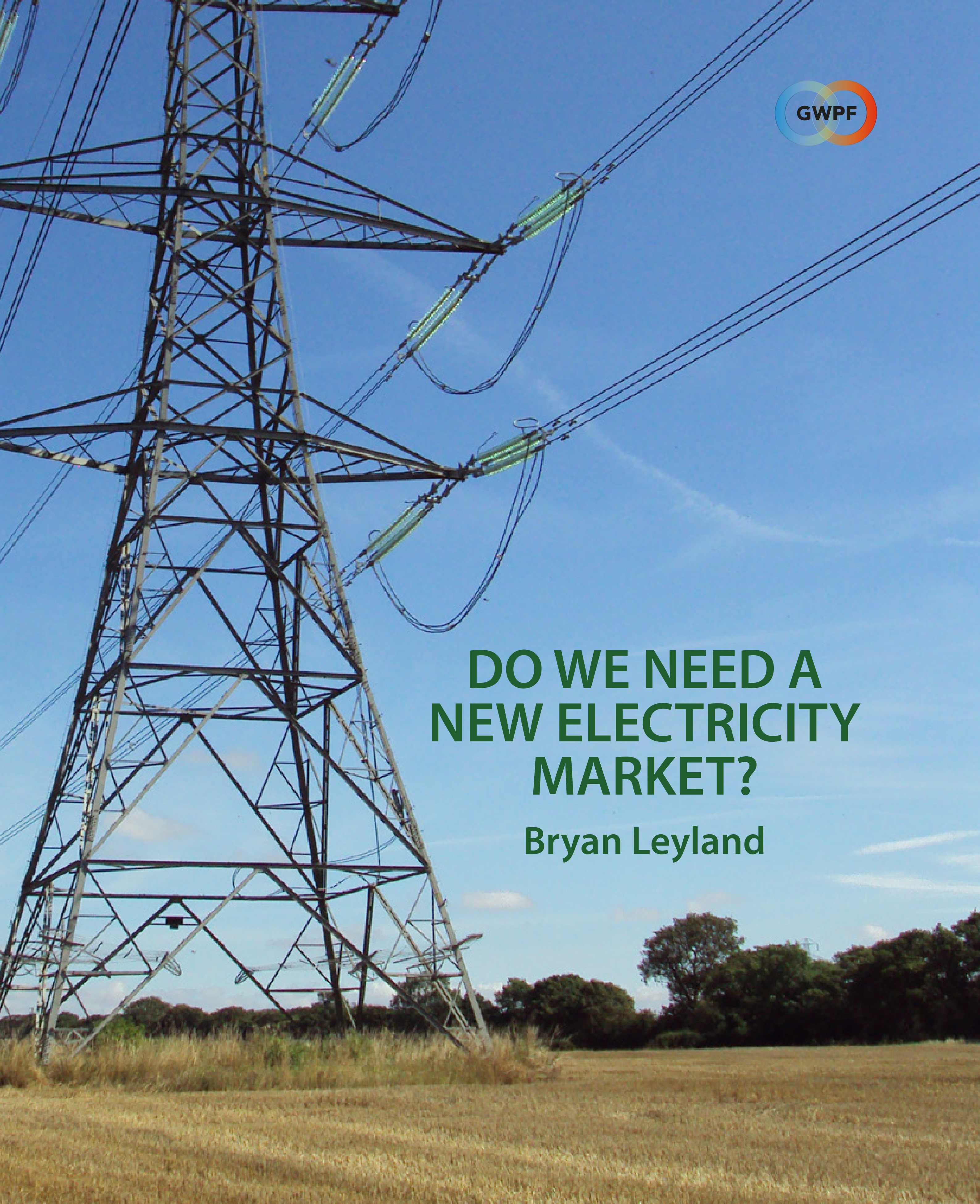

DO WE NEED A NEW ELECTRICITY MARKET?

Bryan Leyland

The Global Warming Policy Foundation
Note 38

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Contents

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nationalgrid
GENERATION MIX

Introduction

Many countries in the western world have an electricity market based on short-term trading of units of electricity (a 'kWh market'). Recently, most have seen very high prices because gas shortages have increased the cost of generation at gas-fired power stations. The way the market works, the higher price of gas-fired electricity is also paid to lower-cost generators: coal, nuclear, wind and solar.

There is a serious risk of even higher prices, and possibly blackouts, in the Northern Hemisphere winter this year. Given that the market is already delivering unaffordably high prices, a comprehensive review of the market structure is urgently needed.

The existing market

The existing market is based on an underlying assumption that electricity is 'a commodity like any other'. This ignores the fact that it does not have the key characteristics of a market commodity, namely price elasticity and the availability of an alternative. Demand is largely insensitive to price in the short term, but a long period of high prices reduces demand because electricity becomes unaffordable to industry, commerce and, in particular, poor people. The reality is that electricity is the lifeblood of the economy: if the price goes up, the economy suffers. Blackouts bring disaster.

