Clean Energy Investment Trends, 3Q 2017

2017, following in 2016's footsteps

Abraham Louw

October 5, 2017
The third quarter of 2017 saw $66.9 billion invested in clean energy around the world, up 3% from 2Q this year and 40% higher than 3Q 2016

- The numbers for the July-to-September quarter mean that investment in 2017 so far is running 2% above that in the same period of last year, suggesting that the annual total is likely to finish up close to, or a little ahead of, 2016’s figure of $287.5 billion

- Asset finance of utility-scale renewable energy projects jumped 72% globally compared to the same quarter of last year, reaching $54.3 billion

- Quarterly wind investment reach $34.3 billion in 3Q, the highest since 2Q 2016 and ahead of solar investment of $30.5 billion

- The stand-out deal of the third quarter of 2017 was the 2GW Wind Catcher project in the Oklahoma Panhandle costing $4.5 billion
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarterly Trends, New Investment</td>
<td>3</td>
</tr>
<tr>
<td>Quarterly Trends, Funds in Circulation</td>
<td>30</td>
</tr>
<tr>
<td>Top Deals</td>
<td>34</td>
</tr>
<tr>
<td>Annual Trends, New Investment</td>
<td>36</td>
</tr>
<tr>
<td>Clean Energy Stock Performance</td>
<td>56</td>
</tr>
<tr>
<td>Definitions and FAQs</td>
<td>60</td>
</tr>
</tbody>
</table>
Quarterly Trends, New Investment

Quarterly trends since 1Q 2004
Global New Investment in Clean Energy
1Q 2004 – 3Q 2017

Clean energy investment levels in 2017 expected to be similar to the levels seen in 2016. See this note.

Source: Bloomberg New Energy Finance

Version WF17.10
All values nominal

Four quarter running average
Global New Investment in Clean Energy, by Region
1Q 2004 – 3Q 2017

Balance shifts from Europe as largest-investing region to Asia as number one region

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy, by Sector
1Q 2004 – 3Q 2017

Solar moves from third biggest sector in 2006, behind wind and biofuels, to the biggest sector in most quarters by 2011
Quarterly Trends, New Investment

Global New Investment in Clean Energy, by Asset Class
1Q 2004 – 3Q 2017

Dollar investment via asset finance and small-scale solar projects has been affected by sharp reductions in PV costs
Global New Investment in Clean Energy, VC / PE
1Q 2004 – 3Q 2017

$bn

20 18 16 14 12 10 8 6 4 2 0


PE expansion VC late VC early

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy, Public Markets

1Q 2004 – 3Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance
New Investment in Clean Energy

Quarterly Trends, New Investment

AMER

1Q 2004 – 3Q 2017

$bn

Relatively steady trend disguises big variations in investment levels in the US, Canada and Latin America

Source: Bloomberg New Energy Finance

Version WF17.10
All values nominal
Quarterly Trends, New Investment

New Investment in Clean Energy
EMEA
1Q 2004 – 3Q 2017

Investment peaked at the time of the German and Italian solar booms in 2010-11. More recently, Africa and the Middle East have started to account for more big project financings.
The long upswing in APAC investment came to an end in 2016, with slowdowns in PV financing in places like Japan.
Comparing AMER, EMEA & APAC

Is AMER breaking out of the $15 - $20bn range?

Will EMEA ever experience the highs of 2010 & 2011 again?

Has 2015 been APAC’s turning point?
High levels of investment in 2011 came on the back of spending under the American Recovery and Reinvestment Act, and a rush to build wind projects in advance of what would have been the end of the Production Tax Credit in 2012.
New Investment in Clean Energy
United States, by Sector
1Q 2004 – 3Q 2017

Energy smart technologies, including electric vehicles, are an important target for clean energy investment in the US, alongside solar and wind.
New Investment in Clean Energy Europe
1Q 2004 – 3Q 2017

Quarterly Trends, New Investment

$bn


Source: Bloomberg New Energy Finance
A boom in offshore wind saw huge projects getting the go-ahead in both UK and German waters in 2015-16.
In December 2016, China announced further cuts to onshore wind feed-in tariffs for 2018. China’s onshore wind feed-in tariffs have been reduced three times since 2015.
Weaker than expected electricity demand and delayed grid connections have played a part in slowing clean energy investment in 2016-17.
Brazil enjoyed a biofuels investment boom in 2007-08 and, later, a pick-up in wind farm development on the back of auction wins.
Canadian investment has fallen recently, as support programs in Ontario have ended. The focus is now turning to Alberta as the next wind and solar market.
Quarterly Trends, New Investment

