

January 2016


# CLEAN ENERGY INVESTMENT: Q4 2015 FACTPACK

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1. Clean energy coverage and definitions
2. Annual clean energy investment overview
3. Quarterly trends in clean energy: new investment
4. Quarterly trends in clean energy: funds in circulation
5. Clean energy indexes



# CLEAN ENERGY COVERAGE & DEFINITIONS

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# CLEAN ENERGY COVERAGE

**Key:**


	Renewable	✓ Quarterly
	Clean Energy	✓ Annual Only

		Asset Class								
		Technology / Services	Asset Finance (1MW+)	Small Scale Finance (<1MW)	Public Markets	VCPE	M&A	Re-Invested Equity	Corporate R&D	Government R&D
Total Clean Energy	Renewables	Biofuels	✓		✓	✓	✓	✓	✓	✓
		Biomass & Waste	✓		✓	✓	✓	✓	✓	✓
		Geothermal	✓		✓	✓	✓	✓	✓	✓
		Marine	✓		✓	✓	✓	✓	✓	✓
		Small hydro	✓		✓	✓	✓	✓	✓	✓
		Solar	✓	✓	✓	✓	✓	✓	✓	✓
		Wind	✓		✓	✓	✓	✓	✓	✓
		Offshore wind transmission	✓							
	Low Carbon Services	Carbon Markets			✓	✓	✓			
		General Finance & Legal Services			✓	✓	✓		✓	✓
		Services & Support (Clean Energy)			✓	✓	✓			
	Energy Smart Technologies	Digital Energy	✓		✓	✓	✓			
		Efficiency: Built Environment			✓	✓	✓			
		Efficiency: Industry			✓	✓	✓			
		Efficiency: Supply Side			✓	✓	✓		✓	✓
		Electrified Transport			✓	✓	✓			
		Energy Storage	✓		✓	✓	✓			
Fuel Cells				✓	✓	✓				
Hydrogen			✓	✓	✓					

<b>Venture capital &amp; private equity (VCPE)</b>	Early and late stage VC funding rounds as well as funds raised privately for the purposes of expansion by companies that are primarily involved in the clean energy industry according to BNEF exposure ratings.
<b>Public markets (PM)</b>	New equity raised on capital or over-the-counter markets by publicly quoted companies that are primarily involved in the clean energy industry according to BNEF exposure ratings . This may be through initial public offerings (IPOs) or follow-on offerings (secondary, PIPEs, convertibles etc).
<b>Asset finance (AF)</b>	The new-build financing of renewable energy generating projects. This includes both electricity generating and biofuel production assets. Projects may be financed via the balance sheets of the project owners, or through financing mechanisms such as syndicated equity from institutional investors, or project debt from banks.
<b>Asset finance (EST)</b>	Same as above, but for digital energy and energy storage sub categories of the Energy Smart Technologies sector. We only calculate this on an annual basis, so will not be included in quarterly investment estimates.
<b>Re-invested equity</b>	Isolates values for balance-sheet-financed project investments (AF) by companies that have raised money through VC/PE investors or on the capital markets over the past 12 months. The purpose of this calculation is to prevent double-counting upon aggregation of project investments and company investments when calculating total new financial investment in clean energy.
<b>Small-scale solar</b>	Rooftop solar PV below 1MW in capacity. Given the difficulty in tracking individual residential-scale projects, our main asset finance database excludes projects below a certain threshold. This threshold for most tracked sectors is around 1MW. To compensate for this, we add back top-level estimates for missed deals of this nature.
<b>Government R&amp;D</b>	Government R&D figures are sourced from the IEA, IMF, OECD, various government agencies and the BNEF green stimulus dataset.
<b>Corporate R&amp;D</b>	The Bloomberg terminal is used to source Corporate R&D figures for key quoted companies in each clean energy sector, supplemented by data from the BNEF desktop and insight.

Source: Bloomberg New Energy Finance

<b>Wind</b>	Included in this sector are players across the entire value chain of both onshore and offshore developments. From direct investment into wind farms to funds raised by manufacturers of turbines, components and subassemblies, developers, generators, utilities and engineering firms.
<b>Solar</b>	All technologies that capture energy directly from the sun. These include production of electricity using semiconductor-based photovoltaic (PV) materials, use of concentrated sunlight to heat fluid to drive power generation equipment (solar thermal electricity generation or 'STEG'), and passive methods which use solar to replace fossil fuel energy, e.g. to heat water. Whilst company level investment of passive methods is recorded, investment in passive projects is not.
<b>Biofuels</b>	Liquid transportation fuels including biodiesel and bioethanol. These can be derived from a range of biomass sources, including sugar cane, rape seed (canola), soybean oil or cellulose. 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 that are specially adapted for the use of biofuels and products, and the services on which they depend.
<b>Biomass &amp; waste</b>	Production and consumption of solid and gaseous fuels derived from biomass. Solid biomass for the energy sector can include a number of specially-grown crops, such as elephant grass or coppiced willow, but it can also consist of crop residues such as straw. We include in this sector processors of other waste matter for energy generation, such as sewage waste, chemical by-products and biogas produced from municipal waste, as their exploitation often involves the same technologies as grown-for-purpose biomass.
<b>Other renewables</b>	Includes: Small hydro – the generation of electric power from the movement of water, with project capacity between 1MW and 50MW Geothermal – the extraction of useful power from heat stored in the earth Marine – the extraction of energy from the sea.
<b>Energy smart technologies (EST)</b>	This sector covers a range of non-renewable clean energy technologies including digital energy and smart grids, power storage, hydrogen and fuel cells, advanced transportation and energy efficiency on both the demand and supply side. For more in depth definitions of these please visit our corporate website:
<b>Other low-carbon tech / services</b>	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 organisations across the carbon capture and storage (CCS) and carbon market value chains.



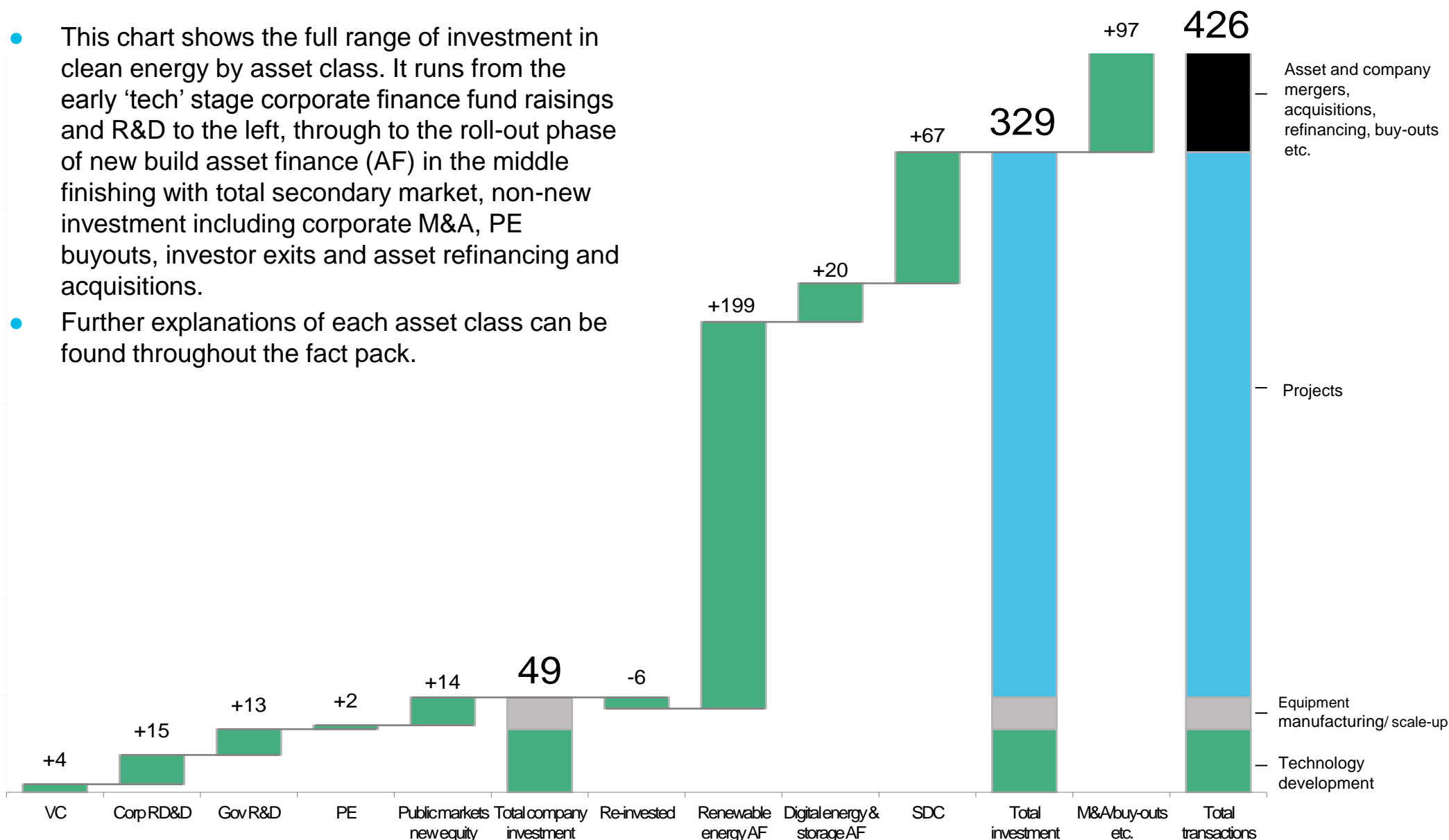
**ANNUAL CLEAN  
ENERGY  
INVESTMENT  
OVERVIEW**

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# 2015 CLEAN ENERGY INVESTMENT TYPES & FLOWS

(\$BN)

- This chart shows the full range of investment in clean energy by asset class. It runs from the early 'tech' stage corporate finance fund raisings and R&D to 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, PE buyouts, investor exits and asset refinancing and acquisitions.
- Further explanations of each asset class can be found throughout the fact pack.



Note: Total values include estimates for undisclosed deals. AF = asset finance, SDC = small distributed capacity.

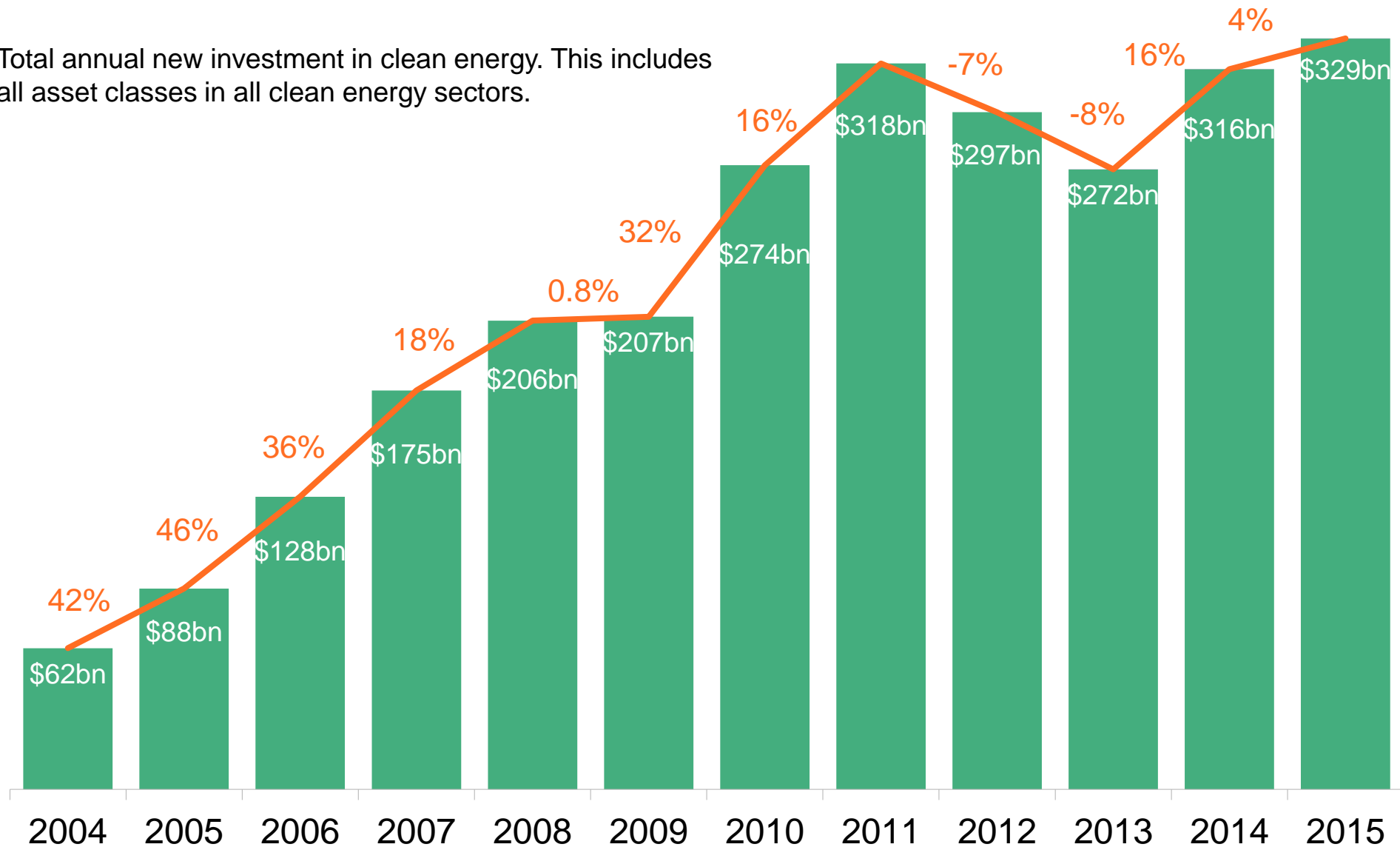
Source: Bloomberg New Energy Finance



# NEW INVESTMENT IN CLEAN ENERGY

2004-15 (\$BN)

- Total annual new investment in clean energy. This includes all asset classes in all clean energy sectors.



