Do we need a new electricity market?

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1. Introduction

Many countries in the western world have an electricity market based on short term trading in kWh. Recently this market has led to very high consumer prices because massive increases in the cost of gas have increased the cost of generation at gas fired stations. The way the market works the higher price of gas fired electricity is paid to lower cost generators fuelled by coal, nuclear, wind and solar.

There is a serious risk of even higher prices and possibly blackouts this Northern winter.

Given that the market is already delivering unaffordably high prices, a comprehensive review of the market structure is needed.

2. 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 electricity does not have the key characteristics of a market commodity: price elasticity and the availability of an alternative good. 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 and if the supply fails, it is a disaster.

The current market pays all generators the price bid by the most expensive generator selected to generate.

A market like this works where there are a lot of factories producing similar widgets with similar technology and new factories have the lowest production cost. So paying all of them the price bid in by the most inefficient factory ensures that newer factories are profitable and encourages the construction of more new factories. If the price is still too high, people can always switch to an alternative widget.

With electricity it is different. There is no alternative to electricity so the generators have a captive market. They quickly learn that the way to make money is to keep the system on the edge of a shortage. Which they can do.

In most countries there are several methods of generating electricity with markedly different technologies and cost structures. Nuclear has a long life, a high capital cost and a low operating cost. Gas-fired generation has a low capital cost and a high fuel cost. Wind and solar have a low cost at the station gate but they impose high costs on the power system because of the cost of providing backup when the wind is not blowing or the sun is not shining. The consumer not the generator, pays for the backup.

Having intermittent wind and solar compete by bidding in at their low station gate cost produces farcical results. They are often subsidized so they can bid in at virtually nothing. If there happens to be a surplus of wind and solar power they will set the price and push reliable low emissions base load generators off the system. This deprives them of the income they need to continue operating profitably. If they shut down 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. Open cycle gas turbines can respond to balance the rapid fluctuations of wind and solar power. Combined cycle plants are much more fuel-efficient, but because they need to operate at a fairly steady load they become less attractive to investors.

When gas is in short supply a small amount of expensive gas generation will push up the price paid to all generators. Generators with low-cost fuel make windfall profits while those that are short of fuel go bust. This high price is passed on to consumers so residential consumers suffer and industry shuts down wreaking huge economic damage. The result is that electricity costs much more than it would have cost if the system was operated to minimise the overall costs of generation.

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

The market results in more wind and solar being built than the system can economically manage while efficient baseload power generation becomes uneconomic and retires from the grid. The price of electricity and the frequency of shortages both increase. System stability is also at risk: system frequency is more difficult to manage and it is harder to keep the voltage stable.

3. Is there a market structure that would produce better results?

The first country to adopt an electricity market was New Zealand. The decision makers were offered the option of a "single buyer market" but rejected it in favour of a kWh market even though it was identified as a riskier option. Many power systems in the world adopted the kWh market because, initially at least, it appeared to be operating successfully.

A single buyer preserves the advantages of the centrally coordinated generation and transmission that is fundamental to vertically integrated systems. The big advantage of the single buyer is that that new power stations are provided on a competitive basis instead of by a centralized and often inflexible monopoly organization.

A single buyer market recognises that electricity is the lifeblood of the economy and has little price elasticity and no alternative good. It’s prime objective is to provide a reliable supply at least cost to the consumer. It also recognises that there is a real and competitive market centred on building and operating power stations in exchange for a long-term contract.

Ideally a single buyer is a non-profit organisation independent of the government (as far as is possible). The organisation coordinates the whole system to ensure that the generation mix and the fuel supply held in reserve to cover contingencies and high demand periods minimises the cost to the consumer while providing adequate reliability. It must also ensure that there is sufficient inertia, voltage support and short circuit current to keep the system stable.

This market treats power stations as process plants that get paid for the fixed and variable costs of turning fuel – wind, water, sunshine, uranium, gas or coal – into electricity.