New Investment in Clean Energy
Mexico
1Q 2004 – 3Q 2017

$bn


Source: Bloomberg New Energy Finance

Version WF17.10
All values nominal

Four quarter running average
The world's largest non-hydro renewable energy financing, for the 1.2GW Hornsea offshore wind project, boosted UK investment in 1Q 2016.
Quarterly Trends, New Investment

New Investment in Clean Energy Germany

1Q 2004 – 3Q 2017

Onshore and offshore wind have dominated German investment since the end of the solar boom in 2012.
France has been a relatively steady market for wind and solar in recent years, but far below the UK and Germany in terms of dollars invested.
In May 2017, Spain auctioned 3GW of renewable capacity, mostly wind. Clean energy investment expected to pick up in the next two years. See this note.
Retroactive cuts to solar feed-in tariffs have deterred clean energy investment in Italy in recent years.
Activity in South Africa is heavily dependent on the timing of rounds of the country's renewable energy auction program.
New Investment in Clean Energy Japan
1Q 2004 – 3Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

All values nominal

Version WF17.10

Four quarter running average
Indian investment is likely to increase in the years ahead, as investors try to meet the government’s ambitious target of 100GW of solar by 2022.
A few large wind farm financings have boosted Australian clean energy investment in recent quarters.
Quarterly Trends, Funds in Circulation

Quarterly trends since 1Q 2004
Funds in circulation is secondary investment in clean energy where existing assets and companies are bought and sold. For instance, the refinancing of renewable energy assets, public market investor exits, private equity buy-outs and mergers and acquisitions.
Global Clean Energy, Funds in Circulation, by Asset Class
1Q 2004 – 3Q 2017

Quarterly Trends, Funds in Circulation

Source: Bloomberg New Energy Finance

Asset fin acq & ref  Corporate m&a  PM exits  PE buy outs

Version WF17.10
All values nominal
Top Deals

Top Quarterly Deals for 3Q 2017
## Top Asset Finance Deals

### 3Q 2017

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country</th>
<th>Sector</th>
<th>Type of Transaction</th>
<th>Capacity</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklahoma Wind Catcher Wind Farm</td>
<td>U.S.</td>
<td>Wind</td>
<td>Equity</td>
<td>2,000 MW</td>
<td>$4,500m</td>
</tr>
<tr>
<td>Hornsea Project Two Offshore Wind Farm</td>
<td>U.K.</td>
<td>Wind</td>
<td>Equity</td>
<td>1,386 MW</td>
<td>$3,673m</td>
</tr>
<tr>
<td>Deutsche Bucht Offshore Wind Farm</td>
<td>Germany</td>
<td>Wind</td>
<td>Debt</td>
<td>252 MW</td>
<td>$1,550m</td>
</tr>
<tr>
<td>Guohua Dongtai Offshore Wind Farm Phase IV H2</td>
<td>China</td>
<td>Wind</td>
<td>Equity</td>
<td>300 MW</td>
<td>na</td>
</tr>
<tr>
<td>GD Power Zhoushan Putuo 6# 2 Offshore Wind Farm</td>
<td>China</td>
<td>Wind</td>
<td>Debt</td>
<td>252 MW</td>
<td>$663m</td>
</tr>
</tbody>
</table>
## Top Deals

### Top Venture Capital / Private Equity Deals

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Country</th>
<th>Sector</th>
<th>Type of Transaction</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Max Enviro Energy Solutions</td>
<td>India</td>
<td>Solar</td>
<td>PE - Expansion capital</td>
<td>$109m</td>
</tr>
<tr>
<td>Green Hedge Energy UK</td>
<td>U.K.</td>
<td>Energy Storage</td>
<td>PE - Expansion capital</td>
<td>$39m</td>
</tr>
<tr>
<td>Advanced Microgrid Solutions</td>
<td>U.S.</td>
<td>Energy Storage</td>
<td>VC - Series B / Second round</td>
<td>$34m</td>
</tr>
<tr>
<td>Romeo Systems</td>
<td>U.S.</td>
<td>Energy Storage</td>
<td>VC - Seed / angel</td>
<td>$30m</td>
</tr>
<tr>
<td>GlassPoint Solar</td>
<td>U.S.</td>
<td>Solar</td>
<td>VC - Further / Pre-IPO round</td>
<td>$20m</td>
</tr>
</tbody>
</table>
## Top Public Market Deals 3Q 2017

