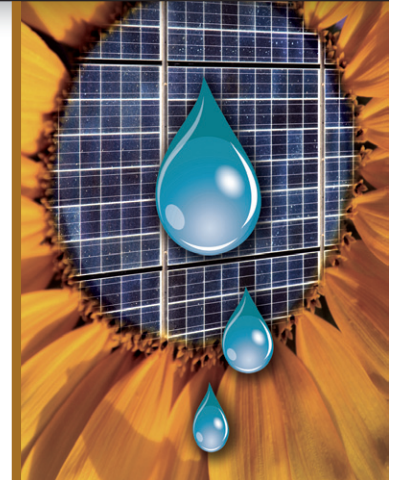


The Race Is On

Who will be the next Rockefeller of energy supply?

As the global economy continues to gain strength, the chemical industry has begun its comeback from the beating it took when business bottomed out. But as chemical companies focus on managing renewed growth in their core businesses, it is also important to turn an eye toward strategic new business areas being created by the growing trend in “cleantech” energy products technologies and services—including solar, biofuels and batteries. These will form the basis of future success.



Chemical companies’ long-term success will depend largely on the ability to identify and exploit future growth segments, one of which is “cleantech” products, technologies and services. As fossil resources become scarce and concerns grow about their influence on the climate, renewable energy will be a major ingredient in the energy mix of the future. It is just as certain that future energy supply will be more fragmented than it is today. History tells us that oil baron John D. Rockefeller dominated energy supply as the world headed into the 20th century. An interesting question as we head into the 21st century is this: What will it take to become the next Rockefeller of energy supply?

A Market with Myriad Challenges

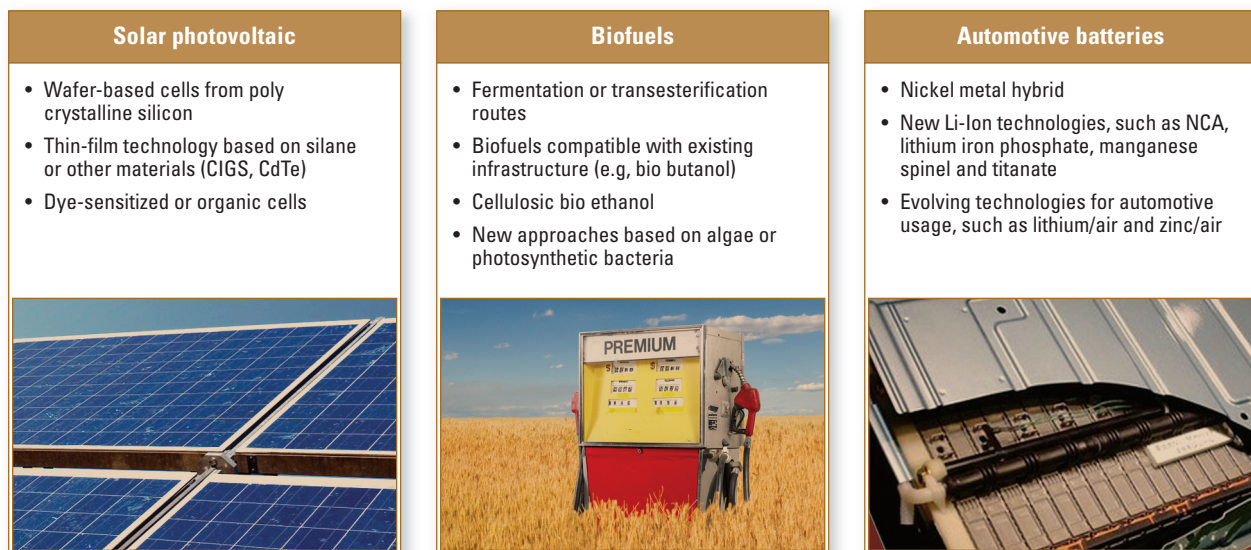
The current cleantech market is a challenging one. It is marked by increasingly complex value chains, along which chemical companies must be

able to deliver effective, innovative products and solutions. Regional markets differ greatly, with various drivers for the adoption of new technologies. A further challenge is that such technologies are constantly evolving, and there is still uncertainty about which will be successful in the future (see figure 1 on the following page).

