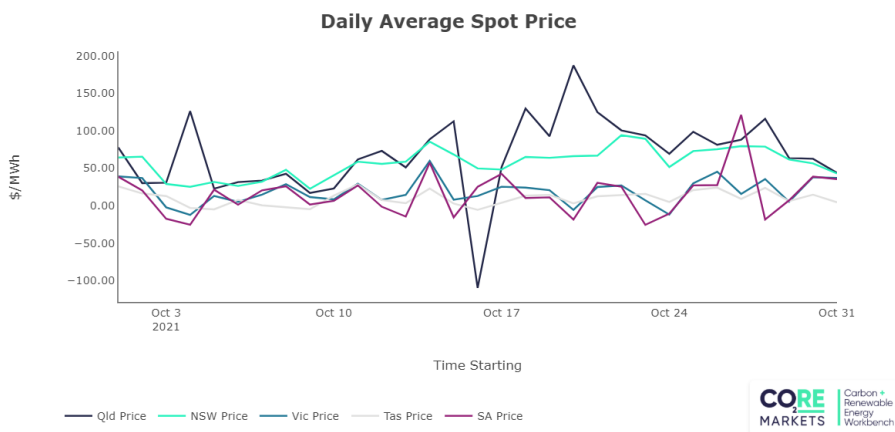


Market Update

A monthly energy & carbon market update

- The NEM has now switched from 30min to 5min settlement periods. While still very early, challenges seem to exist for dispatchable generators, such as batteries and gas-fired plants, the timing of high price events is unpredictable in scenarios such as network curtailment.
- The month of October has seen a new record high of negative price periods in the NEM; slightly more than the previous record highs in the month of September.
- AEMO has launched its Wholesale Demand Response (WDR) mechanism to encourage lower consumptions at critical peak times by allowing demand side participation in the NEM.
- AEMO's Quarterly Energy Dynamics Q3 2021 report was released, showing renewables setting newer records; such as reaching 61.4% instantaneous renewable penetration in the NEM.
- South Australia's 1,300 MW non-synchronous utility limit lifted to 2,500 MW following the installation of four synchronous condensers and this would result in reduced curtailment and increased renewable generation.
- Gas prices in mainland NEM regions have increased on average by 20% to ~\$9.2/GJ as Japan-Korea netback prices sees an even greater 75% month-on-month increase to \$39/GJ.
- Later LGC vintages of Cal23-25 made further strong gains while ACCUs continued their rally setting record highs with each trade; now \$37/tonne of CO₂.

Spot market electricity price – October 2021

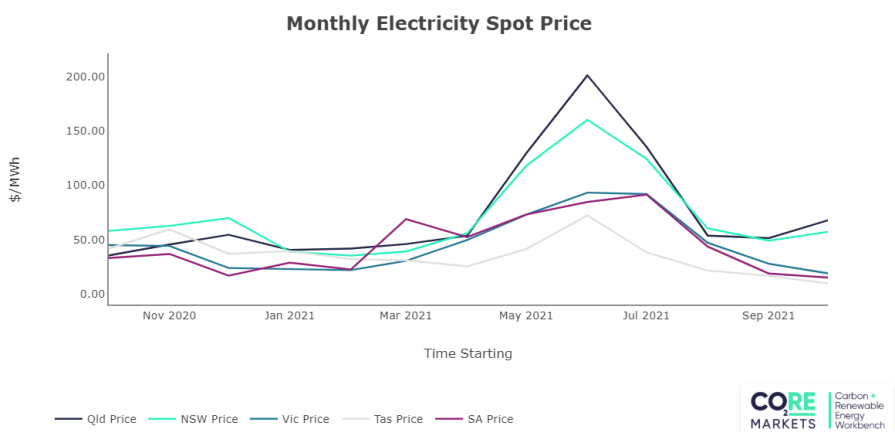


For the first month of 5-minute electricity wholesale market settlements, Queensland was again the most volatile as it had been in September. It was the only NEM region to trade at the Market Cap price of \$15,100/MWh which it did on six separate occasions, doubling the frequency that had occurred in September. The higher priced events influenced outcomes in NSW such that both states reflected higher month on month average pricing, whereas the daily average electricity prices in South Australia and Victoria trended slightly lower.

