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**CONDENSATE EAST OF SUEZ 2008:
NGL's Growing Impact on Petrochemical
and Transport Fuel Markets**

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September 2008

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Executive Summary

- While there are many definitions of condensate as a Natural Gas Liquid (NGL), we consider it to be all NGL (C5 and heavier) that once it becomes a liquid, remains a liquid. This means that condensate can be treated like any light, sweet crude, or in some specialized cases, as a naphtha equivalent, and can use all the infrastructure of conventional crude and oil products. Condensate can be considered a base material, equivalent to crude for refining, a petrochemical feedstock, a blending component, or boiler feed.
- As a NGL, condensate production is inexorably linked to gas reserves, exploration and development. *Wet* gas, high in NGL content, is generally developed before *dry* gas; the acceleration of exploration for and development of gas reserves, both in Asia Pacific and the Mideast Gulf, will inevitably boost condensate output through 2015.
- It is notable that the ballooning of Engineering, Procurement and Construction (EPC) costs has had different impacts on downstream oil and gas projects. Many refinery projects have been delayed and a substantial number of proposals cancelled outright. Gas developments and associated mid- and downstream gas projects have tended to be delayed rather than shelved. This implies a continuing expansion of gas production in the medium term, and a parallel rise in condensate output.
- Over the course of this decade, condensate has moved from a specialty niche into the mainstream of Asia-Pacific and Mideast Gulf trade. Increasingly it has impacted not only petrochemical feedstock balances, but gasoline supply and marketing. Because condensate's flexibility is extraordinarily broad, it has only been recently that traders have begun to fully realize its intrinsic worth.
- Condensate is not included in production quotas of the Organization of Petroleum Exporting Countries (OPEC). Since the late 1990s segregated condensate output increased faster than total liquids production not only in Asia Pacific, where only Indonesia was an OPEC member, but also in the Mideast Gulf, where most producers were members.
- Condensate traditionally has suffered from a tremendous confusion in markets. It is always light; unlike the other NGL, Liquefied Petroleum Gas (LPG), it remains a liquid without special containment; usually is low in sulfur and other contaminants and yields are dominated by naphtha. It is a byproduct of gas production and this makes condensate – unlike crude – to some extent inelastic in price. Output is dictated by gas needs, not prices.
- Naphtha is the key to condensate's main utilizations. Mideast condensate tends to produce large volumes of paraffinic-oriented naphtha; Asia-Pacific grades tend to yield Naphthenes-and-Aromatics (N+A)-oriented naphtha. In oil products, condensate has a tremendous impact on petrochemical feedstock balances (both olefins and aromatics) and gasoline.

- Incremental segregated condensate output in Mideast Gulf countries will come both from a full range of gas developments (Liquefied Natural Gas (LNG), Gas to Liquids (GTL), and piped gas), while additional volumes of condensate in Asia Pacific will come mainly from LNG projects, particularly in Australia, and to a lesser extent Malaysia and Indonesia. Still piped gas will play at least some role in many Asian markets and will be particularly important in India, Myanmar, Vietnam, and China.
- The Gulf's *Big Three* – Saudi Arabia, Qatar, and Iran – will account for much of the buildup in new segregated condensate volumes, adding from 2008 production levels an aggregate 2.2 MM barrels a day (B/D) by 2016. The United Arab Emirates (UAE) will also add more than 100 Thousand Barrels a Day (MBD) in segregated condensate volumes to regional output.
- While Mideast Gulf producers will account for most of the production gains East of Suez, many will try to restrain condensate exports for the foreseeable future. Despite these efforts, condensate sales abroad will continue to rise through the coming decade.
- Asia Pacific is both a large-scale production region, but also a substantial condensate importer, mainly from the Gulf. Large-scale condensate producers such as China, Thailand, and Malaysia will consume most if not all of their segregated output. Other producers, notably Australia, will continue to export large volumes of condensate. Small-scale exporters Brunei, Myanmar, the Philippines, and Vietnam, most likely to be joined soon by India and Bangladesh, are likely to increase production and exports. Indonesian output will begin to rise again, but exports may be limited.
- Asia Pacific's traditional large-scale condensate importers, Japan, South Korea, Singapore, and Taiwan, have been joined by Thailand in buying condensate abroad. China will likely become a major condensate importer by 2012, though domestic output will have priority.
- Gas projects that will add significantly to segregated condensate output in the Mideast Gulf will be mainly LNG additions, though other significant contributions will be made by oil field developments that also have significant associated wet gas, particularly in Saudi Arabia.
- Saudi Arabia is the key producer/exporter to watch in the Mideast Gulf, because theoretically this country's ability to increase condensate output is limited only by time, cost and government policy. In particular, any change in Saudi Aramco (Aramco) constraint of condensate exports could have significant impact on condensate, naphtha and gasoline markets in a relatively short period of time.
- Iran's ability to raise condensate output has been constrained by economic sanctions, uncertain politics and increasingly rising project costs. The domestic market will continue to have first call on whatever incremental output emerges, but still Iran will remain a major condensate exporter.

