

# Getting Decentralised

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Wellington

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BloombergNEF

# Disruptive technologies

## Clean energy



Solar



Wind



Storage



Decentralized energy



Frontier power



Impact on power & utilities

## Advanced transport



Electrified transport



Autonomous driving



Shared mobility



Impact on transport



Impact on oil & power

## Commodities



Carbon



Power



LNG & gas



Oil & products



Metals



Chemicals

## Digital industry



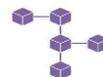
Internet of things



Automation & advanced analytics



Asset mgt, digital manufacturing, logistics



Connected customer, "as a service" business models



Impact on industrials, utilities, healthcare

## Advanced materials



Bioplastics, biomaterials



Composites, New Materials



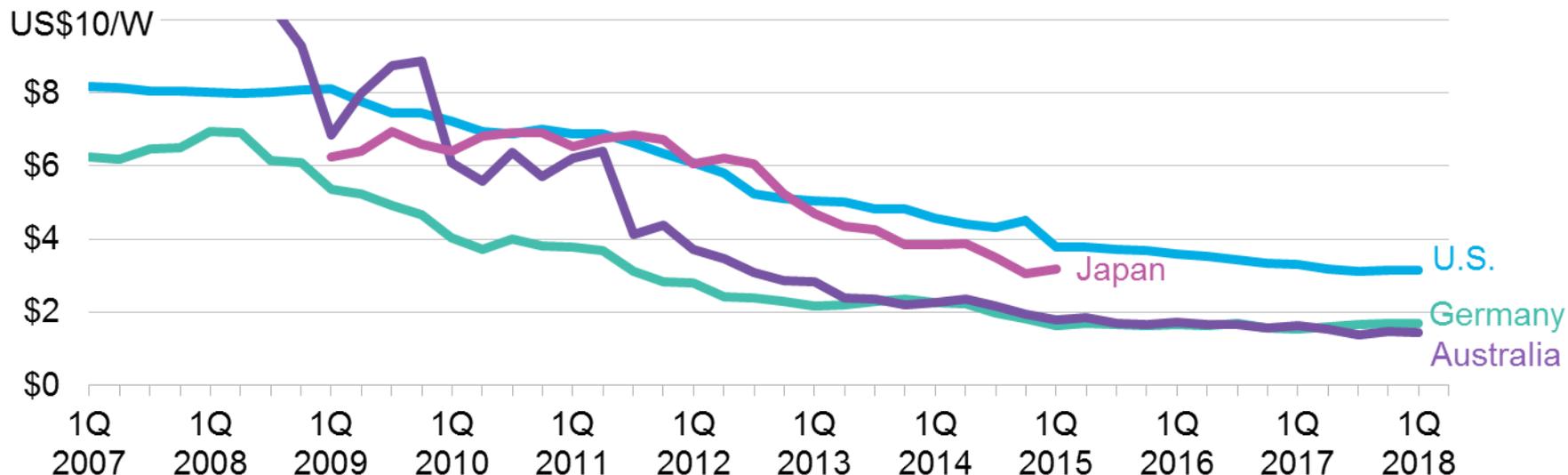
3D Printing, Lightweighting, Recycling, End-of-life