Summer like weather in Queensland led to a significant ramp up in demand around 5pm where air conditioners are all switching on. Cap pricing events also occurred at periods that typically show benign pricing such as between 5am-8am. These spikes occurred when 500-750 MW of coal-fired capacity were not operating due to ramp up timing decisions made well in advance by operators, given they cannot react quickly to opportunities that occur within 5-30 minutes.

AEMO have indicated the margin of instantaneous generation capacity above operational demand during peak periods is at historically low levels in Queensland currently. Price spikes mostly occurred when wind speed has dropped, or the networks have curtailed large scale solar output for system stability reasons, and under the 5-minute settlement system dispatchable generation was finding it difficult to forecast higher price periods.

Spot market electricity price – rolling monthly average



The downward trajectory in monthly average Spot prices since the price spikes of May and June reversed back upward in Queensland and in New South Wales, rising back up by \$16/MWh and \$8/MWh respectively. This was due to the aforementioned price Cap events and a 16-25% increase in frequency of trading intervals between \$50 and \$100. Gas-fired generation in Queensland has exhibited strong correlation to higher energy exports to NSW, so the increases in gas-prices through October have impacted NSW electricity prices through the large interconnectors between the States.

In contrast, other NEM states experienced a decline in their average monthly Spot pricing for October. Average operational demand rose in Queensland and Victoria. South Australia exhibited a lower daily peak demand levels as October progressed and overall lower than September, and this may be attributable to milder weather and sunnier conditions that enabled rooftop PV to provide a larger offset to demand compared to September.

Futures contracts – past 12 months

Electricity Futures Pricing

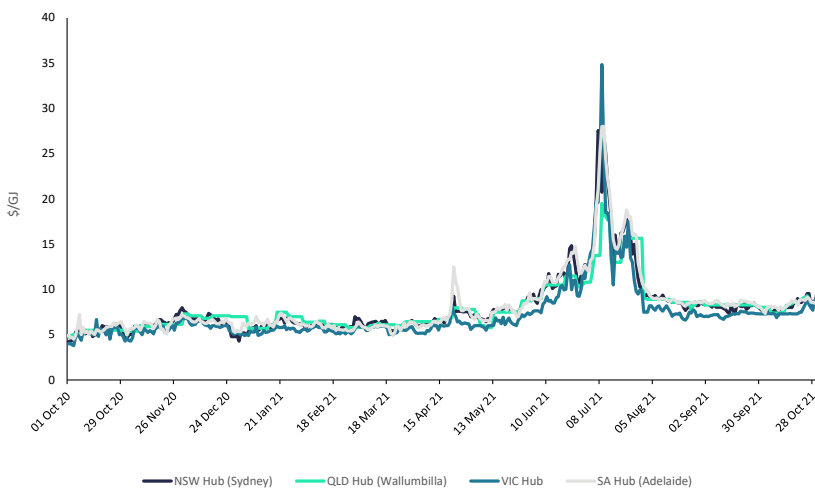


Flat Futures contracts for 2022 rose most sharply in Queensland through October, from \$61/MWh to \$67/MWh, reaching just above \$70/MWh firstly. This was mainly attributable to LNG netback prices which almost doubled across the month. The impact around higher gas prices for export, which influence East coast gas prices particularly out of Queensland, may be lasting into next year as unsatisfied European demand for Gas is overflowing to a wider array of suppliers that also impacts the Asia-Pacific region pricing. Queensland gas-fired power plants will be paying higher charges as Spot gas for them has increased by over 15%.

New South Wales futures pricing, which had been holding mostly steady, experienced an upwards movement influenced mostly by events in Queensland to which they are partly linked through the two large interconnectors. The coal-fired sector had been challenged by record high thermal coal-prices through Asia, but recent government interventions in China have seen their coal prices plummet in the last week of October in response to their energy crisis.

Victoria and South Australia 2022 Futures prices overall concluded October at a similar level to the start of the month, in line with similar low Spot price volatility. Victoria having a material amount of gas-fired power production, although gas-price only moderately correlated to Queensland, experienced a smaller upward movement in the Futures contract pricing at the same time as this drover the northern states higher. South Australia was generally unaffected.