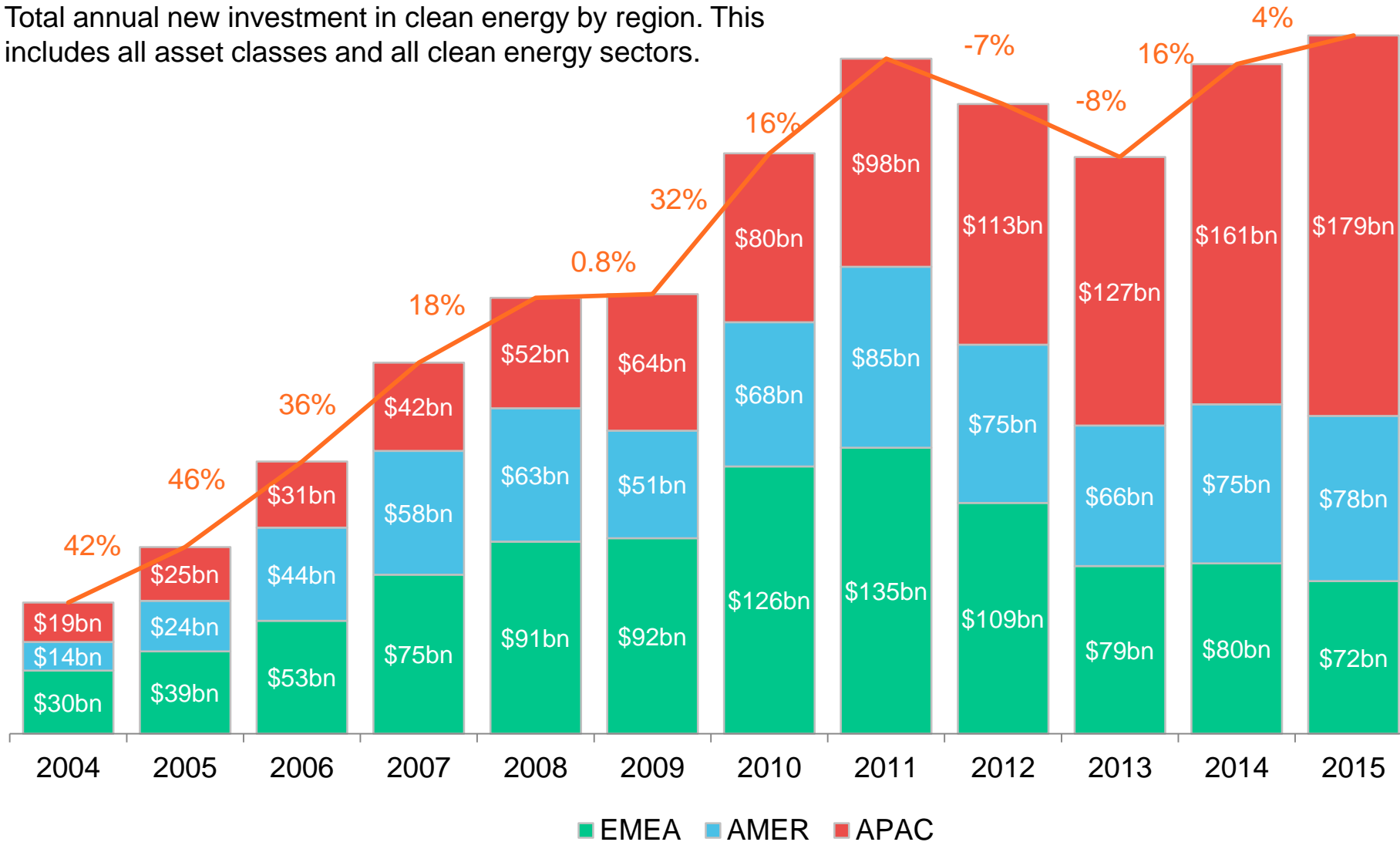
Note: Total values include estimates for undisclosed deals. Includes corporate and government R&D, and spending for digital energy and energy storage projects (not reported in quarterly statistics).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY BY REGION

2004-15 (\$BN)

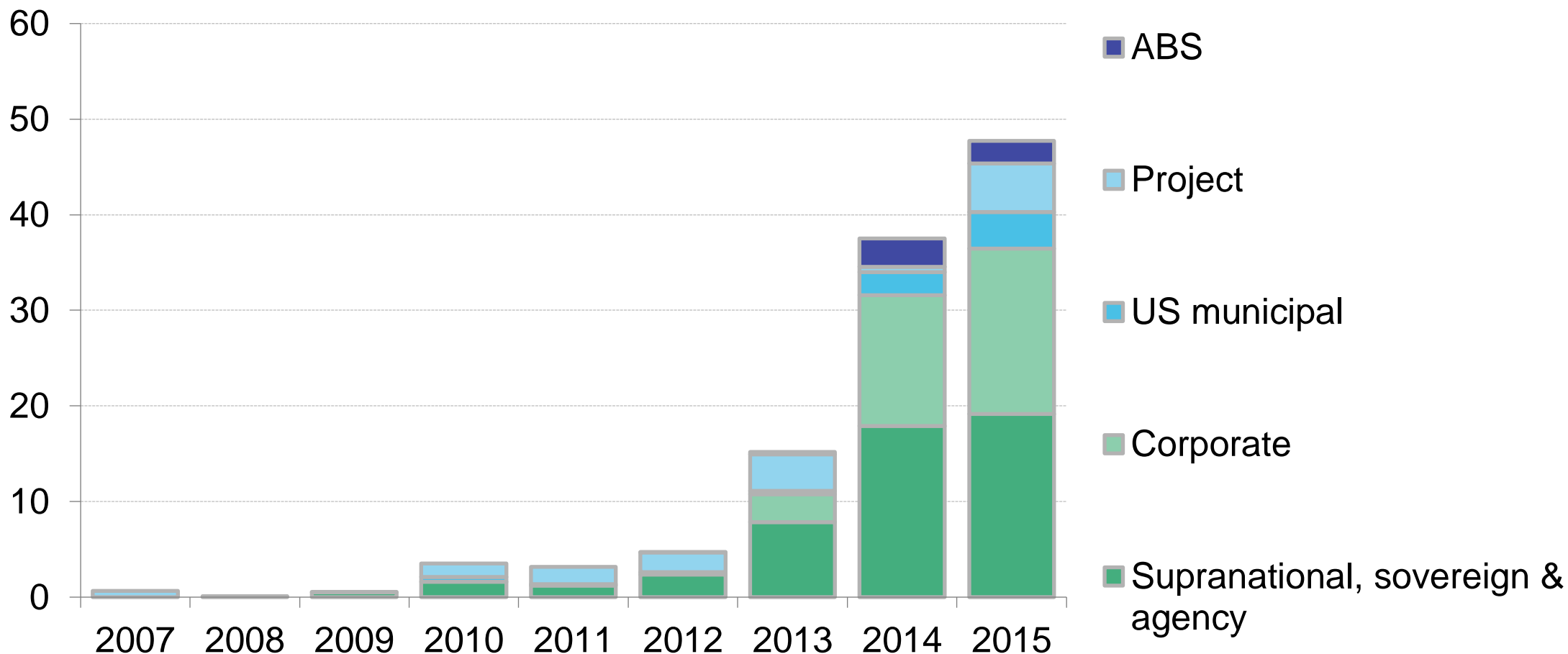
- Total annual new investment in clean energy by region. This includes all asset classes and all clean energy sectors.



Note: Total values include estimates for undisclosed deals. Includes corporate and government R&D, and spending for digital energy and energy storage projects (not reported in quarterly statistics).

Source: Bloomberg New Energy Finance

# ANNUAL HISTORICAL GREEN BOND ISSUANCE, BY TYPE, 2007-15 (\$BN)



Notes: (1) The funds raised by green bonds are neither entirely inclusive nor exclusive of figures for clean energy asset finance. (2) 'Corporate', 'sovereign, supranational and agency' and 'US municipal' include only bonds explicitly labelled as green and which meet the criteria for receiving a green bond 'tag' on the Bloomberg Terminal. (3) 'Project' includes bonds backed by the cash flows of an underlying renewable energy project or portfolio of projects. (4) 'ABS' includes asset-backed securities whose cash flows come from a portfolio of underlying receivables such as loans, leases and PPAs where the receivables are associated with green (eg, renewable energy, energy efficiency) projects.



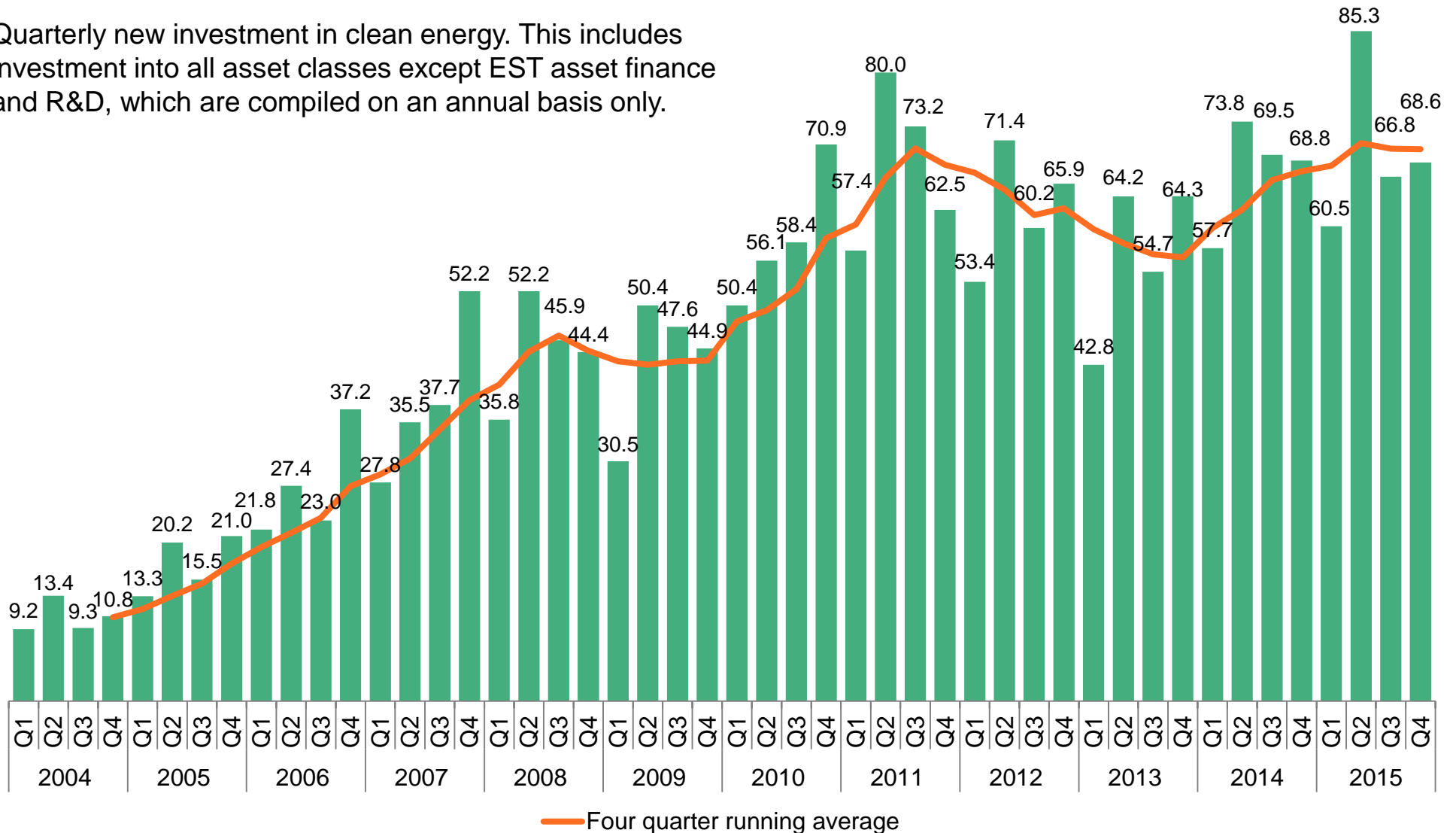
**QUARTERLY TRENDS  
IN CLEAN ENERGY:  
NEW INVESTMENT**

