Lantau Pique

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In this edition

In this edition of Lantau Pique, taking inspiration from the recent acquisition by FPM Power Holdings Ltd (FPM) of a stake in Island Power (now PacificLight Power Pte Ltd), we examine the drivers of genco asset value in the Singapore NEMS.

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Analysis of the Singapore Electricity Market

Earlier this year, FPM Holdings Ltd boldly acquired GMR's stake in Island Power[1]. The acquisition is just one of a number of investments in the Singapore electricity market by various parties in recent times. Indeed, over 3,000 MWs of new capacity are being added to a system with a peak demand of just 7,000 MWs, approximately. Furthermore, virtually all of that new capacity is of the same (CCGT) technology.

In recent months, however, the NEMS has seen prices fall and market dynamics shift. With even more new capacity to be commissioned over the next year or so, the outlook for value recovery is grim. Faster load growth could reduce the duration of the painful period, but seems unlikely. Vesting contracts and retail contracts may mitigate some financial risk, but cannot be relied on for longer-term value support.

In this edition of Lantau Pique, we consider why the Singapore might have appeared so attractive, what was really happening, and how better fundamental analysis helps to discern the difference between appearance and reality.

A Story in Three Parts

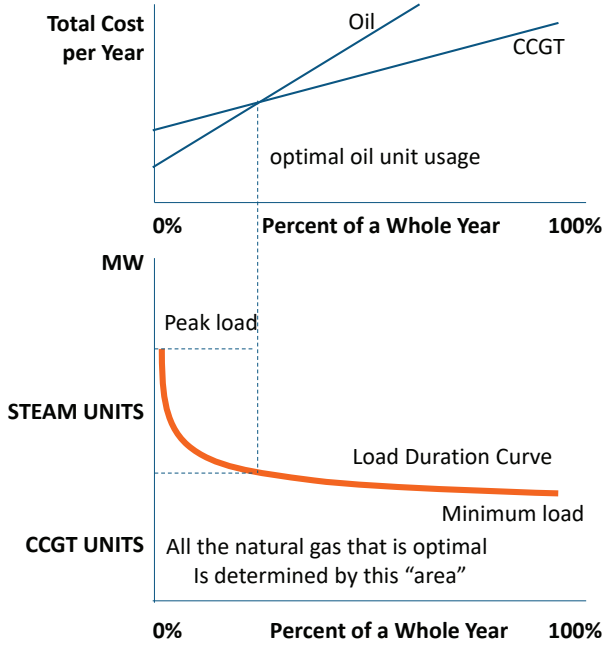
In recent years, the NEMS has experienced different market dynamics across three crucial time periods. The First Period was a period of ample supplies of piped natural gas. The Second Period was when piped natural gas supplies were less than optimal due to a combination of factors ahead of the availability of imported LNG. The Third Period – currently underway – started with the easing of constraints on new natural gas and the commissioning of the LNG terminal. Other developments and market disruptions have played a role, of course[2], but the effect of changing natural gas availability over time has been profound and possibly the most misunderstood.

1 Now called PacificLight Power Pte Ltd.

2 Such as the genco privatization in 2008; the global financial crisis; and even the debilitating haze this past June, which impaired the operation of air-dependent CCGT capacity, to name but three.

During the First Period, which also included the genco privatisation, enough natural gas was available so that gencos could use gas to generate as much electricity as it was optimal for their existing gas-fired capacity to generate (given Singapore's load duration curve). During the First Period, oil-fired generation capacity was needed to top up the supply of capacity available from existing CCGT units to cover peak requirements and the impact of periodic maintenance and forced outages. Natural gas fuel, however, was plentiful relative to the desired level of gas-fired generation from existing gas-fired generation capacity. Market prices were therefore set by "gas-on-gas" competition about 80 percent of the time, and "oil-on-oil" competition for about 20 percent of the time. The First Period can reasonably be characterised as "not fuel constrained". Figure 1 provides a simple construct for visualising this situation.

