

## ENERGY REGULATION BRIEF

March 2003

SECURITY OF  
ENERGY  
SUPPLY

In summer 2002, The UK Department of Trade and Industry asked NERA to examine energy security issues in the competitive parts of the gas and electricity supply chain. This study was part of Government's preparation for a major energy policy White Paper published in February 2003.<sup>1</sup>

The fundamental question was whether markets are likely to respond effectively in managing current or expected risks to energy security. We divided our examination into four subsidiary questions:

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- are there theoretical grounds for expecting barriers to market provision of security?
- are there barriers in practice?
- do current security levels expose consumers to high risk of insecurity?
- are any barriers material and, if so, how might Government tackle them – directly, by trying to remove the barrier, or by some other means?

We produced a lengthy report answering these questions, which we summarise in this brief.

*The views in the ERB represent the views of the authors and not necessarily those of NERA.*

## Context

Security of supply in the energy system has always been an important concern, given society's dependence on energy and the lack of alternative sources. Symptoms of insecurity can be physical (supply interruptions) or financial (persistently high and fluctuating prices). Insecurity may also be short-term, like interruptions to power supply due to severe weather, or long-term, like interruptions due to inadequate investment in generation. The best way to think about energy security is as a process of managing risks.

After the oil shocks of the 1970s, it seemed obvious that Governments should shoulder the prime responsibility for providing secure energy supplies to consumers. Energy was 'strategic' and Governments either (in Europe) owned large parts of the network energy industries or (in North America) regulated them as monopolies. Standard economic theory, assuming profit maximisation, predicts that monopolies will restrict output and raise price. Because of their fears about security, Governments ensured in practice that investment and output were maintained at high levels, rather than restricted.<sup>2</sup>

When energy market liberalisation gathered pace from the late 1980s, energy security still mattered, but seemed initially to need little attention - world fossil fuel markets were slack and there was substantial surplus capacity in the electricity and gas supply industries. But attention has focussed sharply again on security of supply since the end of the 1990s. Against a background of much less stable international oil prices, a range of events and fears stimulated this renewed interest.<sup>3</sup>

<sup>1</sup> Energy White Paper "Our energy future – creating a low carbon economy" Department of Trade and Industry Cm.5761 February 2003. The DTI published two papers by NERA at the same time ([www.dti.gov.uk](http://www.dti.gov.uk)).

<sup>2</sup> The political and economic harm from interrupted supply seemed much greater than from surplus investment, and profit-maximising behaviour was disallowed. So the old order often achieved quite high levels of investment and security, but at substantial cost.

<sup>3</sup> Among the most important stimulants of this renewed interest are: California's major power crisis, with serious blackouts for consumers; the UK's 'fuel protesters', who came close to disabling the gasoline distribution network; the rise of international terrorism, drawing attention to the vulnerability of energy network infrastructures and production facilities; growing dependency on imports of fuel, particularly oil imports into the US and gas imports from outside the European Union; and 'commodity style' wholesale markets in gas and electricity, which might not give sufficient incentives for new capacity investment at the right time.

By the turn of the 21st century, most Governments had withdrawn from performing a 'strategic' role in energy, and they had fewer policy levers with which to influence security levels. The primary question is no longer what *Governments* should do about energy security, but rather whether *markets* are likely to provide adequate levels of security and the right means to manage security risks.

### Basic Theory

No energy system can ever be totally secure - so how much security is enough? In theory, the answer compares consumers' willingness to pay for more security against the costs of providing extra security levels. Extra security is worthwhile up to the point where consumer valuations of extra security are just equal to the costs of providing it - the economically 'optimal' level of security. However, no-one has enough information to estimate this optimal level exactly. In practice, conditions often provide a 'zone of adequacy' within which both the value of security and the costs of providing it will be relatively stable. Within this zone, variations in security impose very little cost on society. Government policy then aims to keep security levels somewhere within that zone of adequacy.

Such a policy objective does not necessarily imply Government intervention. Competitive markets (in the absence of external costs) may well deliver adequate security levels. The question then becomes whether or not there are material barriers - either market or political 'failures' - which will prevent markets from achieving this objective.

### Faulty Approaches to Security

Much comment on security still starts from an explicit or implicit premise that Governments need to play a central role in providing adequate levels of energy security. The argument is usually framed in terms of a present or imminent threat, and Governments are then exhorted to restore or raise levels of security. Such comment rarely mentions the need to balance the benefits of extra security and the cost of providing it. Much of it is thinly disguised lobbying on behalf of special interest groups representing expensive options.

Two common examples of such comment are the beliefs that (a) achieving greater diversity in the fuel sources for the electricity supply system is a priority and (b) energy imports reduce security and should be minimised.

At various times in the UK, the electricity diversity argument has been made on behalf of coal, natural gas, renewables and nuclear power. Diversity is an important idea in the context of security. But it is not clear that diversity should apply only to fuel sources. It may be equally important in terms of the number of firms competing in a market, the source of fuels, the supply route for fuels, or the number of technologies used. And Governments do not have any easy way of establishing just what the appropriate fuel mix might be.