Organisations in the business of building and operating power stations would compete for long-term contracts that are designed to adequately reward them for building, operating and maintaining the station. They are recompensed at cost for any fuel they consume and for variable operation and maintenance costs so the amount a station generates does not affect its profits. This means that their profits are unaffected if the system operator instructs them to generate or to shut down as required to minimise the cost to the consumer. There is would also be a bonus/penalty regime for efficiency and availability. Power plants that are efficient and available would make the highest profits.

When assessing tenders for new generation the single buyer would take into account the cost of providing any needed transmission lines and 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 the distributors and to large consumers using cost reflective tariffs. The tariffs would include higher prices during high demand periods and so encourage demand side management.

The distributors would sell electricity to the consumers so there would no longer be any need for energy traders competing to sell exactly the same product. This could make a useful reduction in the cost to the consumer.

A single buyer market could also have individual contracts between generators and large consumers.

If governments wished to subsidise some forms of generation they would do so outside the market. Given that subsidies can appear and disappear at the whim of governments the effect of subsidies and the uncertainty would need to be carefully considered during tender assessment. Ideally, taxpayers, rather than consumers, would be saddled with the cost of subsidies.

In a perfect world it can be argued that there is a high level of confidence that such a market would deliver in line with its objectives. In the real world, the main danger is that the single buyer would gold plate the system to minimise the risk of being criticised if it turns out that there is not enough generation. 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. But it can be minimised by ensuring that the power plans are independently scrutinised.

4. How could it replace the existing market?

Transitioning from the existing market to a single buyer market would be a complex exercise. The first step would be to switch the generators onto the market and the second step would be to rationalize transmission and distribution.

For stations not yet built, it would be a matter of persuading potential generators to bid into a market that promised a steady income into the future and much less risk. 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 have been making windfall profits based on high gas prices and hence might be reluctant to lose this bonanza. On the other hand, they could easily see the benefits of joining a market with long-term stability and

reasonable profits. For those that held out, the government could step in and offer to buy them out.

The transition would create more interest in building power stations with a long life, reliable output and low and stable operating costs.

It is likely that in a single buyer market generators would be happy to offer nuclear power generation because its reliability, long life and predictable costs lead to a steady income. Wind and solar generation are likely to be less favoured because of their short life and the high cost of providing storage for backup. Open cycle gas turbines would be less popular because of their poor efficiency. So be it.

A single buyer is likely to show more interest in hydropower pumped storage because it has a long life and is much cheaper than batteries. With the current market energy storage facilities with a long life designed to support intermittent and unpredictable wind and solar are a risky business because no one can predict their long-term future.

A single buyer would be responsible for managing the transmission system and building 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 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 in the core grid.

5. How would it benefit the consumers?

With a single buyer market consumers are likely to enjoy a real possibility of a substantial reduction in price and certainty of stable prices into the future. This would result from operating the power system to minimise the overall cost, the elimination of windfall profits and abolishing the nonsense of consumers effectively paying carbon tax on power generated by low emissions stations such as nuclear. In addition, consumers would no longer have to pay for the cost of energy traders competing to sell an identical commodity.

Transmission costs are likely to be reduced because uneconomic lines to remote generators would not be built.

6. Conclusions

The existing market is fundamentally flawed because it treats electricity as "a commodity like any other" when 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 and reliable base load generators are at risk of being driven out of the market.

In her book “Shorting the Grid” Meredith Angwin (https://meredithangwin.com/books/) provides a comprehensive description of the situation in the US where consumers in vertically integrated areas usually have lower costs than those subject to an electricity “market”. Also explains how many rules and regulations are anticompetitive and act against the interests of the consumer.

The existing market has produced perverse results. Tampering with it 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 better seems to be quite strong. After all, the only substantial difference from the largely successful vertical integration arrangement is that it replaces the monopoly in generation with real competition.

The major risk of a single-buyer market is government interference distorting the market. A risk that is particularly obvious right now.

There may well be other market structures that offer equal or better benefits.

What is urgently needed is a comprehensive review of the current market identifying its advantages and disadvantages and comparing it with alternative markets 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.