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2.7GW

Capacity of commissioned co-located wind and solar projects, globally

61%

Average modelled size of solar as percentage of wind to maximize NPV

2.9GW

Pipeline of co-located wind and solar projects set to come online by 2022, globally

Cecilia L'Ecluse

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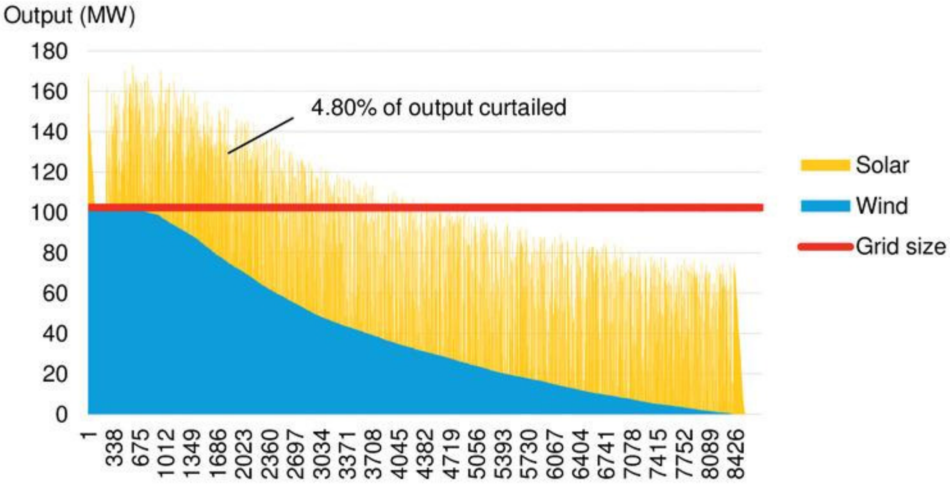
Co-located Wind and Solar: Using a Grid Connection Better

Co-locating wind and solar can bring a number of benefits over single-technology projects. By sharing the grid connection and other costs, adding PV to wind farms can increase projects' net present value. As wind and solar generation profiles are complementary, adding solar to an existing grid connection results in little curtailment, firmer output and less stress on weak grids – and allows asset owners to negotiate better PPAs.

- We used the *Co-located Wind & Solar Model* (web | terminal) to model complementarity, curtailment, grid usage, as well as the economics of hypothetical projects on selected sites in the U.S., Germany and Australia. We also interviewed developers and turbine manufacturers about the key drivers of co-located solar and wind farms.
- The opportunity to share grid connection costs is a key driver for pairing wind and solar. In countries with weak grids, the efficient use of existing transmission infrastructure can avoid the tortuous process of securing a separate connection agreement.
- Curtailment is not as bad as one might think: in sunny Australia a solar plant can be sized up to 80% of an existing wind farm, without increasing the size of the grid connection, and still stay below 5% curtailment, due to the complementary nature of wind and solar (Figure 1).
- Wind farms tend to be located on agricultural land, which presents a hurdle to retrofitting them with solar. Many wind farms also have a particular form of regulated policy support (a feed-in tariff, tax credit or other) which would be voided by adding solar.
- Specific policy can help countries take advantage of the technical benefits of co-location. India's government has already held one auction, which awarded two projects totaling 840MW, and plans five more tenders totaling an estimated 2.3GW.

Figure 1: Hourly wind and solar output Hornsdale, Australia, 102MW wind, 83MW PV



Source: BloombergNEF. Note: Chart shows a full year of modelled hourly wind and solar generation (8760 hours), ordered from highest to lowest wind generation.

1. The case for co-locating wind and solar

1.1. AC/DC? Project design options and their cost benefits

Co-located wind and solar project developers either retrofit PV to an existing wind farm, or build a new project that combines both technologies (greenfield).

One of the main benefits of pairing wind and solar is to reduce capex by sharing balance of plant costs, especially the grid connection and electrical infrastructure, which results in substantial savings compared to two separate greenfield projects. Some development costs such as permitting, land lease and some non-skilled O&M labor costs can be shared.

Figure 2: Vattenfall's wind and solar co-located Parc Cynog

Source: Vattenfall

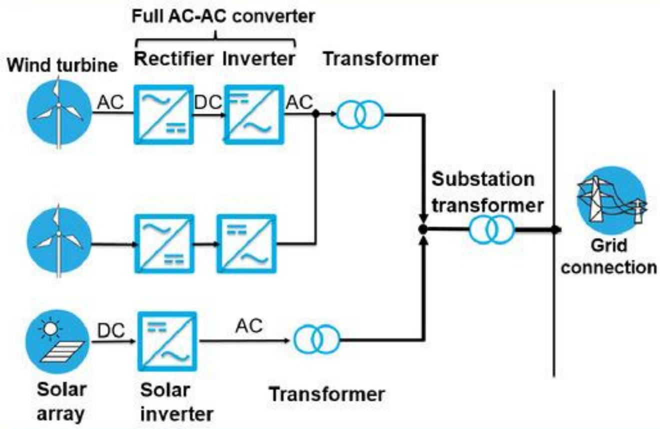
Grid infrastructure and connection agreement

Wind and solar farms both use inverters. Wind turbines produce electricity as alternating current (AC), while PV modules produce electricity as direct current (DC). A typical wind turbine converts the AC to DC through a rectifier and then converts the DC back into AC through an inverter at the correct frequency and voltage to be exported to the grid[1]. A solar farm coverts DC into AC through an inverter as well. The electricity generated from wind and solar can therefore either be AC-coupled or DC-coupled.

