

Frankfurt School FS-UNEP Collaborating Centre for Climate & Sustainable Energy Finance

GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 2015



Frankfurt School-UNEP Centre/BNEF. 2015. Global Trends in Renewable Energy Investment 2015, http://www.fs-unep-centre.org (Frankfurt am Main)

Copyright © Frankfurt School of Finance & Management gGmbH 2015.

This publication may be reproduced in whole or in part in any form for educational or non-profit purposes without special permission from the copyright holder, as long as provided acknowledgement of the source is made. Frankfurt School – UNEP Collaborating Centre for Climate & Sustainable Energy Finance would appreciate receiving a copy of any publication that uses this publication as source.

No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from Frankfurt School of Finance & Management gGmbH.

Disclaimer

Frankfurt School of Finance & Management: The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Frankfurt School of Finance & Management concerning the legal status of any country, territory, city or area or of its authorities, or concerning delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent the decision or the stated policy of the Frankfurt School of Finance & Management, nor does citing of trade names or commercial processes constitute endorsement.

Cover photo courtesy of Bloomberg Mediasource

Photos on pages 14, 18, 25, 27, 31, 32, 34, 37, 43, 45, 47, 51, 52, 53, 57, 81 from Bloomberg Mediasource Photos on other pages reproduced with the permission of:

wpd (page 13); Grupo Clavijo (page 27); Gamesa (pages 28 and 39); Isolux Infrastructure (page 40); SeaRoc Group (page 54); Drax Group (page 61); SolarWorld (page 63); 3Sun/CHPV.co.uk (page 63); OpenHydro (page 67); Tekmar Energy (page 71); Solarpack (page 73); Tidal Energy (page 75); Dong Energy (page 79); Wartsila (page 82)

Photo on page 69 courtesy of Justin Wu

Photo on page 76 courtesy of Angus McCrone

TABLE OF CONTENTS

ACKN	OWLEDGEMENTS	4
FORE	NORD FROM BAN KI-MOON	5
FORE	NORDS FROM ACHIM STEINER, CHRISTIANA FIGUERES AND UDO STEFFENS	6
LIST O	OF FIGURES	7
METH	ODOLOGY AND DEFINITIONS	9
KEY F	INDINGS	11
EXECL	JTIVE SUMMARY	12
	 Sun in Asia, wind in North Sea Costs and challenges 	
1.	 INVESTMENT BY TYPE OF ECONOMY Developed versus developing countries Detailed comparisons by country Developed economies China, India and Brazil Other developing economies 	20
2.	 PUTTING SUSTAINABLE ENERGY INTO PERSPECTIVE	30
3.	 FOCUS CHAPTER: STRUCTURAL CHALLENGES IN THE ELECTRICITY SYSTEM	36
4.	SOURCES OF INVESTMENT	42
	 Funds New sources Green bonds Development banks Institutional investors 	
5.	ASSET FINANCE	50
	- Box on large hydro-electric projects	
6.	 SMALL DISTRIBUTED CAPACITY Box on small-scale's global footprint 	56
7.	PUBLIC MARKETS	60
8.	VENTURE CAPITAL AND PRIVATE EQUITY	66
9.	RESEARCH AND DEVELOPMENT	
J. 10.		
	SARY	
GLO3 :		04

ACKNOWLEDGEMENTS

This report was commissioned by UNEP's Division of Technology, Industry and Economic (DTIE) in cooperation with Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and produced in collaboration with Bloomberg New Energy Finance.

CONCEPT AND EDITORIAL OVERSIGHT

Angus McCrone (Lead Author, Chief Editor) Ulf Moslener (Lead Editor) Eric Usher Christine Grüning Virginia Sonntag-O'Brien

CONTRIBUTORS

Victoria Cuming Luke Mills David Strahan Rohan Boyle Kieron Stopforth Sabrina Latimer Lisa Becker

COORDINATION

Angus McCrone

DESIGN AND LAYOUT The Bubblegate Company Limited

MEDIA OUTREACH

Terry Collins Nick Nuttall (UNFCCC) Jennifer MacDonald (Bloomberg) Angelika Werner (Frankfurt School of Finance & Management) Elisa Ants (Frankfurt School of Finance & Management) Moira O'Brien-Malone (UNEP)

THANKS TO THE FOLLOWING EXPERTS WHO REVIEWED AND PROVIDED FEEDBACK ON THE DRAFT REPORT:

Leonardo Boni, Jessica Brown, Barbara Buchner, Donovan Escalante, Gianleo Frisari, Andrew Hobbs, Federico Mazza, Valerio Micale, Padraig Oliver, Martin Stadelmann, Chiara Trabacchi, Mark Fulton, Michaela Pulkert, Tom Thorsch Krader, Tobias Rinke, Sean Kidney, Sabine Miltner, Wolfgang Mostert, Anton Eberhard

Supported by the Federal Republic of Germany



Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

FOREWORD FROM BAN KI-MOON



Climate change is defining our present. Our response to it will define our future. To limit global temperature rise to two degrees Celsius we will need a substantial reduction of greenhouse gas emissions. Global Trends in Renewable Energy Investment 2015 increases our confidence that a low-carbon world is obtainable and that we are on the right path to reach our objective, even though there is still much to accomplish.

