



# GLOBAL TRENDS IN SUSTAINABLE ENERGY INVESTMENT 2008

*Analysis of Trends and Issues  
in the Financing of  
Renewable Energy and  
Energy Efficiency*



UNITED NATIONS ENVIRONMENT PROGRAMME

ENDORSED BY



# Executive Summary

Once again, global investment in sustainable energy broke all previous records, with \$148.4 billion of new money raised in 2007, an increase of 60% over 2006. Total financial transactions in sustainable energy, including acquisition activity, was \$204.9 billion<sup>1</sup>. Asset finance – investment in new renewable energy capacity – was the main driver for this surge in investment, rising 68% to reach \$84.5 billion in 2007, fuelled mainly by the wind sector. Public market investment also raced ahead in 2007, with investment of \$23.4 billion in 2007, more than double the \$10.5 billion raised in 2006.

The impact of the credit crisis in the financial markets started to show through in early 2008, with few new listings on the public markets and stock prices down 17.9%. Corporate M&A surged forward, reflecting the consolidation that tends to accompany tighter market conditions. However, by the second quarter investor uncertainty seems to have passed and overall investment during the first half of 2008 has been just above what was seen in the first half of 2007. Although asset finance is down somewhat, VC/PE investment, public market capital raising and stock prices are all healthy, indicating that the finance community still sees strong fundamentals underlying the sector and is increasingly looking to take part in its future growth.

This bodes well for the industry. Investment in the sustainable energy sectors must continue to grow strongly if targets for greenhouse gas reductions and renewables and efficiency increases are to be met. According to New Energy Finance (Global Futures 2008), investment between now and 2030 is expected to reach \$450 billion a year by 2012, rising to more than \$600 billion a year from 2020. The sector's performance during 2007 sets it on track to achieve these levels, with the current credit crunch testing the markets resolve, but not dislodging it.

Investment flows have not only continued to grow, but have broadened and diversified, making the overall picture one of greater breadth, depth and scale in sustainable energy. The mainstream capital markets are now fully receptive to sustainable energy companies, supported by a surge in funds destined for clean energy investment. At the other end of the spectrum specialist financing has also opened up with the development of innovative financing structures for distributed renewable generation and demand-side management.

Another aspect of this industry deepening has been greater activity in next-generation technologies, such as cellulosic ethanol, thin-film solar technologies and energy efficiency. Wind continues to dominate sustainable energy investment, but the portfolio of available technologies has both widened (as nascent technologies start to come into their own) and deepened (as existing technologies are refined). This is partly in response to changing supply/demand patterns (e.g. continuing silicon shortages, or the controversial competition between food and fuel from food-based ethanol feedstocks), but also reflects improved efficiencies and decreasing costs as renewable technologies strive to reach grid parity. Furthermore, the willingness to look beyond mature technologies suggests that investors are taking renewable energy and energy efficiency increasingly seriously.

The year 2007 also saw a geographic broadening, with renewable capacity rollout continuing to shift away from Europe and towards China and the United States. In recent years, sustainable energy investment in China has been largely for manufacturing expansion as an export industry. In 2007, however, the 2008 Beijing Olympic Games sharpened the country's political resolve and strengthened programmes to promote cleaner generation and cut energy intensity. During 2007, investment in non-hydro renewables capacity in China increased by more than four times, to \$10.8 billion.

Acceptance of sustainable energy also became more widespread in the US, extending beyond its traditional heartland of California. A new administration in 2008 is expected to make renewable energy and energy efficiency a political priority and in recent months, regulatory uncertainty in the US (particularly over the possible introduction of a carbon tax) has put a number of coal-fired generation plants on hold. The financial sector is also gearing up for a major shift in political attitude. Citi, JPMorgan Chase and Morgan Stanley have jointly established a set of "Carbon Principles", which will guide how they lend to and advise major power companies in the US. The three banks expect future investment in fossil

<sup>1</sup> The \$204.9 billion total investment includes \$7.5 billion of energy efficiency investment (3.7% of the total), split between VC/PE (\$1.8bn), public markets (\$1.6bn) and M&A (\$4.0bn).

fuel energy projects to be required to supply “reliable electric power to the US market” and have developed the principles to evaluate risks in financing these carbon-emitting projects, given the growing uncertainty around regional and national climate change policy. Under the Principles the banks will also consider power companies’ inclusion of energy efficiency and renewable resources in their portfolios as part of an “enhanced diligence process”.

Political landmarks in 2007 included the Bali talks in December, which were attended by representatives from 180 countries, where a roadmap for future discussions towards strengthened international action on climate change was set out with a target for agreeing a way forward by the end of 2009. This was immediately preceded by a change of leadership in Australia, and with it, a dramatic shift in the country’s attitude to renewable energy.

This report presents the financial perspective, or ‘dollar view’, of the current state of play in sustainable energy development. The analysis in this report consists of actual data on the different types of capital flows and their movement over time, combined with analysis of regional and sectoral trends. This information is intended to be a strategic tool for understanding the status of the clean energy sector’s development and for weighing future public and private commitments to the sector.