Both methods allow the technologies to share a substation and the wires transporting electricity to the point of interconnection with the grid. Capex savings are higher for DC-coupled projects as they also share some power electronics (e.g. a dedicated solar inverter is not required).

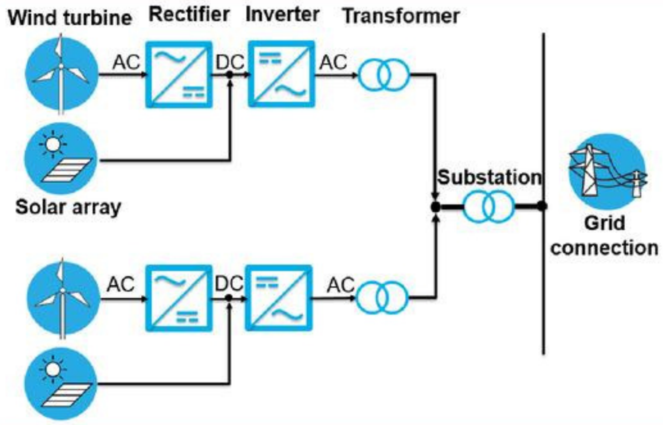
To date, all utility-scale projects we track are AC-coupled, as DC coupling is technically much more complex. Currently, the only DC-coupled projects are demonstrators: GE and Vestas have adapted turbines to integrate co-located solar arrays and have small-scale projects in the U.S. and Spain, respectively.

Table 1: Co-located wind-plus-solar configurations

Configuration	Characteristics
Type 1: AC-coupled wind-plus-solar	
 	**How it works:** Electricity is integrated as AC after output from each technology has passed through its own inverter. Electricity is then exported through a shared substation to the grid. **Shared electrical infrastructure:** Substation, transmission lines and grid interconnection **Project example:** The 175MW Goldwind White Rock Wind Farm Phase I (web | terminal) was commissioned in Australia at the end of 2017. The 23.5MW Goldwind White Rock PV Plant (web | terminal) was built at the same site and commissioned in 2H 2018. The technologies share grid infrastructure and access tracks.

[1] Older models of wind turbine were fixed-speed: the rotor could only operate at one speed, unable to change depending on the wind conditions to maximize efficiency. The rotor speed of modern, variable-speed wind turbines can be changed, meaning maximum efficiency is possible at a range of wind speeds. However, the voltage and frequency of the generated electricity can also fluctuate. Power conversion equipment (AC-DC-AC converter) is needed to ensure that the voltage supplied to the grid is the correct frequency.

Type 2: DC-coupled wind-plus-solar



How it works: The converter inside the wind turbine is adapted to combine DC power sources. Wind generation passes through the rectifier, at which point the solar generation is integrated. The technologies share a common inverter as well as the grid connection infrastructure.

Shared electrical infrastructure: Power electronics (inverter, transformer, project substation, transmission lines and grid interconnection)

Project example: The 3MW Janda III Hybrid Wind Farm (web | terminal) was commissioned in Spain in March 2018. The project has one Vestas V112 112m 3.00MW turbine. The modified turbine converter integrates a 372kW solar PV system as direct current. Vestas also upgraded the turbine's controllers and other hardware.

Source: BloombergNEF

In Australia, the U.K. and the U.S., developers must also pay for grid reinforcement costs incurred as a result of connecting their project to the network. The impact on the grid of a project with a firmer output is likely to be lower (and the generation easier to integrate) than that of a single-technology project, and any costs that are incurred could be shared.

Other costs

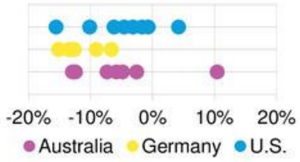
Development costs: various development costs can be shared between the two technologies. When retrofitting PV to an existing wind project, the project owners will have already carried out site-specific studies (eg, environmental impact assessments, geotechnical studies) and can leverage other existing knowledge of the site. When building greenfield, the costs can be shared between the two technologies.

Securing access to land can be a significant expense in some countries. It may require less negotiation to adjust existing agreements on use with landowners to add a solar farm to an existing wind farm than to a greenfield site. In some cases, existing land agreements may not be suitable for renegotiation. For example, in India, while wind farms can span large areas, developers often only have access to small parcels of land around each turbine, meaning a completely new agreement is needed to add solar arrays.

Operation and maintenance costs: several interviewees highlighted that it is also possible to make limited savings on operational costs on co-located wind-solar projects. While wind asset management usually requires dedicated maintenance equipment and a team onsite, much of solar maintenance is less specialized (eg, panel cleaning and security). Opex can be reduced if existing wind staff can be trained to carry out these tasks, with solar maintenance crews only dispatched for the upkeep of specialized equipment.

1.2. Key for co-location: wind and solar generation complementarity

Figure 3: Correlation between wind and solar generation on selected sample sites



Source: BloombergNEF. Note: Correlation as calculated in the Co-located Wind & Solar Model. Negative correlation implies resource complementarity.

Intraday and seasonal complementarity

The complementarity of solar and wind resources is key for the co-location business case. Dan Juhl, CEO of Juhl Energy, which has developed several DC-co-located plants in Minnesota, U.S. explains that “In the mid-west of the U.S., co-location works particularly well. Solar firms up the wind: wind contributes to the winter demand peak, and PV to the summer demand peak.”

