Clean Energy Investment Trends, 2017

2017, challenging the highs of 2015

Abraham Louw

January 16, 2018
Solar Boom In China Boost Global Investment in 2017

Global clean energy investment was $333.5 billion in 2017, up 3% from 2016 and the second highest annual figure ever. The 2017 investment figure is all the more remarkable considering the falling capital costs for the leading technology – solar.

• Typical utility-scale photovoltaic systems were about 25% cheaper per megawatt in 2017 than they were two years earlier yet solar investment globally increased 18% year on year to $160.8 billion in 2017

• A boom in solar pushed Chinese investment to a record $132.6 billion in 2017. China accounted for 40% of the global clean energy investment in 2017

• The next biggest investing country was the U.S., at $56.9 billion, up 1% on 2016 despite the less friendly tone towards renewables adopted by the Trump administration

• Mexico and Australia saw 2017 investment levels at an all-time high of $6.2 billion and $9 billion respectively

• While solar technologies were the biggest recipients of investment in 2017, the biggest deals were in offshore wind. Orsted said it had reached ‘final investment decision’ on the 1.4GW Hornsea 2 project in the U.K. North Sea, estimated at $4.8 billion. There were also 13 Chinese offshore wind projects financed with total capacity of 3.7GW, and an estimated investment of $10.8 billion
Annual Trends, New Investment

Annual trends since 2004
Global New Investment in Clean Energy

2004 – 2017

$bn

Investment in 2017 only 7% short of 2015’s record investment of $360 billion.

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

January 16, 2018
Global New Investment in Clean Energy by Region
2004 – 2017

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

$bn

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy by Sector
2004 – 2017

Solar moves from third biggest sector in 2006, behind wind and biofuels, to the biggest sector in most quarters by 2011
Global New Investment in Clean Energy by Asset Class

$\text{bn}

Dollar investment via asset finance and small-scale solar projects has been affected by sharp reductions in PV costs
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 2004 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
New Investment in Clean Energy Europe
2004 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

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.
New Investment in Clean Energy China
2004 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Regulators curbed investment in utility-scale solar, they did however not set caps on distribution-grid connected (DGC) systems (basically town-level systems) which developers invested heavily in.
New Investment in Clean Energy
Brazil
2004 – 2017

Brazil enjoyed a biofuels investment boom in 2007-08 and, later, a pick-up in wind farm development on the back of auction wins.
New Investment in Clean Energy Canada
2004 – 2017

$bn

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
Mexico
2004 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
New Investment in Clean Energy
United Kingdom
2004 – 2017

$bn

Version WF18.01
All values nominal

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
United Kingdom, by sector
2004 – 2017

$bn

The world’s largest non-hydro renewable energy financing, for the 1.2GW Hornsea offshore wind project, boosted UK investment in 1Q 2016
New Investment in Clean Energy
Germany
2004 – 2017

$bn
New Investment in Clean Energy Germany, by sector
2004 – 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.
### New Investment in Clean Energy

**Italy**

**2004 – 2017**

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment (bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.2</td>
</tr>
<tr>
<td>2005</td>
<td>2.4</td>
</tr>
<tr>
<td>2006</td>
<td>2.0</td>
</tr>
<tr>
<td>2007</td>
<td>3.8</td>
</tr>
<tr>
<td>2008</td>
<td>8.1</td>
</tr>
<tr>
<td>2009</td>
<td>8.4</td>
</tr>
<tr>
<td>2010</td>
<td>24.3</td>
</tr>
<tr>
<td>2011</td>
<td>32.3</td>
</tr>
<tr>
<td>2012</td>
<td>15.6</td>
</tr>
<tr>
<td>2013</td>
<td>4.3</td>
</tr>
<tr>
<td>2014</td>
<td>1.7</td>
</tr>
<tr>
<td>2015</td>
<td>2.1</td>
</tr>
<tr>
<td>2016</td>
<td>2.2</td>
</tr>
<tr>
<td>2017</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Retroactive cuts to solar feed-in tariffs have deterred clean energy investment in Italy in recent years.**

**Source:** Bloomberg New Energy Finance
New Investment in Clean Energy
Japan
2004 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

All values nominal

Version WF18.01
Annual Trends, New Investment

New Investment in Clean Energy
Japan, by sector
2004 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

Solar  Other  Wind
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.
New Investment in Clean Energy
Australia
2004 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Quarterly Trends, New Investment

Quarterly trends since 1Q 2004
Quarterly Trends, New Investment

Global New Investment in Clean Energy
1Q 2004 – 4Q 2017

$bn


Version WF18.01
All values nominal

Four quarter running average

Source:
Bloomberg New Energy Finance
Global New Investment in Clean Energy, by Region
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Global New Investment in Clean Energy, by Asset Class
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Quarterly Trends, New Investment

Global New Investment in Clean Energy, VC / PE
1Q 2004 – 4Q 2017

$bn

20 18 16 14 12 10 8 6 4 2 0


Version WF18.01
All values nominal

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy

AMER

1Q 2004 – 4Q 2017

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

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy
EMEA
1Q 2004 – 4Q 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.

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
APAC
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Comparing AMER, EMEA & APAC

Will AMER break out of the $15 - $25bn range?

