

**MND a.s.**  
Czech Republic

# Vienna Basin Exploration and Field Development

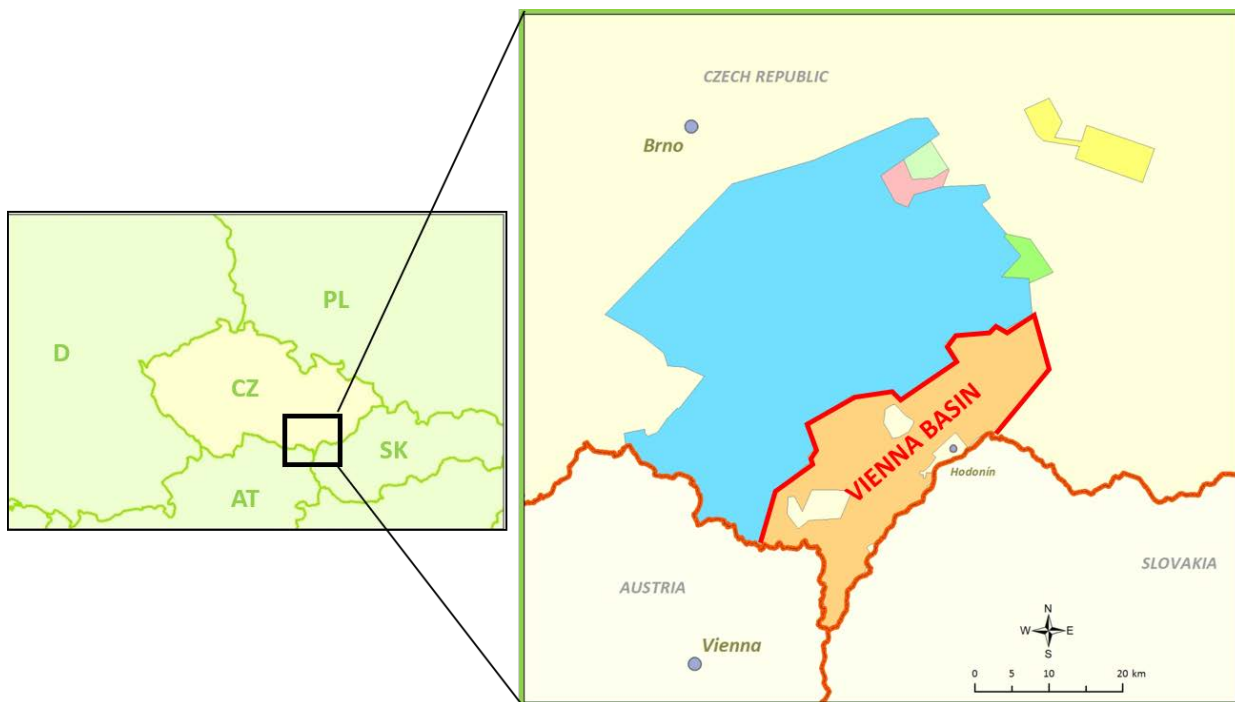
Farm out Brochure  
July 2020



**MND**

## MND a.s. - VIENNA BASIN EXPLORATION LICENSE

**Figure 1** Location of Vienna Basin Exploration License



### Opportunity Summary

MND a.s. is seeking a Joint Venture partner for a farm out of the exploration activities in the Vienna Basin VIII Exploration License and selected Mining Plots in the Czech Republic. The proven hydrocarbon system includes all levels of Vienna

Basin sedimentary fill. In total, 27 leads and prospects are identified and documented of the Pmean Prospective Resources 1,552 MCMOE (9.8 MMBOE)

Units and Multipliers: CM - Cubic Meter, CMOE - Cubic Meter of Oil Equivalent, M - Thousand, MM - Million

### License Summary

Valid till	31. 12. 2025
Area	532 sq km (131,460 acres)
MND share	100%
3D survey	541 sq km (1995 - 2007) - partly out of license
No. of wells	2,000+

MND has held the exploration area since beginning of its exploration history. After privatization of NOC (Moravske Naftove Doly) in 1992, all assets including database of vintage data were transferred to MND. In accordance with the Terms and Conditions

of the license lease, there is no obligatory work programme - the only legal requirement is an annual license fee that has to be covered. The fee is progressive; in 2020 about 350,000€ was paid and there is an annual increase of about 19,000€.

