Introduction

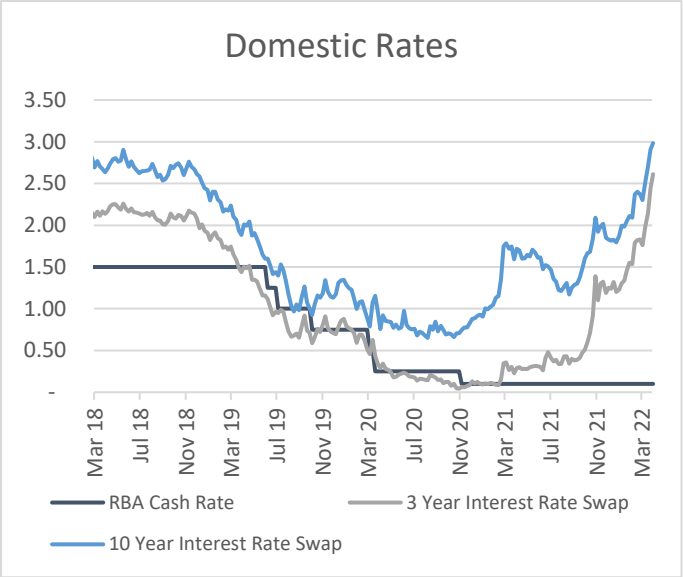
Welcome to the first newsletter of 2022. The last few months have seen a rapid transition from the reopening trade and recovery from Covid to a world of worryingly high inflation, soaring commodity prices and rising interest rates. There is a lot happening in the fixed income world and the world more generally. From oil prices to carbon credits, markets have seen a very volatile start to the year.

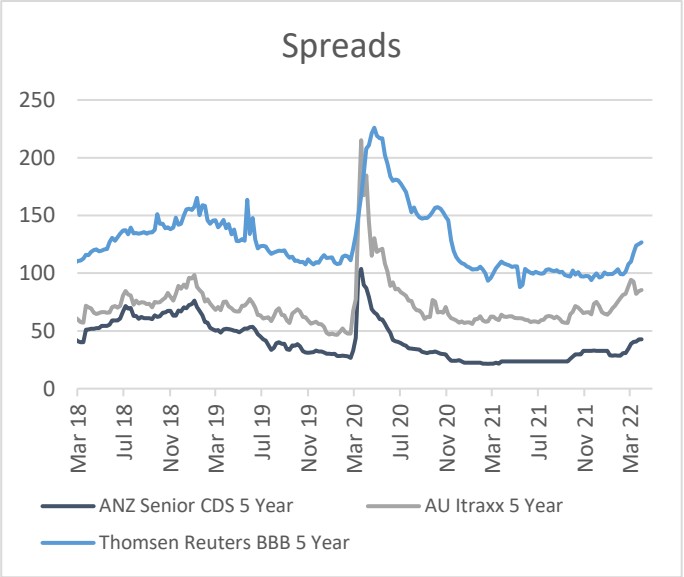
This quarter we look at the impact of raising interest rates on different types of infrastructure assets. The second article looks at the carbon markets and its future. Lastly, we lift some heavy weights by looking at gravitational energy storage.

