# Deloitte<mark>.</mark>



# A brand new merchant world

Perspectives and transaction analyses for renewable energy

June 2020

# The future looks bright ...also commercially!



#### **Editorial by Troels E. Lorentzen**

The days of industry reliance on government subsidies have come to an end. The trade-off between economics and sustainable energy has faded. Grid parity and merchant projects are real. Onshore renewables like onshore wind and solar PV have managed to reduce LCOE (levelised cost of electricity) at a remarkable pace. Solar PV in particular (see the *Spotlight* article on page 8).

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In Denmark, fixed project support for solar PV projects ended in May 2016, and for onshore wind projects in February 2018. The support schemes were replaced by technology-neutral auctions in November 2018 and 2019.

Both onshore wind and solar PV projects were awarded support at auctions (premiums to spot market prices). At the first auction, the average winning bid was 2.28 øre/kWh (c. EUR 3.06 per MWh) and in the second auction the average winning bid was 1.54 øre/kWh (c. EUR 2.06 per MWh). The latest auction in 2019 was, in fact, undersubscribed. If future auctions are to take place, they will likely be designed around reallocation of merchant risk from producer to consumer, for instance via market-based contracts for difference.

With Denmark having some of the lowest market prices of electricity in the world, this tendency will likely be global.

Projects have been announced to be built without government support (see the *Feature* article on page 4). Project developers and project owners will need to deal with a merchant world for renewable energy.



#### The rise of the corporate PPA

In the transition from subsidised to merchant projects we have seen corporates offering to offtake power on long-term purchase agreements (corporate PPAs). This does not only echo the increased focus on ESG (environmental, social and corporate governance) but also makes good economic sense for corporates. And corporate PPAs allow for project financing to the benefit of project developers and project owners.

However, corporate PPA markets are still immature and limited to greenfield projects and large corporates with high credit ratings. Corporate PPA markets will need to be simplified and standardised to be relevant in the long term.

In recent years, assumed lifetime has increased by 10-20 years depending on technology and land lease options. Most corporate PPAs have a 10-year tenor, which is much shorter than most government support schemes. As a consequence, all projects will have a higher degree of merchant exposure.

#### The impact on transaction prices

Our latest analysis finds the average transaction price of installed onshore wind projects to be EUR 1.6m per MW (see transaction study on page 15). This result is consistent when comparing to our latest study in 2017 and our first study in 2010. We find the average price of installed solar PV to be EUR 1.8m per MW (see transaction study on page 17). This is a decrease of EUR 0.4m per MW since our latest study in 2018 and a decrease of EUR 1.7m per MW since our first study in 2010.





There is a direct link between project costs and LCOE and between project costs and transaction prices. However, there are some time lag effects before we see the drop in LCOE in transaction prices.

Further, the increased merchant exposure, which cannot be offset by corporate PPAs, will leave investors requiring an additional risk premium. How this will be estimated, I am not sure, but it will likely be overestimated for the first generation of merchant projects. Remember, merchant risk is fundamentally good. For utilities: this should be your DNA, and for financial investors: remember electricity prices are uncorrelated with capital markets and other investments.

#### What will the future look like?

Grid parity will lead to an increase in renewable energy. Great. However, electricity markets are not organised to absorb a high degree of nondispatchable renewable energy or to recover capital expenditure and costs.

As the renewable energy sector offers a solution for the energy transition towards carbon neutrality by the second half of this century, the future will inadvertently make the power sector reorganise to solve these problems.

On the supply side, we will see stronger and more connected grids, a better balance of technologies and large investments into power-to-X technologies. On the demand side, we will see electrification and consumer response technologies, as the retail market moves towards hour-by-hour pricing.

The future looks bright ... also commercially!

# BeGreen to build one of Scandinavia's largest solar parks

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It will be among the first solar parks in Denmark financed 100% free of subsidies

e will be quite busy for a while, which also applies to a large number of manufacturers and sub-suppliers," says the co-founder and chairman of BeGreen, Anders Dolmer, from his office. Outside, the sun's rays hit the stunning landscape of fields, meadows and lakes. Soon, they will also hit a solar park with an area equal to 400 soccer fields further west. More specifically, at the decommissioned airport in Vandel. Here BeGreen is constructing its new solar park, which will be located next to the company's first solar park, which today is the largest solar park in the Nordics.