Impact on industrials, materials and energy

# Rooftop solar continues to get cheaper

## Residential PV system prices in different markets

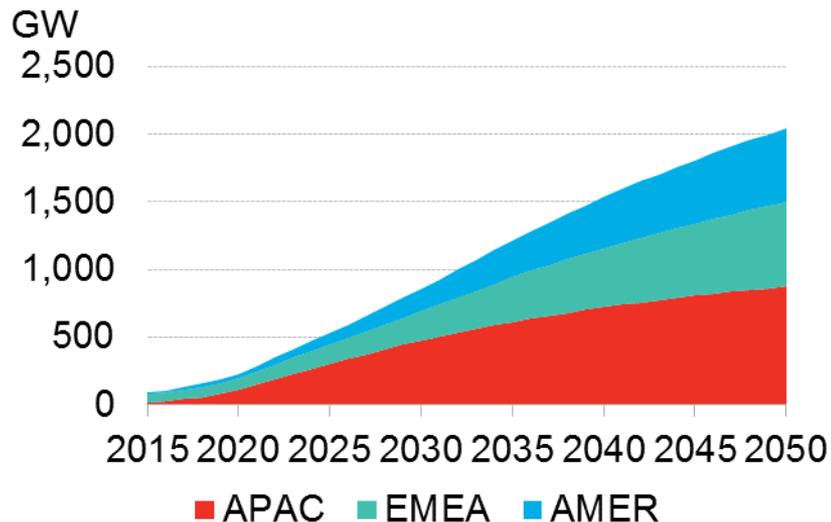


Source: Bloomberg NEF, EnergySage, METI, SolarChoice.com.au, BSW-Solar, company filings.



# We expect small-scale PV to grow 13-fold by 2050

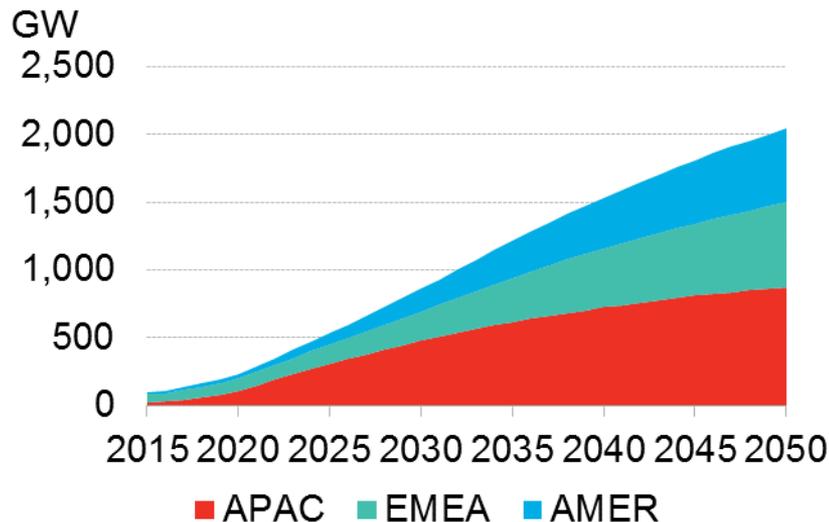
## Small-scale PV cumulative capacity



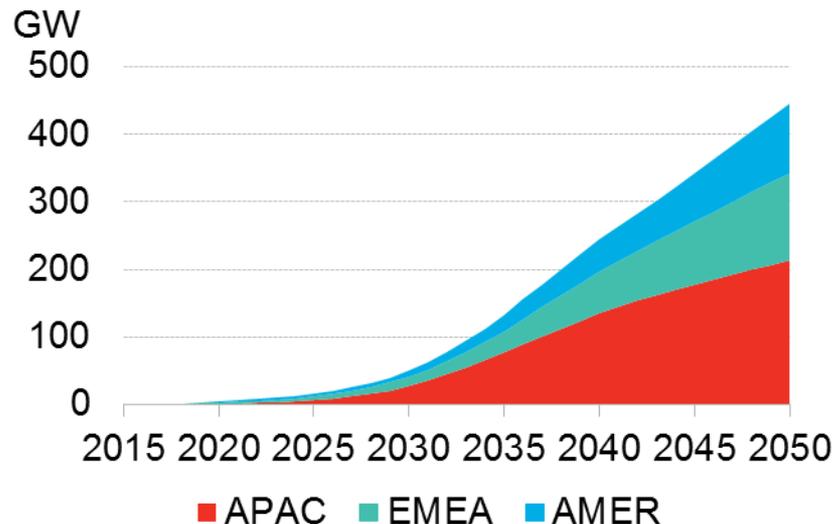
Source: Bloomberg NEF, [New Energy Outlook 2018](#).

