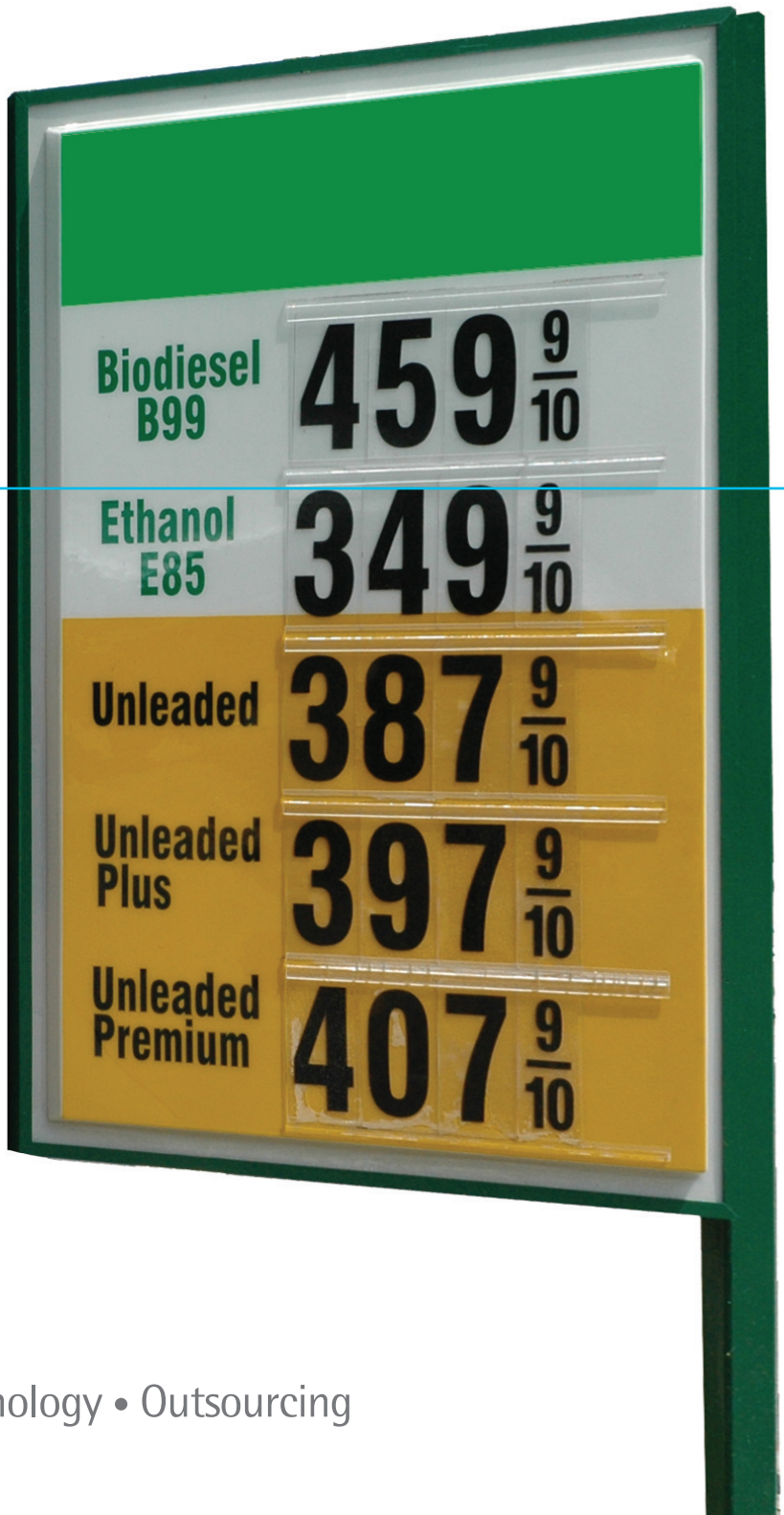
Biofuels' Time of Transition

Achieving high performance in a world of increasing fuel diversity

Executive Summary



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Biofuels are gaining global momentum as a renewable and sustainable transportation fuel, despite practical and political challenges.

