

A WORD ABOUT WIND 

JULY 2014



# HIDDEN INVESTMENT OPPORTUNITIES

The emerging markets and sectors that you need to know about

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# EDITORIAL



by Richard Heap,  
editor at A Word About Wind

**“The industry needs the pioneers willing to take the bold step to invest in the ‘next big thing’. They may win, they may lose. Either way, they are vital if wind is to continue growing.”**

## A Word About Wind

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It's natural to get excited by the 'next big thing'. Whether it's a hot new band, a young sports star or a mind-blowing gizmo, it's fun to be among the first to hear about something.

And, when you're talking about new investment opportunities, it can be lucrative too. Emerging markets can offer investors the chance to make higher returns than more established markets.

That is why we are looking at some of these markets in this report. We know that no market can be totally 'hidden', but there are some that most of our readers will not have explored. These are the opportunities we will focus on.

Of course, investing in new markets is not without risks. The promise of higher returns depends on the market growing as the investor expects, which can never be guaranteed.

Being among the first into a market also means higher set-up costs, lack of a supportive infrastructure to help if things go wrong, and risks — both economic and political — that investors may not be willing to take if they were doing business in their home market. It isn't simple. This is why we can only give insight into these markets. What you do with that knowledge is up to you.

The common thread that links all the markets in this report is that they are changing fast, and will all have a significant impact on re-shaping the wind sector between now and 2020.

For instance, this is the year we expect wind power in Africa to take off. There has, historically, been activity in North Africa, but little elsewhere on the continent. Yet, this year, wind power totalling up to 1GW is set to be installed in South Africa, and this should spark growth across the continent, particularly up the continent's eastern coast.

There are also emerging opportunities in grid-scale battery storage. This will become a significant market over the next decade as grid operators seek to add more wind and solar to their energy mix, but have to cope with fluctuating production. This is likely to have an impact on your investment decisions, even if you don't invest in it directly.

We have also included insights from industry experts.

Kojo Ako-Asare, head of corporate finance at Google, explains how the internet giant decides on which new investment opportunities it will put its money into.

Jérôme Guillet, managing director at Green Giraffe Energy Bankers, gives us a view into the structuring of the €3bn fundraising at the planned 600MW project Gemini.

And independent renewables expert Chris Lloyd looks at potential for investors in Japan's burgeoning offshore sector, including in floating turbines.

Investing in new markets won't be for everybody. But the industry needs the pioneers willing to take the bold step to invest. They may win, they may lose — but, either way, they are vital if this industry is to grow in new markets and gain new knowledge. ■

Hidden Investment Opportunities is the second of five special reports we will publish in 2014. For more information about our special reports programme, please get in touch.

If you want to contact me then call, find me on Twitter (@RichHeap), or email: richard@awordaboutwind.com

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# DATABANK: THE NEXT BIG THINGS

## Chile, Mexico and Turkey are among the smaller markets showing fast growth

These opportunities fall into two categories: early movers in regions where wind is in its infancy; or late movers in areas where it is established.

Like holidaymakers, it is common for investors in wind power to want to get away from the well-known destinations. So which are the most interesting countries off the beaten track?

In this analysis, we are looking at nations with wind markets that are growing but do not rank among the largest in the world.

Broadly, these 'hidden' opportunities fall into two categories. Either the country is an early mover in a part of the world where wind is in its infancy, such as South America; or in an established region but over-shadowed by powerful neighbours.

We have quantified this in our table (see next page) by identifying countries that meet the following three criteria:

- Capacity of between 100MW and 3GW.
- Growth of 10% or more in 2013.
- Population of more than 10million.

We used these criteria to ensure we are not focusing on markets that are either very big nor very small; and where wind is already experiencing growth. By doing this, we have identified 12 countries from all over the world, and you can find out further information about them in our region-by-region breakdown.



The Canela I wind farm in Chile

Source: Edu3k via Wikimedia Commons



Source: Mark Scott Johnson via Flickr

Last year, the government passed laws stating that 20% of the country's energy must come from renewables by 2024

#### LATIN AND CENTRAL AMERICA

The Latin American market is unsurprisingly dominated by Brazil, which installed schemes totalling more than 953MW in 2013 and accounts for almost three-quarters of the region's total wind capacity. The total installed capacity in Latin America is currently around 4.8GW.

Chile is arguably the most exciting market in Latin America due to the attractive investment climate created by government. Last year, the government passed laws stating that 20% of the country's energy must come from renewables by 2024; and wind farms taking advantage of strong winds on its 6,435km coastline will play a big role.

The wind industry in Chile is now awaiting secondary legislation from the government that is set to open the market to foreign direct investment. The country had installed capacity of 376MW at the end of last year, with 457MW being built and more than 4.3GW approved.

Investment opportunities are even more embryonic in Argentina, where 76MW was added in 2013 to take total capacity to 218MW. Historically, investors have found it tough to make deals stack up due to the lack of incentives for wind farms, and the government needs to address this if it wants to meet its target of installing 1.2GW by 2016 to reduce reliance on foreign power imports. But, with its economy facing trouble, investors must tread carefully.

In Central America, the most exciting market is Mexico. The market is not exactly 'hidden' given that Mexican president, Enrique Pena Nieto, said in February that there would be no limits on inbound renewable energy investors.

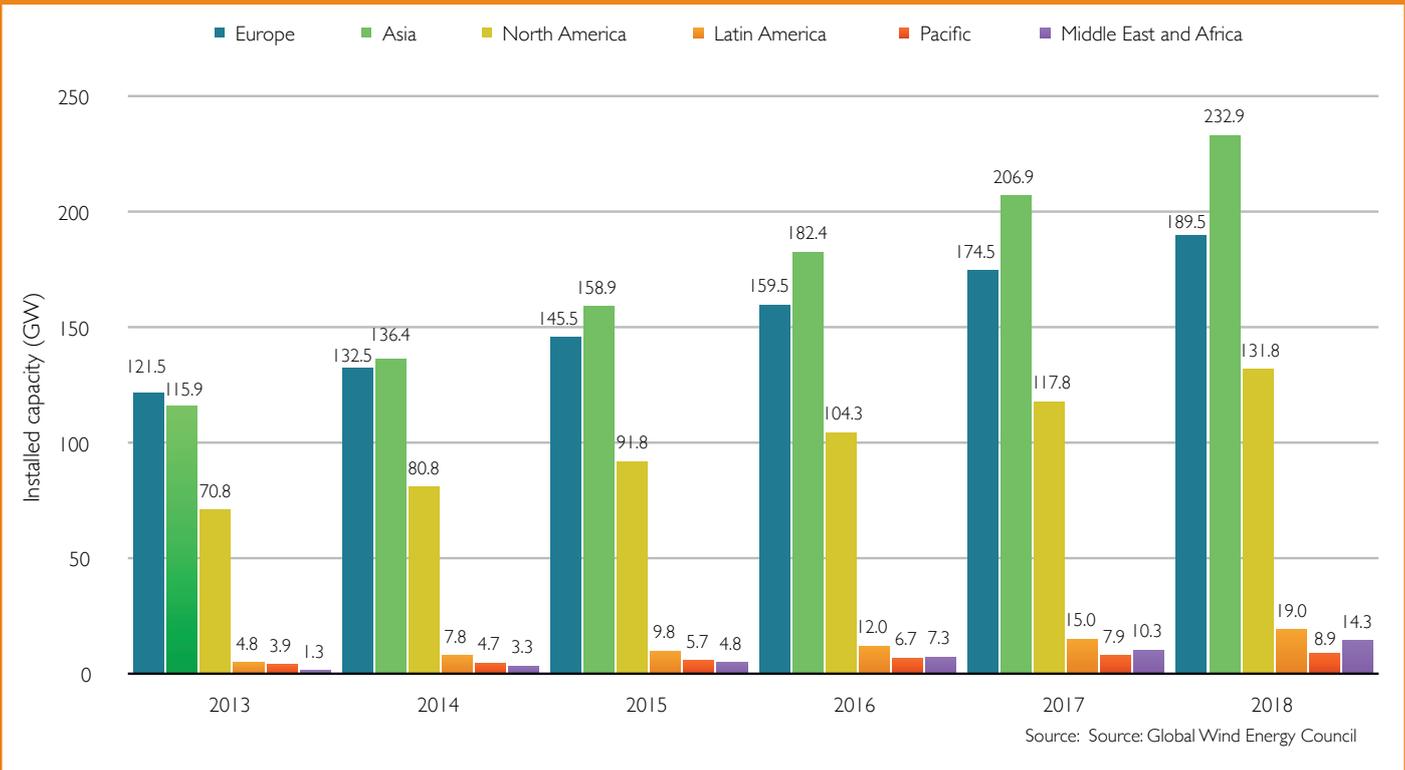
This statement sent a message that the country is open for business, but it should also make investors question whether there is any long-term strategy in place.