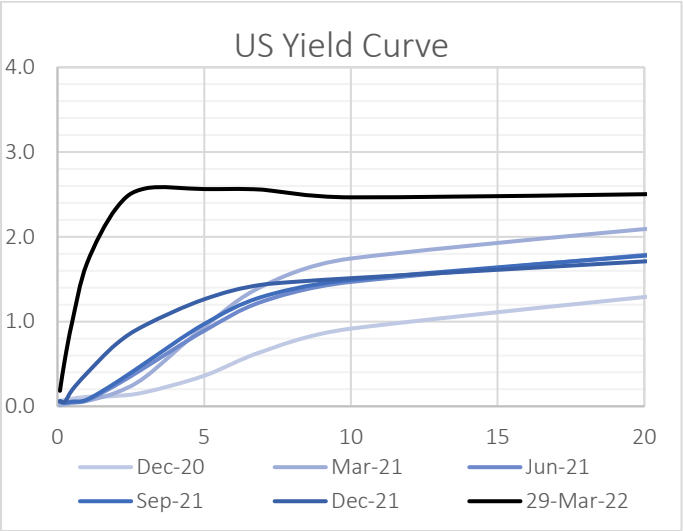
Markets update

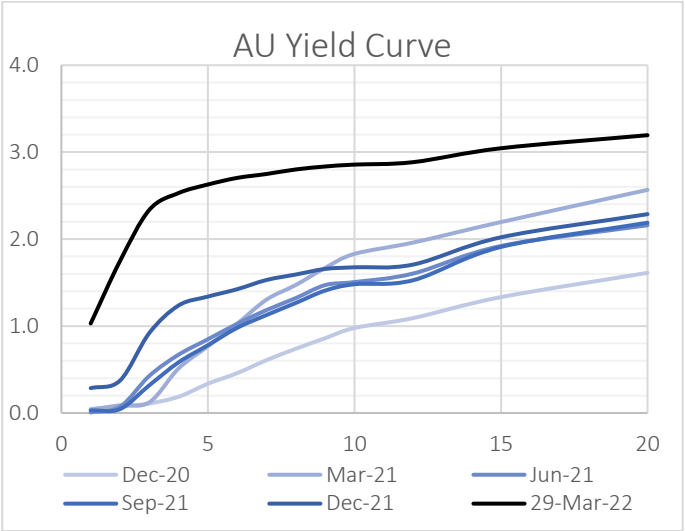
For the first time in three years, the US central bank has raised interest rates by 25 basis points. The move has come as part of the Fed's broader response to tackling 40-year high inflation numbers of 7.9% over the last year. High oil prices, conflict in Ukraine, following almost of two years of Covid relates supply issues has shocked the global supply chain. Markets have priced a steep increase in official rates in the short run. In the US, official rates are anticipated to increase at each of the remaining five Federal reserve meetings this year.

The domestic yield curve has shifted outwards and for the first time since late 2018, three-year bond yields have crossed two percent. The 10 year bond was last constantly above today's levels in 2014!. All eyes are on the RBA whether they will follow suit and change the dovish guidance on future rate hikes (although there is an election we need to get out of the way first).









New issuance and refinancing

Date	Borrower	Instrument	Size ($m)	Term (Yrs)
December	Ross River Solar Farm Refinance	Loan	138	5
December	Oaklands Hill Wind Farm	Loan	180	14
January	Duxton Port	Loan	40	3
January	Pluto Train 2 Acquisition	Loan	3,484	7
January	Clare Solar Farm	Loan	112	4
February	AGL	Loan	1,400	n/a
February	IntelliHUB	Loan	1,437	5
March	Bouldercombe BESS	Loan	45	12
March	Southern Cross Airports	Loan	4,400	2/5
March	Ausnet	Bond	500	6

Equity and other news

- Canadian fund manager Brookfield has acquired a 50% stake in Australia and New Zealand smart meters company IntelliHUB for $1 bn.
- Brookfield, OMERS and AustralianSuper are submitting their final bids to acquire Axicom, telecommunications tower operator.
- Infrastructure Capital Group acquired a majority interest in a portfolio of small-scale solar projects from Providence Asset Group (PAG). The portfolio contains 15 operational solar sites in Victoria and a development pipeline of 25 projects across New South Wales.
- Brookfield and Grok Ventures (the family office of Mike Cannon-Brookes) submitted a $5 billion takeover bid to acquire AGL Energy with intentions to shut down its coal generators earlier than their planned closure dates. The initial and revised offers were rejected by the AGL board.