Co-located Wind & Solar Model

The *Co-located Wind & Solar Model* (web | terminal) finds the optimal amount of solar capacity to add to a wind farm to maximize the combined project’s net present value (NPV). The model also shows total curtailment and grid usage for the optimal wind and solar capacities, as well as solar-wind correlation for the resources onsite.

We modelled several hypothetical co-located sites, by adding solar to an existing wind farm – five sites in Germany, six in the U.S and six in Australia.

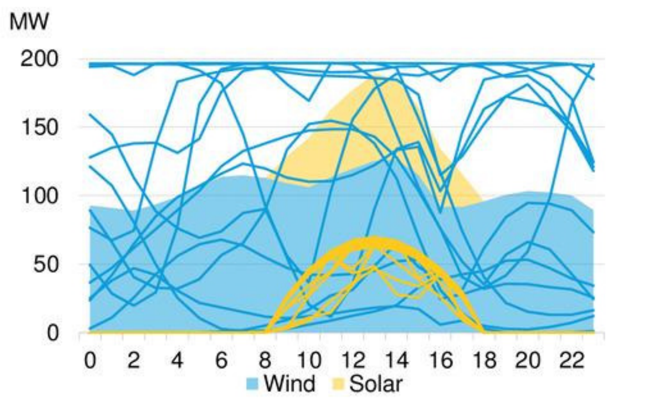
The graphs below reflect optimal wind and solar capacity (i.e. maximized NPV) according to our model.

Details about the methodology behind this model can be found in Appendix A. The model inputs and modelling results for different sites can be found in Appendix B and Appendix C respectively.

On almost all sites we explored in the U.S., Australia and Germany, we observed a negative correlation (meaning higher complementarity) between wind and solar generation (Figure 3). However, correlation is very location-specific due to local nature of the wind resource. For example, in Victoria, Australia, we found negative correlations ranging from -2.25% to -12.82%. An overview of all the modelled sites with their respective correlations can be found in Appendix C.

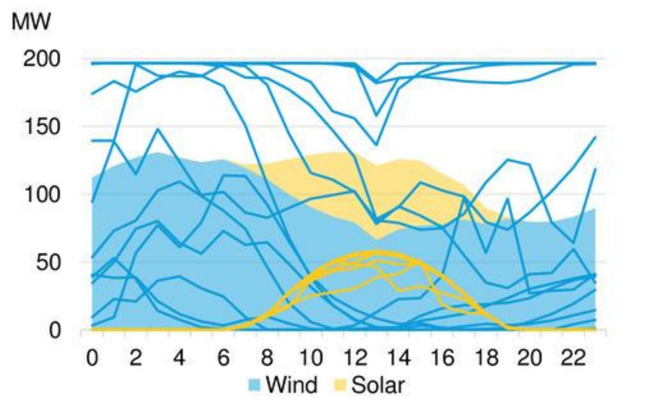
Complementarity can be intraday, seasonal, or both. For example, at the modelled Bearkat wind farm in Texas, U.S, wind generation tends to be strong in the early morning and then dips around noon, when solar generation takes over. We modelled this 196.7MW wind farm with 78.2MW of solar, the NPV-maximising amount suggested by the analysis results in Appendix C. Total solar and wind output is not much different in January and July (Figure 4 and 5): wind and solar output on an average January day is 2786MWh and 399MWh respectively, in July it is 2540MWh and 390MWh respectively. Solar complements the noon dip in wind production, especially in summer.

Figure 4: Daily and average wind and solar output during January 1-14, 2014, on Bearkat wind farm site, Texas, U.S.



Source: BloombergNEF. Note: profile shows 78.2MW of PV and 196.7MW of wind capacity. Solid block is average, lines are individual days.

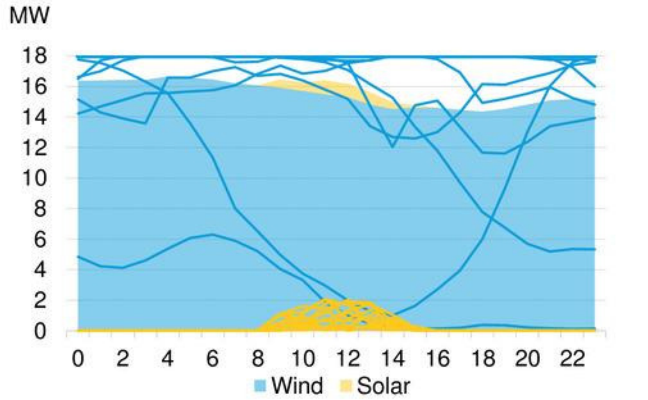
Figure 5: Daily and average wind and solar output during July 1-14, 2014, on Bearkat wind farm site, Texas, U.S.



Source: BloombergNEF. Note: profile shows 78.2MW of PV and 196.7MW of wind capacity. Solid block is average, lines are individual days.