Against this backdrop, A.T. Kearney and the European Chemical Marketing and Strategy Association (ECMSA) conducted a study to explore the chemical industry’s potential role in the new age of energy supply. Based on a survey of executive directors, heads of strategy and research-and-development, the study looks at how the chemical industry can best contribute to—and benefit from—the advancement of new cleantech industries. It covers solar energy, biofuels and the automotive-battery industry, analyzes the importance of market drivers in adopting new technologies, and explores the set-up of future value

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FIGURE 1: Evolution of solar, biofuel and battery technologies



Note: CIGS is copper indium gallium di-selenide (compound semiconductor); CdTe is cadmium telluride; NCA is nickel cobalt aluminum

Source: A.T. Kearney

chains. The following is an analysis of opportunities in each of these emerging markets.

Solar Energy

Solar energy appears to have the most long-term potential for the chemical industry, with photovoltaic clearly on the advance. First generation (wafer-based) technology is still growing. Cadmium Telluride (CdTe) thin-film has gone to mass production and dominates the second-generation market, while third generation dye-sensitized and organic-cell technologies are on the brink of acceptance and offer even more promising opportunities down the road.

Our study reveals that broad-scale market adoption will depend mainly on technological advancements and regulatory support. The global conditions for both look promising, although they differ by region—based on technology- and climate-driven factors, infrastruc-

ture, local culture and regulatory agencies. Spain, for example, provides an excellent example of the immense impact regulations can have on the adoption of a specific technology. A few years ago, Spain implemented an ambitious solar-power incentive program, which caused installed capacity to quadruple from 2007 to 2008. Concerned about the unexpected growth, the government then put in place an annual cap of 500 megawatts, bringing to a near-halt what it had been so successful in jump-starting.

Because emerging new technologies will require new materials, the chemical industry's role might evolve into that of a key partner for developing innovative new cell compounds. Success factors will differ along the value chain. For example, economies of scale will be vital for raw materials, but innovation will make all the difference for chemicals that help reduce production costs and improve cell efficiency.

Significant challenges exist in next-generation solar markets. An obvious one is how quickly chemical and engineering players can establish “win-win” cooperation formats, as they did for first-generation photovoltaic solutions that combined material access (chemical) with market-channel access (engineering). Another challenge is the still-unsolved end-of-life problem, which will require further cooperation in the recycling phase of the cycle. This presents another opportunity for chemical companies.

The primary challenge, however, is to become providers not only of chemical materials but also of functionality.

Next-Generation Biofuels

The new-generation cellulosic and algae biofuels show promise for chemical companies. Study participants expect to see favorable regulatory conditions and competitive prices for these second- and third-generation biofuels. Proof of

this view can be seen in Brazil, which has established a sustainable biofuels economy based on sugarcane. The lesson here is that there will be no one-size-fits-all solution for biofuels; rather, there will be different solutions that spring from each region's unique biological, agricultural and environmental characteristics.

The biofuels field will be a natural one for oil companies, which already have in place a basic fuel infrastructure, refining expertise and customer access. Chemical companies can play a major role in providing process chemicals, such as enzymes and starch and yeast technologies needed to produce new-generation biofuels. There also is an interesting side effect of biofuel technologies: They provide solutions for sustainable raw-material replacement for many chemical products—another potential boon for the chemical industry. As for cooperation, the current focus is on R&D, but as the biofuel market matures, that focus is expected to shift to the supply chain.

A clear opportunity exists for chemical companies to develop technologies that combine high-margin chemical products with biofuel products. Opportunities also exist to develop replacement materials for current fossil-based products.

Automotive Battery Industry

As electric vehicles take center stage in the automotive industry, lithium-ion is now entering the automotive power train application. This is a huge opportunity for the chemical industry, as battery performance, cost and safety are driven by chemical components; the technology race is still open among various Li-Ion chemistry variants.

As the market moves to electric vehicles, battery costs will come down. In the short- and mid-term, cost reductions will come mainly from regulation and government subsidies, in the mid-term from new chemistry variants and in the long term from the effects of scale and experience. Adoption will also be influenced by regional environments; regulators across the world have initiated incentives, with Asia clearly in the lead.

Photovoltaic energy could account for as much as 20 percent of Europe's overall electricity market by 2020.

Control of the battery value chain is expected to be with automotive OEMs (original equipment manufacturers), as they continue to build their expertise and know-how. To participate in this growth market, chemical companies are pursuing very different strategies: Some are moving downstream in the value chain into cell or even battery manufacturing via joint ventures, while others are forming loose supplier relationships and are mainly focused on gaining size and strength. In the long run, the industry structure is expected to imitate the classic automotive supplier base, with chemical players taking positions of Tier 2 or 3 suppliers.

