



Tech Talk: pipelines, a help that can be costly

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I have written about the limitations in the free flow of oil because of the increasingly heavy and sour nature of the reserves that are now being developed, and [the need for suitable refineries](#) to process that oil. I then wrote about how it's not just oil from oilwells, but also the [non-gas-liquids](#) (NGLs) that count toward the total volume of oil that is consumed in the world. There are other constraints to production, and the one that I'm going to talk about today is that of transportation. It seemed appropriate at a time when Chevron has just announced a doubling of the size of the pipeline from the Tengiz field in western Kazakhstan to Novorosslysk on the Black Sea. It will now carry some [1.4 mbd of oil](#) to the port, whence it will be transshipped in tankers.

Transportation is, of course, a major problem for many energy forms, as [Leanan caught](#), the Chinese are already facing problems this winter over the distribution of power.

Most of China's resource production bases, including coal and oil, are either concentrated in the northern or western provinces, away from the key demand areas located in the southern and eastern region, such as Shanghai and Guangdong.

Any supply shortfall could prompt a surge in import demand as utilities and firms seek alternative fuel supplies to feed their power plants.

And it turns out that they are not the only ones. As the new snowfall wraps over the United Kingdom there are concerns over the [distribution of fuel oil](#).

Downing Street was forced to respond to reports that heating oil might need to be rationed over the winter because of rocketing prices and restricted deliveries, admitting there was a problem moving it around the country.

The energy minister, Charles Hendry, sparked alarm yesterday when he warned the House of Commons that the situation could become "very serious" if there was further snow over the Christmas period. Thousands of public buildings and an estimated 660,000 homes rely on oil for heating and Hendry told MPs some had been told supplies would not be available for four weeks.

All of which serve to emphasize a point that I wanted to make today about how the presence of a pipeline can, but not always, help the situation.

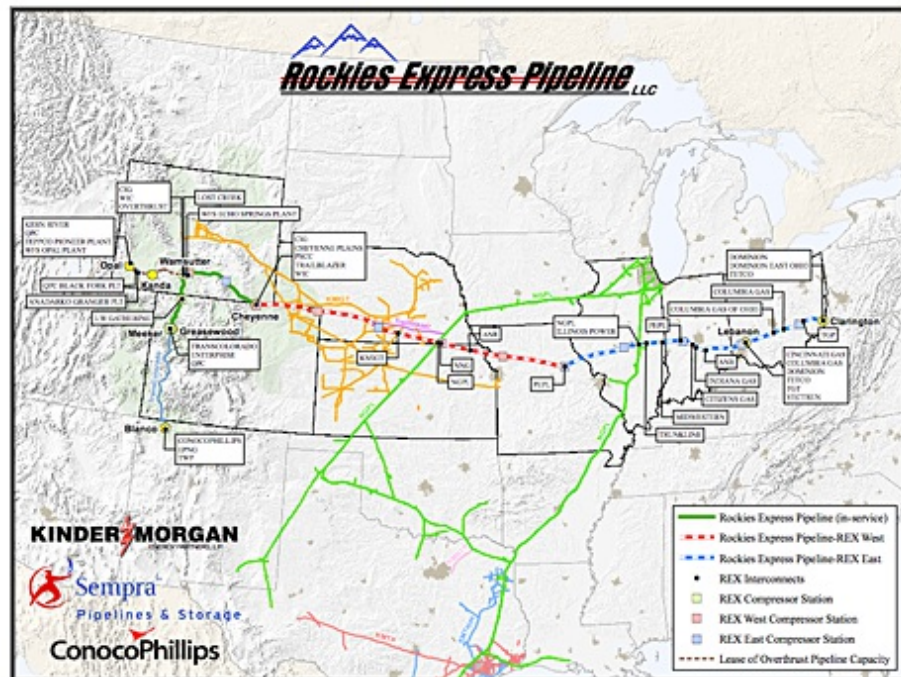
The oil and gas industries flourish largely because of these pipelines, which carry liquids easily over long distances. Perhaps the most famous is the pipeline that carries oil from the North Slope to Valdez. It has survived the varying Alaskan weather conditions, [passing over permafrost and](#)

... rivers, or being buried, depending on the geology. It was the only viable way to effectively develop that reserve.