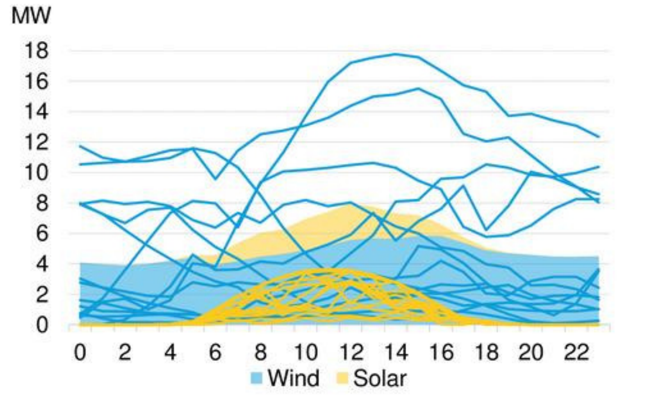
In Germany, complementarity is seasonal rather than daily. We modelled the 18MW Briloner Hochflaeche wind farm with 4.66MW of solar, the NPV-maximising amount suggested by the analysis results in Appendix C. On an average January day, wind output was 129MWh and often blows strongly all day (Figure 6), while on an average July day it is only 93MWh. On average, solar generates just 6.7MWh per day in January, but 30MWh in July (Figure 6 and 7).

Figure 6: Daily and average wind and solar output during January 1-14, 2014, in Brilon, Germany



Source: BloombergNEF. Note: profile shows 7.76MW of PV and 18MW of wind capacity. Solid block is average, lines are individual days.

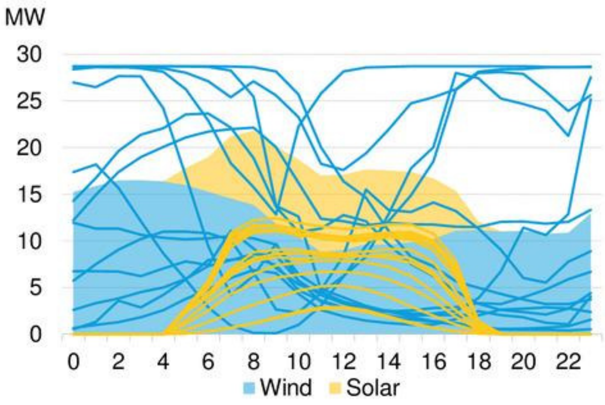
Figure 7: Daily and average wind and solar output during July 1-14, 2014, in Brilon, Germany



Source: BloombergNEF. Note: profile shows 7.76MW of PV and 18MW of wind capacity. Solid block is average, lines are individual days.

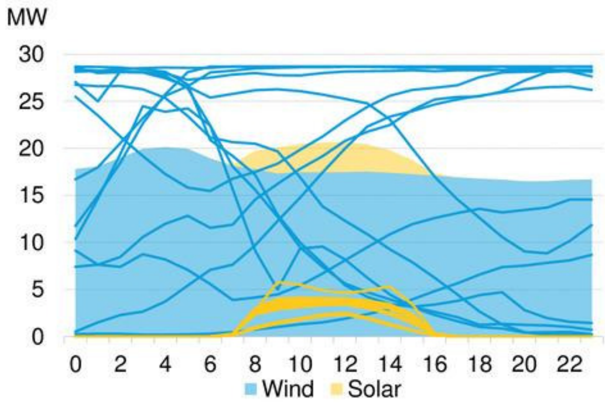
In Victoria, Australia we see a combination of intraday and seasonal complementarity. We modelled the 28.7MW Pacific Hydro Yaloak South wind farm with 13.28MW of solar (Figure 7 and 8). In January, Australia's summer, we see a reduced wind output compared to Australia's winter (303MWh vs 442MWh on average days), as well as a pronounced dip in wind generation in the middle of the day, at which point solar generation increases.

Figure 8: Daily and average wind and solar output during January 1-14, 2015, on Yaloak wind farm site, Victoria, Australia



Source: BloombergNEF. Note: profile shows 13.28MW of PV and 28.7MW of wind capacity. Solid block is average, lines are individual days.

Figure 9: Daily and average Wind and solar output during July 1-14, 2015, on Yaloak wind farm site, Victoria, Australia



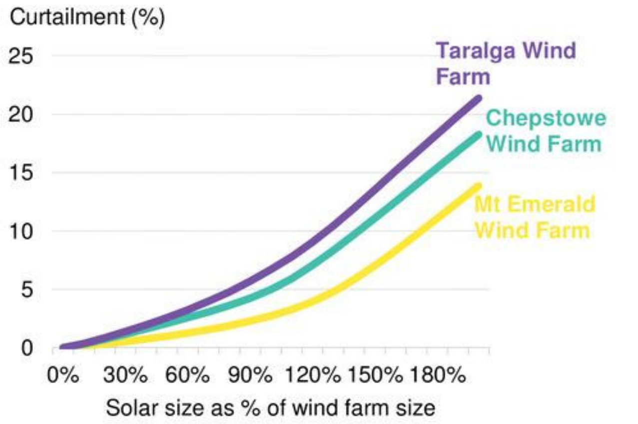
Source: BloombergNEF. Note: profile shows 13.28MW of PV and 28.7MW of wind capacity. Solid block is average, lines are individual days.

An undersized grid connection does not necessarily lead to high curtailment

Retrofitting an existing wind farm with solar, using the existing grid connection, means that nameplate capacity will exceed the grid connection. Generation will need to be curtailed when both technologies are producing at maximum output at the same time. However, our modelling of hour-by-hour conditions showed less curtailment than expected.