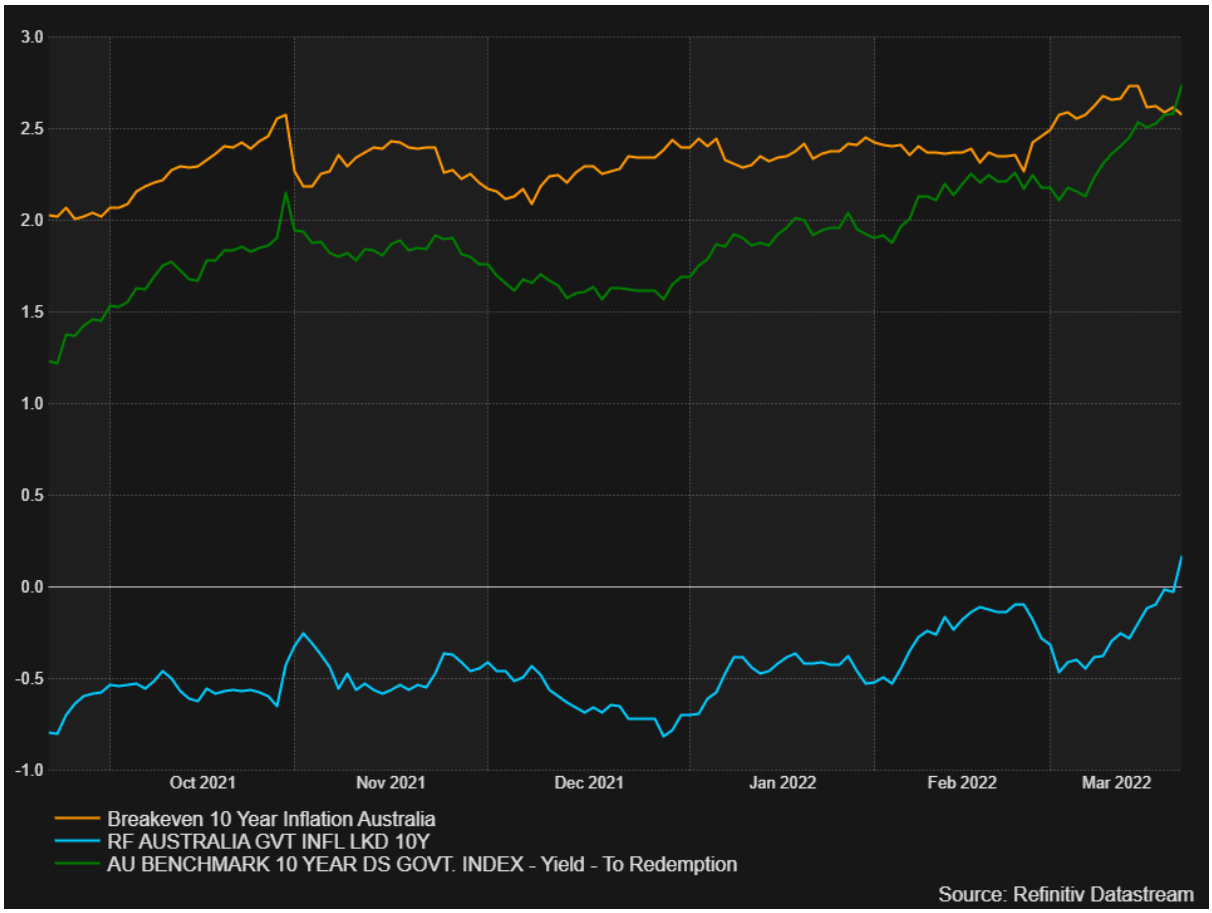
- Origin Energy has announced it will close the 2.88GW Eraring coal-fired power station earlier than expected. The planned plant closure has been brought forward from 2032 to 2025.
- Major construction commenced in February on Project EnergyConnect, a 900-kilometre interconnector between South Australia and New South Wales.
- Korea Zinc's subsidiary Ark Energy Corporation has agreed to buy 100% of Australian wind and solar developer Epuron Holdings. Korea Zinc also pledged to invest US$50 million in Energy Vault, an energy storage developer.
- The Australian Renewable Energy Agency is launching a $100 million funding package to support at least three grid scale battery projects (each with at least 70MW in capacity providing system stability services).
- The Foresight Solar Fund has taken full ownership of the 30MW Oakey 1 Solar Farm and 17MW Longreach Solar Farm, after acquiring the remaining 51% stake from Canadian Solar.
- Palisade Investment Partners and First Sentier Investors are acquiring a 50% stake in the 420MW Macarthur Wind Farm from Commonwealth Superannuation Corporation.
- UK based RES Group has acquired Australian renewable energy asset manager Blueshore. Blueshore has 1.6GW of assets under management.
- Cleanaway Waste Management has formed a joint venture with Asahi Beverages and Coco-Cola Europacific partners to construct a $50 million PET plastics recycling facility. Cleanaway Waste management has also announced to develop two waste-to-energy plants in Victoria and Queensland.
- Edify Energy's 150MW lithium-ion battery projects have entered the final rounds of auction. It is the first battery project to be put to auction in Australia and has seen interest from Macquarie Infrastructure and Real Assets, Federation Asset Management and Palisade.
- Quinbrook Infrastructure partners have listed their 900MW Lockyer battery and gas storage project for auction.
- ASX listed, NEW Energy Solar has put its US solar farms up for sale. The company sold all of its Australian assets and is currently only operating in the US.
- ANZ invested $50 million to acquire a minority shareholding in Pollination, a climate change investment and advisory firm.
- APA Group has obtained the right to buy all senior secured bank debt of the bankrupt Basslink interconnector.
- BAI Communications intends to sell its Australian towers business which owns and operates 752 broadcast towers and 400 mobile network towers.
- Squadron Energy has acquired the Clarke Creek renewable hub project from Goldwind and Lacour Energy. The project includes ~450MW of wind, solar and battery and the windfarm is contracted under a 15 year PPA with Queensland government-owned Stanwell Group.
- Shell has agreed to acquire a 49% stake in Australia's WestWind Energy with plans to deliver 3000MW pipeline of renewable capacity.
- CEFC, Octopus and Hostplus have teamed up to develop Gippsland Renewable Energy Park in Victoria. The first stage of the project involves 500MW of solar capacity and 500MW of storage.