"We are in the process of breaking our own record, and we expect the new park to have a capacity of 155 MWp".





This will be sufficient to meet the annual energy needs of 34,000 households and reduce annual carbon emissions by 135,000 tonnes of CO2 per year. However, this is not the only milestone which Anders Dolmer is proud of. The new solar park will be among the first of its kind to be built without any subsidies.

"When we established BeGreen, the ambition was to become the first company in the world to build solar parks without any subsidies. We are realising this now, and of course it means a lot to our company that we can show that we are executing on our ambition".

# An important step for the green transition

As the new solar cell project is based on purely commercial terms, there is no longer any excuse for not fostering the green transition in Denmark, according to Anders Dolmer.

"When we established BeGreen, the ambition was to become the first company in the world to build solar parks without any subsidies ... We are realising this now".

"It should no longer be an obstacle that tax payers will not pay for power production. In this way, this project is ultimately sustainable, both energy-wise and economically", he says, stressing that this applies on several parameters.

When BeGreen establishes a solar park, the agricultural area is converted into grass, which, in addition to binding carbon and nutrients in the soil, ensures that there can continue to be agricultural production in the area. In the past, BeGreen has used sheep to keep the grass among the solar cells under control, but going forward BeGreen is planning to cut the grass, which will be used for animal nutrition with any residual organic waste being used as a feedstock for biogas.

"This allows us to recirculate carbon back to the soil. In addition, we will not use pesticides for the 40 years that the project is expected to be in operation, which is good for the groundwater", he said, adding:

"As we come from an agricultural background, it means a world to us to help ensure a sustainable food industry. One thing is to locate some energy plants on your land; another thing is to continue to produce food at the same time. Not many people incorporate that part".

BeGreen

snapshot

BeGreen develops, constructs and operates large-scale solar parks and energy storage solutions with a focus on Denmark, Sweden and Poland.

To date, BeGreen has 120 MWp installed capacity and aims to develop and construct an additional 4 GWp by the end of 2025.

# Commercial terms are a game changer

Anders Dolmer has not regretted switching from farm work to solar energy production. And as the new solar park can run on purely commercial terms, this is indeed an exciting milestone.

"It is one of the most exciting industries you can possibly deal with. There has been a fantastic technological development, which has made a solar cell almost twice as efficient within a few years measured on one year's production", he says.

"At the same time, the price of solar cells has fallen, giving you high quality at a significantly lower price. A few years ago, solar projects were not profitable at all without subsidies, but this is actually the case now". According to Deloitte's expert Troels E. Lorentzen, who has followed the development of Danish solar parks for a number of years, it will become a game changer for the market that subsidies are no longer necessary. He believes that the Danish market has seen the last round of subsidies, namely the one that took place in December 2019.

"No more subsidies and auctions within this space. The whole green movement with climateconscious consumers that is taking place in these years is pushing companies to deliver economically sustainable solutions", he says and continues:

"The diametrical opposite of subsidies is to build solar cells and produce at the given spot price. However, there is also a middle course, namely the possibility of selling power on long-term contracts funded either through a wholesaler or commercially through a corporate PPA".



"The diametrical opposite of subsidies is to build solar cells and produce at the given spot price. However, there is also a middle course, namely the possibility of selling power on long-term contracts funded either through a wholesaler or commercially through a corporate PPA".

# Great potential – and crucial limitations

According to the latest forecasts presented by Energinet, the Danish electricity transmission system operator, Denmark can look forward to more than a doubling of electricity consumption by 2050. This requires a significant expansion of the energy grid, Anders Dolmer points out.

"There is no doubt that politicians are aware that our infrastructure needs to be dramatically expanded to cope with this. It will also be one of the most significant constraints on how to develop the energy industry, whether it is wind, solar or something third", he says, and adds:

"The grid and the expansion of the grid are absolutely crucial for how this is going to happen. We work to incorporate batteries into our solar parks, both for long- and short-term storage of energy. This will be absolutely crucial to utilise the existing grid and will be a big part of the solution".

The solar park is expected to start construction in 2020 and produce its first power in 2021. BeGreen has several similar projects in the pipeline.