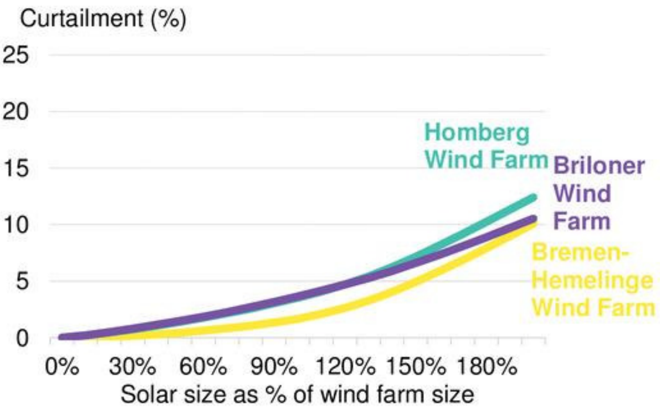
How much is curtailed depends on the site's solar and wind resources and on their correlation. Figures 10 and 11 show curtailment for wind farms with different wind capacity factors as a function of solar capacity, in Germany and Australia. Higher wind and solar capacity factors, and larger projects, mean more curtailment. However, in Australia the model suggests we can add a solar farm up to 70% of the existing wind farm capacity and still stay well below 5% curtailment of the total combined output, even with high wind resources. In Germany, which is much less sunny, sizing a solar farm up to 100% of the size of the wind farm capacity still leads to modelled curtailment below 5%.

Figure 10: Australia curtailment of total combined output



Source: BloombergNEF. Note: Solar capacity factor is 20.85%.

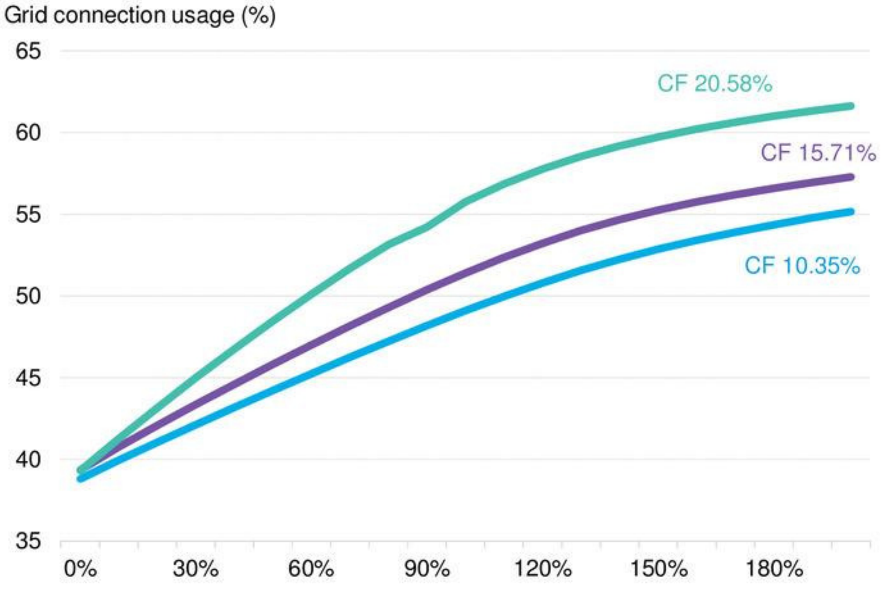
Figure 11: Germany curtailment of total combined output



Source: BloombergNEF. Note: Solar capacity factor is 12.09%

As curtailment levels are relatively low, adding solar to an existing wind farm can substantially increase the grid connection usage of the project. However, it is not possible to get grid utilization close to 100% by combining wind and solar. Even when adding a substantial amount of solar, up to 200% of the existing wind capacity, grid usage still plateaus at around 60% (Figure 12).

Figure 12: Grid connection usage by solar size as a ratio of wind size, for different solar capacity factors



Source: BloombergNEF. Note: wind capacity factor equals 39%.

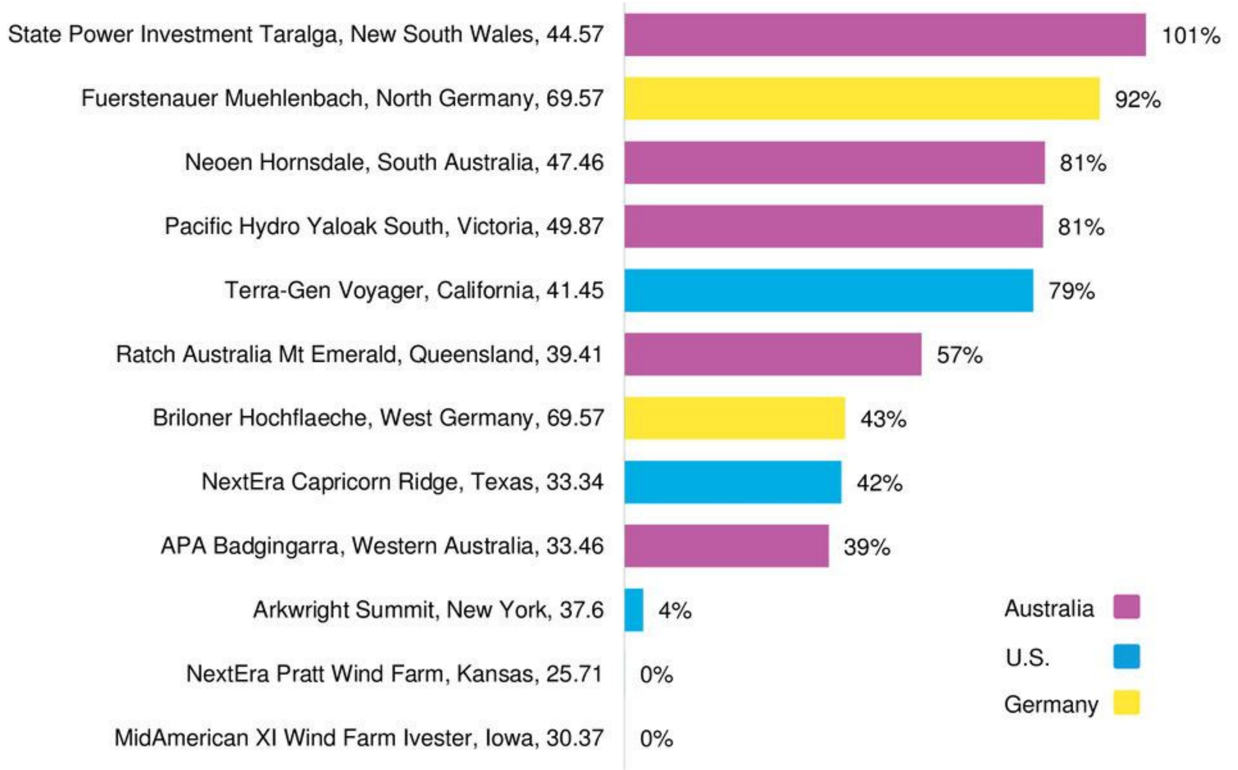
1.3. Increasing the value of wind assets by retrofitting solar