## Key findings

**New investment in sustainable energy reached record levels of \$148.4 billion, 60% higher than in 2006.** Asset finance (to build sustainable power generation and biofuels capacity) accounted for 57% of new investment in 2007. Public market investment more than doubled in 2007 with \$23.4 billion of new money raised. Convertible bond issuance increased eightfold in 2007, reflecting progressively less stable stock market conditions. Wind continued to attract the most investment, mainly for new capacity build, but solar investment took off in 2007 – \$28.6 billion of new investment flowed into solar, which has grown at an average annual rate of 254% since 2004.

**Sustainable energy accounted for 31 gigawatts (23%) of new power generation capacity added worldwide in 2007, and 5.4% of installed generation capacity.** Wind power continues to dominate renewable energy capacity. In 2007, wind attracted more investment than nuclear or hydro, and accounted for more new generation capacity in Europe than any other power source. Interest in clean energy investment surged forward, with assets under management in clean energy funds rising to \$35 billion in 2007 and boosting quoted sustainable energy companies’ valuations. The WilderHill New Energy Global Innovation Index (NEX) rose 57.9% in 2007. Sustainable energy companies continued to make their mark on the public equity markets, accounting for 19% of new capital raised by the energy sector in 2007.

**Early-stage venture capital investment surged 112% to \$2 billion in 2007,** boosted by interest in emerging renewable technologies, rather than just those on the brink of commercialisation, as competition for deals intensified. Private equity finance for expansion started strongly in 2007, driven largely by the boom in ethanol production in the US, but this ground to a halt in May 2007 as feedstock costs rose and ethanol prices fell. Overall, venture capital and private equity (VC/PE) investment in biofuels fell by almost one-third in 2007, to \$2.1 billion. However, biofuels investment has not dried up altogether, shifting to Brazil, India and China, as well as towards second-generation technologies. Solar attracted by far the most VC/PE investment (\$3.7 billion), both for new technologies and for manufacturing capacity expansion, although biomass and waste to energy saw the fastest (432%) growth. The US continued to lead VC/PE investment, but grew only slightly year on year in dollar terms. European investment is growing strongly as investors become more willing to take early-stage risk.

**Research & Development spending on clean energy and energy efficiency was \$16.9 billion in 2007,** including corporate R&D of \$9.8 billion, and government R&D of \$7.1 billion. Europe and the Middle East saw the most corporate R&D activity, followed by the Americas and then Asia. Patterns of government R&D are the reverse, with Asian governments (notably Japan, China and India) investing relatively heavily in R&D. The US and UK host the most clean energy incubators, often supported by public funding. Many of the most successful incubators have benefited from government support. Solar is the single most incubated technology, with a bias towards service companies, disruptive technologies and large-scale generation such as solar thermal electricity generation (STEG). Collectively,

though, energy efficiency technologies account for the greatest number of incubated companies.

**Clean energy companies more than doubled the amount of money they raised on the world's public markets in 2007, raising \$27 billion.** Iberenova, the wind power development arm of Spanish power giant Iberdrola, raised \$7.2 billion in a landmark flotation in December 2007, the largest Spanish IPO ever and the fourth largest public deal of the year. Since then, the US and European public markets have effectively closed. Wind dominated public market investment (\$11.3 billion), although wind companies raised no money in the US in 2007. Solar companies continued to raise significant amounts of capital (\$9.4 billion), particularly Chinese manufacturers tapping the US markets. Public market activity from developing countries increased strongly in 2007, with investment tripling to \$2.9 billion, although this is often on overseas markets such as the London or New York Stock Exchanges.

**Financing of sustainable energy assets grew by 61% in 2007 to \$108 billion**, most of it for new generation projects. The wind sector continued to be the leading sector for asset finance, attracting \$39 billion in 2007 and adding another 21GW of capacity. Global installed wind capacity exceeded 100GW in March 2008. Wind investment focused on the US, China and Spain, which together accounted for nearly 60% of new wind farms built worldwide in 2007. Solar was the fastest growing asset finance sector in 2007, increasing 250% to \$17.7 billion. Solar investment was subsidy-driven, with Germany remaining the dominant market for new capacity. Asset financing in China and India grew significantly, to \$10.8 billion in China and \$2.3 billion in India, suggesting a shift away from manufacturing to generation capacity.

**Corporate Mergers & Acquisition activity increased 52% to \$25.7 billion in 2007**, buoyed up by equity financing and diversification activity. Wind led M&A activity as supply-chain shortages drove consolidation amongst component manufacturers, while offshore wind projects saw increased interest. Wind assets are gradually being transferred from developers to utilities. Biofuels M&A was driven by industry turmoil, which shook out weaker players, as well as by the rising cost of building new plants, leading developers to acquire existing ones. The US and Europe dominated M&A activity, while Brazilian biofuels became a focus for non-OECD transactions.