- Despite a moratorium on new gas development, Qatar will continue to export more condensate than Iran. Once the moratorium is ended, and new projects begin to add further condensate output by 2016, Qatar could possibly challenge Saudi Arabia as the top condensate producer and exporter East of Suez.
- The UAE will see a substantial rise in output through end-decade, but growth in condensate production will slow post-2010. As in Saudi Arabia, Iran and Qatar, the UAE will add condensate splitting capacity by end-decade.
- Yemen will emerge as a regular condensate producer and exporter by 2010; we believe that segregated condensate output and sales abroad in neighboring Oman will remain constrained by falling oil output. Iraq has become a segregated condensate producer in 2008; Kuwait may become a producer by 2016.
- South Asian condensate will be dominated by India, where large offshore gas discoveries under development will boost Indian segregated condensate production substantially by the coming decade. Segregated condensate use will remain minimal and Indian companies will begin to regularly export output. Bangladesh will too begin to export condensate regularly, though in relatively small volume.
- After a number of years of stagnation, Indonesian condensate production will rise steadily over the medium term, but growing domestic needs will likely limit exports. Small-volume, though steady, increases in condensate output should be seen in Myanmar, Thailand, and Vietnam, and while Myanmar and Vietnam will increase exports, Thailand will absorb all incremental condensate output for its booming domestic refining and petrochemical sectors. Small-volume production and exports will continue in the Philippines.
- Malaysia will remain the odd producer out. Segregated condensate production will remain range-bound at 105-115 MBD, until 2014-2016. It is unclear whether policy will remain unchanged of limiting exports when faced with another surge in new condensate output likely post-2016.
- Singapore's use of condensate has steadily risen since the mid-1990s, on increased refining and petrochemical feedstock needs and vastly increased blending activity. Completion of another condensate splitter will increase condensate imports further.
- In contrast, Taiwan's condensate imports have declined substantially in recent years, as refiners China Petroleum Corp. (CPC) and (Formosa Plastics Corp.) FPC have preferred to process full-range naphtha in lieu of segregated condensate. There has been a slight revival in condensate imports in 2007-2008 which will continue for the medium term, but we do not expect more than a modest increase in imports through 2013.

- China has emerged as a growing force in condensate, as it has in most segments of oil and gas for the region. A growing recognition of condensate's value, plus a vast program of accelerated gas development across the country will sharply boost segregated output, but demand will likely run ahead of new supply. China will expand its splitter capacity substantially by 2014 and we see that demand pressure for both gasoline and petrochemical feedstock will not ease off through end-decade.
- While Russia's Sakhalin projects could potentially add a large volume of segregated condensate to international trade, as could Oman, the need to maximize crude exports will continue to trump the potential for segregated condensate exports. In both cases field operators believe they will gain a better sales price by blending condensate into crude. In Oman, a further incentive is to maintain the gravity and sweet nature of Oman Export Blend, even though future output will use emerging heavier and higher-sulfur crude streams. The danger in blending large volumes of condensate with such crude streams is that a *barbell* outturn will result, with a high proportion of residual and light-end product, but with a comparatively small middle distillate yield.
- In 2007, Japan wrested the top importer spot away from South Korea. Yet Seoul and Tokyo will compete for the position of leading condensate importer in Asia Pacific through the coming decade. Singapore's condensate use skyrocketed in 2007, leaving the Island Republic only slightly behind Korean volumes. While Thai imports remained steady, this market, together with China, will import increasing condensate volumes through 2016.
- Japan has discovered the utility of condensate as a tool to increasing petrochemical feedstock flexibility and possibly reducing the cost of feedstock imports. Japanese companies will be investing substantially in expanding condensate processing capacity through 2011.
- Thailand has joined the ranks of major condensate importers and this market's expanding condensate needs will have to be met in large part by imports. Condensate splitters make up a substantial percentage of downstream capacity in Thailand and capacity will expand further by 2012.
- Australia will remain a major condensate exporter, even when this market's second splitter is commissioned by end-decade. Australia's new condensate output will be based mainly on LNG, with some additional contributions from NGL-stripping and piped gas projects.
- Because of their large proportion of light-ends outturn, condensate tends to bottleneck conventional refineries. Condensate splitters are simple distillation towers with cut-points adjusted to handling a high proportion of light product and tower overheads sufficient to handle that volume flow. The number of splitting complexes and their average size has grown significantly since 1997.

