

Power market trends and opportunities for solar

Solar Finance & Investment Europe 2018

Stefan Gebski, Baringa Partners

31 January 2018



Introduction to Baringa Partners



Baringa Partners LLP is a market-leading consulting company with a focus on the challenges of tomorrow in energy, telecommunications and financial industries

We help clients using our deep industry insight to:

- ▲ Run more effective businesses
- ▲ Launch new businesses and reach new markets
- ▲ Understand and navigate industry change.



We don't want to be the biggest... Baringa was founded in 2000 and now has:

600 Employees

55 Partners

5 Offices worldwide



UK, Germany, Ireland, UAE and USA

Our reputation is hard won and we're determined to keep it growing.



Energy, utilities & environment	
Company	Stars
Baringa Partners	★★★★★
McKinsey & Company	★★★★★
Accenture	★★★★★
Atkins	★★★★★
BCG - The Boston Consulting Group	★★★★★

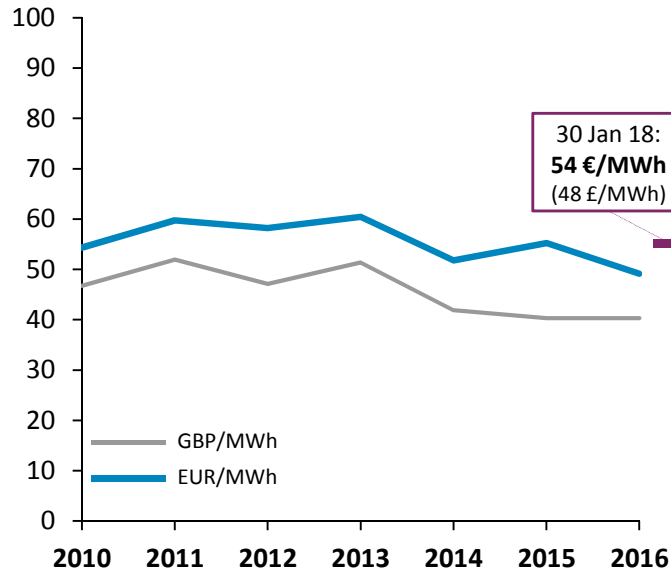
Power market trends and opportunities for solar

- ▲ Outlook for power prices in Europe
- ▲ Routes to market for generators
- ▲ Subsidy trends in Europe
- ▲ Opportunities with corporate customers
- ▲ Emerging opportunities

Will power prices rebound?

Historical Day-Ahead wholesale power prices in selected European markets

GB (£/MWh)

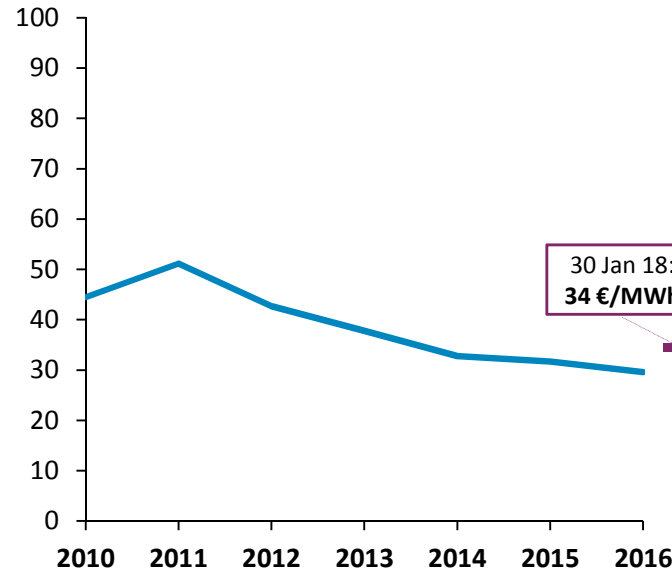


- ▲ Falling wholesale prices, broadly stabilising in recent years at c.45 £/MWh, although have recovered more recently

▲ Key drivers going forwards:

- Recovery in gas prices
- Coal closures
- Rising carbon prices
- Scarcity pricing
- Rising renewables output

Germany (€/MWh)

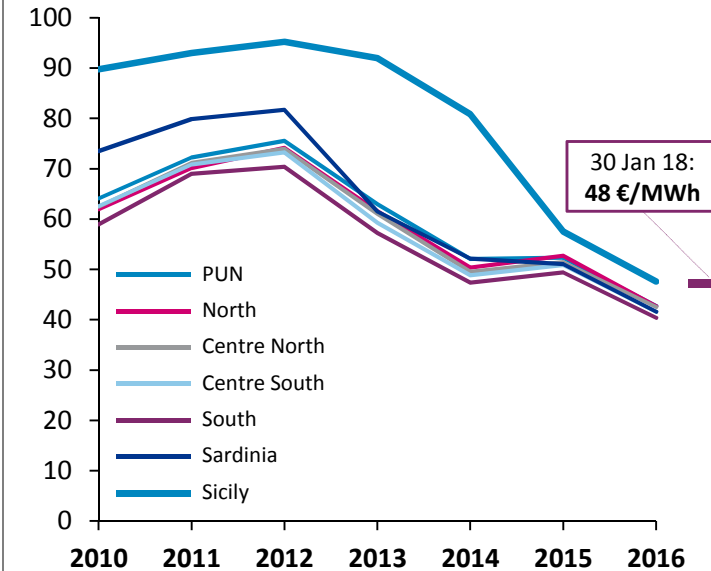


- ▲ Wholesale prices have fallen with lower commodity prices and rising renewables output
- ▲ Instances of negative prices in day-ahead

▲ Key drivers going forwards:

- Recovery in gas prices
- Nuclear phase-out
- Coal reduction
- Rising carbon prices
- Rising renewables output

Italy (€/MWh)