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# NEW INVESTMENT IN CLEAN ENERGY

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



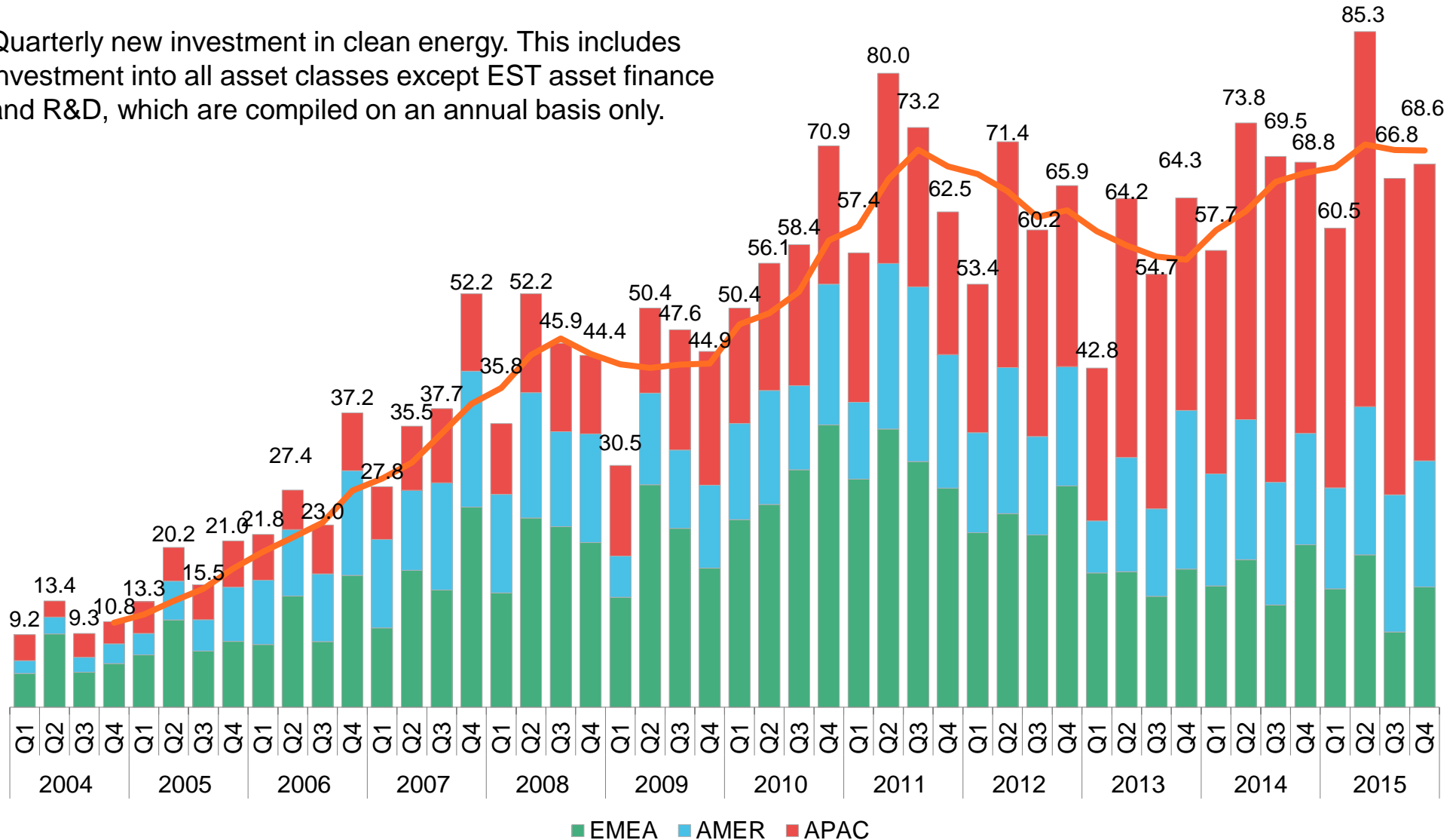
Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY BY REGION

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



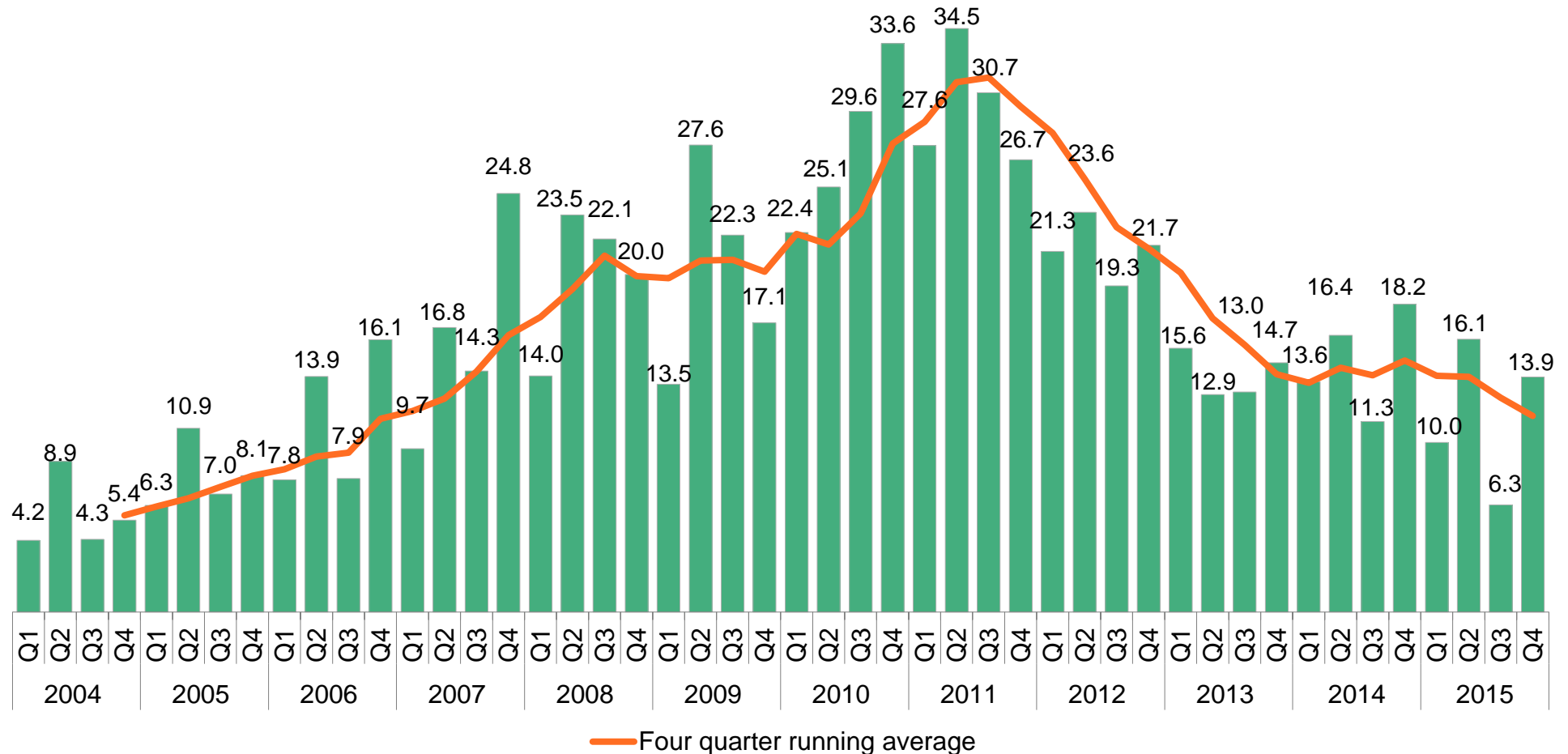
Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY IN EUROPE

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



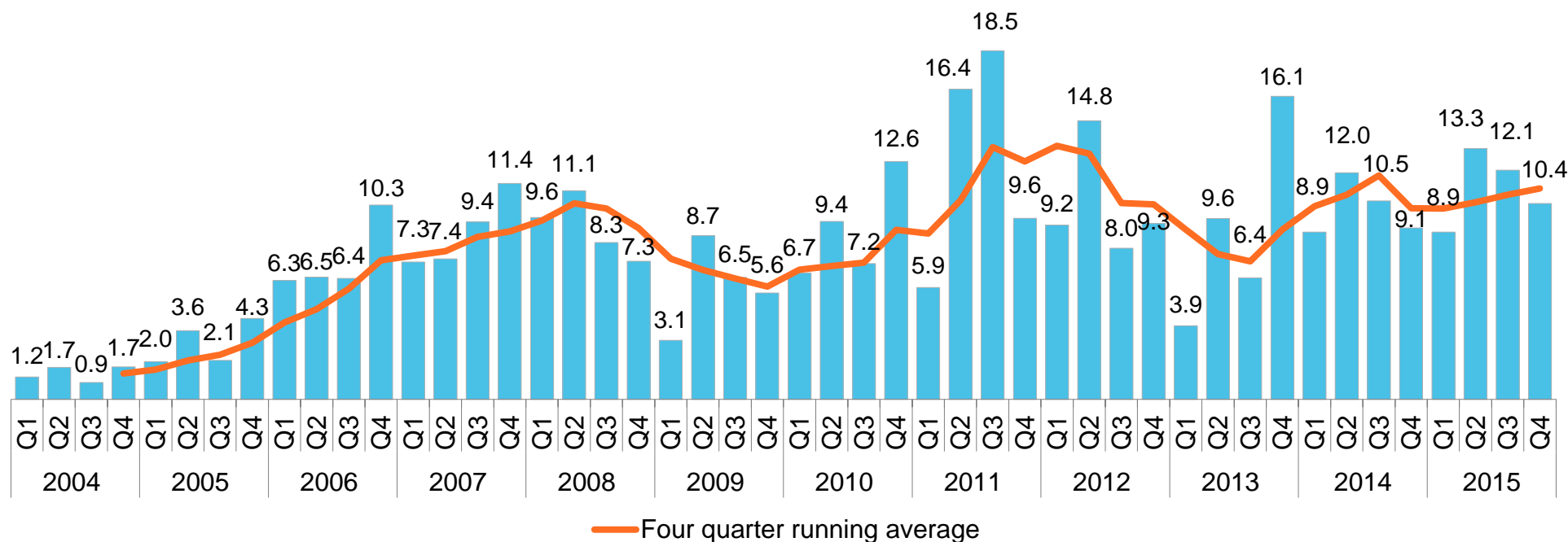
Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY IN THE US