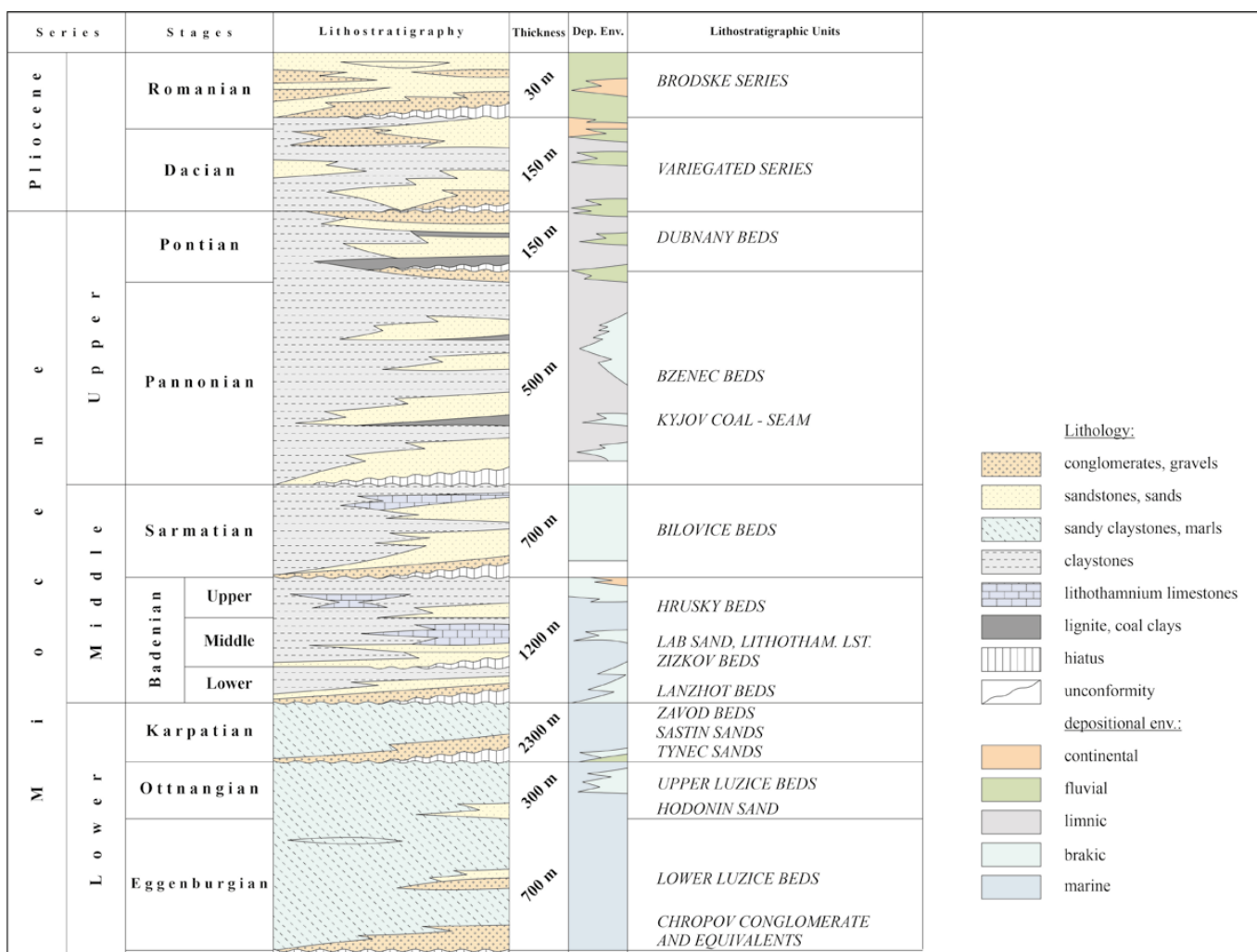
## Regional Settings and Petroleum Geology Overview

The Vienna Basin is situated between the Eastern Alps and Western Carpathians. It is a polyhistorical basin whose rhomboidal shape is related to its strike slip development phase. Czech territory covers its northernmost closure, where it is divided by normal faults into numerous fault blocks. The Vienna Basin fill is of the Lower to Upper Miocene age, at the surface covered by Quaternary deposits. The fill is comprised mainly of clastics (very fine ss. to fine conglomerates) and pelites with aleuritic layers. Only occasionally do carbonate patch reefs occur. The sediments are of shallow marine, deltaic, lagoonal, and riverine origin.

The reservoir rocks can be found in a whole sedimentary column and are related to the clastics and carbonates. The sealing is provided either by overlying and juxtaposed pelitic rocks or by fault gauge. The structural trap type prevails, but combined and stratigraphic traps are also proven. The source rock of thermogenic hydrocarbons is proven to be combined Jurassic Mikulov Marls and Paleogene Flysh that provide the Vienna Basin basement. Only a minor portion of hydrocarbons is considered to be of biogenic origin.

Traps are mostly formed by several tectonic stages and/or by erosion.

