UKRAINE’s Natural Gas Production 2020
CONTENT

1. Overview of Natural Gas Market

2. Exploration and Production Insights

3. Regulatory Policy
UKRAINE HAS SIGNIFICANT POTENTIAL TO ENHANCE DOMESTIC PRODUCTION OF NATURAL GAS

**Resource-rich country**

Conventional natural gas reserves are 805 bcm (2nd in Europe) among them 2P reserves account for 350 bcm. Only 2.8% to 6% of these reserves are extracted annually.

**Well developed infrastructure**

An extensive mid-stream infrastructure with an independent TSO allows rapid commercialization of new projects entering the domestic market (7th in Europe), with potential for gas export.

**Historical legacy**

Ukraine’s oil and gas industry has a 100 year history. In the late 1970s, gas production was three times higher than current volume.
UKRAINIAN MARKET IS THE 7TH LARGEST NATURAL GAS CONSUMER IN EUROPE, HOWEVER, MOSTLY DEPENDING ON IMPORT

Ukraine’s natural gas balance bcm

Import in 2019 14.3 bcm

Imports meet 1/3 of Ukraine’s gas demand.

Gas imported from three European countries.

Sources: AGPU, Naftogaz of Ukraine.
IMPORT PARITY PRICES TRADITIONALLY SECURE MARKET NETBACK FOR PRIVATE DOMESTIC PRODUCERS

Wholesale natural gas prices
US$/thcm

Consumption in 2019
29.8 bcm

Household sector accounts for 1/2 of total consumption. Currently all prices are market based.

Sources: UEEX, Naftogaz of Ukraine.
OVER THE YEARS ENERGY COMPANIES CONFIDENTLY KEEP THEIR PRODUCTION RATE FLAT

Natural gas production in Ukraine

Top 10 gas producers in 2019

<table>
<thead>
<tr>
<th>Year</th>
<th>UGV</th>
<th>DTEK</th>
<th>Ukrnafta</th>
<th>UNB</th>
<th>Burisma</th>
<th>Smart Energy</th>
<th>PPC</th>
<th>Geo Alliance</th>
<th>ZNS</th>
<th>KUB-GAS</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>19.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>20.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>21.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>20.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>14.904</td>
<td>1.660</td>
<td>1.160</td>
<td>735</td>
<td>697</td>
<td>369</td>
<td>281</td>
<td>210</td>
<td>152</td>
<td>131</td>
<td>402</td>
</tr>
</tbody>
</table>

Sources: AGPU, Ministry of Energy and Environmental Protection of Ukraine.

No mandatory NOC participation rules apply.

State share on the market remains high – Naftogaz Group accounts for 80% of total production.
UKRAINE IS CAPABLE TO MEET OWN DEMAND AND EVEN TO BECOME AN EXPORTER OF NATURAL GAS BY 2028

By 2028 total natural gas production may grow up to 30 bcm (by 43%).

55% of produced gas has to come from new conventional and unconventional projects (greenfields).

Gross investments in E&P sector should be increased threefold and total $38 billion over a 10 year period.

Investments are supposed to cover E&P of additional 320 bcm of 2P reserves.
1. Overview of Natural Gas Market

2. Exploration and Production Insights

3. Regulatory Policy
UKRAINE HAS RICH RESERVES AND VAST UNLOCKED RESOURCES POTENTIAL

Discovered hydrocarbons in Ukraine
International and national classification

<table>
<thead>
<tr>
<th></th>
<th>Natural gas</th>
<th>Oil and condensate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bcm</td>
<td>min t</td>
</tr>
<tr>
<td>Proved reserves</td>
<td>280</td>
<td>33</td>
</tr>
<tr>
<td>Probable reserves</td>
<td>65</td>
<td>13</td>
</tr>
<tr>
<td>Possible reserves</td>
<td>80</td>
<td>29</td>
</tr>
<tr>
<td>Reserves 3P</td>
<td>119</td>
<td>75</td>
</tr>
<tr>
<td>Contingent resources (3C)</td>
<td>464</td>
<td>95</td>
</tr>
<tr>
<td>Booked reserves (national classification)</td>
<td>805</td>
<td>138</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Oil and Gas reserves and resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>million barrels of oil equivalent (mmboe)</td>
<td></td>
</tr>
<tr>
<td>Proved reserves</td>
<td>3477 mmboe</td>
</tr>
<tr>
<td>Probable reserves</td>
<td>+1160 mmboe</td>
</tr>
<tr>
<td>Possible reserves</td>
<td>+1490 mmboe</td>
</tr>
<tr>
<td>Reserves 3P</td>
<td>24 years</td>
</tr>
<tr>
<td>Contingent resources (3C)</td>
<td>33 years</td>
</tr>
<tr>
<td>Booked reserves (national classification)</td>
<td>47 years</td>
</tr>
</tbody>
</table>