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

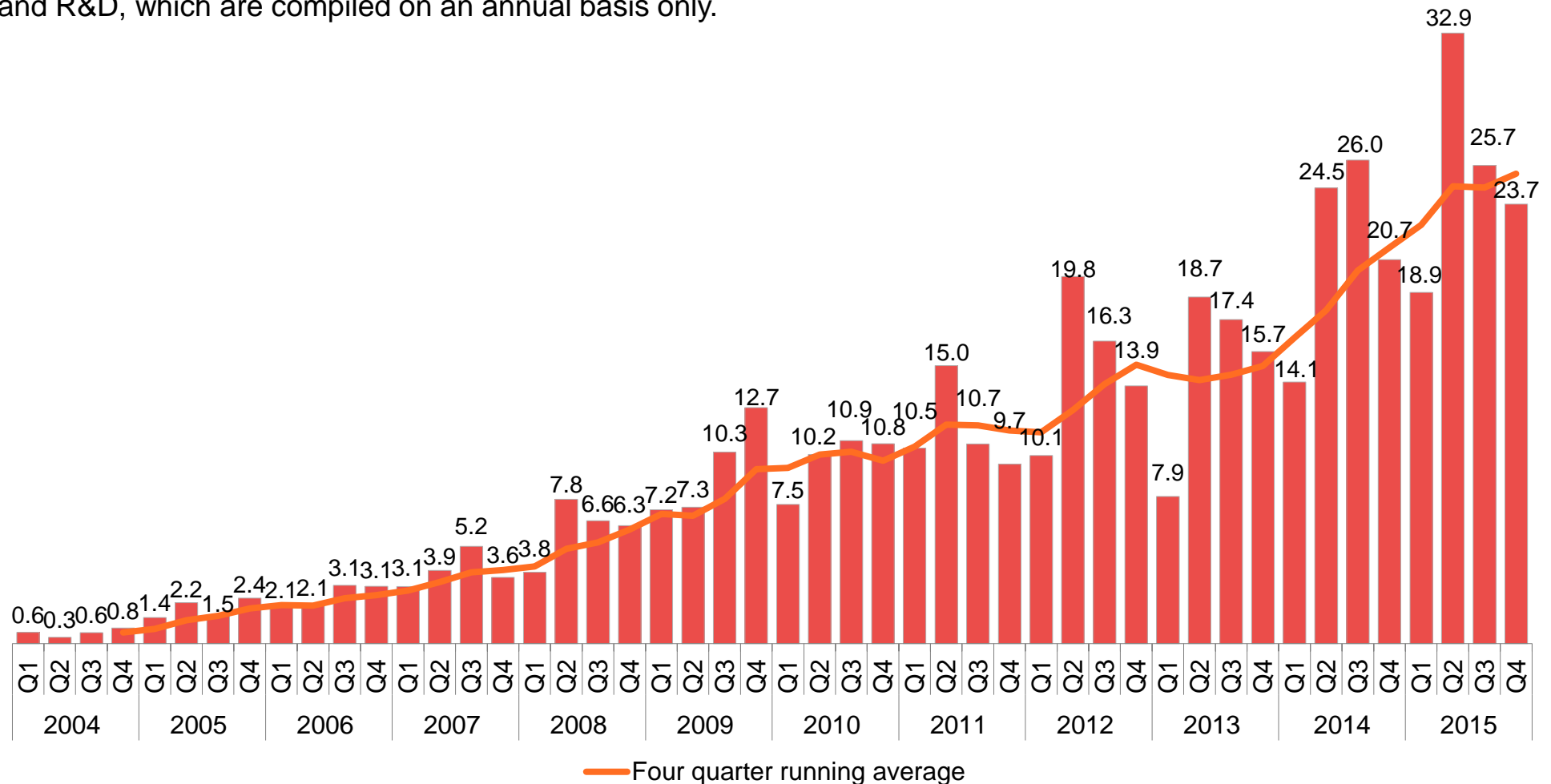
Source: Bloomberg New Energy Finance



# NEW INVESTMENT IN CLEAN ENERGY IN CHINA

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



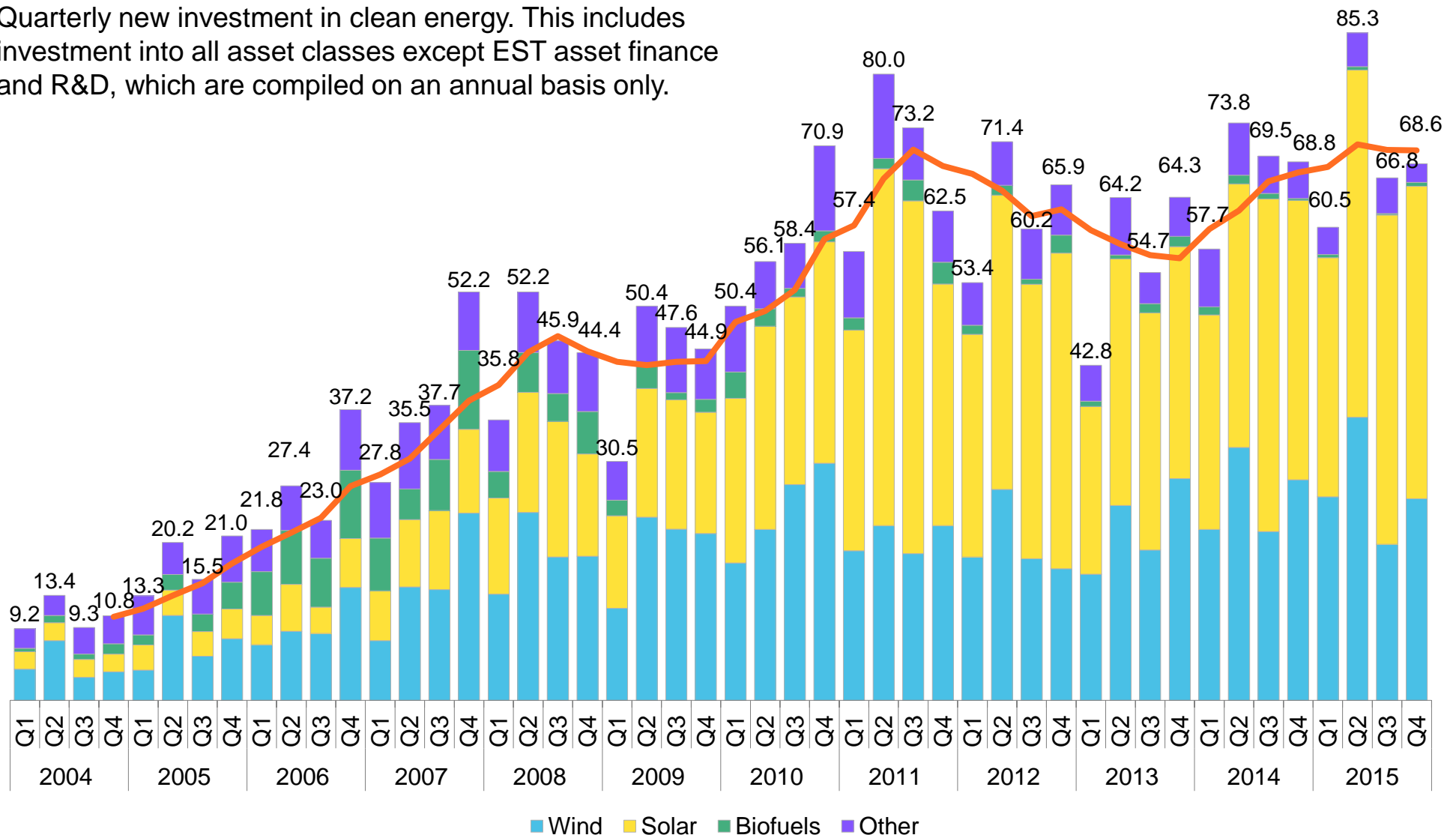
Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY BY SECTOR

Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.

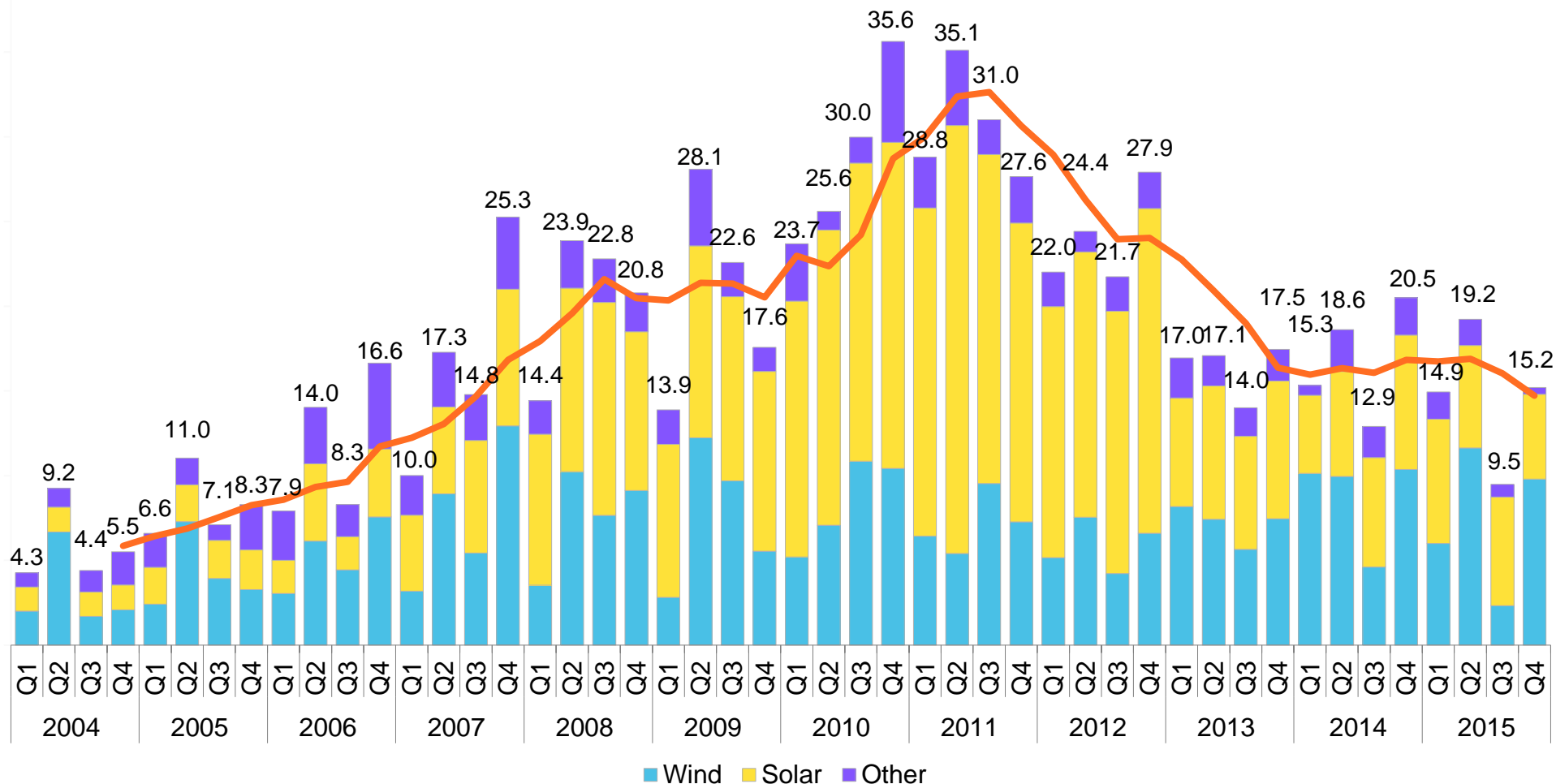


Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# EMEA NEW INVESTMENT IN CLEAN ENERGY BY SECTOR Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.

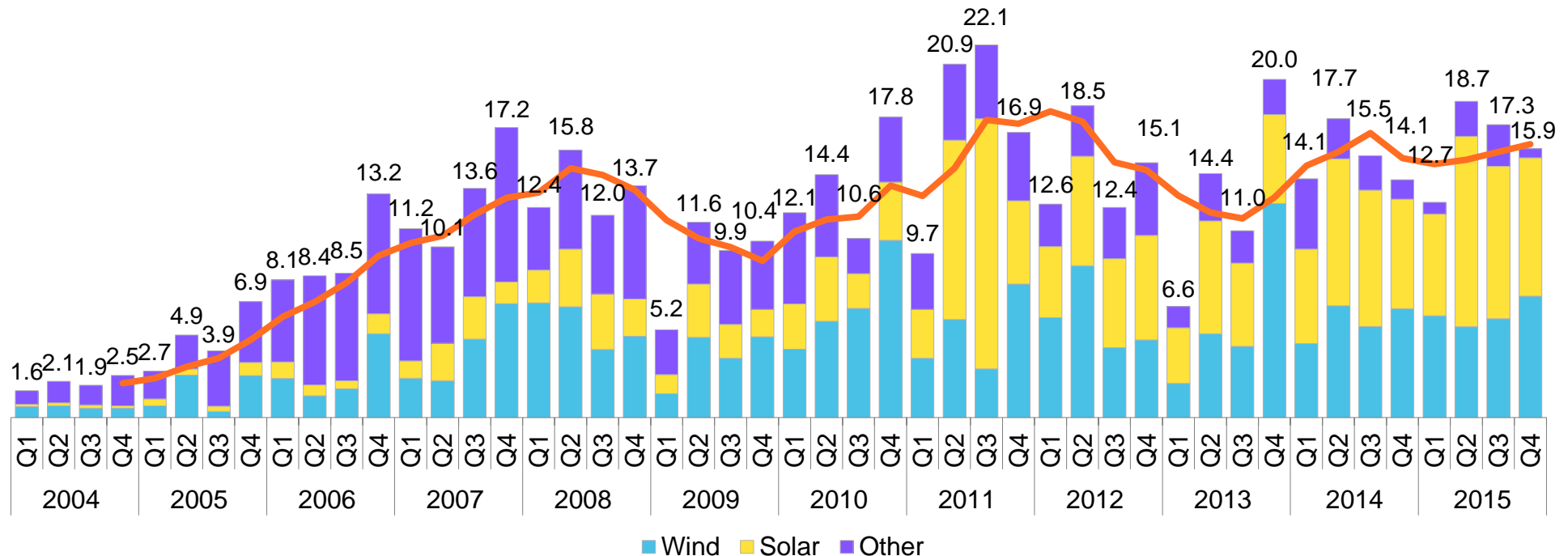


Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# AMER NEW INVESTMENT IN CLEAN ENERGY BY SECTOR Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.