### Small but growing global wind energy markets

Country	Total wind capacity (MW) at end of 2012	Capacity added in 2013 (MW)	Total wind capacity (MW) at end of 2013	Percentage growth in capacity in 2013	Population (millions)
Turkey	2310	646	2956	28%	74.0
Netherlands	2390	303	2693	13%	16.8
Romania	1904	695	2599	37%	21.3
Mexico	1537	380	1917	25%	120.8
Belgium	1375	276	1651	20%	11.1
South Korea	482	79	561	16%	50.0
Morocco	292	203	495	70%	32.5
Ukraine	276	95	371	34%	45.6
Chile	205	130	335	63%	17.5
Thailand	124	99	223	80%	66.8
Argentina	142	76	218	54%	41.1
Tunisia	154	54	209	35%	10.8
Ethiopia	81	90	171	111%	91.7
Pakistan	56	50	106	89%	179.2

Source: Global Wind Energy Council / European Wind Energy Association / World Bank

## Total capacity by region 2013 - 2018



### Thailand and South Korea are making big strides in the shadow of two powerhouses - China and India

#### AFRICA

African nations are only beginning to switch on to the potential of wind power and it only had 1.3GW installed at the end of 2013, according to the Global Wind Energy Council (see above) — and that figure also includes the Middle East.

This year, the market is set to take off in countries such as South Africa, although it did not make our table because it only had 10MW installed at the end of 2013. However, schemes totalling between 500MW and

1GW are due to be completed in South Africa this year following the establishment of government subsidy schemes.

The only African country that featured in our table is Ethiopia, which more than doubled its capacity in 2013 with the addition of 90MW. Its government also has a highly ambitious plan to build wind power totalling more than 7GW by 2030. You can read more analysis on the opportunities in Africa on page 17.

#### ASIA

It is understandable that economic powerhouses like China and India overshadow many of their regional neighbours, but countries like Thailand and South Korea are also making big strides. Investors hoping to enter the latter two will need to bring innovative approaches, and develop a solid local base.

Thailand's wind market has been slow to take off because the low wind speeds in many parts of the country mean conventional turbines do not work efficiently. Even so, there are investors taking advantage with Nopporn Suppipat, founder of Wind Energy Holdings, the best known. His firm has built two wind farms totalling 207MW and is planning seven more with a combined capacity of 650MW.

The market is now opening further as manufacturers develop more low-wind turbines, and this should help investors to take advan-

Turbines in northern Ethiopia



Source: Adam Jones via Flickr

Investors at A Word About Wind's annual conference



**There are few European markets that investors have not considered, and those in the EU are facing uncertainty.**

tage of good government subsidies. Thailand is also under pressure to replace its natural gas reserves, which are set to run out in 2021.

Meanwhile, in South Korea the focus is on growing offshore. In February, Hyundai Heavy Industries installed a 5.5MW turbine off Jeju Island in the East China Sea; Samsung is planning an 84MW wind farm off the same island; and the government is planning a test field for Korean turbine manufacturers off the coast of Jeollanam and Jeollabak provinces. Investors experienced in this sector will want to keep an eye on this burgeoning market.

**EUROPE**

There are few markets in Europe that investors have not considered, and those in the European Union are being affected by uncertainty over EU renewable energy targets. The fastest growers in 2013 were Belgium and the Netherlands.

Outside the EU, the most exciting country in Europe — or, at least, partly in Europe — is Turkey, which is shaping up to be a key strategic hub for green power in the Middle East as well as feeding energy to its European neighbours. Read more on Turkey on page 27. ■



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# INSIDE PROJECT GEMINI: HOW TO RAISE €3BN



Jérôme Guillet is managing director at Green Giraffe Energy Bankers

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**Funding is available for the right schemes but, as the €3bn fundraising for 600MW project Gemini shows, you need a clear idea of which investors you are targeting.**

In 2011, when project Gemini, owned by developer Typhoon Offshore (with a participation by Dutch waste-to-energy group HVC) started working on the financing of the project with the support of Green Giraffe Energy Bankers, the challenges were massive.

At 600MW, it was a very large project; there was a requirement to find both the equity and the debt; and it was complicated

by a difficult banking market in the midst of the eurozone crisis. But the project team had two major advantages. First, an experienced technical and commercial team that had done

the job before: a large part of the team had been involved in the successful Q7 and Belwind offshore wind projects.

**“The project team had two major advantages: an experienced technical and commercial team; and a strategy to go for non-recourse financing.”**

And, second, it had a clear strategy to go for non-recourse finance, with realistic expectations as to what could be achieved. The team implemented a detailed plan to first select contractors with the ultimate financing in mind, negotiate bankable construction contracts, raise the equity on the basis of a precise description of what the debt terms were expected to be, and finally go the banking market.

The contractors, Siemens and Van Oord, were selected in 2012 and, as part of the deal, they agreed to provide some project equity. The contracts were negotiated with advi-

sors specifically tasked to represent future lenders' interests, and preliminary contacts were made with public financing institu-

tions like the European Investment Bank and export credit agencies. Subcontractors were selected, among other criteria, with possible support of their national electrical contractors' association in mind.

With a due diligence package already designed with lenders in mind, it was possible to attract investors with a well-identified profile. That is, compatible with project finance (attracted to the levered returns and familiar with the risk discipline and process it implies); willing to take a leading role in the project; and able to bear construction risk.

Northland Power, the party that was selected, further found that the Dutch regulatory regime, with its price support mechanism designed to provide high revenue stability across a variety of wind levels, was well-adapted to its stated corporate policy, as a quoted company, to distribute stable dividends. Northland brought its project finance experience, and project develop-

ment and contracting expertise, to the existing team and it was an excellent fit.

With all the right blocks in place, project finance lenders found the transaction highly attractive and the project was able to raise more than €2bn in debt, and close to €3bn in total, demonstrating that there is indeed enough money for good projects.

**“With all the right blocks in place, project finance lenders found the transaction highly attractive. The project was able to raise more than €2bn in debt, and close to €3bn in total.”**

This does not mean Gemini's strategy is the only one that can raise funding for offshore wind, but it does show that successful transactions require a strategy where the seller knows what it is sell-

ing, what it wants from the market, and targets the relevant subset of investors.

By being selective, you can find a better fit between the proposed risk/reward profile and buyers' expectations. ■

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# GOOGLE: THE \$1BN GREEN SEARCH

**Kojo Ako-Asare, Google's head of corporate finance, explains why the internet giant is looking worldwide for 'high impact' wind investments.**

Google may run the world's most popular search engine, but it is also spending its time searching for wind investment opportunities.

In an interview with *A Word About Wind*, Google's head of corporate finance Kojo

Ako-Asare talks about the company's approach to investing in renewable energy schemes. He explained its attitude to investing in emerging markets and developed markets; prospects for the US wind sector despite uncertainty over the wind production tax credit (PTC); and the potential to get further involved in investing in ground-breaking wind technology.

Over the last four years, the US internet giant has invested more than \$1bn in 16 wind and solar projects. Six of these are US wind farms and one is the Atlantic Wind Connection, which is a transmission project that could promote the development of offshore wind farms along the mid-Atlantic coast (see box, page 13).

In total, he says Google has "a couple of dozen" people looking for green energy deals. The company typically does not get involved in the day-to-day asset management of its wind projects, but it will sometimes get involved if there is a specific problem that needs fixing.

Of its remaining eight projects in solar, six have been in the US with one in Germany and one in South Africa. Ako-Asare says most of its projects have been in the US because of the range of opportunities in the country, and because it is easier to in-

Kojo Ako-Asare from Google



Source: Google press office

**“We are encouraged by what we are seeing in Europe. There is a lot of opportunity, especially when you consider they are going to have to de-commission a number of nuclear power plants.”**

vest in the country where Google is headquartered. Future opportunities will come from further afield.

