

Corporate Renewable Energy Procurement Monthly

This is the second issue of Bloomberg New Energy Finance's monthly analysis of corporate renewable energy procurement. It details recent global power purchase agreement (PPA) deals and provides market updates for Mexico, the US, the Nordics and India. This month's issue also includes an interview on corporate PPAs with Nick Boyle, CEO of Lightsource, a leading UK PV project owner and developer.

RECENT DEALS

Off-taker	Project name	Country	Size (MW)	Current project owners	Our take
Amazon Web Services	Amazon Texas Wind Farm	United States	227.7	Lincoln Clean Energy	This is Amazon's first PPA in Texas. The debut of Amazon Energy in Q2 2016 allows the company to buy and sell physical energy wholesale, but is unclear if this is a physical PPA or simply a contract for difference. <i>Date: 15 September.</i>
Google	Aquila Lehtirova Wind Farm	Sweden	147.6	Aquila Capital	This is Google's third onshore wind PPA this year. The PPA agreement length is 10 years. <i>Date: 14 October.</i>
Google; AkzoNobel; Philips; and, DSM	Krammer Wind Park	Netherlands	102	Community-owned cooperatives	This consortium of Google, AkzoNobel, Philips and DSM formed two years ago to source renewable energy. This is the first PPA deal inked, where they have agreed to purchase 0.35TWh per year from Windpark Krammer. The cooperatives who launched the project will use less than 5% of the wind project output. <i>Date: 14 October.</i>
Johnson & Johnson	E.ON Colbeck's Corner Wind Farm	United States	100	E.ON Climate & Renewables	Johnson & Johnson eclipsed its previous largest PPA of 4MW by announcing a 100MW wind PPA in Texas, where over 50% of US corporate PPAs have been signed in 2016 to date. <i>Date: 17 September.</i>
Iron Mountain	Amazon Texas Wind Farm	United States	25.3	Lincoln Clean Energy	Iron Mountain will hedge nearly a third of its total energy consumption under a long-term virtual PPA with Lincoln Clean Energy for the remaining 10% of the 253MW Amazon Texas Wind Farm. <i>Date: 11 October.</i>

Source: Bloomberg New Energy Finance. Note: This table represents the largest deals during the period of August-date 2016.

MARKET UPDATES

AMERICAS (AMER)

Mexico's corporate PPAs: current market

While Mexico's sweeping electricity market reforms have had a chilling effect on PPA signing activity among corporate and industrial electricity users this year, we expect transaction volume to return in 2017. Prior to the country's power market reforms, large consumers could purchase electricity from independent power producers through 'self-supply' contracts (*autoabastecimiento*). Such contracts were the main driver for clean energy deployment in the country, especially wind. By the end of 2015, some 2.4GW of wind farms were installed to supply large energy consumers in the country (Figure 3). Under the new power market rules, large consumers must be wholesale market participants and may procure electricity directly from a generator, through an energy trader/agggregator, or buy directly in the spot market. But Mexico's wholesale market only started in January 2016 and it did so with a limited number of participants and slim liquidity.

The transition has stalled Mexico's corporate PPA market for a couple of reasons. First, it introduced a learning curve: large energy consumers are only beginning to understand how to execute deals under the new rules, an issue compounded by the fact that most companies (those below the top 20 largest users) tend to lack sophisticated resources internally for assessing long-term electricity agreements. Second, the transition has made it challenging to make reasonable long-term wholesale power price projections, even for the most sophisticated potential off-takers. The result – large consumers are in a 'wait and see' mode. We expect that Mexico's corporate PPA market

will bounce back once the wholesale market starts full operation (day-ahead and hour-ahead) in 2017 and energy traders/ aggregators (*suministrador calificado*) begin full operations. At the moment, 12 companies have requested permits to act as energy aggregators, including Comision Federal de Electricidad (CFE), Iberdrola and Intergen.