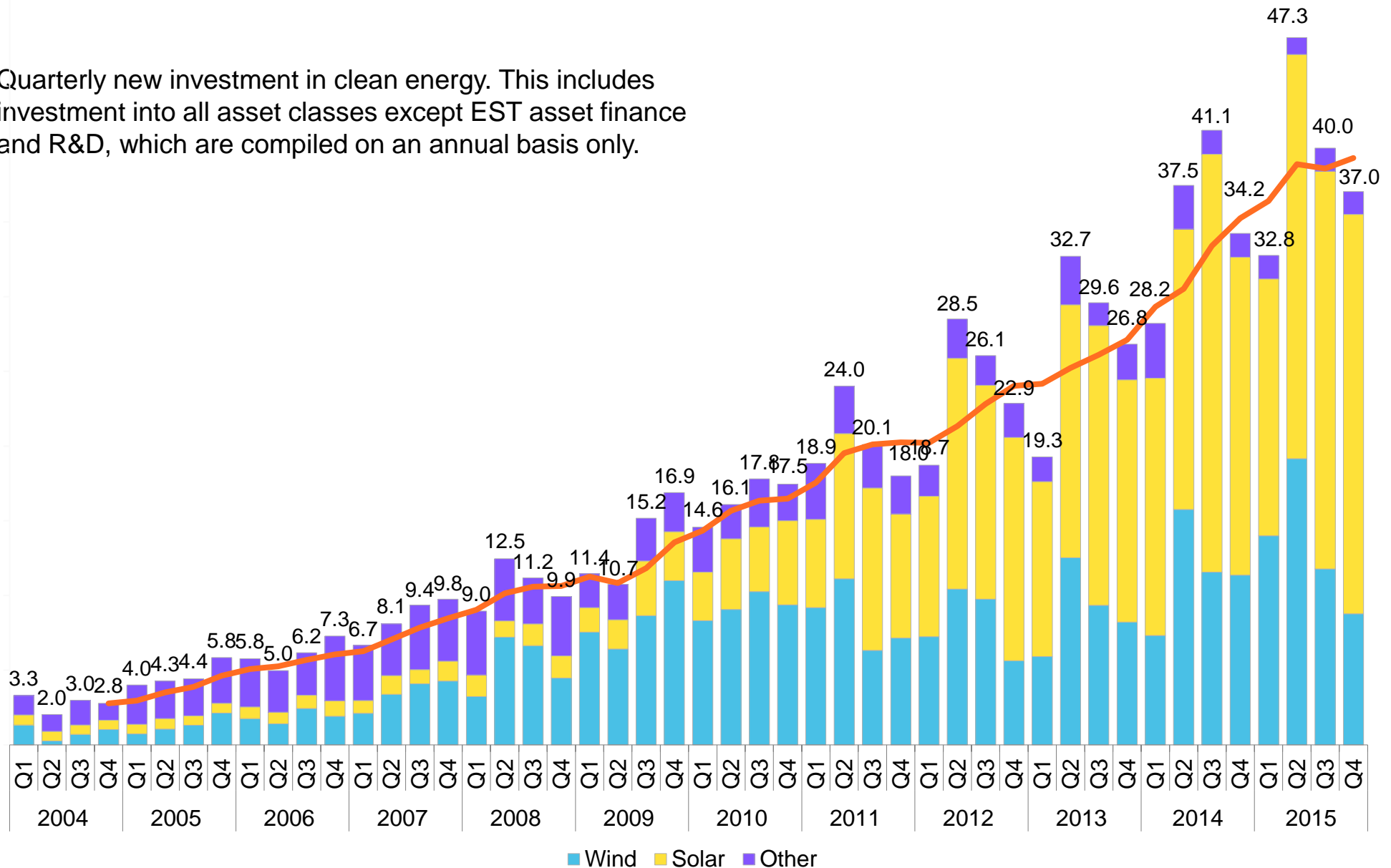


Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# APAC NEW INVESTMENT IN CLEAN ENERGY BY SECTOR Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.

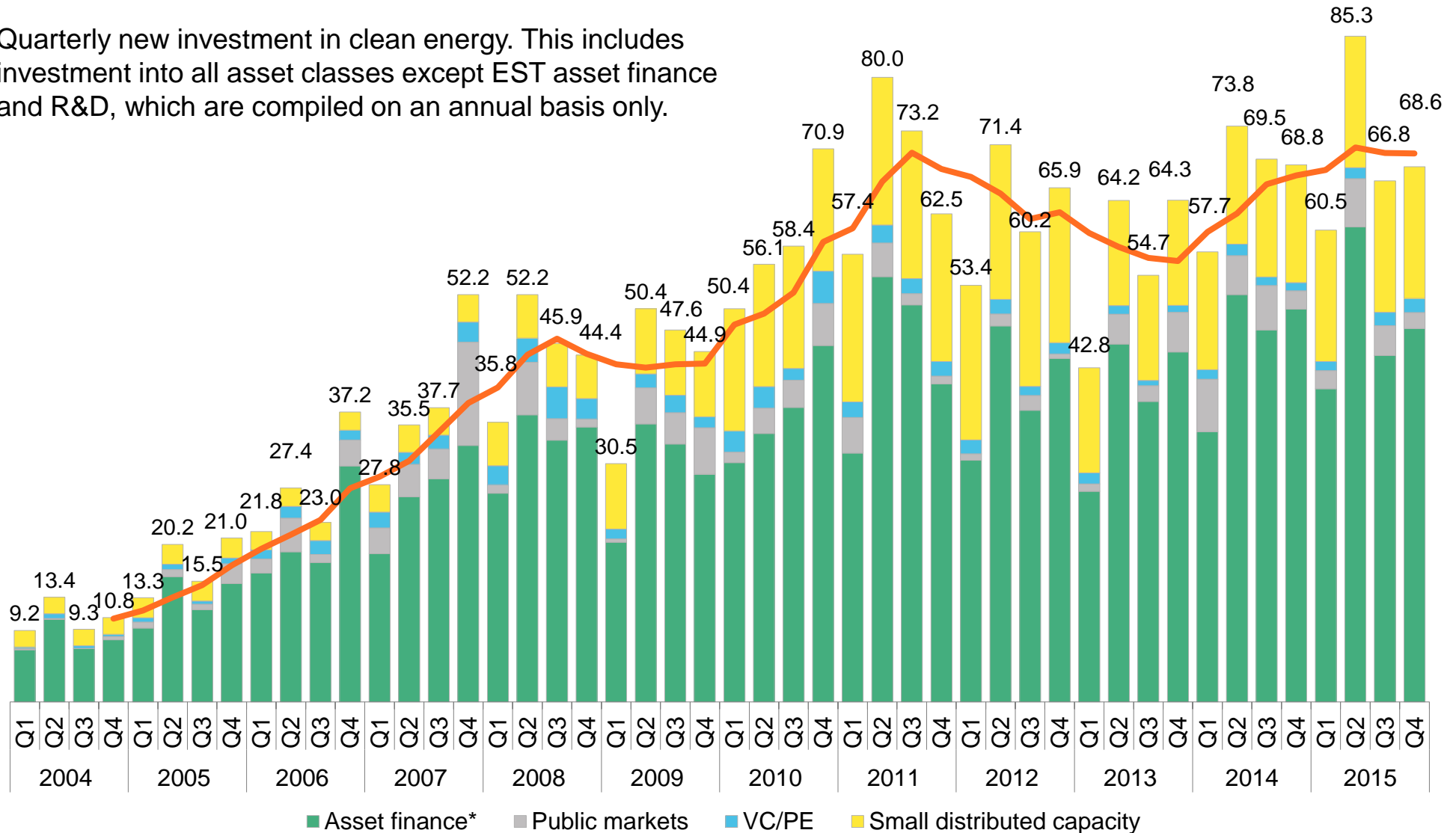


Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# NEW INVESTMENT IN CLEAN ENERGY BY ASSET CLASS Q1 2004-Q4 2015 (\$BN)

- Quarterly new investment in clean energy. This includes investment into all asset classes except EST asset finance and R&D, which are compiled on an annual basis only.



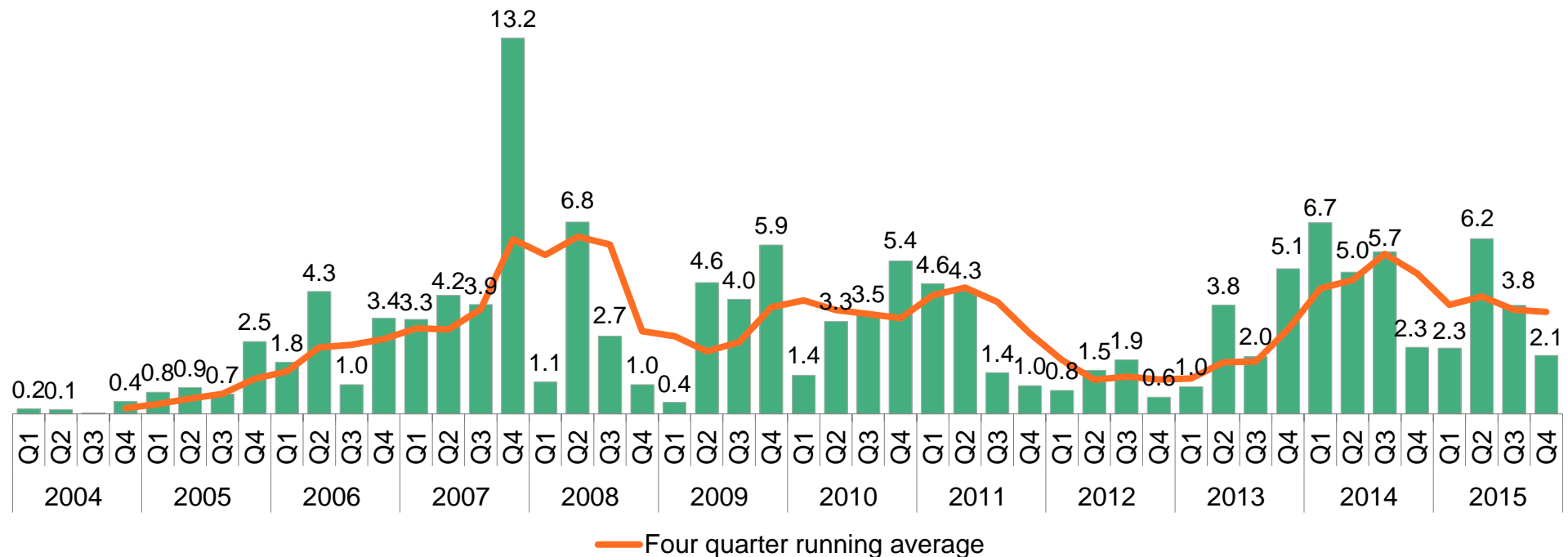
\*Asset finance adjusted for re-invested equity

Note: Total values include estimates for undisclosed deals. Excludes corporate and government R&D, and spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# PUBLIC MARKET NEW INVESTMENT IN CLEAN ENERGY Q1 2004-Q4 2015 (\$BN)

- New equity raised on capital or over-the-counter (OTC) markets by publicly quoted companies that are primarily involved in the clean energy industry. This may be through initial public offerings (IPOs) or follow-on offerings (secondary, PIPEs, convertibles etc).



Note: Total values include estimates for undisclosed deals.

Source: Bloomberg New Energy Finance

# TOP PUBLIC MARKET TRANSACTIONS OF THE QUARTER Q4 2015

Organisation	Stock exchange	Sector	Type of transaction	New equity raised	Total offering size
Sanan Optoelectronics	Shanghai Stock Exchange	Solar	Secondary	\$544m	\$544m
SunPower	NASDAQ Global Select Market (GS)	Solar	Convertible	\$400m	\$400m
Xiamen Changelight	Shenzhen Stock Exchange - Main Board	Efficiency: Built Environment	Secondary	\$125m	\$125m
Renewables Infrastructure Group	London Stock Exchange	Wind	Secondary	\$119m	\$119m
SolarCity	NASDAQ Global Select Market (GS)	Solar	Private Investment in Public Equity (PIPE)	\$113m	\$113m

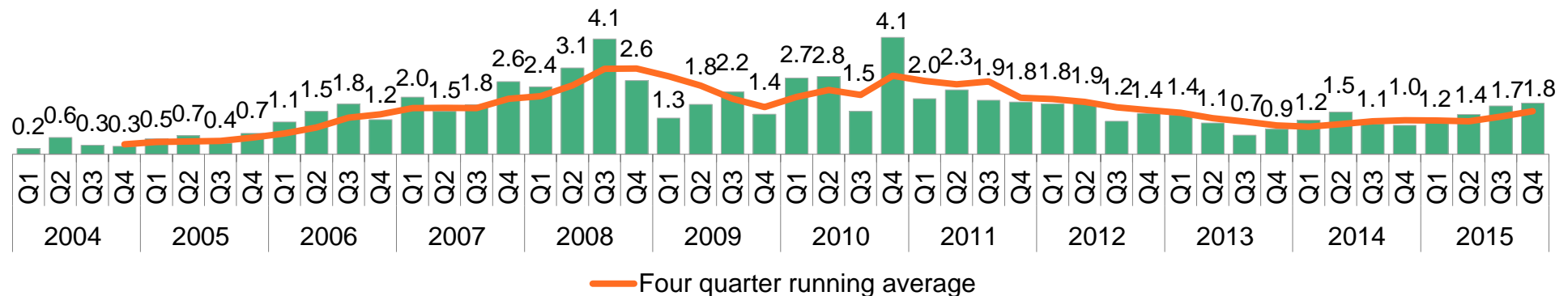
Source: Bloomberg New Energy Finance



# VC/PE NEW INVESTMENT IN CLEAN ENERGY

Q1 2004-Q4 2015 (\$BN)

- Early- and late-stage VC funding rounds as well as funds raised privately for the purposes of expansion by companies that are primarily involved in the clean energy industry according to BNEF exposure ratings.