“We are increasingly encouraged by what we are seeing in Europe,” he says. “There is a lot of opportunity in Europe, especially when you consider that they are going to have to de-commission a number of nuclear power plants.”

He points towards Google’s \$12m investment in the Jasper Power Project in South Africa, which it made in May 2013. This is a 94MW solar PV plant in the Northern Cape Province, and it is poised to begin commercial operations later this year.

In this case, he says that the size of the investment is less significant than the potential impact. Its green energy investments have varied between \$7m and \$200m.

“The fact that it will be one of the largest PV plants in South Africa was quite encouraging, so we went ahead and worked with the folks there to make an investment,” he says, and adds that this is in line with the company’s strategy of making investments that will have a large impact on their community. This is more significant than the country where the project is located, as Google’s global reach gives it access to a wide range of markets.

“We have a range of criteria as to what makes a great investment versus an investment we pass on. We generally like to focus on opportunities that have a huge impact,” he says.

The firm is also getting a feel for the overseas wind industry through power purchase deals it has signed with wind farm operators in order to power a data centre in Finland. In June 2013, it agreed a ten-year power purchase deal with O2 and Allianz to buy wind energy from a 72MW wind farm at Maevara in northern Sweden. It followed this in January 2014 with a ten-year deal with Eolus Wind to buy all the electricity from four wind farms totaling 59MW in Sweden, due to complete in 2015. This followed three similar wind power purchase contracts to help fund its data centres in the US.

While Google is keen to explore opportunities in emerging markets, it continues to have a strong focus on the US.

Ako-Asare says there will continue to be exciting prospects in the US, despite problems with renewing the wind production tax credit (PTC) that has been so vital to the growth of wind power in the US. The PTC expired at the end of 2013, and the US Senate opted not to revive it in May as part of a tax extenders bill.

**“We find technologies that make sense and are worth putting money behind.”**



Alta Wind Energy Center in California

Source: Google press office

## Google's wind investments: 2010 to now

Shepherd's Flat wind farm



Source: Google press office

**Alta Wind Energy Center:** Invested \$157m in 2011 in two projects totaling 270MW in the Alta Wind Energy Center (AWEC) in southern California. Invested \$55m in the 102MW Alta IV and \$102m in the 168MW Alta V. AWEC is currently comprised of nine schemes with combined capacity of more than 1.5GW, and is being developed by Terra-Gen Power.

**Atlantic Wind Connection:** Invested an undisclosed sum for a 37.5% stake in early stage development in this scheme, which is a proposed 250-mile transmission scheme that could open up the mid-Atlantic coast to 7GW of offshore wind farms. The project is being led by transmission company Trans-Elect and developer Atlantic Grid Development, with Bregal Energy, Elia and Marubeni investing alongside Google.

**Panhandle 2:** In December 2013, invested \$75m in the 182MW Panhandle 2 wind farm in Carson County, Texas. Developed by Pattern Energy, it is due to complete this year.

**Peace Garden wind farms:** In May 2010, invested \$38.8m in two wind

farms in North Dakota with combined capacity of 169.5MW, which were developed by NextEra Energy Resources. This was Google's first investment in a utility-scale renewable energy project.

**Rippey:** In November 2012, invested \$75m in a 50MW wind farm in Rippey, a small town in Greene County, Iowa. The project was developed by RPM Access, and the energy produced has been contracted to utility Central Iowa Power Cooperative.

**Shepherd's Flat wind farm:** In April 2011, announced \$100m in the 845MW Shepherd's Flat wind farm in Arlington, Oregon. Energy produced is being sold under long-term agreements to Southern California Edison. It officially opened in 2012.

**Spinning Spur:** In December 2012, invested \$200m in the 161MW Spinning Spur wind farm in Oldham County, Texas, which was developed by EDF Renewable Energy. Energy produced by the project has been contracted to Southwestern Public Service (SPS), a utility serving Texas and New Mexico.

"I recently read a report from the Department of Energy that illustrated that the cost of wind power has dropped 43% over the past four years, and there are even parts of the US where wind is already at grid parity without subsidies," he says. "Those costs will continue to decline and, in my mind, that will only improve the economics behind wind energy."

He is also confident in the prospects for US offshore wind too, as the country is can learn lessons from established offshore markets in Europe and other emerging markets in Asia: "There's a compelling case for offshore wind to grow dramatically in the United States."

The other opportunity where Google has taken its first steps is investing directly in wind technology companies. Last May, it bought Makani Power, which is developing airborne wind turbines, for an undisclosed sum. Google had previously invested £15m in the company, which is now part of Google X. This is the arm of Google that is developing technology including Google Glass eyewear, and its self-driving cars, Google Chauffeur.

Ako-Asare says that the company would look at similar investments.

"This is not our primary focus at the moment but... we're always open to new ideas," he says. "As I've said, we're a company that invests in the right technology and, instead of saying 'No', we find technologies that make sense and are worth putting money behind."

Its focus currently is on completed projects. Both in the US and overseas, it will certainly find no shortage of opportunities. ■

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# POST-FUKUSHIMA JAPAN OPTS FOR OFFSHORE



Chris Lloyd is a freelance project manager with over a decade's worth of experience in developing renewable energy projects

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The Japanese government is seeking to open the offshore market to overseas investors. Here are five reasons you should invest in this market.

Renewable energy, and particularly offshore wind, is a hot topic in Japan, driven by the post-Fukushima energy crunch and President Abe's reformist government.

In June, a new law to liberalise the electricity market, including unbundling the energy utilities, passed in the Japanese Diet. It is expected to be favourable for renewable energy producers.

This follows an improved feed-in tariff of 36 yen/kWh (£20/MWh) introduced this year. This feed-in tariff was short of the 50 yen / kWh that the Japan Wind Power Association estimated was needed to meet ambitious expansion plans.

Even so, taken together with the market liberalisation, it is expected to create opportunities for players from the established renewable industry in the UK and Europe. Here are five such opportunities:

**“Subsidies and market liberalisation are set to create opportunities for players from the established renewable industry in the UK and Europe.”**

**Trading:** The UK has been through a similar separation of energy generation and retail, and those who worked through this period will know of the opportunities that arose out of the change.

The clear winners in the UK have been trading arms of utilities through their vertical integration. This success is in spite of the fact that only a tiny fraction of energy is traded on the open market, due to legal restrictions on European utilities.

It is unclear if the same will happen in Japan. Opportunists looking for a high-risk investment should keep a close eye on the potential for electricity trading.

**Floating foundations:** Although Japan is currently pursuing development akin to Round 1 in the UK, a dearth of shallow seas in its territorial waters means that floating foundation concepts could soon

become prevalent. Recently, Japanese engineering giants have sought to acquire intellectual property in this area, so the developers of floating technology should be looking engage with Japanese firms.

**Consenting:** The requirement to undertake environmental impact assessments on offshore wind farms came into force in 2012, resulting in delays to most offshore projects.

However, the lack of a robust screening process means that developers are still able to shrink from their environmental obligations by opting to avoid assessing the high-risk receptors.

The Wild Bird Society of Japan is working to make sure robust assessment processes are in place, and good opportunities exist for developers with experience of commercial fishing, and the collision and displacement of sea birds.

**“With few domestic developers in offshore wind, and little experience of offshore construction, major players will be able to export services.”**

**Infrastructure:** Japan does not have the traditional marine industrial background of Europe and, as such, there is a shortage of infrastructure in the form of both suitable ports / harbours and specialist vessels.

