Infrastructure needed, not fuel

By Walt Patterson

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Listen carefully when politicians chant their new mantra, 'security of energy supply'. They don't mean it. They mean secure supplies of fuel, not of 'energy'. They mean, in particular, uninterrupted imports of oil and natural gas. That's a desirable objective; but it falls far short of what the rest of us want. We want secure supplies not merely of 'energy' but of energy services. In the case of electricity, we want to keep the lights on. Fuel alone isn't enough. Indeed fuel alone may not even be necessary. We can generate, deliver and use electricity without fuel. What we need for electricity is not fuel but infrastructure. You can have electricity without fuel, but not without infrastructure. Without infrastructure electricity doesn't even exist.

Unfortunately, however, politicians don't appear to understand this. When they liberalized electricity, they imported all the concepts of the oil and gas industry, as if they applied equally to electricity. They don't. Fuel – fossil fuel, in particular - comes out of a hole in the ground. If we want to use it anywhere else, we have to take it there. Fuel is a commodity. You can buy and sell fuel in batch transactions; what matters is the price per barrel or other unit. If you don't get the price you want, you can store the fuel until you do. But electricity is different. Electricity is not a commodity; it is a process, happening instantaneously and simultaneously throughout an entire interconnected system of generators, network and loads. We cannot store electricity – not in the form we use it. But we can generate electricity anywhere – with or without fuel.

Today's so-called 'electricity market' is therefore fundamentally misconceived. It treats electricity as though it were a commodity, and overlooks the crucial factor that electricity is above all a question of infrastructure – of the physical assets that generate, deliver and use it. For security of supply of electricity services, all these physical assets together, all this infrastructure, has to be in place and operating. Needless to say, the infrastructure should be arranged to maximize reliable delivery of services and minimize vulnerability to disruption.

To take an obvious example, one way to reduce vulnerability to disruption of fuel supply for electricity is to reduce the need for fuel. That's a key reason why generation based on renewable energy ought to be a central aim of policy for any government wanting to keep the lights on. Wind generation, for instance, is the fastest-growing form of what we can call 'infrastructure generation', to distinguish it from fuel-based generation. For fuel-based generation, the cost of the fuel makes up a major part of the cost of the output. For infrastructure generation, such as wind, hydro and photovoltaics, almost the entire cost is up-front investment. To treat this as though it were fuel-based severely misrepresents what is happening. It grievously distorts the finances of such physical assets. Their financial status is determined not by batch transactions in commodities but by return on investment, depreciation, tax treatment and other familiar aspects of asset accountancy. Governments urgently need to recognize explicitly the distinctive difference of electricity infrastructure – not only generation and networks but also loads, including appliances and buildings. If governments can once shake off their fixation on fuel-based concepts and policies, they have potent leverage available, notably through differential asset taxation, to foster dramatic improvements in electricity.

Networks, too, have a crucial role to play. Traditional network configuration and operation distort and downgrade the advantages of innovative small-scale generation, especially infrastructure generation. One key attribute of small-scale generation is precisely that it is small, and therefore comparable in size to a load. For instance, to regard a 2MW wind turbine as equivalent to, say, a 250MW gas turbine is nonsensical. The system effect of the wind turbine is closer to that of a load such as an industrial motor than to that of traditional large-scale central-station generation. Connecting the wind turbine is akin to disconnecting the motor, and vice versa. Indeed, with appropriate technology and transactions, loads and generators of similar

size and performance ought to interact directly, across a system. The assumption that a load is independent, that a generator must respond and be dispatched accordingly, is just that – an assumption, dating back more than a century, and long since overdue for reassessment.

What causes instability and triggers blackouts is not the loss of output from a wind turbine. It is the loss of a large-scale central generator, or the circuit carrying its output – hence the need for costly redundancy and spinning reserve, wasteful and adding to environmental impact. Wind turbines and other small-scale generators add diversity and stability. Instead of being penalized for not being dispatched, they ought to earn a premium. We should pay infrastructure generators not merely for units of output, but for availability of assets, for access to them and for use of them - exactly as we already do for the physical assets of the electricity network. Those network assets in turn should evolve and adapt to take advantage of the attributes of small-scale generation, especially infrastructure generation. Innovative network configuration, including optimized local networks linking local generation to local loads, will bring multiple benefits of lower losses and higher reliability. If the generation is infrastructure generation, with no fuel risk and no emissions, so much the better.

If governments want to enhance the security of electricity services, they need to start by understanding that electricity is not oil. The best way to reduce vulnerability to interruption of fuel supplies is not to depend on them. Wind and other infrastructure generation, diverse and decentralized, should have a key role in keeping the lights on.