# Storage will follow on its heels

## Small-scale PV cumulative capacity

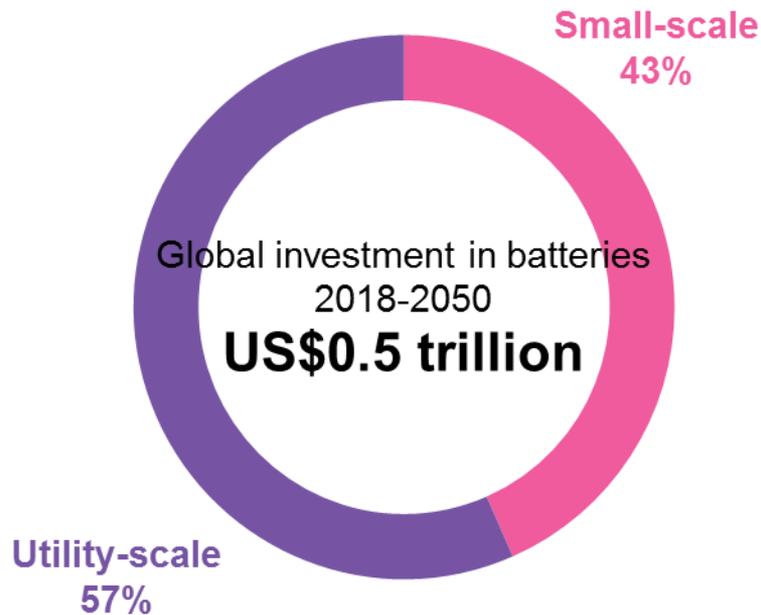
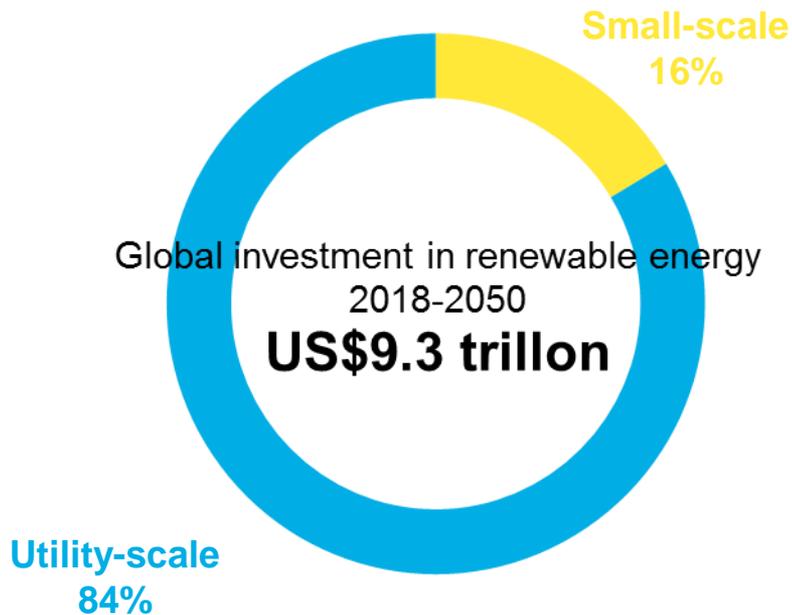


## Small-scale storage cumulative capacity



Source: Bloomberg NEF, [New Energy Outlook 2018](#).