Their increasing adoption, supported to varying degrees by regulators and government incentives, is creating a new and potentially massive global market. However, biofuels will not have a clear run—and will ultimately be just one component of a far more diverse future transport fuels mix. So, how big will the biofuels market grow? How fast? And how can biofuels be integrated into the existing fuels supply chain?

To answer such questions, Accenture conducted a comparative analysis of 20 countries' biofuels industries, augmented by interviews with key stakeholders across the biofuels value chain. Our first report, "*Irrational Exuberance"? An Assessment of How the Burgeoning Biofuels Market Can Enable High Performance—A Supply Perspective*, examined the biofuels supply market (including feedstocks and regulation) and was published in 2007. This second report, *Biofuels' Time of Transition: Achieving High Performance in a World of Increasing Fuel Diversity*, examines a number of crucial demand elements—and aims to pinpoint the future timescales, dynamics and demand drivers behind the global biofuels market.

Setting the scene

Biofuels production will exceed predictions

2007 was a tough year for biofuels development, with the market slowing even more quickly than we forecast in our September 2007 study. The difficult conditions reflected excess and stranded capacity in the United States, Europe and Brazil; high and volatile feedstock prices; and low product prices. However, despite the challenges of 2007, we believe biofuels production will probably exceed International Energy Agency predictions of 120 billion liters of ethanol and 23 billion liters of biodiesel before 2020.

The pieces of the jigsaw are there

In terms of both the supply side and demand side, most of the elements are developing in a way that a truly global biofuels market can develop. These elements include feedstocks, regulation, consumer awareness/demand, original equipment manufacturers (OEMs, such as auto manufacturers), distribution (primarily via oil companies), infrastructure, financial markets and technology. Understanding these pieces of the jigsaw will enable companies to achieve high performance in the global and competitive biofuels industry of the future.

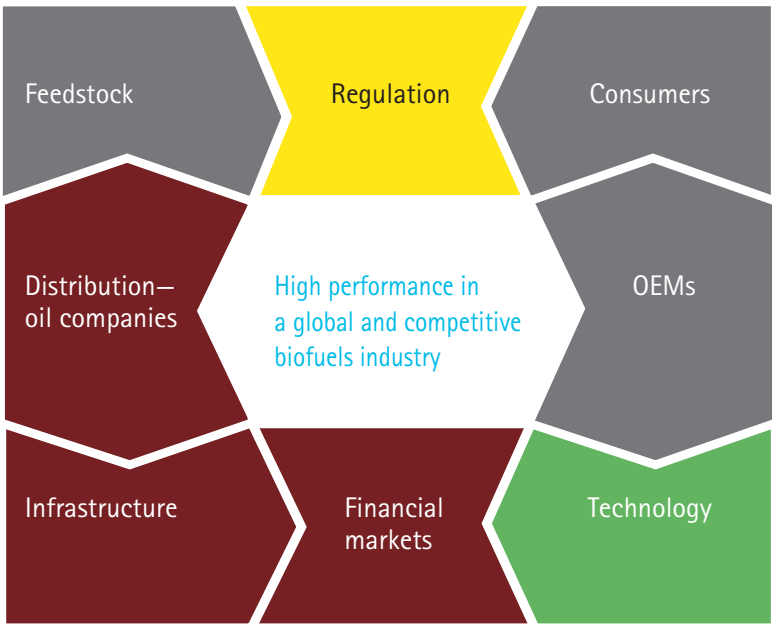
The pain of going from start-up to global market will be greater than expected

The pain during the transition from "biofuels start-up" to "biofuels global industry" will be more acute than originally anticipated. This pain will reflect the significant challenges involved in creating scale markets and will manifest itself in crucial areas:

- **Consumers**—The environmental benefits must be clear for motorists and business-to-business demand to support the growth of biofuels. The debate over the impact of biofuels production on food supplies will act as a brake on consumption growth, but demand will be there so long as governments manage the sustainability issues.
- **Distribution**—There are teething pains integrating biofuels into the established fuels value chain, with key decisions to be made concerning the amount of storage, where and how blending should take place, and how different grades should be accommodated.
- **Infrastructure**—Investment in infrastructure to facilitate and support large-scale operations and physical trading is critical for an efficient global market to develop, but it remains hard to justify the investment up front when the ultimate size of the market is uncertain.
- **Financial markets**—Development of paper markets for ethanol and biodiesel with the liquidity and length required for risk management is necessary to enable producers and consumers of biofuels to grow their operations.