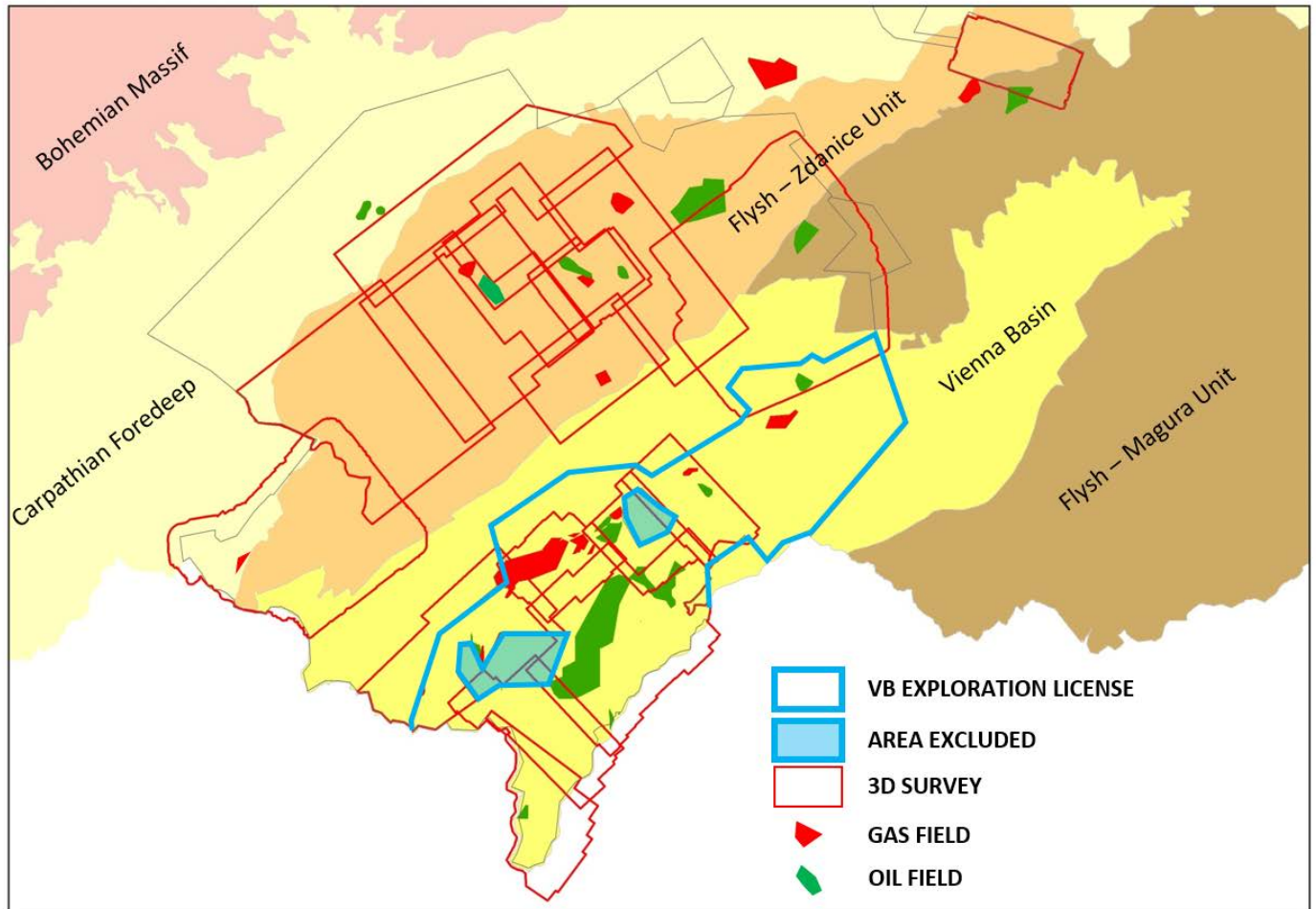
**Figure 2** Lithostratigraphical chart of the Vienna Basin