The belief that energy imports necessarily worsen security is the reverse of the truth. Imports by definition increase diversity of supplies, which enhances security, and they normally *reduce* costs. (No-one imports fuel at higher cost than they need to pay at home.<sup>4</sup>) However there is no obvious reason why markets will not factor in their own estimate of the risk of unreliability, and act to diversify such risks where necessary.

### NERA Analysis of Energy Security

NERA's work for the DTI on security started from the view that barriers to market provision of adequate security could either be 'market failure' - literally the absence of relevant markets, or 'political failure', where the political system impedes the working of the market.

<sup>4</sup> In practice the anti-import argument is often a fear of potentially unreliable suppliers or countries - Russian and Algerian gas are favourite examples.

### *Market failures*

There are a variety of possible market failures. One is the ‘public good’ characteristics of energy security. A commodity or service is a ‘public good’ if providing it to one person means that no other person can be excluded from consumption, and consumption by one person does not reduce the amounts available for others.<sup>5</sup> The ‘public good’ problem in energy security is that provision to small consumers is collective – consumers cannot separately express their individual willingness to pay for different security levels. We estimated that the efficiency effect of this market failure is probably small.<sup>6</sup>

We examined a range of other possible market failures, such as a lack of relevant information in competitive markets, about planned outages of generation plant and other important factors. We also examined the ‘mixed’ case (part market/part political failure) of wholesale markets, modelled on commodity markets, failing to provide adequate long-term investment incentives.

Only this latter case seemed to us potentially serious. In energy markets, prices fluctuate substantially, but investors face asymmetric risks. The incentive to invest depends on the ability to earn a certain average rate of return. When prices are very low investors suffer low returns, which must be offset by high returns when prices rise to very high levels in shortage conditions. In these cases, Governments or regulators may step in to cap prices (and so diminish average returns). Even the expectation of such intervention would discourage investors from investing and increase the risk of insecurity in future years. We suggested that Government should consider introducing capacity-inducing mechanisms to safeguard against this problem – there are several examples of such mechanisms in liberalised electricity systems elsewhere. Government, however, rejected the need for such mechanisms in its White Paper.

We also examined other issues of concern – especially potentially inadequate provision of diversity (for example in the UK electricity system’s ‘dash for gas’) and increased dependence on imported gas. However these are *not* market failures. They are rather *risks* to which the energy system may be exposed. The question is not whether such risks are large or small, but rather whether anything will stop markets from handling them effectively. Our analysis suggested that markets would adequately handle such risks.

### *Political failures*

‘Political failures’ are potentially serious, and encompass regulatory as well as directly political barriers. Regulatory failures are clearly possible but we did not identify any which seemed likely to be material. Political ‘failures’ usually stem from the unintended consequences for energy security of policy decisions taken for different public policy objectives.

The three potential political failure issues we investigated were: the impact of environmental policy (for example the UK’s Renewables Obligation) on investment incentives; the impact of emissions controls on operating flexibility of plant; and potential obstacles in the local planning system. While all these have the potential to impede market provision of security, in practice they have only a limited impact. Market players are generally able to anticipate these failures and find strategies to compensate for them. These strategies often increase the cost of achieving a given level of security, but do not diminish security levels.<sup>7</sup>

<sup>5</sup> National defence and fundamental research are the most common examples of pure public goods and they are unlikely to be produced by a private market system.

<sup>6</sup> However we recognised that social policy would probably imply higher security levels than willingness to pay, given the incidence of poverty in the UK, especially as manifested in an inability to afford adequate warmth.

<sup>7</sup> The one possible exception is the impact of the planning system for example on major gas projects, where the possibilities of ‘substitution’ (shifting location or plant size) are minimal due to the location restrictions on projects like LNG terminals or gas storage projects.

## Conclusions

There is considerable confusion between the existence of *risks* to energy security and *barriers* to the provision of security. There are undoubtedly many security risks – though often, as with gas imports from so called “unreliable” suppliers, much room for debate about the magnitude of the risk. The task of liberalised energy markets is to manage those risks effectively. Only where barriers (market or political failures) impede such effective management is there a convincing case for Government intervention. The best intervention will often be the removal of the barrier (eg reform of the planning system), rather than direct action in energy markets. Generally, the UK Government White Paper and the recent JESS report<sup>8</sup> have adopted this market-based approach to security.

We agree with the general Government White Paper view that markets are generally powerful and well-informed enough to provide adequate security levels. However, we remain concerned about the potential for consumers and markets generally to place reliance on Government “rescue packages” in the event of perceived threats to security. If Government’s hold out the prospect of intervention whenever “the going gets tough”, markets may never be able to provide effective risk management.

<sup>8</sup> Joint Energy Security of Supply Working Group (JESS) Second report February 2003.

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