Next Generation Cleantech

Doing Even More, With Even Less...

...Costs

...Resources

...Damage to our Air, Water, and Land

January 2018
Clean is more than green. Clean technology, or “cleantech”, should not be confused with the terms environmental technologies or “green tech” popularized in the 1970s and 80s. Cleantech is new technology and related business models offering competitive returns for investors and customers while providing solutions to global challenges. Where greentech, or envirotech, represents the highly regulatory driven, “end-of-pipe” technology of the past with limited opportunity for attractive returns, cleantech is driven by market economics therefore offering greater financial upside and sustainability.

The concept of cleantech embraces a diverse range of products, services, and processes across industry verticals that are inherently designed to,

- Provide superior performance at lower costs
- Greatly reduce or eliminate negative ecological impact
- Improve the productive and responsible use of natural resources

Cleantech spans many industry verticals and is defined by the following eleven segments

- Energy Generation
- Energy Storage
- Energy Infrastructure
- Energy Efficiency
- Transportation
- Water & Wastewater
- Air & Environment
- Materials
- Manufacturing/Industrial
- Agriculture
- Recycling & Waste
Living on Borrowed Time: Old Industries are on Notice

Hard to find an incumbent company or established industry which is not exercised by what an enduring (sustainable) future looks like. Trillions of $’s of market value are at stake. That is why we are all here, no?
A Perfect Storm of Systemic Innovation?

How to deal with the potent mix of opportunity, threat and disruption, from a series of convergent drivers and accelerators? “Cleaner” is an important one, but does not sit “stand-alone”.
Transport: ready for such a Perfect Storm in the 2020’s?

Could such change and disruption in the Transport sector “drag along” and accelerate change in other segments – like Energy and Power?
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AI impacts across the entire energy and power value chain

Key use cases

- Project development/ Customer acquisition
  - Marketing and sales of DER
  - Meteorological models for optimized asset location
  - Optimized design and engineering

- Generation
  - Predictive maintenance of generation assets
  - Performance improvement
  - Intermittency forecasts

- Transmission & Distribution
  - Grid optimization
  - Microgrids and VPP management
  - Storage-based flexibility
  - Predicting demand
  - Distribution Automation and Control (DMS)

- Consumption/ Retail Energy
  - Optimized building management
  - Smart home
  - Consumption Disaggregation
  - Transactive Energy

Example Innovator

- PowerScout
- sparkcognition
- awesense
- Innowatts
Our Blockchain in Energy And Industry Time-Line: Warming Up For the 2020's
Innovation in many of the ‘next-gen’ areas we examine is driven by a convergence of several underlying key drivers/enablers.

- **Satellite Networks**: Smarter, Cheaper, Reusable?
- **Geospatial Analytics**: Seeing is believing
- **The Next-Generation**: Some manufacturing shifts to space
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Disruption Intensity: who’s feeling it most right now? where’s the momentum?

Utilities exhibit a long, steady burn, but the real intensity in growth rates of open innovation are today found around Transportation & Logistics, and Ag and Food.
Living on Borrowed Time: Old Industries are on Notice

How to deal with the potent mix of opportunity, threat and disruption, from a series of convergent drivers and trends – “cleaner” is an important one, but does not sit “stand-alone”.

Source: Cleantech Group’s Quarterly Investment Monitor, Q4 2017
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Dry Powder is Returning: a stronger year for cleantech-related fundraising

- **Pangaea Ventures**
  ~$40 million
  Advanced materials, energy, electronics, health, and sustainability.

- **SET Ventures**
  ~€60 million
  European Smart Energy

- **SOFINNOVA**
  ~€106 million
  ‘Dedicated to renewable chemistry’

- **The Engine**
  $150 million
  Robotics, manufacturing, biotech, energy

- **Obvious Ventures**
  $191.9 million
  World Positive: Sustainable Systems, Healthy Living...