Infrastructure and rising rates

Over the past six months, the 10 year inflation linked government bond has increased from -0.80% to 0.17% (the blue line in the chart below). This is an almost 1% increase in real rates! At the same time the nominal 10 year government bond has risen from 1.22% to 2.74% (green line) and, thus, the market implied breakeven has increased from 2.0% to 2.6% (orange line).

Higher interest rates are usually driven by higher expected inflation rates, and if there is a corresponding move in both, there is little effect on infrastructure valuations (as both net cash flows and the discount rates used to value them move higher).

However, if rates rise faster than inflation expectations, then real rates are increasing (as they have done over the past six months) the cost of capital is increasing at a faster rate than the project cashflows and valuations will likely fall.



The infrastructure asset class, like all risk assets, has enjoyed the strong tailwinds of falling interest rates (nominal and real) over the last three decades. Given the recent rise in real yields investors may be interested in how this reversal is likely affects the infrastructure asset class. This article looks at the relative sensitivity of various infrastructure sub-sectors to rises in interest rates.

Not all infrastructure sectors are affected equally by rising interest rates. Across the subsectors there are differing revenue models, leverage levels and approaches to interest rate hedging. We summarise the broad infrastructure sub-sectors below – patronage assets, regulated utilities, and public private partnerships.

	Patronage infrastructure	Regulated utilities	Private public partnerships
Examples	Toll roads, airports and seaports.	Electricity and gas transmission and distribution.	Public private partnerships with an availability-based revenue structure
Revenue structure	Inflation linked and/or patronage linked to economic growth	Regulated and periodically reset to WACC x Regulated Asset Base (RAB)	Generally a fixed structure with passthroughs for rates and inflation
Leverage	Low (40-60%)	Medium (60-75%)	High (75-85%)
Typical interest rate hedging	Fully hedged for the first 5-7 years with partial hedging thereafter.	Fully hedged and aligned with 5 year regulatory resets	Fully hedged for full term or the State takes long term base rate risk.
Net interest rate exposure	High Equity exposure + unhedged debt tail	Low-Medium Revenues re-set every 5 years with updated base rate	Medium-High Equity exposure is long-dated but usually no unhedged debt tail.
Typical equity duration	15-25	8-15	10-20

Private public partnerships

For highly geared assets with fixed revenue lines such as PPPs with availability payments, there is no direct link to revenue and interest rates. However, due to the high level of gearing, projects are exposed to interest rates via debt interest payments and refinancing risk. Projects usually mitigate interest rate risk by entering into interest rate swaps for the full tenor of the concession. In general, PPPs are proxies for fixed rate bonds with fixed/defined operating cashflows and their valuation linked to the discount rate of those cashflows.

Investments in PPPs would be expected to suffer a significant return headwind in 2022 as valuations are updated on the basis of higher equity discount rates in line with higher 10 year bond rates.

Regulated utilities

As mentioned in the previous section, for most infrastructure assets there is no direct link between revenue and interest rates. The one exception is regulated utilities in Australia, where the allowable revenue is usually reset every five years as part of a regulatory review cycle. In general, this reset allows revenue equal to a regulated return on capital plus operating costs. This means that higher interest rates (all else equal) will feed through to higher revenues for regulated utilities, albeit with a lag linked to the regulatory reset process. The increase in revenue is in theory expected to match the rising cost of debt.