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Stock Exchange</th>
<th>Sector</th>
<th>Type of Transaction</th>
<th>New Equity Raised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing Shouhang Resources Saving</td>
<td>Shanghai Stock Exchange</td>
<td>Solar</td>
<td>Secondary &amp; PIPE</td>
<td>$675m</td>
</tr>
<tr>
<td>Greencoat Renewables</td>
<td>AIM (London)</td>
<td>Wind</td>
<td>IPO</td>
<td>$314m</td>
</tr>
<tr>
<td>Capital Stage Finance</td>
<td>Hamburg Stock Exchange</td>
<td>Solar</td>
<td>Convertible &amp; Other</td>
<td>$116m</td>
</tr>
<tr>
<td>John Laing Environmental Assets Group</td>
<td>London Stock Exchange</td>
<td>Services &amp; Support</td>
<td>Secondary &amp; PIPE</td>
<td>$51m</td>
</tr>
<tr>
<td>Brenmiller Energy</td>
<td>Tel Aviv Stock Exchange</td>
<td>Solar</td>
<td>IPO</td>
<td>$13m</td>
</tr>
</tbody>
</table>
Annual Trends, New Investment

Annual trends since 2004
Global New Investment in Clean Energy
2004 – 2016

$bn

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy by Region
2004 – 2016

$bn

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy by Sector
2004 – 2016

$bn
Global New Investment in Clean Energy by Asset Class
2004 – 2016

$bn

Version WF17.07
All values nominal

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
United States
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Annual Trends, New Investment

High levels of investment in 2011 came on the back of spending under the American Recovery and Reinvestment Act, and a rush to build wind projects in advance of what would have been the end of the Production Tax Credit in 2012.
New Investment in Clean Energy Europe
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy

China

2004 – 2016

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
Brazil
2004 – 2016

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy Canada
2004 – 2016

$bn

1.5  2.1  2.5  4.1  3.1  3.6  6.6  6.9  5.8  6.7  6.9  4.4  2.4

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
Mexico
2004 – 2016

$bn

0.2 0.2 0.1 0.1 0.7 0.4 2.5 0.4 1.6 1.9 2.0 2.5 1.0

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
United Kingdom
2004 – 2016

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
Germany
2004 – 2016

$bn

2004: 12.5
2005: 15.3
2006: 17.3
2007: 19.9
2008: 21.7
2009: 27.9
2010: 40.4
2011: 36.8
2012: 27.1
2013: 18.8
2014: 19.6
2015: 18.1
2016: 15.3

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
France
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy Spain
2004 – 2016

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
Italy
2004 – 2016

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
South Africa
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal

October 5, 2017
New Investment in Clean Energy India
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
New Investment in Clean Energy
Australia
2004 – 2016

$bn

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
Clean Energy Stock Performance

Clean energy and the stock market
The WilderHill New Energy Global Innovation Index (NEX) is a modified dollar-weighted index of publicly traded companies active in renewable and low-carbon energy, and which stand to benefit from responses to climate change and energy security concerns. The majority of index members are quoted outside the US.
Clean Energy Stock Performance

NEX vs NASDAQ & S&P 500

2012 – 2017 YTD

Values as of Oct 4, 2017. All indexes rebased to 100 on Jan 1, 2012

Source: Bloomberg New Energy Finance
Clean Energy Stock Performance

NEX vs NASDAQ & S&P 500

2015 – 2017 YTD

Values as of Oct 4, 2017. All indexes rebased to 100 on Jan 1, 2015

Source: Bloomberg New Energy Finance
Definitions and FAQs

How Bloomberg New Energy Finance defines clean energy
Definitions and FAQs

Definitions

2016 Clean Energy Investment Types and Flows

$bn

This chart shows the full range of investment in clean energy by asset class. It runs from the early ‘tech’ stage fund raisings and r&d on the left, through to the roll-out phase of new build asset finance (AF) in the middle finishing with total secondary market, non-new investment including corporate M&A, private equity buy-outs, investor exits and asset refinancing and acquisitions.

Source: Bloomberg New Energy Finance

Version WF17.07
All values nominal
Definitions and FAQs

Definitions

Asset classes

Venture capital and private equity (VCPE)
Early and late stage venture capital funding rounds of pure play clean energy companies as well as funds raised privately for the purposes of expansion.

Public markets (PM)
Funds raised by publicly quoted or OTC quoted pure play clean energy companies on the capital markets. This may be through IPOs or follow-on offerings like secondary offerings, private investment in public equity or PIPEs, convertibles etc.

Asset finance
The new build financing of renewable energy generating projects as well as smart metering and energy storage projects - smart metering and energy storage investment are only reported annually. Renewable energy generating projects includes both electricity generating and biofuels producing assets. Projects may be financed off the owner's balance sheet, or through financing mechanisms such as project finance, syndicated equity from institutional investors, or project bonds underwritten by banks.