### Deloitte's role in the project

Deloitte has been a cornerstone of the project since the beginning. Deloitte has made the financial model we have been working on and has put a lot of efforts into the development. There are continuously new things to deal with, and Deloitte has ensured that all these issues have been implemented, validated and, above all, discussed. This is absolutely crucial, as the margins are relatively small, so a small calculation error can have a major impact. And then there is the entire M&A process, where Deloitte has been our core financial and tax adviser and made sure that we achieved our goal.

Anders Dolmer Co-founder and Chairman of BeGreen



BeGreen's solar park, Vandel

# Consequences of cost-competitive renewable energy

After years of continuous decline, the cost of renewable energy is now at a level where it can challenge the cheapest conventional power sources. As a result, new renewable projects are being commissioned without any subsidy support. However, subsidy independence comes with new obstacles for renewable project developers. The future leaders of power production will be the ones that manage to mitigate merchant risk, market volatility and profit cannibalisation.

fter almost a decade of continuous improvements in cost-competitiveness, onshore renewables are now consistently cheaper than conventional power sources and moving into all-merchant territory. Improvements in cost-competitiveness have come from both overall cost reductions and better energy yield. Onshore wind projects are achieving larger rotor diameters and turbine sizes, resulting in improved capacity factors. For solar PV, dramatic decreases in the price of PV modules have driven an average reduction in costs of 17% per year from 2010 to 2018.

Cost-competitiveness is measured using levelized cost of electricity (LCOE), a standardised concept developed to benchmark all electricity generation technologies against each other. LCOE represents the average power price that a project should realise to be value-creating. It considers the expected production and costs of a given project over its entire lifetime, while also accounting for the cost of capital. The LCOE of onshore wind has been within the fuel cost range<sup>1</sup> since IRENA started collecting data in 2010, and solar PV since 2014.

For 2019, IRENA estimated the average LCOEs of onshore wind and solar PV at 47 EUR/MWh and 61 EUR/MWh. Both estimates are close to the lower end of IRENA's fuel cost range, which spans from 44 to 155 EUR/MWh. Auction data indicates that by 2021, onshore wind and solar PV is consistently undercutting the cheapest conventional power sources with prices of 35 EUR/MWh and 38 EUR/MWh, respectively.

<sup>1)</sup> The fuel cost range represents the cost of power generation for fossil-fuelled power sources. According to IRENA (2020), the cheapest fossil-fuelled power source is coal.

Figure 1: Solar PV and onshore wind LCOE

EUR/MWh (2019)



Sources: Renewable Power Generation Costs In 2018 and 2019, IRENA (2019 and 2020)

According to IRENA, this is cheaper than the marginal cost of around 800 GW of already operational coal-fired power plants<sup>2</sup>. This means that the LCOE of onshore renewables can compete with the marginal production costs of a coal-fired power plant, even after including fixed costs such as depreciation and overhead costs in the LCOE calculation.

The LCOE represents the average power price that a project should realise to be valuecreating, considering expected lifetime production and costs while also accounting for its cost of capital.

In other words, it will in some cases be cheaper to build a new onshore wind farm than to use already built coal-fired power plants to produce electricity.

Since IRENA's fuel cost range was calculated, the individual cost parameters for fossil fuel technologies have fluctuated. The prices of oil, gas and coal have all declined since late 2018. Most notably, the 2020 oil price war pushed Brent crude oil prices down by 72% in the first quarter of 2020<sup>3</sup>.

For European plants, emission costs are tied to European Emission Allowances (EUAs). The pre-announced supply stop in 2019<sup>4</sup> caused EUA prices to triple during 2018 and 2019. Following the spread of COVID-19, EUA prices took a 36% drop in 10 days in March 2020<sup>5</sup>.

We have yet to see the long-term impact of these fluctuations on power prices, LCOEs and the profitability of renewable projects. Either way, increasing demand for renewables positions them to continue their cost reductions and challenge conventional power sources. While this still leaves the issue of intermittent production for renewables, the CEO of Nextera, a leading North American energy company, predicts that batterybacked wind and solar will be cheaper than gasand coal-fired plants by 2025<sup>6</sup>.