Figure 1

Development is needed in some areas to create a truly global biofuels industry



Source: Accenture analysis

Study highlights

The impact of biofuels on food supplies has been exaggerated during the "food versus fuel" debate

The debate is about whether the use of agricultural output for energy purposes competes with its use for food purposes, resulting in food shortages and/or higher food prices. This long-running discussion was catapulted to global prominence by the steep rises in global food prices that started in 2006. Some commentators have sought to make it a "biofuels-equals-bad" argument. However, this view ignores wider global socioeconomic trends, as well as the nonhomogenous nature of biofuels, especially second and third generation. For example, in volume terms, bioethanol accounts for more than 90 percent of the biofuels market, and 90 percent of bioethanol production comes from just two crops: sugarcane and corn. However, corn price rises have been the smallest among those of grains—up 31 percent over the year to March 2008, compared with the 78 percent rise in rice, which is not a common biofuel. Raw sugar prices actually fell in early 2007 and struggled for many months to recover. The reality is that biofuels can be produced sustainably or unsustainably. It is up to regulators to ensure that the incentive system around biofuels drives sustainable production and the use of feedstocks and processes that produce a net greenhouse gas reduction.

While governments are expected to guide sustainability through the legislative and regulatory environment, their supporting role as consumers is often underrepresented

In most countries, the state controls or influences public services with a significant transport element—education, health, waste and recycling, parks, emergency services, armed forces—and there are many examples of countries where biofuels have begun to form part of this transport element. While such developments started off in an uncoordinated manner, there are opportunities for countries (especially within a region) to share ideas, information and experience about switching public-sector fleets to biofuels. The European Union, for example, is funding several coordination programs.

A number of private sector industries are also moving—or considering moving—toward greater adoption of biofuels, but they remain highly sensitive to public perceptions

Several road and rail **passenger transport companies** have begun to position themselves with customers as environmentally friendly alternatives to personal car use or aviation, and are seeking to strengthen this differentiation by investigating methods to improve their emissions profiles. **Freight transport** is a further key market for biofuels, and already several large logistics providers are either conducting trials or moving to biofuels. **Retailing** relies on customer perceptions and buying values—so it is not surprising that some large retailers initially voiced their public support for biofuels, and then scaled back amid the intense food-versus-fuel debate in recent months. Even **airlines** are looking to biofuels as a possible way to reduce their emissions. Despite the fact that the physical and chemical properties of jet fuel are different from auto fuels, the most bullish airlines are looking to biofuels to fulfill between 5 and 10 percent of their fuel needs.

Take-up of biofuels by the average motorist will be dependent upon three things evolving at the same time: the availability of new fuel and vehicles that use them—and the infrastructure that supports the new fuel

One without the other two has limited effect. For example, flexible fuel vehicles (FFVs) form a significant proportion of new-vehicle sales in some places, but many times are driven on fossil fuels because of the scarcity of biofuels refueling sites.

OEMs assessing the feasibility of investing in biofuels will focus their analysis on four key areas:

- **Effect on existing vehicle models**. OEMs are understandably cautious about warranty issues for existing and older models.
- **Potential for new vehicle models**. The introduction of FFVs would allow for much greater ethanol blending as standard.
- **Regulatory incentive**. The global patchwork of regulation is affecting OEMs' rollout of FFVs.
- **Supporting consumer infrastructure**. Awareness and access to E85 have to be good enough for consumers to differentiate between buying a regular model and an FFV.