Note: Total values include estimates for undisclosed deals.

Source: Bloomberg New Energy Finance

# TOP VC/PE TRANSACTIONS OF THE QUARTER

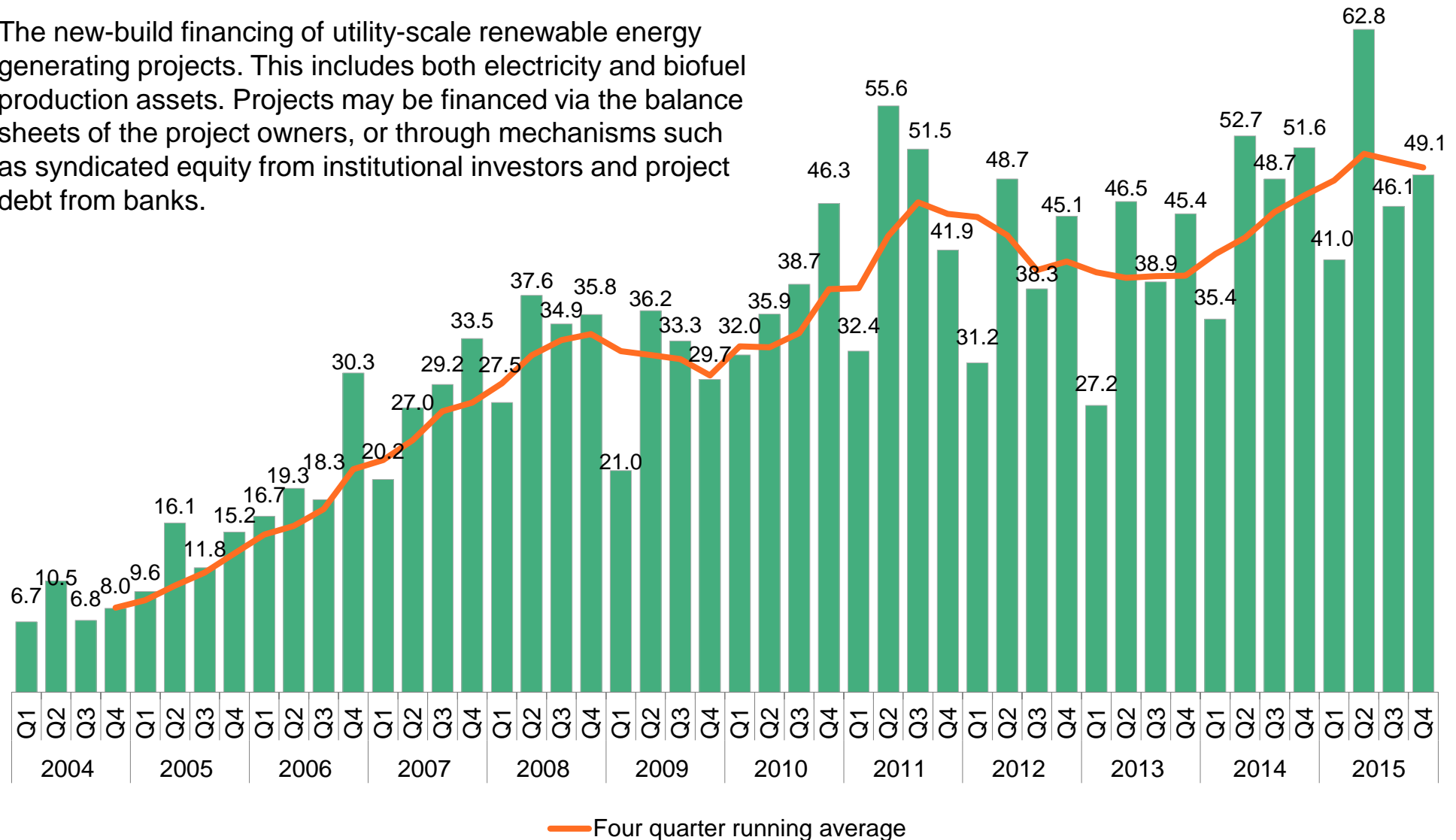
## Q4 2015

Organisation	Country	Sector	Type of transaction	Value
Welspun Energy	India	Solar	VC Early Stage	\$617m
Sunnova Energy	United States	Solar	PE Expansion Capital	\$300m
Renovate America	United States	Efficiency: Built Environment	VC Late Stage	\$90m
Sungevity	United States	Solar	PE Expansion Capital	\$50m
Yunicos	Germany	Energy Storage	PE Expansion Capital	\$50m

Source: Bloomberg New Energy Finance

# ASSET FINANCING FOR NEW-BUILD RENEWABLE ENERGY ASSETS Q1 2004-Q4 2015 (\$BN)

- The new-build financing of utility-scale renewable energy generating projects. This includes both electricity and biofuel production assets. Projects may be financed via the balance sheets of the project owners, or through mechanisms such as syndicated equity from institutional investors and project debt from banks.



Note: Total values include estimates for undisclosed deals. Excludes spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# TOP ASSET FINANCE TRANSACTIONS OF THE QUARTER Q4 2015

Project name	Country	Sector	Type of transaction	Capacity	Value
Galloper Offshore Wind Farm	United Kingdom	Wind	Debt	336MW	\$2314m
Nafin Mexico Wind Farm Portfolio	Mexico	Wind	Debt	1605MW	na
Walney Island Offshore Wind Farm Extension Phase I	United Kingdom	Wind	Equity	330MW	na
Walney Island Offshore Wind Farm Extension Phase II	United Kingdom	Wind	Equity	330MW	na
Nobelwind Offshore Wind Farm Phase II	Belgium	Wind	Debt	165MW	\$728m

Source: Bloomberg New Energy Finance



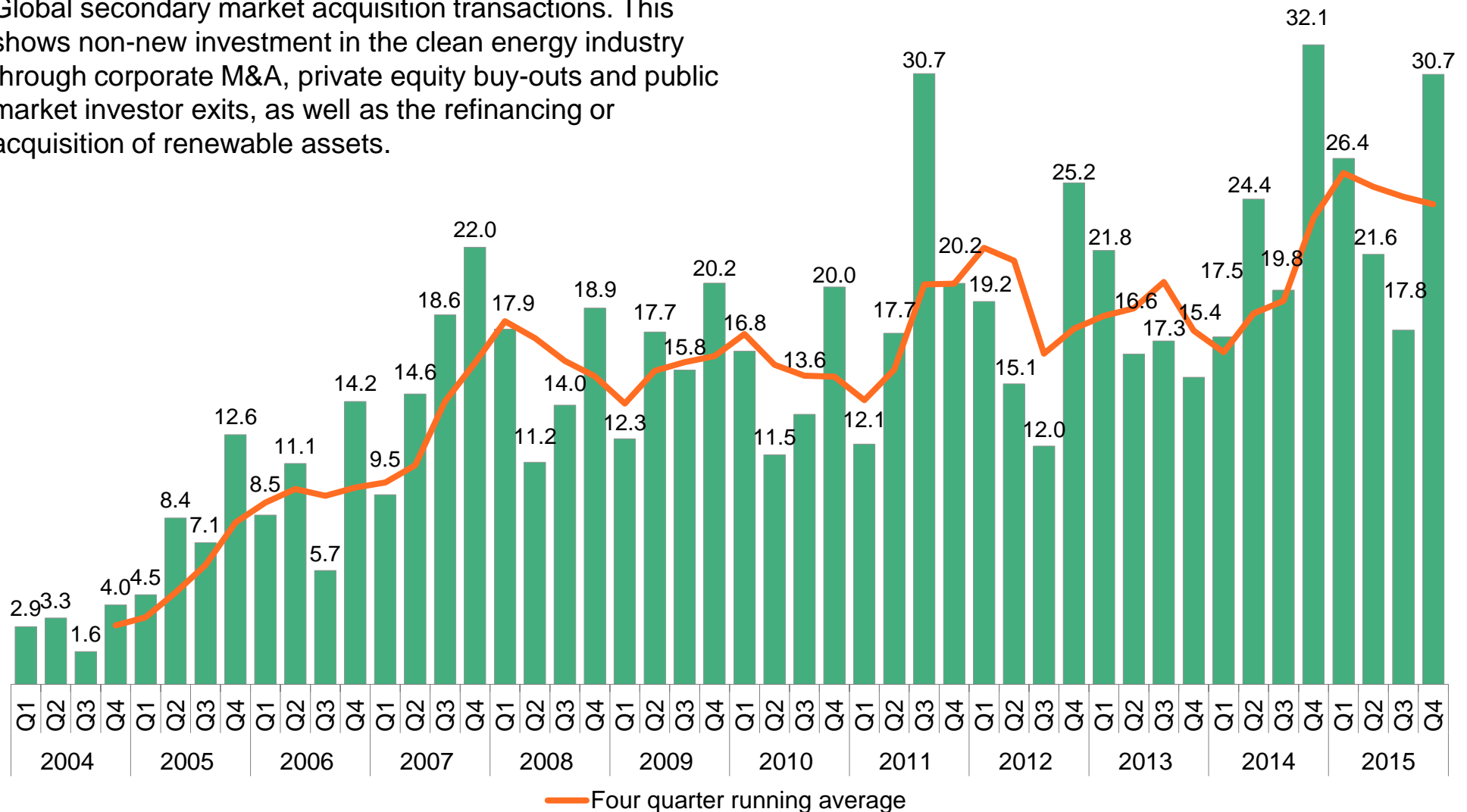
**QUARTERLY TRENDS  
IN CLEAN ENERGY:  
FUNDS IN  
CIRCULATION**

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# FUNDS IN CIRCULATION IN CLEAN ENERGY

Q1 2004-Q4 2015 (\$BN)

- Global secondary market acquisition transactions. This shows non-new investment in the clean energy industry through corporate M&A, private equity buy-outs and public market investor exits, as well as the refinancing or acquisition of renewable assets.



Note: Total values include estimates for undisclosed deals. Excludes spending for digital energy and energy storage projects (reported in annual statistics only).

Source: Bloomberg New Energy Finance

# TOP TRANSACTIONS FOR FUNDS IN CIRCULATION

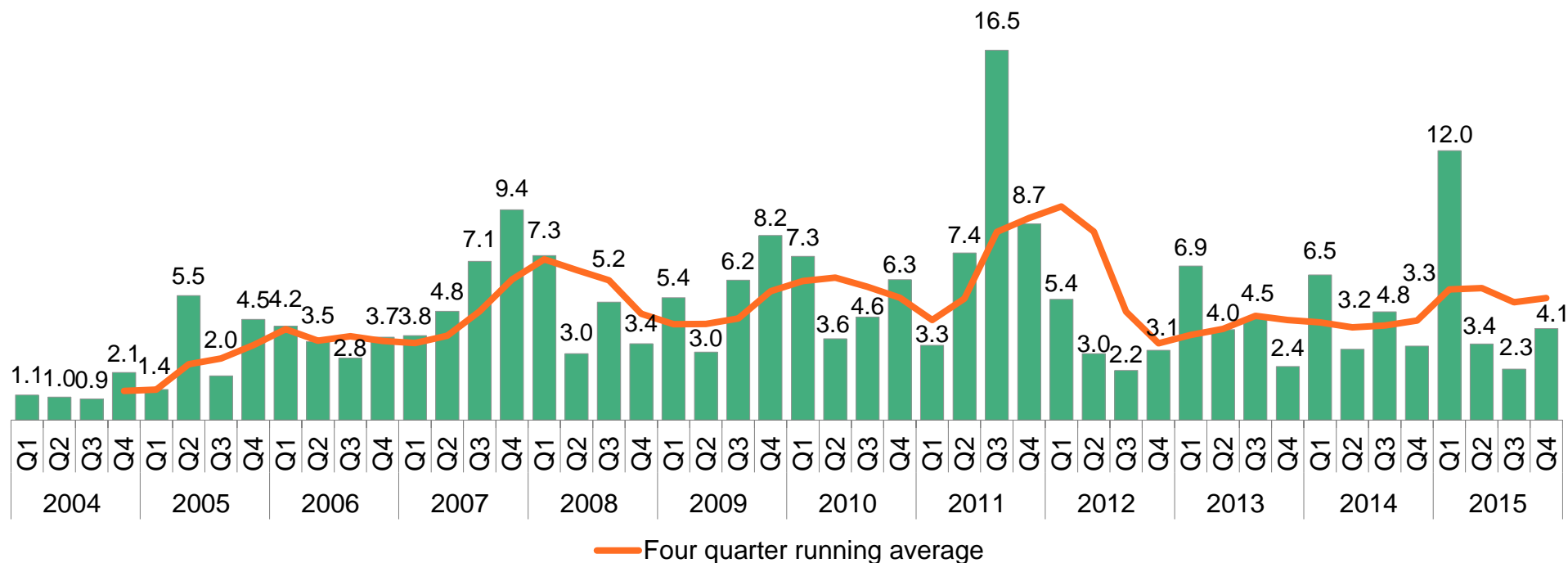
Q4 2015

Organisation	Country	Sector	Type of transaction	Acquirer	Value
Invenergy North American Wind Portfolio TerraForm Acquisition	Canada	Wind	Term loan	TerraForm Power	\$2000m
MeerWind Sud und Ost Offshore Wind Farm Phase I Refinancing	Germany	Wind	Bond	Blackstone Group	\$1067m
Benedict First State Investment Portugal Wind Farm Portfolio Acquisition	Portugal	Wind	Bond	First State Wind Energy	\$1012m
Finerge-Gestao de Projectos Energeticos SA	Portugal	Wind	Equity (company)	First State Wind Energy	\$956m
GDF Suez Mitsui Axium Infrastructure Canadian Wind/Solar Portfolio Refinancing	Canada	Wind	Term loan	Fiera Axium, IPR-GDF, Mitsui & Co	\$464m

Source: Bloomberg New Energy Finance

# CORPORATE M&A TRANSACTIONS IN CLEAN ENERGY Q1 2004-Q4 2015 (\$BN)

- Global mergers and acquisitions of companies that are primarily involved in the clean energy industry according to BNEF exposure ratings.