For more, see our *H1 2016 Mexico & Central America Market Outlook* and our Research Note on *PPAs in Canada and Mexico*.

US corporate PPAs: market update

While US corporate PPA signing activity has slowed in 2016 relative to 2015, we expect the US to remain a key market for such deals for the foreseeable future. This is for at least two fundamental reasons. First, new corporate renewable energy commitments continue to emerge, seemingly by the week. Secondly, and perhaps more importantly, conversations with several of the most prominent energy procurement strategists suggest a shift away from satisfying commitments with voluntary renewable energy credit (REC) purchases, historically the primary mechanism used by companies to make renewable electricity claims, to PPAs, despite their higher cost. For example, we estimate that US corporate PPAs typically embed a \$10-20/MWh 'green premium' compared to voluntary REC purchases, which have traded below \$1/MWh since 2015 (Figure 4). For additional details and analysis on the voluntary REC market in the US, see our Research Note on *The voluntary REC market after the flood*.

Corporate Renewable Energy Procurement Monthly

EUROPE, MIDDLE EAST & AFRICA (EMEA)

REC scheme supports PPA growth in Nordics

With cumulative PPA capacity of roughly 1GW (Figure 5), the Nordics market represents almost 50% of PPAs in EMEA. Its combined cumulative capacity is 27% larger than that of the UK. Whilst Google and other technology companies have dominated corporate PPA deals in the region, signing large long-term purchase agreements with onshore wind farms (see *recent deals* table for more on Google's recent transaction in Sweden), the likes of Novo Nordisk, Norsk Hydro and Novozymes have also signed significant deals.

The outlook for the Nordics varies by country. The joint Sweden/Norway electricity certificate scheme is currently an important driver for corporate PPAs in the region. The division between the power price and renewable energy certificates allows for separate hedging contracts, which is unfeasible in markets with feed-in tariff (FiT) regimes. Norway is expected to leave this scheme in 2020, whilst Sweden has vowed to extend it until 2030, which changes the attractiveness of signing corporate PPAs in the two countries. As Finland closes its Feed-in Premium scheme in November 2017 to move to auction-based allocation of subsidies, the market could become more attractive for corporate PPAs, as wind costs edge towards grid parity.

For more details, see BNEF's Research Note on *Hotspots for corporate PPAs in EMEA*.

Major off-takers join BNEF's panel at Summit, flagging barriers and opportunities for PPAs

Francois Sterin, global infrastructure director at Google, Vanessa Miler, renewable energy strategist at Microsoft, Nick

Boyle, CEO at Lightsources and Phil Dominy, assistant director for energy & environmental finance at Ernst & Young, joined a panel at BNEF's Future of Energy Summit to discuss corporate renewable energy sourcing strategies. Despite demand from major corporates for renewable electricity, direct purchasing still faces hurdles. Some of those discussed:

- **Price and policy:** In regions with FiTs, the developer has no incentive to sign a long-term agreement on the wholesale price.
- **Location:** For onsite PPAs, there can be difficulties in finding an available location of the correct size, close enough to the company operations. This is especially the case for urban areas.
- **Transparency:** Some issues with transparency, including the transfer of environmental attributes, the monetization of green certificates and the risk of double counting.

However, the future of corporate renewable energy sourcing is not all doom and gloom. When asked what future opportunities there may be in this space, panellists offered the following:

- Third-party offerings of certified and trusted renewable energy services are an opportunity, including for utilities who want to create more customer-focused offerings.
- The removal of policy barriers: In particular, this includes barriers in some countries that do not allow for private off-taker and developer contracts. This barrier breakdown would provide opportunities for PPAs beyond the UK and the Nordics.
- The drive from corporates to take control of price and supply security through revisiting how they buy their electricity will be a continuing business opportunity for developers.