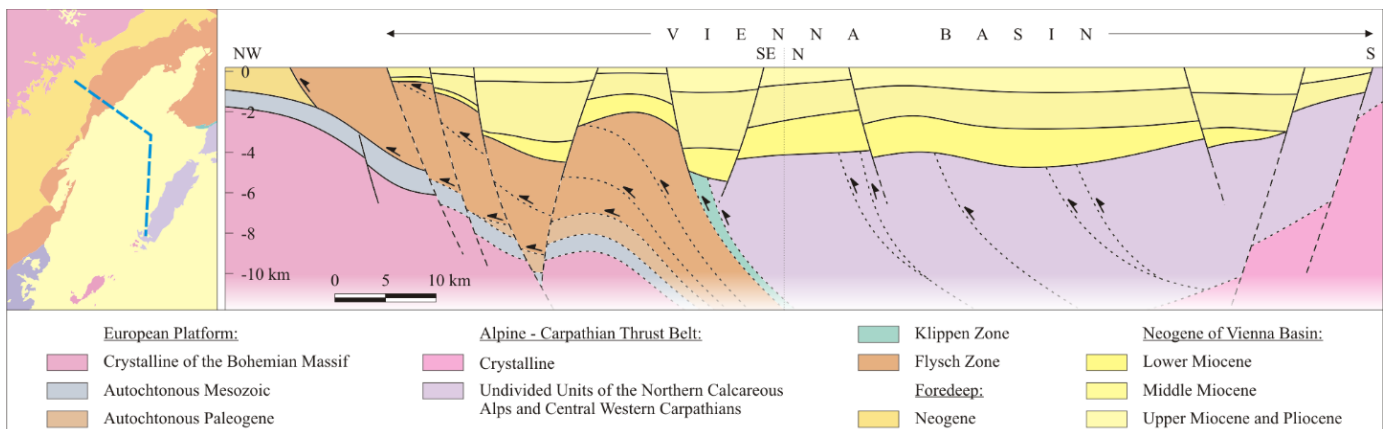


## Regional Settings and Petroleum Geology Overview

**Figure 3** Map of VB Exploration License and coverage by 3D seismic



**Figure 4** Schematic cross-section of Vienna Basin (Prochác at col., 2012)



## Exploration History

The HC seeps in the Vienna Basin region have been known since ancient times. The first attempts to explore and discover HC fields for industrial purposes were made at the beginning of 20th Century at the Czech and Slovak border. During the first half of the 20th Century, the first HC fields were discovered in shallow depths of the Ratiškovice, Vacenovice, Hodonín, Bílovice - Žižkov and Břeclav areas in Upper and Middle Miocene sediments.

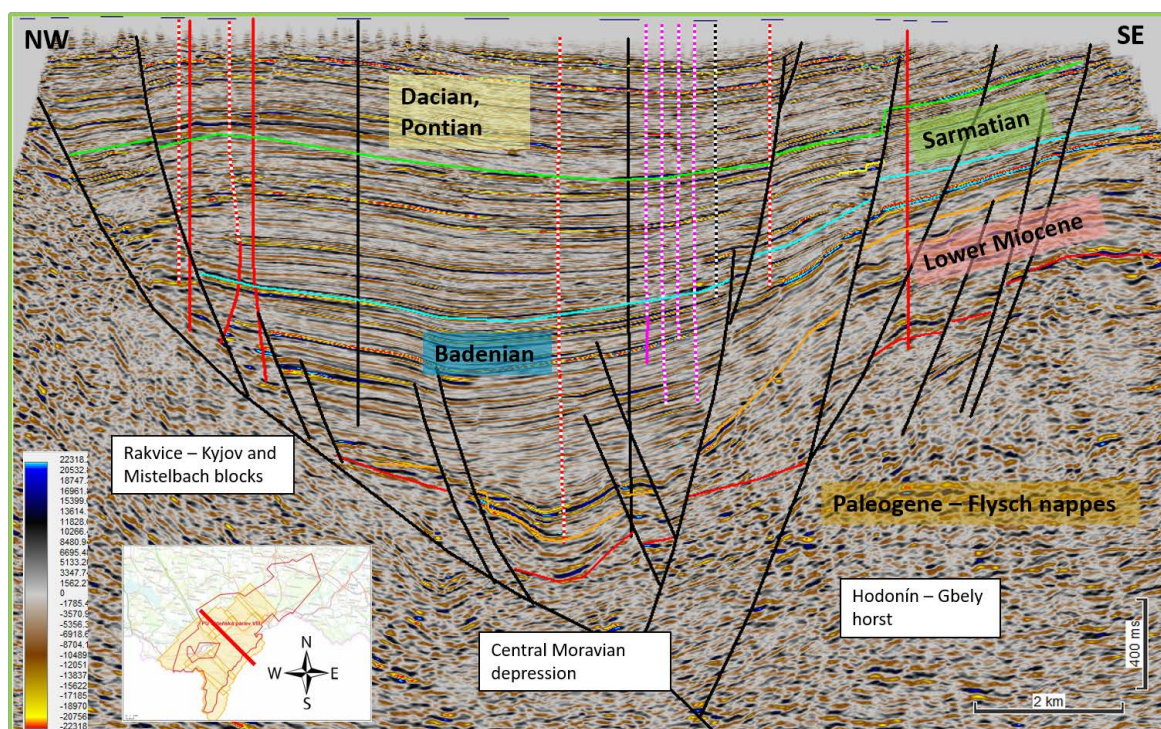
The most important fields, among others, in the Czech part of the Vienna Basin are Poddvorov - discovered in 1952, Lanžhot (1957) and Hrušky (1959). These fields are still producing. The most important horizons at these fields are 12th - 14th Sarmatian, 7th Upper Badenian, 12th Middle Badenian "Láb" horizon, and basal Middle and Lower Badenian. All of the horizons comprise very fine sandstones to fine conglomerates with good to excellent primary porosities, usually between 16 - 30%, and permeabilities varying between 300 mD - 3.5 D.

There were also important new fields discovered: Poštorná (2002) where the oil and gas-bearing horizons belong to Middle Badenian Poštorná sands, Prušánky (2001) where the main horizon is the 12th Middle Badenian "Láb" horizon, and Ladná (2011) where Láb horizon and underlying Žižkov member are the main HC-bearing horizons. Prušánky is considered to be the biggest single structure - single horizon field discovered in the Czech Vienna Basin, where 260 MMCM of Gas and 58 MCM of Oil

have been produced to date (remaining 2P 74 MCMOE in 2020). The follow-up potential of the whole Vienna Basin block remains large. There were several shallow low risk - low reserves prospects identified around the region in Sarmatian age strata. The main remaining potential of the Vienna Basin is the Lower to Middle Miocene age and basement Flysh horizons in deeper structures. They represent medium to high risk - high reserves potential. Finally, old field development and secondary production represents an additional potential of the basin fill.