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

Will APAC continue to be the driver of green investment?
Quarterly Trends, New Investment

New Investment in Clean Energy
United States

1Q 2004 – 4Q 2017

$bn


Source: Bloomberg New Energy Finance

Four quarter running average

Version WF18.01
All values nominal
Quarterly Trends, New Investment

New Investment in Clean Energy
United States, by Sector

1Q 2004 – 4Q 2017

$bn

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy Europe
1Q 2004 – 4Q 2017

$bn

Four quarter running average

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

January 16, 2018
New Investment in Clean Energy China
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment
New Investment in Clean Energy
China, by sector
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment
New Investment in Clean Energy Brazil
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

Four quarter running average
Quarterly Trends, New Investment

New Investment in Clean Energy Canada
1Q 2004 – 4Q 2017

$bn

20
18
16
14
12
10
8
6
4
2
0


Version WF18.01
All values nominal

Four quarter running average

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy
Mexico

1Q 2004 – 4Q 2017

$bn

20
18
16
14
12
10
8
6
4
2
0


Version WF18.01
All values nominal

Four quarter running average

Source:
Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy
Germany
1Q 2004 – 4Q 2017

$bn

Source: Bloomberg New Energy Finance
New Investment in Clean Energy Italy
1Q 2004 – 4Q 2017

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal

Four quarter running average
Quarterly Trends, New Investment

New Investment in Clean Energy
Japan

1Q 2004 – 4Q 2017

$bn

20 18 16 14 12 10 8 6 4 2 0


Four quarter running average

Source: Bloomberg New Energy Finance

Version WF18.01
All values nominal
Quarterly Trends, Funds in Circulation

Quarterly trends since 1Q 2004
Global Clean Energy, Funds in Circulation, by Region
1Q 2004 – 4Q 2017

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 Sector
1Q 2004 – 4Q 2017

Quarterly Trends, Funds in Circulation

All values nominal

Version WF18.01

Source: Bloomberg New Energy Finance
Global Clean Energy, Funds in Circulation, by Asset Class
1Q 2004 – 4Q 2017

Quarterly Trends, Funds in Circulation

$bn


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

Source: Bloomberg New Energy Finance
Top Deals

Top Quarterly Deals for 4Q 2017
# Top Asset Finance Deals

## 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>Hornsea Project Two Offshore Wind Farm</td>
<td>U.K.</td>
<td>Wind</td>
<td>Equity</td>
<td>1386 MW</td>
<td>$4,828m</td>
</tr>
<tr>
<td>Oklahoma Wind Catcher Wind Farm</td>
<td>U.S.</td>
<td>Wind</td>
<td>Equity</td>
<td>2000 MW</td>
<td>$2,902m</td>
</tr>
<tr>
<td>Hohe See Offshore Wind Farm</td>
<td>Germany</td>
<td>Wind</td>
<td>Equity</td>
<td>497 MW</td>
<td>$1,910m</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>Shanghai Electric Power Yancheng Dafeng H3 Offshore Wind Farm</td>
<td>China</td>
<td>Wind</td>
<td>Equity</td>
<td>302 MW</td>
<td>na</td>
</tr>
</tbody>
</table>
## Top Deals

### Top Venture Capital / Private Equity Deals 2017

<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>Microvast Power System</td>
<td>China</td>
<td>Electrified Transport</td>
<td>VC - Series A / First round</td>
<td>$400m</td>
</tr>
<tr>
<td>Greenko Energy Holdings</td>
<td>India</td>
<td>Wind</td>
<td>PE - Expansion capital</td>
<td>$155m</td>
</tr>
<tr>
<td>Proterra</td>
<td>U.S.</td>
<td>Electrified Transport</td>
<td>PE - Expansion capital</td>
<td>$140m</td>
</tr>
<tr>
<td>Sunlight Financial</td>
<td>U.S.</td>
<td>Solar</td>
<td>VC - Series A / First round</td>
<td>$130m</td>
</tr>
<tr>
<td>Hero Future Energies</td>
<td>India</td>
<td>Wind</td>
<td>PE - Expansion capital</td>
<td>$125m</td>
</tr>
</tbody>
</table>
## Top Public Market Deals 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>Tesla</td>
<td>NASDAQ</td>
<td>Electrified Transport</td>
<td>Convertible</td>
<td>$978m</td>
</tr>
<tr>
<td>Guodian Nanjing Automation</td>
<td>Shanghai Stock Exchange</td>
<td>Digital Energy</td>
<td>Private Investment in Public Equity (PIPE)</td>
<td>$545m</td>
</tr>
<tr>
<td>Risen Energy</td>
<td>Shenzhen Stock Exchange</td>
<td>Solar</td>
<td>Secondary</td>
<td>$465m</td>
</tr>
<tr>
<td>Greencoat UK Wind</td>
<td>London Stock Exchange</td>
<td>Wind</td>
<td>Secondary</td>
<td>$447m</td>
</tr>
<tr>
<td>China Everbright Greentech</td>
<td>Hong Kong Stock Exchange</td>
<td>Biomass &amp; Waste</td>
<td>IPO</td>
<td>$434m</td>
</tr>
</tbody>
</table>
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 – 2018 YTD

Values as of Jan 9, 2018, 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 – 2018 YTD

Source: Bloomberg New Energy Finance

Values as of Jan 9, 2018. All indexes re-based to 100 on Jan 1, 2015.

Bloomberg
New Energy Finance
Definitions and FAQs

How Bloomberg New Energy Finance defines clean energy
Definitions

2017 Clean Energy Investment Types and Flows

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.
Definitions

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.
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.
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