East coast gas prices – past 12 months



The daily gas spot prices have all increased in all mainland NEM regions in the last month after returning to historical levels after the spike in gas prices following the Callide-C failure in May. The 7-day moving averages went up by almost \$1/GJ in all states through the course of October. The NEM's average spot gas price increased 20% through October from \$7.7 to \$9.2 per GJ.

New South Wales and Queensland saw their monthly high prices at the end of the month at ~\$9.6/GJ. Victoria and South Australia both saw prices pass the \$9/GJ mark before ending the month at ~\$8.7/GJ. South Australia saw the smallest increase in daily gas prices of 10%.

Given the low electricity demand seen in NEM regions this month with milder spring weather, the gas price increase is likely to be stemming from the continuing rise in Japan-Korea LNG netback prices which influences the price the Queensland hubs will sell domestically. After a 50% netback price increase in September to \$22/GJ, the month of October has seen a further 75% increase to \$39/GJ. Given the continuing gas shortage in Europe placing upward pressure on gas prices in Asia, it remains to be seen how much these will influence domestic gas prices in the coming months.

Environmental certificates market – ACCUs

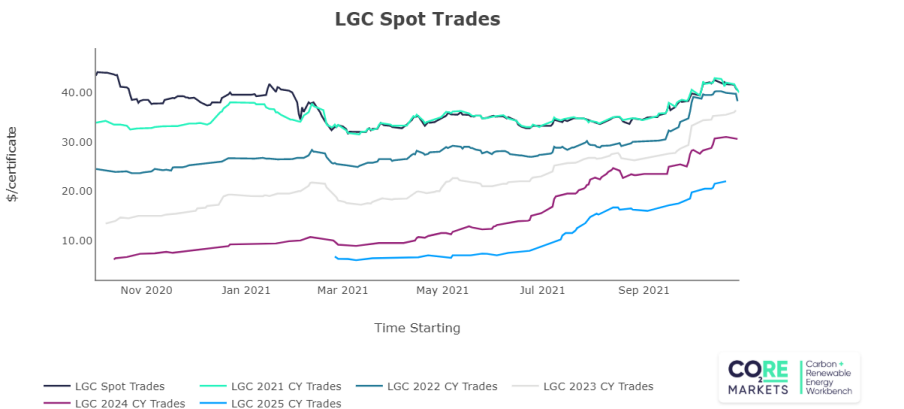


ACCU prices have rallied strongly in the 2 months since September, up 47% to end the month of October at another record high of \$35.75.

This has been brought about increased voluntary buying from corporates and investors with the expectation that ACCU prices will continue their upward movement as tighter supply and prospects of a national net-zero emissions target apply upwards pressure.

ACCUs have continued their rise into early November and at the time of this lookback review, sitting at \$37/certificate.

Environmental certificates market – LGCs

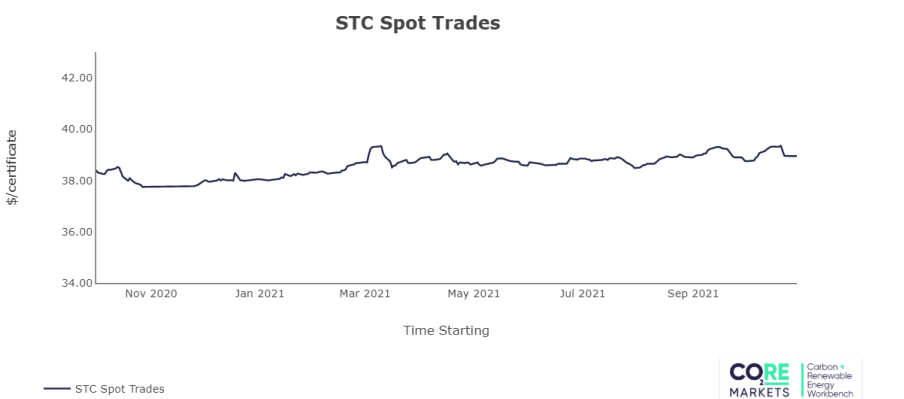


Increased corporate demand for longer term LGCs has been a major contributing factor for prices rising across the board in recent months.