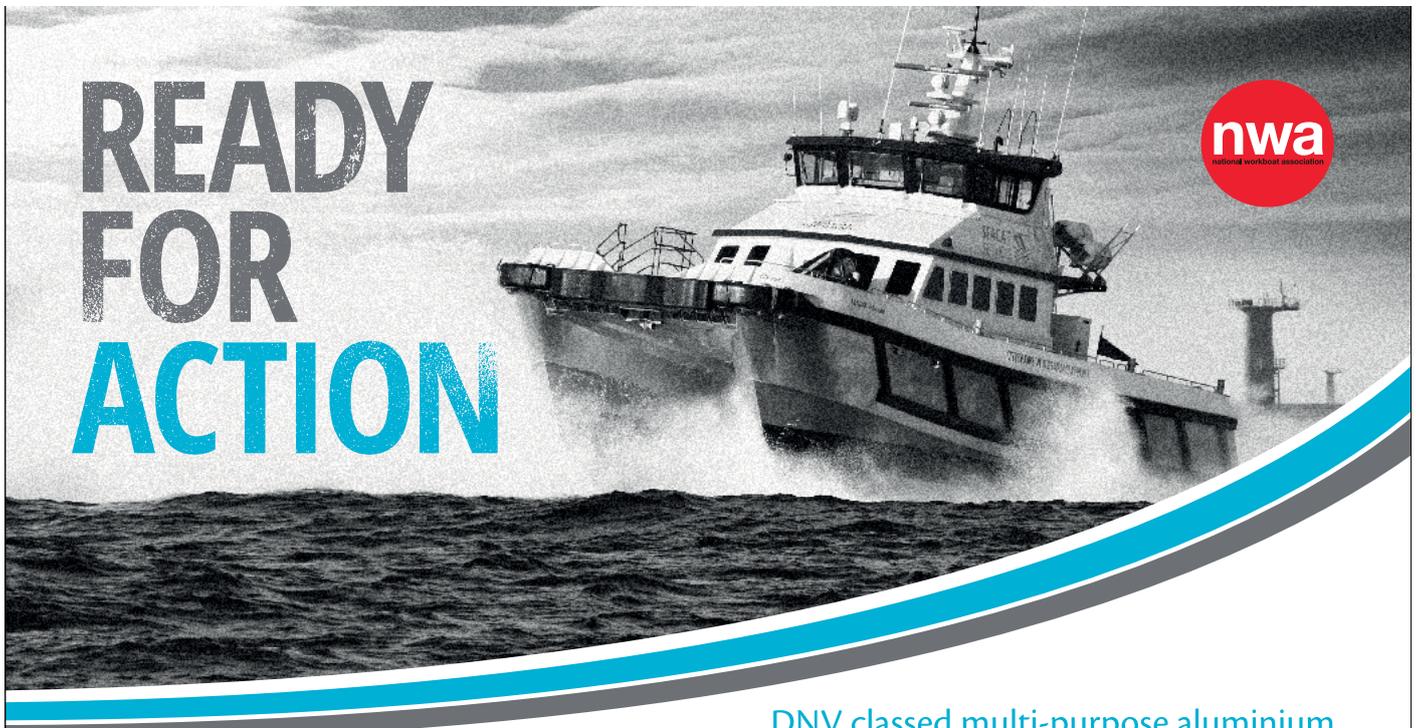
Ports areas are under the management of the Ministry of Land, Infrastructure, Transport & Tourism.

The ownership structure is reminiscent of much of continental Europe, and the government wants the

first offshore investments to be made in these areas.

Opportunities exist for the major port operators and infrastructure developers.

**Skills:** With very few domestic developers engaged in offshore wind and little experience of offshore construction, the major players have a good opportunity to export their services. ■



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# AFRICA: THE UNEXPLORED CONTINENT

## Rapid expansion in South Africa should help to spark growth across sub-Saharan Africa as countries seek cheap electricity.

This is the year that the African wind market awakens. Activity on the continent has so far been concentrated on the North African nations of Egypt, Morocco and Tunisia, but the market is now gathering pace in South Africa and starting to grow in countries including Kenya and Ethiopia. It should also open up new opportunities for investors, although they are still few and far between.

There are pressures in Africa that augur well for wind power. Two-thirds of people in sub-Saharan Africa don't have access to electricity, and over 85% of those in rural areas don't have it. The wind sector has the potential to provide competitively-priced energy for some of the 1.1 billion people

in this region. This is why some nations are introducing policies to promote green energy (see table, next page).

But there are also good reasons that would put off investors from investing in this part of the world. Energy grids are patchy, the costs of being the first into a new region are high, and there are viable concerns about the unstable political regimes and lack of economic transparency in some nations. This is why the fast-growing South African market is the obvious starting point for most investors.

### SOUTH AFRICA: AFRICA'S EMERGING MARKET LEADER

In May 2014, a consortium including Mainstream Renewable Power and emerging markets energy investor Globeleq commissioned their 138MW wind farm Jeffrey's Bay on South Africa's Eastern Cape. This is the nation's first large wind farm, and the first wind farm built under the government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

By the end of this year, South Africa is due to have the largest installed capacity in Africa, ahead of the more developed markets in North Africa (see box, page 19). Projects totalling 1GW are due to be completed in the country this year, according to the Global Wind Energy Council. The South African government also has ambitions to install wind energy of 5GW by 2019 and 9GW by 2030.

Two-thirds of people in sub-Saharan Africa don't have access to electricity. Wind has the potential to address this.



Jeffrey's Bay wind farm in South Africa

Source: Mainstream Renewable Power

South Africa has suffered from widespread power failures since 2008 due to energy shortages, the result of chronic underinvestment since the 1970s.

This doesn't mean wind power is the favoured energy source of state-owned utility Eskom or the ruling African National Congress (ANC). Eskom is building the third- and fourth-largest coal-fired power stations in the southern hemisphere, Medupi and Kusile, with total capacity of 9.6GW; while many ANC leaders still have vested interests in coal.

Even so, there are two reasons why investors should be positive about the prospects for wind.

The first is that the country has suffered from widespread power failures since 2008 due to energy shortages, which is a result of chronic underinvestment in the power system since the 1970s. The ANC is under pressure to develop a robust energy system following rolling blackouts earlier this year, and wind will be part of this solution — even if only a small part.

The second is that the country has put in place successful support mechanisms, particularly the REIPPPP. Under this system, the Department of Energy has since 2011 awarded developers the right to build 64 renewable power projects, totalling 3.9GW, in three tender rounds.

It is following this with a fourth tender round this summer, where projects are due to be awarded licenses by the end of 2014, and where the government has an aimed of 590MW of wind; and a fifth tender round in 2015. Other African nations are seeking to replicate REIPPPP.

Jeffreys Bay is the first wind project to be delivered under this system. In total, 32 wind projects totalling 1,8GW have been commissioned in three tender rounds, and these have attracted total investment of \$4.7bn according to the World Bank Group. The most common financing structure has been debt finance, although corporate finance arrangements have also proved popular.

Most of the debt has come from commercial banks, with the rest from development finance bodies, pension funds and insurance funds. Eight-six percent has come from within South Africa.

Helmut Hertzog, energy efficiency sector manager at GreenCape, which is a development agency set up to support green manufacturing in the Western Cape, says one success of REIPPPP is how it has led to new opportunities for manufacturers.

Under REIPPPP, schemes have to meet specific local content targets. In the first round, 25% of parts for the wind farm had to come from within South Africa, although it had an aim of 45%. This had risen to a 40% statutory aim and a 65% ambition in the third round. The focus on finding parts locally is leading to the growth of a new market for manufacturers and supply chain firms: "It's no longer that easy to farm off the things that couldn't be done locally," says Hertzog.

Matthew R. Thibodeau, principal consultancy at US-based engineering practise

## National policies to promote renewable energy

Country	Feed-in-tariff (FIT)	Capital subsidies, grants, rebates	Investment or other tax credits	Sales tax, energy tax, excise tax or VAT reduction	Public investment, loans or financing	Public competitive bidding
Algeria	●		●	●		
Egypt				●		●
Ethiopia				●		
Ghana		●		●	●	
Kenya	●		●			
Mauritius		●				
Morocco			●	●		
Rwanda	●				●	
South Africa	●	●		●	●	●
Tunisia		●		●	●	
Uganda	●	●		●	●	
Zambia				●		

Source: African Development Bank, March 2013

## North Africa: Political uncertainty stifles energy investment



Source: Darla Hueske via Flickr

Egypt, Morocco and Tunisia have historically been the largest wind power markets in Africa, but this north African dominance will end this year as South Africa makes major advances.

In theory, the prospects for wind investment in north Africa should be good. Demand for electricity in the region is growing as a result of economic development, rising living standards, and population growth. Investment in power generation projects — including renewables — should be a priority.

The big obstacle for attracting investment to north Africa is political uncertainty in the wake of the Arab Spring of early 2011 (above), which continues to deter foreign investors.

