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Hydropower Power Systems Electricity Markets

Australian energy market review

Submission by Bryan Leyland MSc, DistFEng NZ, FIMechE, FIEE(rtd).

Bryan has been in the electricity industry for more than 60 years and has worked in New Zealand and in many overseas countries on a range of power projects. He has had an interest in electricity markets ever since New Zealand decided on a market based on kilowatt hours in the 1990s. He predicted that this would lead to rising prices and a decrease in security of supply. This is what has happened.

The first step should be to identify the basic problems.

1 **Heavily subsidised wind and solar power does not benefit the consumer.** It also does not benefit the environment because nobody has yet provided convincing evidence that man-made carbon dioxide causes dangerous global warming. Therefore, all subsidies and other advantages – like free backup – enjoyed by wind and solar power should end.

2 T**he market structure, based on an assumption that electricity is a "commodity like any other" is fatally flawed.** "Market commodities" have price elasticity and an alternative good must be available. Electricity does not have price elasticity because its value is far greater than its price. And there is no alternative good – you can't run a computer on gas.

For a reliable and economic supply, we need to have a reliable supply of kWh at the lowest possible price and a guarantee that sufficient MW will be available to meet peak demands.

3 **Because generators control the price when there is a shortage and they also control the amount of generation available they are often able to game the market.** Which they do.

So the two commodity market, while being a substantial improvement, would not eliminate gouging.

Comment

In an efficiently operated power system each new increment of generation is selected on the basis that it will lead to the lowest overall cost of generation. No Inducement to do this exists with the current market.

Solutions
Changing the market into a two commodity market kWh and MW) would make a big improvement and would be relatively easy to do. At the same time all subsidies for renewable energy and energy storage systems should be abandoned.

A single buyer market where a central entity – as free as possible from government control – manages and optimises power generation, contracts with each existing generator on a long-term basis based on paying an annual sum to cover capital costs, operation and maintenance and profit and paying for fuel at cost is a much better option.

When new generation is needed international tenders are issued that described the need – base load or peaking for instance – and whether or not there are preferred locations. The tender is awarded based on the offer that provides the lowest cost of generation.

Doing this taps into a genuine and very competitive international market for the construction and operation of power stations. It also allows the system operator to select the most suitable generation at any moment in time.

A market like this will guarantee power at the lowest possible cost and it will guarantee security of supply.

I strongly recommend that a single buyer market be considered carefully.

Documents describing the problems with the existing Australian market and describing the single buyer market system in more detail are attached.Sincerely yours,

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Death spiral (Magazine Article by Bryan Leyland)

It seems to me that Australian power systems are heading into a death spiral resulting from installing large amounts of expensive and unreliable wind and solar power.

For years, the Australian electricity market has subsidised and promoted “renewable energy” such as solar and wind power because of a belief that it would make a substantial reduction in carbon dioxide emissions at a low price. The trouble is that they reduce carbon dioxide by a small amount so it turns out to be an extremely expensive way of reducing CO2.

The subsidies are driven by a mistaken belief that man-made carbon dioxide causes dangerous global warming. Few people realise that the evidence supporting this disease is very weak and almost entirely depends on the output of computer models that predicted that, by now, the world would be 0.5° warmer than it actually is. This serious error in their predictions proves that the models are worthless. Further evidence is provided by the fact that nobody has succeeded in providing convincing evidence that man-made carbon dioxide causes dangerous global warming. (If anybody has such evidence, there is a NZ$6000 prize waiting for them at the website of the New Zealand Climate Science Coalition.)

A critical error in setting up the electricity market is that it does not reward generators that can guarantee to be available over peak demand periods over generators that cannot. The market simply pays all generators the same price – the spot price – for every kilowatt hour they generate in each period. In a rational market, generators that reliably provide electricity over peak demand periods would receive an extra payment for their valuable – and essential – service.

As a result of the subsidies and privileges and the shortcomings of the electricity market, many wind farms and solar installations have been developed and made good returns for the promoters. These installations cannot guarantee to provide power when it is needed and their output can increase or decrease very rapidly. They destabilise the power system and massive additional expenditure is required to provide the power needed when the wind doesn’t blow and the sun isn't shining and to provide for rapid increases in system output when wind drops suddenly or a cloud crosses the sun. These costs are passed on to the consumer, not, as it should be, to the wind and solar farms that caused the problem.

Domestic solar power is a classic example of how subsidising an uneconomic source of electricity drives us towards an unsustainable system that can only end in disaster.

It works this way: those who purchase roof mounted solar cells substantially reduce their electricity consumption and, in many cases, export surplus electricity back into the system when the sun is shining and household demand is low. In many cases, they will be credited for this export power at the price they pay to purchase electricity whether or not the system needs it.