The following factors are critical in determining whether retrofitting a wind farm with solar makes economic sense:

- **Shared grid costs**: the higher the local grid connection cost, the more is saved by using the existing wind farm's connection. This is especially important in regions where developers have to pay for their own grid connection.
- **Capex**: the cheaper solar is, the more attractive oversizing becomes (in this calculation, wind is a sunk cost).
- **Tariff**: we assume one tariff for both solar and wind production. The higher the tariff, the more attractive oversizing becomes if the limitation is the grid connection (at low tariffs the model obviously suggests not building anything). For Australia and the U.S. we assume the average wholesale electricity price in the location of the wind farm. For Germany, we assume the average tariff awarded in the most recent wind auction in February 2019: 61.10 euro/MWh ($69.57 /MWh). These tariffs are quite high, but the firmer output provided by combined wind and solar generation has allowed developers to negotiate better terms on a PPA or secure other benefits in some markets. For example, Juhl Energy was able to secure a higher PPA price for its project in Minnesota by providing a more consistent output to the distribution network close to load centers.
- **Weak grids**: pairing wind and solar can be even more attractive in countries and regions with weak grids. In India, for example, the lack of sufficient transmission capacity is one of the major reasons for project delays, adding significant costs. Co-located projects can maximize grid usage for the existing infrastructure.

Figure 13 shows the model results.

Figure 13: Optimal solar capacity as a percentage of wind, tariff assumption in $/MWh



Source: BloombergNEF. Note: Optimal means maximized NPV

Australia is the most attractive market for retrofitting existing wind farms with solar according to the model. This is due to the combination of very good solar resources and high wholesale electricity prices / tariffs compared to the U.S. Grid costs are also high compared with the U.S. and Germany.

Germany comes second, mainly because of high tariffs. The auctions of February 2019 awarded on average tariffs of 48 euro ($55)/MWh) for solar and 61.1 euros ($68)/MWh for wind. Even assuming the lower solar tariff, adding solar to an existing windfarm increases the NPV substantially.

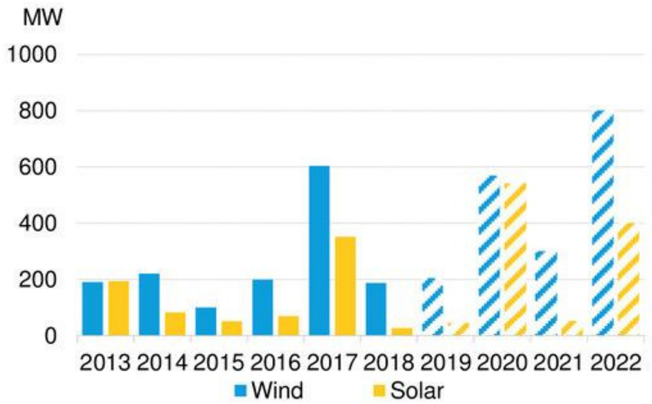
The U.S. is a mixed story. In Texas, projects increase their NPV mainly because of good solar resources and in California because of the high wholesale electricity prices. In other U.S. regions we did not find that retrofitting solar could increase wind projects' NPV.

2. Co-location in practice

2.1. Current market size

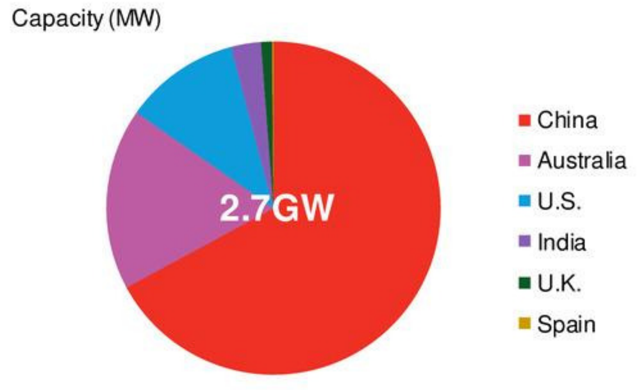
BloombergNEF's project database currently tracks 2.7GW of commissioned co-located wind and solar projects across six countries (see attached Excel). China accounts for two thirds of this capacity and is the only market with more than 1GW installed. The average solar capacity as a percentage of wind capacity for Chinese projects was relatively high: 81%.