Figure 1: The "Optimal" Plant Mix

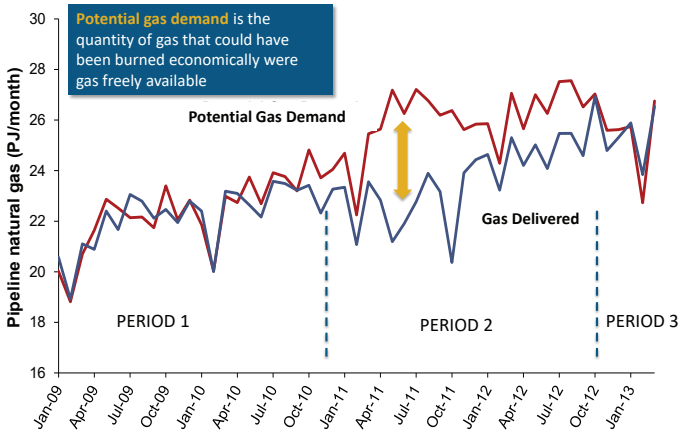


In 2006, Singapore imposed a moratorium on new pipeline gas contracts to import additional natural gas via the Malaysian and Indonesian import gas pipeline systems. The moratorium's purpose was to support the commercial development of Singapore's LNG terminal by directing gencos to contract for future gas through the LNG terminal, thus establishing an acceptable minimum terminal throughput volume. The LNG terminal reflected Singapore's desire to enhance security of supply.

Ample gas was available at the start of the moratorium to meet current and projected load. But then, Singapore's electricity demand (both peak and energy demand) surged with the completion of numerous major development projects throughout the country. The combination of growth together with no new sources of natural gas supply ahead of the LNG terminal meant that the existing Malaysian and Indonesian gas supply agreements were no longer sufficient to meet all of the demand that existing gas-fired generation capacity technically could have met. What started as a sufficient amount of natural gas ended up being too little.

The Second Period began as natural gas became scarce. [3] Increasingly, periods arose in which natural gas could have been used (had it been available), but instead higher-cost oil-fired generation had to be used. In effect, the natural gas that was available needed to be "rationed" so as to use it when it was most valuable. Hydro generators with limited water storage do this all the time – they have to determine when is best to use their water, best being defined as "most valuable". Any input susceptible to rationing because it is in short supply will see its value increase. Thus, gencos continued to buy natural gas under their existing contracts at the existing contract price. But suddenly instead of deriving higher prices from only about 20 percent of the periods (when oil-fired units were running to meet peak demand), higher prices were seen far more often, reflecting the fact that the scarcity value of limited natural gas had increased to just below the value of the next best available fuel (HSFO). Figure 2 provides a useful way to visualise the situation. The figure shows how, during the Second Period, the actual quantity of natural gas available to the NEMS was less than the quantity of natural gas that could have been used economically had it been available.

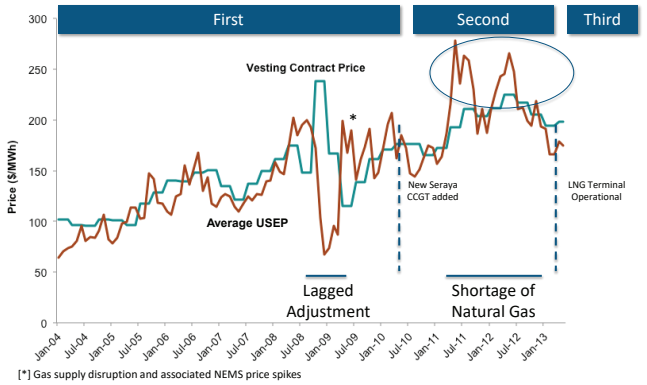
Figure 2: The Second Period is Defined by Scarce Gas



This underlying gas supply dynamic has been a key value driver in the Singapore power market. The relationship between the vesting contract price and the average USEP price has long been managed through the vesting contract regime – as is clear in Figure 3. But what also can be seen in Figure 3 are two material disturbances in that relationship. The first is simply due to the time lag between the vesting contract price and the rapidly falling oil price during the global financial crisis – an artefact of the calculation formula used – so we can ignore it for our purposes of identifying fundamental factors. The second, however, follows shortly after the start of the Second Period, at the end of 2010, and runs to the beginning of 2013. The relatively stable longer-term pricing relationship between USEP and the vesting contract price (which is pegged to an estimate of the Long-Run Marginal Cost of new CCGT capacity) was disrupted by the gas supply shortage. NEMS spot prices were materially higher for nearly two years.