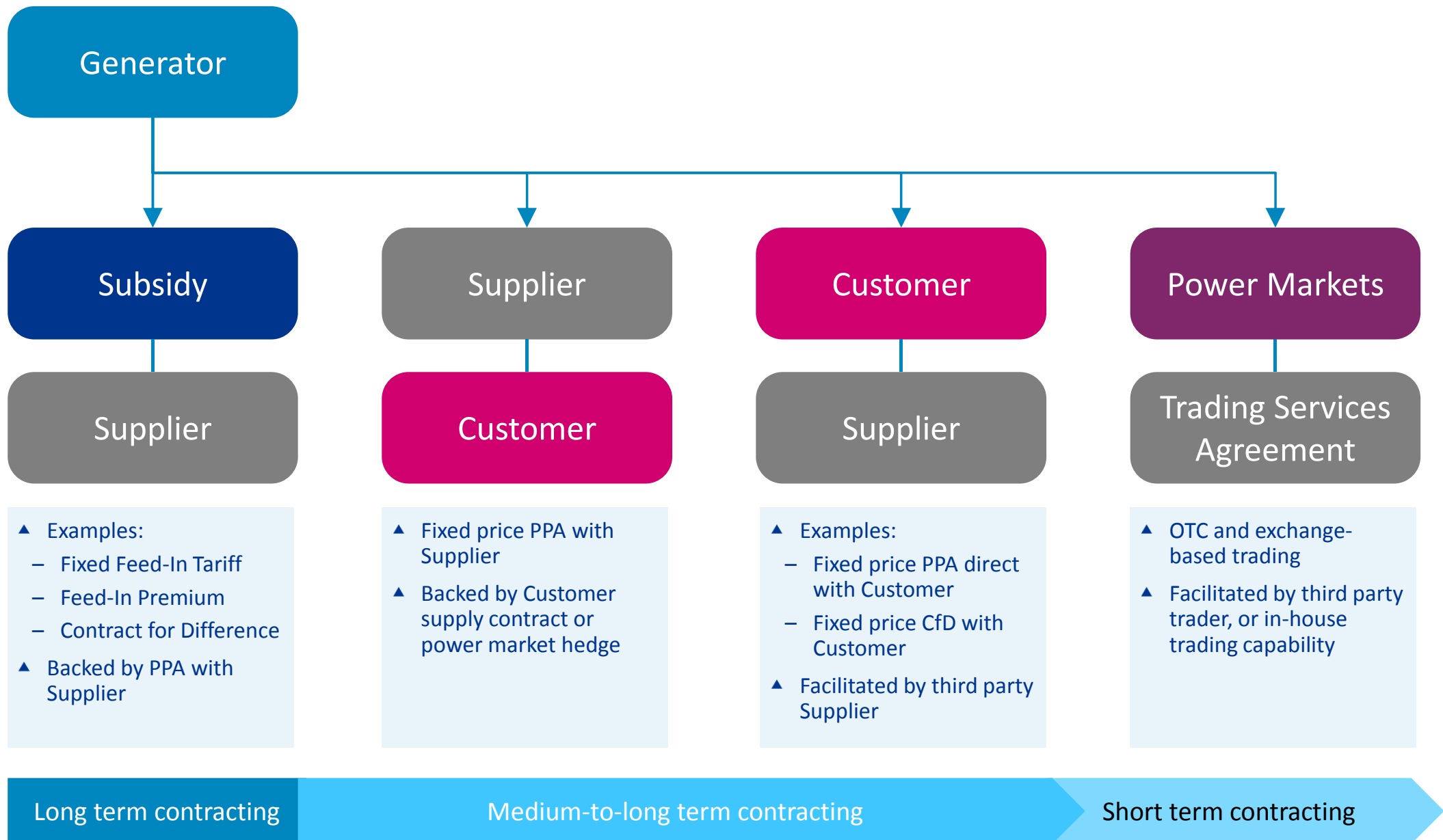


- ▲ Six pricing zones, highest prices in Sicily
- ▲ Zonal prices have fallen, and converged, with greater renewables penetration

▲ Key drivers going forwards:

- Recovery in gas prices
- Rising carbon prices
- Rising renewables output

A range of routes to market are emerging

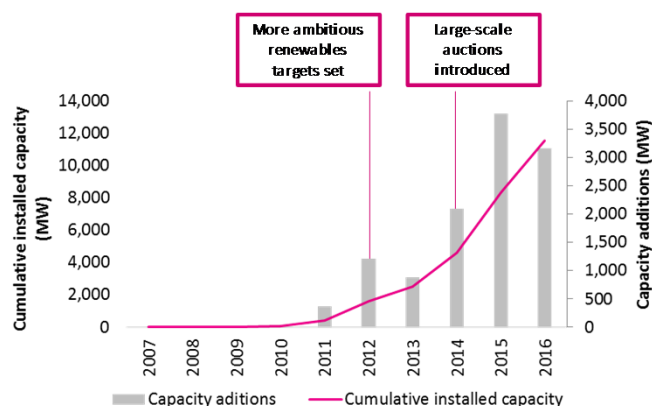


Access to subsidy is becoming more restrictive and allocation is increasingly competitive