For example, the Egyptian wind power sector grew from 145MW at the end of 2004 to 550MW at the end of 2010, but little has happened since then. Gamesa is due to finish a 200MW project in the Gulf of El-Zayt this summer; but further growth is proceeding slowly due to investor uncertainty and a weakened economy after the ousting of former president Hosni Mubarak in February 2011. The country has a 7.2GW wind target by 2020 but meeting that looks totally unrealistic at present.

In neighbouring Libya, where former president Colonel Gaddafi was killed in October 2011, there is slow progress on the country's first project, 61MW near Dernah, due to arguments over land use.

Meanwhile, Tunisia commissioned 54MW in 2013 to take total capacity to 209MW, although the country offers few opportunities for private investors as development has been public sector-led; and Algeria last year gained its first 10MW pilot.

The most significant growth in north Africa is happening in Morocco, where Moroccan firm Nareva Holdings added 203MW of capacity in three schemes last year. This took the country's total supply to 495MW, and Nareva is planning to add to this later this year with a further 300MW facility that it is developing with GDF Suez near the city of Tarfaya.

There are also significant plans afoot. State utility ONEE launched a tender in February to find a development partner for five wind farms totalling 850MW, which are due to be completed by 2020. The country has shown it is willing to accept foreign firms, and has been somewhat isolated from the upheaval of the Arab Spring.

Sargent & Lundy, who specialises in investment in South Africa, says a challenge for supply chain companies is that REIPPPP has attracted a great deal of competition from companies promoting schemes. This has driven down the cost of projects, and would make it tougher for smaller manufacturers that do not benefit from the same economies of scale as larger rivals.

He also adds that the market may be growing fast, but there are also plenty of investors looking to get involved in the country, including private equity firms, banks and development agencies. This

is good for those planning to develop schemes, but it also means that investors would face plenty of competition if they want to get involved in South Africa and take advantage of its fast growth.

### KENYA: LAKE TURKANA,... AND THEN?

Outside South Africa, the most interesting sub-Saharan market is Kenya, although this is mainly because it is the location of the largest wind farm proposed in Africa: the 310MW Lake Turkana. It is one of the largest private investments planned in Kenya and construction is due to start this year.

London's Aldwych International agreed a €623m funding package with lenders including African Development Bank, the European Investment Bank and the Standard Bank of South Africa earlier this year. This was followed last month by the US Overseas Private Investment Corporation, which approved an investment guarantee of \$250m to support the development.

The government also has an aim of 2GW of wind power by 2030, which doesn't sound particularly exciting for investors but is still larger than the country's existing total energy capacity, of 1.5GW. It estimates that wind could account for 9% of total capacity by 2030, and has set up a feed-in tariff to help support the growth of the wind power sector.

However, there have also been reports that the country is holding off awarding licenses for new wind farms until 2017, and so now is not a good time to get involved in this market.

Investors would be better served by thinking in terms of groups of countries. For example, the east African coast has the largest wind potential, which includes Ethiopia, Mozambique and Tanzania. This group of countries — which also includes Burundi, the Democratic Republic of Congo, Egypt, Libya, Rwanda, Sudan and Uganda — was formed in 2005 to focus on developing power systems that cross national borders. Investors would do best to focus on regions rather than countries.

In Ethiopia, the 120MW Ashegoda wind farm was commissioned last October, and is currently the biggest wind farm in Africa. Ashegoda was completed in phases in 2012 and 2013, was developed by French firm Vergnet, and funded primarily by the French Development Agency and French financial institution BNP Paribas. The country also has plans for 800MW of new

“Deals seem to be considerably slower in the making, but this will change as precedents are set over time and investors become more comfortable operating in the markets.”

wind farms. And, in Tanzania, work is due to start on a 50MW project called Singida, funded by Chinese investors.

The market is still at a very early stage and there are limited opportunities to fund projects that are already in the planning.

#### GLOBAL FIRMS GET INVOLVED

The most active manufacturers involved in Africa have been Gamesa, Vestas, Alstom and Nordex, according to the African Development Bank in a 2013 white paper on the growth of the wind sector:

The bank has forecast that more global players will seek to increase their presence in Africa; and it says policymakers need to focus on ways to attract them, learn from them and pool orders so they can benefit from economies of scale. These help to drive down the costs of wind.

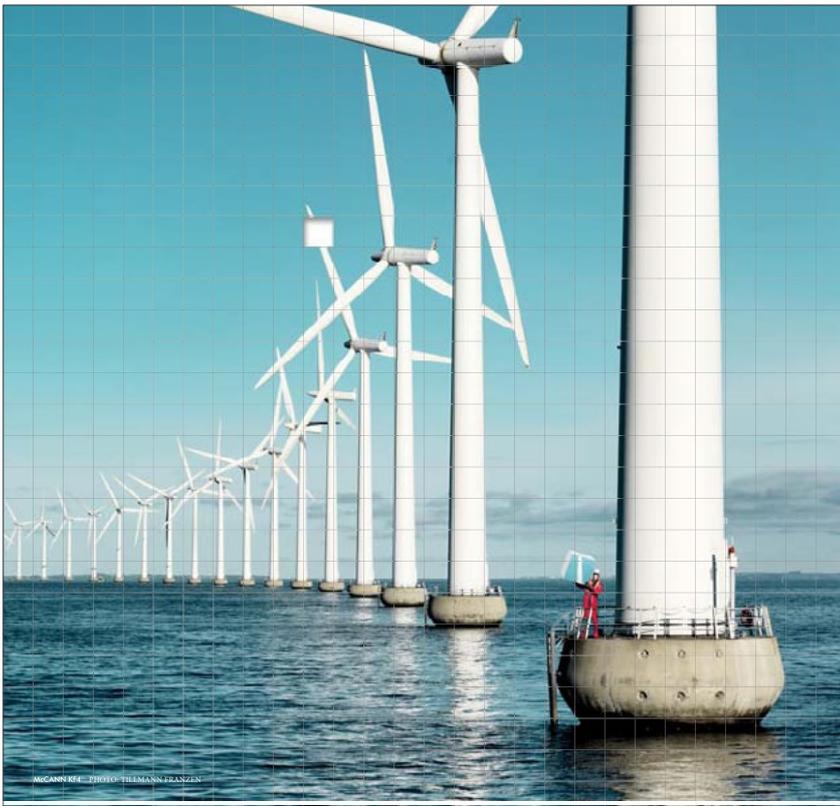
It has also identified how reliant the wind sector currently is on government backing. Across Africa, the public sector is the main backer of completed wind projects, with 78% government-backed compared with 14% private-sponsored and 7% funded

by private-public partnerships. The private sector is set to grow to more than 50% of total funding as South Africa takes off.

Governments across Africa are likely to need more policies to encourage private sector investment in their energy markets. Investors are also likely to look for power purchase agreements of 15-20 years if they are to have the confidence that they will see strong returns on their investment.

Gareth Blanckenburg, industry analyst for energy and environment at consultancy Frost & Sullivan, says he has seen investors increasingly interested in putting their money into renewables in Africa over the last few years before of the higher returns they offer than “sluggish” developed markets. He says: “Deals seem to be considerably slower in the making, but this will likely change as precedents are set over time and investors become more comfortable operating in these markets.”

It will take some time for investors to get comfortable investing in Africa. But South Africa, with its supportive policies and big plans, would be the best place to start. ■



## JAMES, WE HAVE A PROBLEM

### How do we lower the cost of clean energy production for offshore wind?

James Dobbin, Senior Engineer at DNV GL, holds part of the solution to one of the greatest challenges of our time: how to meet growing energy needs in a responsible manner.

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# MAJOR INVESTORS SEE OPPORTUNITIES IN STORAGE



Jason Deign is an *A Word About Wind* correspondent and the publisher of *Energy Storage Report*, which delivers weekly news and analysis on the energy storage industry.

[www.energystoragereport.info](http://www.energystoragereport.info)

If you're casting around for wind-related investments then energy storage is definitely worth a look. Just ask Bill Gates and Warren Buffett.

What have Warren Buffett, Bill Gates and Vinod Khosla got in common? They are all very rich, of course, and, presumably, astute investors. And right now they are holding shares in companies from a sector most people are not even aware of: energy storage.

