EIA’s Proposed Natural Gas Liquids Realignment

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Background

- A high oil-to-gas price ratio has gas producers focusing on liquids, contributing to growing NGL production.

- EIA has begun highlighting our NGL data series and analysis pieces, and issues with terminology have become apparent.

- We attempted to address the inconsistencies arising from supply-oriented versus market-oriented terminology.

- We seek feedback on proposed new terminology and proposed changes to existing terminology. Feedback on implementation is also welcome.
Questions for our workshop attendees

• Does the new terminology make sense? Is it clear why we made changes? Are the changes an improvement?

• We are looking for feedback on four topics in particular:
  – Separation of NGL and olefins
  – Creation of new term: Hydrocarbon Gas Liquids (HGL)
  – Changes to term Liquefied Petroleum Gas (LPG)
  – Removal of lease condensate as an NGL

• Feedback on these items and anything else is welcome and appreciated. Please direct feedback to NGL@eia.gov.
Overview of gas liquids flow

\[ \text{NGPL} + \text{LRG} = \text{HGL} = \text{NGL} + \text{Olefins} \]

**Natural Gas Liquids (NGL)**
(Ethane, Propane, Butanes*, & Pentanes Plus)

**Olefins**
(Ethylene, Propylene, Butylene & Isobutylene)

**Hydrocarbon Gas Liquids (HGL)**

**Natural Gas Plant Liquids (NGPL)**
(Ethane, Propane, Butanes*, & Pentanes Plus)

**Liquefied Refinery Gases (LRG)**
(Ethane, Propane, Butanes*, Pentanes Plus, & Olefins)

**Gas Processing Plant**

**Refinery**

**Field Separator Facilities (“Lease Separators”)**

**Gas Wells**

**Oil Wells**

Butanes include normal butane and isobutane.
The molecules

Natural Gas Plant Liquids are all “paraffins” or “alkanes.” See below:

Liquefied Refinery Gases include some “paraffins,” but also “olefins” or “alkenes,” listed below:

**Paraffins/Alkanes:**
- Ethane (C2H6)
- Propane (C3H8)
- Butane (C4H10)
- Isobutane (C4H10)
- Pentanes Plus (C5H12+)

**Olefins/Alkenes:**
- Ethylene (C2H4)
- Propylene (C3H6)
- Butylene (C4H8)
- Isobutylene (C4H8)
- Pentene (C5H10)

**Gas Processing Plant**
- Dry Gas
- Wet Gas

**Field Separator Facilities (“Lease Separators”)**
- Gas Wells
- Oil Wells

**Refinery**
- Crude Oil/Lease Condensate
- Petroleum Products & Other Liquids

**NGPL + LRG = HGL = NGL + Olefins**
Where do issues arise?

Hydrocarbon Gas Liquids (HGL)

Natural Gas Liquids (NGL)
(Ethane, Propane, Butanes*, & Pentanes Plus)

Olefins
(Ethylene, Propylene, Butylene & Isobutylene)

Oil/Gas/NGL reserves

NGPL + LRG = HGL = NGL + Olefins
Downstream Issues

Natural Gas Liquids (NGL)
(Ethane, propane, butanes, & pentanes plus)

Olefins
(Ethylene, propylene, butylene & isobutylene)

- NGL will now include all NGPL and paraffinic LRG, and exclude olefins.
**Downstream Issues**

**Natural Gas Liquids (NGL)**
(Ethane, Propane, Butanes*, & Pentanes Plus)

**Olefins**
(Ethylene, Propylene, Butylene & Isobutylene)

**Hydrocarbon Gas Liquids (HGL)**

- New term to encompass both NGL and Olefins
- NGPL plus LRG will capture all liquids from a production standpoint
- NGL plus Olefins will capture all liquids from a market standpoint
- HGL is equivalent to the union of NGPL and LRG or of NGL and olefins
- NGL will now include all NGPL and paraffinic LRG, and exclude olefins.

\[ \text{NGPL} + \text{LRG} = \text{HGL} = \text{NGL} + \text{Olefins} \]
Midstream petroleum issues