The whole license Vienna Basin VIII is covered by 1,164.1 km of 2D profiles that were acquired between the years 1970 - 2004. Different methodology was used through the years, from dynamite to vibroseis, resulting in variable quality. About 2/3 of the license is covered by 3D seismic. It was acquired in 7 separate blocks covering 541.1 km<sup>2</sup>, through the years 1995 - 2007, with dynamite and vibroseis methodology. All blocks are merged pre-stack (2009) and several seismic versions - including relative amplitude preservation and AVO attributes - were produced. The latest reprocessing of the merged seismic was done in 2019 by MND using a 5D regularization method - a PSTM cube of this version is also available. All migrated gathers are available as well for further analysis. The seismic quality is dependent on the blocks' age and methodology used, but in general it is good to very good.

**Figure 5** Seismic data quality in Exploration License Area





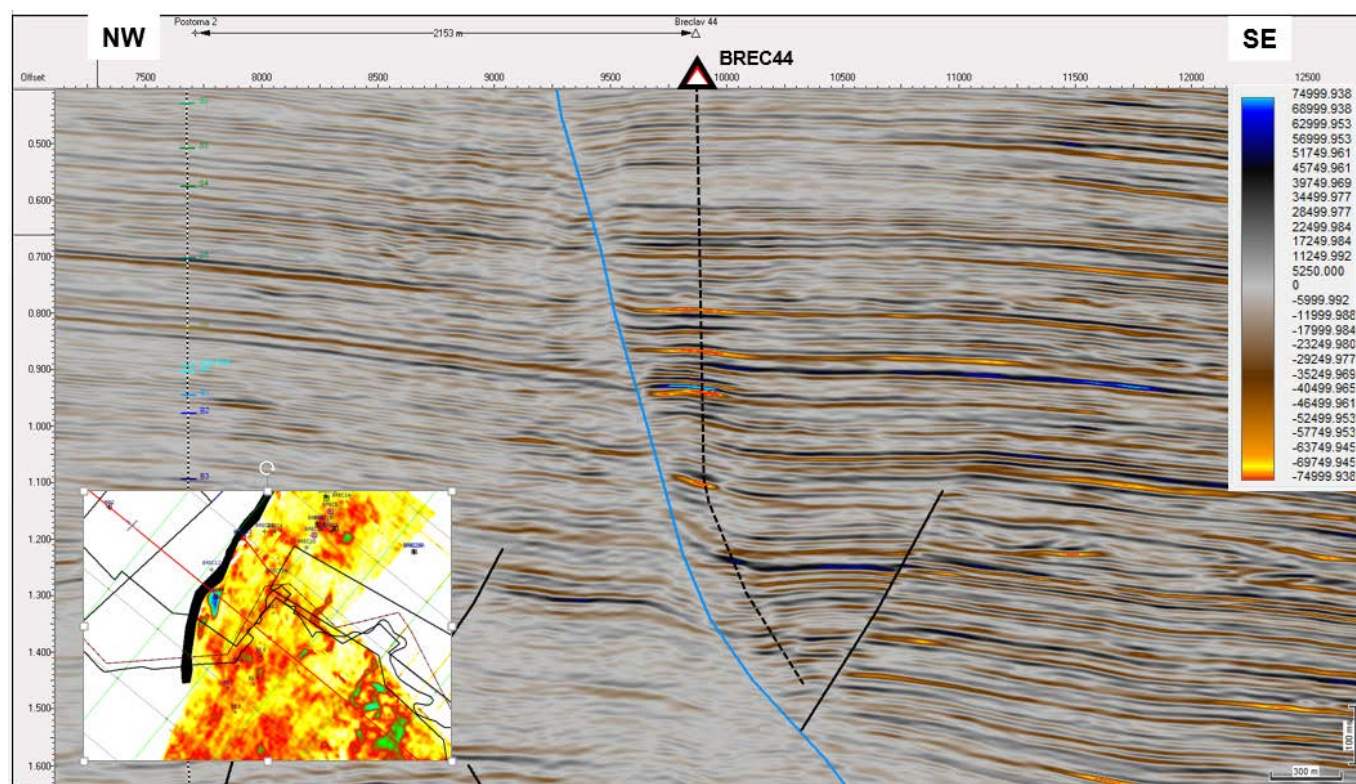
## VIENNA BASIN FARM OUT OPPORTUNITY - EXPLORATION AREA

### Existing L&P portfolio

A major part of the exploration license is covered by 3D survey, and the exploration strategy in the past twenty years has been focused on undiscovered structures in Sarmatian and Badenian sediments. The interpretation of 3D data has led to a number of discoveries.

