

A careful and quantified analysis of the two main drivers for CHP in countries around the world – local energy economics and policy frameworks – should yield robust projections of growth that will be very useful to the CHP industry. Jon Slowe presents just that.

Market prospects

for the CHP equipment industry

Which of these possible headlines for 2013, just five years from now, do you think will be closest to the truth? Will it be:

‘Demand for cogeneration systems has tripled in several markets over the past five years. Equipment manufacturers that positioned themselves for this growth have seen big increases in sales’ or perhaps

‘Cogeneration markets have been largely stagnant over the past five years. What growth there has been has been patchy at best, limited to a tiny handful of major markets.’

Readers will have different views based on their own opinions, experiences, and whether they are, at heart, an optimist or pessimist – but the drivers of future cogeneration market activity can be broken into two fundamental building blocks.

- Spark-spreads – the gap between fuel and power prices. (The term ‘spark-spread’ as used in this article refers to the income of a power plant from selling a unit of electricity, having bought the fuel required to produce this unit of electricity).
- The CHP policy framework – including incentives and barriers.

Delta’s recently launched CHP Policy & Markets Service analyses these twin building blocks, giving views of future market activity based on rigorous research and long experience of CHP markets. Countries covered in this first phase of the Service are: Germany, Italy, Spain, UK, Belgium, Czech Republic, Hungary, Poland, China, India, Russia and South Korea.

This article explores these building blocks and how they relate to future market activity in a selected number of countries, before revisiting the two headlines.

Economics is the overarching issue that determines all

cogeneration investment decisions. While the first building block, spark-spread is the primary determiner of economics, policy can tilt the playing field towards, or away from cogeneration and can be a huge influence on CHP economics. Policy is important in two ways:

- determining subsidies, incentives and market frameworks – for cogeneration and other forms of power generation
- creating and removing barriers to CHP market development.

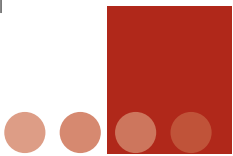
EXAMPLES FROM EUROPE

Take Germany, for example. Power prices are rising on the back of tightening reserve margins. There is strong demand for new power capacity to replace ageing plant – 60 GW of capacity operational in 2000 will need to be replaced by 2020, and as much as 90 GW (75% of all capacity) by 2030. But what slice of this new capacity will cogeneration secure? Government policy will heavily influence overall market share in the future.

According to our analysis, without further policy support the prospects for cogeneration in Germany are not good. For example, taking into account only existing incentive measures currently in force (mainly the Ecotax exemption on natural gas for CHP projects), the economics of a 5 MW gas turbine CHP plant are not compelling, with internal rates of return of 3% at best – far too low for developers and investors.

As another example, for a 2 MWe gas engine CHP project, based on no incentives at all, the simple project payback is 10.5 years. Factoring in the value of the current incentive regime, this falls to 5.8 years.

But the picture may be turning considerably rosier in the future. The Government is proposing a comprehensive support package for industrial cogeneration, with funding of some €300 million per year.



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Table 1. Internal rates of return (IRR) and simple paybacks for CHP in Germany. (Note that the risks associated with building and operating a CHP plant are not included in this analysis).

Technology	Capacity	IRR with existing support measures (%)	IRR with existing and proposed support measures (%)	Simple payback without any support (Yrs)	Simple payback with existing support (Yrs)	Simple payback and proposed support (Yrs)
Gas engine	2 MWe	18.2	31.4	10.5	5.8	4.7
Gas turbine	5 MWe	2.9	12.5	-	12.1	8.0
Gas turbine	400 MWe	18.0	40.3	15.3	5.4	3.8

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Table 2. Summary and rating of UK support mechanisms for CHP

Support mechanism	Eligibility	Economic value	Future prospects	Delta rating
Climate Change Levy Exemption	Good quality (GQ) CHP plants	Up to €6.24 per MWh [but generally less]	Expires in 2013	★★☆☆☆
Enhanced Capital Allowances	GQ CHP plants, except utility-owned CHP plants	100% of investment in generating equipment related to CHP installation can be written off in year 1 against taxable profits	Under revision, possibly being extended to utility CHP from 2011	★★☆☆☆
EU ETS National Allocation Plan	GQ CHP plants			★★☆☆☆

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The precise details of this support are being ironed out, but it is likely to take the form of a 1.5 eurocents/kWh bonus price on all qualifying CHP electricity produced, increasing the IRR for the 5 MW gas turbine CHP from 3% to 12%. And with the additional impact of proposed new pro-CHP legislation, payback for the 2 MW engine falls from 5.8 to 4.7 years.