#### Merchant price risk: The rise of the corporate PPA

Parallel with reductions in LCOEs, subsidy regimes are being phased out, which forces developers to focus on projects that depend entirely on merchant revenue. We are also seeing the end of subsidy support for some existing projects that will now have to rely on merchant revenue. The volatility of wholesale power prices includes a much higher revenue risk than the steady and predictable prices in subsidy regimes. Consequently, project developers are looking for ways to reduce the market exposure in allmerchant projects.

<sup>2)</sup> Renewable Power Generation Costs In 2019, IRENA (2020); 3) Europe Brent Spot Price FOB, U.S. Energy Information Administration (2020); 4) In 2019, the EU Market Stability Reserve started tightening supply of emission allowances by absorbing new allowances into a reserve instead of auctioning them into the market; 5) EEX EUA Primary Auction Spot Report 2020; 6) NextEra CEO: "Near-firm renewables cheaper than fossil-fuel power by 2025", Recharge (2020)



Part of the solution is the corporate power purchase agreement (corporate PPA), a supply contract with a guaranteed fixed price for renewable electricity. Renewable energy producers are offering PPAs to corporates with the value proposition of long-term cost certainty and better ESG scores in the form of renewable energy certificates. In return, developers are able to secure prices for 10 to 20 years, achieving the same low risk as subsidies (assuming a similar counterparty risk). This can provide the last piece of the puzzle for project developers looking to secure project financing with a lender or investor that demands low revenue risk.

In practice, the corporate PPA is a concept under refinement. There is no standardised public market for corporate PPAs, and corporates will therefore have to invest time and resources into

"... With expected standardisation and declining transaction costs, the corporate PPA market will become more open to all suppliers over time and perhaps convince corporates to leave the convenience of the electricity spot market". market research and negotiation. This is weighed against the convenience of trading electricity and certificates through the well-established power exchanges that can already provide hedging options and renewable energy certificates for corporates, although on shorter terms and to a lesser extent. Existing examples of corporate PPAs are therefore most predominantly seen among data-intensive tech companies that have the electricity consumption, the CSR focus and the market insight to outweigh transaction costs<sup>7</sup>.



Large utility companies are best positioned to drive the standardisation and market development of corporate PPAs in the short term. Firstly, their existing market contact and branding give them a natural position to push corporate PPAs in the market. Secondly, supplying corporate PPAs requires the balance sheet to solve the balancing issues of matching supply and demand between supplier and off-taker. Utilities have the portfolio size and diversity of assets to mitigate the risk of supply shortages on their own side and cancellation or default from the off-takers side. Finally, utilities have the corporate setup and market insight necessary to navigate the currently complex market of corporate PPAs.

With expected standardisation and declining transaction costs, the corporate PPA market will become more open to all suppliers over time and perhaps convince corporates to leave the convenience of the electricity spot market.

<sup>7) &</sup>quot;Analysis of the Potential for Corporate Power Purchasing Agreements for Renewable Energy Production in Denmark", Danish Energy Agency (2019)

# Renewables are increasing volatility and cannibalising own profits

Despite successful hedging of market risks, project developers will still be faced with increased market volatility. As market penetration for renewable energy is expected to increase, volatility is expected to increase due to the intermittent production of renewable power sources.

The increasing volatility can partly be offset by improved electricity grids. Interconnectors between countries can distribute supply and demand across a larger geographical area to even out market volatility when renewable energy sources collectively are at either standstill or peak production. The EU is setting targets for individual member states to reach a certain level of integration<sup>8</sup>, prompting them to build and strengthen interconnectors across borders. This is specifically done to integrate a growing share of renewables into the grid and ensure security of supply. However, stronger grids will not alone solve the problems that renewables bring. In an 'all-otherthings-held-constant' scenario, increasing renewable penetration will decrease the power price. This is due to the auction design in the electricity spot market. Renewable technologies enter the merit order<sup>9</sup> at the bottom with a marginal cost of zero. At the top of the merit order, high-cost fossil-fuel technologies like oil and gas are pushed out of the supply curve, resulting in a lower wholesale price of electricity. Consequently, renewable energy will continuously undercut all other technologies and cannibalise its own profits.

If no new market-ready technologies emerge, the expectation is a race to the bottom. To avoid this, market players will have to come up with technologies that can store electricity for longer durations, convert electricity into other energy forms and strengthen demand-side responses to market volatility. Future leaders of energy are companies that invest in the technology that achieves market-readiness first.