The recent portfolio consists of 27 leads and prospects and a further 13 opportunities. The projects are mostly low risk - low reward to mid risk- mid reward range. Average Prospective Resources (L&P only) is 57.5 MCMOE and PoS 30%. The proximity of tie-in infrastructure makes those smaller prospects (usually 1-well fields) economical.

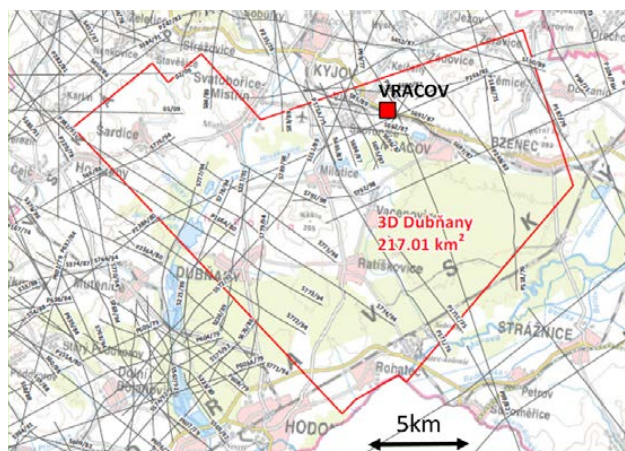
**Figure 6** Breclav 44 prospect is targeting shallow Sarmatian sediments. The expected gas accumulation is identified based on direct hydrocarbon indication (DHI) - high seismic amplitude response, and prominent AVO class III anomaly.



## Acquisition of 3D Survey in northern part of the license

The northern part of the license is still not covered by 3D seismic survey. A survey of about 200 sq km can be acquired for a reasonable budget - the area is flat and easily accessible. The Vracov oil field that would be covered by such a 3D can be added to the package. Remaining 2P reserves are estimated to 18.5 MCM of oil; however, it is very likely that better definition of structure by 3D data will lead to identification of not yet found compartments.

► **Figure 7** 3D polygon proposal, coverage of the area by vintage 2D lines and position of Vracov oil field

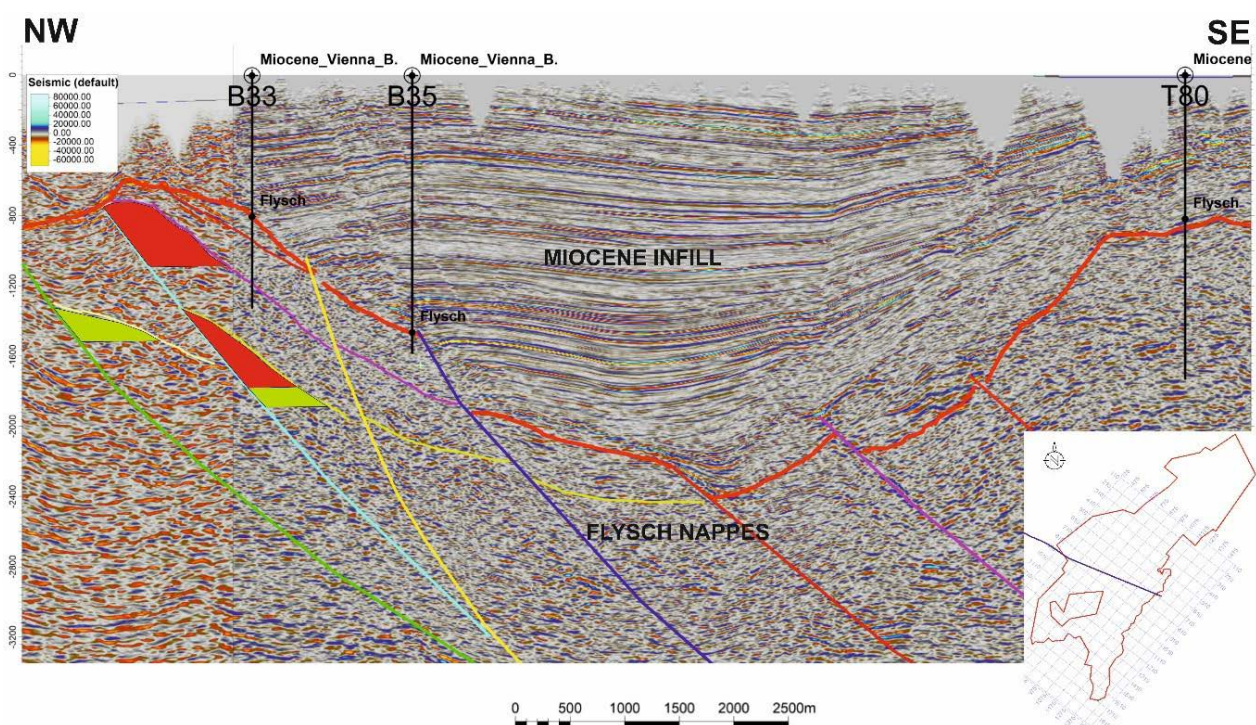


## Exploration of Flysch basement of Vienna Basin

The underlying Flysch strata (Raca Unit) was not a main target of the exploration in the past; however, the results from the Austrian part of the Vienna Basin show significant potential. Especially the west flank of the Vienna Basin can be considered as an extension of the hydrocarbon-prone area. The presence of analogue of Austrian flysch fields - St. Ulrich-Hauskirchen, Rag-Feld, Gösting, Neusiedl - is high. The reservoir rock of these fields, the

glauconitic sandstones, has been proven in the Czech part of the basin also. The flysch part is only partly covered by 3D data and only several wells penetrated the deeper part of the strata. That is why the exploration has to be considered as high risk. The acquisition of the 3D survey focused on flysch (long offset, higher source energy) would reduce the exploration risk.