Re-invested equity
Isolates values for balance sheet-financed project investments by companies who have raised money privately or publicly over the past 12 months. The purpose of this category is to prevent double counting of money raised publicly or privately that has been invested in clean energy assets.

Small scale solar
Given the technical limitations in tracking small-scale solar projects, BNEF's asset finance database excludes projects below roughly 1MW. Unlike utility scale asset investment, small-scale solar investment is based on top-down analyst estimates.

Government r&d
Government r&d figures are sourced from the IEA, IMF, OECD, and various government agencies.

Corporate r&d
The Bloomberg Terminal is used to source corporate r&d figures for key quoted companies in all clean energy sectors.
Definitions and FAQs

Definitions

Sectors

Wind
Electricity generation using wind turbines. Included in this sector, are players across the entire value chain of both onshore and offshore developments. From manufacturers of turbines, components and subassemblies to developers, generators, utilities and engineering firm.

Solar
All technologies which capture energy directly from the sun. These include production of electricity using semiconductor-based photovoltaic (pv) materials, use of concentrated sunlight to heat fluids that drive power generation equipment (solar thermal), and passive methods which use sunlight to heat water. Whilst company level investment of passive methods is recorded, investment in passive projects is not.

Biofuels
Liquid transportation fuels including biodiesel and bioethanol. These can be derived from a range of biomass sources, including sugar cane, rape seed, soybean oil or non-food cellulosic feedstock. Our database excludes producers of base biomass, but includes suppliers of everything from the processing technologies and equipment, through the logistics of distribution, to manufacturers of energy systems which are specially adapted for the use of biofuels and products, and the services on which they depend.

Biomass & waste
Electricity and/or heat produced with bio-based feedstocks, typically through incineration but also through more advanced processes like gasification or anaerobic digestion. This sector also includes waste-to-energy which includes energy produced through landfill gas projects and incineration of municipal and industrial waste.

Energy smart technologies
This sector covers technologies like digital energy, smart grids, power storage, hydrogen and fuel cells, advanced transportation and energy efficiency on both the demand and supply side.

Other renewables
Includes small hydro - hydro projects with capacities smaller or equal to 50MW; geothermal - extraction of useful power from heat stored in the earth; marine - the extraction of tidal, wave and thermal energy from the ocean.
Other low carbon tech / services
This sector covers clean energy service companies such as consultants, government agencies and policy makers, NGOs, financial service providers, investors, and clean energy information providers (such as ourselves). It also covers the corporate activity of organizations across the carbon market value chains.
Q1: Why is there a difference between the sum of the quarterly figures and the annual figures?
Quarterly figures do not include certain asset classes which we only produce annually. These asset classes are corporate and government r&d and asset finance for energy smart technologies, in other words, smart meters and energy storage investment.

Q2: Which countries are included in Europe?
Europe includes all 28 EU countries, and non-EU countries like Switzerland, Norway, Turkey and Russia. The majority of clean energy investment stems from the EU though.
Copyright and disclaimer

This publication is the copyright of Bloomberg New Energy Finance. No portion of this document may be photocopied, reproduced, scanned into an electronic system or transmitted, forwarded or distributed in any way without prior consent of Bloomberg New Energy Finance.

The information contained in this publication is derived from carefully selected sources we believe are reasonable. We do not guarantee its accuracy or completeness and nothing in this document shall be construed to be a representation of such a guarantee. Any opinions expressed reflect the current judgment of the author of the relevant article or features, and does not necessarily reflect the opinion of Bloomberg New Energy Finance, Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates ("Bloomberg"). The opinions presented are subject to change without notice. Bloomberg accepts no responsibility for any liability arising from use of this document or its contents. Nothing herein shall constitute or be construed as an offering of financial instruments, or as investment advice or recommendations by Bloomberg of an investment strategy or whether or not to "buy," "sell" or "hold" an investment.
Bloomberg New Energy Finance is a research firm that helps energy professionals generate opportunities. With a team of experts spread across six continents, BNEF provides independent analysis and insight, enabling decision-makers to navigate change in an evolving energy economy.

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

**Coverage.**

Renewable Energy  
Power & Utilities  
Gas  
Carbon Markets & Climate Negotiations  
Energy Smart Technologies  
Storage  
Electric Vehicles  
Mobility and Autonomous Driving  
Frontier Power  
Emerging Technologies

sales.bnef@bloomberg.net
about.bnef.com  
@BloombergNEF