We would note that there is often not a direct passthrough of interest rate costs as often the actual debt costs are different to how the regulated WACC is calculated (backward looking regulatory method vs forward looking actual rates). Also, where investors acquire regulated assets at greater than 1x Regulated Asset Base (RAB) there is a valuation overhang that is uncorrelated to changes in interest rates. In a general sense, regulated utilities are generally a proxy for floating rate debt as revenues and funding costs move with interest rates. Interest rates effect the valuation component that is greater than the RAB.

Thus, while rising interest rates are likely to be a headwind for regulated assets, our view is that it wouldn't be as material as for PPPs.

Patronage infrastructure

For patronage and economic assets revenue growth is driven by a combination of general economic growth, population growth and inflation. These assets have a higher growth profile and are likely to have the highest interest rate sensitivity due to the longer duration of cashflows. These concessions commonly have minimum levels of revenue escalation, for example Transurban's CityLink guarantees a minimum 4% level of escalation under the concession.

Patronage assets tend to benefit from inflation as revenues grow at a higher rate. In the Transurban's 2022 half year results management presented analysis showing that 68% of revenue had a 4.25% escalation floor and that a 1% increase in inflation would be a greater positive impact than any negative impact from a 1% increase in higher interest rates. The level of interest rates will however change the equity valuation via increased equity discount rate.

This analysis focuses purely on base rates and implicitly assumes that patronage or other revenue drivers are held constant. Other factors such as the Covid-19 pandemic may structurally change the demand profile of some patronage assets unrelated to interest rates and inflation. Separate to interest rates the biggest valuation driver of patronage assets is volume through the asset. These are the growth stocks of the infrastructure asset class!

Summary

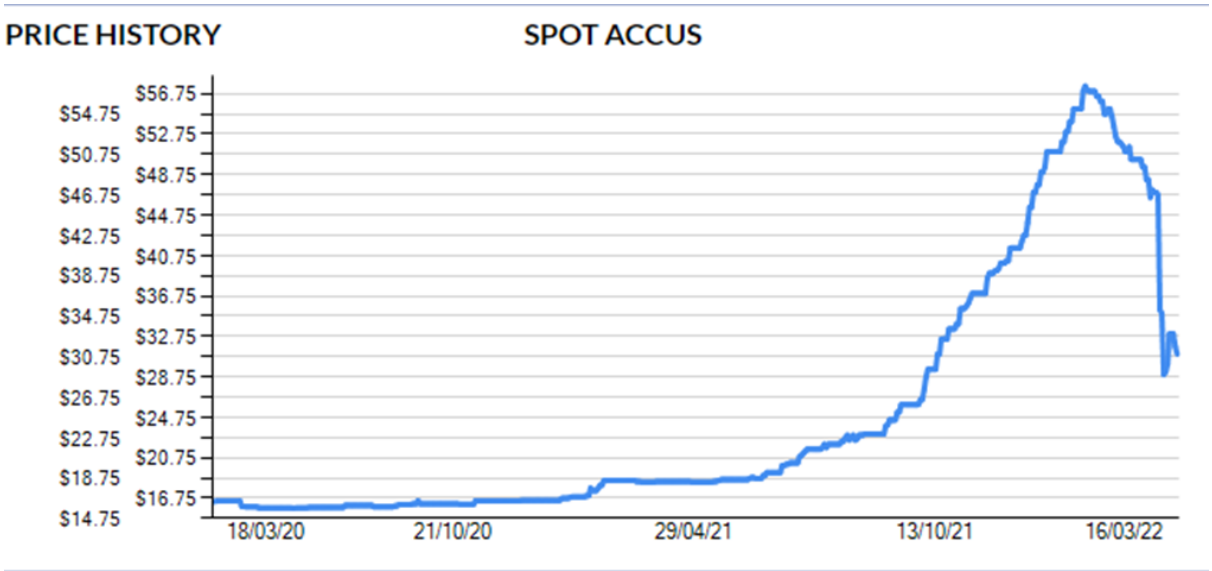
In summary – infrastructure assets by the very nature of their low-risk long-term cash flows are sensitive to interest rates. This has been a massive and surprisingly consistent tail-wind for the performance of equity investments in the sector over the past decade of falling interest rates. Investors should be ready for potential head-winds (or at least gusts!) over the period ahead as higher risk free rates get reflected in asset valuations.

Carbon Credits

Carbon prices globally were on a tear in 2021. There was much conviction around global action to fight climate change following the election of the Biden administration, continued strong climate leadership across the UK and Western Europe and of course excitement pre and post COP26. This dynamic saw European carbon credit prices rally from circa €50 in mid 2020 to almost €100 by the end of 2021. Prices pulled back substantially with the war in Ukraine, but have retraced 50% of their losses.