Table 1 summarizes the IRRs and paybacks for some of the CHP system sizes that Delta has modelled.

Clearly, the prospective bonus payment for CHP electricity produced, together with existing Ecotax exemption, will make CHP investments more attractive to many end users. We expect CHP to be well placed to secure a sizeable share of new power generation investment in the German market – depending on the precise details of the new policy incentives.

The impact of policy in Belgium, and the extent to which it can overcome generally poor economic conditions, is also substantial. Figure 1 summarizes the recent spark-spread trends in the country for a range of CHP plants.

While spark-spreads appear to be on the rise again in the second half of 2007, they are insufficient to make the case for CHP investment a compelling one. However, powerful incentives are in place in the Belgian market, helping to make it one of the most dynamic CHP markets in Europe.

Consider the payback period for a typical 15 MWe gas turbine in Flanders. Without accounting for the effect of any of the existing incentives, project payback exceeds 30 years. But with current support this drops dramatically to about one year. There are similar impacts for other types of CHP project in Flanders, while Wallonia has a strong incentive system of its own, particularly so for smaller projects.

These incentives explain why the CHP market in Belgium is so buoyant. Given the track record of regional governments in the country and the secure time-frame for existing incentives, we expect attractive market conditions to remain in place for several years at least.

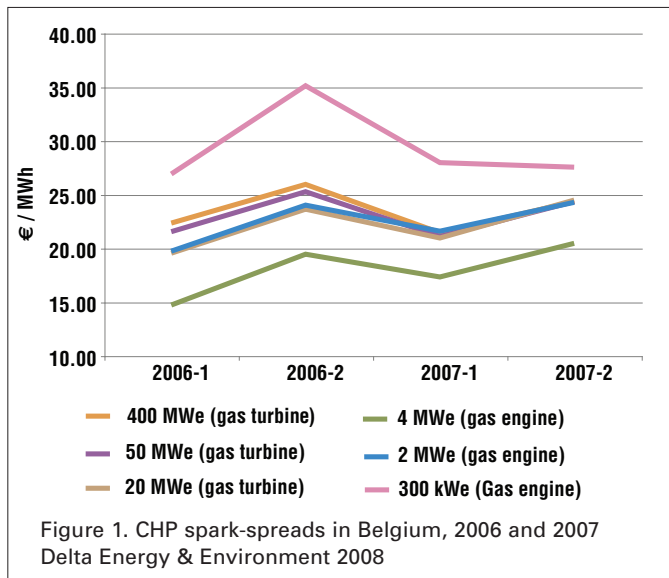
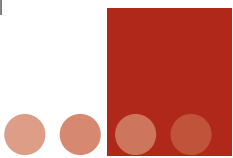


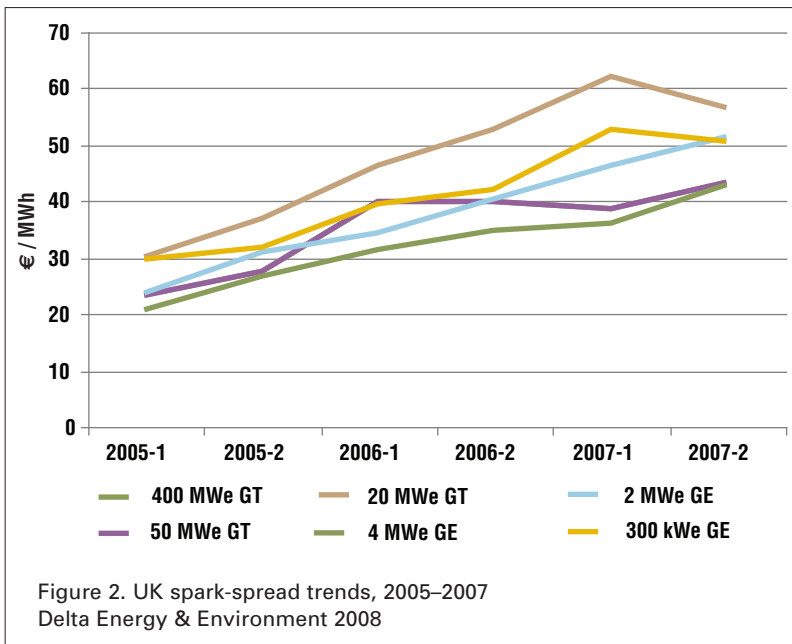
Figure 1. CHP spark-spreads in Belgium, 2006 and 2007
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In strong contrast to the Belgian market, there are very few policy incentives in place in Italy, and the feed-in support for CHP under 10 MW was recently abolished (and, for some market segments, project-breaking barriers exist). But the sheer size of the spark-spread means that Italy does have a healthy CHP market. The country is an example where the policy is a weak driver, but the spark-spread is a strong one.