Figure 2: The merit order effect illustrated

8) Towards a sustainable and integrated Europe (2017), European Commission Expert Group on electricity interconnection targets

9) In the electricity spot market, each producer bids for demand based on its marginal cost. Producers are then brought online to meet demand starting from the lowest marginal cost until all demand is covered. Producers with the highest marginal cost are therefore less likely to be brought online than producers with the lowest marginal cost

## **ANALYSIS INTRO**

# **Transaction analyses**

Our 2020 study finds that transaction multiples for installed onshore wind assets have remained relatively stable, while prices of installed solar PV assets have increased slightly in recent years, following a large decline between 2015 and 2016

## **ANALYSIS INTRO**

# Introduction

Since the release of our latest transaction analyses<sup>1</sup>, we have added 111 transactions of onshore wind farms and 70 transactions of solar PV farms to our dataset.

ver the past decade, Deloitte has tracked transaction pricing developments in the global onshore renewables industry, publishing results on an approximately annual basis, with our latest publications on onshore wind being in 2017 and on solar PV in 2018.

In the same way that many M&A practitioners value companies using price multiples on earnings and book values, renewables can be valued using a price multiple per MW. Although an EV/MW multiple cannot compete with the level of detail that a DCF analysis provides, it serves as a good starting point for a renewable asset valuation and a time-efficient sanity check in a transaction process.

Based on a large quantity of publicly available transaction data, and using our industry experience and insights, we calculate representative transaction multiples (EV/MW<sup>2</sup> multiples) for both types of onshore renewable assets across development stages. See figure 3 below for details on the various project development stages.

We review each publicly available transaction with pricing data and make relevant adjustments as appropriate before adding to our dataset. This dataset provides the basis on which we calculate price multiples<sup>3</sup>. Please note that these multiples may not represent the exact prices that transactions have been executed at (only publicly available information has been used, and we have not had access to detailed financials on each transaction), but the multiples illustrate the overall change in market pricing, across time and development stage.

The results in this publication are based on a sample of 439 onshore wind and 349 solar PV transactions from 2005 to 2020. We note that transaction prices depend on a wide variety of factors, such as local weather conditions, operating efficiency, power price agreements, local tax rules, subsidies, financing and other synergies – most of which are country-dependent.

The quality of the analysis is critically dependent on the quality of the underlying dataset. We have only included transactions where the transaction enterprise value (EV), the total capacity of the target's assets and the project stage of each asset have been clearly disclosed and verified.

In the following two sections we present the results of our onshore wind and solar PV transaction analyses. To account for the continued improvements in cost-competitiveness, for solar PV in particular, we perform both a regression on the entire sample and a rolling regression on the 60 most recent transactions.

### Access the full dataset!

Further information on geographical effects and other sub-analyses is available on request (see page 20 for contact details). Full access to our dataset can also be purchased via our website.

<sup>1) &</sup>quot;A Market Approach for Valuing Onshore Wind Farm Assets (2017)" and "A Market Approach for Valuing Solar PV Farm Assets (2018);

<sup>2)</sup> Enterprise value/megawatt of capacity; 3) Specifically, we perform a regression analysis on the pricing data after adjusting for certain variables, such as transaction stake, currency and stage

# **ANALYSIS INTRO**

#### Figure 3: Onshore renewables development stages

Wind/solar PV project development stages			Analysis stages
	<ul> <li>Project rights</li> <li>Geological study</li> <li>Initial wind/solar study</li> <li>Preliminary business case</li> </ul>		
Project development	<ul> <li>Project design</li> <li>Environmental impact study</li> <li>Community engagement</li> <li>Updated business case analysis</li> </ul>	<mark>وَ * * الْمَ</mark> Project developme	
	<ul> <li>Landowner agreements</li> <li>Building application/consent</li> <li>Grid connection/consent</li> <li>Potential consent appeal</li> <li>Updated business case analysis</li> <li>IID5/tender award</li> </ul>		Project development
Maturation	<ul> <li>Detailed wind/solar study</li> <li>Detailed design</li> <li>Procurement and reservation contracts</li> <li>Updated business case analysis</li> <li>Final consent</li> <li>FID6</li> </ul>		
Construction	<ul> <li>Construction</li> <li>Commissioning</li> <li>Updated business case analysis</li> <li>COD7</li> </ul>		Construction
Installed	<ul> <li>Construction</li> <li>Commissioning</li> <li>Updated business case analysis</li> <li>COD7</li> </ul>		Installed

