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## New Observations on Cleantech

It now has been two years since we began studying and investing in the cleantech private equity arena, positioning us among the earliest fund of funds investors in the space. In that time, cleantech activity has increased significantly in terms of (1) the number and dollar volume of investments and exits and (2) the high quality professional and investment talent in today's cleantech companies. In effect, **cleantech has come of age**. According to the Cleantech Venture Network, the cleantech sector captured 13.4% (or \$843 million) of the \$6.8 billion of venture capital dollars invested in North America during the second quarter, up from 8.5% (\$514 million) in the previous quarter. This ranks cleantech third among all investment sectors, ahead of semiconductors and trailing only software and biotechnology.

We believe the capital that has flowed into cleantech to date is small in comparison with the large, global opportunities that exist across the alternative energy, water and advanced materials subsectors. We believe global demand for innovative cleantech solutions represents a tremendous opportunity for today's investors, particularly venture capitalist with deep domain expertise and, to a lesser extent, buyout firms. Of course, a few skeptics believe there are too many dollars chasing too few good cleantech opportunities. While we agree that a few cleantech areas are getting crowded (e.g., solar), we believe the majority of cleantech subsectors are vastly undercapitalized. We do, however, have a slight concern about one type of cleantech investment activity: project finance deals—where capital is provided to build large wind or solar concentrator farms and similar capital intensive business plans. *Project finance returns* have been compressed over the last year due to intense competition from new entrants: bulge bracket investment banks and hedge funds. So we are avoiding project finance deals with our funds.

Given our interaction with the cleantech investment community and the generally high level of interest our investors have shown in this area, we wanted to convey a few observations about what we believe are promising cleantech investment areas today.

### Where are the opportunities?

**Grid Optimization** Presents a multi-billion dollar global market driven by aging infrastructure and the need for increased reliability and power quality. Energy security is red hot within the space. Investments are currently flowing into the digital grid of the future. Efforts have been made to reduce peak demand and waste through sensors, IT and advanced metering.

**Advanced Materials** Think membranes, coatings, polymers, catalysts, and adhesives with an eye towards increased productivity, filtration and/or conductivity, greater durability or lighter weight. Examples include lightweight biodegradable automotive body panels, sensors and thin films for solar applications. Another interesting opportunity exists in the creation of lighter and stronger materials allowing the use of larger blades on wind turbines.

**Energy Storage** High density new materials and next generation lithium ion batteries are currently attracting attention. Flywheels are also appealing.

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<b>Motors and Controls</b>	More efficient motor and propulsion technology is needed. These items are ubiquitous and combined consume a massive amount of power worldwide in everything from computer cooling fans to public utilities to commercial HVAC systems. Possible innovations include more efficient DC motors, pumps and compressors. Also, a combination of advanced materials, energy storage and electric motor technology culminated in a viable (and fast!) electric car, which is being funded by one of our managers, VantagePoint Venture Partners, among others. See <a href="http://teslamotors.com">teslamotors.com</a> .
<b>Energy Efficient Lighting</b>	Today's residential and commercial lighting technologies make better heat sources than light sources. For anyone who grew up with the "Easy Bake Oven" you know what we mean. Advanced fluorescent (near term) and LED (slightly longer term) will fulfill lighting needs of the future.
<b>Nanotech Deposition</b>	Applications to reduce the use of rare and/or expensive materials in catalytic converters and batteries. Other potential applications include smaller sensors, denser power, etc.
<b>Water</b>	Water purification and desalination with advanced membranes, waste water treatment and waste reduction (sensors, IT and pipe "maintenance bots"). Demand for water technology is immense in China and other developing countries.
<b>Energy Generation</b>	Alternative sources of energy generation. Potential areas include solar (see below), wind (see below), ocean and wave power, geothermal, heat pumps, micro-turbines and advances in components/technology (e.g., for wind turbines).

#### "Hot" sectors: select opportunities in an increasingly crowded space

<b>Solar</b>	Valuations have increased dramatically. Some interesting new technology is maturing (e.g., advanced materials and concentrators), plus there are solar mounting/infrastructure opportunities. There may be a rush to get to critical scale (e.g., Nanosolar).
<b>Biofuels</b>	Project finance deals like building ethanol plants are out of favor with us due to low expected returns caused by the entry of hedge funds (too much capital in this sector). We are interested in early stage deals in emerging technology or that address moisture and other existing challenges in ethanol and bio-diesel. Also, the focus needs to shift (and is shifting) from corn to conversion of waste products like garbage, waste water, switch grass or even cheese whey.
<b>Fuel Cells</b>	Limited near-term opportunities driven by long incubation times and infrastructure challenges: we are largely avoiding this area with the exception of component supply.

#### Other interesting cleantech areas

<b>Recycling</b>	Turning tires and other recyclables into building materials. Batteries.
<b>Agriculture</b>	Natural pesticides made from plant oils.
<b>Other Pollution Control &amp; Abatement</b>	Smokestack "bag" companies, municipal wastewater filtration buyout (roll-up) opportunities and groundwater pollution abatement.

#### Prior Commentary

Please see additional cleantech observations in our [October 2005 commentary](#) on our website.

#### CleanTech Ventures Fund of Funds is Closing

Our CleanTech fund of funds is nearing its final closing. To that end, please contact [Gretchen Postula](#) (612-303-6331) to reserve your allocation if you have not done so already. The investment committee has approved commitments to DFJ Element, Expansion Capital, Nth Power, VantagePoint CleanTech Partners and Sustainable Asset Management (SAM). The remaining prospective commitments are in the final stages of review and are likely to include Technology Partners and Paladin. We believe this fund of funds consists of the "best of the best" managers in the Cleantech sector and hope you will join us as a limited partner if you have not done so already.