- **High-Tech Gründerfonds**
  $354 million
  Software, hardware, energy, automation, life sciences and chemistry

- **Energy Impact Partners**
  Energy technology, clean digital technologies, and utility of the future

- **Maniv Mobility**
  $42 million
  Investing in new mobility

- **Spring Lane Capital**
  $400 million
  Integrated Deployment Capital for solutions not complications

- **ClearSky**
  $168.3 million
  Transformative solutions for cybersecurity

- **S2G Ventures**
  $180 million
  All Things Food. Investing from 'soil to shelf'

- **Aster Capital**
  €240 million
  Energy Transition & Mobilities of the Future

- **Cycle Capital Management**
  RMB600 million
  Industrial technology startups

- **Qingdao Chengtou Haisi Cycle Equity Fund**

**Timeline:**
- 2017
  - Jan: Pangaea Ventures
  - Feb: SET Ventures
  - Mar: SOFINNOVA
  - Apr: The Engine
  - May: Obvious Ventures
  - Jun: High-Tech Gründerfonds
  - Jul: Maniv Mobility
  - Aug: Spring Lane Capital
  - Sep: ClearSky
  - Oct: S2G Ventures
  - Nov: Aster Capital
  - Dec: Cycle Capital Management

- 2018
  - Jan: Qingdao Chengtou Haisi Cycle Equity Fund
The arrival of the billion dollar club is significant for next generation cleantech

<table>
<thead>
<tr>
<th>Investor</th>
<th>Size</th>
<th>Investment Orientation/Language</th>
<th>Illustrative Portfolio Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoftBank</td>
<td>$93 Billion</td>
<td>“Enabling the new age of innovation”</td>
<td>UBER, Grab, DIDI, OSIsoft, NAUTO, Plenty</td>
</tr>
<tr>
<td>TPG Rise Fund</td>
<td>$2 Billion</td>
<td>“achieving social and environmental impact alongside competitive financial returns”</td>
<td>LanzaTech, DiDi, OSIsoft, NAUTO</td>
</tr>
<tr>
<td>OGO</td>
<td>$1 Billion</td>
<td>“technologies that have the potential to significantly reduce greenhouse gas emissions”</td>
<td>EBES, Dharma</td>
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<tr>
<td>RENAULT NISSAN MITSUBISHI Alliance Ventures</td>
<td>$1 Billion</td>
<td>“Building clean, affordable and safe cars for everyone”</td>
<td>Solidia Technologies, achatesPOWER</td>
</tr>
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<td>Breakthrough Energy</td>
<td>$1 Billion</td>
<td>“Ensure...standard of living, including basic electricity, healthy food, comfortable buildings, and convenient transportation, without contributing to climate change.”</td>
<td>ionic MATERIALS</td>
</tr>
<tr>
<td>next47</td>
<td>€1 Billion</td>
<td>“innovation that can disrupt industries and create new markets”</td>
<td>Seurat, ubitricity, Markforged, veobot, IDENTITY3D, ATOM</td>
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<td>TEMASEK HOLDINGS</td>
<td>Access to many billions of AUM</td>
<td>“Committed to transforming economies, growing middle class income populations, deepening comparative advantages, and invest in emerging champions”</td>
<td>Didi, Bolt Threads, Farmers Business Network, Impossible, gogoro</td>
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<tr>
<td>EMERSON ELEMENTAL</td>
<td>Undisclosed</td>
<td>“promoting equitable diffusion of technology and sustainable modernization”</td>
<td>OPTIMUS RIDE, MycoTechnology Inc., Cleantech Group</td>
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First Announced Investments Expected in H1-2018
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“With an estimated $4tn expected to be passed down within a generation in the UK and North America alone, according to a wealth transfer report earlier this year by Royal Bank of Canada, private banks are in a race to retain the millennial children of wealthy families and improve their offerings to entice those in their 20s and 30s to sign up.”

“What is very clear to me is that millennials’ values are distinctively focused on making the world a better place, using financial capital for social return, having an impact and supporting sustainable development,” says Burkhard Varnholt, deputy global chief investment officer at Credit Suisse.
“Society is demanding that companies, both public and private, serve a social purpose. To prosper over time, every company must not only deliver financial performance, but also show how it makes a positive contribution to society.”

Excerpt from the annual letter to S&P500 CEO’s from Larry Fink, CEO of the world’s largest asset manager ($6.3 trillion), BlackRock

Next Generations: Significant Change is Afoot
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Next Generation Cleantech: A Truly Global Affair

Global distribution of investment dollars of 2017 Industrial & Manufacturing venture deals*

*Excludes outlier deals above $350M
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#### Notable 2017 Asian Transportation/Mobility Investments

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<td>Tencent Technology</td>
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<td>WM Motor, NIO, Ola, Lilium, Mobike, Go-Jek</td>
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<td>AI-Drive, Momenta</td>
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<td>ZhenFund</td>
<td>4</td>
<td>TOGO, Fouyoukache</td>
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![Bar chart showing global distribution of investment dollars of 2017 Industrial & Manufacturing venture deals.](chart.png)
Global distribution of investment dollars of 2017 Industrial & Manufacturing venture deals*

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Charting the future,
Connecting the globe.

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