The reason isn't hard to fathom. As renewables' share of the global energy pie grows to around 5%, and most new additions are

in the form of intermittent wind and solar reserves, the question of how to handle intermittency is becoming more pressing for developers and policymakers.

Energy storage, whether through hydro reserves, batteries, flywheels or any of a whole range of other options, seems like just the thing to tackle the problem. And in many respects it is a lot more accessible to investors than other potential solutions,

Warren Buffett discusses his strategy



Source: Fortune Live Media via Flickr

such as smart grids or supergrids, which are often tied by regulatory and transmission system operator constraints.

In terms of potential, many in the energy storage community feel that things are at a similar stage to that witnessed in the solar PV sector about ten years ago. In other words, poised for take-off.

And while much attention is currently focused on storage systems for distributed or residential-scale PV generation, a number of companies are also seeking to address the need for grid-scale setups of the kind that could sit nicely alongside wind farms.

From an investment perspective, this adds up to a classic high-risk, high-reward scenario. The need for energy storage is clear, and growing. A host of promising start-ups are working on ways to solve the problem, and they are hungry for cash.

Some of them may become industrial giants in the next decade. Many will crash. Picking the winners is complicated because,

unlike wind, energy storage is not about variations on a single technology.

It encompasses areas as diverse as liquid air and molten salt, not to mention established concepts like batteries and pumped hydro. And then there is a problem of scale.

Few technologies, let alone players, are at a stage yet to be of interest to major investors. At least one global private equity firm we know has taken a close look at the sector and walked away for lack of sizeable opportunities.

But perhaps that is where the opportunity for wind investors lies. Whereas energy storage in its own right might not yet be ready for big-time backers, adding a relatively strong developer to your existing assets could help give your portfolio a bit of diversity with a technology that nicely complements wind.

It could also give you exposure to a sector that is almost certain to grow in the future. Just ask Buffett or Gates. ■

**“Energy storage is more accessible to investors than other potential solutions to the problem of intermittent energy supply, such as smart grids or supergrids.”**



# GRID BATTERY STORAGE: FOUR REASONS TO INVEST

The emerging battery storage market will present new opportunities for investors. Here are four of the most exciting.

Think of a product. The chances are that Hawaii has to import it. From food and cars to electronics and building materials, there are few areas where the US state is self-sufficient — and energy is no different.

Hawaii is in the middle of the Pacific Ocean, and 2,400 miles from California, its closest neighbouring US state, so it clearly cannot link to a grid on the US mainland. But it is still reliant on the mainland for the imported oil and petroleum from which it generates almost 90% of its energy.

Hawaii is now looking to change that. It has spent the last six years embracing renewable energy to reduce its reliance on imported fuels. Its efforts are an interesting case study on how nations are set to use energy storage to cope with fluctuating production from sources such as wind farms.

It also highlights some important reasons why investors in wind should get interested in storage, particularly battery storage. Here are four reasons why you should take this technology seriously:

## Four reasons to invest

- (1) Remote regions: Battery storage developments can open up investment opportunities in remote regions, including islands and rural communities.
- (2) Managing load capacity: These schemes will be increasingly important in larger countries where grids need to cope with growing amounts of wind.
- (3) Asset management: Enables individual wind farm owners to regulate when they send energy to the grid, in order to take advantage when prices are higher.
- (4) Technology investment: Companies with new storage ideas will be seeking private investment as they seek to develop and commercialise their ideas.

Rooftop solar power in Honolulu, Hawaii



Source: Mana Photo via Shutterstock

Fluctuating supply from solar and wind in Hawaii have been putting extra pressure on the grid. This is causing a “severe emergency” for the grid.

# 1.

## OPENING UP REMOTE REGIONS

The situation in Hawaii shows us the problems for islands if they develop renewable sources but can't store the energy. Storage is now a vital part of the island's ambitious attempts to go green.

In January 2008, the state of Hawaii and the US Department of Energy launched the Hawaii Clean Energy Initiative so business leaders, policy makers and citizens could find a way for the island to become energy independent. This set a goal of 70% of energy from renewable sources by 2030.

The US Department of Energy has reported 12.3% Hawaii's energy in 2013 was from renewable sources, which puts it 20 out of the 50 US states. Solar and wind are its largest sources, but the fluctuating energy supply from both has been putting extra pressure on the grid. The Hawaii Electric Co. has said that this is causing a “severe emergency” for the island's electricity grid.

Generous incentives for solar panels mean that 11% of Hawaii Electric's customers now have them on their homes. The problem for Hawaii is that too much energy is being generated by solar panel in the middle of the day and this is loading more power than is needed onto some parts of the grid.

The result is that Hawaii Electric is now searching for energy storage projects up to 200MW to help manage the solar and wind projects that are causing fluctuations

for the grid. The utility is open to a range of proposals, from newer technology like batteries to more established hydro schemes. Bids in this tender round are due by 21 July and the utility wants winning projects finished by 2017.

Chris Cioni, senior vice president of underwriting at insurer GCube, focusing on technical areas such as battery storage, says he has worked with clients on grid-scale systems in Hawaii, Puerto Rico and other parts of the Caribbean.

He says that battery storage can play a vital role in helping open opportunities for renewable energy in smaller islands and remote communities. This is because battery storage can help handle disruptions, whether there is too much energy being produced at a time or too little.

“When you're on a smaller island, any one interruption is proportionately more disruptive than if you're tied in to a bigger system and have a bigger cushion. Energy storage can play a much more vital role in an island environment to give that cushion effect that is needed,” says Cioni.

Other islands are set to make tougher demands for battery storage. For example, in Puerto Rico, the Puerto Rico Electric Power Authority (PREPA) released a set of minimum requirements for wind and solar projects that they must include energy storage equivalent to 30% of the project's total capacity. The idea is that this will be able to be called on to keep grid power constant.

Puerto Rico is seeking to add 600MW of green power this year, which would take the total share of renewable energy in its energy mix from 1% at the end of 2013 to 6% at the end of 2014. That is a big change for the country's grid, but energy storage is key to making the change happen.

So the first reason to get excited about battery storage schemes is that they open up markets with smaller and less reliable grids to the prospect of more development in the wind and solar sectors. Other applications include helping remote mining communities reduce their reliance on diesel.

This technology can help the industry answer the concerns of critics who argue that wind farms are of little use because their supply of energy is unreliable.

## 2.

### MANAGING LOAD CAPACITY

It is not just islands that will embrace battery storage. Larger countries and regions will use similar technology in order to cope with fluctuating production from their wind farms and solar PV plants. The best example of this is California, which is facing similar challenges as Hawaii, as it seeks to gain 33% of its electricity from renewable sources by 2020.

The state currently has 5.7GW of solar power installed and this makes it the US state with the most installed solar capacity. In 2013, some \$7.1bn was invested in Californian solar, and this year NRG Energy, Google and BrightSource Energy opened the world's largest solar farm, the \$2.2bn 400MW Ivanpah project. For more on Google's strategy, see page 11.

The reason that discussion about battery storage currently revolves around solar power is because solar is more predictable than wind. Both solar and wind can face short-term drops in supply, if it gets cloudy or the wind stops blowing, but the peak production for solar is more predictable given that it is based around the movement of the sun. It is more difficult to predict the fluctuations in wind, although forecasting is

improving. Even so, battery storage is just as important for wind farms as it is for solar farms.

It is one of the key types of technology required to help adapt the UK grid to cope with more wind farms, according to a report in April by the UK's Royal Academy of Engineering. This report looked at the changes that would be needed to the UK's grid to allow for the installation of more onshore and offshore wind farms by 2030, and it identified grid battery storage as a vital change.

The grid will come under more pressure with the growing amount of electric vehicles predicted by 2030. Its report said: "Even in a long period of calm weather, the daily troughs in demand should provide an opportunity to recharge storage systems that can help to meet the following day's peak, unless the available capacity of other kinds of generation falls to very low levels."

Investors need to be aware of battery storage because it is a fundamental driver in how the grid is set to change by 2030. It can also help the industry answer the concerns of critics who argue that wind farms are of little use to established energy grids because their supply of energy is unreliable.

## 3.

### ENABLES WIND FARM OWNERS TO BETTER MANAGE ASSETS

Battery storage does not just benefit the grid. It can also help wind farm operators maximise the value of their asset by enabling them to store energy and supply it to the grid when the prices look most attractive; and enable them to make money selling energy that would otherwise be wasted.