**Figure 8** NW - SE geological cross-section showing the upper - Upper Eocene gas saturated and lower - Middle Eocene oil saturated parts of Bošovice field





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## Existing Mining Plots

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Four existing MND Mining Plots are included as part of the farmout/divestment of an interest and are subject to negotiation. The offered fields are developed for decades. From an MND

perspective, they are at the end of a field life cycle; however, a new review, experience and know how might yield undiscovered potential.

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### Lužice Mining Plot

The indication of hydrocarbons and field structure was discovered by a shallow wells programme (counter flush) and diffraction seismic, during the years 1942 - 43. The first well, Lužice 1, was drilled in 1944 to 1,228m and discovered oil in Eggenburgian and gas in Sarmatian horizons. The field was developed by 175 wells, of which 68 were producers. The structure of the Lužice field is a fault-bound elevation of basement Flysh with onlapping Miocene strata. Miocene sediments also

form stratigraphic and structural types of traps. The main oil and gas bearing horizons are basal Eggenburgian and Ottnangian clastic horizons. The whole complex of basal clastics reaches up to 260m, with particular horizons about 10m thick. Badenian horizons are rather lenticular or horizontally limited, whereas Sarmatian horizons are regionally very stable. Cumulative production from this field reached approximately 445 MCM of oil and 14 MMCM of gas.

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### Týnec Mining Plot

The exploration of the Týnec elevation begun at the end of WWII by drilling the well Týnec 1, which turned out to be dry. The exploration of the area started again during the 1950s. During this time, an oil and gas field was discovered in the Ottnangian and Eggenburgian clastics. During the 70s, exploration returned to the Týnec area again, based on the results in the closer Slovak Čunín

field. New separate traps in Flysh and Lower Miocene strata were found. The last wells were drilled in 1988 - Týnec 137 discovered a gas field in Middle Miocene Láb horizon equivalent. In total, 137 wells were drilled in the area of the Týnec field. Cumulative production is 445 MCM of oil and 5.7 MMCM of gas.

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### Hrušky Mining Plot

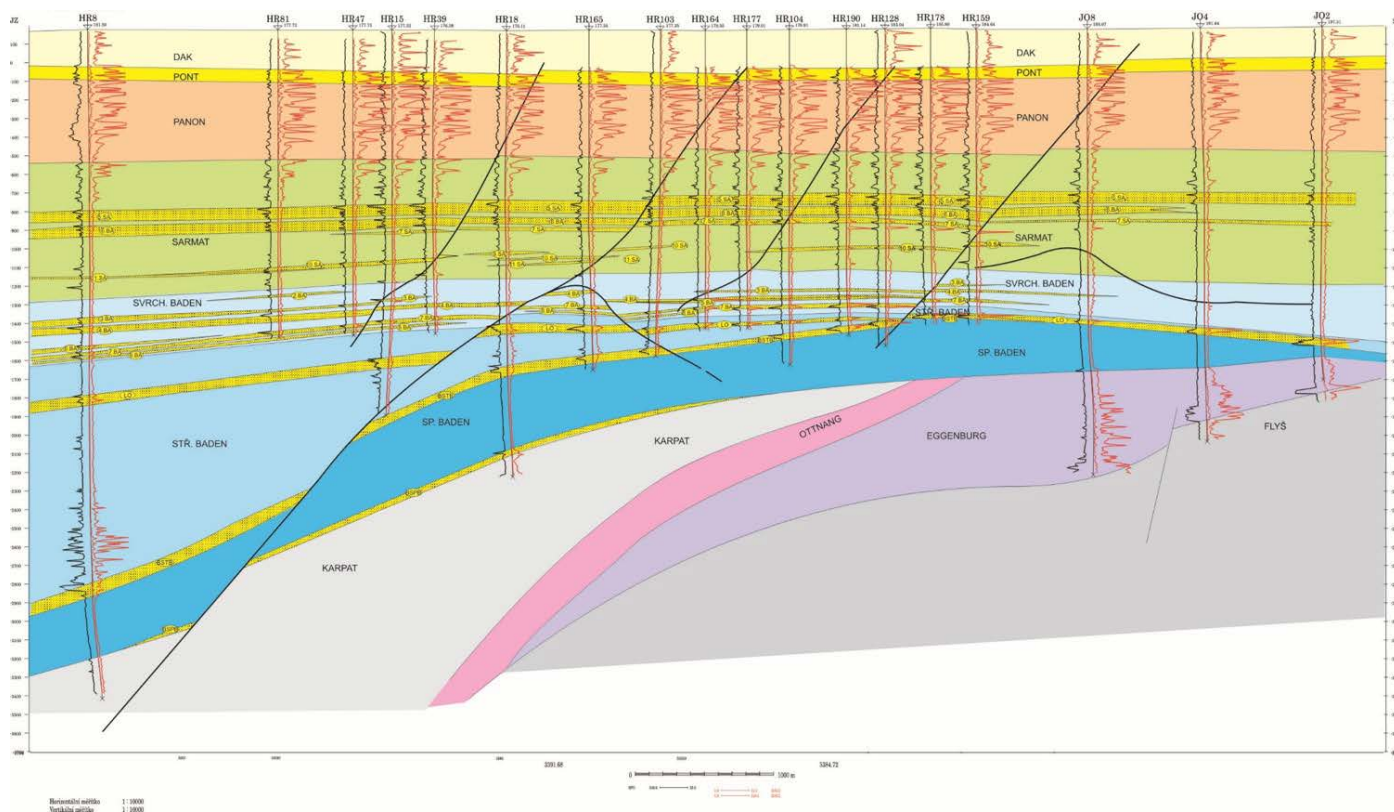
The Hrušky field was based on shallow drilling programme results and the first 2D reflective seismic, discovered in 1959 by the well Hrušky 1, which discovered the oil zone of the most productive 7th Upper Badenian horizon. It remains under production. Among many others, the most important horizons at this field are 9th - 11th Sarmatian complex, 12th - 14th Sarmatian complex (used as UGS in the southern part of the field), 5th, 7th and 9th Upper Badenian, 12th Middle Badenian "Láb" horizon, and basal Middle and Lower Badenian. Hrušky is the overall