4) Environmental Impact Assessment; 5) Initial Investment Decision; 6) Final Investment Decision; 7) Commissioning Date

## **ANALYSIS WIND**

# Onshore wind farm transactions

The cost per MW of onshore wind power has been steady since 2015 with an increasing uniformity in our dataset

ur analysis of 439 onshore wind farm transactions finds that the EV/MW multiples for development stage, under construction and installed capacity are EUR 0.2m, EUR 0.9m and EUR 1.6m, respectively. They are illustrated in figure 4 with 95% confidence intervals.

# Onshore wind transaction multiples (EV/MW)

×.	Development projects	<b>0.2m</b> EUR
	Under construction	<mark>0.9m</mark> EUR
	Installed projects	<b>1.6m</b> EUR

Figure 4: Illustrative lifecycle/value creation for onshore wind farm assets



European transactions make up by far the largest share of the sample with 276 transactions (63% of the dataset), and it appears that European onshore wind assets trade at a minor premium compared to the rest of the world.

Similarly, onshore wind assets in Australia & New Zealand trade at a premium, while Asia, North America and Central & South America trade at a discount<sup>1</sup>.

1) The results for North America and Central & South America are not statistically significant

## **ANALYSIS WIND**



Figure 5: Enterprise value per installed MW, EURm

A rolling regression based on the 60 most recent transactions (figure 5) shows that installed capacity multiples have been stable during the entire period analysed. In the sample, volatility has decreased, and results have become slightly more significant, suggesting more uniformity in pricing. This development is consistent with the stable development in LCOE shown on page 9.

#### **Concluding remarks**

Cost declines, improved yield and the emergence of subsidy-free renewable projects do not seem to have had a noticeable impact on the price per MW of onshore wind power. Since 2015, the price has remained steady and become increasingly uniform across our sample. The following years will show whether the challenge of increased market volatility will affect the business case for onshore wind power.



## **ANALYSIS SOLAR**

# Solar PV transactions

Despite decreasing solar PV panel prices, our EV/MW estimates have increased. The reasons are an increasing number of brownfield transactions and geographical shifts in the data.

ur analysis of solar PV assets results in EV/MW multiple estimates for development stage, under construction and installed capacity of EUR 0.04m, EUR 0.2m and EUR 1.8m, respectively.

These estimates are based on the full sample representing transactions from 2005 to 2020. If we look at a rolling average of the past 60 transactions (figure 7), there has been an increase in the price multiples for installed and under construction solar PV assets since 2015.

# Solar PV transaction multiples (EV/MW)

°××°	Development projects	0.04m EUR
	Under construction	<mark>0.2m</mark> EUR
	Installed projects	<b>1.8m</b> EUR

#### Figure 6: Illustrative lifecycle/value creation for solar PV assets



The increase seems counter-intuitive considering the significant decrease in LCOE in the same period. We believe the increase can be explained by three factors.

Firstly, European and especially Southern European solar PV farms trade at a premium compared to the rest of the world. European transactions make up almost 50% of newly added transactions, and the data shows that the European premium has increased significantly since our latest analysis.

### **ANALYSIS SOLAR**



Figure 7: Enterprise value per installed MW, EURm

Secondly, the average age of installed capacity in the sample has increased. This suggests that the sample includes more brownfield projects, which may realise higher prices due to proven financials and more favourable subsidy schemes. As the expected lifetime of solar PV assets has been increasing in recent years, the valuation of these assets may not be affected by an assumption of a shorter remaining lifetime compared to when they were first transacted.

Finally, solar PV transactions in Asia were previously subject to a discount compared to the rest of the world. The most recent data shows that this discount is diminishing. A rolling regression based on the 60 most recent observations shows that installed capacity multiples have remained at a level of around EUR 1.7m since 2017. Incidentally, this result is quite close to the regression results from the full sample.

#### **Concluding remarks**

As the LCOE of solar PV assets continue to decline towards onshore wind assets, we expect to see installed solar PV multiples converge towards multiples on installed onshore wind. We even expect a future where solar PV is cheaper than onshore wind.



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