ASIA PACIFIC (APAC)

Amplus shines with the Wal-Mart rooftop solar deal

Wal-Mart India has partnered with Amplus Energy Solutions for greening its wholesale stores across the country, by consuming 50% electricity generated from renewable sources. Wal-Mart plans to have a cumulative installation of 5MW of rooftop solar PV projects at 15 locations in Uttar Pradesh, Punjab, Madhya Pradesh, Rajasthan and Andhra Pradesh (Figure 6). This will be at a cost of INR 900m (\$13.4m). The global infrastructure investment fund I Squared Capital has invested \$150 million in Amplus with the anticipation that the portfolio of the company will reach 30MW by the end of March 2017.

Amplus is a Resco (renewable energy service company), owning the PV system and also in charge of its operation and maintenance. The company generally signs PPAs for 15-25 years. The PPAs in the rooftop solar Resco segment are not standardised across the industry but instead vary based on the client's needs. These can be signed at a fixed price throughout the tenure, or can have both fixed and variable price components with some escalation.

PPAs can also be benchmarked against the grid tariff by offering a rate which is a flat 15% lower than the customer is charged by the discom (distribution company).

The electricity prices for corporate procurement from solar and wind energy projects lie between INR 4.5/kWh (\$0.07/kWh) and INR 7.0/kWh (\$0.10/kWh).

Besides Amplus there are several other companies that are enabling corporate procurement of electricity, such as Cleanmax Solar, Madhav Infra, Fourth Partner, Renew Power, Hero Future Energies and Sunshot. These companies either sell power under a Resco mechanism or as third-party power sales contract.

Large commercial and industrial companies are starting to make investments in captive rooftop solar installations, as in many cases, the levelised cost of electricity (LCOE) of renewable electricity is lower than the discom tariffs. Resco companies have also picked up their business, as it is preferred by the off-takers that either do not want to, or do not have the, financial strength to make large upfront investments.

Corporate procurement can grow rapidly if net-metering policies are enforced in all states. The removal of operational difficulties (such as grid access and various charges) in exporting power to other states over long distances will further boost corporate procurement of renewable electricity.

Corporate Renewable Energy Procurement Monthly

INTERVIEW: Private-wire PPAs “can undercut grid power”, PV developer Lightsource

Nick Boyle, CEO and founder of Lightsource Renewable Energy, a leading UK PV project developer and operator, spoke to Bloomberg New Energy Finance about corporate power purchase agreements. He said that the growth of PPAs in the UK has been due to a mixture of policy changes, interesting price inflection points and the drive of corporate first-movers. He argued that companies could save up to 20% on their electricity bills by signing an onsite corporate PPA.



Q: How much growth in corporate PPAs have you witnessed?

A: We were a trailblazer, to some degree, by completing the Bentley factory roof in 2012. It was a very large roof over a very large electricity user; therefore, it was natural to use a PPA. At that point, perhaps, we didn't foresee that PPAs would become what they are today. For Lightsource, PPAs are our main focus in the

UK. We have seen them grow exponentially over the last few years, albeit from a low base. This has been partly fueled by the fact that the support mechanisms of the Feed-in Tariff and Renewables Obligation have now been eroded by the UK government. However, I think that this is only one part. We are also at an interesting inflection point on price, where PPAs can undercut the price of normal grid-accessed electricity. This is the precursor to any PPA.

Supply and price security are two things that people had perhaps not contemplated before. Electricity purchasers are also asking if they can tap into a new and modern way of purchasing. Corporate PPAs provide that. Corporates can control price, tenure, and supply.

Q: Is there a tension between the corporate and developer on PPA contract length?

A: Yes. As a producer, we pay for the build of the solar park by securitizing the predictable revenue streams that have been agreed by a bankable counterparty. We bring that forward to NPV [net present value] and decide whether to spend that money or not, depending on whether we can make the economics work. The longer the tenure, the more we have to spend and the more viable the project becomes.