3 We estimate this was as early as May 2010 based on our work at the time. The obvious impact on pricing was somewhat delayed, however, as PowerSeraya's new CCGT (commissioned in late 2010) softened prices a bit. Also, the January or February Chinese New Year period is always one of much reduced monthly total demand.

Figure 3: USEP vs LRMC (Vesting Price)



[*] Gas supply disruption and associated NEMS price spikes

Figure 4: Existing and Committed New Capacity

Company	Steam	CCGT	OCGT	Other	Total
Seraya	1,448	1,472	180	-	3,100
Senoko	493	2,807	-	-	3,300
Tuas	600	1,440	-	-	2,040
SembCorp	-	785	-	-	785
Keppel	-	490	-	-	490
Fringe	-	-	-	578	578
Total	2,541	6,994	180	578	10,293

Gross Registered Capacity (MW at End 2012)

New Capacity (MW)

Max licensed capacity (MW):
Senoko: 3,300
Seraya: 3,100
Tuas – 2,670

New "players"

Company	2013Q1	2013Q2	2013Q3	2013Q4	2014Q1	2014Q2	2014Q3	2014Q4	Total
Tuas	101	-	-	406	-	32	-	-	539
SembCorp	-	-	-	-	-	-	400	-	400
Keppel	420	-	420	-	-	-	-	-	840
Pacific	-	-	-	400	400	-	-	-	800
Hyflux	-	-	-	-	-	-	-	411	411
Fringe	-	26	-	-	-	-	-	-	26
Total	521	26	420	806	400	32	400	411	3,016

Perhaps coincidentally, but certainly notably, the Second Period is roughly when most of the currently being commissioned or constructed CCGT capacity would have been commenced construction, assuming a two- to three-year construction and commissioning period. Were anticipated higher prices blinding investors and analysts to the temporary nature of the underlying cause?

The Third Period, which is the period we are currently in, began in late 2012 with the build-up of initially small volumes of bridging gas[4], probably increasing with the commissioning of Senoko's new CCGT unit in late 2012, followed by the subsequent availability, from April 2013, of gas from the LNG terminal. These new gas supplies eliminated the gap between potential and actual gas demand. The combination of unconstrained supplies of natural gas and the commissioning of additional natural gas-fired capacity means that oil-fired power stations will be running less and less in the future, if at all. As a result, prices have fallen -- the temporary price uptick due to the adverse impacts on CCGT availability of the temporary, but very extreme, haze that hit Singapore in June notwithstanding.

Valuing Assets in Singapore

Ultimately, the Third Period contains the unfortunate double whammy of the end of gas supply availability constraints combined with the significant introduction of large amounts of new gas-fired capacity.

Looking forward, the amount of new capacity being brought into the NEMS is staggering. As shown in Figure 4, over 3 GW of new gas-fired capacity are set to enter the NEMS in 2013 and 2014. In spite of this, the robust price paid for the purchase of Island Power suggests confidence in future value recovery. How can this all be?

The answer is simple: it cannot. There will be some pain. Particularly for the earlier entrants, and most particularly for those whose costs are closer to the greenfield "LRMC" value.[5] In all cases, deferral would be optimal, if possible. Alas, the signs of this emerging situation have been evident for years.[6] Managers, incentivised to grow companies and develop projects, and bankers seeking to meet quotas have been viewing the NEMS with rose coloured glasses.

It seems reasonable, for example, that at least some stakeholders misperceived the higher prices in the Second Period as confirming durable genco market power. Alas, the higher prices were supported principally by a temporary physical shortage of natural gas supplies during the Second Period caused by the moratorium and subsequent load growth that elevated NEMS prices.[7] Future strategies to exercise market power must be completely different from anything previously seen in Singapore if they are to offset the enormous pro-competitive shift in underlying market fundamentals – a possible, but very unlikely, situation.

4 New pipeline gas allowed to be contracted and used for commercial power generation during the moratorium but that would be terminated by 1 April 2013 because it was linked to commercial purchases of LNG after that point – hence the "bridging" concept.

5 One thing to consider is whether everyone believes they have a special, lower-cost, development opportunity. If so, then it seems equally likely that other, lower-cost development opportunities will be discovered in the future – making the greenfield "LRMC" a high-biased estimate of longer term revenues.