GB



Historical solar roll-out

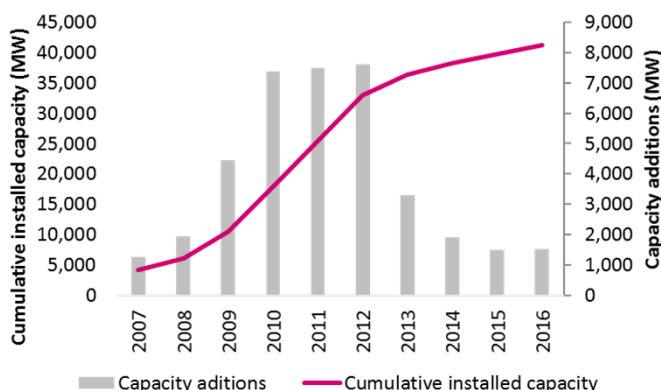


- ▲ Many of the active solar farms receive either RO, Feed-in Tariff or CfD
- ▲ Closure of the RO scheme to solar in 2016 and no further announcements for future solar CfD auctions,
- ▲ Only remaining subsidy scheme is the Feed-in Tariff for solar project <5 MW
- ▲ Indicated in Nov 2017 Budget that there will be no further subsidies for mature technologies (inc. solar) for next 8 years
- ▲ However, first merchant solar farm project was completed this year with a capacity of 10 MW

Germany



Historical solar roll-out

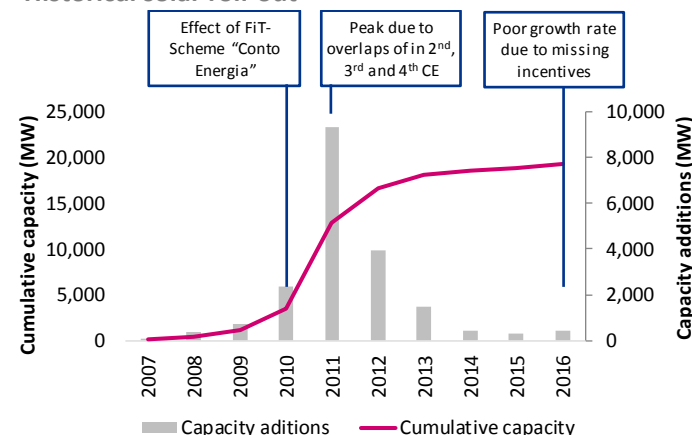


- ▲ Introduction of auction scheme for large scale RES (solar, wind and biomass within the EEG 2014 and 2017) after years of low install rates
- ▲ Since the first auction in 2015 c.1.5 GW has been awarded
- ▲ But competition is rising with average remuneration fees falling from 9.17 ct/kWh to 4.91 ct/kWh
- ▲ Auctions set to continue in 2018, starting with 200MW solar tender in Feb and 200MW mixed wind/solar tender in April

Italy



Historical solar roll-out

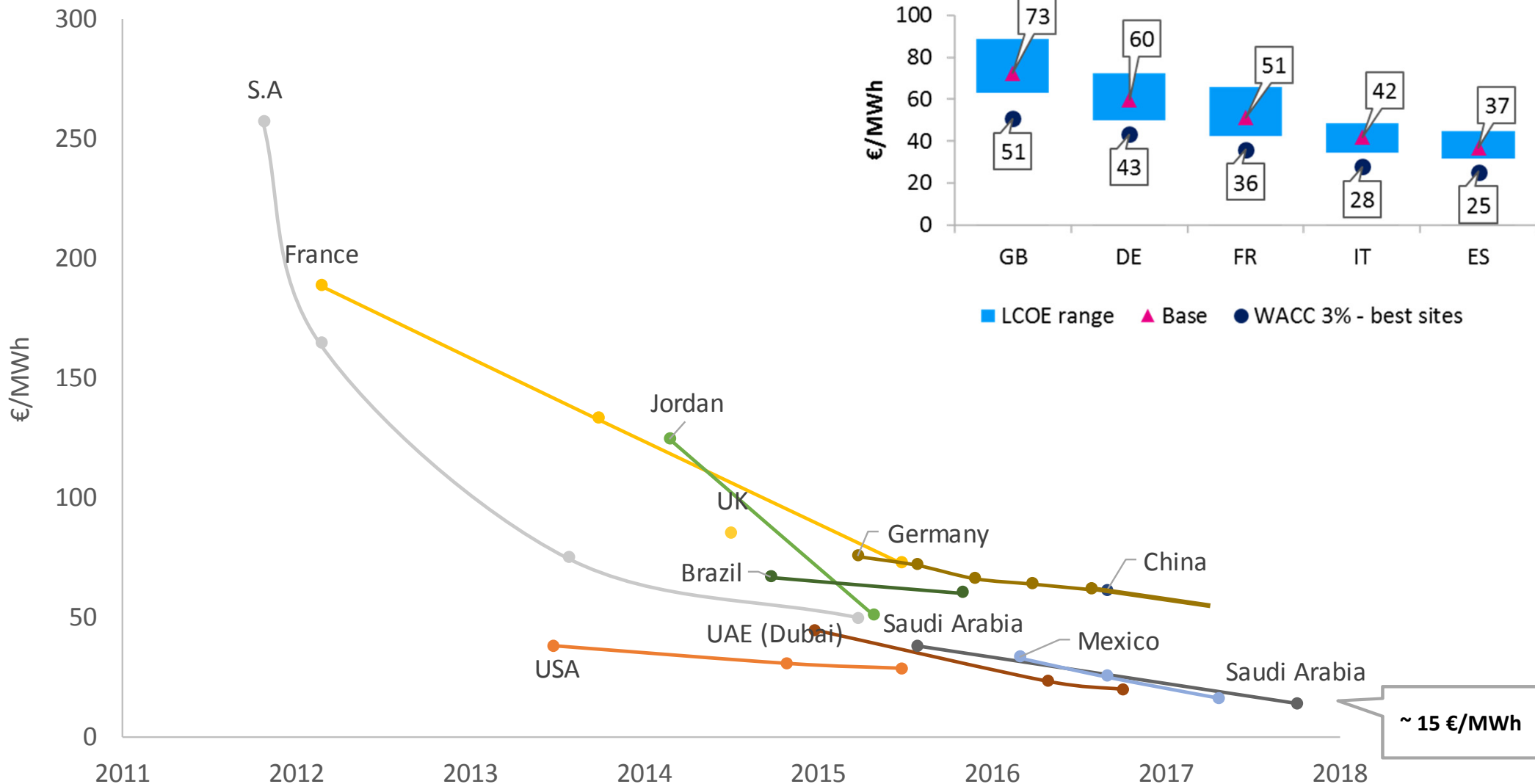


- ▲ Termination of "Conto Energia" solar subsidy scheme in 2013
- ▲ Two new support schemes ("scambio sul posto" and "ritiro dedicato") were introduced to incentivise PV installations but on a less attractive level
- ▲ Since 2014 the average growth rate was at 300-400 MW