At a European Union level, the 2004 Cogeneration Directive has led some Member States to take serious steps to introduce pro-CHP policy that overcomes an otherwise unattractive spark-spread environment. In 2007, the Spanish Government not only published its CHP potential study for the Directive, but it chose to combine this with an energy strategy that strongly stressed the importance of CHP. A series of CHP feed-in tariffs for CHP has been established, which we believe will drive rapid market growth, especially in small building-scale CHP. High gas prices over the past few years have left this sector so far unexploited, but



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existing CHP incentives in the UK.

We therefore expect the industrial cogeneration market to remain largely flat, although do see some opportunities in some sectors – such as gas engines for district heating, a growing interest in biogas and the possible emergence of the market for residential micro-CHP. And a recent government focus on reducing carbon emissions from the heat sector may result in greater policy incentives. The one factor that may override this poor policy environment, similar to Italy, is spark-spread. Analysis of UK CHP spark-spreads shows upward trends that are bringing some CHP sectors firmly into economic reckoning. Figure 2 highlights these trends.

CHINA – A MASSIVE POTENTIAL MARKET

Looking further afield, China is self-evidently a massive potential CHP market – but current market activity for natural gas-based CHP is restricted to little more than a handful of demonstration projects.

State-wide pro-CHP policy is virtually absent, though a handful of cities and regions take more interest. Indeed, the policy environment is characterized more by adversity than incentive. Current interconnection requirements in many parts of China are a source of headaches for smaller CHP systems.

The second critical building block, the spark-spread, is extremely shaky – even where natural gas is available for CHP.

with the new support interest in this market is growing fast.

The UK presents quite a different picture with a weak policy regime for CHP compared to many other markets. Our insight into UK government decision making gives us little confidence that, in the short term, decision makers will open their eyes to the potential prize of some significant low-cost carbon savings that cogeneration could bring. Table 2 presents Delta’s policy rating of

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New supply has been slower to be introduced than originally projected; what's more, in some cities and regions where there is supply, there remains a policy preference for gas use in conventional CCGTs than on-site CHP. For both supply and price reasons, therefore, gas-fired CHP is struggling to compete in many cities with coal-based grid supply.

The best CHP opportunities in the short-to-medium term lie in locations close to the long-distance west-east gas pipelines (particularly further west), and in biogas applications and coal bed/mine methane – this latter option has been a popular target over the past two to three years.

In the long run the Chinese natural gas CHP market is likely to be one of the world's largest; possibly *the* largest. But the timing of the opportunity will require very close market scrutiny to predict correctly. CHP equipment suppliers and developers will have to track developments in the Chinese market with care to make sure they get a piece of the action.

SLIGHTLY TOWARDS OPTIMISM

What does this tell us about the two headlines laid out at the beginning of this article? Analysis of this question depends on assessment of the two building blocks. We see these building blocks stacked very differently across the 12 major markets considered in Delta's CHP Policy & Markets Service. Some markets, such as Belgium and Italy, show healthy activity today across many CHP market segments. Others, such as Germany and Spain, show signs of take-off in the near future. China is not a great

short-term bet, but Russia (another country covered by the Service) is already buoyant and we expect it to become increasingly interesting for CHP and on-site generation markets.

Readers looking for a single answer to our choice of two headlines will be disappointed. But, if we had to pick between the two options, we would currently veer slightly towards the more optimistic headline.

We expect the number of active CHP markets to increase over time due to two factors: the growing need for new power generation capacity in many markets; and government drives to reduce carbon emissions resulting in supportive CHP policies. This will help CHP to access a growing share of the growing power generation market.

One point is clear. This is a crucial time for CHP equipment manufacturers and project developers to track current market activity and to have a deep understanding of how markets are likely to develop. Those that do so successfully, and are nimble enough to respond rapidly to changing market conditions, will best reap the rewards of expanding global CHP markets.

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