The fact is that more than 50% of the cost of electricity is for the generation and transmission system. In an ideal world, this would be charged for on the basis of the consumer’s peak demand but, for various reasons, it is included in the charge for energy (kWh). So if somebody reduces their electricity purchases by 50%, without, as often happens, reducing their peak demand at all, they are not paying their fair share of gen-

eration, transmission and distribution costs. These costs must still be met so the electricity charges to everybody on the system have to be increased to cover the shortfall. This increase in retail charges provides more inducement to install solar cells and this exacerbates the problem and increases electricity charges.

In the end, electricity becomes unaffordable to poor people and, because the market provides insufficient income for the generators making up the shortfall, the electricity supply becomes more and more expensive and, more and more often, fails to meet peak demand.

When this happens, the electricity consumers will begin to realise that large-scale wind and solar power can never provide a reliable economic supply and will revolt against the politicians and insist that the electricity industry leaders who were misled into promoting renewable energy are fired. But the new team will be faced with a difficult and expensive job. They will have to reduce or abolish all subsidies, persuade generating companies to build new clean and efficient power stations burning fossil fuels and write off huge expenditures on transmission lines that are no longer needed. They may even be forced to compensate the people who rorted the subsidies by installing wind farms and solar cells.

It could easily be 20 years to re-establish the rational system producing cheap reliable electricity that the renewable energy enthusiasts destroyed.

The options are clear and simple: abandon the subsidies as soon as possible or sit on your hands and watch the situation getting worse and worse until, in the end, the consumers and taxpayers revolt.

What those in charge of the electricity industry need to learn is that large-scale wind and solar power have no future in a system whose objective is a reliable and economic supply.

Description of a Single Buyer market

Under the 'single buyer' (SB) model, the single buyer is independent of the both the government and the industry, and an independent auditor handles any complaints.

The single buyer option is, in my view, most definitely a market-driven option in an efficient market where there really is price elasticity and many alternatives.

The single buyer would be responsible for coordinating the system and determining the need for new transmission lines. New generation would be obtained by competitive bidding on a truly competitive international market–that of building and operating new power stations on a long term contract. The contracts would be based on the actual cost of generation, plus a reasonable profit margin on the investment. Contracts would be awarded only after the full implications of each new power station had been analysed from the point of view of the long-term cost of fuel, back up generation, and any extra transmission facilities needed. The cost of fuel and operation and maintenance would be based on the actual cost to the generator. There would be a bonus/penalty regime for availability, efficiency and output.

Existing generators would be paid in line with their actual cost of generation. On one hand this would deprive them of the opportunity to rack up the asset value and make windfall profits but, on the other hand, they would have a long term secure return on investment.

The SB manages the system operation using the traditional and proven 'stack' of generation based on increasing marginal cost and transmission losses. The SB then sells wholesale electricity using cost reflective tariffs. As electricity generation is a long-term business, a single buyer must make a range of estimates of likely future load growth and then evaluate all technically feasible and economic resources available for generating electricity. Each load growth scenario will have a total cost of generation associated with it. A range of generation options will be needed because, until tenders are received, there will still be major uncertainties in the costs of the various projects.

Based on the preferred options for generation development, the single buyer can ask for firm offers for the design, construction and operation of a range of power stations. Calling tenders of new generating capacity taps into what I believe is the only truly competitive market in the electricity industry – competing for long term contracts to build, own and operate power stations.

The various offers would then be compared one with the other on the basis of long-term cost, security of supply and the associated transmission costs and losses. Contracts would be placed with the selected tenders. The contract payments would consist of a fixed payment representing a reasonable return on the capital cost of station, and variable payments for the amount of power actually generated. Structuring payments in this way means that the system operator can schedule more or less thermal generation as required by the system without seriously affecting the cash flow of the owner of the station.

As a result, consumers would pay for electricity on a basis that was related to the average cost of generation. Under this system, power generation would be much less risky, financing costs would be lower and we would get the type of generation we needed to optimise the system in the interests of the consumer.

The common objection to the scheme is that it represents “central planning” which, automatically, is assumed to be bad. But this ignores the fact that the electricity system must be operated in a coordinated manner and any change in one part of the system affects the whole system. Therefore, central coordination is essential. To get the minimum cost of generation and the desired level of security, the system must be optimally managed in the short and the long term. If there is a risk of a shortage, reserve generation must be brought in early to manage the risk. if there is a surplus the most expensive stations should be mothballed or abandoned.

While it is possible to argue that the system is imperfect it is necessary to compare with the present dysfunctional system that does not provide good security and leads to ever increasing costs. It is often argued that a single buyer would “gold-plate” the system and this would impose large additional costs on the consumer. In fact, the cost of having surplus plant is not that high compared to the cost to the consumer of the present system that has ever increasing prices, frequent price spikes and shortages. In reality, modern computer programs for system optimisation would make it very difficult to gold plate the system without it being detected during an audit. It would be essential to ensure that the single buyer is as independent from government as is possible and is regularly audited by an independent body.