Global investment in renewable power and fuels in 2014 was nearly 17% higher than in 2013, with a boom in solar installations in China and Japan. Investments in developing countries grew by 36% and almost reached the level of investments in developed countries.

In spite of these positive findings, renewable sources excluding large hydro still account for only 9% of the world's electricity generation. Policy uncertainty and other barriers to investment need to be abolished. We need more private and public investment incentives – including putting a price on carbon to provide markets with the right policy signals to move them to invest in climate solutions.

A key step to this end will be in December 2015, in Paris, when we anticipate a meaningful, universal climate change agreement that can help to further mobilise financial markets to support low-carbon growth. I commend Global Trends in Renewable Energy Investment 2015 to readers in all sectors interested in combatting climate change and supporting a sustainable future for all.

Ban Ki-moon

Secretary-General, United Nations

JOINT FOREWORD FROM ACHIM STEINER, CHRISTIANA FIGUERES AND UDO STEFFENS







ACHIM STEINER

CHRISTIANA FIGUERES UDO STEFFENS

In 2014, global investments in renewable energy increased by 17% to \$270.2 billion. This was the first increase in investment for three years. And the trend was even more impressive in terms of capacity: last year a record of 95GW of wind and solar photovoltaic power was installed globally.

As stated in this Global Trends in Renewable Energy Investment 2015 report, renewable energy excluding large hydro accounted for 48% of new

generating capacity installed globally in 2014, and the share of renewables in global electricity generation increased to 9.1%. This is equivalent to avoided greenhouse gases emissions of some 1.3 gigatonnes annually. The increase in renewables sends a strong signal of opportunity to world leaders and delegates, who are negotiating towards a new, universal agreement on climate change, scheduled to be reached in Paris by the end of 2015 and to come into effect in 2020. The transformation to more sustainable development will be principally achievable when existing technologies are combined with good policies and credible leadership.

Global Trends in Renewable Energy Investment 2015 also highlights a record \$119 billion in new investment in renewable energy in China and Japan combined – with China taking a clear lead at \$83.3 billion, a record increase of 33% from 2013 to 2014. Also of note in this report is the continuous spread of renewable energy into new markets. A remarkable \$131.3 billion, an increase of more than 36% from the previous year, was invested in developing countries in 2014. Meanwhile, investment decisions on offshore wind projects in Europe and China accounted for \$18.6 billion in 2014, and are drawing increased attention in terms of their scale and growth.

The 50%-plus collapse in oil prices in the second half of last year was a daunting challenge. However, although the fall in oil prices is likely to lower investor confidence, oil and renewables do not compete for the same investment funds so the wind and solar sectors should be able to carry on flourishing, particularly if they continue to cut energy costs.

Overall, Global Trends in Renewable Energy Investments 2015 underlines the increasingly positive role that renewable energies are playing in developing a low-carbon economy. The results from this report indicate that we have made good progress – and indeed picked up some momentum – towards our goal of keeping global temperature within the two degrees Celsius limit. However, policy uncertainties in the US and UK markets, amongst others, and retroactive policy changes in countries such as Italy and Romania, as well as concerns about grid access for small-scale solar power in Japan and some US states, have resulted in early challenges for 2015. In this light, a clear signal for the phase-out of fossil fuel dominance by mid-century through a universal climate change agreement will help to make the world liveable in the long term.

Achim Steiner

UN Under-Secretary General and UNEP Executive Director

Christiana Figueres

Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC)