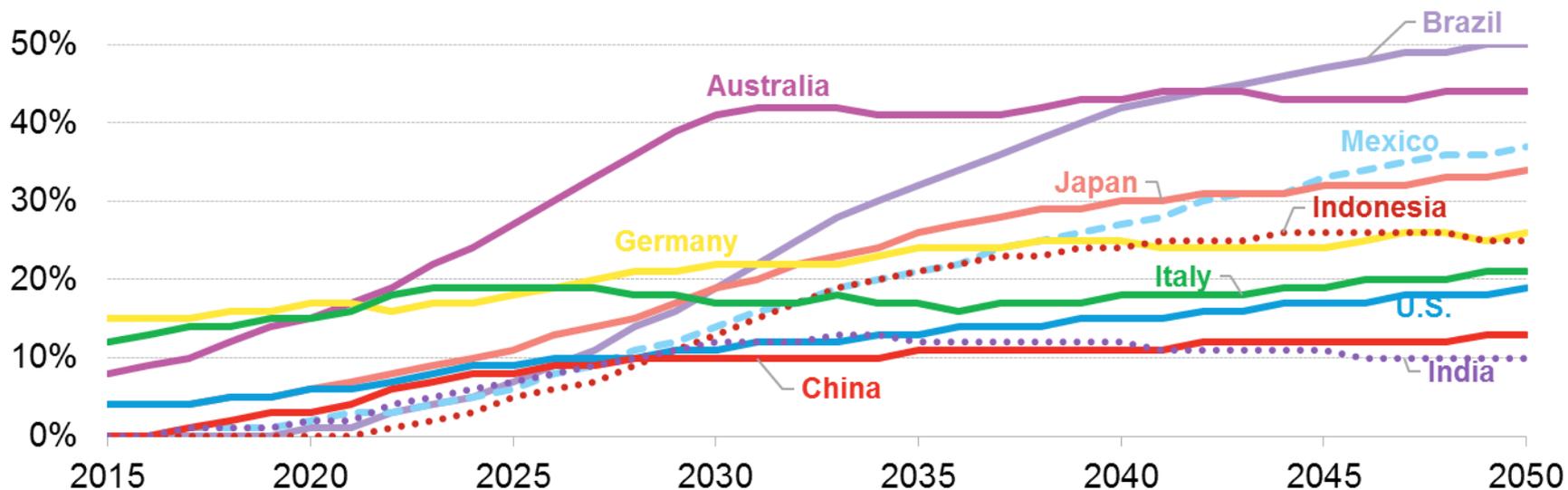
# Behind-the-meter is a \$2 trillion opportunity



Source: Bloomberg NEF, [New Energy Outlook 2018](#).

# Decentralisation - coming to a country near you

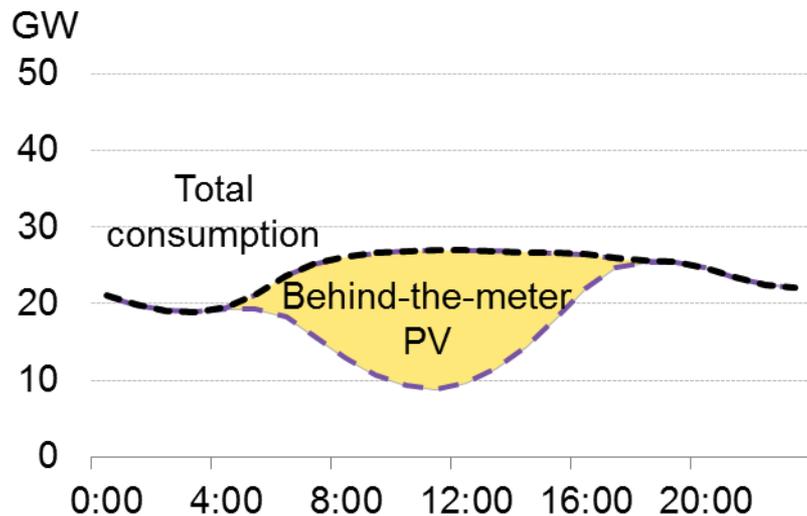
## Decentralisation ratio of selected countries