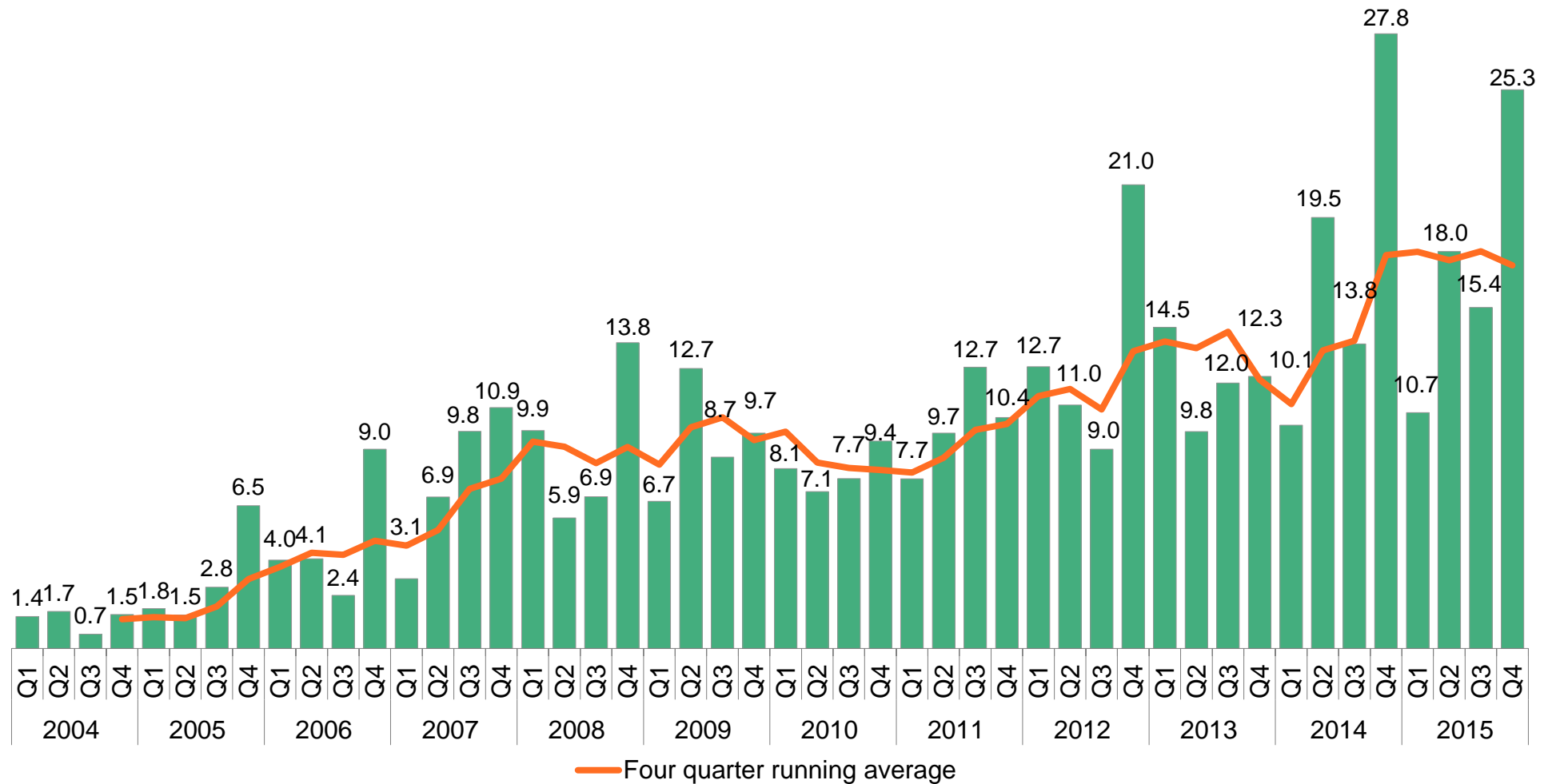
Note: Total values include estimates for undisclosed deals

Source: Bloomberg New Energy Finance



# RENEWABLE ENERGY ASSET ACQUISITIONS & REFINANCING Q1 2004-Q4 2015 (\$BN)

- Global acquisitions or refinancing's of utility-scale (1MW+) renewable energy generating assets.



Note: Total values include estimates for undisclosed deals

Source: Bloomberg New Energy Finance



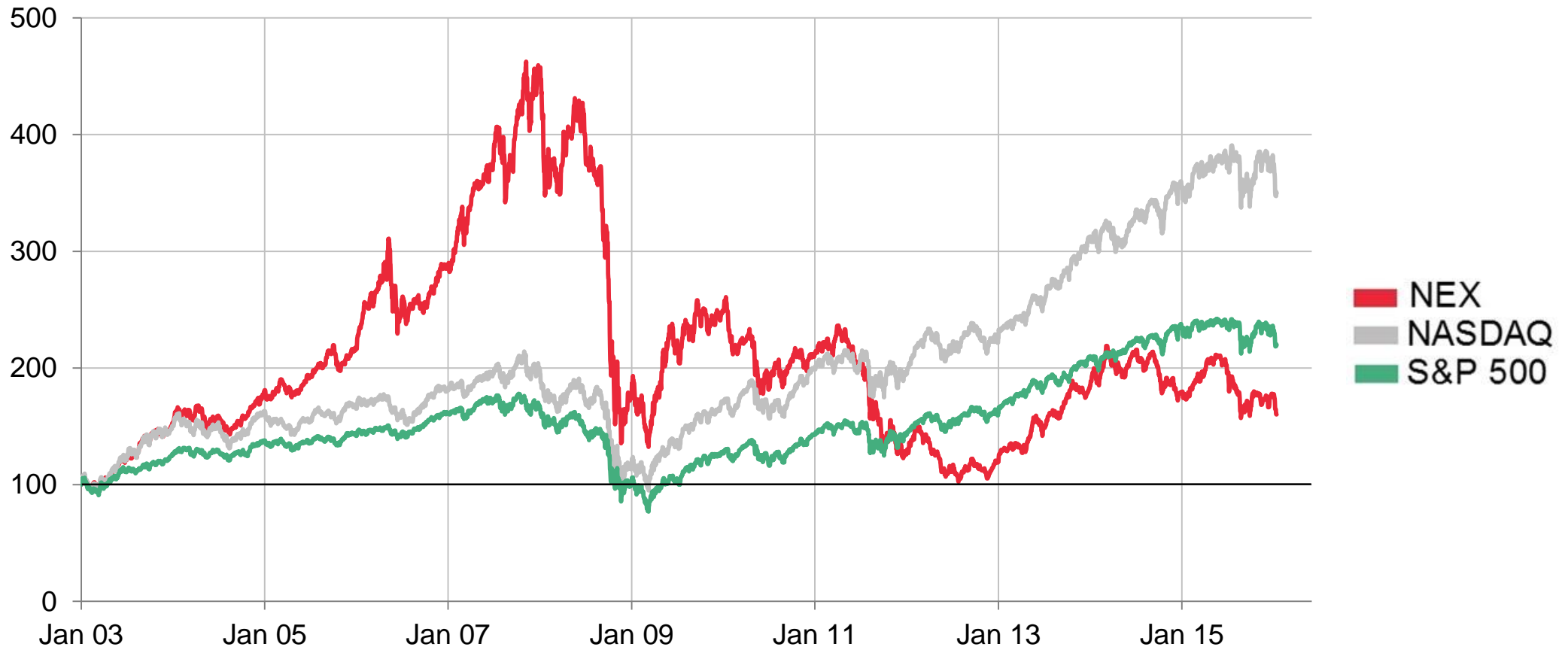
# CLEAN ENERGY INDEXES

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# NEX CLEAN ENERGY INDEX

2003–16 YTD

- 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.