6 We were advising on the value of maintaining investment timing/deferral flexibility in 2009/2010; replaced on one advisory project in 2010 due to projections that were too sensitive to "lumpy" future investment plans; advising on market power and vesting contract requirements in 2011, 2012 and 2013; and presenting projections of downward price adjustments to the investment community since early 2012.

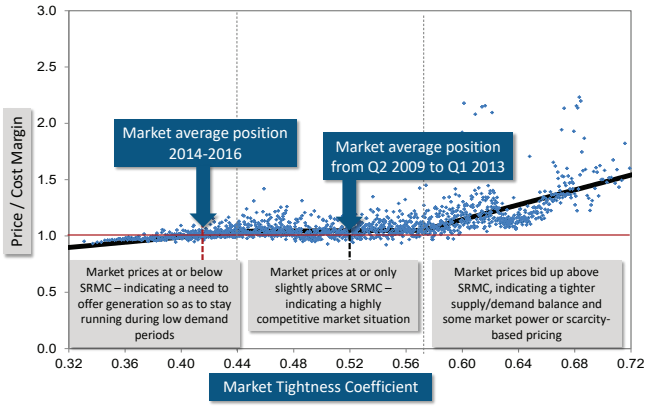
7 Scarcity-based pricing may look like market power, but its root causes are different. Market power derives from there being so few players that they achieve higher prices simply by choosing not to compete with each other. Market power does not require physical shortage of an input in order for the players to achieve higher prices. While market power certainly exists in Singapore (only partly mitigated by the vesting contract regime), a change in market power was not the principal cause of the run up in margins during the Second Period.

Even an industry organised around zillions of earnest, non-conspiring, competitors, each of whom is absolutely unable to budge market prices in the slightest can see prices increase if a critical input were suddenly to become scarce. Any competitor with a contract to purchase the critical input at "legacy" prices can earn a windfall gain during the scarcity period. There will be no change in underlying market power, however. The zillions are still very much in competition with each other. Relieve the scarcity and prices will fall, just as the higher prices of the Second Period are now giving way to the lower prices of the Third Period.

Changing Dynamics

Figure 4 provides a compact summary of just how different from the past we expect future market dynamics to be. On the left hand side (Y-Axis), we measure the price/cost margin as represented by the ratio of the wholesale price (USEP) to the estimated dispatch cost (SRMC). This ratio reflects the price/cost margin, a common barometer of market power. Below (X-Axis) we measure market tightness using the ratio of demand met by the "big three" gencos divided by their available capacity. If 100 percent of the capacity from the "big three" was required to meet peak demand, then the ratio would be 1.0. Given that the big three controlled 82 percent of all NEMS capacity in 2009, a high market tightness value would imply the ability to raise prices. The value for the Net Load / Capacity Ratio from 2009 to 2013 was around 0.52. For the period 2014 to 2016, given scheduled new entry, the ratio will be much lower, at 0.40, creating conditions in which prices seldom materially exceed SRMC.[8]

Figure 4: Sensitivity of Market Prices to Market Conditions



The more exposed an investor is to NEMS prices, the more immediately at risk is their value.

How Long Might This Last?

Ultimately, a combination of load growth and retirements determines how long a period of excess capacity will last. If it were reasonable to assume all this new capacity will be absorbed quickly by growth, then the downside value risk would be reduced accordingly. Robust load growth lowers the financial risk of excess capacity by shortening the period over which the excess exists. An investor with a view that posits higher load growth will tend to be more aggressive. But how reasonable is it to believe that Singapore's future load growth will be that robust?

A detailed treatment of load growth assumptions is beyond this simple Pique, but the prevailing trend in developed countries, including Singapore, is for slower growth in electricity demand as a function of GDP growth in the future as compared to the past. Improving energy efficiency of new technologies is one cause of this. Also, Singapore's GDP is projected to grow in the future at a rate somewhat more slowly in the past due to persistent global macroeconomic weakness; the completion in recent years of several major developments in Singapore (and hence their effect is already incorporated); as well as Singapore's ever-maturing economy. An additional risk factor is the increased investment in cogeneration technologies by some of Singapore's largest electricity customers. ExxonMobil and others have combined to add about 340MW of new cogeneration capacity that will syphon off some baseload demand from the NEMS. The prospect for historically higher levels of load growth in the NEMS therefore face significant headwinds. Singapore may not need any new generation capacity until around 2018 to 2020.

Will End Users Benefit?