Figure 14: Commissioned co-located wind and solar projects and short-term forecast



Source: BloombergNEF. Note: for India auction capacity (due to come online in 2020), a 50:50 split is assumed between wind and solar.

Figure 15: Commissioned wind-plus-solar projects by country



Source: BloombergNEF. Note: chart shows cumulative project capacity (wind and solar combined)

Australia leads the global market outside of China, with a commissioned capacity of 480MW. At 18%, the average solar capacity as a percentage of wind is much lower than in China. This is in contrast to the modelling results above, finding maximum NPV at relatively high levels of solar capacity. This may be due to other barriers, such as difficulties in (re)negotiating land-use agreements. The commissioned wind projects in Australia average 106MW, and a large solar array requires much more space than a large wind farm (land around turbines can also be used for other purposes, eg, agricultural). There are also two greenfield projects under construction in Australia totaling 209MW (176MW wind, 33MW solar) and two permitted projects, including the 1.2GW (800MW wind, up to 400MW solar) Clarke Creek project in Queensland.

2.2. Policy

Success for Indian policies could provide a blueprint for other markets and regions, especially those with weaker grids

Dedicated incentives for co-located wind and solar projects can promote development. So far, India is leading the way. The country has issued a 'National Wind-Solar Hybrid' policy and conducted the world's first auction for large-scale co-located wind and solar projects in December 2018. SB Energy (SoftBank Group) won 450MW and Adani Green Energy won 390MW. The as-yet-unnamed projects are expected to come online by June 2020. A further 1.2GW central government tender is planned later in 2019. See *World's First Wind-Solar Hybrid Auction Whets Appetite* (web | terminal).

State governments in India have also announced co-located wind and solar auctions and policies. The Maharashtra government is planning a tender for developers to add solar arrays to existing wind farms. Meanwhile, the state government of Andhra Pradesh included a provision for 'Round The Clock' projects in its Wind-Solar Hybrid policy document. Co-located projects that pair with on-site batteries or other forms of generation to provide flexible power will receive priority offtake.

The policies in India could serve as a blueprint for other markets if they are successful in encouraging new-build and the retrofit of existing wind projects. This matters especially for weaker grids, where the efficient use of existing electrical infrastructure is even more important.

Existing regulations can also prove a hurdle. In Germany, asset owners will not give up the generous historical tariffs to be able to retrofit their wind farms with solar.

However, existing regulations can also prove a hurdle for the development of co-located projects. The need to renegotiate existing tariffs and subsidies can be a key barrier for retrofit projects. For example, in Germany, wind farm owners will be reluctant to give up the generous historical feed-in tariffs for which older projects are eligible and interrupt long-term O&M contracts. Given the current auction mechanisms, there is very little chance developers will be able to negotiate a mixed wind-solar tariff. Adding solar on a different, lower tariff might work in future but would need to be clearly permitted and metered, so as not to invalidate the wind tariff.

The U.S. provides another example of an existing subsidy scheme preventing development of co-located wind-solar projects. If asset owners claim the production tax credit (PTC) for greenfield projects, they cannot also claim the investment tax credit (ITC) on the equipment shared by the two technologies. The investment tax credit is a key source of revenue for new solar projects in the U.S, and being unable to claim the benefit on the grid infrastructure could be a drawback to co-location in the country.

Table 2: Co-located wind-solar project pipeline, global

Status	Wind	PV
Financed /under construction	286MW	186MW
Permitted	920MW	450MW
Announced	671MW	119MW

Source: BloombergNEF

2.3. Outlook

Because currently most renewables are built under subsidies and tied to stringent regulations, BNEF believes that the case for co-located wind and solar will be better in a post-subsidy world. We see the most potential in Australia, India and Brazil. Table 3 shows the main opportunities and challenges in key markets and how they could impact development in the short term.

Table 3: Main challenges and opportunities for wind-plus-solar co-location in key markets

Country	Key opportunities/challenges
Australia	• Strong wind and solar resources • Well-documented grid challenges and expensive charges to project developers to upgrade the grid for new projects in congested regions. The opportunity to share these higher costs is even more attractive.
India	• Ambitious country-level renewable energy targets and policies, including dedicated auctions for co-located wind and solar projects • Weak grid encourages efficient utilization of transmission infrastructure, and reduced plant variability reduces costs and helps with grid operation and power system stability
U.S.	• Current ITC and PTC subsidies complicate the economics of retrofitting existing wind farms with solar • NextEra recently announced a co-located wind (web | terminal), solar (web | terminal) and storage project, with a combined capacity of 400MW, showing that developers might start to become interested in co-locating wind, solar and storage
Spain	• Only one demonstrator project so far • Increasing merchant exposure of many solar and wind projects could increase attractiveness of co-location • According to DNV GL, interest from developers is picking up
Germany	• Generous legacy feed-in tariff and an established auction scheme reduce the incentives for developers to find additional sources of revenue for existing assets • The innovation tenders in 2019 could provide a route to market for wind-plus-solar projects
Brazil	• Wind-solar co-located projects are now allowed to bid into the country's renewable energy auction • A weaker grid in Brazil and in other countries across the region could drive interest in wind-solar projects
China	• Although China makes up more than half of commissioned wind-plus-solar projects to date, most are government-supported pilot projects and there is not much interest yet from private developers, who are still figuring out the business case

Source: BloombergNEF

Appendices

Appendix A. Co-located model methodology

The Co-located Wind and Solar (CWSM) Model (web | terminal) is a tool that looks at the economics of combining a wind and solar project at a given location to determine, for example, the optimal size of solar to add to an existing wind installation to maximize NPV, given an existing grid connection and land lease. For a new site, it determines the optimal combined amount of wind and solar capacity. Oversizing (curtailment) is allowed if this favors project NPV.