Alaskan pipeline just North of Fairbanks. Note the radiators on the support legs. These disperse the heat from the pipe (and the oil) which keep the permafrost, in which the support legs sit, from melting. The 48-inch line was sized to carry 2.1 mbd of oil. Today it only carries [around 660,000 bd](#).

Pipelines don't just allow reserves to be extracted, consider the [Rockies Express Pipeline](#) that is bringing natural gas from Colorado through [the 1,679 miles to Ohio](#). Before it was installed Colorado would have a surplus of natural gas in the winter, while the North East had a shortage. To a degree (Caribou Maine being still some distance from Ohio) that has now been ameliorated.



The pipeline route ([Kinder Morgan](#))

Pipelines need to be sized for the volumes that flow. In order that the oil/gas flow down the pipe the fluid is pumped into the line at pressure, and at stages along the pipe, as the pressure is “used up” on overcoming friction from the pipe walls, there are booster stations that raise the pressure back to the driving pressure, to keep it moving. (And yes these use some of the fuel, particularly if it is gas, as a power source).

One of the problems with running the pipe under that pressure is that if there is any corrosion or damage to the pipe then the pressure [may have to be lowered](#) to stop the pipe from bursting. Since the flow velocity is a function of the square root of this driving pressure, then as the pressure drops so does the volume pumped.

As a result inspection to make sure there is little or no corrosion should be a regular feature of pipeline maintenance. Given that the pipe can run for miles above or below the surface, external inspection can be difficult, and, instead companies will run “pigs” down the line. (The name comes from the “squeal” as they move) These are put into the pipe at the “top” end and pumped down with the oil. Instruments and sensors within the central compartment can monitor conditions as the pig moves. Pigs are also fitted with wipers that ensure that deposits from the fluid don’t build up along the pipe and cause problems.



Example pig used in the Alaskan pipeline – see the wipers and note the central compartment within the pig.

It is difficult to stop all corrosion, and over time segments of the pipe may need to be replaced because of damage that can build up in the normal course of operations. If inspections are not regular, then, as [BP found in 2006](#), corrosion can lead to a leak, and big problems.

Unfortunately pipelines are not just prone to mechanical problems. Their presence is hard to hide, and thus, become targets for theft. Whether in [Mexico this weekend](#), or [Nigeria almost every day](#), theft by physically extracting fuel from pipelines can be a very dangerous game, with explosions and loss of life a not-infrequent result.

And that is just the small scale operations. On a larger scale the risk can be a lot less. Remember that Western Europe is becoming increasingly dependent on Russian natural gas for supplies, particularly in the winter months. That natural gas travels between the two passing down a pipeline through Ukraine. The financial woes of that country meant that it did not always pay its gas bill, and, [usually in January](#), this led to confrontations between Russia and Ukraine, with Western Europe the frequent loser. To overcome this dependence Russia is now putting in place two smaller pipelines that will circumvent Ukraine to the North (Nordstream) and the South.

One of the key players in that game was Turkmenistan, which supplied its natural gas through pipelines that only went through Russia to their customers. Russia for years was able to dictate the price that it paid Turkmenistan, often considerably less than it was getting from Europe. But since it was the only game in town...

That recently changed, however, with the construction of a pipeline [from Turkmenistan to China](#) and this broke the monopoly that Russia held over the sale of Turkmen gas. The pipeline is now being upgraded and the flow increased to 1.25 billion cu ft/day, [four times the volume](#) that flowed, on average, last year. The pipeline is 4,350 miles long. Ultimately [the flow will be three times that size](#) – about the volume that Turkmenistan used to sell to Russia. (The last reference has the picture of what may be the one Soviet attempt to extinguish a burning gas fire with a nuclear device that didn't work).