Such systems can also help operators cope with tougher rules about subsidies, such as in Brazil.

Last year, the Brazilian Ministry of Mines & Energy introduced new rules for companies bidding for renewable energy subsidies. The ministry introduced its P90 target that says wind farm operators must be able to predict with 90% certainty the minimum level of energy that a wind turbine is likely

to produce, which is an increase from the P50 target — or 50% — that it replaced. Subsidies are tied to whether operators can meet targets, which is tough given wind fluctuations.

Therefore, battery storage developments enable businesses to predict with a great degree of accuracy how much energy they can send to the grid and when. We expect more governments to introduce tougher rules surrounding subsidies, as in Brazil. Governments want to know they are buying energy from reliable sources that will be there when required. This is one reason coal has endured.

One challenge for integrating this technology into individual schemes is its cost. However, there are plenty of firms looking to develop new types of batteries and drive down costs.

# 4.

## ENCOURAGES PRIVATE INVESTMENT IN STORAGE TECH

The International Energy Agency reported in March that there would be investment worth \$380bn in energy storage, including batteries, by 2050 in China, India, the European Union and the US. It is a market that technology firms want to access but, to do so, they need funding; and private equity does not have the same onerous commitments as public borrowing.

For example, in May, we saw an investment by Trinity Capital and CapX Partners in a \$20m debt loan to meet existing and future needs at Aquion Energy, an early-stage battery storage company. This follows the \$55m it raised in January from investors including Bill Gates.

This shows that there are companies out there seeking money to develop new types of batteries. These will include a range of battery systems from lithium ion and lead acid to zinc air and flow batteries. This is an opportunity.

Last month, Sony and Canadian hydro-power company Hydro-Quebec formally

set up a joint venture company to focus on developing new grid-scale battery storage systems. Dr Karim Zaghbi, director in energy storage and conversion at Hydro-Quebec, says that the pair see huge opportunities to roll out new technology in the wind sector over the next few years. This is because countries are looking to make their grids smarter, and cater for electricity demands from growing numbers of electric vehicles.

"I believe this will be a revolution for the smart grid," he says. Zaghbi says that central to this aim of becoming smarter will be how wind farms, energy storage schemes and the grid itself interact.

And the most prominent wind player in this market at present is General Electric, which has built its Brilliant Turbine platform to include integral battery storage. This allows the turbines themselves to capture excess wind energy and then sell it to the grid later.

But there will be plenty of smaller companies looking to go up against these big players, and some of these are likely to present attractive investment opportunities to canny investors. ■

Countries are looking to make their grids smarter and more reactive, as well as cater for growing electricity demand, including from electric vehicles.

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# TURKEY: GATEWAY TO THE GULF

With its location between Europe and the Middle East, Turkey is perfectly placed to be a major energy hub. But growth in the wind sector is hampered by complex laws.

The Turkish government wants the country to cut its reliance on fossil fuel imports, and become a net exporter to Europe and the Middle East.

With installed capacity of 3GW it feels strange to call Turkey a nascent wind market. But that is exactly what it is.

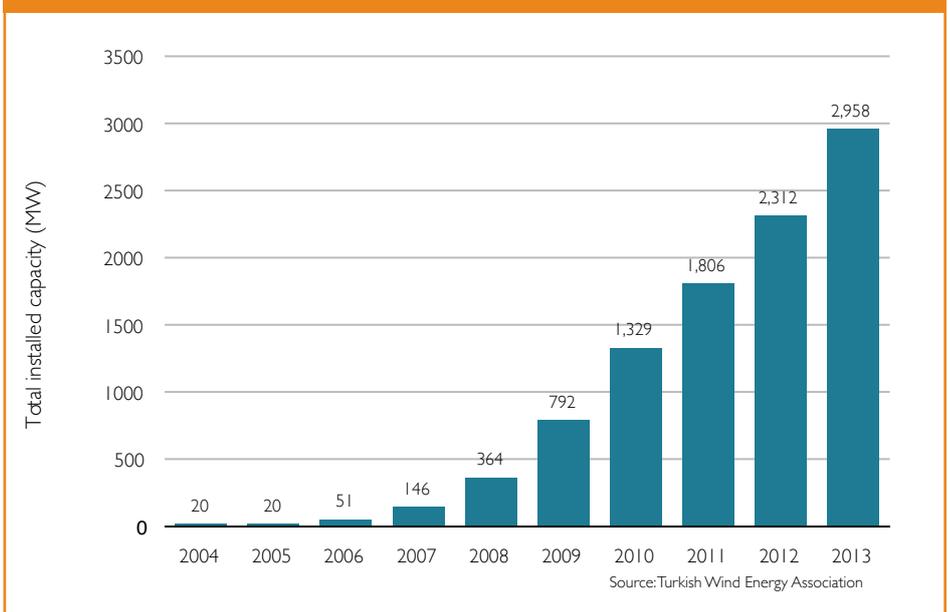
The market has experienced a decade of growth since feed-in tariffs were first introduced in 2005 (see table 1). Even so, the sector falls well short of where Turkey's leaders want it to be, and this presents opportunities to adventurous investors.

The Turkish government wants the country to cut its reliance on fossil fuel imports and, instead, become a net exporter of energy

to the neighbouring regions of Europe and the Middle East. To achieve this, it has set a target of 20GW of wind power by 2023, which would make up one-sixth of the its anticipated energy demand in 2023.

The government has also recognised that Turkey is lagging behind other countries when it comes to the development of wind energy, including smaller nations such as Germany, Spain and the UK. And it is looking to address a wide range of infrastructure issues, including the energy system, by the time the Turkish Republic celebrates its

Table 1 - The growth of wind energy in Turkey over the last decade



“A big portion of the finance and technical knowledge comes from the foreign investors. They expect Turkish partners to run the administrative and regulatory process.”

centenary in 2023. The potential for fast growth in the wind power sector is there, and it would require investors to get involved and fund developments.

But investors cannot base their plans purely on the Turkish government’s ambitions. The government also has to put in place the regulatory framework to make them happen. It is the legal framework that is holding the wind sector back, rather than a lack of demand for renewable energy.

Sule Erkoç, a consultant with 12 years’ experience in the Turkish renewable energy sector; says the government is looking to introduce laws that would encourage overseas investment. She is currently a consultant for Vaisala Energy; previously held senior roles at developer Borusan and GL Garrad Hassan; and spent two years on the board of the Turkish Wind Energy Association.

Erkoç explains that the most common way for international investors to get involved in the Turkish wind market is through partnerships with local developers (see table 2).

She says: “[International investors] are watching [the market] and, in parallel, they are setting up joint ventures with big Turkish investors that have influence in the energy market. A big portion of the finance and technical knowledge comes from the foreign investors, and they expect the Turkish partners to handle the administrative and regulatory process.”

These partnerships are generally driven by utilities or manufacturers. For example, German utility EnBW last year signed a framework agreement with developer Borusan; E.ON bought a 50% stake in Enerjisa, also last year; and General Electric had held a 50% stake in a joint venture with Gama Holding before it sold this earlier this year, as part of its strategy to divest from joint ventures. International investors need to enter such partnerships because of difficulties with bureaucracy.