Solar delivered energy costs continue to fall as a result, now broadly on par with brown power



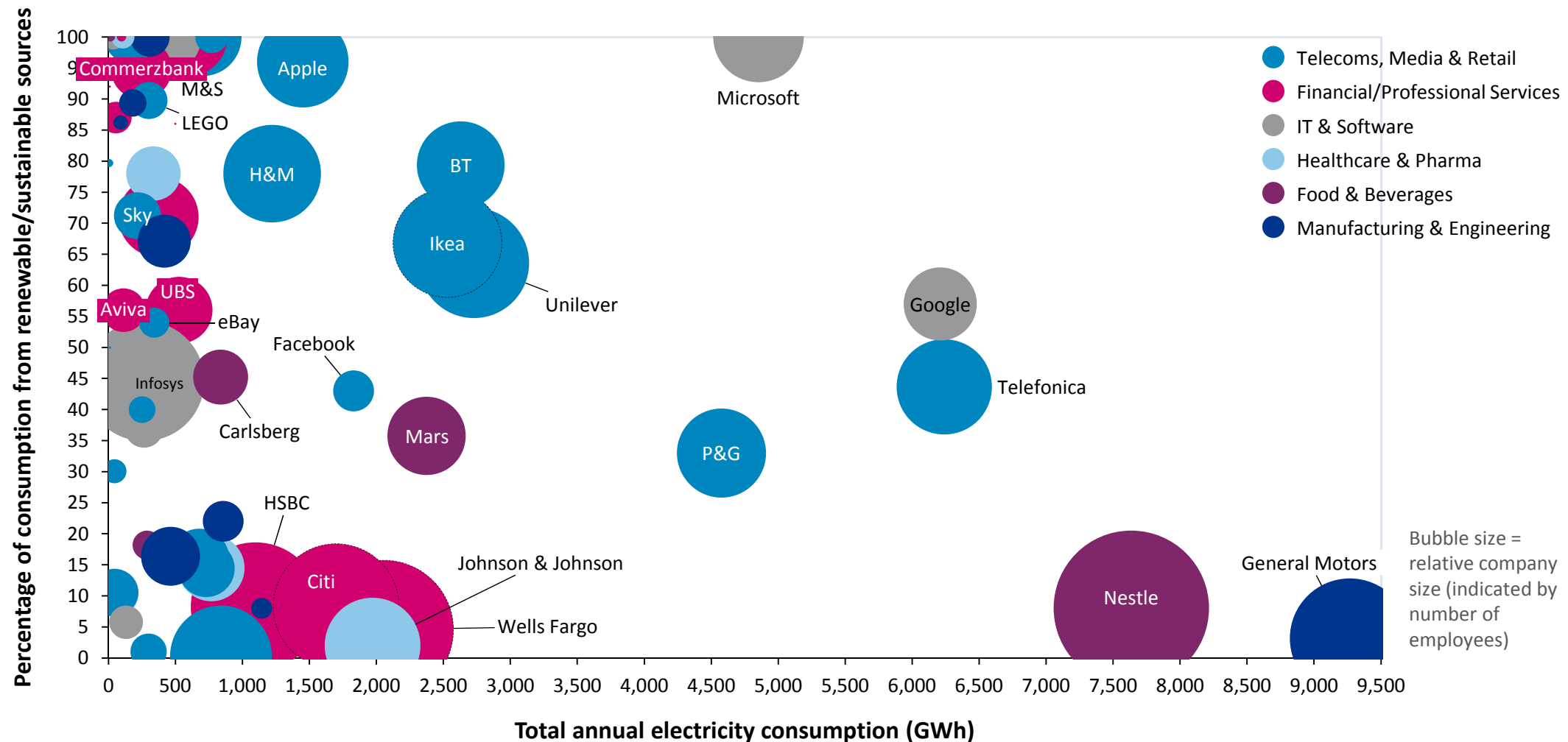
Average solar PV auction out-turn prices, 2011-2018



There is significant and growing demand from corporates for renewable energy

- RE 100**
- ▲ Initiative involving many of the world's largest corporates committed to supporting 100% of their energy requirements from renewable sources
 - ▲ 119 leading global corporates are members of re100, including Aviva, BT, BMW, Coca-Cola, Goldman Sachs, Google, Ikea and Walmart