The current market pays all participants the price bid by the most expensive generator selected to run. Markets like this work with many market commodities, where there are a lot of factories producing similar products and new participants in the market have the lowest production costs. Paying all of them the price bid in by the most inefficient factory ensures the profitability of newer ones and encourages investors to build more of them. If the price is still too high, people can always switch to an alternative product. It doesn't work with electricity because price has only a small effect on demand; its value to the consumer is greater than the price. Electricity generators have a captive market because there is no alternative product. Generators quickly learn that the way to maximise profit is to keep the system on the edge of a shortage. They can make sure this happens because they decide whether or not new generation will be built.

In most countries, there are several methods of generating electricity, with markedly different technologies and cost structures. Nuclear stations have a long life, a high capital cost and a low and predictable operating cost. Gas-fired generation has a low capital cost and a high fuel cost. Wind and solar are heavily subsidised and so have a low cost if it is measured at the wind or solar farm, but they impose high downstream costs on the power system because of the expense of providing backup when the wind is not blowing or the sun is not shining. The consumer, not the generator, pays for the subsidies and backup. This is not fair.

Having intermittent wind and solar compete by bidding in at their low generating cost produces farcical results.

- If there is a surplus of wind or solar power, subsidised renewables generators can bid into the market at very low prices, causing market prices to collapse. This deprives reliable low-emissions baseload generators, such as nuclear, of income, and often puts them out of business. If this is the case, there will not be sufficient generation available on the system to keep the lights on when the wind is not blowing and the sun is not shining.
- The nature of the power plant must also be considered. Inefficient open-cycle gas turbines are needed to respond to rapid fluctuations of wind and solar power. Combined-cycle plants are much more fuel-efficient, but need to operate at a fairly steady load, so they are of limited use in systems with lots of renewables. The end result is more emissions from gas-fired stations.
- When gas is in short supply, the cost of gas-fired generation soars, pushing up market prices, and the market pays this high price to all the other lower-cost generators, who then make windfall profits. These prices are passed on to consumers, so households suffer and industry shuts down, and often moves to countries with lower power costs, wreaking huge economic damage.

The result is that electricity is much more expensive than it would have been if the system was operated in a way that minimised the overall cost of generation.

A carbon tax makes the situation even worse. If the cost of gas is setting the market price, then all the generators get the carbon-tax-boosted price. The unfortunate consumer thus ends up effectively paying the carbon tax on clean wind, solar and nuclear power. It is hard to get crazier than that!

The current kWh market results in the construction of more wind and solar than the system can economically cope with. Baseload power generation becomes uneconomic and retires from the grid. The price of electricity and the frequency of shortages both increase. Grid stability is also at risk: with a large penetration of renewables, system frequency is more difficult to manage, and it is harder to keep the voltage stable.

A single-buyer market

The first country to adopt an electricity market was New Zealand. The decision-makers were offered three options: stay with the Electricity Corporation of New Zealand, introduce a 'single buyer market', or finally to introduce a kWh market. The latter was identified as the most risky option, but was chosen nevertheless. Many power systems in the world subsequently adopted the kWh market structure because it was touted as operating successfully in New Zealand.

A single-buyer market recognises that electricity is the lifeblood of the economy, and that it has little price elasticity and no alternative. Ideally the single buyer is a non-profit organization, independent of the government. The aim is to optimise the system as a whole, so as to minimise the cost to the consumer.

The single buyer coordinates the whole system, manages the generation mix, ensures that there are adequate fuel supplies in reserve to cover contingencies and high demand periods, and manages inertia, voltage and other factors needed to keep the system stable.

A single-buyer market preserves the advantages of the centrally coordinated generation and transmission that is a characteristic of vertically integrated electricity systems. Chief among these is that new power stations are provided as a result of competitive tendering rather than by a centralised and usually inflexible monopoly, or by market players focused on short-term profits.

The single buyer invites bids from the industry for long-term contracts to build and operate the power stations required. The contracts feature a fixed annual fee to cover profits and the fixed costs of turning fuel – wind, water, sunshine, uranium, gas or coal – into electricity. Generators are recompensed at cost for any fuel they consume, and for variable operation and maintenance costs, so the amount they generate does not affect profits. This means that if they are ordered to increase or decrease generation by the system operator, they will not suffer from complying. There would also be a bonus/penalty regime for efficiency and availability. Power plants that are operated efficiently and exceed availability guarantees would make the highest profits.

When assessing tenders for new generation, the single buyer would take into account the cost of providing any transmission lines needed and would also assess future fuel costs. The cost of backup for stations that cannot guarantee to be available when needed would also be a factor in the assessment.