Two other possibilities exist that might support higher genco asset values. The first is the existence of Singapore's vesting contract regime. The second is the existence of retail supply contracts. An investor in a genco, as FPM with Island Power, would need to consider the value of any applicable vesting and retail contracts. Vesting Contracts are clearly a value support to those gencos that hold them, as vesting prices reflect an estimate of the long-run marginal cost (LRMC), and thus protect against falling spot market prices. Indeed, we think that the vesting contract hedge price is calculated (methodologically speaking) in a manner that overstates – for any set of cost parameters and operating performance assumptions – the financial cost required to cover the investment. So we think vesting contracts are inherently valuable when valuing assets covered by them.

The long-established purpose of vesting contracts, however, is to mitigate market power. Given significant new entry into the NEMS by existing and new investors and resulting excess capacity, market power has lessened significantly.[9] Other major changes may also be introduced such as retail competition and an electricity futures market. On balance, the basis for maintaining the vesting contract arrangements is reduced as well. With Singapore already in a position of having some of the highest electricity prices in Asia, the more likely direction of regulatory risk is towards the further reduction or removal of vesting contract support.[10]

8 At the same time, the NEMS structure will have become more competitive by 2015. By then, the big three will control only 70 percent of all capacity (77 percent of all CCGT capacity).

9 It is unlikely that the excess capacity situation can be resolved easily through the retirement of older oil-fired capacity, as vesting contracts are allocated based on capacity shares in the NEMS. A genco who retires excess oil-fired capacity would be giving up some of its vesting contract cover. We figure vesting contract allocations are easily worth more than the ongoing costs to maintain existing older capacity in the NEMS.

10 In addition to providing a relatively assured level of revenues, we believe the vesting contract price methodology causes the resulting vesting contract price to be above the long-run marginal cost (LRMC). As a result, vesting contract quantities can add potentially materially to asset values for as long as the vesting contracts are assumed to last. We will skip over this relatively more technical/methodological point in this Pique.

Retail contracts can also be source of value if they are (or can be) struck at prices higher than those prices that are projected in the spot market. For example, a retail customer driving through the rear-view mirror might not anticipate the wholesale market price "cliff" that corresponds to the shift from higher Second Period prices to lower Third Period prices. Such a customer might adopt a hedging strategy based on historically conditioned expectations. If so, then perhaps it is reasonable to assume that existing retail contracts do not (yet) fully reflect the new (Third Period) NEMS market dynamics – which will only become more evident as new capacity currently being built is finally commissioned. If a genco has a large book of long-term forward retail contracts, it might be insulated from the near term consequences of the "Third Period". If not, then value depends on how quickly end users realise how the shifting market dynamics can benefit them.

Indeed, a close look at market fundamentals suggests that larger customers would do well to take an aggressive negotiating position, or accept additional spot market exposure. At minimum, end users should avoid contracting over lengthy periods into the future. By the end of 2014, the NEMS will be swimming in shiny new capacity, all dressed up and no place to go. Customers who pay attention should be able to learn pretty quickly.

What Happened: Market Failure or Management Blindspot?

Every economics student at some point learns of the story of the many farmers who somehow manage to plant too much (or too little) of the same crop. When they harvest and sell their crops in the market, the aggregated, super-abundant (or short) harvest causes prices to fall (rise). Various causes of this boom (bust) situation can be teased out over time. For example, farmers may collectively plant the right mix of crops given expected weather conditions and yet still experience a larger or smaller harvest depending on how the weather actually turned out. Such weather-driven boom/bust cycles may be financially stressful, but they are readily explained in reference to external random factors. The more problematic risk is when, somehow, for some reason, the summing up of farmer's individual actions do not yield the "optimal" planting mix – resulting in a boom or bust that is not caused by weather variation but by the failure of the market to ration supply and demand efficiently. This seems the more accurate characterisation of Singapore's problem. It is doubtful that any reasonable load growth forecast expectation justified the massive CCGT investment that has been made or the value paid by for generation assets.