The Russians haven't forgotten the benefits that come from owning the pipelines and the control that this gives over the producers. BP learned that lesson the hard way. Gazprom is the Russian company that owns the pipelines (and on a slow news day I could always find a story by seeing what new machinations had been revealed in a Google search for Gazprom). By controlling the pipelines they could dictate what flowed when. As an example let me remind you of the situation that BP faced in developing the Kovykta gas field [back in 2007](#). The deal was that after BP developed the field, they had to produce 9 billion cubic meters (bcm) per year, as the license stipulated. But local consumers could only handle a small fraction of this, and Gazprom, who owned the only pipeline in town, was only willing to allow a flow of 1.7 bcm. Oops! You guessed it, BP was held liable for not meeting the terms of the license and...

You will note that Gazprom has been quite efficient at getting control of a large portion of the pipelines and (as a result) the distribution networks across Europe.

That story brings to mind another caveat, that illustrates the bind that pipeline owners can impose on their clients. Bear in mind that these pipelines are not cheap, and while they can be installed relatively rapidly, they have to be paid for. Thus, before they are installed the owners require long-term commitments from both the seller at one end and the vendor at the other. The Rockies Express [has such commitments](#).

REX is a joint venture of KMP (we own 50 percent and operate the pipeline), Sempra Pipelines and Storage and ConocoPhillips. Long-term, binding firm commitments have been secured for virtually all of the pipeline's capacity. The pipeline is enabling producers to deliver gas from the Rocky Mountains eastward and is helping to ensure that there will be adequate supplies of natural gas to meet growing demand in the Midwest and eastern parts of the country.

There is an underlying point here that is sometimes missed when these projects are discussed, and that is that the agreements between all parties will usually establish a price for the product, at the time that the contracts are signed, that run well into the future. Those prices do not reflect the current market price of the fuel. It is a point that often gets overlooked in discussions over fuel distribution. But many of the ways in which fuel is shipped require considerable investments not only for the production, but also for the transportation, and then for the distribution. Thus the need for commitment and guarantees before the process of construction begins. (This has just been evident in the wait in starting new coal mines in Australia, for example, until long-term contracts with China had been signed.)

However, if the pipeline owner then changes the rules, there is not a whole lot that the other two

partners can do – as a whole list of countries who have been squeezed by Russia would be glad to remind you.

But it is not just over Russia that the world should have a concern. One should not forget the new pipelines that are being constructed across Asia. Whether the Chinese pipeline from Turkmenistan, or the TAPI pipeline from Turkmenistan to India, these mark a switch in the destiny of future fuel production. It is a future that means that a considerable volume of the worlds fuel may no longer be available to the West. And where that fuel is natural gas, and the nations of Europe are building gas-fired power plants to back-up wind and other renewable sources, then if the gas isn't there...

No problem, you say, old HO is being his usual alarmist self. Well you might want to note how many times this winter there is a “[Gas Balancing Alert](#)” action in the UK. [Rune Likvern](#) has already highlighted the start of a possible problem as stocks were drawn down at the start of the winter and it has not got any better. The first Alert [has been issued](#) for this season.

On Monday the National Grid issued a gas balancing alert (GBA) for only the second time, asking power suppliers to use less gas as more was sourced overseas. Extra gas - including supplies from Belgium and Norway - was necessary to meet rising demand after a 30% rise on normal seasonal use during the cold snap.

This is only the second such alert, the first coming [last January](#).

Further information can be found on the [National Grid Website](#). The normal daily usage at this time of year, according to that site, is 364 million scm (standard cubic meters). The trigger for a GBA is 452 mscm, and tomorrow's demand is forecast at 463 mscm. Interruptions seem most likely to occur in the North.

Oh, and just to give you a better sense of the scale of some of these pipes - here is me beside the one in Alaska.



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