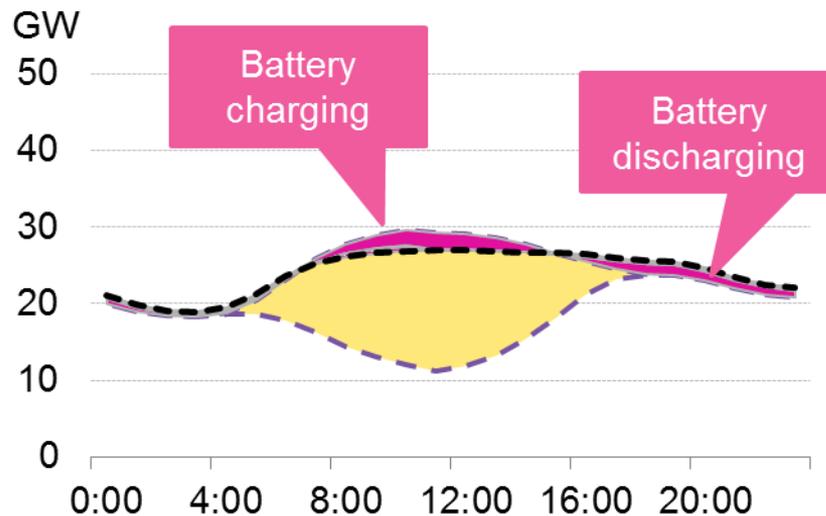
Source: Bloomberg NEF, New Energy Outlook 2018.

# The evolving load profile will underscore the role of flexibility

## Behind-the-meter generation, 2030



## ...with storage



Source: Bloomberg NEF, [Australia behind-the-meter PV and storage forecast](#).

# Utilities are exploring software to manage distributed energy

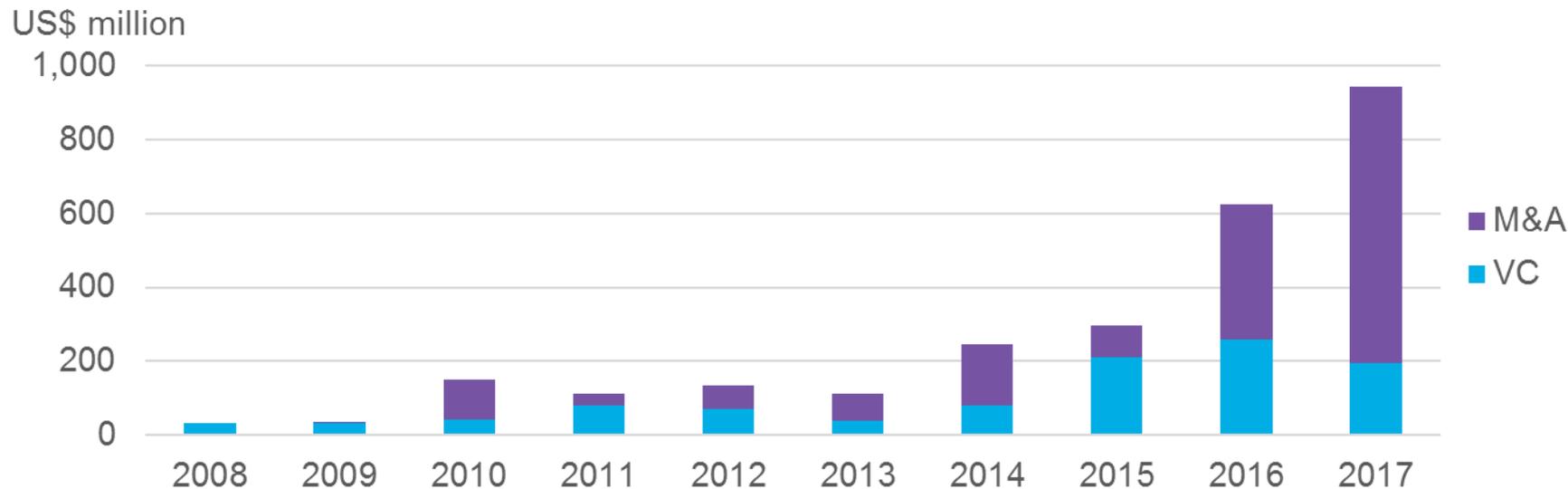
## Residential service offerings from selected global utilities