Source: Refinitive Eikon

Australian Carbon Credit Unit (ACCU) prices, started 2021 much lower than international carbon credit prices at around A$17. Despite the lack of near-term ambition in Australia's COP26 pledges, ACCUs have also been on a rocket ship, rising from the teens to more than $50 over the course of 2021 (see chart below).



Source: accus.com.au

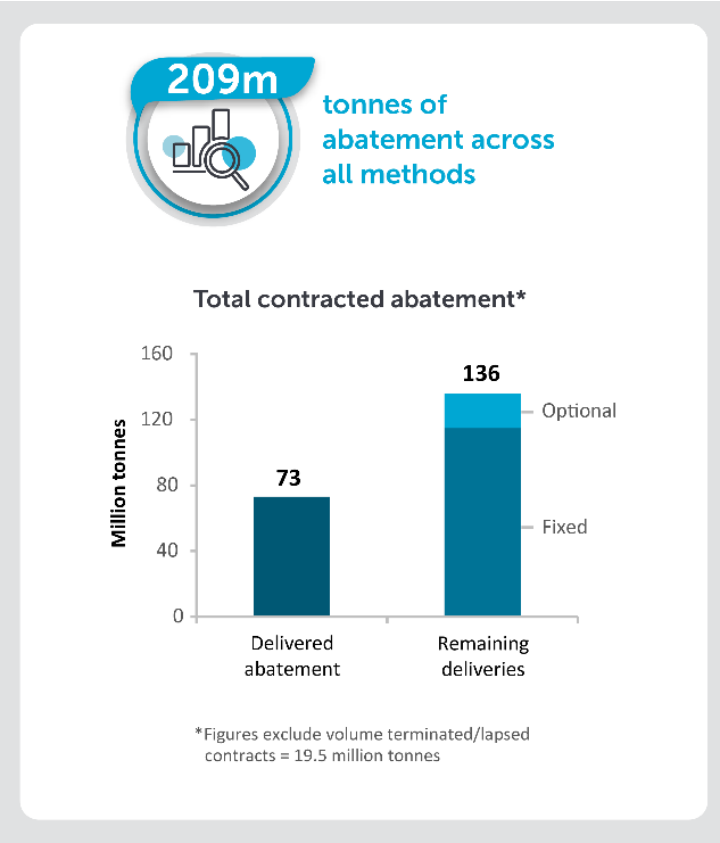
ACCUs represent one metric tonne of CO2. In order for a project to qualify for the production of ACCUs it must first be certified by the Clean Energy Regulator (CER).

To create an ACCU a project has to register with the CER under a number of qualifying approaches. Each approach has a defined methodology and a number of criteria that have to be met. Once a project registers with the CER it will

be granted ACCUs for the carbon abatement it achieves over the project life (often 10 or 20 years). Depending on the project method, ACCUs can start being generated shortly after registration or otherwise need to wait for measurement of how much carbon has been sequestered, before ACCUs are generated.

The largest participant in the ACCU market is the government via the Emissions Reductions Fund (ERF). Between 2017 and 2021 the ERF has undertaken 13 auctions to buy 209m ACCUs from 509 distinct projects at prices between $10 and $17 per tonne. That is a cumulative commitment of circa $2bn.

In early auctions, all ERF contracts were fixed delivery contracts. That is, there was a binding obligation on the project to deliver the ACCUs – even if ACCU prices had risen above the contract price. More recently, bidders at the ERF auction had the choice of electing between a fixed delivery contract and an optional delivery contract. The optional delivery contract was effectively a put option – that is, if spot ACCU prices were higher – the project had the option to not sell to the ERF and capture the higher spot price. However, because this option had only been introduced recently the vast majority of the ERF contracts are fixed delivery contracts (see chart below).



Source: CER announcement from October 2021 ERF Auction

The net of all this, is that while the ACCU market is quite large, currently almost 1,000 projects and 200 million tonnes of sequestration over the next 20 years, the volume of freely tradable ACCUs at a particular point in time is actually quite small. In financial market terms, this is a market with very low free float!