Udo Steffens

President and CEO, Frankfurt School of Finance & Management

LIST OF FIGURES

Figure 1. Global new investment in renewable energy by asset class, 2004-2014	. 12
Figure 2. Global transactions in renewable energy, 2014	
Figure 3. Global Trends In Renewable Energy Investment 2014 data table	
Figure 4. Global new investment in renewable energy: developed v developing countries, 2004-2014	
Figure 5. Global new investment in renewable energy by sector, 2014, and growth on 2013	
Figure 6. VC/PE new investment in renewable energy by sector, 2014	
Figure 7. Public markets new investment in renewable energy by sector, 2014	
Figure 8. Asset finance of renewable energy assets by sector, 2014	
Figure 9. Asset finance of renewable energy assets and small distributed capacity by sector, 2014,	
and growth on 2013	19
Figure 10. Global average levelised cost of electricity for wind and PV, Q3 2009 to H1 2015	
Figure 11. Global new investment in renewable energy: developed v developing countries, 2014,	
and total growth on 2013	20
Figure 12. Global new investment in renewable energy by region, 2004-2014	
Figure 13. Global new investment in renewable energy by region, 2004-2014	
Figure 14. New investment in renewable energy by country and asset class, 2014, and growth on 2013	
Figure 15. Asset finance of renewable energy assets by country, 2014, and growth on 2013	
Figure 16. Small distributed capacity investment by country, 2014, and growth on 2013	
Figure 17. VC/PE, public markets, and asset finance investment in renewable energy in the US by sector, 2014	
Figure 18. VC/PE, public markets, and asset finance investment in renewable energy in Europe by sector, 2014	
Figure 19. VC/PE, public markets, and asset finance investment in renewable energy in China by sector, 2014	
Figure 20. Total VC/PE, public markets, and asset finance investment in renewable energy in Africa, 2014	. 28
Figure 21. Total VC/PE, public markets, and asset finance investment in renewable energy in	~~
Latin America (excluding Brazil), 2014	. 29
Figure 22. Total VC/PE, public markets, and asset finance in renewable energy in non-OECD Asia	
(excluding China and India), 2014	
Figure 23. Renewable power generation and capacity as a proportion of global power, 2007-2014	
Figure 24. Renewable power investment compared to gross fossil-fuel power investment, 2008-2014	
Figure 25. Indexed power sector CO2 emissions, 2013-30, million tonnes of CO2	
Figure 26. Global new investment in energy-smart technologies, 2004-2014	
Figure 27. Results of Climatescope questionnaire of policy-makers and investors in developing countries	
Figure 28. Capital expenditure on renewable energy by major European utilities	
Figure 29. Clean energy fund price performance, 2013 and 2014 (% change)	
Figure 30. Clean energy project bonds, 2014	
5	. 48
Figure 32. Institutional investment in European renewable energy projects, 2007-2014	
Figure 33. Asset financing new investment in renewable energy by type of security, 2004-2014	
Figure 34. Asset financing new investment in renewable energy by region, 2004-2014	
Figure 35. Asset financing new investment in renewable energy by sector, 2004-2014	
Figure 36. Asset finance of wind and solar projects worldwide, by sub-sector, 2001-2014	
Figure 37. Small distributed capacity investment, 2004-2014	. 56
Figure 38. Small PV system cost in Japan, Germany and California, and trend in Chinese module prices	. 57
Figure 39. Small distributed capacity investment by country, 2014, and growth on 2013	
Figure 40. Public market new investment in renewable energy by stage, 2004-2014	
Figure 41. NEX vs selected indices, 2003 to 2015 YTD	. 61
Figure 42. NEX vs selected indices, 2011 to 2015 YTD	. 62

LIST OF FIGURES

Figure 43. NYSE Bloomberg wind, solar and EST indices	. 62
Figure 44. Public market new investment in renewable energy by sector, 2004-2014	. 64
Figure 45. Public market new investment in renewable energy by sector, 2014, and growth on 2013	. 64
Figure 46. Public market new investment in renewable energy by exchange, 2014, and growth on 2013	. 65
Figure 47. Public market new investment in renewable energy by company nationality, 2014,	
and growth on 2013	. 65
Figure 48. VC/PE new investment in renewable energy by stage, 2004-2014	. 66
Figure 49. VC/PE new investment in renewable energy by stage, 2014, and growth on 2013	. 67
Figure 50. VC/PE new investment in renewable energy by sector, 2004-2014	. 68
Figure 51. VC/PE new investment in renewable energy by sector, 2014, and growth on 2013	. 68
Figure 52. VC/PE new investment in renewable energy by region, 2004-2014	
Figure 53. VC/PE new investment in renewable energy by region, 2014, and growth on 2013	. 70
Figure 54. R&D investment in renewable energy, 2004-2014	. 72
Figure 55. Corporate and government R&D renewable energy investment by technology, 2014,	
and growth on 2013	. 73
Figure 56. Corporate and government R&D renewable energy investment by region, 2014,	
and growth on 2013	. 74
Figure 57. Acquisition transactions in renewable energy by type, 2004-2014	. 78
Figure 58. Acquisition transactions in renewable energy by sector, 2004-2014	. 79
Figure 59. Acquisition transactions in renewable energy by sector, 2014, and growth on 2013	. 80

预览已结束, 完整报告链接和二维码如下:



https://www.yunbaogao.cn/report/index/report?reportId=5_16068