Getting Decentralised

Asia Pacific Energy Leaders’ Summit, Wellington

Annabel Wilton

October 31, 2018
# 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 mgmt, 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

Commercial PV already at socket parity in many markets

Source: Bloomberg NEF, *Socket Parity Is Here, But Solar Adoption Needs More*. Note: Country-level results are based on one or more regions.
We expect small-scale PV to grow 13-fold by 2050

Small-scale PV cumulative capacity

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

Global investment in renewable energy 2018-2050
US$9.3 trillion

- Utility-scale 84%
- Small-scale 16%


Global investment in batteries 2018-2050
US$0.5 trillion

- Utility-scale 57%
- Small-scale 43%
Decentralisation - coming to a country near you

Decentralisation ratio of selected countries

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

<table>
<thead>
<tr>
<th>Service</th>
<th>Europe</th>
<th>Australia</th>
<th>U.S.</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enel</td>
<td>EON</td>
<td>Centrica</td>
<td>AGL</td>
</tr>
<tr>
<td>PV</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Storage</td>
<td>Yes</td>
<td>Yes</td>
<td>Exploring</td>
<td>Yes</td>
</tr>
<tr>
<td>Home repair services</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Not active</td>
</tr>
<tr>
<td>Connected home</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Exploring</td>
</tr>
<tr>
<td>Home electric vehicle charging</td>
<td>Yes</td>
<td>Yes</td>
<td>Not active</td>
<td>Exploring</td>
</tr>
<tr>
<td>Demand response</td>
<td>Exploring</td>
<td>Exploring</td>
<td>Not active</td>
<td>Exploring</td>
</tr>
<tr>
<td>Virtual power plants</td>
<td>Exploring</td>
<td>Exploring</td>
<td>Not active</td>
<td>Exploring</td>
</tr>
<tr>
<td>Peer-to-peer trading</td>
<td>Not active</td>
<td>Not active</td>
<td>Exploring</td>
<td>Exploring</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Physical network management</th>
<th>Core DERMS functions</th>
<th>Customer integration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SIEMENS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversified industrials</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ABB</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhanced analytics</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>opusone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Smarter grid solutions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EnergyHub</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AutoGrid</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>enbala</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sunverge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TESLA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How will distributed flexibility be integrated?

The present

System operator

Ancillary services

Capacity market

Energy market

Distribution utility

Generators

Retailers

Customers

Aggregators

The future?

System operator

Flexibility market

Energy market

Distribution utility

Generators

Retailers

Customers

Aggregators

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.*
Copyright and disclaimer

The Bloomberg NEF (“BNEF”), service/information is derived from selected public sources. Bloomberg Finance L.P. and its affiliates, in providing the service/information, believe that the information it uses comes from reliable sources, but do not guarantee the accuracy or completeness of this information, which is subject to change without notice, and nothing in this document shall be construed as such a guarantee. The statements in this service/document reflect the current judgment of the authors of the relevant articles or features, and do not necessarily reflect the opinion of Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates (“Bloomberg”). Bloomberg disclaims any liability arising from use of this document, its contents and/or this service. Nothing herein shall constitute or be construed as an offering of financial instruments or as investment advice or recommendations by Bloomberg of an investment or other strategy (e.g., whether or not to “buy”, “sell”, or “hold” an investment). The information available through this service is not based on consideration of a subscriber’s individual circumstances and should not be considered as information sufficient upon which to base an investment decision. You should determine on your own whether you agree with the content. This service should not be construed as tax or accounting advice or as a service designed to facilitate any subscriber's compliance with its tax, accounting or other legal obligations. Employees involved in this service may hold positions in the companies mentioned in the services/information.

The data included in these materials are for illustrative purposes only. The BLOOMBERG TERMINAL service and Bloomberg data products (the “Services”) are owned and distributed by Bloomberg Finance L.P. (“BFLP”) except that Bloomberg L.P. and its subsidiaries (“BLP”) distribute these products in Argentina, Australia and certain jurisdictions in the Pacific islands, Bermuda, China, India, Japan, Korea and New Zealand. BLP provides BFLP with global marketing and operational support. Certain features, functions, products and services are available only to sophisticated investors and only where permitted. BFLP, BLP and their affiliates do not guarantee the accuracy of prices or other information in the Services. Nothing in the Services shall constitute or be construed as an offering of financial instruments by BFLP, BLP or their affiliates, or as investment advice or recommendations by BFLP, BLP or their affiliates of an investment strategy or whether or not to “buy”, “sell” or “hold” an investment. Information available via the Services should not be considered as information sufficient upon which to base an investment decision. The following are trademarks and service marks of BFLP, a Delaware limited partnership, or its subsidiaries: BLOOMBERG, BLOOMBERG ANYWHERE, BLOOMBERG MARKETS, BLOOMBERG NEWS, BLOOMBERG PROFESSIONAL, BLOOMBERG TERMINAL and BLOOMBERG.COM. Absence of any trademark or service mark from this list does not waive Bloomberg's intellectual property rights in that that name, mark or logo. All rights reserved. © 2018 Bloomberg.
Bloomberg NEF (BNEF) is a leading provider of primary research on clean energy, advanced transport, digital industry, innovative materials, and commodities.

BNEF’s global team leverages the world’s most sophisticated data sets to create clear perspectives and in-depth forecasts that frame the financial, economic and policy implications of industry-transforming trends and technologies.

BNEF research and analysis is accessible via web and mobile platforms, as well as on the Bloomberg Terminal.

Coverage.
Clean energy
Advanced transport
Commodities
Digital industry

Client enquiries:
Bloomberg Terminal: press <Help> key twice
Email: support.bnef@bloomberg.net

Learn more:
about.bnef.com | @BloombergNEF