For example, the chart below shows the creation and surrender activity for ACCUs in 2021. The total supply of ACCUs, including those from prior years, was 25 million tonnes (tiny compared to Australia's emissions of 500 million tonnes). Demand for ACCUs for surrender through bilateral trade was less than 15 million tonnes – dominated by ERF delivery obligations.

Source: CER, March 2022 Quarterly Report

What this chart doesn't capture is demand for ACCUs for investment/speculation purposes. That is, acquiring ACCUs today for the purpose of surrendering them later (when ACCU prices might be higher). According to RenewEconomy, for the last three years the volume on the secondary market has been between 3.8 and 6 million ACCUs annually. A relatively small shift in speculative activity, or perhaps only $50m of capital value, could completely shift market dynamics, shifting the market in 2021 from one of oversupply (and where voluntary demand could be easily met from uncontracted supply), to one where there was stiff competition to access the small number of uncontracted or optional delivery ERF contract ACCUs.

This has radically changed in March 2022, when the Federal Government announced a change in policy to allow project owners with flexibility to exit their 'fixed delivery' carbon abatement contracts (CACs) under the Emissions Reduction Fund.

This announcement reduced the ACCU price by 38% overnight.

Under this arrangement suppliers to the ERF will pay the agreed price to the ERF plus a break fee of $12.50. The ERF price varies from auction to auction, but in approximate terms this would equate to a break cost of $22-$29.

Recent ACCU prices have reflected this massive shift in supply demand dynamics – as we go to print the price has settled at $31 (a fall from $57 in January). Thus, the market seems to have settled at a price that is reflective of break cost for the additional new supply with a relatively small additional premium.

The price of ACCUs is also likely to remain subdued for the foreseeable future. As carbon market analysts RepuTex recently pointed out, in the next three months 7m ACCUs could be released from ERF contracts, and up to 112m by 2033. Given the secondary market has hovered around 5m ACCUs traded annually for the last 3 years – the ERF releases can easily swamp the market.

So why did the Federal Government intervene – the rationale put the public was that it would "increase liquidity, allow project proponents to take advantage of higher private market prices and ensure equitable treatment" (Source: ABC, Mister for Energy and Emissions Reduction).

But is market intervention the right path?

It depends which side of the fence you sit on. The market should settle at a price of the lowest cost marginal new supplier of credits, but in a highly constrained market, the price will inevitably be volatile and that's what we saw late last year/early this year.

The winners from the Federal Government's decision are going to be emitters, traders, and legacy ERF auction winners with fixed delivery contracts. The losers will be unhedged speculators, and project owners that either had no ERF contract or optional delivery contracts – they've seen the value of their projects eviscerated.

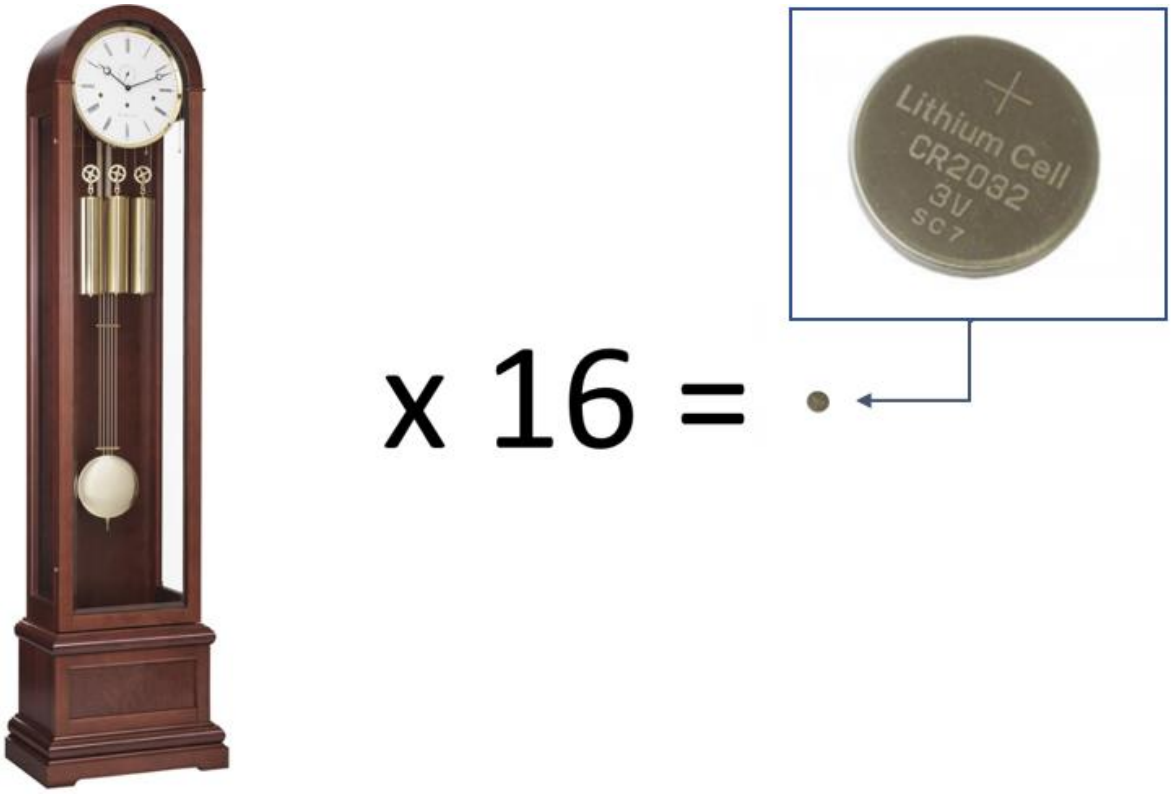
This all comes at a time when we need convergence in carbon credit markets globally. Climate change is a global problem – it doesn't matter where CO2 emission reduction occurs – they just needs to happen, and of course,

