be matched with incentive structures supportive of high-tech investment.
- Technology development is happening worldwide - plug into what is happening elsewhere.
- Public resources should be prioritised for resolving local challenges and boosting areas of unique advantage - not picking arbitrary winners.

### 9. Think and act globally

- Encourage productive working relations with rapidly industrialising countries like China and India - the future markets for energy technology will be dominated by them.
- Avoid measures that require equipment for the UK to be different to that for global supply - the UK is a small player in a big market for suppliers.
- We will have to buy from others, and we should be prepared to learn from them too - our policies must embrace an active approach to collaboration.

### 10. Be informed

- The IET provides impartial and accessible information on current technologies by means of factfiles, policy briefings and submissions to Government and Select Committees.
  - <http://www.theiet.org/policy>
  - <http://www.theiet.org/factfiles>

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**About the IET**

The Institution of Engineering and Technology (IET) is a world-leading professional organisation for engineering and technology, sharing and advancing knowledge to promote science, engineering and technology. It has 150,000 members in 127 countries.

Founded in 1871, it was renamed the IET in March 2006 when the Institution of Electrical Engineers (IEE) joined with the Institution of Incorporated Engineers (IIE).

<http://www.theiet.org/about>

**Cover images (clockwise from top left)**

- Drax Power Station at sunset, Selby North Yorkshire England
- Sizewell B nuclear power station, Suffolk, England
- A new wind turbine (assembling the rotor to the generator housing)
- Modern building covered in solar panels

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