Liquefied Petroleum Gas (LPG)
- Currently defined as C2-C4 by EIA
- We propose removing ethane as it is not a liquid and industry and IEA exclude it from LPG

Olefins
- Olefins, or alkenes, are a subset of Liquefied Refinery Gas (LRG)
- We propose leaving them in LRG but removing them from the definition of NGL on the grounds that when people discuss NGL they are excluding olefins
Example of midstream petroleum issues

[Image of Custom Table Builder]

- Frequency: Annual
- Select a Year Range: 2009 to 2014
- U.S. Prices
- International Crude Oil and Liquid Fuels
- U.S. Crude Oil and Liquid Fuels
  - Supply
  - Field Production
  - U.S. Crude Oil
  - Alaska Crude Oil
  - Federal Gulf of Mexico Crude Oil
  - Lower 48 States (Excl GOM) Crude Oil
  - Pentanes Plus
  - Liquefied Petroleum Gas

NGPL + LRG = HGL = NGL + Olefins
Midstream gas issues

Natural Gas Plant Liquids
• Currently considered “field production” of crude oil
• We would like to discontinue this since they are a natural gas byproduct

Pentanes Plus
• We will now define “natural gasoline” (a market term and product traded in the spot market) as a subset of Pentanes Plus
• Natural gasoline is “mostly pentanes and hexanes,” which accounts for most of pentanes plus

Extraction Loss
• Shrinkage due to NGPL removal is called “extraction loss” by EIA.
• Propose changing name to “NGPL production” on the grounds that the NGPL are not lost but removed and sent to market
Example of midstream gas issues

Table 5.1b Petroleum Overview, Selected Years, 1949-2011
(Thousand Barrels per Day)

<table>
<thead>
<tr>
<th>Year</th>
<th>48 States</th>
<th>Alaska</th>
<th>Total</th>
<th>Natural Gas Plant Liquids</th>
<th>Total</th>
<th>Renewable Fuels and Oxygenates</th>
<th>Processing Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949</td>
<td>5,046</td>
<td>0</td>
<td>5,046</td>
<td>430</td>
<td>5,477</td>
<td>NA</td>
<td>-2</td>
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<tr>
<td>1950</td>
<td>5,407</td>
<td>0</td>
<td>5,407</td>
<td>499</td>
<td>5,906</td>
<td>NA</td>
<td>2</td>
</tr>
<tr>
<td>1955</td>
<td>6,807</td>
<td>0</td>
<td>6,807</td>
<td>771</td>
<td>7,578</td>
<td>NA</td>
<td>34</td>
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<tr>
<td>1960</td>
<td>7,034</td>
<td>2</td>
<td>7,036</td>
<td>929</td>
<td>7,965</td>
<td>NA</td>
<td>146</td>
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<tr>
<td>1965</td>
<td>7,774</td>
<td>30</td>
<td>7,804</td>
<td>1,210</td>
<td>9,014</td>
<td>NA</td>
<td>220</td>
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<tr>
<td>1970</td>
<td>9,408</td>
<td>229</td>
<td>9,637</td>
<td>1,660</td>
<td>11,297</td>
<td>NA</td>
<td>359</td>
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<tr>
<td>1975</td>
<td>8,183</td>
<td>191</td>
<td>8,375</td>
<td>1,633</td>
<td>10,007</td>
<td>NA</td>
<td>460</td>
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<tr>
<td>1976</td>
<td>7,958</td>
<td>173</td>
<td>8,132</td>
<td>1,604</td>
<td>9,736</td>
<td>NA</td>
<td>477</td>
</tr>
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<td>1977</td>
<td>7,781</td>
<td>464</td>
<td>8,245</td>
<td>1,618</td>
<td>9,862</td>
<td>NA</td>
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<tr>
<td>1978</td>
<td>7,478</td>
<td>1,229</td>
<td>8,707</td>
<td>1,567</td>
<td>10,275</td>
<td>NA</td>
<td>496</td>
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<tr>
<td>1979</td>
<td>7,151</td>
<td>1,401</td>
<td>8,552</td>
<td>1,584</td>
<td>10,135</td>
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<tr>
<td>1980</td>
<td>6,980</td>
<td>1,617</td>
<td>8,597</td>
<td>1,573</td>
<td>10,170</td>
<td>NA</td>
<td>597</td>
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<tr>
<td>1981</td>
<td>6,962</td>
<td>1,609</td>
<td>8,572</td>
<td>1,609</td>
<td>10,180</td>
<td>NA</td>
<td>508</td>
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<tr>
<td>1982</td>
<td>6,953</td>
<td>1,696</td>
<td>8,649</td>
<td>1,550</td>
<td>10,199</td>
<td>NA</td>
<td>531</td>
</tr>
<tr>
<td>1983</td>
<td>6,874</td>
<td>1,714</td>
<td>8,588</td>
<td>1,559</td>
<td>10,246</td>
<td>NA</td>
<td>488</td>
</tr>
<tr>
<td>1984</td>
<td>7,157</td>
<td>1,722</td>
<td>8,879</td>
<td>1,630</td>
<td>10,509</td>
<td>NA</td>
<td>553</td>
</tr>
<tr>
<td>1985</td>
<td>7,146</td>
<td>1,825</td>
<td>8,971</td>
<td>1,609</td>
<td>10,581</td>
<td>NA</td>
<td>557</td>
</tr>
<tr>
<td>1986</td>
<td>6,814</td>
<td>1,867</td>
<td>8,681</td>
<td>1,551</td>
<td>10,231</td>
<td>NA</td>
<td>616</td>
</tr>
<tr>
<td>1987</td>
<td>6,387</td>
<td>1,962</td>
<td>8,349</td>
<td>1,595</td>
<td>9,944</td>
<td>NA</td>
<td>639</td>
</tr>
</tbody>
</table>
Upstream issues