	Europe			Australia		U.S.		Japan	
	Enel	EON	Centrica	AGL	Origin	Exelon	AEP	Tepco	Kansai
PV	Yes	Yes	Yes	Yes	Yes	Yes	Not active	Exploring	Not active
Storage	Yes	Yes	Exploring	Yes	Yes	Not active	Not active	Exploring	Not active
Home repair services	Yes	Yes	Yes	Not active	Yes	Yes	Yes	Yes	Yes
Connected home	Yes	Yes	Yes	Exploring	Yes	Yes	Exploring	Yes	Yes
Home electric vehicle charging	Yes	Yes	Not active	Exploring	Not active	Yes	Yes	Not active	Not active
Demand response	Exploring	Exploring	Not active	Exploring	Not active	Yes	Exploring	Not active	Not active
Virtual power plants	Exploring	Exploring	Not active	Exploring	Not active	Not active	Not active	Exploring	Exploring
Peer-to-peer trading	Not active	Not active	Exploring	Exploring	Exploring	Not active	Not active	Exploring	Exploring

Source: Bloomberg NEF, **European Utility Residential Retail Strategy**, company reports and presentations. Note: As of May 2018, all categories are subjectively assigned by BNEF.

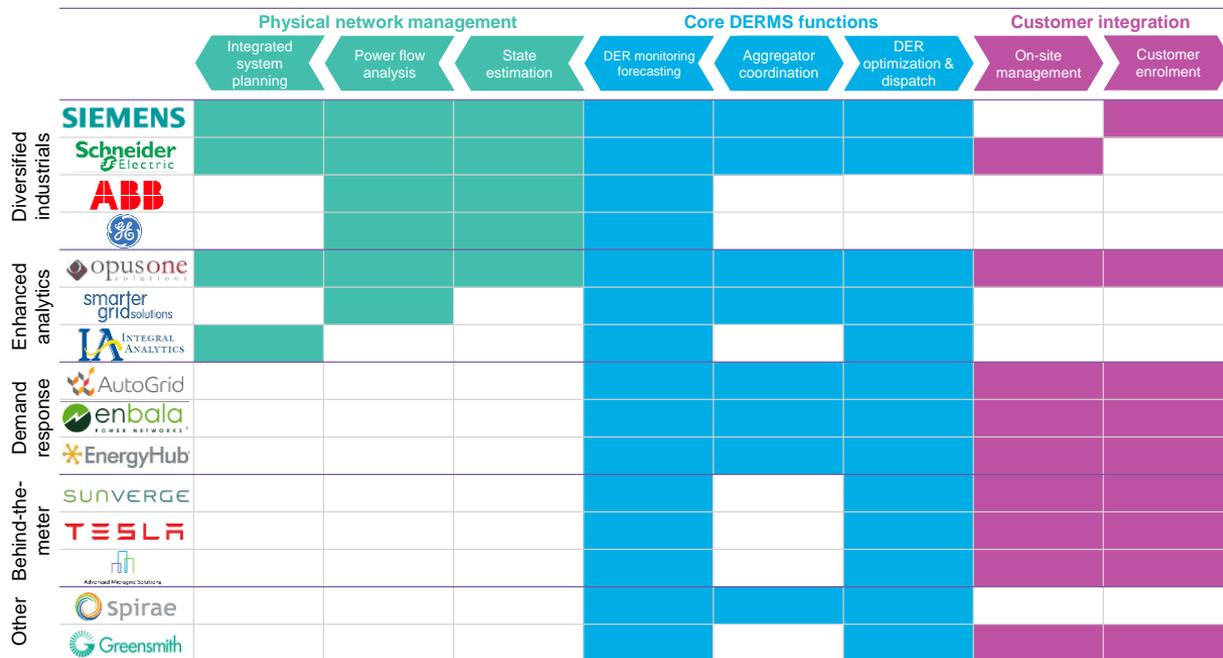
# Investments in virtual power plant companies are accelerating

## Virtual power plant venture capital and M&A



Source: Bloomberg NEF, [Virtual Power Plant 101](#).

