The two companies currently at the front of the small-scale GTL stage each have significant recent breakthroughs to report. Here, and on page 73, Adrian Cottrill talks about tipping points with their respective chief executives.

Kazakhstan offers lift-off for CompactGTL

After a decade of perseverance, most notably through the 360 barrels per day pilot plant that has been operating in Brazil since 2000, the UK's CompactGTL reckons it has at last achieved the elusive breakthrough it has been seeking for so long.

On 10 March this year, the company signed a memorandum of co-operation to build a 3000 bpd plant in Kazakhstan. The facility is expected to go on stream in 2017 and is reckoned to be worth about $300 million.

Initial engineering should take about 12 months, followed by a construction period of around two years. That indicates a final investment decision being made in the next 12 months.

The March agreement is "to support the development and implementation in Kazakhstan of the world's first commercially deployed small-scale GTL plant. Associated gas that might otherwise be wasted will be fed through the plant to produce synthetic diesel.

"Together with investors from Kazakhstan and the support of its government," said the announcement, "we have agreed to finance, design and build the plant to produce fuels for local consumption and promote high technology industry in the region."

CompactGTL established partners include Japan's Sumitomo, for reactor block construction at a new $40 million factory in Osaka, and Kawasaki for assembling those blocks into container-sized modules. The company's preferred engineering partner for all early stage work is Fluor (which has 400 people in Kazakhstan), but it intends to hold a competition for the ultimate engineering, procurement and construction contract.

Over the past year, CompactGTL has been through some high profile organisational changes. In March 2013, ex-BP chief executive Tony Hayward entered the picture as the company's new non-executive chairman, taking over from Jeremy Coller of Coller Capital. Then in October, Peter Riches took up the position of chief executive, succeeding Nicholas Guy, who had opted for retirement after close to five years in that role.

In January, the company suddenly announced it had gone into administration. This turned out to be a move as four weeks and -- at exit on 4 February -- was described as a move necessary "to complete restructuring with a significant new investment anew."

That investment, expected to be "several million pounds" was by a partnership headed by Hayward and UK investment banking dealmaker Ian Hannam, which became majority owner of CompactGTL.

There had perhaps been hints of this move a year earlier, at the time of Hayward's appointment, when he spoke of the company as "unique in its field" and "providing a game-changing solution to the global problem of gas flaring."

For Peter Riches, last October's move from deputy chairman to chief executive became his second stint in the latter role. Business development director Iain Baxter was also appointed to the board at this time, becoming executive director.

Involved in the company since its inception, Riches was its first chief executive, for three and a half years, from October 2005. Originally, I joined them for six months following the investment by Coller Capital. But it clearly turned into something much longer term," says the 63-year-old, a geologist by background, with a long early career behind him in Texas.

Riches is clearly invigorated by the energy in the restructured company. "Tony Hayward wants to get on with it. He is an extremely well connected person who knows how to work in this space, how to get deals done in all kinds of difficult places, and more quickly to deliver. There is a big commitment to get this thing up and running and get the first plant under way."

Riches is enthusiastic about an upcoming July UK court action by Velocys for alleged patent infringement. "We will vigorously defend ourselves. And my view is that whoever succeeds first will open the market for everybody," he comments.

The origins of CompactGTL lie in work conducted within AEA Technology, a spin-off company from the UK's Atomic Energy Authority. Its early aim was to develop a process plant for gas-to-liquids conversion that is compact enough to be added to the topologies of a floating oil production facility. The resulting target product was an unadulterated synthetic oil that could be blended back in with the field's main stream of crude so that no separate provision need be made for storage and transport.

"Yes, when we started this journey 10 years ago we saw the real opportunity space for our technology as being offshore," says Riches. The driver in those early days was Petronas in Brazil, which was motivated to investigate GTL as a means to avoid flaring of gas associated with extended well production tests at its giant discoveries far offshore (see page 77).

"They were great innovators in deep water and were passionate about the opportunity," he says. "So we were very pleased to be the first company they came to in their investigations."

In a programme that has cost at least £65 million and been fully funded by the oil company, CompactGTL built a 20 bpd demonstration plant at Ancraje on the north-east coast. This started up in December 2000 and still continues to be operated as part of Petronas' test programme.