Note: Audit of reserves and resources conducted according to SPE PRMS for: UGV (M&L, 2017, including tight gas reservoir resources), Ukrnafta, Geo Alliance (D&M, 2016), PPC, Burisma Group (D&M, 2018), Cub Energy (R&S, 2018), Regal Petroleum, Cadogan Petroleum, Kashtan Petroleum. For the rest, calculation is carried out according to the national classification, where the following analogies have been used: Proved - 111 (P); Probable – 121, Possible – 122. Resources (contingent) includes subcategories 211-221-222-332. Booked reserves according to the national classification, also include undistributed reserve fund of natural gas (36 bcm), crude oil and condensate (18 mln t).

Source: AGPU, companies’ open data, State Geologic and Subsoil Survey of Ukraine.
AT THE SAME TIME, PROSPECTIVE RESOURCES ARE LOCKED AT GREAT DEPTHS…

Distribution of gas prospective resources by depth
C3, subcategory 333

Over 70% of prospective resources are deeper than 3,000 meters and 22% are at depths below 5,000 meters.

With the attractive pricing and fiscal conditions, a great part of prospective resources could be transferred to a reserves category in the near future.

* Prospective resources in places delineated based on seismic data, but not confirmed by drilling.
AND ARE SPREAD ACROSS MANY SMALL FIELDS

Distribution of gas fields by size
402

Distribution of oil fields by size
197

Over 92% of fields have reserves less than 5 bcm and 5 mln t. They are considered as small and very small. Large and middle-size fields, accounting for a half of the country’s reserve belong to state-owned companies. However, these fields are at the final stage of development with a depletion over 70%.

Source: AGPU, State Geologic and Subsoil Survey of Ukraine.
ON TOP OF THAT, UKRAINE HAS SIZABLE AMOUNT OF TIGHT GAS RESOURCES

Ukraine has significant potential of unconventional resources, including tight sands. Its technically recoverable reserves are estimated at 1.2 trillion cm.

At the same time, development of tight gas horizons with low permeability and porosity is less attractive due to complexity of production:

- Low productivity of wells, requiring non-stop drilling
- Production enhancement (hydraulic fracturing) and horizontal drilling
- Short lifetime of wells (5 years) vs traditional gas wells (10-20 years)
- Rapid well flow rate decline (50% in 1 year)

These common features and such negative factors as significant depth of reserves, lack of hi-end services on the market make unconventional gas production commercially challenging.

Source: AGPU, IHS assessments, 2015.
UKRAINE’S SERVICE MARKET IS ONE OF THE LARGEST IN EUROPE, HOWEVER SOPHISTICATED PRODUCTION METHODS ARE HARDLY USED

Source: AGPU, Baker Hughes Rig Count.

Ukraine’s oil field service market pcs.

- Drilling rigs: 150
- Workover rigs: 390
- Coiled tubing units: 950
- Hydrofracuring fleets: 210
- Other contractors:
  - Drilling rigs: 91
  - Workover rigs: 102
  - Coiled tubing units: 21
  - Hydrofracuring fleets: 6

Ukraine has the largest onshore rig fleet in Europe.

Availability of industry experts and competent engineering and technical staff.

Wide range of services contractors.

Well-developed supply chain of manufactured goods (pipes, cement, etc.).

Big 4 OFSC operate on the market.

Source: AGPU, Baker Hughes Rig Count.
1. Overview of Natural Gas Market

2. Exploration and Production Insights

3. Regulatory Policy
TO ATTRACT INVESTMENTS, THE UPSTREAM REGULATIONS HAVE BEEN DRASTICALLY IMPROVED

The growth of domestic natural gas production is a strategic priority of Ukraine’s Government

Natural potential
- Substantial reserves base
- Large oil field services market
- Developed gas infrastructure
- Market-based prices

Regulatory environment
- Attractive fiscal regime
- Modern regulations
- Independent gas transmission operator

Access to reserves
- Open licensing rounds 2019/20
- Easy access to geoscience data
- One stop shop

Sources: AGIPU.
ATTRACTIVE TAXATION FOR NEW INVESTMENTS IN NATURAL GAS PRODUCTION

Fiscal regime

Friendly fiscal policy:
Incentive fiscal rates (6% and 12%) for new onshore gas wells drilled in 2018 and later.
The state guarantees the fiscal stability for a 5-year period.
5% of paid royalties are distributed for local communities’ development.
Producers are subject to the standard CIT rate of 18 %, and VAT of 20 %.