Sample of corporates participating in the Re100 initiative

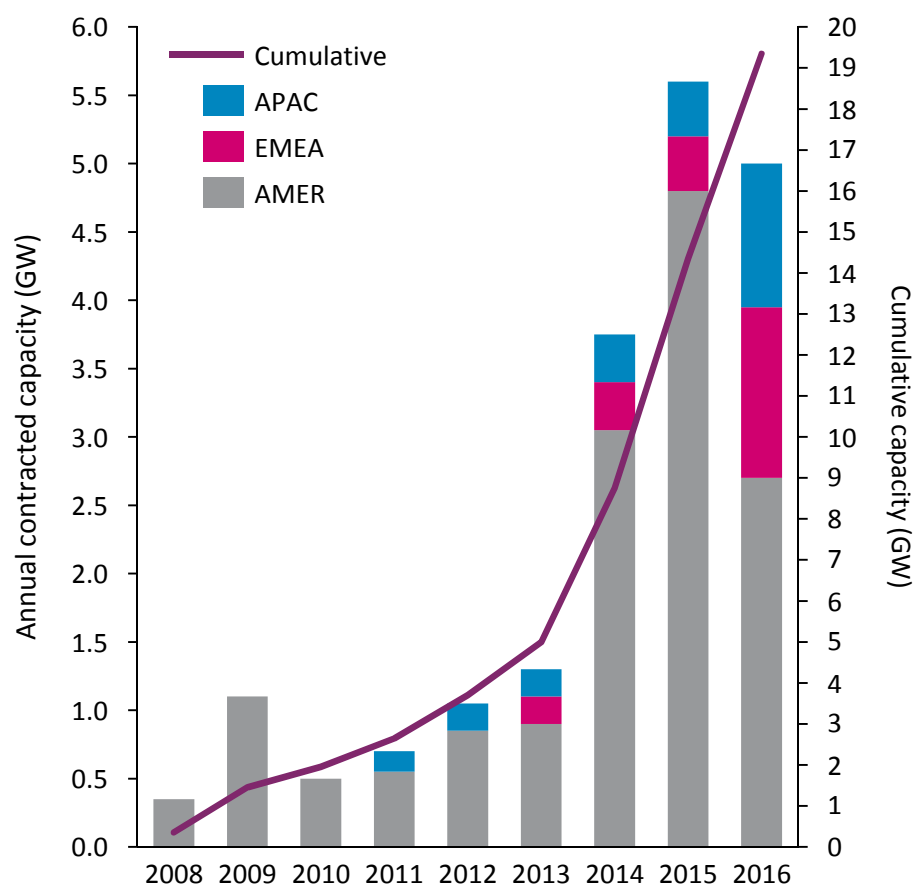


Corporate PPAs have emerged as subsidy alternatives, but the market remains nascent

Corporate PPA annual deal volumes have grown significantly but the initial boom appears to have slowed

Deals sizes have mainly been small but a few large (>150 MW) deals have emerged in the last 1-2 years

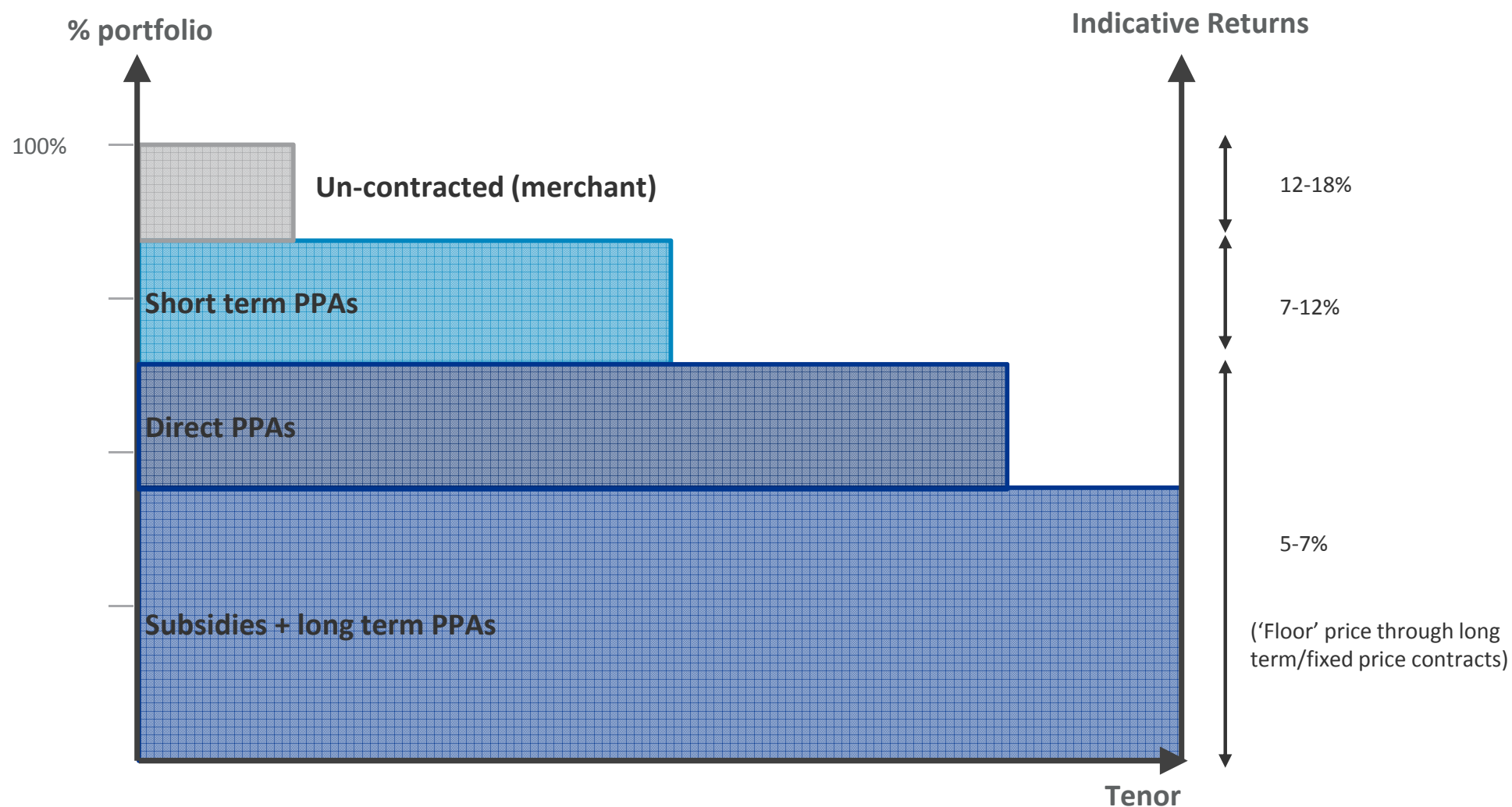
Global corporate PPAs by region & signing year