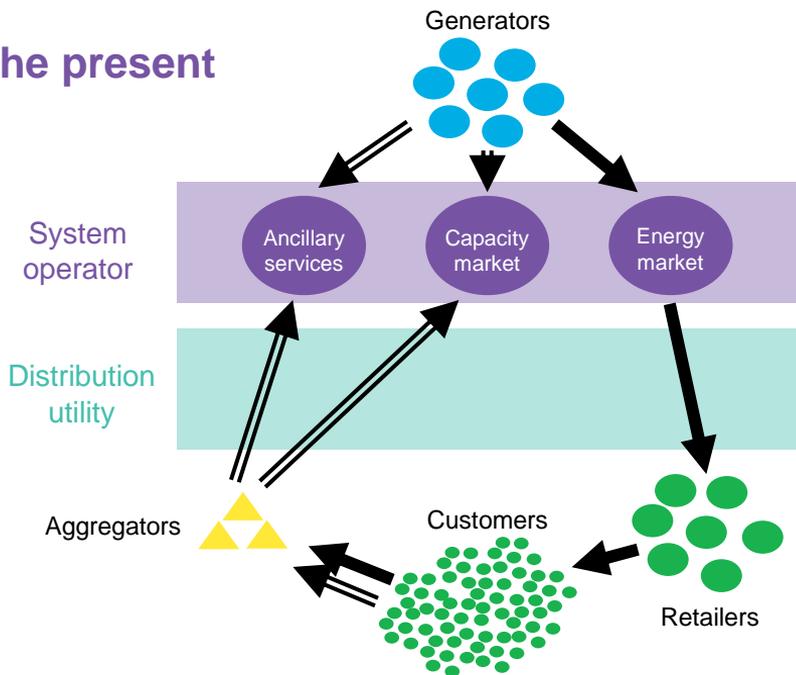
# Distributed energy software is the next frontier



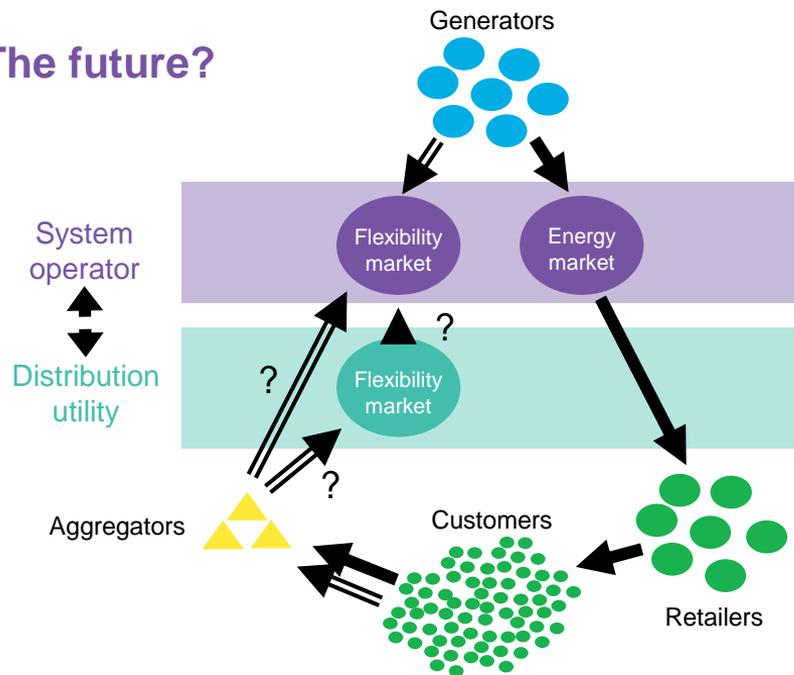
Source: Bloomberg NEF, ***Distributed Energy Resource Management 101***.

# How will distributed flexibility be integrated?

## The present



## The future?



Source: Bloomberg NEF, *Power Market Design for a Renewable Future*.

# Key take-aways

1. PV and storage cost declines will drive decentralisation
2. Evolving load profiles will underscore the need for flexibility
3. Utilities are exploring software to procure flexibility from customers
4. Increasingly decentralised systems will require a market redesign

*Source: Bloomberg NEF.*

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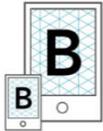
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