- In 1997, total condensate refining capacity East of Suez was less than 200 MBD, with no units operating in the Mideast Gulf. By 2008, condensate processing capacity (splitters and petrochemical pretreatment units) topped 2.0 MM B/D, with more than half of that operating in Asia Pacific; by 2011, total condensate processing will approach 3 MM B/D and by 2013 will reach nearly 4.4 MM B/D capacity. The Mideast Gulf share will rise as a proportion of total condensate processing capacity from 43% in 2008 to 53% in 2011 and by 2013 nearly 57%.
- The buildup of condensate processing capacity in the Mideast Gulf had been particularly impressive and until a handful of Asia-Pacific projects were completed in 2006, the Mideast usually accounted for 60% or more of all splitting capacity for much of the decade. Condensate splitters accounted for a substantial minority of all new distillation capacity commissioned – averaging more than 20% - from 1997-2005 East of Suez, with particular impact in the Mideast Gulf.
- Yet Asia-Pacific interest in condensate splitters has revived and a number of projects are underway in this region as well as the Mideast Gulf. Condensate splitting as a proportion of total condensate use East of Suez has grown steadily. By 2007, splitters accounted for more than two-thirds of all segregated condensate use.
- Growing splitter capacity will result in large volumes of naphtha. While Mideast splitters will absorb much of the N+A end of naphtha, using that to create gasoline for domestic needs, they will export most of the remaining paraffinic naphtha. This will result in a substantial increase in paraffinic naphtha exports, targeting Asian markets, with a considerable impact on petrochemical feedstock prices.
- A wide range of drivers has supported the construction of condensate splitters, but the chief reasons for Mideast Gulf project boosters have been to restrain condensate exports and produce more gasoline. In contrast, Asia-Pacific projects generally have aimed at providing petrochemical feedstock. Naphtha is the chief determinant in condensate value and the nature of that naphtha, whether the material is paraffinic-oriented or N+A-oriented, dictates optimum utilization.
- Paraffinic-oriented condensates generally are best at providing feedstock for ethylene cracking. Most Mideast condensates produce paraffinic-oriented naphtha; yet there are some Asia-Pacific grades, such as Bontang Return condensate, that produce naphtha with substantial paraffin content. Paraffinic-oriented condensates tend to be lighter and produce less middle distillate.
- Southeast Asian and Australasian condensates tend to be more N+A-oriented than Mideast Gulf production and therefore tend to be heavier and yield larger proportions of middle distillate. Yet there are Mideast grades, such as Sharjah, that are N+A-oriented; some Mideast Gulf production, such as South Pars, has a high yield of middle distillate.

- While the volume and nature of naphtha yields are a key consideration in evaluating condensate, and so finding a pricing system that reflects its market value, naphtha is not the only factor. Refiners, when buying for their slates, tend to prefer crude linkage as more accurately reflecting condensate value; petrochemical buyers tend to prefer naphtha linkage.
- In reality, there are many pricing systems for condensate, which is a natural reflection of its versatility. Sellers often change their condensate linkage from crude to naphtha when moving grades to different markets and Dubai, Murban, Tapis, and even occasionally Brent are used as crude markers for East of Suez pricing. Naphtha linkage is usually to Mideast Gulf averages, or to the Singapore open-spec naphtha market, though at times can be priced off of condensate grades such as NW Shelf.
- What has emerged in recent years is an increasing integration of condensate, naphtha, and gasoline downstream, each influencing and impacting the supply/demand balances, prices and trade availability of the other. Traders, planners, and supply executives have begun to realize that condensate is the connecting point, the *nexus* of much of the light end of the oil barrel. Similarly, the interplay of gas and NGLs, including the mutual impact of condensate and LPG on each other, has begun to be recognized by gas project planners.
- It is generally agreed that Asia Pacific will remain a growth leader for oil demand at least through the coming decade and substantial refining capacity currently is under construction to meet that. This alone would provide a steady and growing support for increased condensate use. Yet what is often not fully realized is that there is a fast-track parallel expansion in base petrochemical capacity and that this incremental capacity for the most part is based on naphtha or direct-use condensate feedstock. This will certainly assure substantial new demand for incremental condensate output.
- The Mideast Gulf will continue to remain a major exporter – and major supplier to Asia Pacific – of light-end products (mainly naphtha and LPG) and condensate. The future use of condensate splitters in the Gulf may well firm up segregated condensate prices, while at the same time creating a supply overhang for naphtha. Condensate's future prices may well be dictated by Asia Pacific's ability to absorb incremental volumes of splitter-derived naphtha.
- Condensate has moved into the mainstream of Asia-Pacific and Mideast Gulf supply and marketing, as it is emerging as a global trade, impacting a broad range of products (naphtha, gasoline, LPG, and to some extent middle distillates) and changing the relationship of petrochemical companies and oil refiners. We believe its importance can only grow for the foreseeable future.