As battery performance (range) and safety problems continue, the

majority of cooperations are focused on R&D. As scale is deemed a primary way to lower costs, success in this market will depend on being part of the first mass-market model. To become a mass-market supplier, chemical companies know that the materials must first and foremost conquer the performance challenges.

Guidelines for Becoming Energy's New Rockefeller

For chemical companies to capitalize fully on emerging energy sources, they will have to focus on the most attractive new energy field, identify its capability gaps and develop ways to fill them. Becoming energy's new Rockefeller will require adherence to the following guidelines:

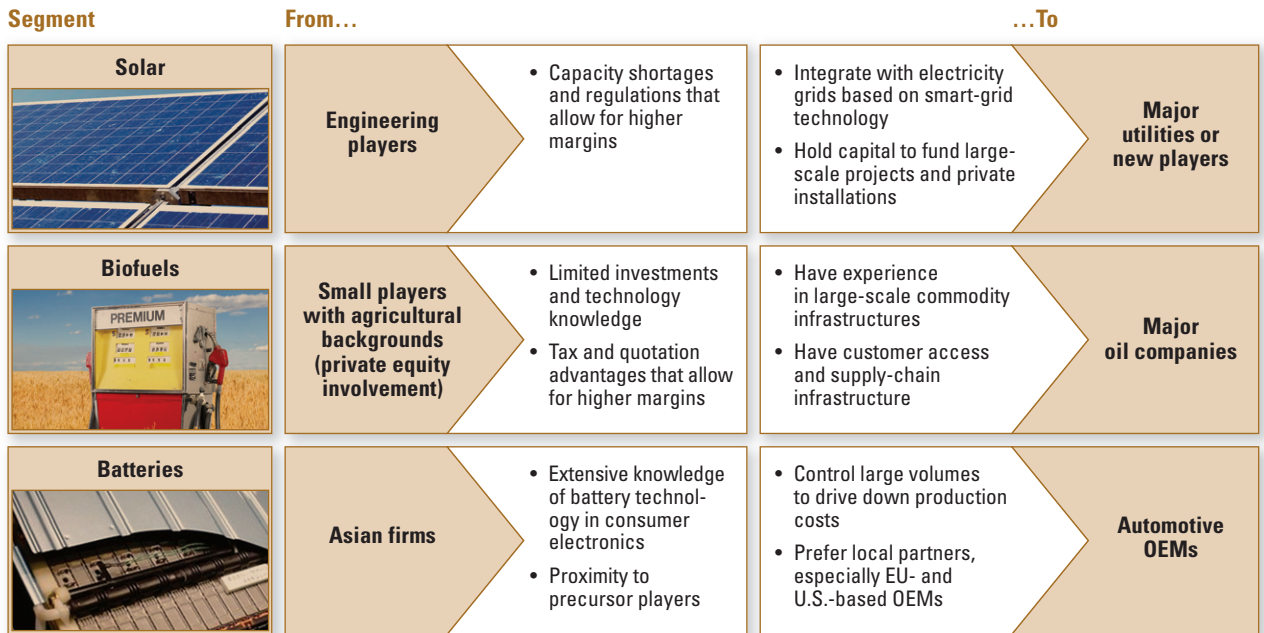
Look to the long term. Further improve your strategic-planning skills and extend your planning and decision-making timeframes to seamlessly adapt to the market's technological and regulatory changes and price fluctuations.

Look beyond your own four walls. Look beyond your own value chains and consider competition between value chains, including between new and old energy sources.

Look toward solutions. Successfully supporting cleantech firms requires looking beyond single molecules to develop new molecules, applications and integrated solutions that address today's new market challenges.

Look for partners. Find appropriate cooperation formats based on technological compatibility, value-chain hierarchy, regional-market development opportunities and risks. Exclusive partnerships, however, must be balanced with cost and scale benefits to secure

FIGURE 2: The new industry landscape



Note: OEMs are original equipment manufacturers

Source: A.T. Kearney

a competitive advantage. Figure 2 highlights the current and future industry landscapes.

We estimate that by 2020, 8 to 10 percent of the world's vehicles will be plug-in hybrids or pure electric

vehicles, and 15 to 19 percent will be full hybrids. Photovoltaic energy could account for as much as 20 percent of Europe's overall electricity market by then, while biomass-based energy—which includes biofuels—

is expected to account for 5 to 10 percent of all energy consumption within the next decade. Chemical companies willing to follow these guidelines can take their place as 21st century Rockefellers.

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