preferably at the lowest cost. Globally, regulators need to be strengthening and giving confidence in markets, allowing for tradability (across markets), improving liquidity and price discovery.

Arguably the projects that have been bid into the ERF process are the easiest, least cost projects. From here it only gets harder. The IPC models rely heavily on carbon sequestration to get to net zero by 2050 (as does the Federal Government's net-zero by 2050 strategy). By their nature, carbon sequestration projects (natural or mechanical) are all long-life, high upfront cost projects, and I don't need to lecture this readership group on the importance of policy stability and investor confidence as it relates to long term revenues to support these projects. Price signals and market confidence are critical.

So we at Infradebt see the Government's intervention as hindering rather than helping, they may have alleviated a perceived short-term squeeze, but sent a range of bad signals to the market about the risks of bringing on new supply and the cost of continued pollution for emitters. For Australia – annually we emit 500m tonnes of CO_2, renewables will put a dent in the problem, but to get to net zero will require extensive use of carbon sequestration to decarbonise the economy as we transition. One could also view carbon sequestration as a huge opportunity for Australia – natural projects require land and mechanical projects require vast sums of low-cost renewable energy. But for the opportunity to be executable we need a viable, defensible, liquid carbon credit market.

Gravity Energy Storage



There has been quite a bit of buzz about gravitational energy storage recently. That is, storing energy by lifting weights. This energy can be released by lowering the weights and using the kinetic energy to run a generation. That is, pump hydro but with concrete blocks instead of water.

A key attraction of these concepts – compared to pump hydro – which has been in operation for well over a hundred years, is the flexibility of a modular structure that isn't dependent on terrain/geography. That is, a storage system, that can be put where it is needed.

The challenge with gravity energy storage is that gravity isn't very strong. It takes an enormous amount of weight raised to a large height to store large amounts of energy.

Let's put some numbers on it. The weights in a grandfather clock – which is a long-standing form of gravity energy storage – might store around 100 Joules of energy (say 10kg x 1 metre).

To compare that with a battery. A CR2032 coin cell battery (commonly used in a watch or heart rate monitor strap) – can provide 150 milliamp hours at 3 volts – which is 0.45 Wh or 1620 joules of energy. That is, it would take 16 grandfather clock weight systems to replace one tiny coin cell battery.

To put this in utility scale terms, a Tesla Megapack 2 can store 3 MWh or 10,800 MJ. To store the equivalent in a gravitational storage system with a head of 50 meters (ie something that is the height of a 20 storey building), would require a mass of 22,000 tonnes!

What that represents is hard to comprehend. I like to think of large weights in terms of blue whales (140 tonnes according to Wikipedia) and so the weight would need to be equivalent to 150 blue whales! Alternatively, this is around 9,200 cubic metres of concrete or a solid block 20 metres by 20 metres by 20 metres.

For me the sheer material cost of the weights and the system to hold them up represent a huge challenge for land based gravitational storage. That is, large head provided by terrain of traditional pump energy, is a key advantage, despite the site selection limitations it imposes, that is hard to overcome.