**Lease Condensate**
- Currently considered an NGL, but is mixed with and sold as crude oil
- To be recategorized as crude oil because it never reaches NGL markets

**Reserves**
- NGL are shown in reserves as “Natural Gas Liquids Proved Reserves”
- To be changed to “Expected Production from Total Natural Gas Proved Reserves,” with NGPL and dry gas break-out
- NGPL and dry gas reserves are conceptually confusing, since they must be processed above ground to become separate products
Miscellaneous issues

**Natural Gas Liquids**
- NGL to be used in the plural

**NGPL Composite Price**
- “NGL Composite Price” renamed “NGPL Composite Price”
- This is to correspond to the NGPL/LRG differentiation

**Light/Heavy NGL**
- Light NGL and Heavy NGL are acceptable terms, but will not be in the glossary and must be defined wherever used
- This is a useful distinction for analysis but not relevant to our data collection, so we will opt to define it on an as-needed basis.
### HGL: before and after realignment

<table>
<thead>
<tr>
<th>Before</th>
<th>After / Supply</th>
<th>After / Supply</th>
<th>After / Demand</th>
<th>After / Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGL</td>
<td>NGPL</td>
<td>LRG</td>
<td>NGL</td>
<td>Olefins</td>
</tr>
<tr>
<td>NGPL/LRG</td>
<td>Ethane</td>
<td>Ethane</td>
<td>Ethane</td>
<td>Ethylene</td>
</tr>
<tr>
<td>LPG</td>
<td>Ethane</td>
<td>Ethane</td>
<td>Ethane</td>
<td>Ethylene</td>
</tr>
<tr>
<td>Ethane</td>
<td>Propane</td>
<td>Propane</td>
<td>Propane</td>
<td>Butylene</td>
</tr>
<tr>
<td>Ethylene</td>
<td>Butane</td>
<td>Butane</td>
<td>Butane</td>
<td>Normal</td>
</tr>
<tr>
<td>Propane</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Iso</td>
</tr>
<tr>
<td>Propylene</td>
<td>Iso</td>
<td>Iso</td>
<td>Iso</td>
<td></td>
</tr>
<tr>
<td>Butane</td>
<td>Pentanes+</td>
<td>Olefins</td>
<td>Pentanes+</td>
<td></td>
</tr>
<tr>
<td>Butylene</td>
<td>Ethylene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isobutane</td>
<td>Propylene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isobutylene</td>
<td>Butylene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentanes+</td>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isopentane</td>
<td>Iso</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lease Condensate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Comparison of term: natural gas liquids (NGL)