Wind capacity factors are calculated as follows:

- P50 capacity factors
- 30 year site-specific hourly wind speed data for a specific site (latitude/longitude)
- Uses BNEF Turbine Database to select power curves and calculate hourly capacity factors over a full 'representative' year

Solar capacity factors are calculated as follows:

- P50 capacity factors
- 18 year site-specific hourly global horizontal irradiation data
- Hourly capacity factors calculated for non-tracking panels in 'typical' year

See model user guide for full data methodology.

Appendix B. Co-located model assumptions

Table 4: Model inputs

Variable	Assumption
Capex, opex, financing	Taken from LCOE 2H 2018 wind and solar data
Grid costs	• Fixed cost of $145,850/MW (substation and other shared electrical infrastructure at the project site) • $233,020/km for the transmission line transporting electricity from the project to the point of grid interconnection – Australia: 15km distance to grid – U.S.: 10km distance to grid – Germany: 2km distance to grid
Hourly solar capacity factors	• U.S. and Germany: *Solar Capacity Factor Tool* (web | terminal) • Australia: hourly capacity factors derived from PVWatts. We assume tracking for all projects.
Hourly wind capacity factors	• *Wind Farm Capacity Factor Tool* (web | terminal)
Tariff	• Australia: 2018 average regional wholesale prices, taken from *Australia Power Price Forecast* (web | terminal). Australian power prices range between $33.5/MWh (Western Australia) and $49.9/MWh (Victoria) • U.S.: 2018 average regional wholesale prices, taken from the U.S. Power tool • Germany: results of the latest wind auction (61.1 euros ($68)/MWh for wind)

Source: BloombergNEF

Appendix C. Co-located modelling results

Table 5: Modelling results

Wind farm name	Wind size (MW)	Optimal solar size (MW)	Wind capacity factor	Solar capacity factor	Curtailment (% of MWh)	Grid (% used)	Combined equity IRR	Combined equity NPV (USD)
Germany – hurdle IRR 4% for wind, 5% for solar								
Arzfeld West Wind Farm	10.35	10	41.8%	11.64%	3.7%	51.08%	11.00%	8,302,616
Beckum Wersewind Wind Farm	11.35	14	30.6%	11.14%	2.98%	42.94%	6.24%	2,972,271
Briloner Hochflaeche Wind Farm	18	7.67	47.3%	10.39%	1.23%	51.07%	14.08%	19,030,609
Fuerstenauer Muehlenbach Wind Farm	16.8	15.4	41.9%	11.24%	2.52%	50.89%	11.31%	13,871,526
PNE Gerdau Schwienau Wind Farm Repowered	21.6	25	30.5%	11.40%	3.15%	42.32%	6.40%	5,927,793
Australia – 9% hurdle IRR								
APA Badgingarra Solar Hybrid Wind Farm	130	51.19	31.8%	23.17%	1.79%	40.16%	2.12%	(51,509,703)
Bald Hills Wind Farm	106	54.11	40.2%	17.43%	2.88%	47.59%	11.06%	14,534,189
Neoen Hornsdale Wind Farm Phase I	102.4	83.01	39.3%	20.58%	4.80%	53.31%	10.54%	11,038,733
Pacific Hydro Yaloak South Wind Farm	28.7	23.16	42.2%	18.97%	4.66%	54.82%	11.31%	4,907,726
Ratch Australia Mt Emerald Wind Farm	186.3	106.72	42.6%	21.75%	3.22%	53.24%	8.51%	(5,939,474)
State Power Investment Taralga Wind Farm	106.8	107.4	28.6%	19.20%	3.44%	46.28%	5.76%	(23,989,128)
U.S. – hurdle IRR 9.0% for wind, 7.3% for solar								
Arkwright Summit Wind Farm	78.4	2.82	47.9%	14.15%	0.16%	48.36%	14.94%	29,414,936
MidAmerican XI Wind Farm Ivester Phase VIII	90.8	0	43.4%	15.22%	0.00%	43.42%	9.24%	1,323,764
NextEra Pratt Wind Farm	245	0	54.6%	18.82%	0.00%	54.59%	11.49%	36,967,322
Terra-Gen Voyager II Wind Farm Phase III	21.6	17.03	51.8%	22.25%	10.58%	62.02%	17.69%	13,661,978
NextEra Capricorn Ridge Wind Farm Phase I Repowered	150	62.74	50.6%	19.20%	2.89%	56.90%	14.15%	50,388,075
NextEra Horse Hollow Wind Farm II Repowered	299	83.63	52.42%	19.01%	2.14%	56.50%	15.05%	115,580,395

Source: BloombergNEF

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