Tax revenue to state budget (%) from gas production by countries

FIELD DEVELOPMENT REGULATIONS HAVE BEEN IMPROVED IN TERMS OF TIME AND SIMPLICITY

During 2018-2019:

20+ permits and regulations have been abolished, providing easier access to land tracts.

Currently, there are three steps to be taken by operators:

- Acreage allotment: reach an agreement with landowner
- Wells’ drilling permit: meet the safety requirements
- EIA: meet the environmental standards

Source: AGIPU.
IN 2019, UKRAINE ENTERED INTO A GLOBAL COMPETITION TO ATTRACT INTERNATIONAL CAPITAL

*Ukraine was in the **TOP 10 countries**, offering bid rounds*

39 blocks

25000 sq. km

Source: Enverus.
ROUND1: MORE THAN TEN DOMESTIC AND INTERNATIONAL COMPANIES WERE AWARDED WITH 28 E&P LICENSES IN 2019

<table>
<thead>
<tr>
<th>Key outcomes</th>
<th>Licenses number</th>
<th>Acreages sq. km</th>
<th>Reserves bcm</th>
<th>Best bidders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concessions</td>
<td>19</td>
<td>2940</td>
<td>YTF(^1)</td>
<td>6</td>
</tr>
<tr>
<td>greenfields</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSAs</td>
<td>9</td>
<td>11400</td>
<td>YTF(^1)</td>
<td>7</td>
</tr>
<tr>
<td>greenfields</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PECs</td>
<td>13</td>
<td>385</td>
<td>14.8</td>
<td>Under</td>
</tr>
<tr>
<td>brownfields</td>
<td></td>
<td></td>
<td></td>
<td>consideration</td>
</tr>
</tbody>
</table>

Note: 1. Predominantly, the blocks have undiscovered hydrocarbons resources estimated as inferred (yet-to-find).

Source: AGPU.
ROUND 1: AS A RESULT, WINNERS COMMITED TO INVEST $600 MILLION TO 1.5 BILLION IN EXPLORATION DURING A FIVE YEAR PERIOD

Ukraine 2019: Licensing Rounds
5 years commitments

<table>
<thead>
<tr>
<th></th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment, $ mln</td>
<td>1500</td>
<td>600</td>
</tr>
<tr>
<td>3D sq. km</td>
<td>5600</td>
<td>4500</td>
</tr>
<tr>
<td>Exploration wells</td>
<td>73</td>
<td>58</td>
</tr>
</tbody>
</table>

Source: State Geologic and Subsoil Survey of Ukraine.
ROUND 2: SIX COMPANIES SUBMITTED PSA BIDS IN FEBRUARY 2020, HALF OF THEM ARE INTERNATIONAL PRODUCERS

<table>
<thead>
<tr>
<th>Block onshore</th>
<th>Acreages, sq. km</th>
<th>Bidding* companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grunivska</td>
<td>1082</td>
<td>UGV, Vermilion Energy, EPH(NAFTA)</td>
</tr>
<tr>
<td>Ichnyanska</td>
<td>2086</td>
<td>York Energy</td>
</tr>
<tr>
<td>Okhtyrska</td>
<td>672</td>
<td>UGV, Vermilion Energy, DTEK, EPH(NAFTA), UNB</td>
</tr>
</tbody>
</table>

* The winners have to be selected in April 2020
OIL AND GAS LICENSING ROUNDS 2020: UKRAINE IS READY TO OFFER 30 000 sq. km OF ACREAGES

Round 2
(application deadline expired)
- February - 3 onshore PSA blocks

Round 3
(new PSA tenders and concession auctions)
- 2Q 2020 - 3 onshore PSA blocks
- 2Q 2020 - 2 offshore PSA blocks
- 30 + onshore concession blocks
- Yuzivska and Oleska PSA projects
  (open for partnership with “Nadra of Ukraine”)

Source: State Geologic and Subsoil Survey of Ukraine.
CONTACTS

STATE GEOLOGIC AND SUBSOIL SURVEY OF UKRAINE

16 Anton Tsedik St, Kyiv, Ukraine, 03057
+38 044 536 13 18
investment@geo.gov.ua
www.geo.gov.ua

ASSOCIATION OF GAS PRODUCERS OF UKRAINE

42/44 Shovkovychna St, office 11-B, Kyiv, Ukraine, 01024
+38 044 536 53 64
+38 097 536 53 64
office@agpu.org.ua
www.agpu.org.ua