The last week of October saw Cal21-22 lose the gains they had made during the month with both falling ~2%. The pricing of later vintages of Cal23-25 also flattened out in the last week, by this time had already experienced a monthly gain of 8-11%.

LGCs	Curve	Last Trade
Spot	40.50	41.33
Cal 21	40.00	41.75
Cal 22	38.25	39.38
Cal 23	36.40	36.75
Cal 24	30.58	31.35
Cal 25	22.00	22.50

Environmental certificates market – STCs



October marks another month of STC prices bouncing up and down around a relatively narrow price band.

Spot STC prices rose to 39.25 in the lead up to Retailers Q3 surrender deadline of October 28th.

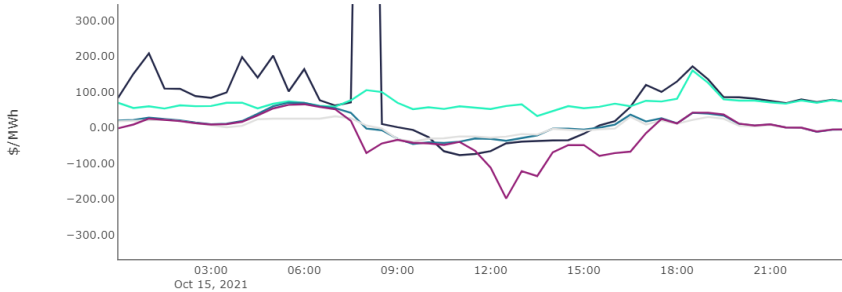
The end of lockdown in Melbourne was followed by a significant jump up in the weekly creation. It rose by almost 25% from the 3rd week in October to last week of the month (from 810k to 995k).

There remain some supply chain challenges around components to rooftop Solar installs that had been coming from China. Caused by both shipping delays and reduced production out of China related to electricity shortages.

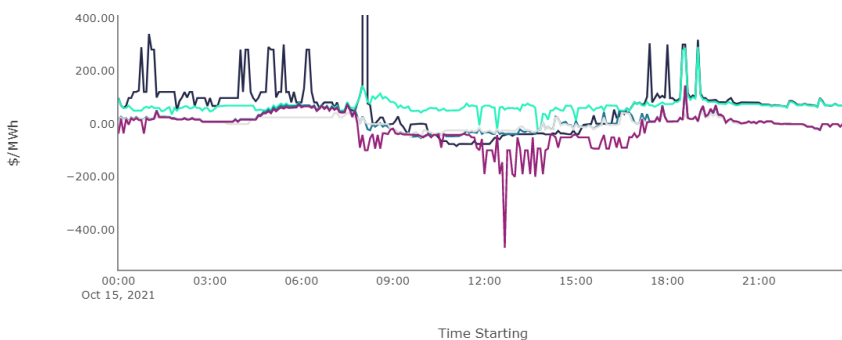
It remains to be seen whether this can have any major impact in coming months if inventory levels are sufficient or alternative suppliers are found.

Feature: NEM moves to 5min Settlements

NEM Prices on October 15th - 30min Settlement



NEM Prices on October 15th - 5min Settlement



— Qld Price — NSW Price — Vic Price — Tas Price — SA Price

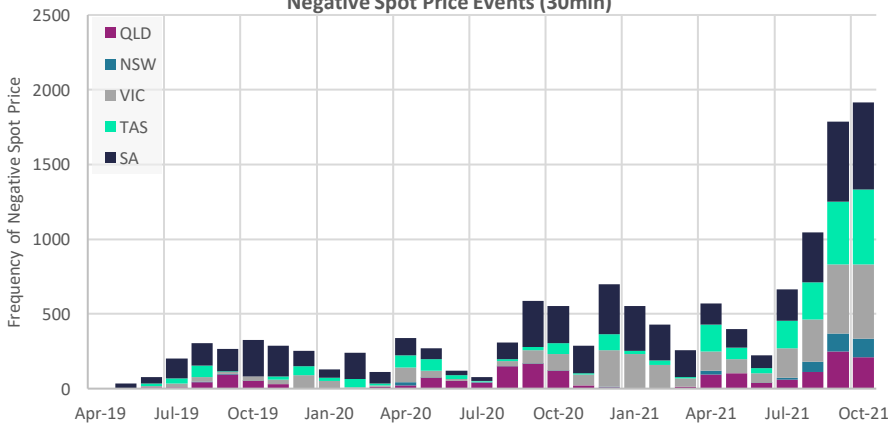


With the newly implemented changes from a 30 minute settlement (30MS) to a 5 minute settlement (5MS), there are a limited conclusions to make as there are many factors influencing the market currently, though 5MS combined with lower operational demand and high VRE penetration should be expected to reduce the inclination among renewable plant operators to leave bids at the market floor of -\$1,000 although they can still afford to bid below \$0 given LGC revenue.