<table>
<thead>
<tr>
<th><strong>EIA Proposed</strong></th>
<th><strong>GPA (Gas Processors Association)</strong></th>
<th><strong>IEA (International Energy Agency)</strong></th>
<th><strong>USGS (U.S. Geological Survey)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethane, propane, normal butane, isobutane, and pentanes plus. Natural gas plant liquids and all liquefied refinery gases, except olefins.</td>
<td>Natural gas liquids are those hydrocarbons liquefied at the surface in field facilities or in gas processing plants.</td>
<td>NGL are liquid or liquefied hydrocarbons recovered from natural gas in separation facilities or gas processing plants.</td>
<td>Natural gas liquids include natural gas plant liquids (primarily ethane, propane, butane, and isobutane) and lease condensate.</td>
</tr>
</tbody>
</table>

NGPL + LRG = HGL = NGL + Olefins
### Comparison of term: liquefied petroleum gases (LPG)

<table>
<thead>
<tr>
<th>EIA Proposed</th>
<th>GPA (Gas Processors Association)</th>
<th>IEA (International Energy Agency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily propane, normal butane, and isobutane. These gases may be marketed individually or mixed. They can be liquefied through pressurization without refrigeration for convenience of transportation. Excludes ethane and olefins.</td>
<td>“LP-gas”: Predominately propane or butane separately or in mixtures which are maintained in a liquid state under the pressure within the confining vessel.</td>
<td>Light hydrocarbon fractions comprising propane and butane or a combination of the two. They could also include propylene, butylene, isobutene and isobutylene. LPG are normally liquefied under pressure for transportation and storage.</td>
</tr>
</tbody>
</table>
## Comparison with Gas Processors Association

<table>
<thead>
<tr>
<th>Term</th>
<th>EIA Proposed</th>
<th>GPA (Gas Processors Association)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquefied refinery gases (LRG)</td>
<td>Hydrocarbon gas liquids produced in refineries from processing of crude oil and unfinished oils. Ethane, ethylene, propane, propylene, normal butane, butylene, isobutane, and isobutylene.</td>
<td>Liquid propane or butane produced by a crude oil refinery. It may differ from LP-gas in that propylene and butylene may be present.</td>
</tr>
<tr>
<td>Natural gasoline</td>
<td>A commodity product commonly traded in NGL markets (mostly pentanes and hexanes) that remain liquid at ambient temperatures and atmospheric pressure. A subset of pentanes plus.</td>
<td>A mixture of hydrocarbons, mostly pentanes and heavier, extracted from natural gas.</td>
</tr>
</tbody>
</table>
Changes proposed by EIA to realign NGL data and related terminology

**Natural Gas Liquids (NGL)** Use in the singular as market term; exclude olefins and lease condensate

**Olefins** Separate as subset of Liquefied Refinery Gas (LRG); include ethylene, propylene, butylene, and isobutylene; exclude aromatics

**Natural Gas Plant Liquids (NGPL)** Discontinue NGPL as “field production of crude oil;” NGPL ≠ NGL

**Reserves** Change to “Expected Production from Total Natural Gas Proved Reserves,” with NGL and dry gas break-out

**Extraction Loss** Change name to “NGPL production”

**NGPL Composite Price** Rename composite spot price instead of “NGL Composite Price”

**Pentanes Plus** Make synonymous with plant condensate and define as “mostly pentanes and hexanes, including natural gasoline”

**Hydrocarbon Gas Liquids (HGL)** Create a new term, HGL = NGL + olefins = NGPL + LRG

**Liquefied Petroleum Gas (LPG)** Remove ethane and olefins from LPG definition

**Lease Condensate** Re-categorize exclusively as crude oil; excluded from NGL

NGPL + LRG = HGL = NGL + Olefins
Questions for our workshop attendees

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  – Separation of NGL and olefins
  – Creation of new term: Hydrocarbon Gas Liquids (HGL)
  – Changes to term Liquefied Petroleum Gas (LPG)
  – Removal of lease condensate as an NGL

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Thank you!


Short-Term Energy Outlook | www.eia.gov/steo

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Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy