Clean Energy Investment Trends, 1Q 2018

2018, following in 2017’s footsteps

Abraham Louw

April 11, 2018
Solar Boom In China Boost Global Investment in 2017

Clean energy investment was $61.1 billion in the first quarter of 2018, down 10% year-on-year but there were pockets of strength, mainly in developing economies.

- Developing countries were prominent in clean energy investment in the first three months of 2018, with China once again accounting for more than 40% of the world total.

- Eye-catching projects reached financial close in Morocco, Vietnam, Indonesia and Mexico like the $2.4 billion 800MW NOORm Midelt Portfolio in Morocco, made up of a mix of PV panels and solar thermal systems with storage.

- Overal, solar investment slip 19% to $37.4 billion, affected both by weaker activity in some markets and by lower unit prices for photovoltaic systems.

- Wind investment showed a rise of 10% in the first quarter to $18.9 billion.

- The first quarter figures are the lowest for any quarter since 3Q 2016, but it is too early to predict a fall in annual investment this year. For instance, we expect to see the financing of a number of big-ticket offshore wind projects in U.K., Belgian, Dutch and Danish waters during the months ahead.
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Quarterly Trends, New Investment

Quarterly trends since 1Q 2005
Global New Investment in Clean Energy

1Q 2005 – 1Q 2018

$bn

Quarterly Trends, New Investment

Version WF18.04
All values nominal

Four quarter running average

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy, by Region
1Q 2005 – 1Q 2018

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

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy, by Sector

1Q 2005 – 1Q 2018

Solar moves from third biggest sector in 2006, behind wind and biofuels, to the biggest sector in most quarters by 2011.

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
Global New Investment in Clean Energy, by Asset Class
1Q 2005 – 1Q 2018

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

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

Global New Investment in Clean Energy, VC / PE
1Q 2005 – 1Q 2018

$bn

PE expansion
VC late
VC early

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy, Public Markets
1Q 2005 – 1Q 2018

$bn

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy

AMER

1Q 2005 – 1Q 2018

$bn

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

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
Quarterly Trends, New Investment

New Investment in Clean Energy

EMEA

1Q 2005 – 1Q 2018

$bn

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

Version WF18.04
All values nominal

Solar  Wind  Other
New Investment in Clean Energy
APAC
1Q 2005 – 1Q 2018

$bn

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
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?
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 2005 – 1Q 2018

$bn

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy Europe

1Q 2005 – 1Q 2018

$bn

Four quarter running average

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
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
1Q 2005 – 1Q 2018

$bn

Four quarter running average

Source: Bloomberg New Energy Finance
2017 was a record year for solar investment in China, we expect 2018 to be similar, see this note.

Source: Bloomberg New Energy Finance
Brazil enjoyed a biofuels investment boom in 2007-08 and, later, a pick-up in wind farm development on the back of auction wins.
Quarterly Trends, New Investment

New Investment in Clean Energy
Canada
1Q 2005 – 1Q 2018

$bn

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
Quarterly Trends, New Investment

New Investment in Clean Energy
Mexico
1Q 2005 – 1Q 2018

$bn

Four quarter running average

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
United Kingdom
1Q 2005 – 1Q 2018

On of 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 2005 – 1Q 2018

$bn

Source: Bloomberg New Energy Finance
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.
New Investment in Clean Energy
Spain
1Q 2005 – 1Q 2018

$bn

Quarterly Trends, New Investment

Source: Bloomberg New Energy Finance

All values nominal

Version WF18.04
Retroactive cuts to solar feed-in tariffs have deterred clean energy investment in Italy in recent years.
Quarterly Trends, New Investment

New Investment in Clean Energy
Japan
1Q 2005 – 1Q 2018

$bn

Source: Bloomberg New Energy Finance
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.
Australia achieved record investment levels in 2017, however, 2017 will likely mark a peak – investment will taper over the coming years unless there is a significant change in government policy, see this note.
Quarterly Trends, New Investment

New Investment in Clean Energy Vietnam
1Q 2005 – 1Q 2018

$bn

Four quarter running average

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
Quarterly Trends, Funds in Circulation

Quarterly trends since 1Q 2005
Quarterly Trends, Funds in Circulation

Global Clean Energy, Funds in Circulation, by Region
1Q 2005 – 1Q 2018

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.

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
Quarterly Trends, Funds in Circulation

Global Clean Energy, Funds in Circulation, by Sector

1Q 2005 – 1Q 2018

$bn

Solar  Wind  Other  Biofuels

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
Global Clean Energy, Funds in Circulation, by Asset Class
1Q 2005 – 1Q 2018