Largest European corporate PPA deals in 2016-17

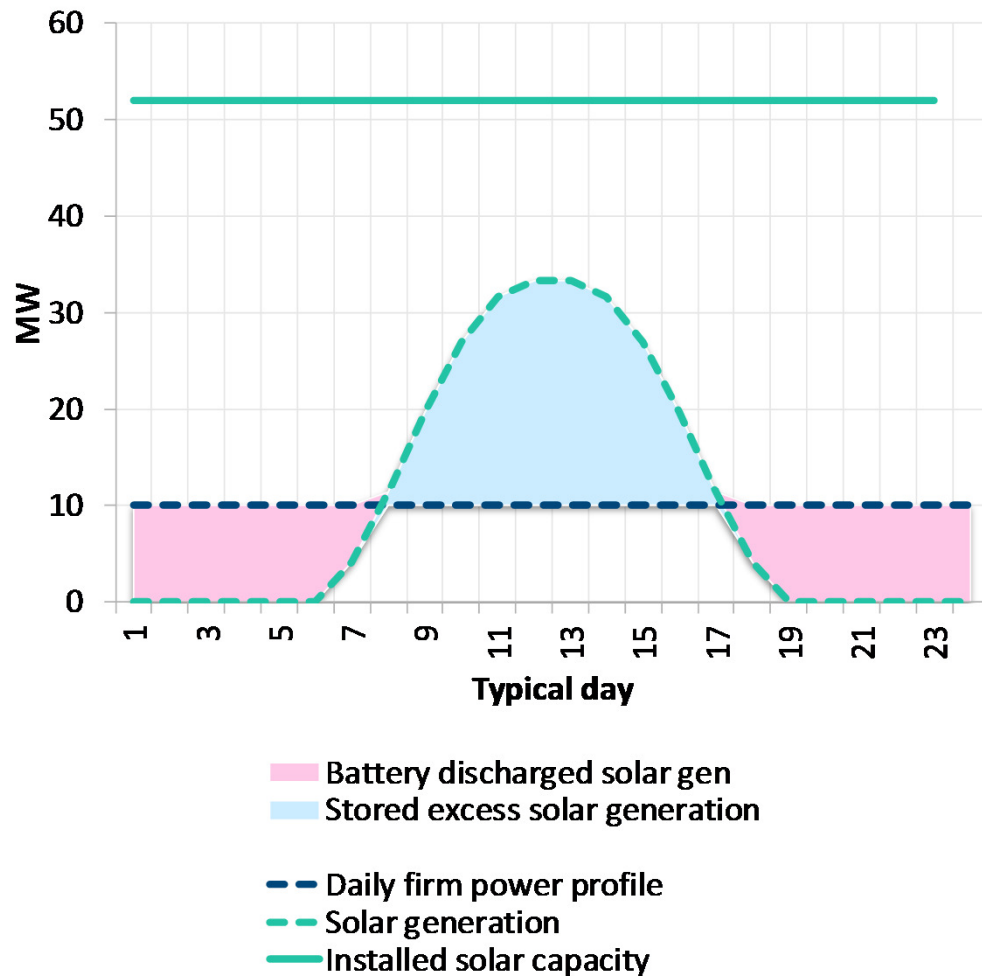
Corporate counterparty	Country	Deal year	Generation tech	Contract size (MW)
Norsk Hydro	Sweden	2017	Onshore Wind	650
Norsk Hydro	Norway	2016	Onshore wind	330
Alcoa Norway	Norway	2017	Onshore Wind	281
Microsoft	Netherlands	2017	Onshore Wind	180
Google	Norway	2016	Onshore Wind	160
Lego Group	England, UK	2016	Offshore Wind	65
Google	Netherlands	2016	Onshore Wind	63
Unilever	Scotland, UK	2017	Onshore Wind	60
Mars	Scotland, UK	2016	Onshore Wind	60
Nationwide	England, UK	2016	GM Solar PV	45
Microsoft	Ireland	2017	Onshore Wind	37
Nestlé	Scotland, UK	2016	Onshore Wind	30

Different routes to market can be managed within a balanced portfolio

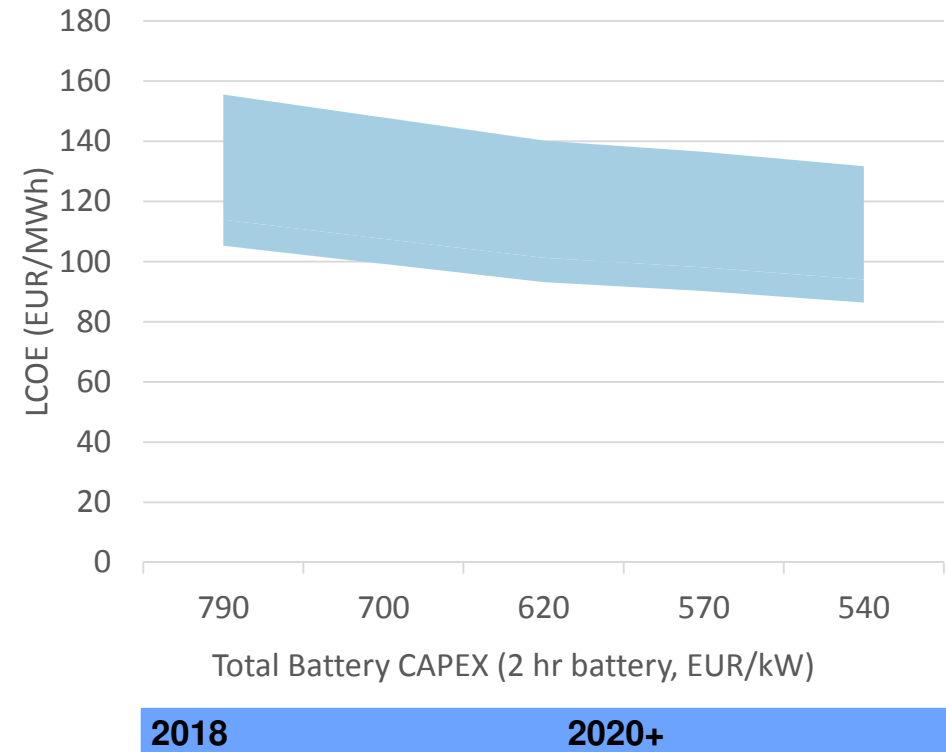


Battery hybrids are emerging but require battery technology costs to fall further

