

# HORIZONS

5<sup>th</sup> January, 2013



## 2012: CLOSER TO A SUSTAINABLE ENERGY MIX

2012 proved to be exciting for those interested in the energy space. Even as we saw the world economy slowing down, oil prices continued to stay above \$100 a barrel. New gas finds and a renewed push towards non-fossil fuels led to further diversification of energy mix. Major countries moved closer, some even faster than expected, to their energy targets. Progress was sometimes voluntary (e.g. RE targets in China and Germany), sometimes forced (e.g. avoidance of nuclear energy in Japan) and even accidental for a few (e.g. Shale Gas finds in USA).

While it would be unrealistic to expect “Alternative Energy” to stop being just an alternative and become the mainstay of our energy needs, it can still substitute fossil fuels to a great extent. “Energy Independence”, is a goal pushed by political calculations and not the reality of an increasingly connected world where countries need to support each other in addressing their growing energy needs. The case of Japan, which was self sufficient up till the Fukushima disaster is a case in point.

Overall it has been a good year for the global movement towards finding a sustainable mix of energy. We try to capture here some highlights of all the action that took us forward towards this goal in 2012.



## SHALE GAS: GAMECHANGER?

Arguably the biggest newsmaker during the year, the real impact of shale gas was seen in a significant decline in America's share of energy derived from coal. From almost 60% in 1998, share of coal has declined to less than 40%. Cheaper energy is making industries more competitive, reducing dependence on the volatile Middle East and has reduced carbon emissions by 450 million tonnes over the last five years. Compare this to Europe, where rising cost of gas is leading to higher consumption of coal. Concerns about "Fracking" (Hydraulic Fracturation – the technology used to recover gas from shale deposits) persist – Europeans are worried about possible seismic aftereffects, pollution of ground water and methane leaks. The jury is out but the Americans are going ahead anyway; others may follow.



## SOLAR ENERGY: POWER TO THE PEOPLE

Solar power is growing at break-neck speed. Cost of PV panels has already fallen below \$0.65 per watt. 2012 saw an overall capacity addition of 10 GW compared to just under 3 GW in 2011. Germany continued its leadership in this area reaching estimated 7 GW of capacity. "Swanson's Law" suggests that the cost of cells falls by 20% with each doubling of global manufacturing capacity. New solar cells are capable of using radiation in the infrared spectrum thus boosting usable range. Finally, other costs like grid integration and storage are expected to fall as off-grid applications boost installed capacity.

## WIND ENERGY: NO MATTER WHAT

As with any mature technology, the focus was more commercial and regulatory aspects. While British opposition protested the almost \$650 million per year subsidy given to wind, Democrats in the US secured a last minute extension for the Production Tax Credit (PTC) to wind energy generators, thereby giving further reprieve to an industry coping with compressed margins. On the growth front, total capacity crossed 250 GW in 2012. The US crossed 50 GW, EU 100 GW with China and India bringing up the rear. The industry still faces lots of challenges – dependence on unpredictable Government subsidies, grid integration issues and solar power stealing the limelight.



## BIO-FUELS: IN THE WORKS

Compared to wind and solar, bio-fuels are relatively low profile. Dependence on feedstock has tied down developers to local constraints. While ethanol produced from corn faced flak for diverting scarce food resources, Brazil maintained its leadership in production from sugarcane. However, the sector slowed down this year with lower harvest of sugarcane crop as well as the new find of offshore deep water oil reserves. India dithered in introducing the 5% ethanol blending program while the US extended tax credits to bio-fuels.

The EU meanwhile seems to be put off bio-fuels – use of land to cultivate biofuel crops leads to destruction of carbon sinks. It has proposed a 5% cap on the amount of biofuels in its 2020 transport mix. Nevertheless, innovation continues in this sector. Cellulosic Ethanol that is made from digesting agricultural waste like straw and husk is the next frontier.



### NUCLEAR POWER: ON THE DEFENSIVE

Nuclear power faced unprecedented opposition this year. Three Mile Island in 1976, Chernobyl in 1986 and now Fukushima in 2011 have brought it back into unfavorable limelight. While all three accidents were the result of poor implementation of safety procedures, it is no consolation to public concerns about safety. Implementing bold declarations by Germans and Japanese of giving up completely on nuclear power may not be as easy as it sounds. At stake are interests of large international power companies who will go bust overnight if this happens. Besides, where will all the stable power come from? Meanwhile, undeterred by these events, the USA and UK went ahead with further addition in nuclear power capacity. The US already has in excess of 100 GW installed.