The single buyer would sell electricity to distributors and large consumers, with cost-reflective tariffs; in other words, higher prices during high-demand periods, so as to encourage demand-side management. The distributors sell electricity to the consumers, so there would no longer be any need for energy traders to compete to sell exactly the same product. This could represent a useful reduction in the cost to the consumer.

If governments wished to subsidise some forms of generation, this would complicate matters. Given that subsidies can appear and disappear at the whim of governments, their effect and the uncertainty they introduce for investors would need to be carefully considered during tender assessment.

In a perfect world, such a market would be expected to deliver in line with its objectives, because all it does is add real competition to existing monopoly operations, which have been reasonably successful. In the real world, the main danger is that the single buyer would gold plate the system to minimise the risk of being criticised for generation shortfalls. Given that a shortage of generation is much more economically damaging to a country than the extra cost of moderate overbuilding, the risk is not great, and it can be minimised by ensuring that the plans are independently scrutinised.

A single buyer would be responsible for managing transmission system development and would initiate the building of new lines. The single buyer could decide that all consumers must share the cost of the core grid, with transmission lines and switchgear dedicated to individual consumers or groups of consumers being charged as an extra. The cost of transmission lines needed for new generators would be factored into the generator tender evaluation. The lines could then be funded by the single buyer and incorporated into the core grid which would be owned and operated by an independent organization.

How could the transition take place?

Transitioning from the existing market to a single-buyer market would be an interesting exercise. The first step would be to switch generators onto the market; the second step would be to rationalise transmission and distribution.

For stations not yet built, it would be a matter of persuading developers to switch to a market that promised a steady income and much less risk far into the future. They and their bankers should be delighted!

Switching existing generation into the new market could be difficult. The main problem is that, in many countries around the world, generators that have been making windfall profits, as a result of high gas prices and subsidies, will be reluctant to lose this bonanza. On the other hand, they should see the benefits of joining a market with long-term stability and reasonable profit levels. For those that held out, the government could step in and offer to buy them out.

The transition would favour building power stations with long lives, reliable output and low and stable operating costs.

- Nuclear power would be more attractive because of its reliability, long life and predictable costs.
- Wind and solar generation would be less favoured because of their short operating lives and the high cost of providing backup.
- Open-cycle gas turbines would be less popular because of their poor efficiency.
- Pumped storage would be favoured because it has a long life and is much cheaper than batteries and other storage technologies.*

How would it benefit the consumer?

Operating the power system to minimise the overall cost, eliminating windfall profits and the foolishness of consumers effec-

* In the current market, energy storage facilities designed to support intermittent and unpredictable wind and solar are a risky business because no one can predict their long-term future.

tively paying a carbon tax on power generated by low emissions stations, and ending the nonsense of paying for energy traders, would bring enormous benefits. Consumers would enjoy substantial reductions in prices and see stable prices into the future. Transmission costs would almost certainly fall too, because expensive and uneconomic lines to remote and often intermittent generators would no longer be built.

Conclusions

The existing market is fundamentally flawed because it treats electricity as 'a commodity like any other', which it most certainly is not. As we are seeing right now, it leads to shortages and unaffordable prices. Some generators reap windfall profits, and many efficient, reliable and essential baseload generators are at risk of being driven out of the market.

In her book *Shorting the Grid,*[†] Meredith Angwin provides a comprehensive description of the situation in the US, where consumers in most vertically integrated areas have lower costs than those subject to an electricity 'market'. She also points out that many rules and regulations are anticompetitive and act against the interests of the consumer.

The existing market in the UK has produced perverse results. Government tampering has made it even worse. Other options urgently need to be considered before it does any more damage to our economies, industries, commerce and, in particular, to ordinary people.

The evidence supporting the proposition that a single-buyer market would be much better seems to be strong. After all, the only substantial difference from the largely successful vertical integration arrangements in the US and the old Central Electricity Generation Board is that it replaces monopoly generation with real competition. The major risk of a single-buyer market is government interference, but this is a risk that applies equally to the current market.

We urgently need a comprehensive review of the current market, identifying its advantages and disadvantages, and comparing it with the single-buyer model (and other alternatives) to see which is the best at providing a reliable and economic supply. Continuing with the present flawed market, distorted by subsidies and price caps, is not a rational option.

† M Angwin, *Shorting the Grid*, Carnot Communications, 2020.

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People are naturally concerned about the environment, and want to see policies that protect it, while enhancing human wellbeing; policies that don't hurt, but help.

The Global Warming Policy Foundation (GWPF) is committed to the search for practical policies. Our aim is to raise standards in learning and understanding through rigorous research and analysis, to help inform a balanced debate amongst the interested public and decision-makers. We aim to create an educational platform on which common ground can be established, helping to overcome polarisation and partisanship. We aim to promote a culture of debate, respect, and a hunger for knowledge.

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38	Bryan Leyland	Do We Need A New Electricity Market?

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