biggest field in the Czech Vienna Basin; part is, from a structural and sedimentological point of view, a very complex field found in a large number of fault blocks and horizons. In total, 260 wells were drilled in the area and 73 special UGS wells. Cumulative production of this field to date is 1.94 BCM of gas and 1.7 MMCM of oil.

The remaining potential (2020 MND Book of Reserves and Resources) is 20.6 MCMOE 2P and 272.2 2C reserves.



**Figure 9** General section through the Hrušky field with highlighted position and main oil and gas bearing horizons (yellow layers). It is important to note that any of the sandy horizons from the top of Sarmatian strata are HC bearing or with strong HC shows and can be a possible exploration target.



### Lanžhot Mining Plot

As the position and results of the well Lanžhot 1 are unknown, the first discovery well drilled in the southern part of the Hodonín - Gbely horst (south-eastern limit of the Czech VB part at the Slovak, Austrian and Czech boundary) was in 1956, Lanžhot 2, which discovered an oilfield in Lower Badenian strata. The field was developed by 27 wells, of which 10 were producers and

the rest was dry. Main producing horizons are 26th - 28th Lower Badenian clastic horizons and basal conglomerate. Secondary targets were clastic horizons of Sarmatian and Panonian age. Cumulative production from the field is 119 MCM of oil and 199.4 MMCM of gas.



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## Infrastructure

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The Czech Republic has a well-developed gas network and a number of oil fields are producing in the area. Tie-in costs

in the Vienna Basin License Area are expected to be low, as infrastructure of both existing and depleted fields is close by.

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## Data availability

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All data from the Exploration license area are available. Most of the data is available in digital format – including well data, 2D and 3D seismic (from field data to final products), the extensive archive of well files and G&G reports. All the available data for the Vienna Basin License, including the Kingdom and/or Petrel

workstation, will be made available in the data room after execution of the appropriate Confidentiality Agreement.

The MND Technical team is based in Hodonin, Czech Republic – a 1.5-hr drive from Vienna Airport.

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## Terms

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Whilst MND is a well-resourced company with considerable technical expertise, the new company policy is to maintain a commercial level of risk and boost the exploration programme through co-operation and partnership.

The co-operation between MND and the Partner will be covered by a Joint Venture Agreement, establishing an unincorporated civil law association (JV). MND will provide its rights to the Vienna Basin License for the JV purpose. The overall work programme up to 2025 is expected to include eight exploration/appraisal wells and a suitably qualified partner will be required to carry the drilling cost for part of the programme (subject to negotiation).

Other G&G activities, e.g., seismic data reprocessing, initiated by Partner will be 100% financed by the initiating party, if not agreed otherwise. The overall work programme up to 2025 is expected to include eight exploration/appraisal wells.

Cooperation on Mining Plots will be also covered by the Joint Venture Agreement. After analysis and evaluation, the Partner is expected to propose and finance the development (redevelopment) programme. The added production (above recent 2P production profile) would be shared proportionally (subject to negotiation).

MND is also open to cooperation via an asset swap.

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## Contacts

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