So the analysis of causal factors must turn to other considerations. For example, the problem of the farmers in the real world is at least partly mitigated through sophisticated forward and insurance markets.[11] Farmers in the more developed agricultural markets can sell their entire crops before they are even harvested[12], mitigating one financial risk associated with market failure. With improved financial markets, and much greater information transparency, it is easier to identify the optimal planting configuration given expected weather conditions. And even if weather turns out to be different from expectations, crop insurance and weather derivatives are also available. These factors can assist farmers in avoiding or mitigating self-inflicted boom/bust cycles but they typically require large and highly sophisticated financial markets. Modern agricultural markets in developed economies are quite sophisticated and have grown very large and interconnected.

The NEMS, in contrast, is small. One might think that the small size of the NEMS means that everyone can easily know enough about what others are doing so as to achieve sensible outcomes. But this is clearly not so. The electricity farmers in Singapore have heard each other speak of plans for years, and then each watched as the other pushed spade into ground. They should hardly be surprised at the magnitude of the crop they collectively have planted. The addition of 3 GWs of new capacity is a pretty bountiful harvest for a small market with a peak demand of only about 7 GW to begin with. And unlike the planting of a crop for just a season by real farmers, the large-scale planting of CCGT capacity will tie up Singapore's electricity fields for years.

It would appear that Singapore's electricity market has failed, at least in an economic sense, to signal and achieve the appropriate level of investment. Whereas consumers may temporarily benefit from excess supply, the reality is that far too many resources have been ploughed into the electricity sector in an economic sense. We see this as a significant market failure: one with complex causes and without simple solutions. For now, let's just suggest that smaller markets combined with large, lumpy investments and imperfect forward/information markets are prone to disturbing games of investment "chicken"[13]. If conditions call for a sudden surge of capacity – say because of a shift in fuel-driven economics that supports both new entry and cannibalisation of existing facilities, then perhaps the disruptive size of the opportunity invites a complex prisoners' dilemma in which it is very difficult, in a competitive electricity market context, for the invisible hand to achieve coordinated restraint for the collective good. We suspect this problem – which may disproportionately impact smaller, energy-only, electricity markets – merits a great deal more attention.

11 Incidentally, our observation does not require belief that agricultural markets are perfect, only that the availability of hedging and information mechanisms provides a significant assist in mitigating the most severe boom/bust cycles.

12 A generation investor without a life-of-asset PPA or similarly lengthy bilateral offtake contract cannot replicate such forward contract protection. Most contracts in competitive electricity markets are for much, much shorter periods, on the order of a year and seldom more than five.

13 The game of "chicken" is a notorious game in which two drivers head towards each other at high speed with the "chicken" being the driver who swerves to avoid collision. The pay-off matrix is gruesome.

Looking Ahead

Over three defining time periods, the NEMS has experienced significant shifts that affect the underlying sources of value of existing generation assets and future opportunities. The differential between PNG and LNG that was anticipated in 2008 has largely evaporated due to changing fuel market dynamics. The gas constraints resulting from the moratorium and exacerbated by surging load growth are gone. The new LNG terminal is pumping out gas and new gas-fired capacity is being commissioned, reducing the need for oil-fired generation. And finally, the competitiveness of the market has increased due to new capacity and new competitors.

Market fundamentals, therefore, paint a picture of wholesale prices that track just slightly above short-run marginal costs. Prevailing vesting and retail contracts can support value to an extent. Pressure to reduce vesting contract cover and the growing awareness of larger retail customers will gradually wear down these value supports. With NEMS prices trending down towards short-run marginal cost, the results could be grim for some stakeholders.

It is impossible to foresee all of the different ways value will move over time, but the NEMS and other electricity sectors are only as robust as their economic fundamentals. Smaller markets have unique challenges, especially given lumpy investments and their potentially material and long-lasting impacts. At minimum, stakeholders should be focussing on how to recognise these risks earlier and develop appropriate responses.

The question of value reduction is also one of degree. We have predicated our market view on the assumption that the future – half hour by half hour, matched for corresponding circumstances – will resemble the past. In other words, that the dominant gencos will not be able to fundamentally alter the "rules of the game" in terms of their ability to exercise market power. Given the relatively grim outlook, they will surely be looking hard at ways to optimise their exercise of market power. Readers of past Lantau Piques will know that both (1) the determining of how best to capitalise on market power and (2) the modelling of future market power based on a departure from historical evidence are two dark arts. Small changes in assumptions can produce enormous value shifts. Alas, history has been generally unkind to those who have bet on aggressive, durable, market power and against the vicissitudes of competition or the pressures of governments and regulators.