IOCs and NOCs are investing in infrastructure to blend biofuels to scale as compliance with mandates becomes a more urgent issue

International oil companies (IOCs) and national oil companies (NOCs) are working through the various practical challenges of integrating ethanol and biodiesel into the hydrocarbon supply chains. One of the challenges facing IOCs and NOCs is developing and integrating biofuels-specific processes because the stages preceding blending are different from those in the integrated oil supply chain. The specific challenges that integrated oil companies face in integrating biofuels into their fuels value chains are:

- **Securing supply**. This includes tackling issues such as feedstock strategy, the fragmented supplier base, contract lengths and pricing. NOCs, in particular, are also investing in production facilities and, in some cases, even moving into agriculture.
- **Trading and risk management**. The expanding product mix is making risk management increasingly complex.
- **Storage of supply, blending and distribution.** How much storage is needed, where should it be, and who should own it?
- **Managing changes to the retail sites**. In most countries, gasoline with significant ethanol content will require equipment changes at retail sites.
- **Implications for marketing and product development**. As fuels marketers increase the biofuel volumes they sell, current product slates will be adapted. Marketers face a choice between adding more biofuel components to existing products or creating new products with high biofuel content to sell alongside their current grades.

Infrastructure investment is critical to achieving global scale and trade

- In Brazil, ethanol supply sources are concentrated far from the coast (and ports) and continue moving toward the central region of Brazil. These attributes of the Brazilian supply chain lead to inefficient logistics. Brazil's ambition to be an international ethanol trader requires infrastructure investment to gain competitiveness.
- In the United States, the large volumes of ethanol established by federal mandates are also incentivizing US pipeline owners to explore ways of overcoming current technical constraints. Short-term solutions focus on establishing ethanol trading and distribution terminals.
- In Europe, biodiesel (and to a lesser extent, ethanol) is traded across borders, with little perceived bottlenecks. The challenge in Europe is that it is almost too easy to grow incrementally, adding on infrastructure capacity as a plant is built. However, based on the future capacity volumes that need to flow, an incremental approach to infrastructure may not be the most effective way to scale this market.

Financial markets are still immature, and risk management is a significant challenge

For biofuels to become a global industry, trading exchanges must develop that allow buyers and sellers to trade products efficiently across international markets. Financial markets provide the opportunity to manage risk using futures and options. Risk management is a crucial capability for players extending their operations to a large scale. Increasing physical volumes will drive spot markets, which will in turn create the price transparency and liquidity required for paper products (such as derivatives) to grow.

Technology currently supports the development of biofuels, but there are game changers on the horizon

Supporting technologies will make the position of the current players in the market stronger, supporting the creation of a global agriculture-based (but not necessarily food) biofuels industry. Supporting technology has led to improved crop yields, diversified product mixes and alternative feedstocks, such as corn stover and straw. Competing technologies will threaten the position of the players in the market today and fundamentally challenge any assumptions and forecasts of the growth of biofuels. Competing technologies include third-generation biofuels (for example, nonagricultural science such as algae biodiesel) as well as electric (i.e., pure electric, hybrid and plug-in hybrid) and hydrogen alternatives.

Conclusions

A far more diverse transport fuels market will develop

The emergence and growth of biofuels herald not only much greater diversity in transport fuels in the future, but also the evolution of a fuels marketplace characterized by new products, new players and a different competitive landscape. While this will clearly involve a shift away from gasoline and diesel, there will also be a much wider range of non-fossil fuel providers and products, both in biofuels and new competing technologies:

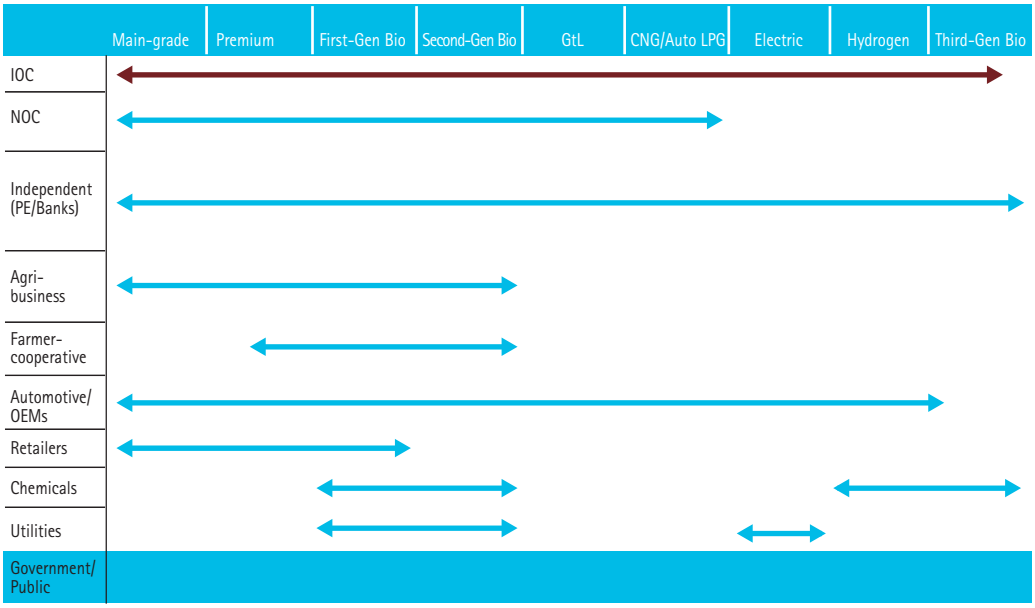
- In *biofuels*, first-generation technologies such as ethanol from sugarcane will be joined by second-generation technologies such as cellulosic ethanol and by new biofuels pathways under development such as butanol, further diversifying the product mix. First- and second-generation biofuels will be used in tandem for a number of years.
- Later, *competing technologies* such as third-generation nonagricultural biofuels, viable electric transport and hydrogen-based fuels will arrive and challenge biofuels, driven by efforts to crack the dual problems of climate change and energy security. These competing technologies are central to the future diversity in transport fuels. For example, the advent of viable plug-in hybrid cars with the capacity to run on electricity and other fossil or non-fossil fuels, will bring power utilities and other new entrants into the fuels marketplace. These entrants will develop new offers for transport customers, such as recharging facilities at workplaces, hotels and car parks. Utilities and other players are already pursuing these opportunities.

The industry has a 10-year window of opportunity

In Accenture's view, the biofuels industry has a window of opportunity of perhaps 10 years to evolve into a truly global and efficient industry before new technologies compete with first- and second-generation biofuels. The challenge for the biofuels industry is to carve out its place and to become as global and efficient as possible—before these technologies arrive.

Figure 2

Activity today in a variety of sectors will create a new transport fuel landscape



Source: Accenture research and analysis

CNG = Compressed natural gas
GtL = Gas to liquids
LPG = Liquefied petroleum gas

There are seven key capabilities for success in biofuels

Market participants seeking to achieve high performance in biofuels will need to master seven key capabilities to navigate through the transition. These are:

- **An effective nonmarket strategy**—navigating the patchwork of regulation, tariffs and incentives, and managing consumer perception.
- **Superior investment evaluation**—choosing the right mix of investments and the amount and type of capital to invest, and understanding when to consider mergers and acquisitions.
- **Partnering**—finding and keeping the right partners to share risks and access markets, skills and financing.
- **Supply chain**—aligning and optimizing the cross-border feedstock and biofuels supply chains.
- **Customer/contract management**—managing portfolios of bilateral long- and medium-term contracts.
- **Trading and risk management**—using the financial markets to manage risks and surpluses/shortfalls in contract positions.
- **Portfolio of investments in various technologies**—using diversification to manage the uncertainty of which technologies will prevail.

This does not mean that all the players will have the same strategies or that there is a particular group that is advantaged. The pieces are still falling into place, and during this transition, the participants' strategies are continuing to evolve.

Biofuels' Time of Transition: Achieving High Performance in a World of Increasing Fuel Diversity further explores the challenges and opportunities of the global biofuels market place. In addition to a focused analysis of the evolving biofuels marketplace, the study includes detailed case studies on:

- The "food versus fuel" debate
- A commentary on land-use change
- The impact of biofuels on growth in sub-Saharan Africa
- National oil companies (NOCs) and bioethanol in China
- The arrival of the plug-in hybrid
- California's Low-Carbon Fuel Standard (LCFS): Accelerating fuel-on-fuel competition

For more information about the detailed study or to better understand how Accenture can help your company achieve high performance, contact melissa.stark@accenture.com.

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