Silver & Photovoltaics – A new solution using old materials

Used by humans for over 6,000 years as jewellery and currency, Silver is one of the metals we have used longest. In the 21st century, however, it is increasingly used for a more modern purpose.

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Two of South America's greatest rivers, the Uruguay and the Paraná, slide into each other about halfway down the continent, combining to form a mighty estuary, second only to the Amazon in size. More than 200 kilometres wide, it drains vast swathes of five countries, and, looking at it today, chocolate brown waves lapping up against the boundaries of the capital cities of Montevideo and Buenos Aires, it is hard to grasp why some of the most well-known figures of the European age of colonial exploration – Drake, Magellan, Cabot – ended up giving it a shiny new name. Rio de la Plata – the River of Silver.

It was the last of those three famous navigators, Sebastian Cabot, who ascended the river systems and encountered indigenous peoples, dripping in silver ornaments, and gave it that moniker. Having heard rumours of mountains of silver in the hinterlands, and steeped in legends of other metallic motherlodes across the continent – after all, this was the age when many lives were wasted in a futile search for El Dorado, the City of Gold – the name seemed apt.

Today, however, the name takes on another significance, linked to an industry unimaginable to those men or the people they encountered: electricity.

Uruguay, on the one bank, has been a world leader in the introduction of renewable sources into their energy mix; wind and solar made up a measly 1% as recently as 2013, rising to a respectable 32% in 2017, with that number continuing to trend upwards in the years since. Once you take hydroelectric power into account, though, you will see Uruguay catapulted into esteemed company; it took a mammoth 98% of its energy from renewables in 2019, on a par with world leaders Denmark, Lithuania and Luxembourg. On the other bank, however, you find Buenos Aires, and beyond, for thousands and thousands of kilometres, stretches Argentina. Its energy mix is a little less sustainable, having derived 86% of its energy in 2019 from burning fossil fuels. In stark contrast to their neighbours across the river, renewable sources made up less than 10% of the Argentinian national mix

across the river, renewable sources made up less than 10% of the Argentinian national mix in that period. Both countries, however, benefit from massive hydroelectric projects on the Rio de la Plata, such as the Salta Grande dam, on the border between the two. Renewable, yes, but at the cost of large reservoirs behind the structure which inundate people's homes and submerge potentially critical ecosystems – hardly watertight ESG credentials there.
Silver comes into play once more in the area then, as a potential cornerstone in a new generation of efficient, clean, power. Whilst its distant cousin, copper, is often considered the best conductor of electrical charge, it is actually greatly outperformed by silver – it's only the latter's scarcity that has led to the former's use in wiring, cabling and household electrics. In fact, so much better is silver as a conductor, that it is one of the most vital components in photovoltaic (PV) cells – that's solar panels to you and me. And this is where my invoking of the Rio de la Plata comes into its own.

As mentioned, solar energy has only just started to be developed in Uruguay. Since 2013, though, this powerhouse of renewable innovation has started increasingly to explore PV sources, as indeed it should; the country generally receives as much sunlight at many parts of the Mediterranean and North Africa – i.e. the Sahara – with an average 1,700 KW per square metre beating down on the roofs of Uruguayans each year. With an extensive new solar development planned for Punta del Tigre, an existing power plant north of Montevideo, PV will become increasingly significant in the country in coming years.
However it is particularly in remote rural areas, far away from the mainline grid in this sizeable but sparsely populated land, that solar energy is particularly viable as an ideal method of ensuring reliable and affordable electricity for all, without the need for expensive and potentially damaging hydroelectric dams.
Silver's aforementioned powers as a conductor is the reason for this – ground into a fine powder and then converted into a paste, it is used to coat silicon wafers in each individual PV cell. As the silicon is bombarded by sunlight, it releases electrons and imparts a charge, which the silver instantly conducts into batteries or directly onto the electrical grid.
Although this coating is thin, each solar panel (made up of scores of cells) could hold as much as 20g of the metal – or very roughly as much as, well, a silver spoon.
Silver, then, despite being prized since antiquity for its shine, for its rarity, for its malleability, is perfect for this ultramodern task. So much so, that demand from PV plants threatens to put real pressure on the global supply of the metal in the medium term - right now, demand from the global PV industry totals a hefty 98.7m ounces, or about 10% of

global demand. Having slowed in the turbulence of 2020, recent events, not least the prospect of heightened green spending in a Biden presidency, may well accelerate this trend once more. Although opinion is divided on the total effects of this, it is a trend that has led some analysts to suggest that the spot price of silver could rally to well over $50/oz, heights not seen since the late 70s and early 80s, as stocks are depleted to meet this growing hunger for clean energy.

This, however, raises the question of an age-old adage in commodities investing – that there's no cure for high prices like high prices. The market forces work in such a way that either supply rises to meet the demand – more production of silver – or the demand is somehow lowered to the level of supply – technology changes to sidestep the expensive commodity. Given that an average of 6% of the cost of a PV cell comes from the silver load, one might think that alternatives would be sought in order to drive affordability; indeed, the innovation means that the silver load in each cell could be cut by as much as 50% in the next 10 years.

Investors need not, however, worry unduly. Modern scientists, for all their progress, have not yet been able to find a material better suited to this purpose than silver – and they have tried. Pioneering materials, such as perovskite, have been deployed to replace silicon, for example. But no known material conducts electricity quite like silver, meaning it may never be replaced in PV cells. So even as the silver load in an individual cell drops, the proliferation of PV cells across the world, at sites such as Punta del Tigre in Uruguay, means that tailwinds may build around the price of the metal; the International Energy Agency anticipates that solar energy will meet 80% of the increased electricity demand through to 2030, with absolute output rocketing more 350% in that period, from 720 TWh all the way up to 3,300 TWh.

Returning once more to the banks of the Rio de la Plata, then, we see how silver might come to define this land once more. Just last year, Uruguay’s Minister of Energy endorsed plans to increase the contribution of solar energy to his country’s grid, tacitly inviting increased silver demand. Argentina? Well progress there may be slower. But having sat on the side of the road for over 3 hours in what is essentially a desert when his Rosario to Cordoba bus broke down, this writer can confirm that there is no shortage of intense sunlight in that country either, so watch this space.

By Tom Sleep, November 2020

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