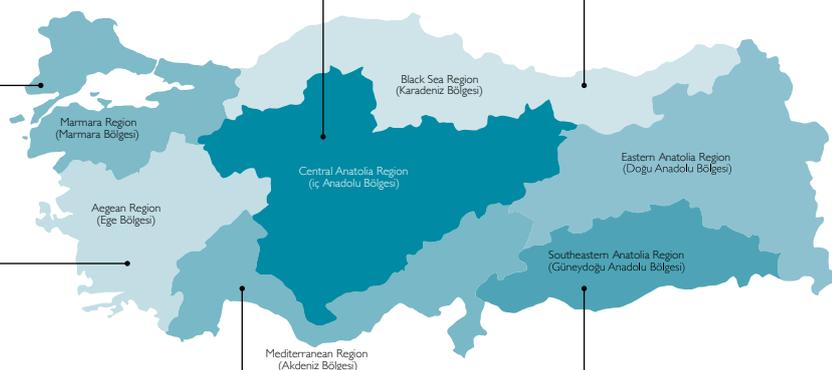
Erkoç says the Turkish government is also wary about handing out too many licenses for new wind farms. There was a rush of applications to develop wind farms after

## Regional and city breakdown in Turkish wind

Marmara Region		
City	Installed capacity (MW)	Under construction (MW)
Balıkesir	712.3	64.3
Canakkale	133.7	38.5
Istanbul	121.1	57.5
Bilecik	40	
Tekirdağ	32.8	65.1
Edirne	15	70
Kırklareli	0	67
Yalova	0	54
<b>TOTAL</b>	<b>1054.9</b>	<b>416.4</b>

Central Anatolia Region		
City	Installed capacity (MW)	Under construction (MW)
Kırşehir	79	
Kayseri	72	
Sivas	0	44
<b>TOTAL</b>	<b>151</b>	<b>44</b>

Black Sea Region		
City	Installed capacity (MW)	Under construction (MW)
Amasya	40	
Tokat	40	
<b>TOTAL</b>	<b>80</b>	



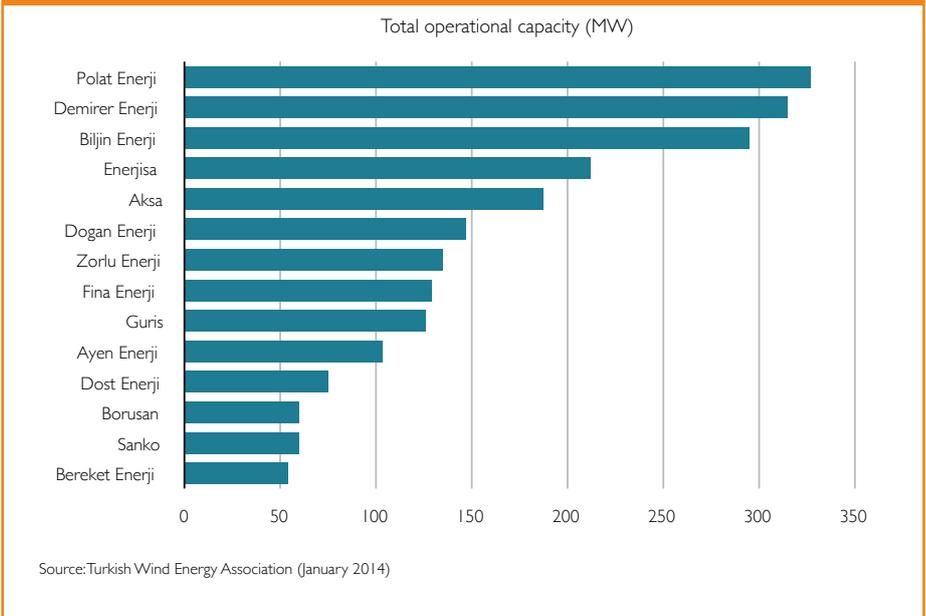
Aegean Region		
City	Installed capacity (MW)	Under construction (MW)
Izmir	576.9	124.3
Manisa	366.4	73.3
Aydın	105	
Afyon	78.2	77.6
Uşak	54	
Muğla	29.6	98.4
<b>TOTAL</b>	<b>1210.1</b>	<b>373.6</b>

Mediterranean Region		
City	Installed capacity (MW)	Under construction (MW)
Hatay	216	97
Osmaniye	135	50
Mersin	84	
<b>TOTAL</b>	<b>435</b>	<b>147</b>

Southeast Anatolia Region		
City	Installed capacity (MW)	Under construction (MW)
Adıyaman	27.5	
<b>TOTAL</b>	<b>27.5</b>	

Source: Turkish Wind Energy Association (January 2014)

Table 2 - Turkish wind investors ranked by capacity (over 50MW)



“The government is more careful. They don’t want to make the same mistake. They don’t want huge numbers of applications.”

feed-in tariffs were introduced in 2005, but no rules in place to ensure they were technically feasible. There is now 10.5GW at various stages of planning, according to the Turkish Wind Energy Association.

This rush has presented the government with a logistical headache and forced it to reverse-engineer regulations for the sector, with the result that the system is difficult for developers — both local and overseas — to negotiate. This is causing delays to schemes and holding back the market.

“They are more and more careful,” says Erkoc. “They don’t want to make the same

mistake. They don’t want huge numbers of applications in front of them.”

Turkey’s Energy Market Regulatory Authority has been seeking to crack down on projects that it does not think have been progressing fast enough. It set a deadline of May 2014 to cancel any projects that were licensed in 2011 and early 2012 that had not received all necessary approvals. This comes as the Ministry of Energy gears up for a new licensing round from 28 May 2015. This is despite accusations from developers that the delays have been caused by cumbersome rules.

These are a present challenge, although the government has indicated that it is seeking to improve the regulatory process. If it can succeed in doing so then this would further open up the market to big overseas investors who want to own schemes.

Such a boom would also make Turkey more attractive for firms in the supply chain.

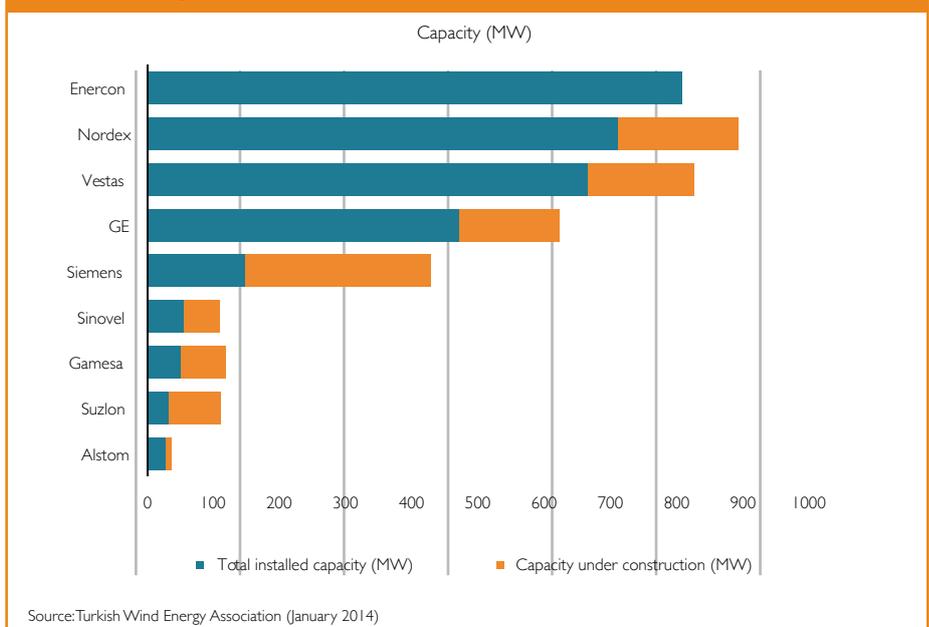
The market has also been attractive to manufacturers including Enercon and Nordex (see table 3, next page), which is partly due to its own growth potential and partly due to its strategic location for the Middle East and eastern Europe. Incentives have been introduced to encourage developers



Source: gypsy in moda via Flickr

Setting aside regulatory problems, the prospects for Turkey are good. It has a growing population, a rapidly industrialising economy, and wants to be a net exporter of energy.

Table 3 - Largest turbine manufacturers in Turkey



to source their parts from local manufacturers, and so it makes sense for global firms to set up locally.

exporter of energy to neighbours including Iraq and Syria, and in eastern Europe. If it succeeds then it is also likely to inspire further wind expansion in the Middle East.

Setting aside the regulatory problems, the prospects for wind power in Turkey are good. It needs more energy to cope with a growing population, a rapidly industrialising economy, and to establish itself as an

Turkey may not find quick solutions to its complex regulatory environment, but demographics like this show that, if it can, then its prospects are good. ■

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Ahead of the launch, we will be inviting a closed group of carefully selected members for their input and views. To request to take part in this and to have your say, email [adam@awordaboutwind.com](mailto:adam@awordaboutwind.com).



## Our next report

What trends in wind power technology will shape the industry over the next five years? And what does this mean for the finance sector?

Investing in Tech: Ten trends set to shape the industry over the next five years will be published on 10th September 2014.

For advertising information and to find out further information, email [advertising@awordaboutwind.com](mailto:advertising@awordaboutwind.com).

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