Solar PV + battery hybrid “firm power” illustration

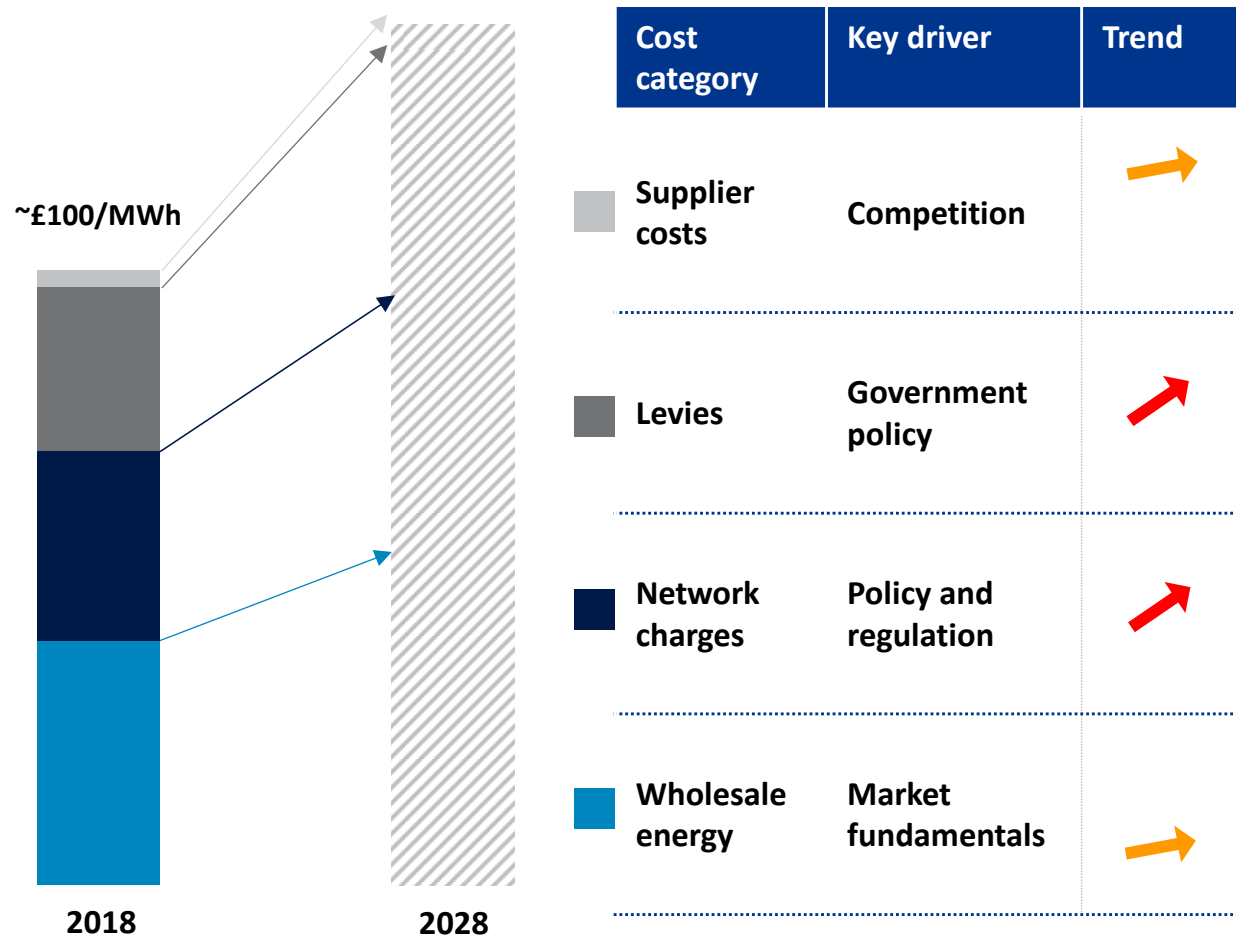


Levelised Cost of Energy, Solar PV + Battery 100% Firm

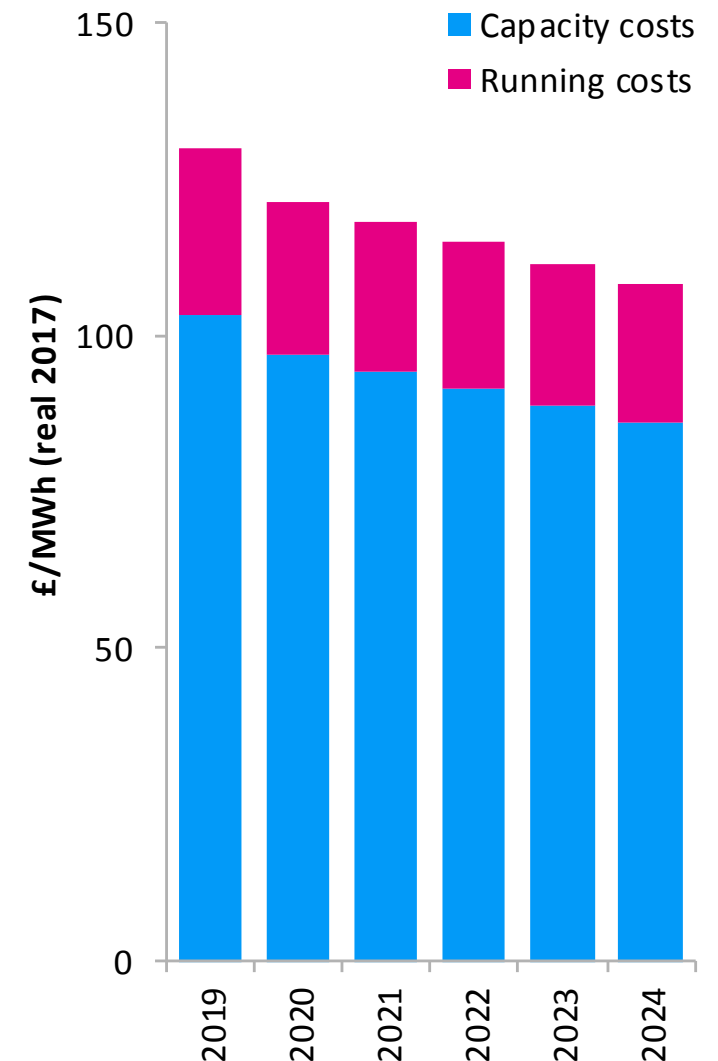


Rising energy costs for large users create a business case for BtM solar-battery hybrids

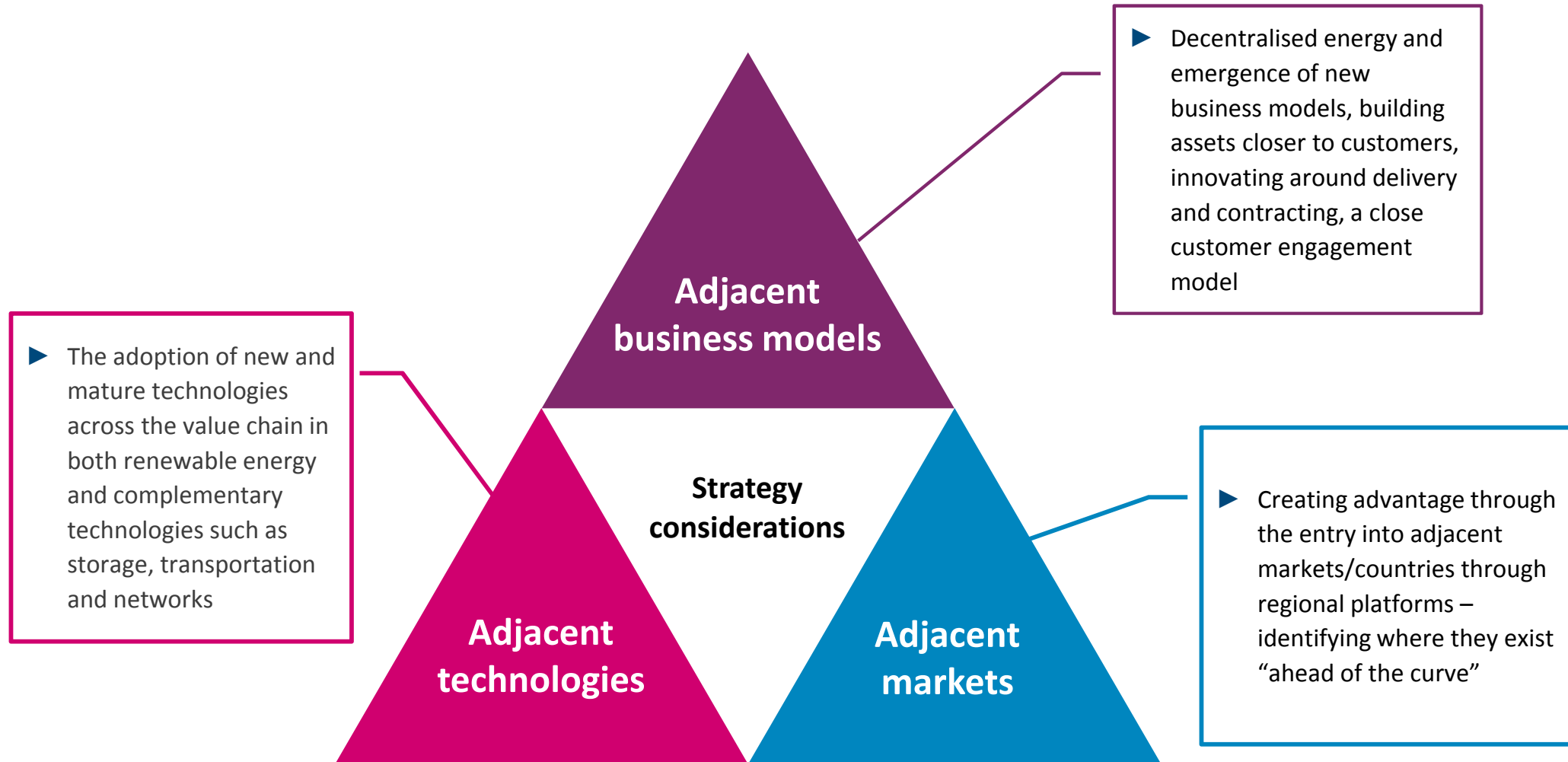
Breakdown of the average retail electricity tariff for a medium-sized I&C user in GB:



Illustrative BtM solar-battery hybrid economics:



In conclusion, what can a future strategy look like?



Thank you



Stefan Gebski
Senior Manager

Mobile: +44 7814 566830
Email: stefan.gebski@baringa.com

Baringa Partners LLP
3rd Floor, Dominican Court
17 Hatfields
London SE1 8DJ
UK
www.baringa.com