We have to educate individuals about why they should enter into longer-term contracts. Many companies have never thought about fixing the price of electricity in the long-term because it was never an option. We are finding, particularly with Brexit and other uncertainties, companies are seeing a corporate PPA as a hedge and a means of delivering a percentage of their electricity at a predictable price, long into the future. That's a big plus.

Q: You've touched on the value of hedging, but what about cost savings. In an interview earlier this year, you stated that Lightsource looks to save corporates 15% on their electricity bills...

A: I am probably being gutsy but we could probably push that to 20% (and certainly in the 15% to 20% range). If someone is paying 10 pence today, we look to provide between 8 and 8.5

pence. We are also fixing it with the RPI [Retail Price Index], the index that everything else in their business is fixed at. Ultimately, we are saving them money today, and compounding that saving over time, as RPI increases at a lower rate than electricity price inflation.

Q: With such savings, why isn't everyone signing a PPA? Where are the issues?

A: Education takes time. We have certainly seen that water companies, in particular, are making clear statements of intent for corporate PPAs. For example, we built a deep-water floating solar park on the Queen Elizabeth reservoir, just outside London – a world first. This is a 100% take-or-pay arrangement, so Thames Water takes 100% of the electricity in a PPA for 25 years. We have also just built the first large-scale solar park (5MW) in Northern Ireland, at Belfast International Airport. Again, it will buy 100% of the electricity over a 25-year period. We expect to see a number of first-movers, and when others see that the process is working well, a greater volume of PPA deals will follow. I believe that avalanche is already starting. Lightsource has already had conversations with four airports since connecting Belfast.

Q: What was particularly good about the Belfast deal?

A: There are two types of PPA – private-wire PPAs and virtual PPAs. We used private-wire at Belfast airport, meaning we physically built the connection and it is behind the meter. This works because we are competing with the retail electricity price, rather than the wholesale price. Moving forward, we will move into sleeving arrangements [back-to-back contract], where we build facilities remotely, connect to the national grid, with the grid delivering electricity to the end-user. We are not at this point today, as we are still 18-24 months away from grid parity.

Q: Do you have more issues with a virtual PPA than a physical one?

A: There are contractual challenges given the fact that you are using someone else's equipment, there are more counterparties and longer documentation. But none of this is insurmountable. With hardwire PPAs, you still have to deal with wayleaves [right of way for operations in privately-owned land], physically building the connection, and upkeep of the wires. Both options have their challenges.

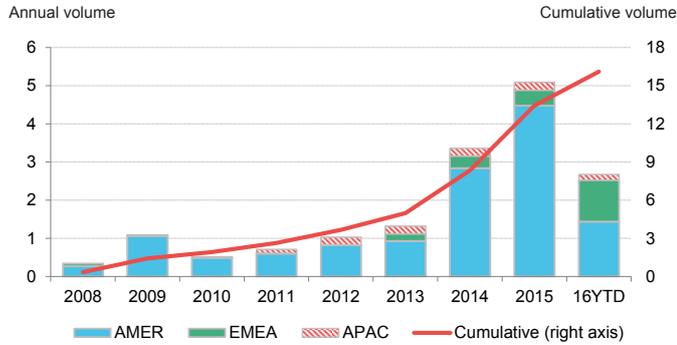
Q: Where are the hotspots in EMEA, outside of the UK and the Nordics?

A: [Choosing a corporate PPA] is not a green decision. This is about price. A CFO of a business in Germany or in Britain is every bit as likely to listen to the fact that we can future-proof their electricity supply at a price that massively undercuts the incumbent delivery. Maybe some countries pick it up more quickly. If it happens in the US, it'll happen in Europe and elsewhere.