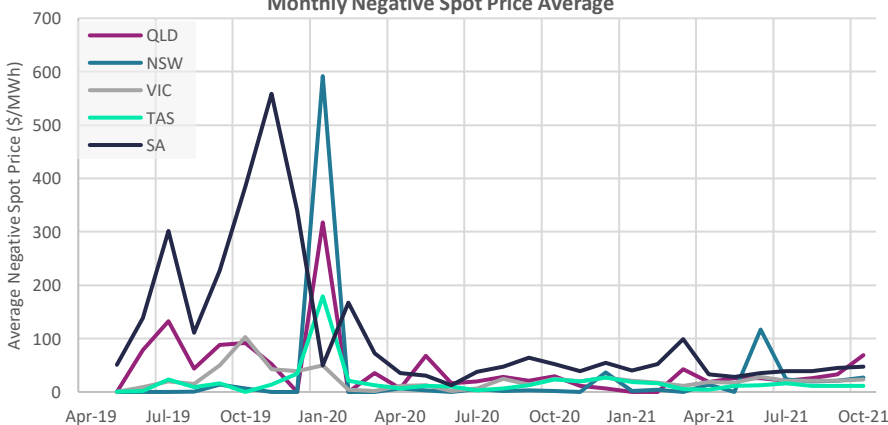
Taking a snapshot of October 15th as an example, it can be clearly seen that price volatility has increased without the previous price averaging over 6 intervals. The shorter 5MS favors fast market responsive technologies, particularly batteries, which can capture the brief intervals of extreme positive and negative price events. In Queensland, spot prices reached the cap of \$15,100 at 8:05. Legacy thermal generators will unlikely be able to capture these brief windows with their slower response times.

Feature: Negative Spot Price Trends

Negative Spot Price Events (30min)



Monthly Negative Spot Price Average



While the frequency of negative spot prices has been increasing historically, the past several months have seen a drastic rise in negative pricing events NEM-wide. The month of October saw only slightly more events than September and that negative price events may be beginning to peak if historical patterns prevail.

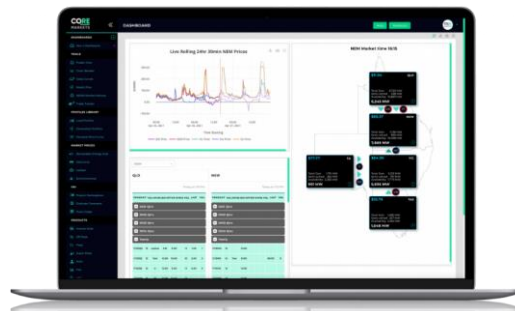
Historically, the number of negative spot price events was generally limited to regions of high renewable energy penetration - most prominently South Australia. However, the spring of 2021 has for the first time seen a concurrent and rapid increase in negative spot price occurrences in all regions. This includes New South Wales which has historically been relatively immune to negative pricing events.

Average negative spot prices have greatly stabilised since Q2 2020 across all NEM regions, coinciding with the different bidding strategies by market participants. Coal and hydro generators concentrated their bids into price bands <\$35 while renewable generators became more pro-active with re-bids to avoid prices falling negative.

Over the last 4 months in Victoria and New South Wales had similar average negative spot prices at -\$22/MWh; South Australia had the highest negative price averages of -\$42/MWh; and Tasmania with the lowest at -\$13/MWh. Queensland's price average of -\$37/MWh has increased more than usual largely due to an extended 3hr period of consistent -\$1,000 price periods on October 16th.

Feature: CORE Markets – the game-changing SaaS platform for carbon & energy markets

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