**At the end of December 2007, over \$30.0 billion was under management in core clean energy funds**, in addition to \$26.4 billion in environmental funds and \$10.9 billion in funds that invest exclusively in renewable power projects. There was a record number of new clean energy public equity fund launches in 2007: 17 compared to just five in 2006. Several of these were from mainstream fund managers launching 'climate change' funds. The arrival of these heavyweight fund managers to the sector is likely to encourage the larger publicly listed companies they normally invest in to expand into sustainable energy and other low carbon sectors. Private (VC/PE) funds and project funds also increased their funds under management during 2007.

**CDM activity is dominated by India (32% of registered projects), China (19%) and Brazil (13%).** In terms of emission credits generated, however, China leads with 53%, followed by India with just 15%, reflecting the larger average CDM project size in China. Renewable energy accounts for around 55% of CDM projects by number, but only 29% by emission credits. By the end 2007, \$12.5 billion had been raised by carbon funds: \$9.4 billion in private funds and \$3.6 billion in public funds. Private funds grew strongly in 2007, reflecting investor interest in carbon trading, while public funds remained flat. The UK is the leading market for private carbon investment, accounting for 65% of private carbon funds under management.

**There is a continuing shift in investment from developed to developing countries.** China, India and Brazil are attracting an increasing share of new investment, growing from 12% (\$1.8 billion) in 2004 to 22% (\$26 billion) in 2007, a market expansion of 14 times.

In China asset finance reached a record \$10.8 billion, most of it for new wind capacity, which more than doubled to 6GW. Asset finance in India also grew (to \$2.5 billion), but the country's most notable trend was Indian companies raising money overseas in a series of foreign currency convertible bonds, which no Indian renewable energy company had issued prior to 2007. Investment in Brazil continues to be dominated by ethanol, which drove private equity investment, asset finance and M&A, as investor interest shifted from the beleaguered US ethanol market to Brazil. Wind investment is picking up slowly in Brazil.

Africa continues to lag other regions in terms of sustainable energy investment, however, there is promising large-scale solar development in North Africa and signs of change in South Africa, where targets for renewable energy have been set and the country's first wind farm commissioned.

Investment in **energy efficiency technology** reached a record \$1.8 billion, an increase of 78% on 2006. Energy efficiency accounted for 18% of new VC/PE money flowing into the sustainable energy sector, second only to solar. Supply-side applications saw a surge in early-stage investment (more than double the 2006 figure), although demand-side technologies still raised marginally more money in 2007, particularly in transport and buildings. The demand side also dominated M&A activity in the sector. Financing energy efficiency is challenging, because the benefits are asymmetrical and the industry's diverse and fragmented nature makes it difficult for investors to identify large enough opportunities. In many cases some level of public intervention and support is needed to correct market failures, organise the market and catalyse investment



**Global investment in sustainable energy broke all previous records in 2007, with \$148.4 billion of new money raised, an increase of 60% over 2006. Total investment in sustainable energy, including acquisition activity, was \$204.9 billion.**

**Asset finance – investment in new renewable energy capacity - was the main driver for this surge in investment, rising 68% to reach \$84.5 billion in 2007, fuelled mainly by the wind sector. Public market investment also raced ahead in 2007, with investment of \$23.4 billion in 2007, more than double the \$10.5 billion raised in 2006.**

**In early 2008, investment growth continues amid the turmoil in the global financial markets.**

**This healthy investment environment bodes well for the continued growth of the sustainable energy sector. The report provides an overview of different types of capital flows and an analysis of the trends in sustainable energy investment activity in OECD and Developing Countries.**

**The information is intended to be a strategic tool for understanding the status of the sustainable energy sector's development and for weighing future public and private commitments to the sector.**

**www.unep.org**

United Nations Environment Programme  
P.O. Box 30552 Nairobi, Kenya  
Tel.: +254-(0)20-762 1234  
Fax: +254-(0)20-762 3927  
E-mail: [unepubb@unep.org](mailto:unepubb@unep.org)



For more information, contact:

**UNEP DTIE  
Energy Branch  
Renewable Energy and Finance Unit  
Sustainable Energy  
Finance Initiative**

15 rue de Milan  
75441 Paris CEDEX 09  
France  
Tel: +33 1 4437 1450  
Fax: +33 1 4437 1474  
E-mail: [sefi@unep.fr](mailto:sefi@unep.fr)  
[www.sefi.unep.org](http://www.sefi.unep.org)  
[www.unep.fr/energy/finance](http://www.unep.fr/energy/finance)

**New Energy Finance Limited**

New Penderel House  
High Holborn  
London WC1V 7HP  
Tel: +44 20 7092 8800  
Fax: +44 20 7092 8801  
E-mail : [info@newenergyfinance.com](mailto:info@newenergyfinance.com)  
[www.newenergyfinance.com](http://www.newenergyfinance.com)

**ISBN:978-92-807-2939-9  
DTI/1066/PA**