$bn

Quarterly Trends, Funds in Circulation

Source: Bloomberg New Energy Finance
Top Deals

Top Quarterly Deals for 1Q 2018
## 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>NOORm Midelt Solar Portfolio</td>
<td>Morocco</td>
<td>Solar</td>
<td>Debt</td>
<td>800 MW</td>
<td>$2,411m</td>
</tr>
<tr>
<td>Xcel Rush Creek Wind Farm</td>
<td>U.S.</td>
<td>Wind</td>
<td>Equity</td>
<td>600 MW</td>
<td>$1,036m</td>
</tr>
<tr>
<td>Supreme Rantau Dedap Geothermal Project</td>
<td>Indonesia</td>
<td>Geothermal</td>
<td>Debt</td>
<td>91 MW</td>
<td>$701m</td>
</tr>
<tr>
<td>NLC TANGEDCO PV Plant</td>
<td>India</td>
<td>Solar</td>
<td>Debt</td>
<td>709 MW</td>
<td>na</td>
</tr>
<tr>
<td>United States Nordex Wind Farm I</td>
<td>U.S.</td>
<td>Wind</td>
<td>Equity</td>
<td>319 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>Beijing CHJ Information Technology</td>
<td>China</td>
<td>Electrified Transport</td>
<td>VC - Series B / Second round</td>
<td>$475m</td>
</tr>
<tr>
<td>Guangzhou Xiaopeng Motors Technology</td>
<td>China</td>
<td>Electrified Transport</td>
<td>VC - Series B / Second round</td>
<td>$348m</td>
</tr>
<tr>
<td>Enerkem</td>
<td>Canada</td>
<td>Biofuels</td>
<td>PE - Expansion capital</td>
<td>$224m</td>
</tr>
<tr>
<td>Zhe Jiang Skio Matrix</td>
<td>China</td>
<td>Electrified Transport</td>
<td>VC - Series D / Fourth round</td>
<td>$159m</td>
</tr>
<tr>
<td>C3 Inc</td>
<td>U.S.</td>
<td>Digital Energy</td>
<td>PE - Expansion capital</td>
<td>$100m</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>Implementa Hebe</td>
<td>Nordic Growth Market</td>
<td>Solar</td>
<td>Exercise of Rights</td>
<td>$85m</td>
</tr>
<tr>
<td>Renewables Infrastructure Group</td>
<td>London Stock Exchange</td>
<td>Wind</td>
<td>Secondary</td>
<td>$81m</td>
</tr>
<tr>
<td>JinkoSolar Holding</td>
<td>New York Stock Exchange</td>
<td>Solar</td>
<td>Secondary</td>
<td>$75m</td>
</tr>
<tr>
<td>Terna Energy</td>
<td>Athens Stock Exchange</td>
<td>Wind</td>
<td>Secondary</td>
<td>$64m</td>
</tr>
<tr>
<td>Blockchain Power Trust</td>
<td>TSX Venture Exchange</td>
<td>Solar</td>
<td>Secondary</td>
<td>$35m</td>
</tr>
</tbody>
</table>
Annual Trends, New Investment

Annual trends since 2005
Annual Trends, New Investment

Global New Investment in Clean Energy
2005 – 2017

$bn

Year
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Investment
88.0
129.8
182.2
205.2
206.8
276.1
324.0
290.7
268.6
321.3
360.3
324.6
333.5

% Change
48%
40%
13%
1%
33%
17%
-10%
-8%
20%
12%
-10%
3%

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
Global New Investment in Clean Energy by Region
2005 – 2017

$bn

Source: Bloomberg New Energy Finance
Global New Investment in Clean Energy by Asset Class
2005 – 2017

$bn

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
United States
2005 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy Europe
2005 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy Europe
2005 – 2017

$bn

version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
China
2005 – 2017

$bn

2005: 8.8
2006: 11.2
2007: 16.8
2008: 25.6
2009: 38.7
2010: 45.0
2011: 51.5
2012: 62.6
2013: 66.9
2014: 89.6
2015: 125.4
2016: 107.2
2017: 132.6

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
Annual Trends, New Investment

New Investment in Clean Energy
China, by sector
2005 – 2017

$bn

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
Brazil
2005 – 2017

$bn

Annual Trends, New Investment
New Investment in Clean Energy Canada

2005 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
Mexico
2005 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
United Kingdom
2005 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
United Kingdom, by sector
2005 – 2017

$bn
New Investment in Clean Energy
Germany, by sector
2005 – 2017

$bn

Onshore and offshore wind have dominated German investment since the end of the solar boom in 2012.
New Investment in Clean Energy
France
2005 – 2017

$bn

Annual Trends, New Investment

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>3.2</td>
</tr>
<tr>
<td>2006</td>
<td>5.3</td>
</tr>
<tr>
<td>2007</td>
<td>4.9</td>
</tr>
<tr>
<td>2008</td>
<td>5.6</td>
</tr>
<tr>
<td>2009</td>
<td>4.6</td>
</tr>
<tr>
<td>2010</td>
<td>6.3</td>
</tr>
<tr>
<td>2011</td>
<td>10.5</td>
</tr>
<tr>
<td>2012</td>
<td>7.0</td>
</tr>
<tr>
<td>2013</td>
<td>5.2</td>
</tr>
<tr>
<td>2014</td>
<td>7.3</td>
</tr>
<tr>
<td>2015</td>
<td>4.1</td>
</tr>
<tr>
<td>2016</td>
<td>4.3</td>
</tr>
<tr>
<td>2017</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
Spain
2005 – 2017

$bn

Source: Bloomberg New Energy Finance
New Investment in Clean Energy
Italy
2005 – 2017

$bn

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
Japan
2005 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
Japan, by sector
2005 – 2017

$bn

Source: Bloomberg New Energy Finance
New Investment in Clean Energy India
2005 – 2017

$bn

Annual Trends, New Investment

Source: Bloomberg New Energy Finance

Version WF18.04
All values nominal
New Investment in Clean Energy
Australia
2005 – 2017

$bn

1.4  1.8  1.5  1.5  2.3  5.2  6.2  5.4  4.8  2.2  2.2  3.6  9.0

Version WF18.04
All values nominal

Source: Bloomberg New Energy Finance
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 April 6, 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

Values as of April 6, 2018, 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
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
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

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