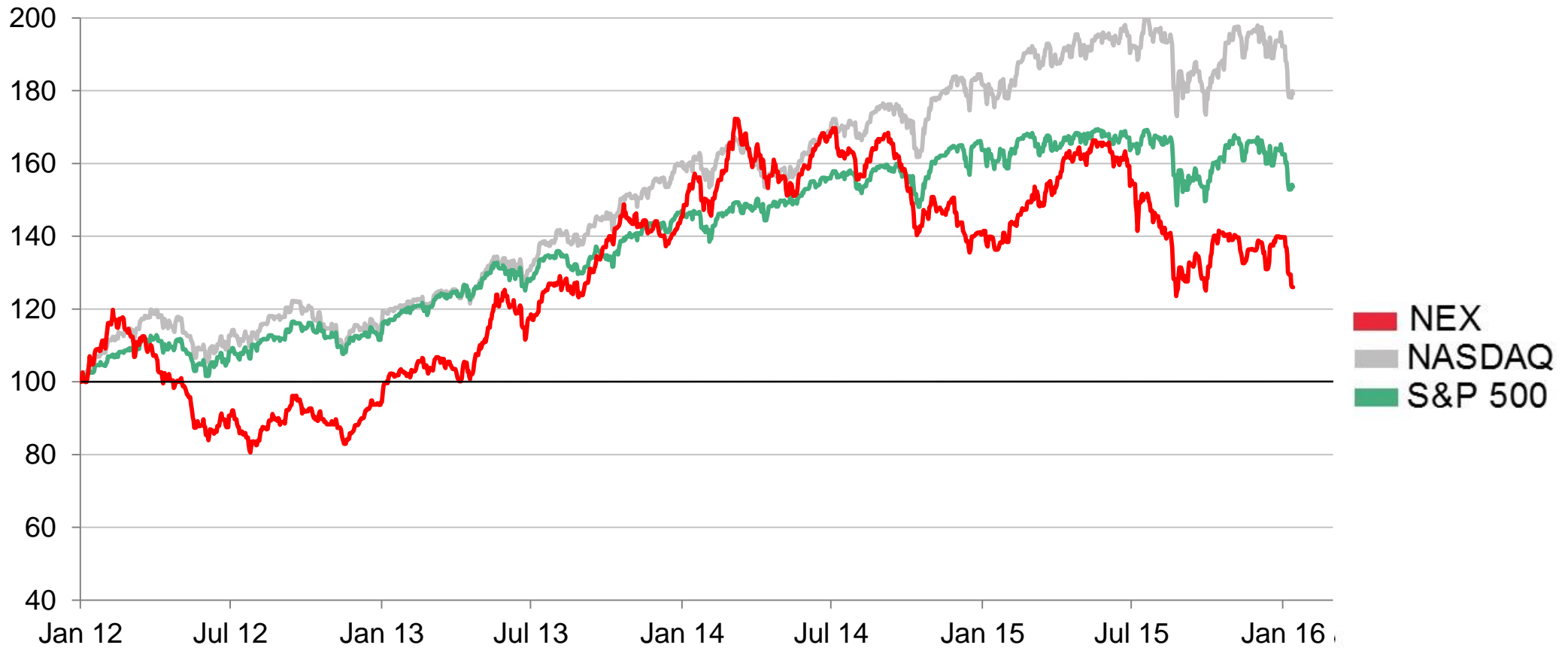


Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 100 on 1 Jan 2003

Source: Bloomberg New Energy Finance

# NEX CLEAN ENERGY INDEX

## 2012–16 YTD

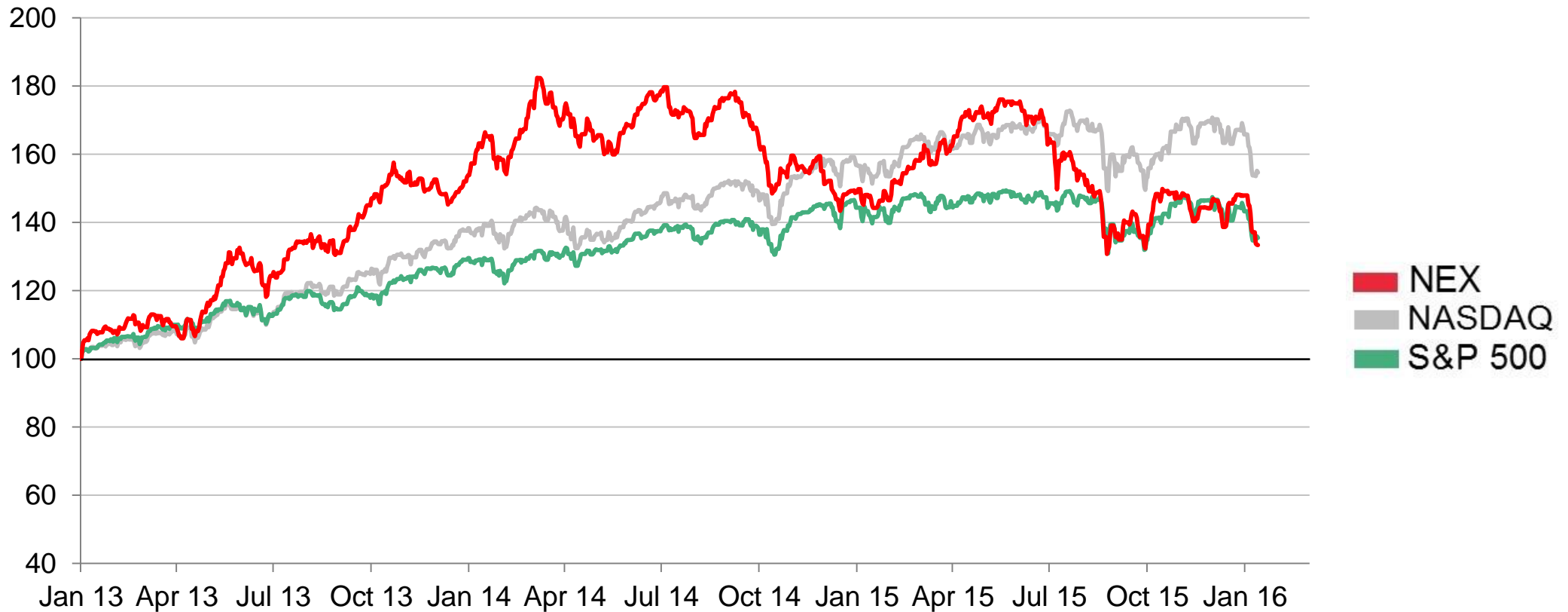


Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 100 on 1 Jan 2011

Source: Bloomberg New Energy Finance

# NEX CLEAN ENERGY INDEX

## 2013–16 YTD

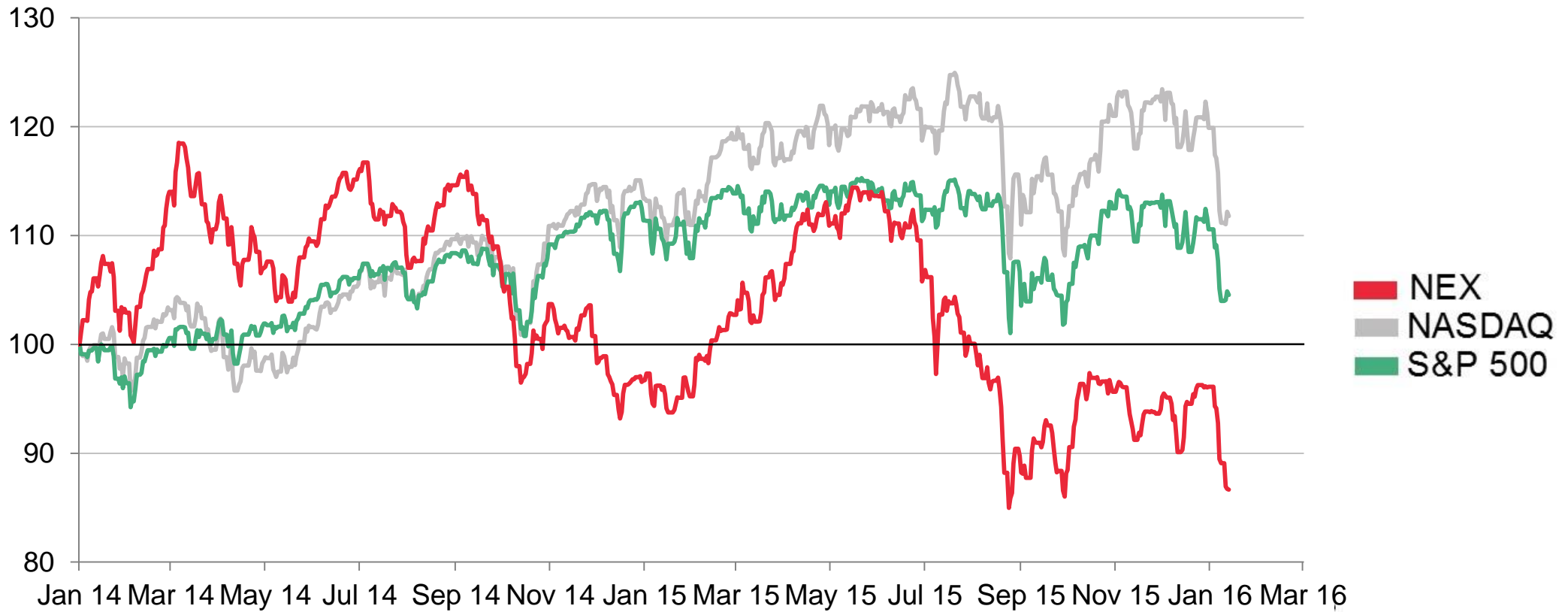


Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 100 on 1 Jan 2011

Source: Bloomberg New Energy Finance

# NEX CLEAN ENERGY INDEX

## 2014–16 YTD

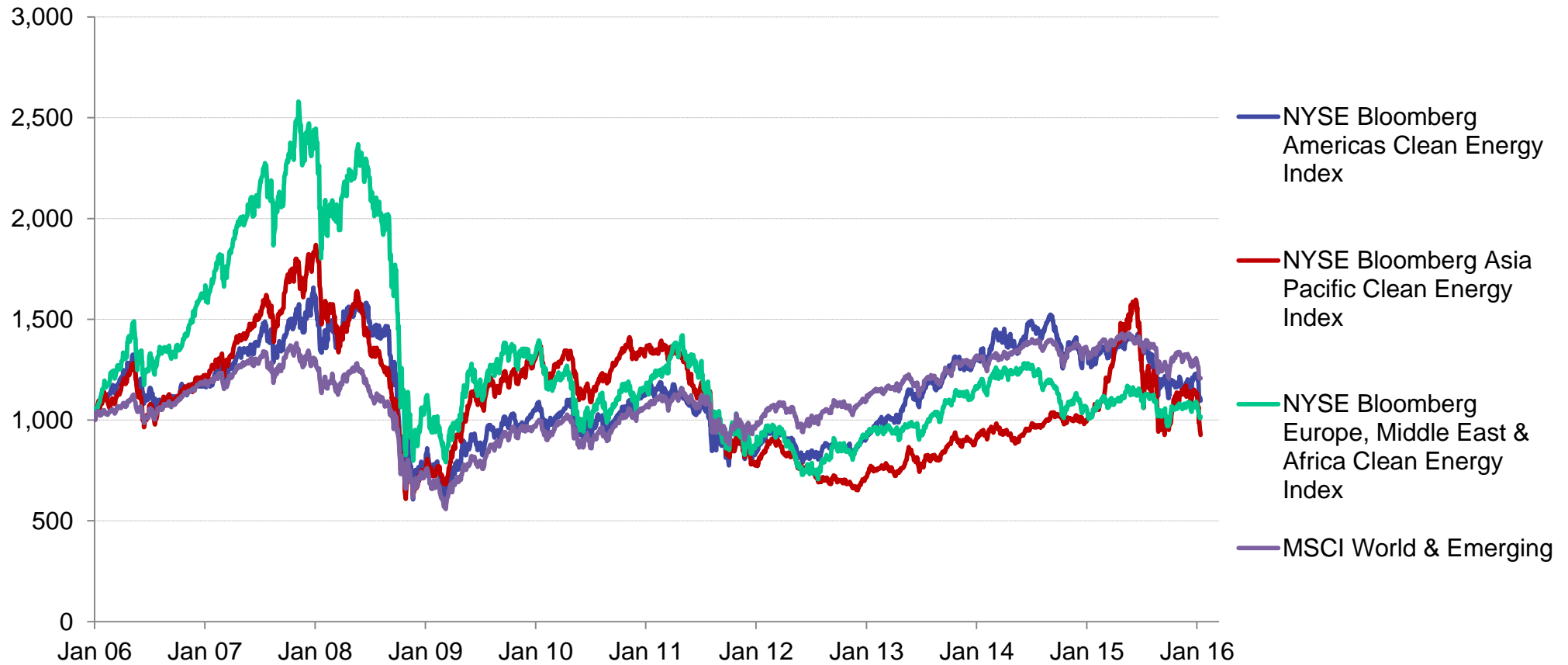


Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 100 on 1 Jan 2011

Source: Bloomberg New Energy Finance

# NYSE BNEF REGIONAL CLEAN ENERGY INDEXES

2006-16 YTD

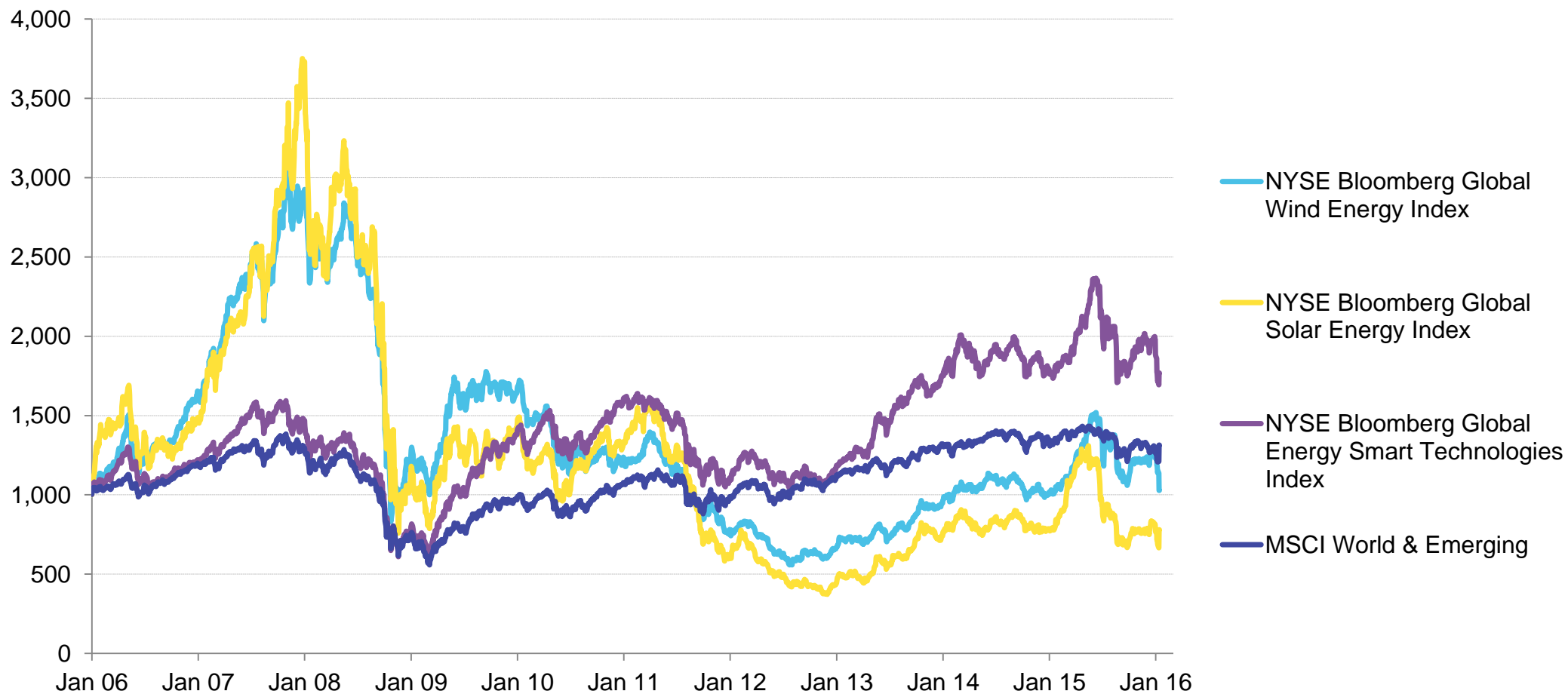


Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 1,000 on 30 December 2005

Source: Bloomberg New Energy Finance

# NYSE GLOBAL CLEAN ENERGY SECTOR INDEXES

2006-16 YTD



Note: Values as of 13 January 2016; NASDAQ and S&P 500 rebased to 1,000 on 30 December 2005

Source: Bloomberg New Energy Finance



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## **MARKETS**

Renewable Energy  
Energy Smart Technologies  
Advanced Transport  
Gas  
Carbon and RECs

## **SERVICES**

Americas Service  
Asia Pacific Service  
EMEA Service  
Applied Research  
Events and Workshops

Unique analysis, tools and data for decision-makers driving  
change in the energy system

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