By 2000, after two decades of private operation, energy experts agreed on one thing: Britain’s privatised electricity industry wasn’t working. It was clear that the privatisation goals of low prices and long-term investment weren’t being met in an industry that was getting increasingly complex and difficult to predict. But Derek Bunn and the Energy Markets Group at London Business School had an answer – a new forecasting approach they called ‘agent-based modelling’.

For nearly half a century Britain had a state-owned power industry. The assumption was simply that this was the way things had to be – how could a critical sector like electric power be entrusted to profit-driven private industry? That assumption, like so many others, was overturned by Margaret Thatcher’s Conservative government. Her belief was that if the electricity supply industry had been in private hands before nationalisation in 1946, then it could be placed in private hands again.

At first, the government expected that privatisation alone would automatically create a more efficient industry – so much so that the Department of Energy was abolished.

But it soon became clear that a market dominated by two large players, where customers have little choice of supplier, and where the product can’t be stored for future consumption, was going to be difficult to control.

Gaming the system
“Inevitably what happened was that the large companies learned how to game the system,” says Bunn. “Initially they really didn’t know how the market would work – they were very engineering-led with no experience of competitive markets. But they gradually started bringing in people from the oil and gas companies, people who understood private industry, and in what was really a quite unregulated market they knew how to keep prices high.”

At first Bunn and the Energy Markets Group concentrated on building models of how the industry would behave under various scenarios of energy prices and investment incentives. “With privatisation the investment case had changed, because suddenly the cost of capital went from very low to quite high, and nobody knew whether or how companies would invest,” says Bunn.

A complex industry
But the electricity market wasn’t working as policymakers expected. Patterns of ownership and control were getting more complex, making price and investment forecasting more difficult. In response Bunn and his team began to devise a form of economic modelling for the industry that would take these complexities into account, the new agent-based approach.

“Before this the industry was modelled in aggregate – nobody had thought in terms of who actually owns the assets,” says Bunn. “So we were able to show in advance what would happen when, for example, the big companies sold generation assets and started buying retail operations. And remember this is an imperfect market that demands complex modelling – you don’t go out of business just because you put your prices up.”

Getting to grips with climate change
The introduction of agent-based modelling was timely because it was able to respond to the next big change in the industry, as climate change suddenly became a government policy priority.

The influential Stern Report on climate change was published in 2005, followed by the Climate Change Act of 2008. The UK now has a wide range of energy subsidies and controls, including minimum prices for carbon emissions, subsidies for solar and wind power, and a panoply of energy efficiency standards. “What we have ended up with is a market that was originally meant to be driven by competition now being driven by policy interventions and decisions on political risk,” says Bunn.

International advice
One result of that is that the Energy Markets Group now spends much of its time examining how efficient government incentives are, and whether new incentives will work in an industry already heavily incentivised – the effect that Bunn calls ‘policy crowding’. This work is no longer confined to the UK – the Energy Markets Group has devised applications to electricity market reforms in Italy, Germany, Spain, Korea and Russia, and the approach has been taken-up by advisors in the United States, Australia and New Zealand.

“Every country is different when it comes to policy risk, but many are facing essentially the same dilemmas,” says Bunn. “Our work has clarified how company behaviour influences prices, and that makes it easier for regulators everywhere to ask the difficult questions they need to ask. And this is an international market now – there is no obligation on the part of capital to invest in any one country.

“If any one country manages its risks badly,
then there simply won’t be any investment. That means the lights go out – which is why our work is needed.”

Derek Bunn is Professor of Decision Sciences at London Business School

Audio clip transcription:

“I think the major impact that we have had is bringing in the focus on individual agents, and the way they interact to produce prices that are often perceived to be relatively high, and the implications that that then has on investment and policy in the electricity market. Taking an agent-based focus is something that was unusual fifteen years ago but has become much more common, both in simulation models and in empirical models, within the last five to seven years.”