However, since 2008, the world financial crisis and Petronas' ensuing cashflow and political problems have slowed its momentum in GTL.

"We feel they are still keen to do something but for the last year or two we have not been able to say with any confidence it's likely to be soon," says Riches. "So therefore we've had to reassess our priorities."

"The key thing is to overcome technology assertion by doing a project onshore," he says, noting that small-scale GTL gives pause for thought because it is both capital intensive and a new technology that has yet to provide a convincing full demonstration of its wonders.

"Even though we've done a small plant that has been approved by Petronas for use offshore,
it’s still not on the scale of a commercial plant.”

Baxter points out: “Although in the past you might reasonably have assumed our goal was solely offshore, in fact we’ve always been interested in onshore, where the biggest market opportunity is.”

“We’ve attracted lots of interest from oil and gas companies around the world and done a number of client-funded feasibility studies,” he says. “But because Petrobras was lined up to commission the ‘serial number 1’ plant, I think all those customers were working on the assumption they would be ‘serial number two’, so when Petrobras slowed down, all those other projects slowed down too.”

Things crystallised when Hayward became chairman in March last year, says Riches.

“He said: until we’ve built a plant and got it to work, no one will buy one, so that’s what we’re going to do — find a way to get one built.”

“Which is how we came to be in Kazakhstan,” continues Riches. “I feel it didn’t matter whether it was us or a competitor — someone needed to get one up, to open up the market. Offshore is still part of what we want. But our primary objective is to get this first one up and running.”

A size thing

Asked about the ideal size of plant for small-scale GTL, Baxter reckons it is in the range 2000 to 5000 bpd, viable to stand alone as a means of gas monetisation. “In 10 years’ time, that is where we think the average size will be.”

“The minimum practical size is about 600 bpd,” he says, “but that sits squarely in the regime of stranded oil that needs a solution for gas disposal and is not hugely attractive. As an upper limit, we can see it going to 10,000 bpd, but that’s a bit of a stretch. The largest study we’ve done is for 30,000 bpd.”

CompactGTL’s emphasis is on offering a complete integrated plant, from gas in to product out. “Our whole approach is to develop a robust, reliable and operable commercial system,” says Riches. “To me, this is the biggest challenge.

Baxter says: “The complexity is in the integration and balance of all the flows and temperatures and complex chemistry — how you manage the whole package. For example, strange things can happen when you feel tail gas back in to the front end of the process. This is critical, and we have a good grasp on that.”

CompactGTL freely admits it does not use the supercritical catalyst that Velocys can boast. And the channels in its reactor are mini, not micro. “As a scientist pursuing maximum efficiency you’d activate at micro-channels, smaller than a millimetre or so,” says Baxter. “However, when you consider long-term requirements such as avoiding backages, manufacturability and operability in the field, we feel you are better off having larger channels.”

And CompactGTL does have “a very strong piece of intellectual property”. It carries out the Fischer-Tropsch (FT) process in two stages, removing water vapour between those stages, which extends catalyst life.

“We don’t try and do the FT all in one hit,” explains Baxter. “This halves the water vapour present at each stage, and water vapour is one of the principal influences in the spring of a coiled-based catalyst.”

In the more intense setting of a single-stage reactor process with its higher water content, the catalyst needs to be regenerated about once a month. That involves a plant shutdown, while various gases are passed over the catalyst in situ to condition it and recover some of its performance.

“We don’t have that problem,” says Baxter. “We don’t want any regeneration during the entire life of our catalyst, expected to be three to five years between replacements.”

When the need for catalyst replacement does come, CompactGTL’s approach is to remove and exchange the reactors, rather than attempting operations in situ. “We don’t want exposed catalyst material at the plant,” says Baxter, “it’s highly pyrophoric and would present safety and operational issues there.”

“There is a trade-off in the economics here, in terms of the location,” he says. “What’s becoming clear to us from customers is that once you go above about 2000 bpd plant size, there’s usually a pretty compelling reason to set up a reactor refurbishment facility locally to the plant to avoid shipping them long distances. The capital cost of such a facility is relatively small.”