### TRANSPORTATION: CLEAN EVOLUTION

Lithium Ion battery powered electric vehicles have gained visibility in the last few years. Automakers like Toyota and Mercedes are also experimenting with fuel cells – these convert chemical energy from hydrogen to electricity through a reaction with oxygen producing just water vapor as emissions. These cars can now run 300 kilometres before they need to be charged again. However the technology is expensive. Hydrogen needs to be 99.999% pure and being leakage prone and corrosive to steel, needs structural back-up. Nitrogen is the latest on the horizon. Compressed nitrogen, when released, expands 700 fold and can power engines. The technology is also cheaper and lighter compared to heavy battery packs in electric vehicles.

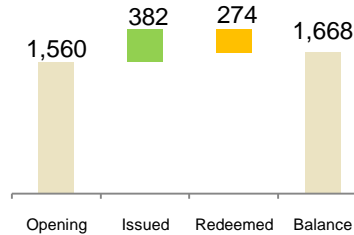
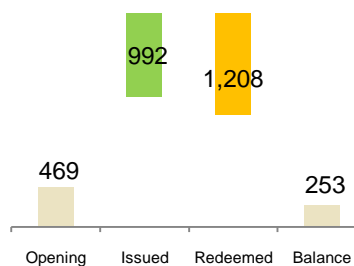


### ENERGY STORAGE: FINAL FRONTIER

Grid scale storage can dramatically improve prospects of integrating RE with the grid. Today, Pumped Storage Hydro (PSH) accounts for most of the grid scale storage in the world. Energy generated by RE sources is stored in the form of water raised to heights that is later released when energy is needed. Compressed Air Energy Storage (CAES) is a new alternative. Efficiencies are however low due to heat losses. Latest on the scene is Pumped Heat Energy Storage (PHES) that stores heat in molten salts. Our billing and tariff setting systems will need to keep up with large scale deployment of these technologies.

These are just a few highlights of all the action taking place on the energy front. Much more is taking place in the hope that the next Google will be in the area of energy. Cheers to 2013!

## REC Inventory

Non-Solar REC Inventory  
Dec-2012 ('000 RECs)Solar REC Inventory  
Dec-2012Registered Capacity,  
April 2012 to date

State	MW
Tamil Nadu	342
Maharashtra	285
Gujarat	140
Karnataka	132
Andhra Pradesh	71
Others	148
<b>Total</b>	<b>1,118</b>

## REC Market in December 2012

Non-Solar	Buy Bids	Sell Bids	Volume Traded	Price (Rs. per REC)	Trade Value Rs. Crores
IEX	1,73,644	8,55,784	1,73,644	1,500	26
PXIL	1,00,000	5,97,842	1,00,000	1,500	15
<b>Total</b>	<b>2,73,644</b>	<b>14,53,626</b>	<b>2,73,644</b>		<b>41</b>

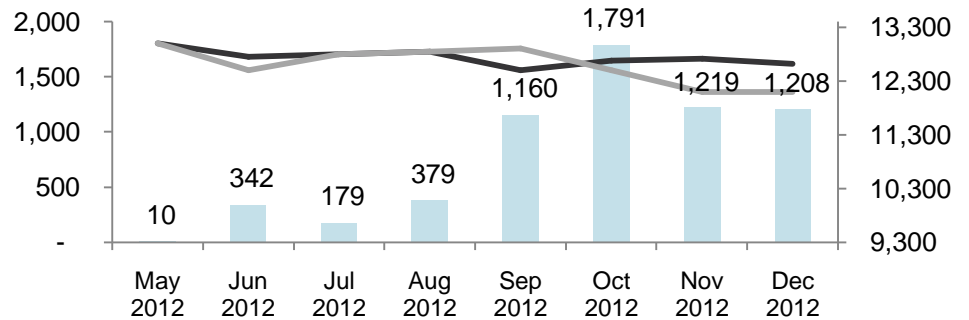
## Total IEX &amp; PXIL Non-solar REC Trade



— IEX and PXIL Whole Volume Trade in Thousands — Price at IEX (RHS) — Price at PXIL (RHS)

Solar	Buy Bids	Sell Bids	Volume Traded	Price (Rs. per REC)	Trade Value Rs. Crores
IEX	1,608	977	931	12,620	1.17
PXIL	583	484	277	12,100	0.33
<b>Total</b>	<b>1,096</b>	<b>1,461</b>	<b>1,208</b>		<b>1.51</b>

## Total IEX &amp; PXIL Solar REC Trade



— Total Traded Volume (IEX and PXIL) — Price at IEX — Price at PXIL

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