Corporate Renewable Energy Procurement Monthly

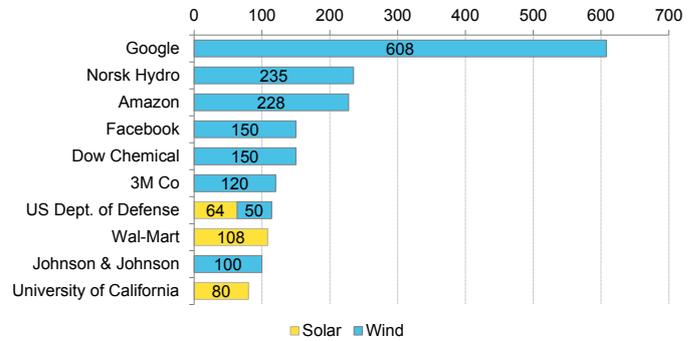
DATA

Figure 1: Global corporate PPAs by region and year, 2008-16YTD (GW)



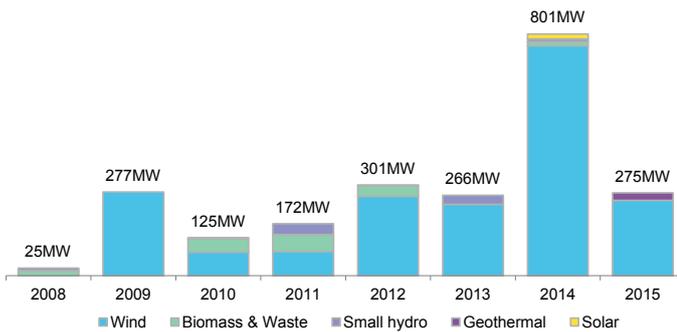
Source: Bloomberg New Energy Finance. Note: Includes onsite generation like commercial rooftop PV installations. APAC capacity is estimated and will be updated on an ongoing basis.

Figure 2: Top 10 corporate off-takers in 2016 (MW)



Source: Bloomberg New Energy Finance. Note: Google off-take amount has been revised to also include its 2016 US PPA deals.

Figure 3: Mexico's renewable self-supply capacity installed by technology, 2008-15



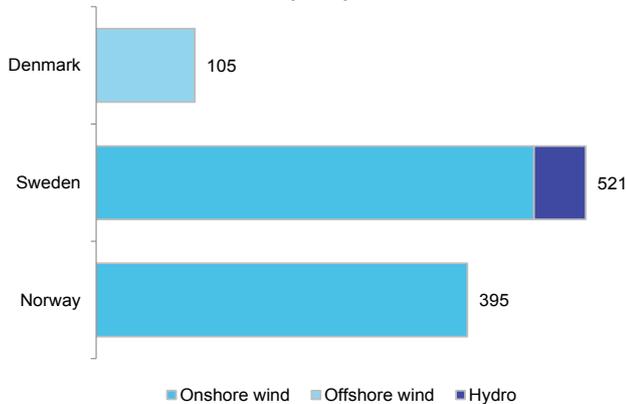
Source: Bloomberg New Energy Finance. Note: See our Mexico corporate PPA database for additional details and underlying data.

Figure 4: Green-e national wind REC, 2011-16 (\$/MWh)



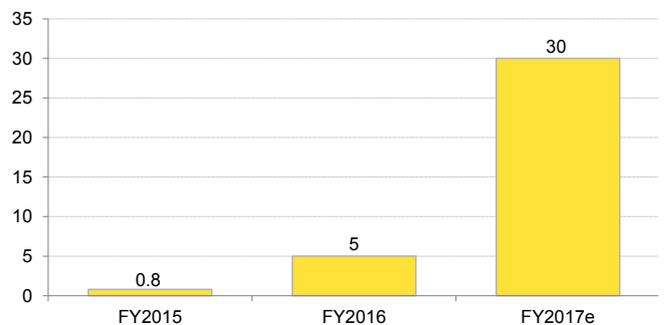
Source: ICAP, Bloomberg New Energy Finance.

Figure 5: Nordic corporate PPA capacity by country (MW)



Source: Bloomberg New Energy Finance.

Figure 6: Amplus Energy solar PV portfolio in India (MW)



Source: Bloomberg New Energy Finance. Note: India's financial year is from April to March.